WxSolution

Software Reference Manual

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Introduction

WxSolution is a robust software product that interfaces with the Heathkit ID-5001 Advanced Weather Computer, the Heathkit ID-4001 Digital Weather Computer, the Davis Weather Monitor II and Vantage Pro, and Texas Weather Report WR-25, Peet Bros. Ultimeter, and the Oregon Scientific WMR-968 weather computers to produce climatological data reports and to provide remote data access. WxSolution software provides numerous features to analyze and generate many types of reports. Remote access offers the viewing of real-time data and retrieval of historic data. WxSolution can also be programmed to send numeric pages to a pager when certain user-defined conditions are met such as (but not limited to) high winds, heavy rains, or low temperatures. WxSolution uploads current data to APRSWXNET/CWOP, Weather Underground, Weather For You, and Anything Weather as well as the user's own web site. WxServer, which is part of WxSolution, is an Internet server that allows access to real-time data via the Internet using WxClient. WxSolution imports archives and databases from the Davis weather computers so that reports can be generated when WxSolution was not monitoring and recording data. And WxSolution also delivers daily, monthly, and annual reports as well as alerts by electronic mail. WxSolution continuously analyzes and records the current weather conditions 24 hours a day, 365 days a year to achieve these features.

1. Installation

This section will guide you through the installation of WxSolution.

1.1 System Requirements

WxSolution has been designed to operate on a computer that runs continuously 24 hours a day, 365 days a year. An uninterruptible power supply (UPS) is strongly recommended both for the PC and weather computer to prevent data loss during brief power failures. Refer to the appendices for information on how configure your PC for continuous operation.

To run WxSolution software you will need:

- Windows® XP/Vista/7/8.1/10 with the latest service packs installed
- Microsoft® Internet Explorer® 9 or higher
- Outlook Express® 6.0 or higher, or Windows (Live) Mail for email – supported on XP and Vista only
- 10 MB hard disk space + approximately 5 MB per month of usage
- One serial port and cable connected to the weather computer (also USB on Davis VP)
- WeatherLink® interface module required for all Davis systems
- WeatherLink-IP® interface module supported for all Davis Vantage Pro and Vue.
- Printer (recommended)
- Network connection (required for FTP, WxServer, and Internet data uploads)

1.2 Installing WxSolution

If you are installing on a computer that logs on to a network, please refer to Appendix A.4. WxSolution needs to start to run when the computer boots up. If a login prompt appears during boot up, WxSolution cannot start until you enter a username and password. If the computer reboots due to a power failure, for example, WxSolution cannot analyze and record data until you log in. This behavior defeats the "always-on" design of WxSolution!

Before installation:

- Double-check that the Windows Time Zone information on your computer is correct. To verify, double-click the time on the Windows System Tray, then select the Time Zone tab.
- Know which COM port is attached to the weather computer (ex. **COM1**, **COM2**, etc). You will need to select the correct port during configuration.

If you downloaded the installation program, follow the instructions in section 1.2.1. If you received WxSolution on CD-ROM, proceed to section 1.2.2.

1.2.1 Internet Download File

If the installation package was received electronically, then create a temporary folder on your hard drive and copy the downloaded file into the folder. Make a backup disk! (Copy the file to a CD-R/CD-RW or other storage medium.)

To install WxSolution:

1. Run the downloaded file to install WxSolution. Follow the on-screen prompts.

Proceed to section 1.2.3.

1.2.2 CD-ROM Installation

To install WxSolution:

1. Insert the CD-ROM. The Installation Program should start automatically. If not, run **Setup.exe** from the CD-ROM to install WxSolution. Follow the on-screen prompts.

1.2.3 Initial Configuration

Setup will create a shortcut to WxSolution in the Windows Startup folder that allows WxSolution to start automatically whenever the computer boots. Configure WxSolution by clicking the Windows **Start** button on the Task Bar and select **Programs→Startup→WxSolution**. The first time that WxSolution runs, it will prompt you to configure the essential configuration parameters. Refer to Configuration (section 2) for information about setting up WxSolution.

Context-sensitive help is available in WxSolution by pressing F1 on any screen.

2. Configuration

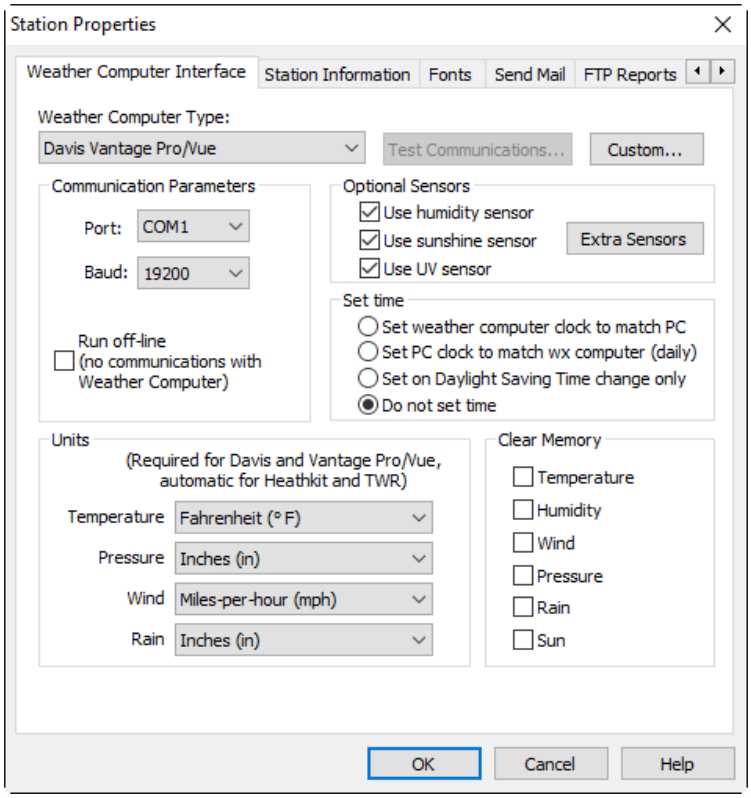
The first time WxSolution runs, the configuration screens in this section will be presented. You can also configure these parameters at any future time by selecting **File→Properties→Station Setup**.

You must configure the **Weather Computer Interface** before WxSolution can run. After completing the configuration, click **OK** to save the configuration and begin running WxSolution.

If WxSolution cannot communicate with the weather computer during start up, then the configuration screen will appear so that you can change any misconfigured communications parameters.

2.1 Weather Computer

The Weather Computer Interface screen selects the weather computer type, configures the communications parameters, and several weather computer properties.



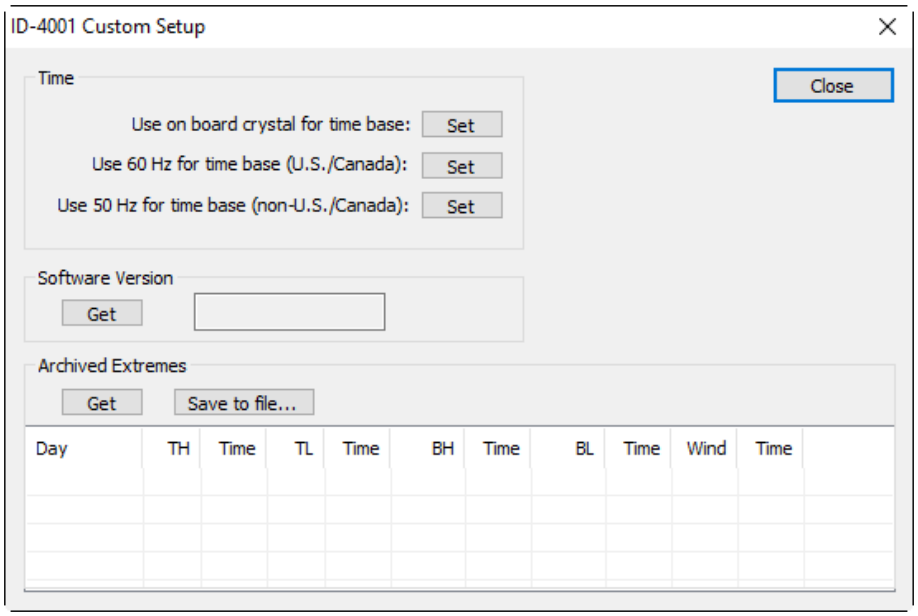
Changing the weather computer type, communications port or speed requires a restart WxSolution before the changes take effect.

Weather Computer Type	Select the weather computer model that is connected.
Port	Set the communications (COM) port to which the weather computer is attached. Ports that exist but are in use appear in parentheses. Before selecting a port that is in use, close the application that is using it. For the Davis Vantage Pro, the USB port and TCP/IP will also appear. **Default = COM1**.
Baud	Set the speed at which to communicate with the weather computer. Note that the speed ***must*** match the setting on the weather computer. Refer to your weather computer reference guide for determining and setting the baud rate. Defaults: Heathkit ID-4001: **19200** Heathkit ID-5001: **9600** Davis WeatherLink (WM2, WW3, GroWeather): **2400** Davis Vantage Pro: **19200** Texas Weather Report: **19200** Peet Bros Ultimeter: **2400** WMR-968: **9600**
Run Offline	When checked, WxSolution will not communicate with the weather computer.

Set Time	This selection allows the synchronizing of the clock on the PC with the clock on the weather computer. The clocks on most PCs are relatively inaccurate and will drift either fast or slow a few seconds per day. At startup and daily at 3:30 AM, WxSolution will set the time according to one of these settings. **Default = Do not set time.** ☞ The Davis WM2 cannot automatically adjust for Daylight Saving Time. Also, the WM2 cannot automatically roll over to leap day (February 29). You must set the date to 2/29 on the WM2 by selecting **Set Wx Computer Time** from the **File** menu. ☞ The Davis WM2 and VP do not include seconds when setting or getting time. (Time sets are performed using the current minutes and 00 seconds.) For the most accurate clock reading on the WM2, set the time at the beginning of the minute. For the Davis VP set the time about 15 to 30 seconds ***slow***. This is to ensure that the daily data can be read from the Davis at midnight. ☞ For the Heathkit ID-4001, the set time function will delay for 30 seconds after setting time before returning to observing current data because the ID-4001 "corrupts" the temperature and/or pressure during the set time operation. ☞ Reading or setting the time on the Texas Weather Report is currently not supported.
Units	WxSolution will automatically determine the units for ID-5001 and TWR users while Davis users will have to enter the units. **Default = °F, inches,** and **miles per hour.**
Use humidity sensor	If you have a humidity sensor attached to the weather computer, select this option. If not, deselect this item, which prevents the display of the humidity and dew point on the screen and in reports. **Default = checked**.
Use sunshine sensor	If you have the optional Thunderhead Technologies sunshine sensor installed on your Heathkit ID-5001 or are using the Davis Vantage Pro Plus, select this option. See Appendix A.3.2 for information about the Thunderhead Technologies sunshine sensor. This will add the sunshine parameter to the screen and on the reports. If you are not using a sunshine sensor on the Heathkit or you are using a Davis Monitor II or Ultimeter, deselect this item. **Default = unchecked**.
Use UV sensor	If you have a UV sensor attached to the weather computer, select this option. If not, deselect this item. **Default = unchecked**.
Extra Sensors	Click to configure which extra sensors are installed.
Test Communications	This selection will attempt to communicate with the weather computer using the configured weather computer type, COM port, and baud rate. This button will be grayed if WxSolution is currently communicating with the weather computer.
Custom	Will access custom settings for the selected Weather Computer. • For the Davis WeatherLink-IP use this to define the IP or MAC address and the TCP port. • For the ID-4001, this screen will allow custom configuration parameters and downloading the archive.
Clear Memory	Select which parameters to clear from the weather computer memory. Only applies to the Heathkit ID-5001.

2.1.1 Custom Settings for the ID-4001

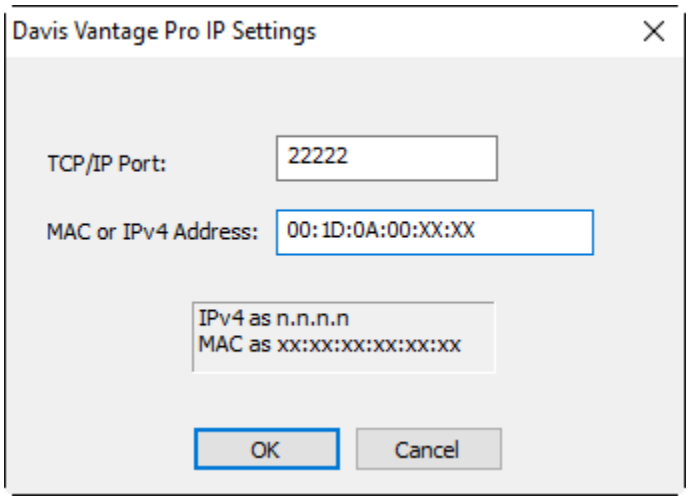
This screen allows you access and configure settings unique to the ID-4001.



Use on board crystal for time base	The ID-4001 will use the crystal on the upgrade CPU board to keep time. Use this setting if the line current frequency is inaccurate.
Use 60 Hz for time base	The ID-4001 will use the 60 Hz line current frequency for timekeeping. If the ID-4001 cannot auto-detect the line frequency, you can force it use 60 Hz.
Use 50 Hz for time base	The ID-4001 will use the 50 Hz line current frequency for timekeeping. If the ID-4001 cannot auto-detect the line frequency, you can force it use 50 Hz.
Get software version	Retrieves the 3-byte software version from the ID-4001. It is displayed in hexadecimal.
Archived Extremes – Get	Retrieves the high and lows for the previous 31 days and displays it on the screen.
Archived Extremes – Save to File	Retrieves the high and lows for the previous 31 days and saves it to a text file.

2.1.2 Custom Settings for Davis WeatherLink-IP

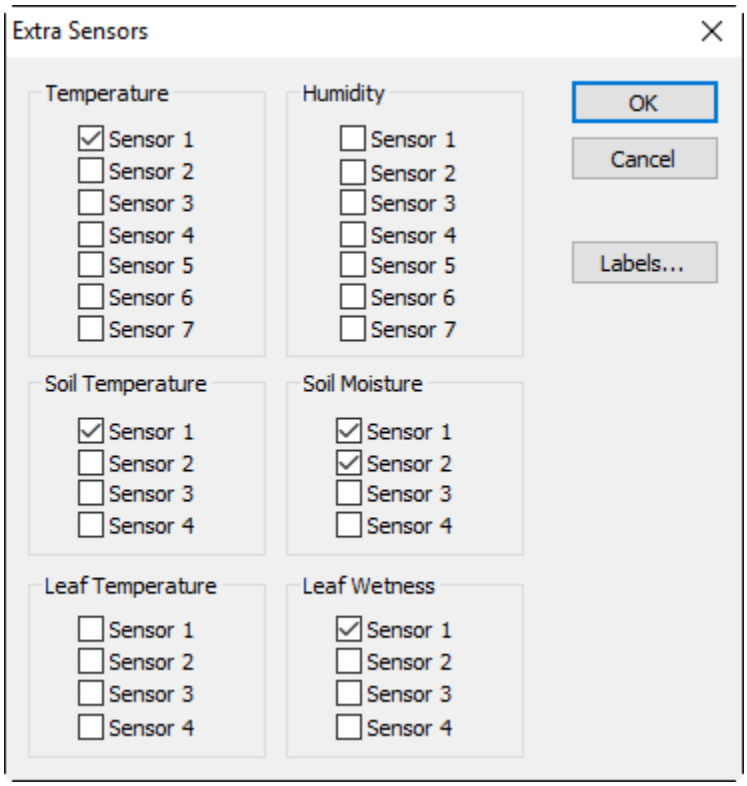
This screen allows you access and configure settings unique to the Davis WeatherLink-IP.



TCP/IP Port	Enter the TCP/IP port. It is typically fixed at 22222.
MAC or IP Address	Enter MAC address (DID) from label on the side of the WeatherLink-IP module, or enter the IP address of the device on the LAN.

2.1.3 Extra Sensors

Use this screen to indicate which extra sensors are in use.



Texas Weather Report

Temperature – Sensor 1	The auxiliary temperature sensor.

Davis Vantage Pro

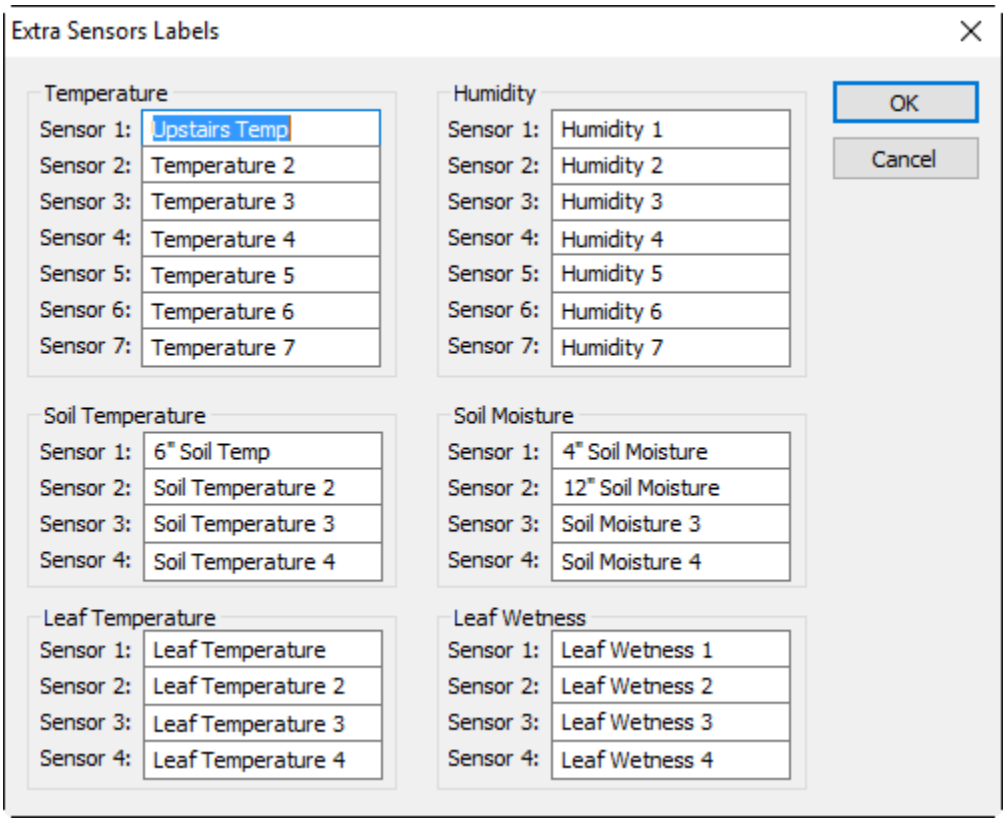
Temperature	Select sensor 1 - 7 in ascending order.
Humidity	Select sensor 1 - 7 in ascending order.
Soil Temperature	Select sensor 1 - 4 in ascending order.
Soil Moisture	Select sensor 1 - 4 in ascending order.
Leaf Temperature	Select sensor 1 - 4 in ascending order.
Leaf Wetness	Select sensor 1 - 4 in ascending order.

Notes:

- The Vantage Pro will designate each additional sensor in numerical order starting at one.

2.1.4 Extra Sensors Labels

Use this screen to enter the labels to use for the extra sensors.



Texas Weather Report

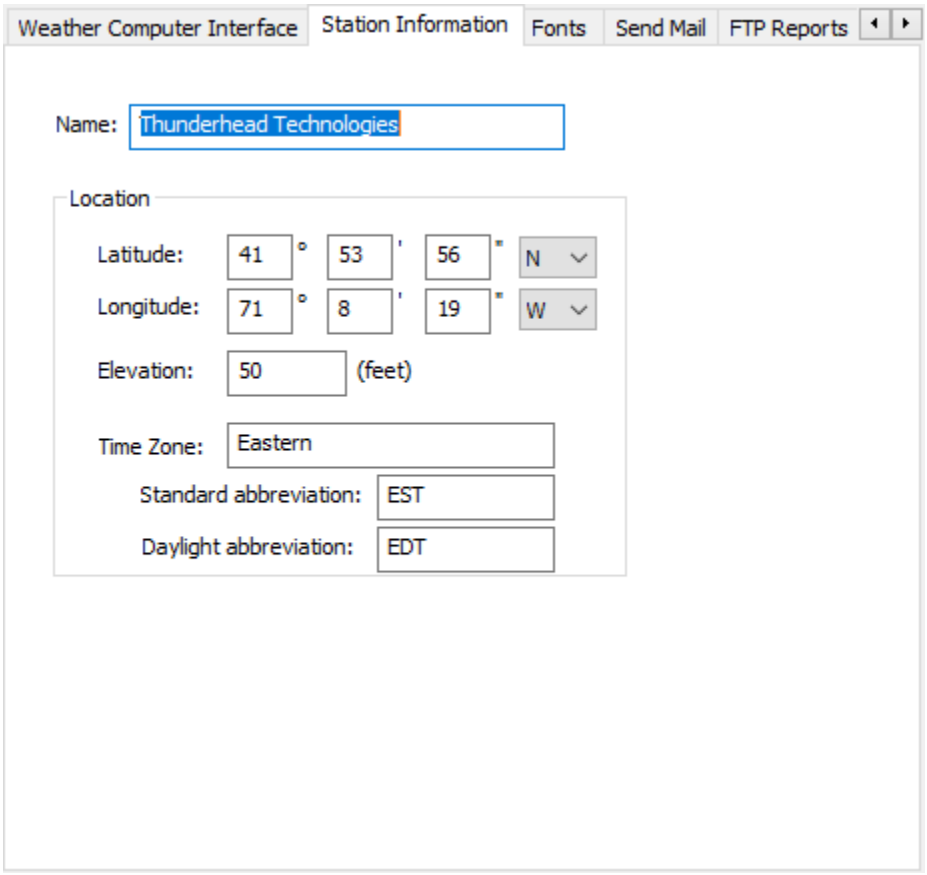
Temperature – Sensor 1	The auxiliary temperature sensor.

Davis Vantage Pro

Temperature	Select sensor 1 - 7 in ascending order.
Humidity	Select sensor 1 - 7 in ascending order.
Soil Temperature	Select sensor 1 - 4 in ascending order.
Soil Moisture	Select sensor 1 - 4 in ascending order.
Leaf Temperature	Select sensor 1 - 4 in ascending order.
Leaf Wetness	Select sensor 1 - 4 in ascending order.

2.2 Station Information

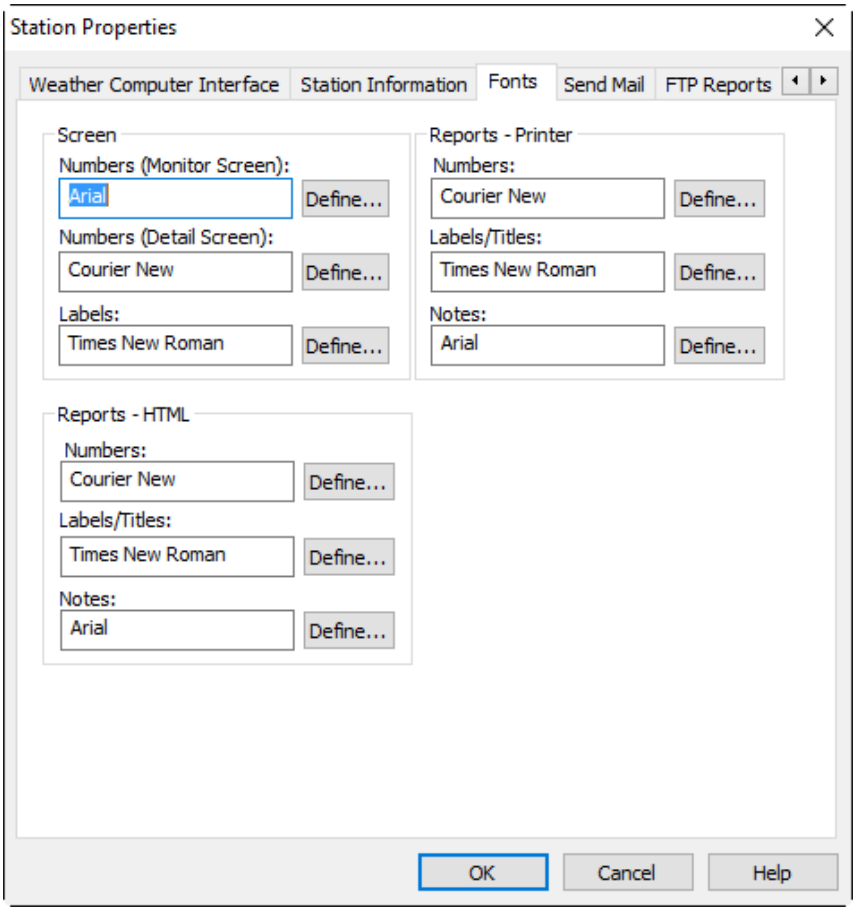
The Station Information screen prompts you for information about your station that will appear on the screen, on printed reports, and on remote access. You can also change this information at any future time.



Name	Assign a name to this station, for example “Taunton 2W”. Limited to 40 characters.
Latitude	Enter the degrees, minutes, seconds, and select “N” or “S” for this station's latitude.
Longitude	Enter the degrees, minutes, seconds, and select “W” or “E” for this station's longitude.
Elevation	Enter the ground elevation of this station in feet relative to sea level.
Time Zone	Enter the name of your time zone (WxSolution will retrieve the time zone name from Windows) but it may be changed.
Standard Abbreviation	Abbreviation for standard time. WxSolution build the abbreviation from the Standard Time from Windows. This value can be changed.
Daylight Abbreviation	Abbreviation for daylight saving time. WxSolution build the abbreviation from the Daylight Saving Time from Windows. This value can be changed.

2.3 Fonts

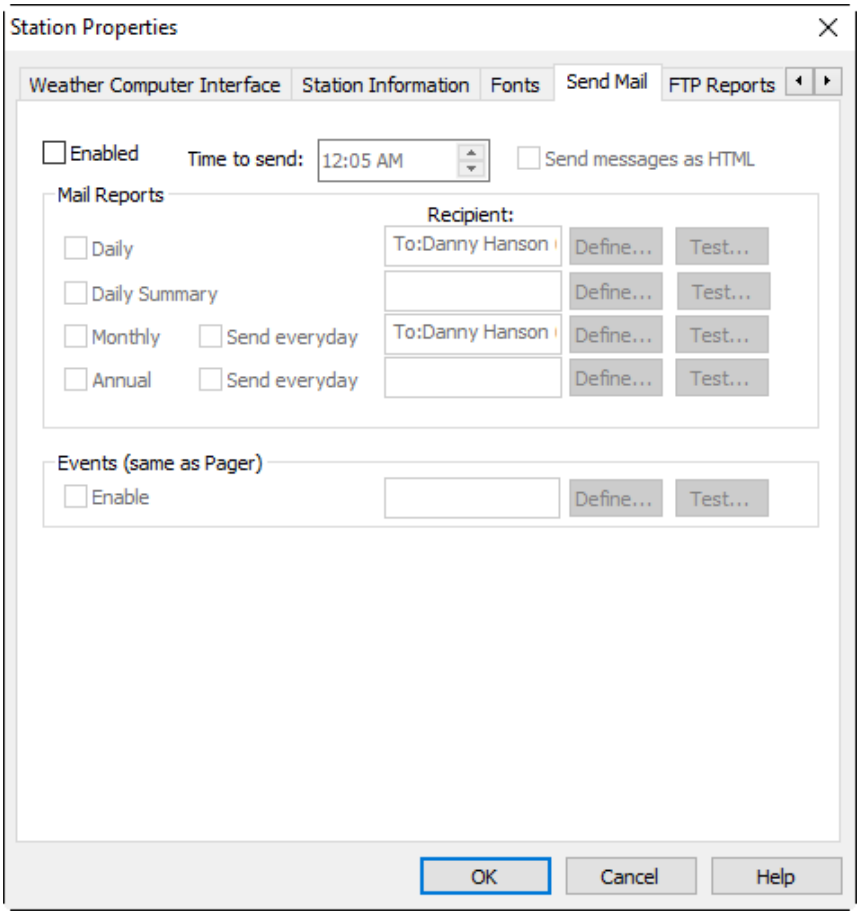
The Fonts screen allows you to customize the fonts that are used on the display and on the printed reports. Click the **Define** button beside each item to choose a different font. You can also select bold and italics attributes. Selecting a font size has no effect.



Screen – Numbers Monitor	Used for the numbers on the Monitor screen. **Default** = "Arial"
Screen – Numbers Detail	Used for the numbers on the Detail screen. Only fixed-spaced fonts are recommended. **Default** = **"Courier New"**.
Screen – Labels	Used for the text labels on the Monitor screen. **Default** = "Times New Roman"
Reports – Printer Numbers	Used for the numbers on the reports. Only fixed-spaced fonts are displayed. **Default** = **"Courier New"**.
Reports – Printer Labels	Used for the text labels on the reports. **Default** = **"Courier New"**
Reports – Printer Notes	Used for the Notes section of the report. **Default** = "Arial"
Reports – HTML Numbers	Used for the numbers on the reports. Only fixed-spaced fonts are displayed. **Default** = **"Courier New"**, 8 pt.
Reports – HTML Labels	Used for the text labels on the reports. **Default** = "Times New Roman", 12pt.
Reports – HTML Notes	Used for the Notes section of the report. **Default** = "Arial", 8 pt.

2.4 Send Mail

The Send Mail screen configures the automatic generation of electronic mail reports and alerts by WxSolution.



Prerequisites:

- Must have Microsoft Office (Outlook)™ or Outlook Express™ (on Windows XP) or Windows Live Mail (Windows Vista, 7) installed and configured with a default identity, and a default user account that does not require a password. The current implementation has not been tested with other mail providers. Send Mail does not work with the default “Mail” application in Windows 8 or 10.
- Must have contacts defined in the address book to send mail.
- For Outlook Express, you must disable a setting in OLE for mail to be sent by WxSolution. In Outlook Express go to the Options menu, select the Security tab, and uncheck the “warn me when other applications…” item.
- For Windows Live Mail (Vista and Windows 7), contacts are defined in Windows Contact Manager. Also, Define Recipients does not work -- entries must be manually entered.
- For Outlook, you must disable Outlook warnings for automated sending of mail by WxSolution. In Outlook go to the Options menu, select the Trust Center, Programmatic Access and select the "Never warn me about suspicious activity" option (must be Administrator).

Configuration

General

Enabled	Check this box to enable sending mail. **Default = unchecked**.
Time to send	Select the time of day to send the previous day's reports. Do not set to 12:00 AM. **Default = 12:05:00 AM**.
Send messages as HTML	Check this box to send the reports in HTML. Unchecked is plain text format. **Default = unchecked**.

Reports

WxSolution can automatically send a daily report each day, a monthly report at the beginning of each new day and/or month, and the annual report at beginning of a new year.

Daily	Check this box to send daily reports. For example, the daily report for the July 1 will be sent at 12:05:00 AM on July 2 by default.
Monthly	Check this box to send monthly reports. For example, the monthly report for July will be sent at 12:05:00 AM on August 1 by default.
Send everyday	Check this box to send monthly reports every day. For example, the updated partial monthly report will be sent each day.
Annual	Check this box to send annual reports. For example, the annual report for the year 2010 will be sent at 12:05:00 AM on January 1, 2011.
Recipient	The recipient name(s) for the report. Use the Define button to specify the recipients.
Define	The standard mail address dialog will be displayed allowing you to select the contact(s). You can choose any combination of To, CC, and BCC.
Test	It is highly recommended you send a test message. If Outlook finds any ambiguity in the contacts you selected, Outlook will display a dialog requesting that you resolve the ambiguity. You must not have any ambiguous names in the recipients, otherwise the mail will not be sent.

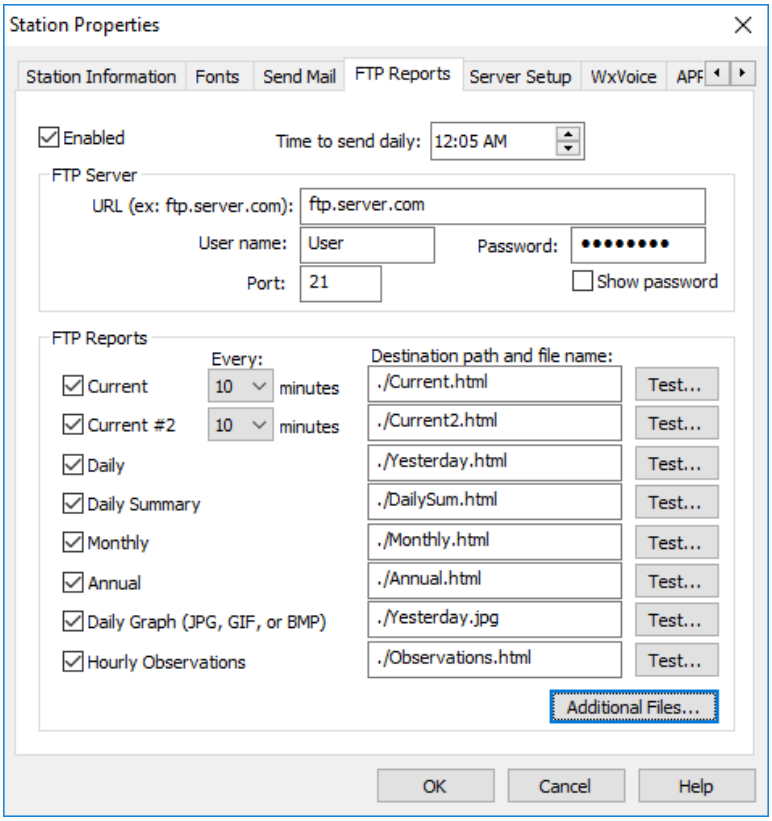
Events (same as Pager)

WxSolution allows you send alert mails. The configuration of the pager events is performed on the Pager configuration screen.

Enable	Check this box to enable sending alert mails.
Recipient	The recipient name(s) for the report. Use the Define button to specify the recipients.
Define	The standard OE address dialog will be displayed allowing you to select the contact(s). You can choose any combination of To, CC, and BCC.
Test	It is highly recommended you send a test message. If Outlook finds any ambiguity in the contacts you selected, Outlook will display a dialog requesting that you resolve the ambiguity. You must not have any ambiguous names in the recipients, otherwise the mail will not be sent.

2.5 FTP Reports

WxSolution allows you to send the current conditions, yesterday's report, current monthly reports, daily graph, and hourly observations via FTP to your web site. You must select **Enable** at the top of the screen to enable the FTP feature. If sending of Daily and Monthly reports is enabled, then the format of the report is HTML. This will force the corresponding report for the Send Mail feature to also be HTML format.



Prerequisites:

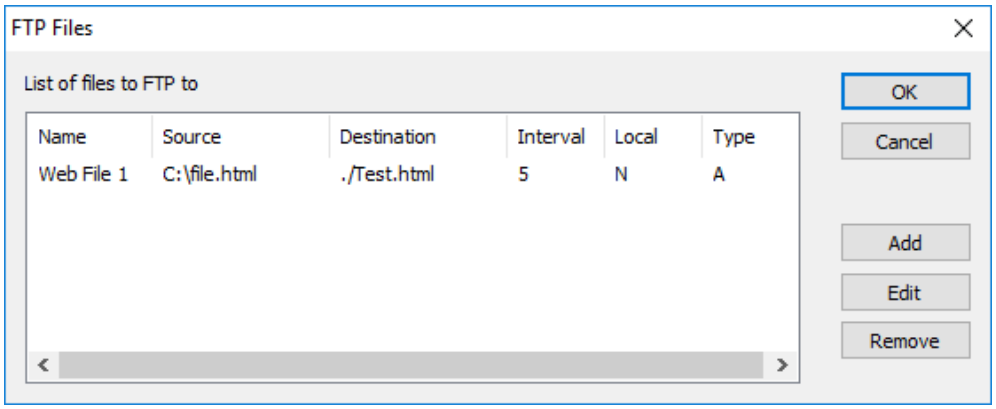
- Must have a connection to the Internet.
- Must have a user account on an FTP server.
- Refer to your ISP (Internet Service Provider) for instructions on how to FTP to your web site.

URL	Enter the URL to your FTP/web site. For example, **ftp.server.com**.
User name	Enter the user name that has permission to upload files to your web site. For example, **User**.
Password	Enter the password for the User name account.
Show Password	When checked, the password will be unmasked.
Current	Check Current to enable/disable sending the current conditions. Select the time interval for sending (1, 2, 5, 10, 15, 30, or 60 minutes). Finally enter the destination file name to which to copy the file, for example, **./Current.html**. Press **Help** to view the reference for customizing the Current report.

Current #2	Check Current #2 to enable/disable sending of a second current conditions page. Select the time interval for sending (1, 2, 5, 10, 15, 30, or 60 minutes). Finally enter the destination file name to which to copy the file, for example, **./Current2.html**. Press **Help** to view the reference for customizing the Current report.
Daily	Check Daily to enable/disable sending yesterday's report. Enter the destination file name to which to copy the file, for example, **./Yesterday.html**.
Monthly	Check Monthly to enable/disable sending the current monthly report. Enter the destination file name to which to copy the file, for example, **./Month.html**.
Annual	Check Annual to enable/disable sending the current annual report. Enter the destination file name to which to copy the file, for example, **./Annual.html**.
Daily Graph	Check Daily Graph to enable/disable sending a strip chart of yesterday's data. The strip chart will be a JPG file (or GIF or PNG – see Graphics Option tab). Enter the destination file name to which to copy the file, for example, **./Yesterday.jpg**.
Hourly Observations	Check Hourly Observations to enable/disable sending the hourly observations report. Enter the destination file name to which to copy the file, for example, **./Observations.html**. Press **Help** to view the reference for customizing the Observation report.
Test	It is highly recommended you send a test file for each item that has been enabled. This will verify the URL, user name, password, and destination file names.
Additional Files	Allows you specific additional files to substitute tags in and FTP to your web server.

2.5.1 Additional Files

This screen allows you to specify additional files to generate and upload via FTP by WxSolution to your web site.

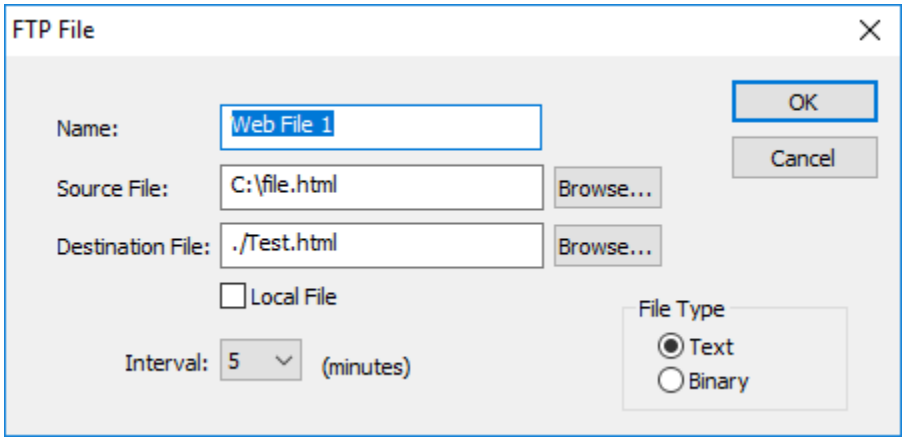


Name	Descriptive name for this entry (for reference only).
Source	The source file name.
Destination	The destination URL or file name.
Interval	The update interval in minutes.
Local	Indicates whether the destination file is a local file. If Yes, it will be generated but not FTP-ed.

Add	Press to add a file to the list.
Edit	Press to edit a file in the list. You can also double-click on a file in the list.
Remove	Removes the highlighted file in the list.

2.5.2 Edit FTP Files

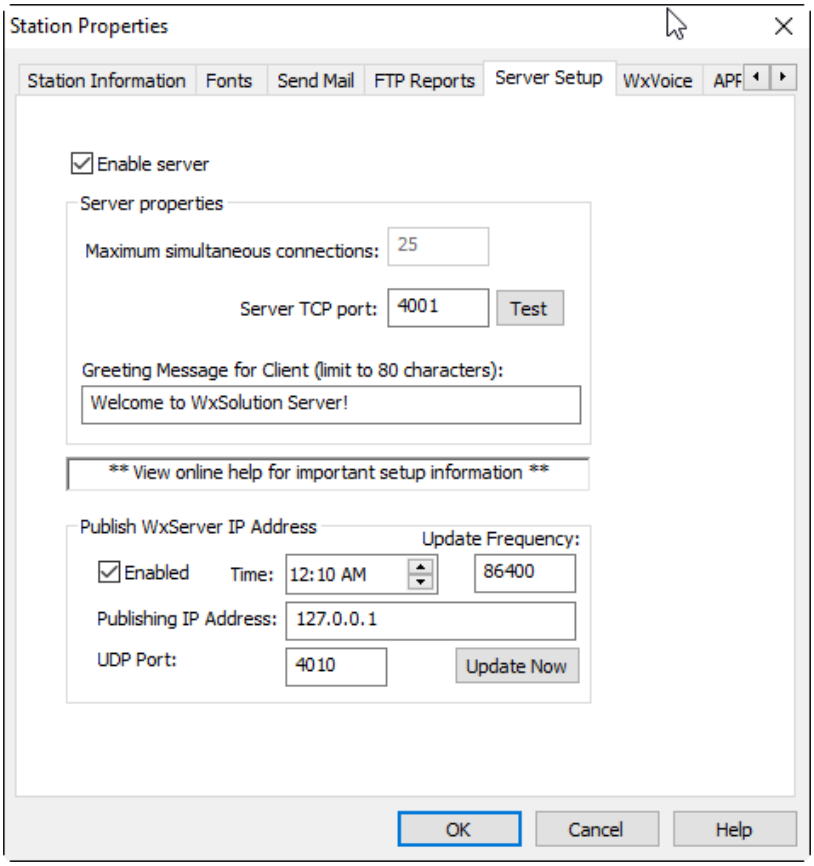
The FTP File Edit page configures the parameters for a file that will be generated by WxSolution and uploaded via FTP to your web site.



Name	Descriptive name for this entry (for reference only).
Source	Enter the source file name. Press Browse to search for the file.
Destination	Enter the destination URL or file name. Press Browse to search for the local file.
Interval	Select the upload interval.
Local	Check this box to indicate the destination file is a local file. If checked, it will be generated but not FTP-ed.

2.6 Server Setup

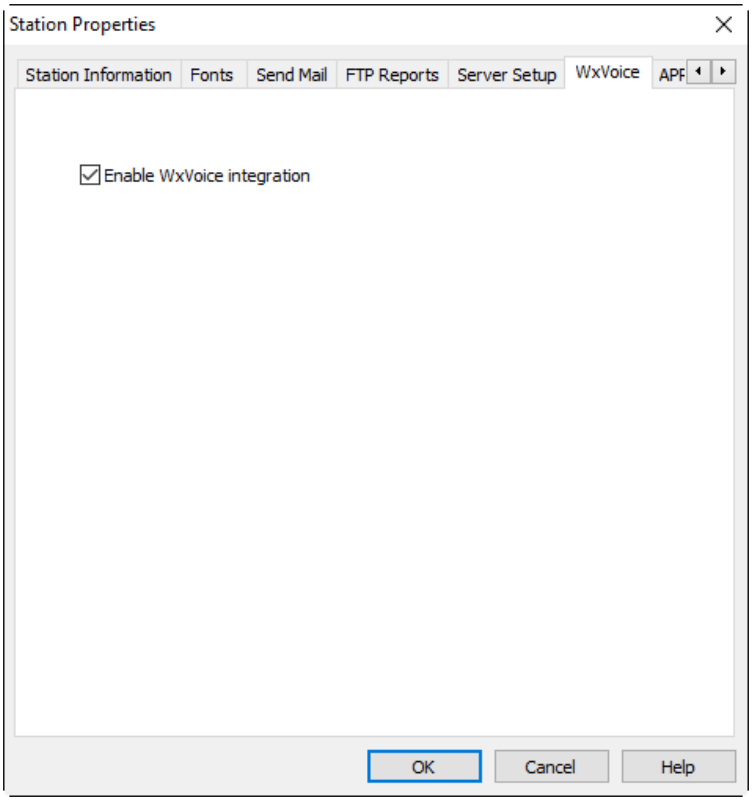
WxServer can be used on a computer that has a broadband connection to the Internet.



Enable server	Click to enable/disable the server. **Default=unchecked.**
Simultaneous Connections	Enter the maximum number of connections to the server. **Default=25**. *This item is currently not configurable.*
TCP Port	Enter the TCP port on which to accept connections. If you are running a firewall application, verify that the port you choose is not blocked. **Default=4001**. If using Windows XP SP2 or later, verify that the TCP port will not be blocked. If using a cable/DSL router, enable Port Forwarding in your router to "forward" the TCP connection to the PC.
Test	Click to check if the selected port is available for use.
Greeting Message for Client	Enter a message that will appear on the status bar (bottom-most portion of the screen) of WxClient when users first connect to this server. The text must be limited to about 80 characters, which is roughly the amount that will fit on the screen.
Publish WxServer IP Address	Contact Thunderhead Technologies for details on these fields.

2.7 WxVoice

WxVoice is companion software sold separately. Contact Thunderhead Technologies for more information.

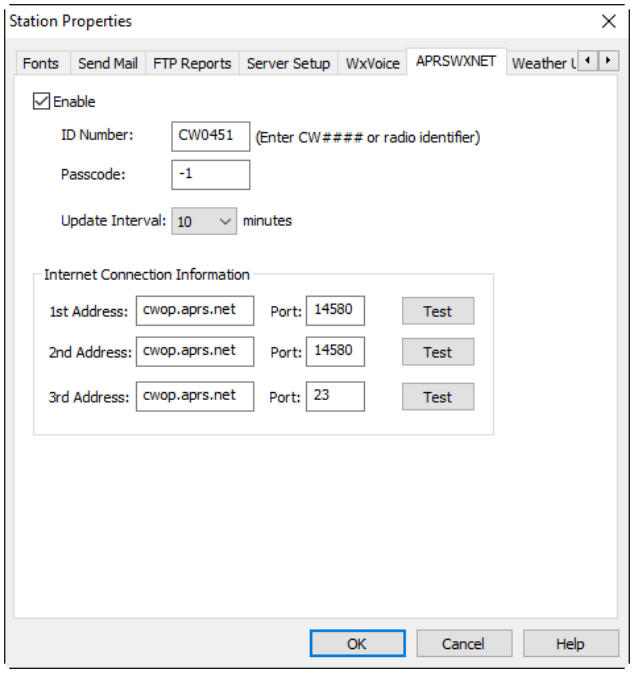


2.8 APRSWxNet

Citizen Weather Observer Program (CWOP) operates the APRSWxNet as a near real-time national mesonet of automated weather data. APRSWxNet uses both Ham radio and the Internet to receive weather data from automated weather stations. NOAA uses this data to enhance its knowledge of mesoscale weather. Once you have signed up, you can set WxSolution to upload weather data at regular intervals. Go to http://www.findu.com/citizenweather/ to learn more about CWOP and to join the network.

Prerequisites:

- Must have an APRSWxNet account.



Enable	Check to enable/disable sending APRSWxNet data
ID Number	Enter your ID number (including CW, DW, etc.)
Update Interval	Select the update interval: 10, 15, 30, or 60 minutes
1st Address	Address of the first APRSWxNet server (cwop.aprs.net)
1st Port	Port number of the first server (14580)
2nd Address	Address of the second APRSWxNet server (cwop.aprs.net)
2nd Port	Port number of the second server (14580)
3rd Address	Address of the third APRSWxNet server (cwop.aprs.net)
3rd Port	Port number of the third server (23)
Test	Send a data packet now.

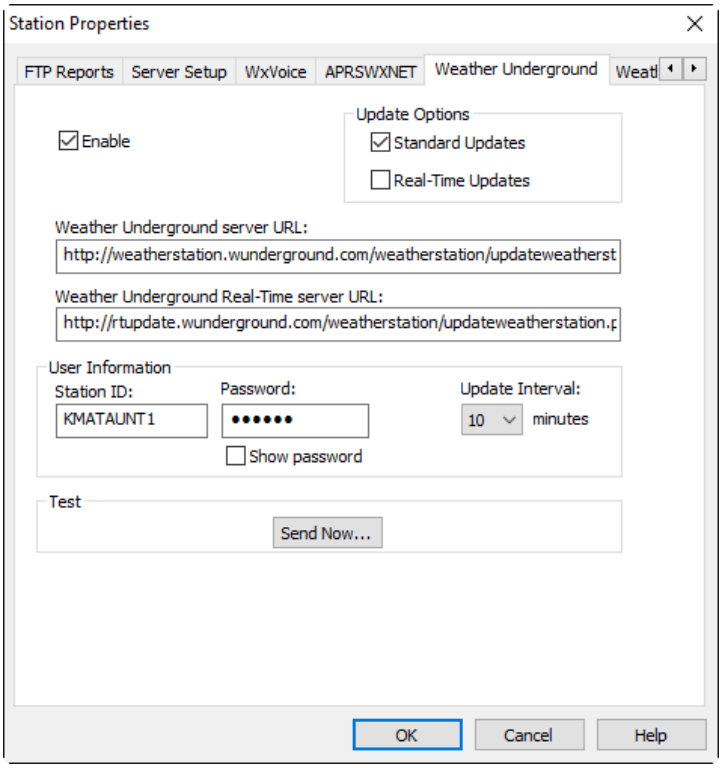
Only modify the addresses and ports of the APRSWxNet servers if you know that they have changed.

2.9 Weather Underground

Weather Underground (http://www.wunderground.com/weatherstation/index.asp) is vast resource of worldwide weather data. Once you create an account on Weather Underground, WxSolution can upload your current data at regular intervals.

Prerequisites:

- Must have a Weather Underground account.



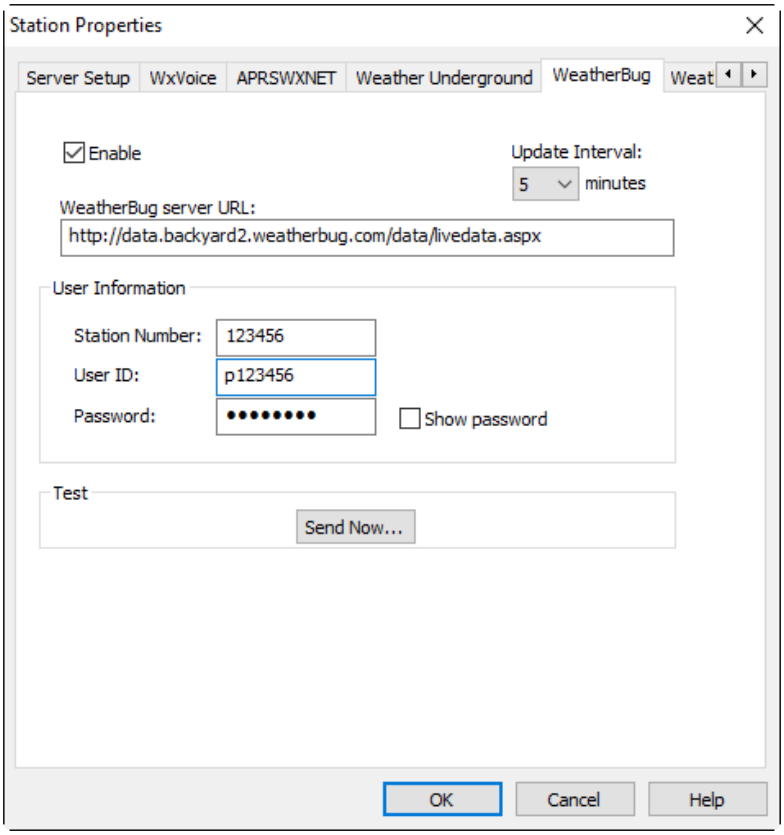
Enable	Check to enable/disable sending Weather Underground data.
Standard Updates	Sends the standard data at the specified Update Interval.
Real-Time Updates	Sends the data every 2.5 seconds.
URL	Default is **http://weatherstation.wunderground.com/weatherstation/ updateweatherstation.php**
Real-Time URL	Default is **http://rtupdate.wunderground.com/weatherstation/ updateweatherstation.php**
Station ID	Enter your station identifier (usually begins with K).
Password	Enter your password.
Show Password	When checked, the password will be unmasked.
Update Interval	Select the update interval: 5, 10, 15, 30, or 60 minutes.
Send Now	Send the current data right now (for testing).

2.10 WeatherBug

WeatherBug Backyard Weather is a part of the vast WeatherBug network. Once you create an account, WxSolution can upload your current data at regular intervals.

Prerequisites:

- Must have a WeatherBug account.



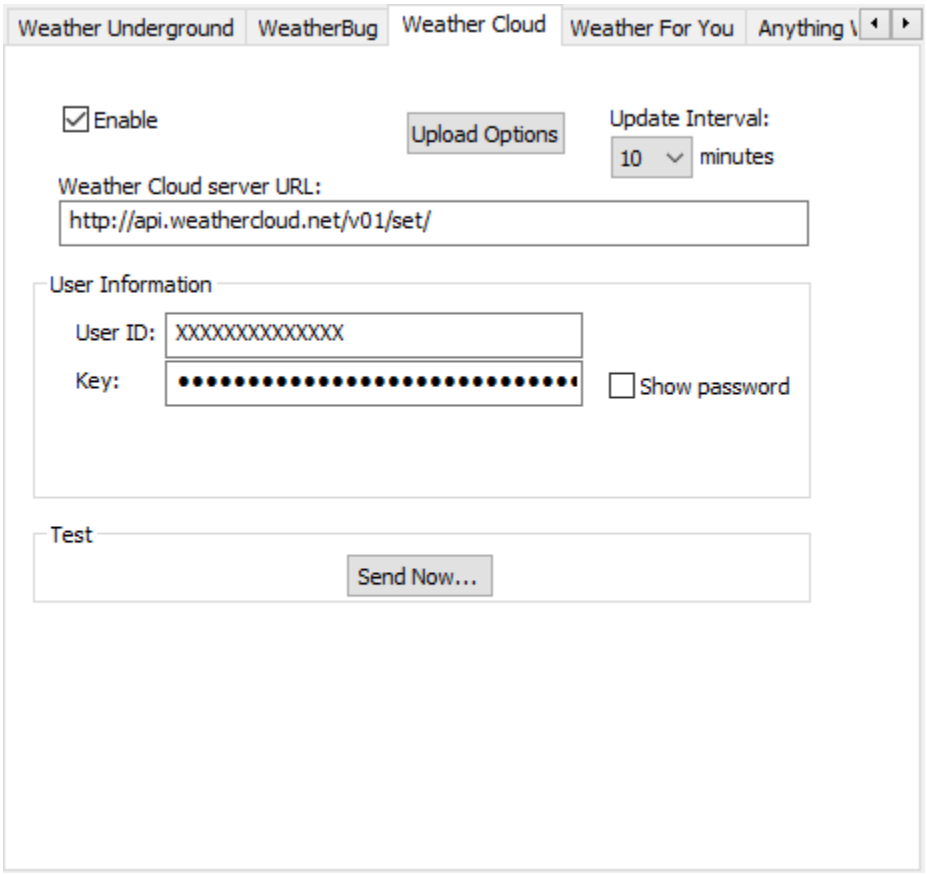
Enable	Check to enable/disable sending WeatherBug data
URL	Default is **http://data.backyard2.weatherbug.com/data/livedata.aspx**
Station Number	Enter your station number.
User ID	Enter your User ID.
Password	Enter your password.
Show Password	When checked, the password will be unmasked.
Update Interval	Select the update interval: 5, 10, 15, 30, or 60 minutes.
Send Now	Send the current data right now (for testing).

2.11 Weather Cloud

Weather Cloud (http://www.weathercloud.net) is vast resource of worldwide weather data. Once you create an account, WxSolution can upload your current data at regular intervals.

Prerequisites:

- Must have a Weather Cloud account.



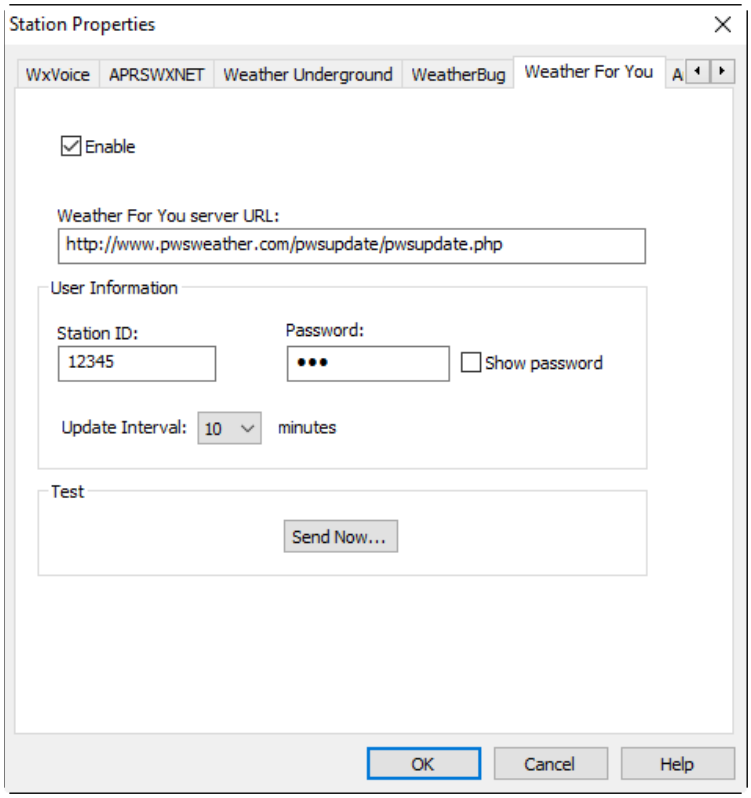
Enable	Check to enable/disable sending Weather Cloud data
URL	Default is **http://api.weathercloud.net/v01/set/**
User ID	Enter your User ID.
Key	Enter your key.
Show Password	When checked, the password will be unmasked.
Update Interval	Select the update interval: only 10 minutes is supported at this time.
Send Now	Send the current data right now (for testing).

2.12 Weather For You

Weather For You (http://www.weatherforyou.com) is vast resource of worldwide weather data. Once you create an account, WxSolution can upload your current data at regular intervals.

Prerequisites:

- Must have a Weather For You account.



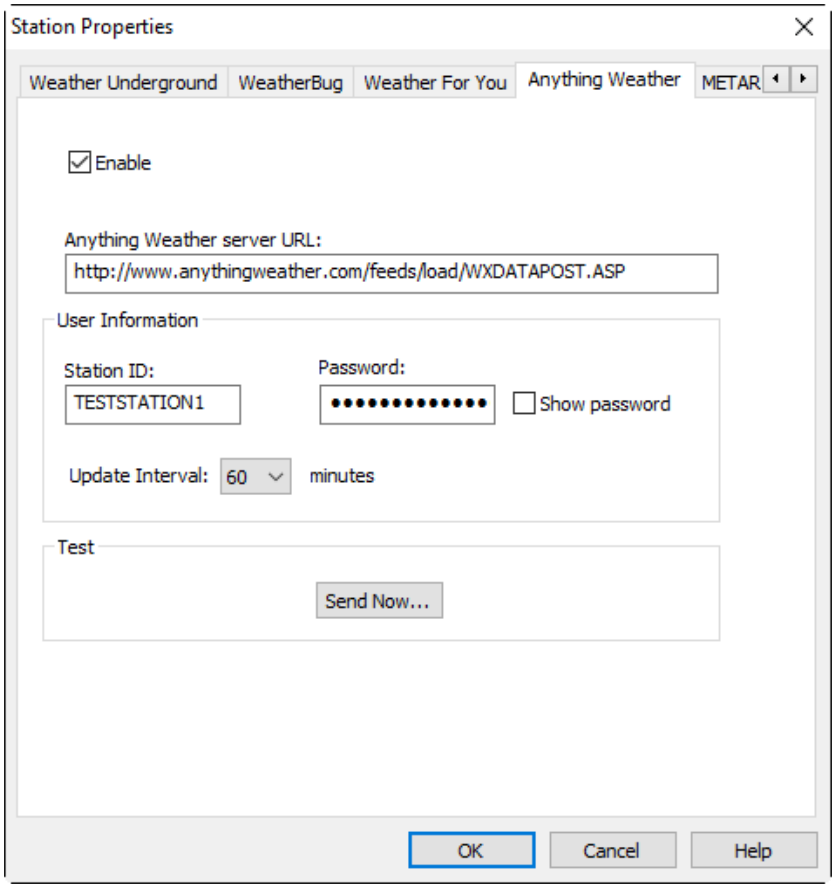
Enable	Check to enable/disable sending Weather For You data
URL	Default is **http://www.pwsweather.com/pwsupdate/pwsupdate.php**
Station ID	Enter your station identifier.
Password	Enter your password.
Show Password	When checked, the password will be unmasked.
Update Interval	Select the update interval: 5, 10, 15, 30, or 60 minutes.
Send Now	Send the current data right now (for testing).

2.13 Anything Weather

Anything Weather (http://www.anythingweather.com) is vast resource of worldwide weather data. Once you create an account, WxSolution can upload your current data at regular intervals.

Prerequisites:

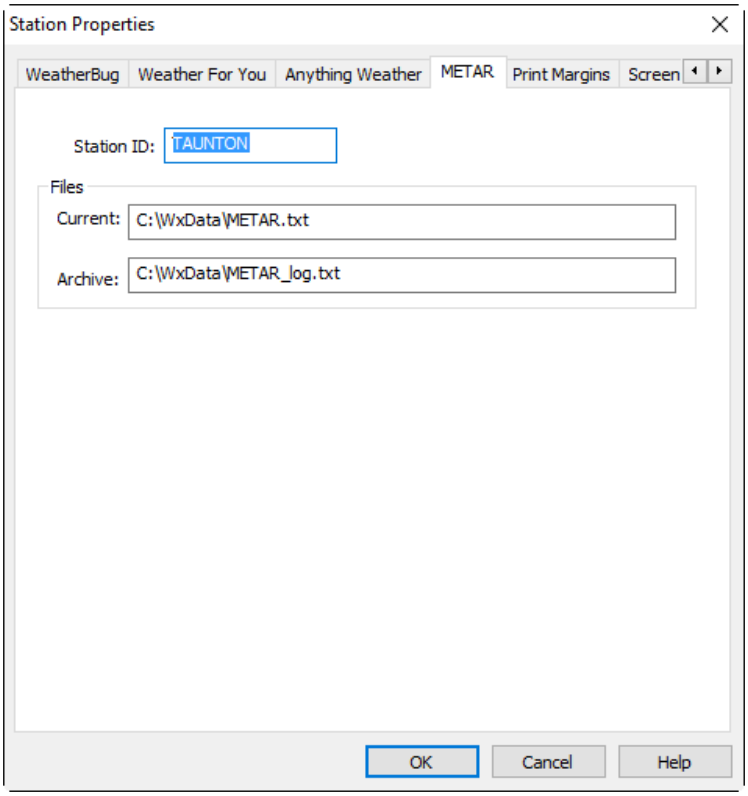
* Must have an Anything Weather account.



Enable	Check to enable/disable sending Anything Weather data
URL	Default is **http://www.anythingweather.com/feeds/load/WXDATAPOST.ASP**
Station ID	Enter your station identifier.
Password	Enter your password.
Show Password	When checked, the password will be unmasked.
Update Interval	Select the update interval: 5, 10, 15, 30, or 60 minutes.
Send Now	Send the current data right now (for testing).

2.14 METAR

The METAR page configures METAR settings used by WxSolution. A METAR observation is created each hour. It is saved to the Current File and appended to the Archive File.



Station ID	Enter your METAR station identifier.
Current File	Enter the current METAR observation file name. **Default = METAR.txt**.
Archive File	Enter the METAR observation archive file name. **Default = METAR_log.txt**.

More information about the METAR coding standard can be found at **http://www.met.tamu.edu/class/METAR/metar.html**. The METAR standard is defined in the "Federal Meteorological Handbook Number 1" (FMH)**.**

Following is an example of a WxSolution METAR report:

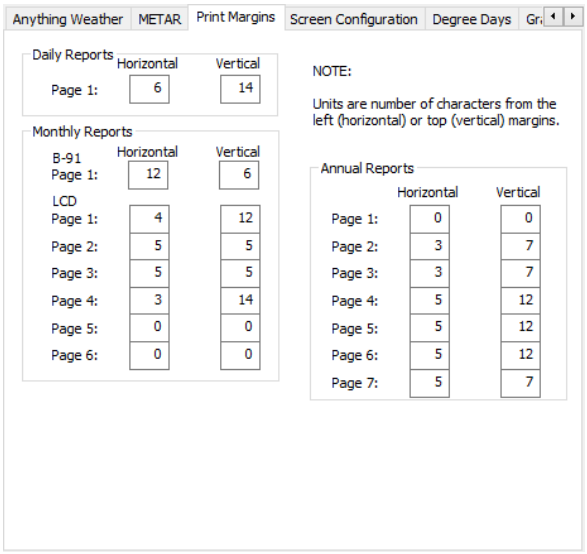
```
METAR TAUNTON 280000Z AUTO 17002G06KT -RA 03/M02 A3018 RMK AO1 PK WND
01012/17 P0010 SLP220 T00321015 10104 21032 400411039 57004 60010
```

TAUNTON	Station identifier
280000Z	28th day, 00:00 UTC (12 AM)
AUTO	Indicates this is an automated report
1700206KT	Wind: 170° at 2 knots gusting to 6 knots
-RA	Current weather: -RA=light rain, RA=moderate rain, +RA=heavy rain
03/M02	Temperature/Dew point in whole °C. 'M' indicates negative. T=3°C, Td=-2°C
A3018	Altimeter in inches Hg.
RMK AO1	Automated without precipitation discriminator
PK WND 01012/17	Peak wind gust: 12 knots from 10° at 17 minutes past the top of the hour
P0010	Hourly rainfall in hundredths of an inch: 0.10"
SLP220	Sea-level pressure in millibars (tens, ones, and tenths). 220 = 1022.0 mb.
T00321015	Temperature/Dew point in tenths °C. '1' indicates negative. T=3.2°C, Td=-1.5°C
10104	6-hour maximum temperature n tenths °C. '1' indicates negative. T_{max}=10.4°C.
21032	6-hour minimum temperature in tenths °C. '1' indicates negative. T_{min}=-3.2°C
400411039	Daily (local time) max/min temperature. '1' indicates negative. T_{max}=4.1°C, T_{min}=-3.9°C
50074	Pressure tendency. Refer to the FMH for specific details.
60010	3 or 6-hour rainfall in hundredths of an inch
70025	Daily (local time) rainfall in hundredths of an inch

Note that not all of the fields will appear in each report. Refer to the FMH for specific details.

2.15 Print Margins

Configures the margins for the LCD printed reports. The values are the number of characters from the left (horizontal) or top (vertical) margins of the page (approximately 1/10 inch per character). The actual distance of the absolute printable edge varies for each printer; typically the minimum printable distance from the left and top edges is about 0.3 inches.



The default values are:

Daily Report

	Horizontal	Vertical
Page 1	6	14

Monthly Report

B-91

	Horizontal	Vertical
Page 1	4	12

LCD

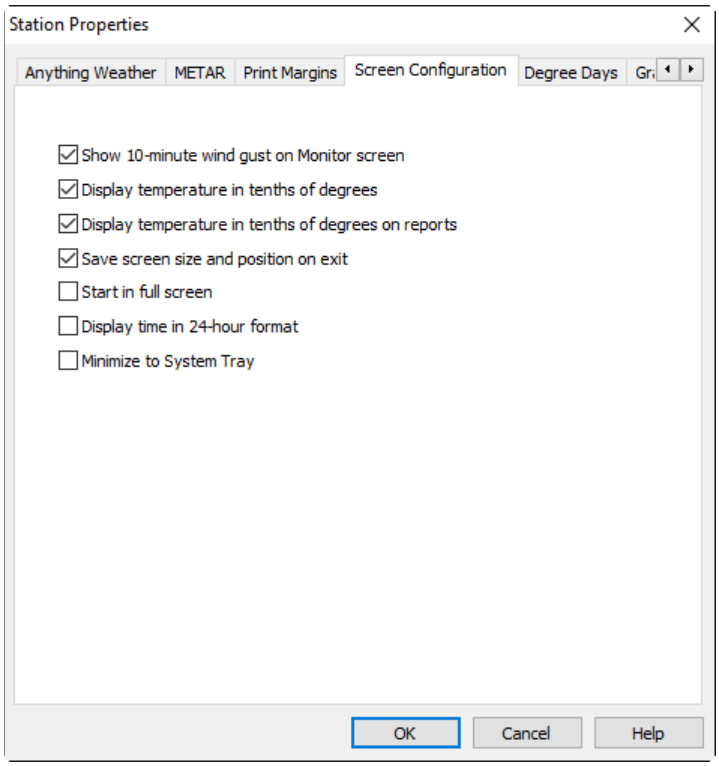
	Horizontal	Vertical
Page 1	4	12
Page 2	5	5
Page 3	5	5
Page 4	3	14
Page 5	0	0
Page 6	0	0

Annual Report

	Horizontal	Vertical
Page 1	0	0
Page 2	3	7
Page 3	3	7
Page 4	5	12
Page 5	5	12
Page 6	5	12
Page 7	5	7

2.16 Screen Configuration

The Screen Configuration screen contains several configuration items.



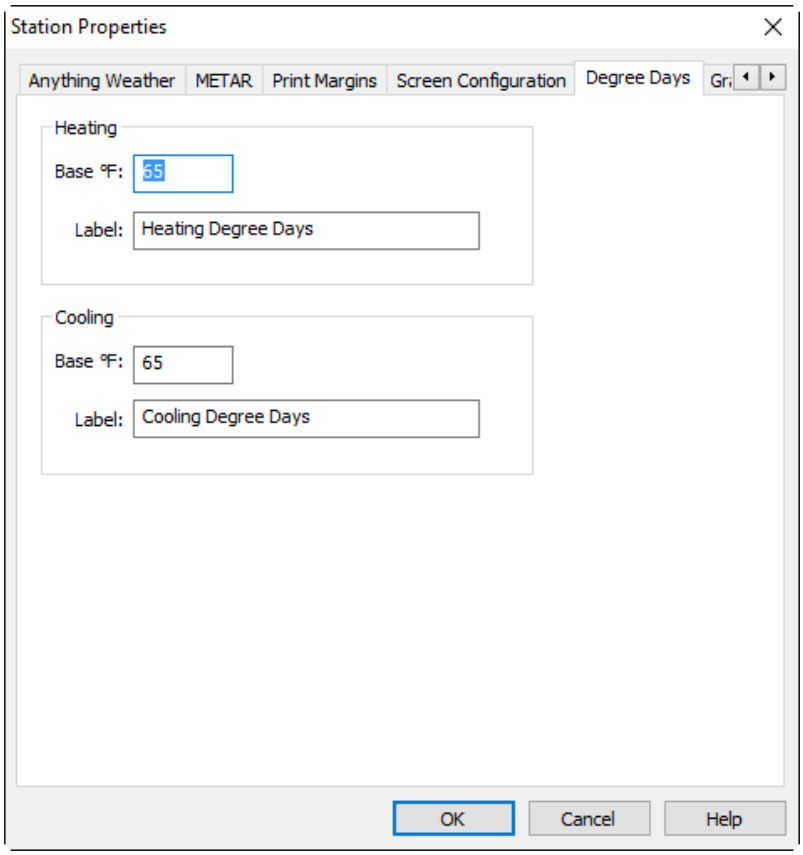
Show 10-minute wind gust	Displays the peak gust for the last 10 minutes above the wind compass. **Default = unchecked**.
Display data in tenths of degrees	Check this option to view the temperature and dew point in tenths of a degree, barometric pressure to the thousandth of an inch, and wind speed in tenths (for meters/sec only) on the screen. **Default = unchecked**.
Display data in tenths of degrees on reports	Check this option to show the temperature and dew point in tenths of a degree, barometric pressure to the thousandth of an inch, and wind speed in tenths (for meters/sec only) on the reports. **Default = unchecked**.
Save screen size and position on exit	Check to save the screen size and position. The window will be the same size and at the position as the last time WxSolution was run. Unchecked, the window will be the default size the next time WxSolution is run. **Default = unchecked**.
Start in full screen*	When checked, the WxSolution screen will cover the entire desktop.
Display time in 24-hour format	Check to display time in 24-hour format (00:00:00 to 23:59:59). Uncheck for AM/PM format. **Default = unchecked**.
Minimize to System Tray	On startup, minimizes WxSolution to an icon in the System Tray (lower-right position of desktop). Click the icon to restore the application window.

* Requires WxSolution to be restarted before change takes effect.

2.17 Degree Days

Configures the heating and cooling degree days. The base values are used as the basis for the degree days calculation. If the mean daily temperature is **less than** the heating degree days base value, then there will be heating degree days for that day. For example, if the mean temperature is 42°F and the base is 65°F, then there will be 65 – 42 = 23 heating degree days for that day. If the mean daily temperature is **greater than** the cooling degree days base value, then there will be heating degree days for that day.

For example, if the mean temperature is 82°F, then there will be 82 - 65 = 17 **cooling** degree days for that day.

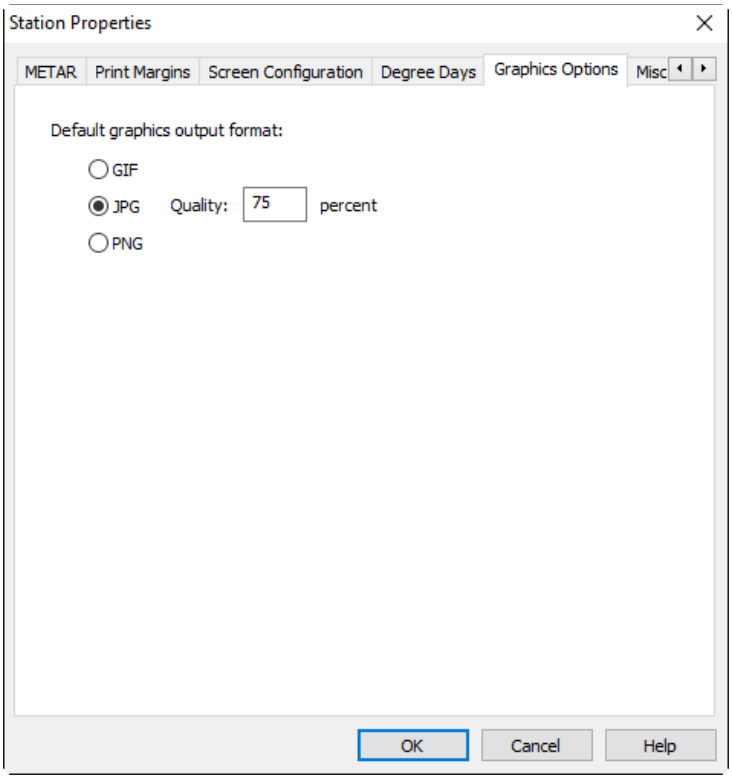


Base °F	Enter the base for the heating or cooling degree days in °F. **Default=65°F**.
Label	Enter the label that will be used to display the degree days. **Default="Heating Degree Days", "Cooling Degree Days"**.

2.18 Graphics Options

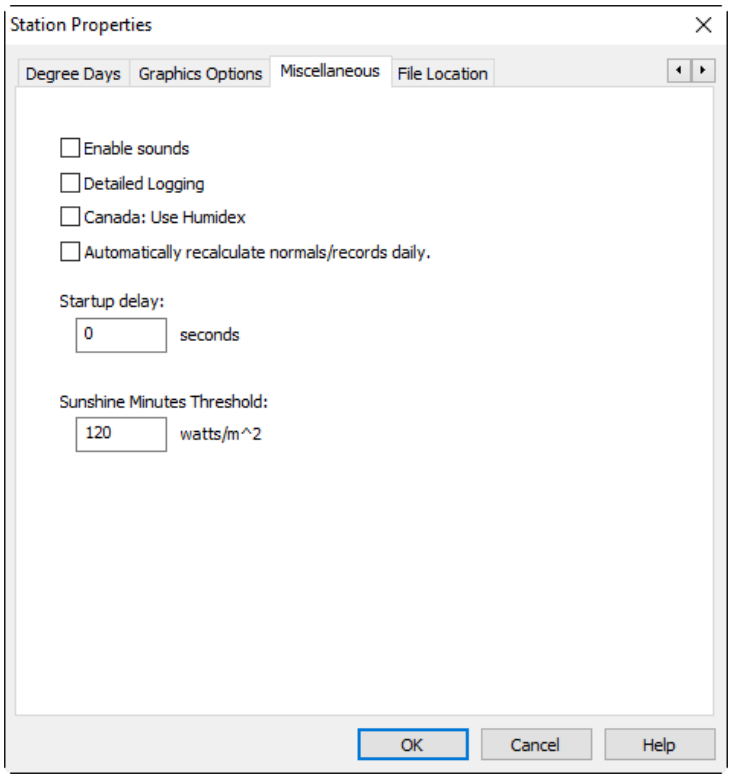
Configures the graphics file output option. This setting determines the format of the output file for the strip chart, wind rose, and generate report items.

The size of the output is determined by the content, however GIF usually produces the smallest file size. The JPG quality determines the amount of compression to apply. The higher the number, the greater the quality but larger the file size.



2.19 Miscellaneous Configuration Items

The Miscellaneous screen contains several configuration items.



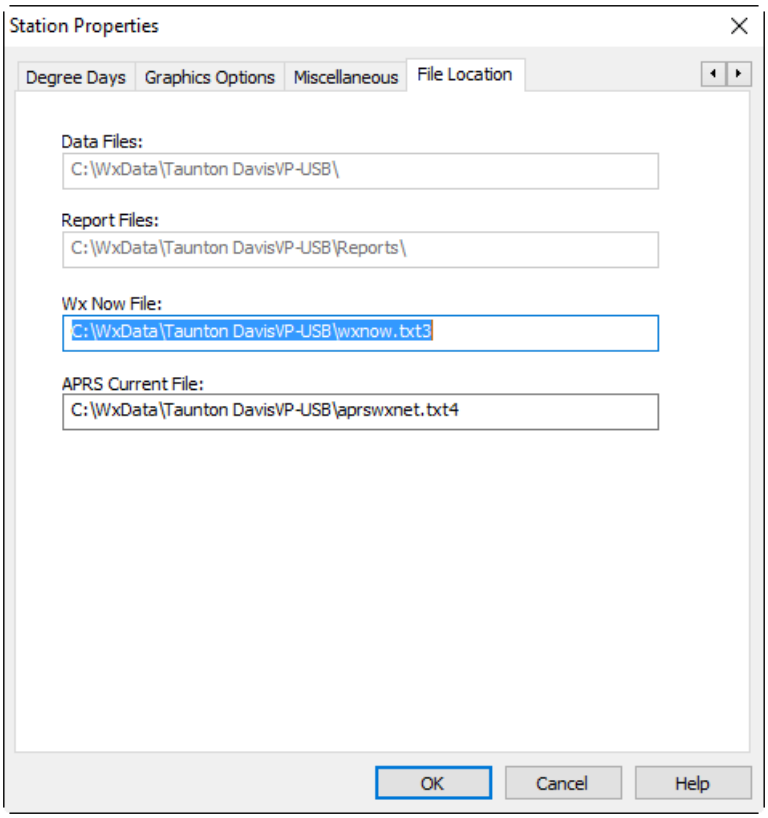
Enable sounds	Enables the playing of sounds for certain events: ▪ WxServer connection and disconnect. ▪ Weather computer communications errors. **Default = unchecked**.
Detailed Logging	Check to recorded detailed information about WxSolution operation in the log file. Only recommended if problems are occurring. **Default = unchecked**.
Canada: Use Humidex	Check to use Humidex instead of Heat Index. **Default = unchecked**.
Automatically recalculate normals/records daily	If checked, WxSolution will automatically regenerate the normals/records each day.
Startup delay	Enter the number of seconds to delay completely starting WxSolution in seconds (up to 120 seconds). Use this feature if you must allow time for other applications or devices/drivers to initialize before starting WxSolution. **Default = 0 seconds**.
Sunshine Minutes Threshold	Enter the minimum solar threshold in Watts/m^2. **Default = 120**.

* Requires WxSolution to be restarted before change takes effect.

2.20 File Location

The File Location screen shows the directories where files created by WxSolution will be stored. Currently, directly changing these directories is not permitted.

The **Wx Now File** is a text file that contains the data portion of the APRSWxNet packet. It can be read by various APRS programs for further processing. The **APRS Current File** is the full text of the APRSWxNet packet.



Data Files*	This is the location of all data files that WxSolution creates.
Report Files*	This is the location where text, HTML, and graphics report files will be stored.
Wx Now File	This is the file name and location of the Wx Now text file.
APRS Current File	This is the file name and location of the APRS Current text file.

* If you must change the Data or Report Files directories:

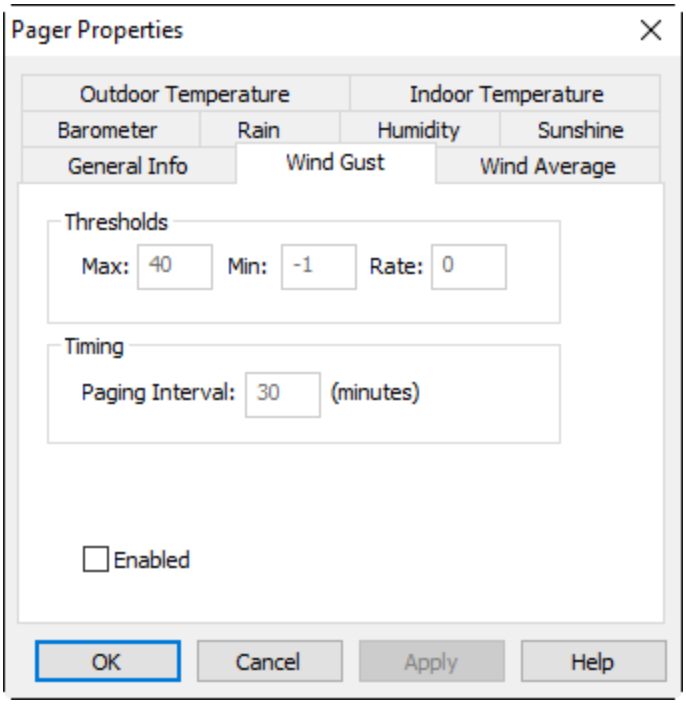
1. Shutdown WxSolution.
2. Use the Windows Registry editor, **regedit**, to change the entries `DataPath` and/or `ReportPath` under `HKEY_LOCAL_MACHINE\SOFTWARE\`*`WOW6432Node`*`\Thunderhead Technologies\WxSolution` in the registry. Note: WOW6432Node is only for 64-bit systems. For 64-bit systems, use “Program Files (x86)” instead of “Program Files”.
3. Move all files from the old directory to the new directory.
4. Restart WxSolution.

2.21 Pager Setup

The Pager Properties set of screens will configure the pager feature of WxSolution. If Pager Events is enabled in the Send Mail configuration, then an email will be sent. Refer to page format in Appendix A.2 for a description of the numeric message format.

2.21.1 Parameter Setup

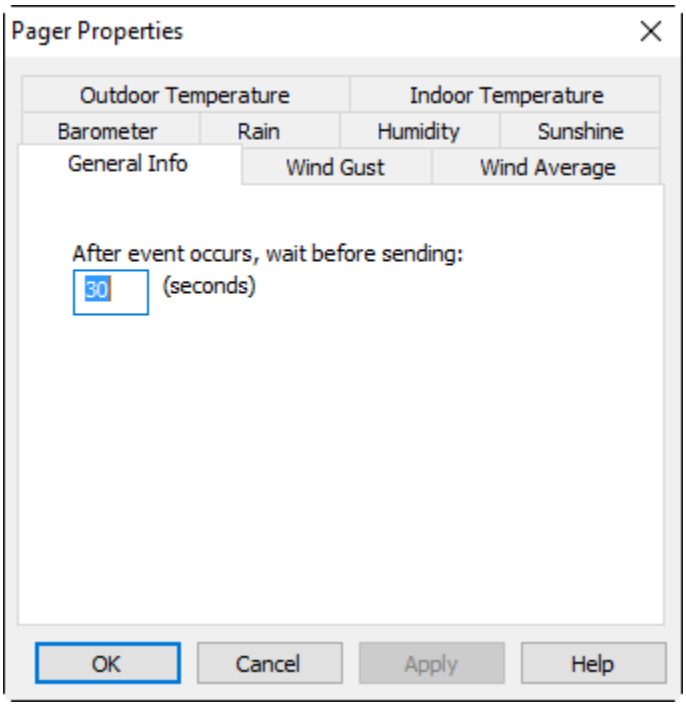
The values entered will determine if, when, and how often WxSolution pages you for each of the defined parameters. This screen is identical for each of the eight weather parameters.



Enabled	Enables this parameter for paging. A check indicates it is enabled while a space indicates it is disabled. If a parameter is disabled, no paging is sent for this parameter.
Max	This is the maximum threshold for paging. If the current value is equal to or greater than this setting, then WxSolution will page the **highest value occurring up to the time the page is sent**. Set this value to a very high value to disable paging the maximum value.
Min	This is the minimum threshold for paging. If the current value is equal to or less than this setting, then WxSolution will page the **lowest value occurring up to the time the page is sent**. Set this value to a very low value to disable paging the minimum value.
Rate	This is the rate threshold for paging. If the absolute value of the hourly rate change is equal to or greater than is value, then WxSolution will page the **greatest value occurring up to the time the page is sent**. Set this value to zero (0) to disable paging the rate value.
Paging Interval	This is the interval in minutes between each page. If the max, min, or rate thresholds are exceeded repeatedly, then each successive page will be sent the specified number of minutes after the previous page for this parameter plus the number of seconds specified in **Wait Before Dial**. Default is **30 minutes** between successive pages.

2.21.2 General Info

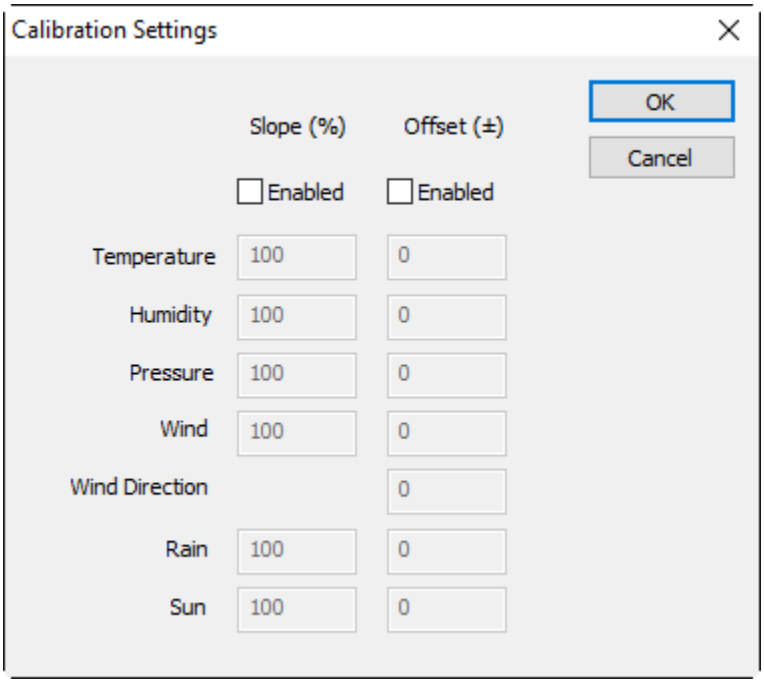
The General Information screen configures the time to delay before sending the page. Pages are sent via email.



After event occurs, wait before dialing	This indicates the number of seconds to wait once a threshold has been exceeded for the first time before the page is actually sent. It is desirable to wait at least a few seconds, especially for wind thresholds, to allow a little bit of time to pass before sending since this would allow the very highest (or lowest) value to occur, rather than just the first value to exceed the threshold. **Default is 30 seconds**.

2.22 Calibration Settings

The Calibration Settings screen allows correction of inaccurate data received from the weather computer. This feature is primarily intended for users of the Davis WM2 weather computer that cannot be manually calibrated. However, it is also available for the Heathkit users.



There are two parameters that can adjust the data values: slope and offset. Slope is used to compensate for an under- or over-responsive sensor. Offset is used to adjust a sensor that is consistently reading a value too high or too low.

For example:

1. If a wind sensor reads 20 mph in a true 30 mph breeze then the sensor is under-responsive.
2. If a wind sensor reads 40 mph in a true 30 mph breeze then the sensor is over-responsive. In either case the slope value needs to be changed to correct the wind reading.
3. If a temperature sensor is always reading 5° too high, then the offset would need to be changed.

Slope values are specified in percent values. This is why the default slope is 100% (or a multiplying factor of 1.00). In example 1 above, the slope must be increased, thus the slope value should be: 30/20 = 1.5 or 150%. In example 2, the slope must be decreased and the slope value should be: 30/40 = 0.75 or 75%.

Offset values are specified as positive or negative values. The default is 0 (no change). In example 3, the offset value would be –5 to lower the temperature reading.

Notes:

- If you enter values for both slope and offset, the slope is applied first, then the offset.
- Some software safeguards have been implemented to perform sanity checks on the data. WxSolution will prevent negative wind speed, negative humidity/sunshine, humidity and sunshine greater than 1700 (100 for Thunderhead Technologies sunshine sensor on the ID-5001), negative pressure, and temperature values to be within operational limits.

3. Menu and Function Reference

WxSolution uses the following menus to perform the numerous features of the software.

3.1 File

Save Hourly Data

Saves current hourly data now. Hourly data is automatically saved that the end of each hour and when WxSolution is shutdown. Only use this feature if you are expecting WxSolution not shutdown properly, such as an impending power outage.

Save Daily Data

Reads the extremes from the weather computer memory and saves it in the memory data file. If configured to clear the memory data, the weather computer memory is cleared. Use this feature if you are shutting down WxSolution and don't expect to restart until after midnight, or if you are resetting the weather computer (which clears its memory).

Set Wx Computer Time

Sets the weather computer's clock to match the clock on this computer. Use this feature to easily set the clock on the weather computer (versus manually using the keypad on the console).

Print

Prints the current Monitor, Detail, or Graph screen. For the best rendering, select **Print Setup** first and change the page orientation to landscape.

Print Preview

Previews how the printed screen will appear.

Print Setup

Configures the properties of the printer. Use this selection to set the page orientation to landscape when printing the screen. Be sure to change the setting back to portrait before printing any reports.

Properties:

Station Setup

Configures station information, weather computer parameters, WxServer, and more.

Pager Setup

Configures the pager feature.

Calibration

Configures calibration values for correcting data values from the weather computer.

Exit

Shuts down WxSolution.

3.2 Edit

Edit HTML Forms

Allow editing of the customizable HTML forms **Current.html**, **Current2.html**, and **Observations.html** in the **…\WxSolution\Forms\HTML** folder. Use the Copy HTML Form Files command before editing the forms.

Copy HTML Form Files

Copies the preconfigured forms to the customizable HTML forms **Current.html**, **Current2.html**, and **Observations.html** in the **…\WxSolution\Forms\HTML** folder.

Solar and UV enabled	Current-SunUV.html, Current2-SunUV.html, Observations-SunUV.html
Solar enabled	Current-NoUV.html, Current2-NoUV.html, Observations-NoUV.html
No solar or UV enabled	Current-NoSunUV.html, Current2-NoSunUV.html, Observations-NoSunUV.html

3.3 View

Monitor Screen

Changes the display to the monitor screen, which is the default screen (**CTRL+M** also changes to this screen).

Detail Screen

Changes the display to the detail screen (**CTRL+D** also changes to this screen).

Extra Sensors Screen

Changes the display to the extra sensors screen (**CTRL+X** also changes to this screen).

Graph Screen

Changes the display to the hourly strip chart (**CTRL+G** also changes to this screen).

Full Screen

Changes the display to cover the entire desktop. To return to the normal screen, press **Esc** or click a mouse button.

Past Hourly Data

Shows a configurable view of the hourly means and extremes for past hours.

3.4 Data

Edit Hourly Data

Edits the hourly summary records. Also allows detailed viewing of the hourly records.

Edit Extra Data

Edits the daily extra data records. Extra data includes snowfall, snow cover, precipitation types, and sky cover. Be sure to sum the hourly records (see below) for each date changed after making the changes.

Edit Memory Data

Edits the daily memory read from the weather computer.

Edit Observation Data

Edits the hourly observation record. The observation record is a record of current weather parameters at the beginning of each hour.

Edit Monthly LCD Data

Edits the monthly LCD data (year-to-date precipitation, degree days).

Edit Annual LCD Data

Edits the annual LCD data (for missing monthly summaries).

Edit Strip Chart Data

Edits the minute-by-minute strip chart data.

Edit Normals and Records Data

Edits the normals and records data.

Edit Extra Sensor Data

Edits the extra sensors summary records. Also allows detailed viewing of the extra sensors records.

Edit Daily Notes
Edits the daily notes for the B-91 and Daily LCD Reports.

Sum Hourly Records
Sums the hourly records for a specified date storing the means and extremes in the record 24 for that date. Summing hourly records is automatically performed each day at midnight. Summing hourly records is necessary if you edit an hourly record or if WxSolution was not running at midnight that day. If no summary exists, the day will be skipped on the monthly report.

Sum Extra Sensors Records
Sums the extra sensors records for a specified date storing the means and extremes in the record 24 for that date. Summing extra sensors records is automatically performed each day at midnight. Summing extra sensors records is necessary if you edit an extra sensors record or if WxSolution was not running at midnight that day.

Download Archive
Downloads the archive from the weather computer.

3.5 Reports

LCD Reports
Creates LCD reports.

Annual Report Setup
Configures information for the annual LCD report.

LCD Daily Records
Creates reports of record highs and lows and means.

User-defined Summation
Calculates means and extremes for the specified date ranges.

Wind Rose
Creates wind rose graphs for a day, month, or year.

Strip Chart
Creates strip chart graphs for a configurable time span – up to one month of one-minute data.

3.6 Tools

Import Data
Imports hourly summary records, hourly observation records, daily memory records, external data, LCD analysis data, and strip chart data.

Import WeatherLink Database
Imports Davis WeatherLink 3.x, 4.x, and up to 5.9 databases into WxSolution hourly summary records, hourly observation records, and strip chart databases. Importing this data allows creation of reports from your existing data.

Export Data
Exports hourly summary records, hourly observation records, daily memory records, external data, and LCD analysis.

Export Strip Chart Data
Exports Strip Chart data to comma-separated format.

Miscellaneous

Restart Wx Computer Communications
Restarts the automatic data transmission of the ID-5001 (not applicable to the Davis). If you powered down the Heathkit while WxSolution was running, use this to restart communications. Alternatively, you can restart WxSolution (recommended).

Disconnect WxServer Clients
Disconnects any clients that are currently connected to WxSolution WxServer.

Reset Rainfall to Match Wx Computer

Resets the rainfall total in WxSolution to match that on the weather computer. Use this feature if you cleared the rainfall manually on the weather computer console while WxSolution was running.

Reset Daily Extremes

Rereads the hourly records for today and displays any updated information. This feature is used after editing an hourly record for today.

Reset Monthly/Annual/All-time Statistics

Rereads the hourly records to compute the monthly, annual, and all-time statistics. These statistics are used on the Current.html web upload page. This feature is used after editing hourly records. Note that this feature only reads the monthly summary for the hourly data. To update these statistics, generate a monthly LCD report for month that was edited.

Reconcile Wind Gusts

Intended for the Davis Vantage Pro, this will compare the daily peak wind gusts from the Hourly database and the Weather Computer Memory database (read from the VP memory) and reports when the VP memory has recorded a higher value. This feature was designed to overcome the problem when the highest wind gust is not received in the real-time traffic. It not unusual for an occasional radio packet to be missed and the wind gust is the most susceptible to packet loss.

3.7 Help

Help Topics

Displays a list of help topics.

About WxSolution

Displays WxSolution program information.

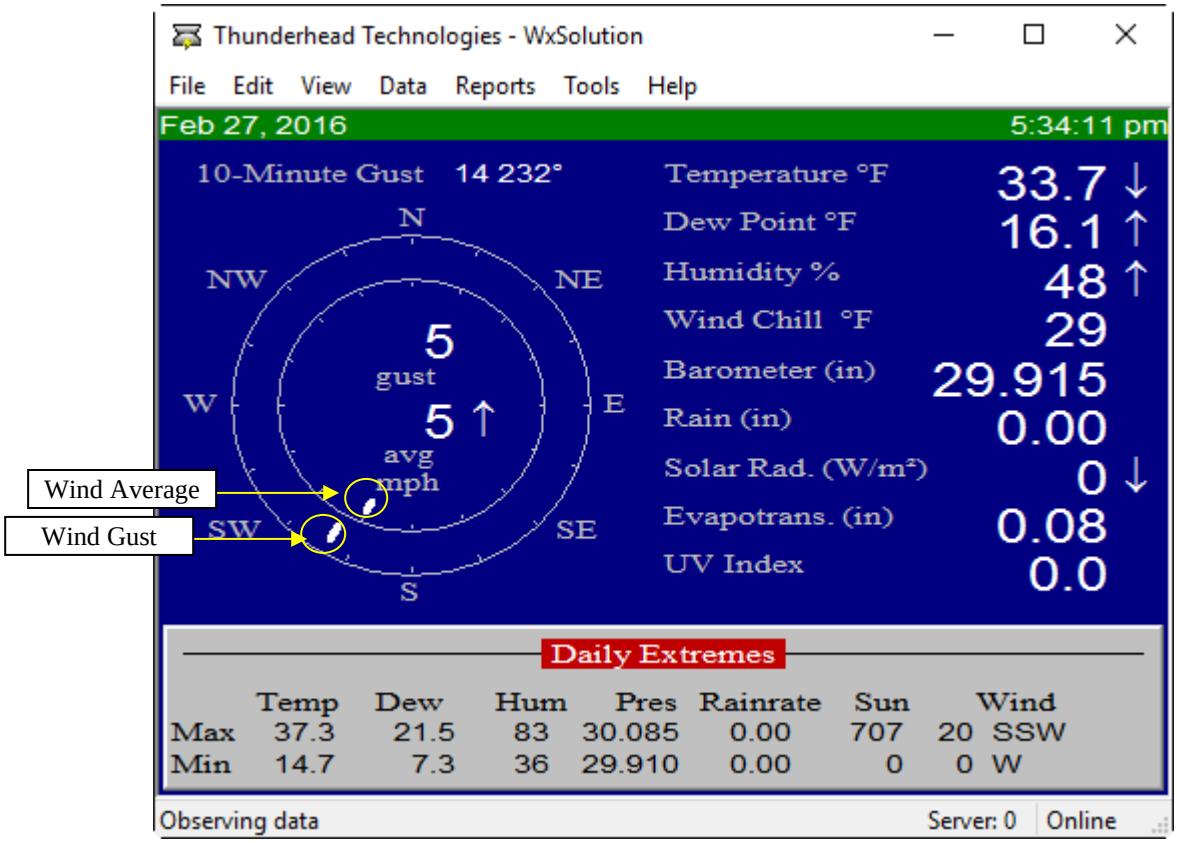
Register

Displays WxSolution registration information. If you have not already registered, you can enter your registration number. You are limited to 20 days of usage WxSolution before you must register.

4. Using WxSolution Software

The following sections describe the features of WxSolution.

4.1 Monitor Screen



Wind	The large concentric circles on the left half of the display represent the wind gust and two-minute average directions. The number above **gust** is the current instantaneous wind speed and number above **avg** is the current two-minute speed. The current direction is indicated by a dash on the outer compass. The current two-minute average direction is indicated by a dash on the inner compass.

The current values for the other parameters appear on the right half of the screen. If you are not using the humidity sensor, the dew point and humidity values will be blank. If you are not using the sunshine sensor, the sunshine parameter will not appear. The rainfall value is the total for today.

Daily Extremes

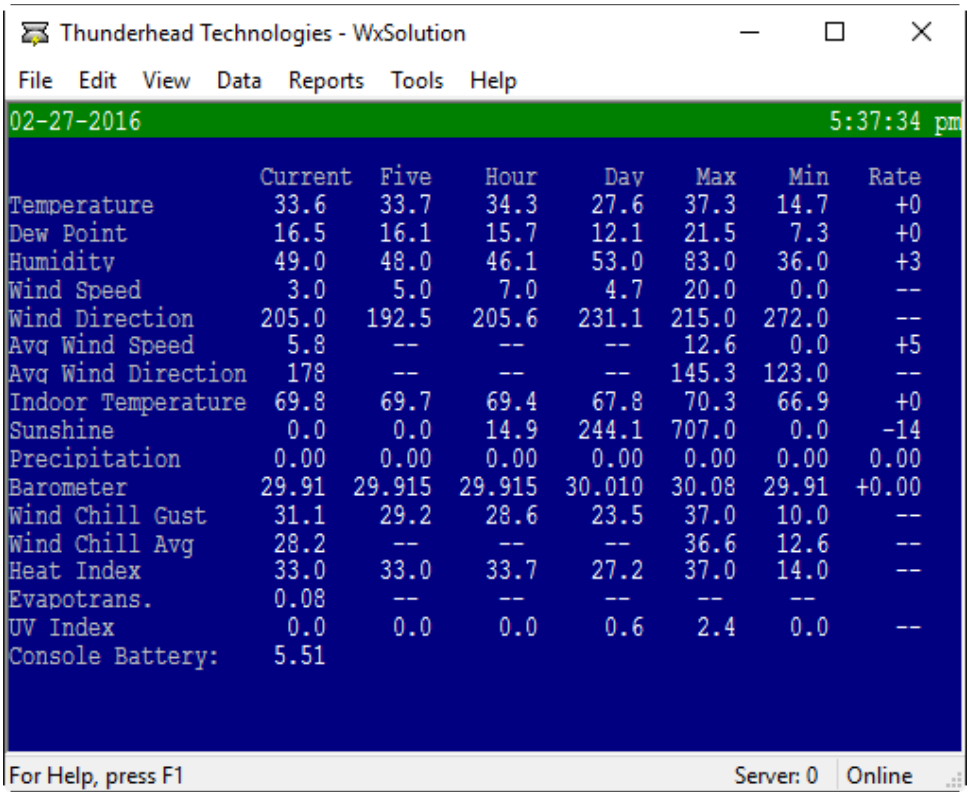
Max/Min	The maximum and minimum values for each of the parameters occurring since midnight
Temp	Outdoor temperature
Dew	Dew point
Hum	Humidity
Pres	Barometric Pressure
Rain	Rainfall – maximum and minimum instantaneous rainfall rates
Sun	Sunshine index (if configured to use the sunshine sensor)
Wind	Wind gust and direction

Status
Indicates the current operation of WxSolution. Typically displays “For Help, press F1” or “Observing data”.

Server *n*
n indicates the number of clients using WxServer. (Not displayed if WxServer is not configured.)

Online/Offline
Indicates whether WxSolution is communicating with the weather computer (Online) or not (Offline).

4.2 Detail Screen

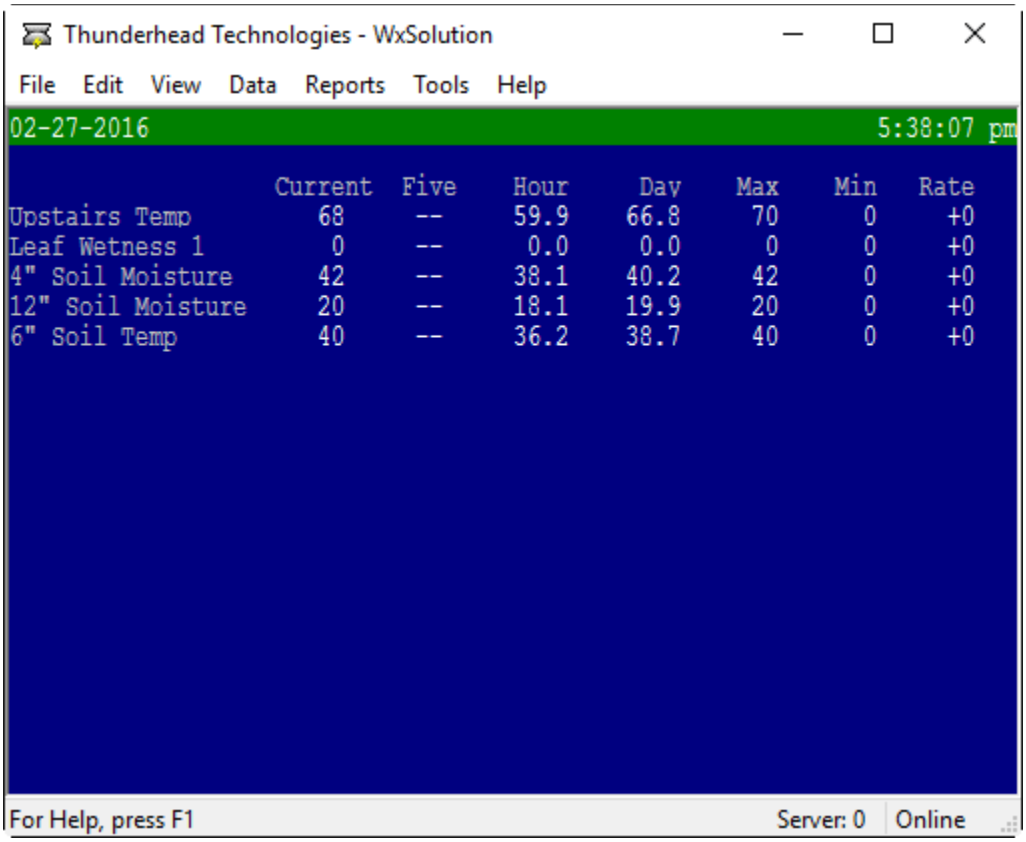


	Current	Five	Hour	Day	Max	Min	Rate
Temperature	33.6	33.7	34.3	27.6	37.3	14.7	+0
Dew Point	16.5	16.1	15.7	12.1	21.5	7.3	+0
Humidity	49.0	48.0	46.1	53.0	83.0	36.0	+3
Wind Speed	3.0	5.0	7.0	4.7	20.0	0.0	--
Wind Direction	205.0	192.5	205.6	231.1	215.0	272.0	--
Avg Wind Speed	5.8	--	--	--	12.6	0.0	+5
Avg Wind Direction	178	--	--	--	145.3	123.0	--
Indoor Temperature	69.8	69.7	69.4	67.8	70.3	66.9	+0
Sunshine	0.0	0.0	14.9	244.1	707.0	0.0	-14
Precipitation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barometer	29.91	29.915	29.915	30.010	30.08	29.91	+0.00
Wind Chill Gust	31.1	29.2	28.6	23.5	37.0	10.0	--
Wind Chill Avg	28.2	--	--	--	36.6	12.6	--
Heat Index	33.0	33.0	33.7	27.2	37.0	14.0	--
Evapotrans.	0.08	--	--	--	--	--	
UV Index	0.0	0.0	0.0	0.6	2.4	0.0	--
Console Battery:	5.51						

Current	Current value of the parameter
Five	Average value for the last five minutes
Hour	Average value since the start of the current hour
Day	Average value since the start of the current day
Max	Maximum value since the start of the current day
Min	Minimum value since the start of the current day
Rate	Change per hour as computed by the weather computer
Peak Gust Last 10 Minutes	The highest wind gust in the last 10 minutes. This value is saved at the beginning of the hour in the hourly observations.
Conditions	Heathkit only: displays the Alert, Warning, and/or Fog indicators.

Notes:
1. Precipitation rates are the maximum and minimum instantaneous rainfall rate.
2. The Sunshine parameter will appear only if enabled.

4.3 Extra Sensors Screen

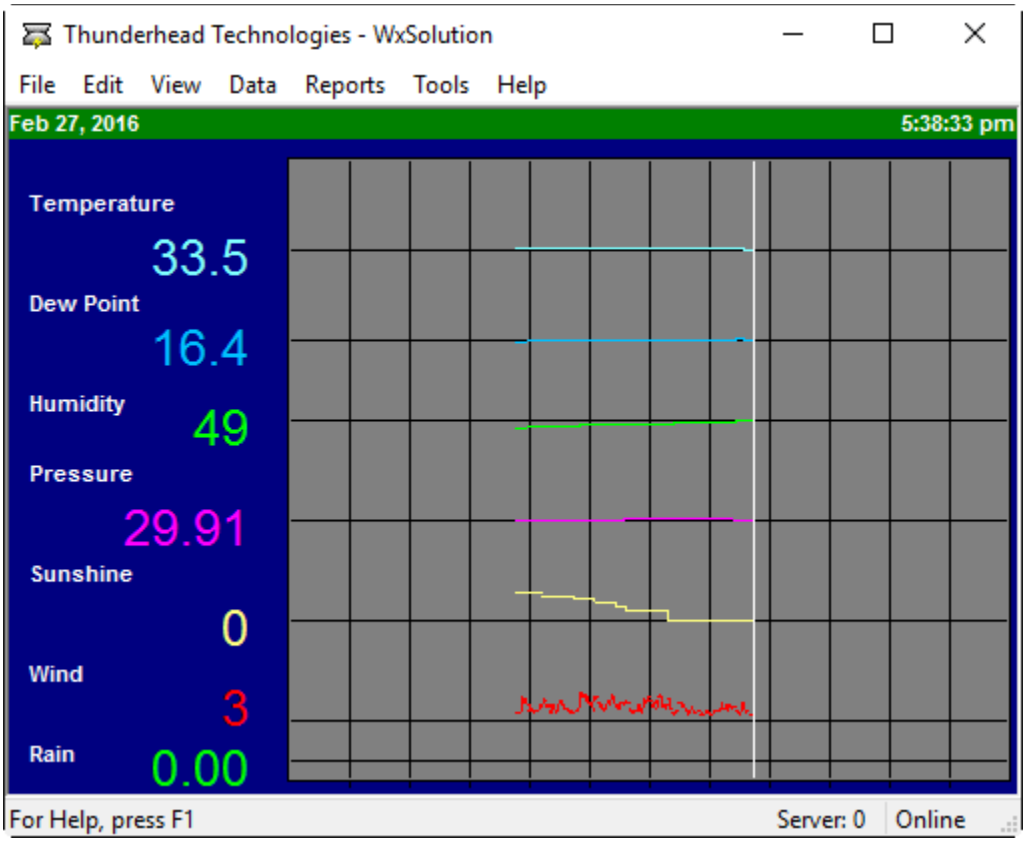


Current	Current value of the parameter
Five	Average value for the last five minutes – TBD
Hour	Average value since the start of the current hour
Day	Average value since the start of the current day
Max	Maximum value since the start of the current day
Min	Minimum value since the start of the current day
Rate	Change per hour as computed by the weather computer

Notes:

- Only those sensors that are enabled are displayed.

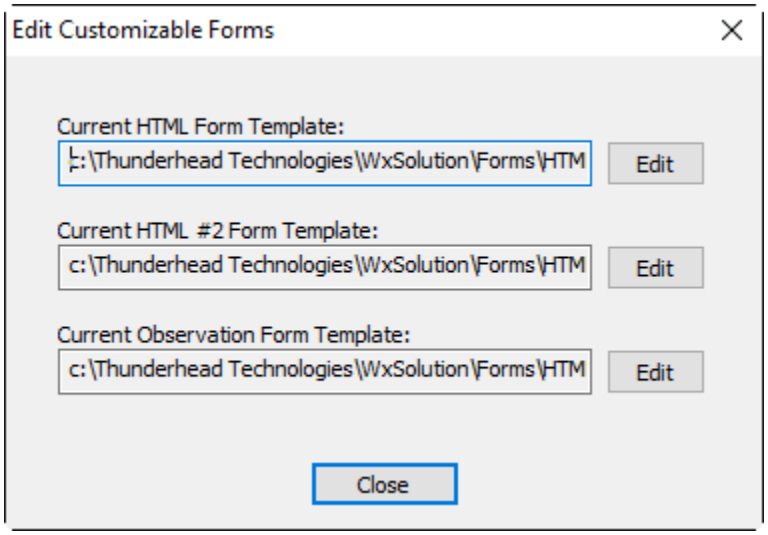
4.4 Graph Screen



The graph screen plots the data over the last hour. The graph draws left-to-right and loops back to overwrite the previous hour's data as it moves. The horizontal resolution is 10 seconds. The vertical white line indicates the current data position. At the beginning of the hour, the current data value becomes the aligned with the horizontal grid line (except for wind and rain). Rainfall is indicated by a green “dot” at the time the rain bucket empties. The current data value is also displayed next to the parameter label. The bottom axis is the minutes past the hour.

4.5 Edit HTML Forms

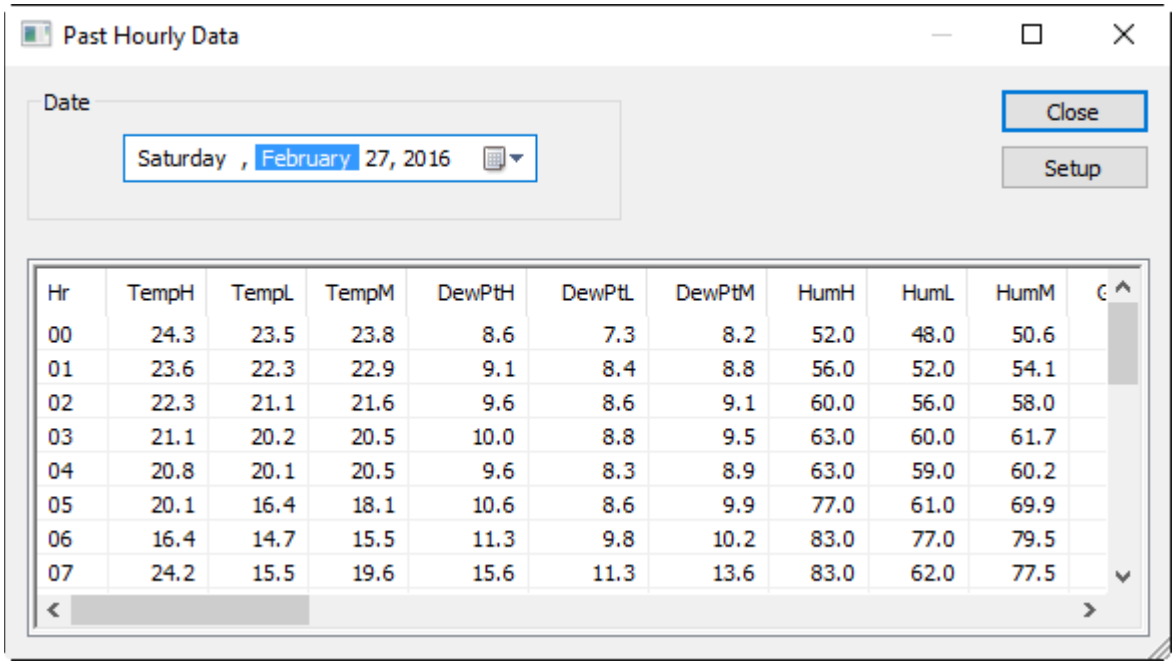
Use this screen to edit customizable forms. Pressing **Edit** will launch the default HTML editor.



Current HTML Form Template	Edit Current.html
Current HTML #2 Form Template	Edit Current2.html
Current Observation Form Template	Edit Observations.html

4.6 Viewing Past Hourly Data

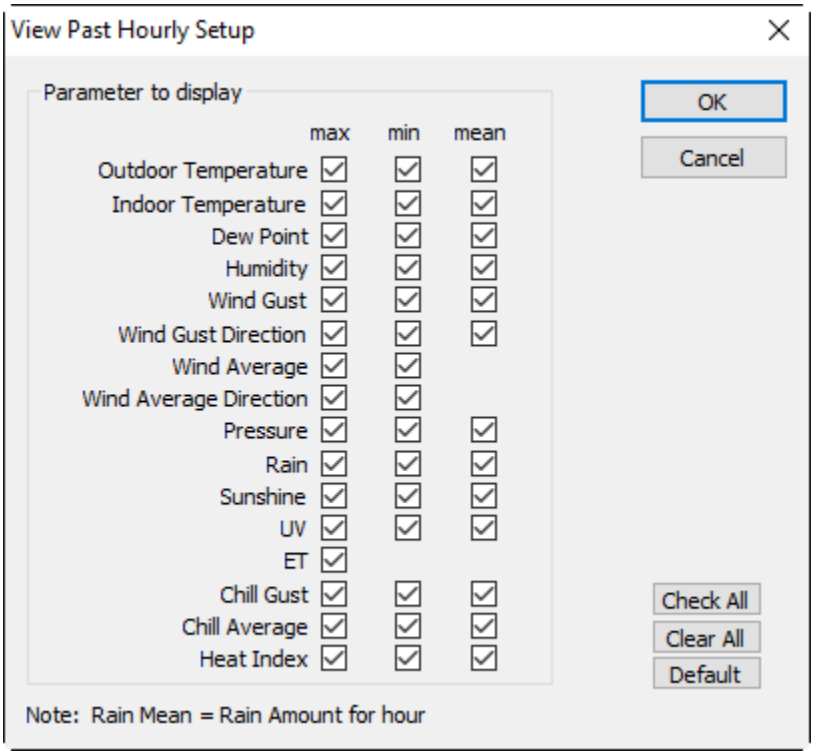
Use this screen view past hourly summary data. Select the month, day, and year of the data you wish to view. Grabbing the corner of the window with the mouse and dragging it to the desired size can resize the window.



Hr	TempH	TempL	TempM	DewPtH	DewPtL	DewPtM	HumH	HumL	HumM
00	24.3	23.5	23.8	8.6	7.3	8.2	52.0	48.0	50.6
01	23.6	22.3	22.9	9.1	8.4	8.8	56.0	52.0	54.1
02	22.3	21.1	21.6	9.6	8.6	9.1	60.0	56.0	58.0
03	21.1	20.2	20.5	10.0	8.8	9.5	63.0	60.0	61.7
04	20.8	20.1	20.5	9.6	8.3	8.9	63.0	59.0	60.2
05	20.1	16.4	18.1	10.6	8.6	9.9	77.0	61.0	69.9
06	16.4	14.7	15.5	11.3	9.8	10.2	83.0	77.0	79.5
07	24.2	15.5	19.6	15.6	11.3	13.6	83.0	62.0	77.5

TempH	High outdoor temperature	**RainH**	High instantaneous rainfall rate
TempL	Low outdoor temperature	**RainL**	Low instantaneous rainfall rate
TempM	Mean outdoor temperature	**Rain**	Total hourly rainfall
DewPtH	High dew point	**SunH**	High sunshine index
DewPtL	Low dew point	**SunL**	Low sunshine index
DewPtM	Mean dew point	**SunM**	Mean sunshine index
HumH	High humidity	**ITempH**	High indoor temperature
HumL	Low humidity	**ITempL**	Low indoor temperature
HumM	Mean humidity	**ITempM**	Mean indoor temperature
GustH	High wind gust	**UVH**	High ultraviolet index
GDirH	Direction of high wind gust	**UVL**	Low ultraviolet index
GustL	Low wind gust	**UVM**	Mean ultraviolet index
GDirL	Direction of low wind gust	**ChillGustH**	High wind chill gust
WAvgH	High wind average	**ChillGustL**	Low wind chill gust
ADirH	Direction of high wind average	**ChillGustM**	Mean wind chill gust
WAvgL	Low wind average	**ChillAvgH**	High wind chill average
ADirL	Direction of low wind average	**ChillAvgL**	Low wind chill average
SpdH	Mean wind speed	**ChillAvgM**	Mean wind chill average
DirM	Mean wind direction (resultant)	**HeatIndexH**	High heat index
PresH	High barometric pressure	**HeatIndexL**	Low heat index
PresL	Low barometric pressure	**HeatIndexM**	Mean heat index
PresM	Mean barometric pressure	**ET**	Evapotranspiration (total for hour)

Select **Setup** to choose the columns you wish to view.



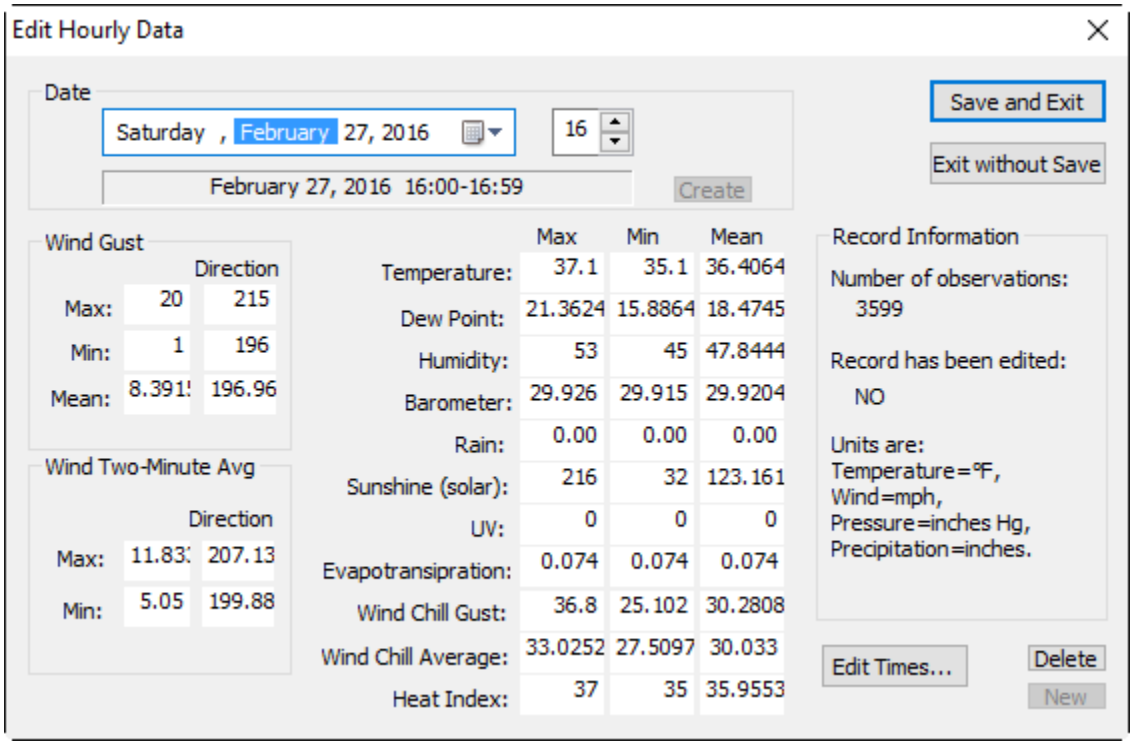
Use this screen to select which data items appear in the Past Hourly Summary Data. Certain items will be checked by default. To select an item to be displayed, check the box under the max, min, or mean column for the weather parameter of interest. The date and time will always appear in the left-most column.

Check All	Selects all parameters
Clear All	Clears all parameters
Default	Selects the default parameters

The items will be displayed in order from left to right, top-down. Max appears first, followed by min, and then mean. Outdoor Temperature is first, followed by Indoor Temperature, Dew Point, Humidity, Wind Gust, Wind Gust Direction, Wind Average, Wind Average Direction, Pressure, Rain, Sunshine, UV, ET, Chill Gust, Chill Average, and Heat Index in that order.

4.7 Edit Hourly Data

Use the Editing Hourly Data screen to edit past hourly data. Editing should only be needed to account for missing or erroneous data.



If you change the date or hour after editing, you will be prompted to save the changes.

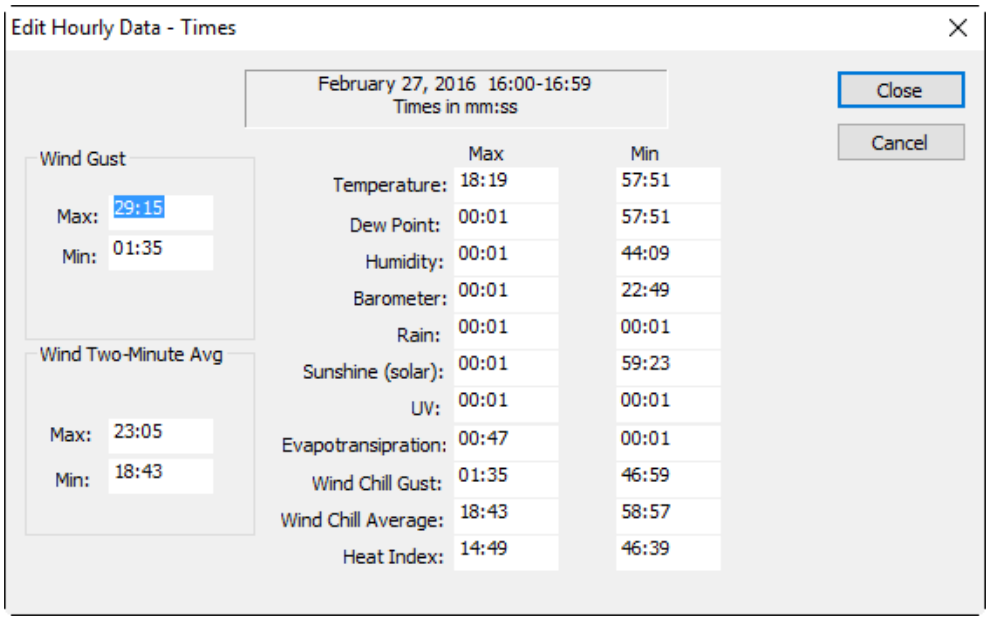
Notes:

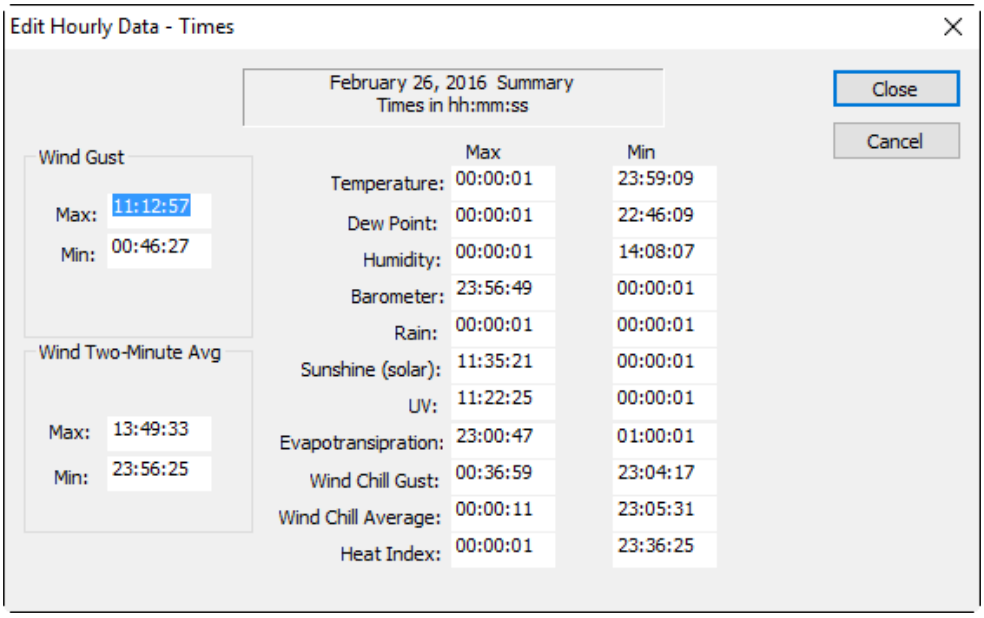
1. Hour 24 is the daily summary record. Values represent means and extremes for the entire day.
2. Precipitation values are:
   Max: The maximum instantaneous rainfall during the hour. See the glossary in Appendix A.1 for an explanation of instantaneous rainfall.
   Min: The minimum instantaneous rainfall during the hour.
   Amount: The total amount of rainfall during the hour.
3. If no data exists for the hour, **** NO DATA AVAILABLE **** appears in the date/hour position above the Record Information field.
4. To permanently delete a record, select **Delete**.
5. To create a new record if no data exists, select **New**. For creating many new records, it may be easier to first export this month's hourly data file, edit the data using a spreadsheet, and then import the records back into WxSolution.
6. Press **Edit Times** to change the time of occurrence.

Be sure to select Sum Hourly Records from the Data menu after editing a record to update the daily summary record. Changes you made may not be reflected in the analysis data or reports if you do not.

Use the Edit Hourly Data screen to edit past hourly data. Editing should only be needed to account for missing or erroneous data.

When editing times, the time is in *minutes:seconds* for hours 00-23 and *hours:minutes:seconds* for hour 24, the summary record.



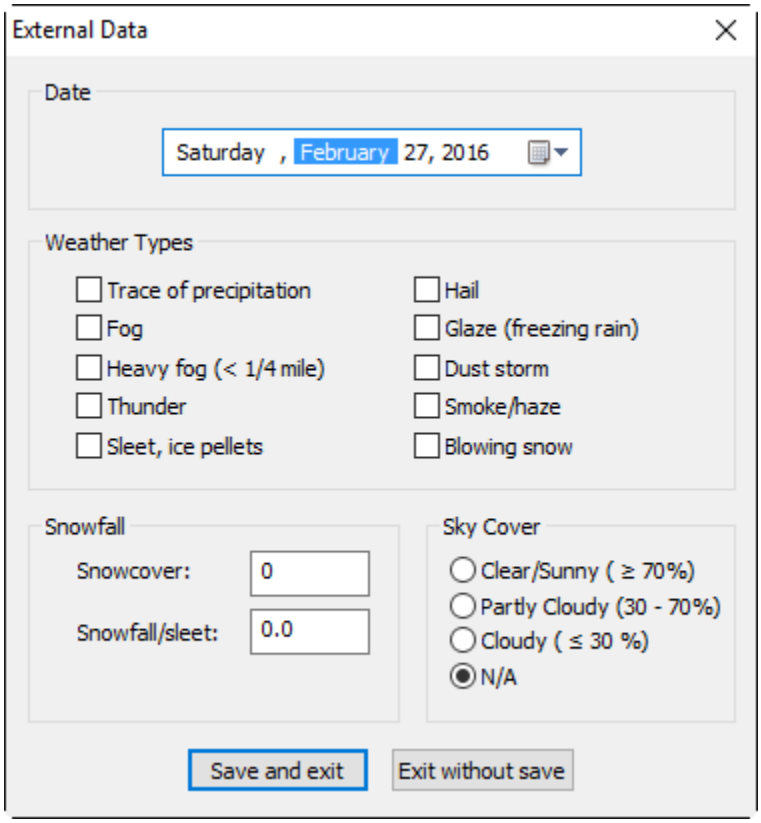


Notes:

- Ensure that the hour value is correct for the selected hour.

4.8 Edit External Data

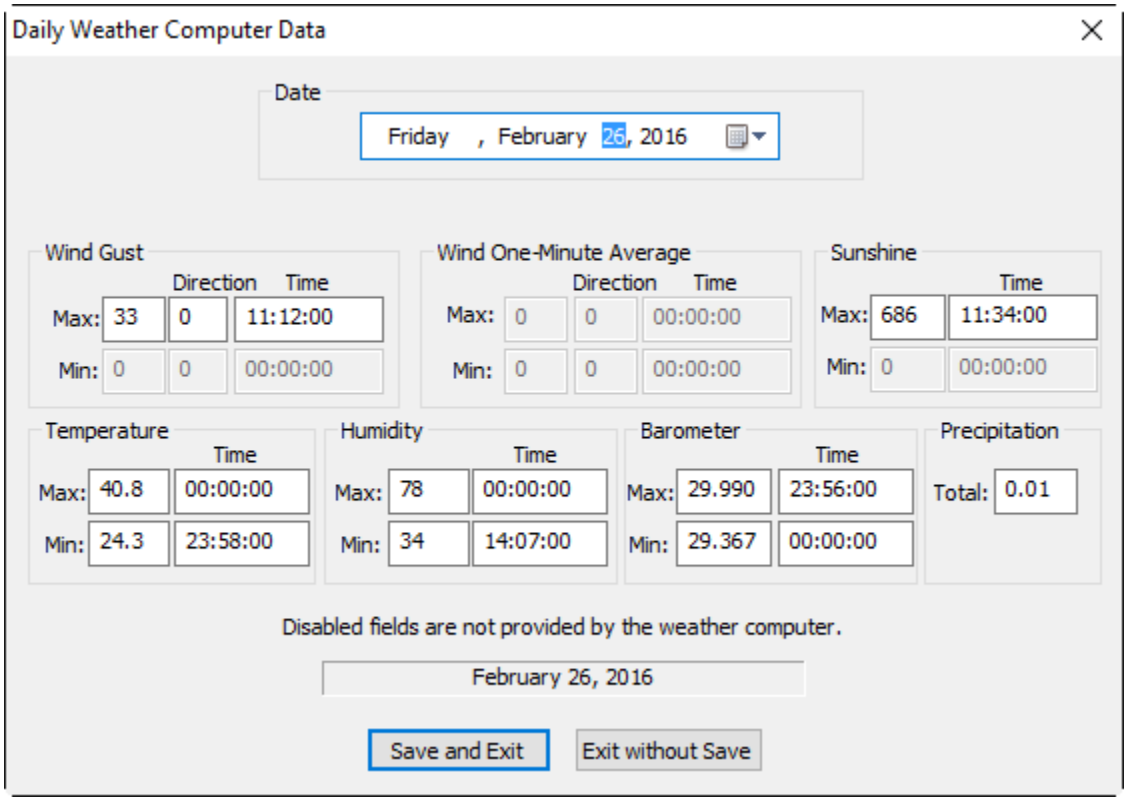
The Editing External Data screen records daily occurrences of snowfall, snow cover, precipitation types, and sky cover.



Weather Types	Check all the weather events that occurred for the day.
Snow cover	Enter in whole inches the amount snow on the ground. For trace amounts enter "**T**".
Snowfall/sleet	Enter to the nearest tenth of an inch the snowfall. For trace amounts enter "**T**".
Sky Cover	Select the appropriate sky cover: **Clear**, **Partly Cloudy**, or **Cloudy**. Select **N/A** if not observed.

4.9 Edit Weather Computer Daily Data

To edit or view the daily data retrieved from the weather computer, enter the date you wish to view. This data does not appear in the reports; however, it is used to validate the hourly records when creating the daily, monthly, and annual reports.

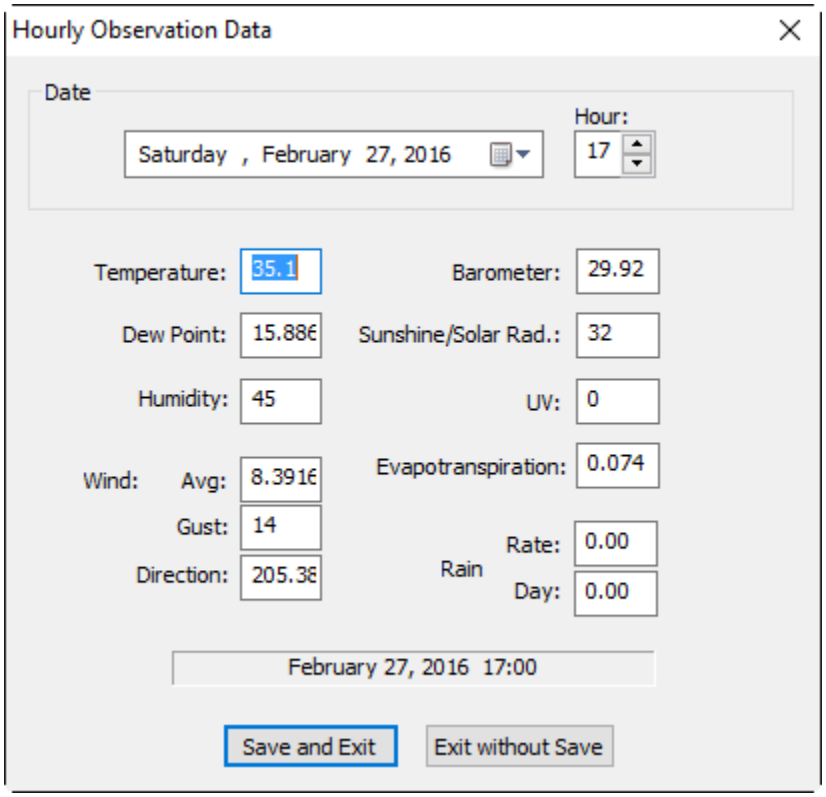


Notes:

1. If you change the date after making any changes, you will be prompted to save the current day's data.
2. The correct form of the time field is ***hh:mm:ss***. For example, “01:23:45”.
3. Wind One-Minute Average is only available for the Heathkit ID-5001. Wind Gust Min, Wind One-Minute Average, Barometer, and Sunshine are not available in the Davis WM2. Wind Gust Min and Wind One-Minute Average are not available in the Vantage Pro. The unavailable fields are disabled.

4.10 Edit Hourly Observation Data

Use this screen to edit or view the past hourly data recorded at the beginning of each hour. This data appears on pages 2 and 3 of the monthly LCD reports.

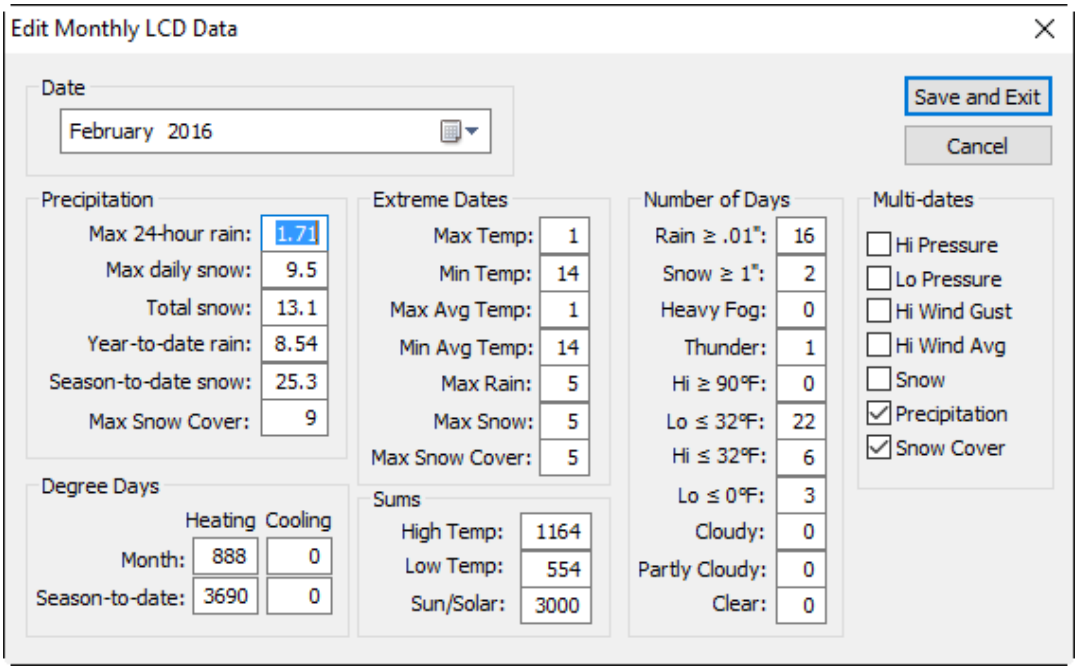


Rain Rate	The instantaneous rainfall rate at the time of observation
Rain Day	The total rainfall accumulated for the day up to the observation time
Wind Gust	The highest wind gust occurring the ten minutes preceding the observation time

Note: If you change the date/time after making any changes, you will be prompted to save the current day's data.

4.11 Edit Monthly LCD Data

Select the month and year. If this is your first LCD report and no LCD file exists for the previous month, then the month and year will be grayed. Only edit monthly LCD data if no previous data exists (this is the first month running WxSolution) or if WxSolution has incorrectly calculated the information.



Year-to-date rain	Since January 1. Enter 'T' for trace.
Season-to-date snow	Enter 'T' for trace. Since July 1 northern hemisphere; since January 1 southern hemisphere.
Season-to-date heating degree days	Since July 1 northern hemisphere; since January 1 southern hemisphere.
Season-to-date cooling degree days	Since January 1 northern hemisphere; since July 1 southern hemisphere.
Max 24-hour rain	Highest rainfall accumulation spanning any 24-hour period
Extreme Dates	The day of the month on which the high or low occurred.
Sums	The summation of the parameter for each day of the month.
Number of Days	The number of days the condition occurred during the month.
Multi-dates	Check if the extreme occurred on more than one day. For precipitation, check if the 24-hour maximum spanned two calendar days.

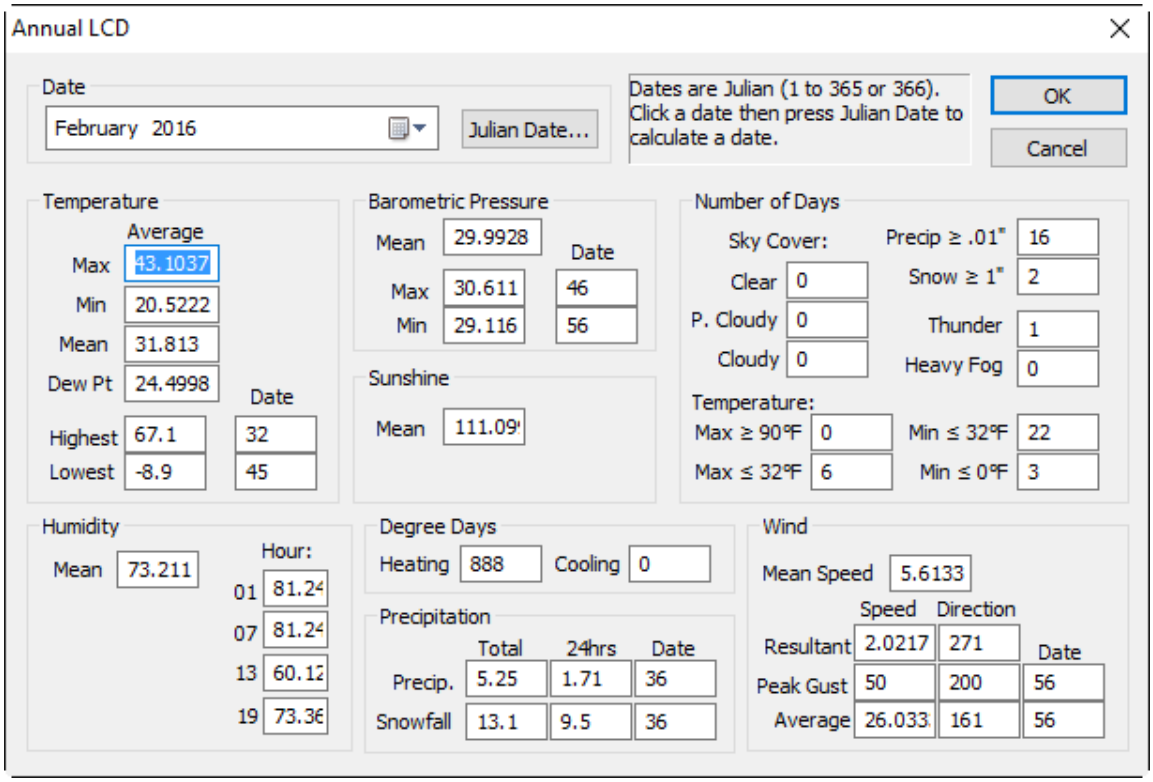
To calculate degree days, add the high and low temperatures in °F and divide by two. Round up the result to the nearest whole degree. For base 65, if the result is greater than 65, subtract 65 from the result – these are cooling degree days. If the result is less than 65, subtract the result from 65 – these are heating degree days. If the result is 65, then there are no heating or cooling degree days. Sum the degree days for the each day in month(s) of the season so far.

Examples:

1. High = 80, low = 67. (80+67) ÷ 2 = 73.5. 73.5 rounds up to 74. Since 74 is greater than 65, 74–65 = **9** cooling degree days.
2. High = 45, low = 26. (45+26) ÷ 2 = 35.5. 35.5 rounds up to 36. Since 36 is less than 65, 65–36 = **29** heating degree days.

4.12 Edit Annual LCD Data

Use this screen to modify the LCD summaries generated by WxSolution.



Temperature

Max	Average maximum temperature for the month
Min	Average minimum temperature for the month
Mean	Average mean temperature for the month
Dew Pt	Average dew point for the month
Highest/Date	Highest temperature for the month and the date
Lowest/Date	Lowest temperature for the month and the date

Barometric Pressure

Mean	Mean barometric pressure for the month
Max/Date	Highest barometric pressure for the month and the date
Min/Date	Lowest barometric pressure for the month and the date

Sunshine

Mean	Mean sunshine for the month

Humidity

Mean	Mean humidity for the month
Hour 01	Mean humidity for hour 01 for the month
Hour 07	Mean humidity for hour 07 for the month
Hour 13	Mean humidity for hour 13 for the month
Hour 19	Mean humidity for hour 19 for the month

Degree Days

Heating	Total heating degree days for the month
Cooling	Total cooling degree days for the month

Precipitation

Precip – total	Total precipitation for the month. Enter 'T' for trace.
Precip – 24 hrs/Date	Greatest 24-hour precipitation for the month and start date. Enter 'T' for trace.
Snowfall – total	Total snowfall for the month. Enter 'T' for trace.
Snowfall – 24 hrs/Date	Greatest one day snowfall for the month and start date. Enter 'T' for trace.

Wind

Mean Speed	Mean wind speed for the month
Resultant Speed/Direction	Resultant wind speed and direction for the month
Peak Gust/Direction	Peak wind gust and direction for the month
Average/Direction	Highest two-minute average wind speed and direction for the month

Number of Days

Sky cover

Clear	Days with less than 30% cloud cover
Partly Cloudy	Days with between 30% and 70% cloud cover
Cloudy	Days with more than 70% cloud cover

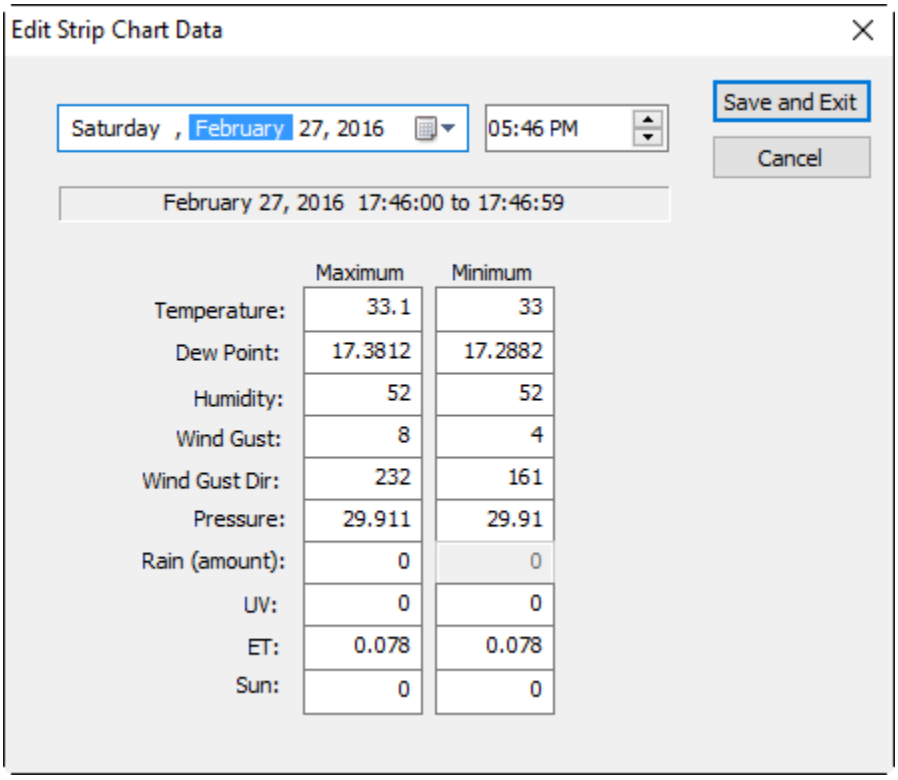
Temperature

Max ≥ 90°F	Days with high temperature greater than or equal to 90°F
Max ≤ 32°F	Days with high temperature less than or equal to 32°F
Min ≤ 32°F	Days with low temperature less than or equal to 32°F
Min ≤ 0°F	Days with low temperature less than or equal to 0°F
Precip ≥ .01"	Days with precipitation greater than or equal to 0.01 inch
Snow ≥ 1"	Days with snowfall greater than or equal to 1 inch

Note: The dates are Julian (from 1 to 365/366) for the entire year. To calculate a Julian date, check in a date field then press the **Julian Date** button then select the month, day, and year. The Julian date will appear in the lower right corner of the screen. It will be placed in the last date field that was selected.

4.13 Edit Strip Chart Data

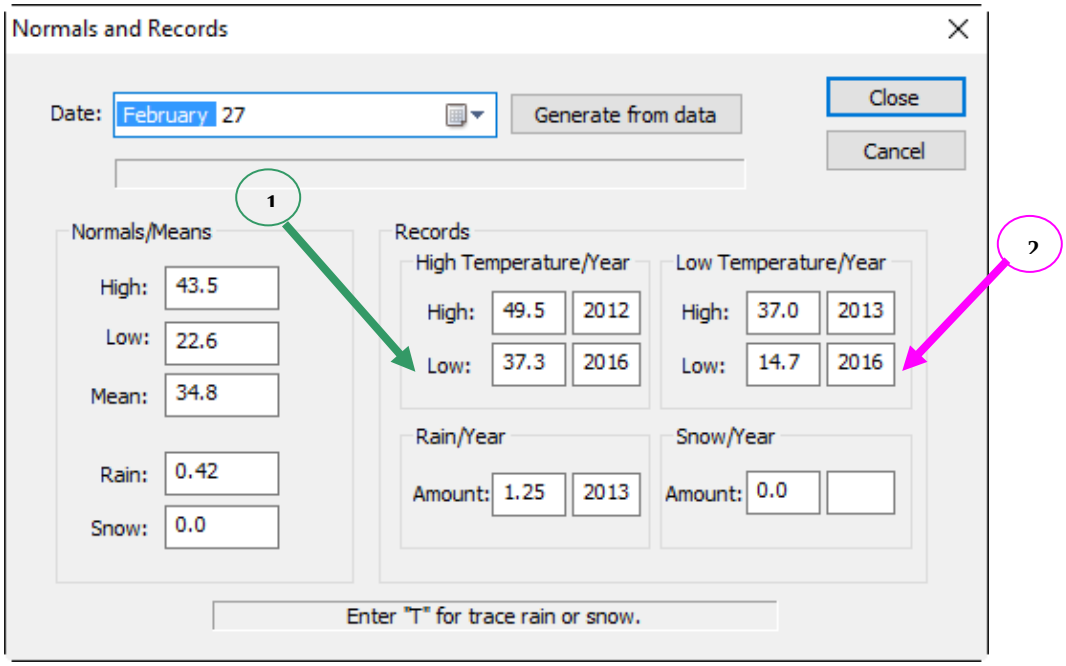
Edit Strip Chart Data allows modification of the WxSolution minute-by-minute data used to generate the strip chart graphs.



Use the data and time controls to select the desired record. You cannot add new records from this dialog. Use the import feature to add new records.

4.14 Edit Normals and Records

Use this screen to edit normals and records data. Use the Import feature to more easily enter data for an entire month.

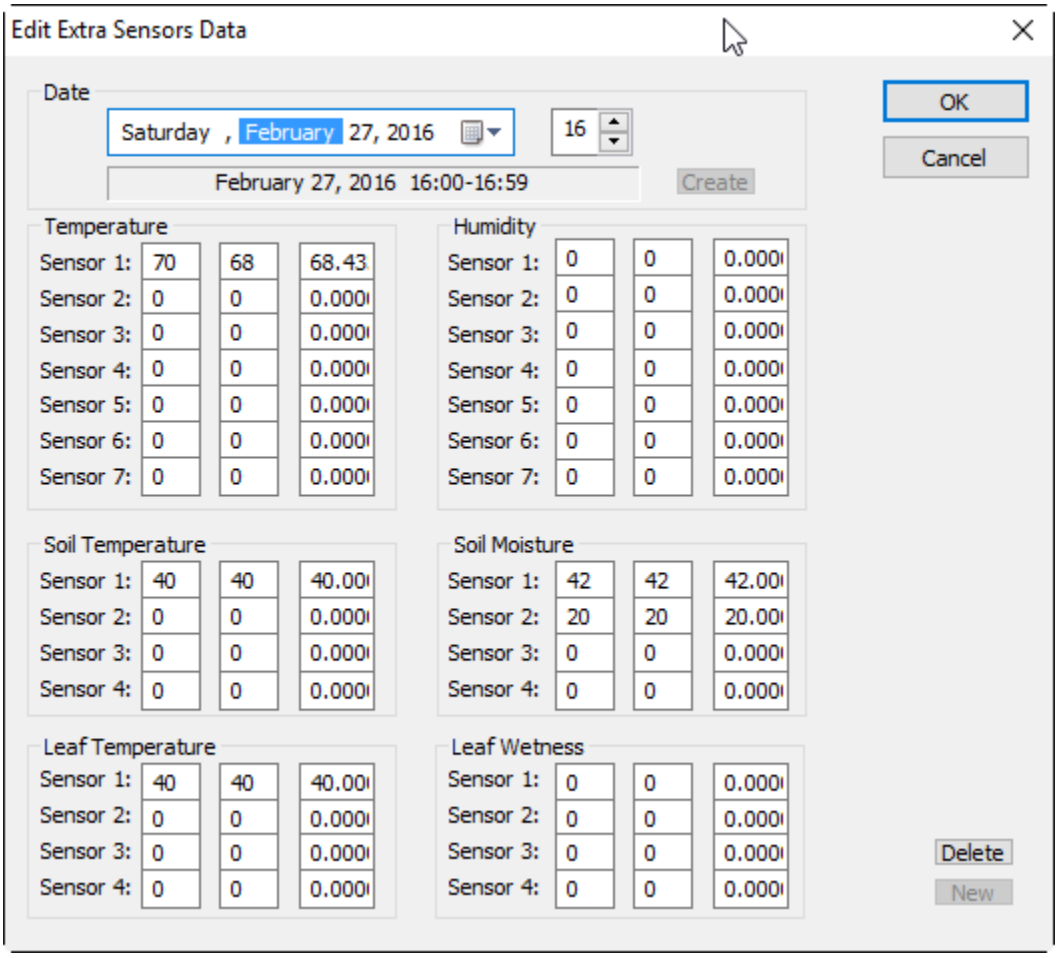


Date	Select the month, date. The year is ignored.
Normals	Enter the normal high, low, and mean temperatures. Enter the normal rainfall and snowfall.
Records	Enter the record highs and lows. The record low high temperature is the minimum high temperature for the day (1). The record high low temperature is the maximum low temperature for the day (2).
Generate from data	Press to generate normals and records from your data. Your climate record should be sufficiently long to produce meaningful results. Normals are typically calculated over a 30-year period.

Enter “T” for trace rain and snow amounts. The year field will be blank if the record rain and/or snow are zero for the day.

4.15 Edit Extra Sensors Data

Use the Editing Extra Sensors Data screen to edit past extra sensors data. Editing should only be needed to account for missing or erroneous data.



If you change the date or hour after editing, you will be prompted to save the changes.

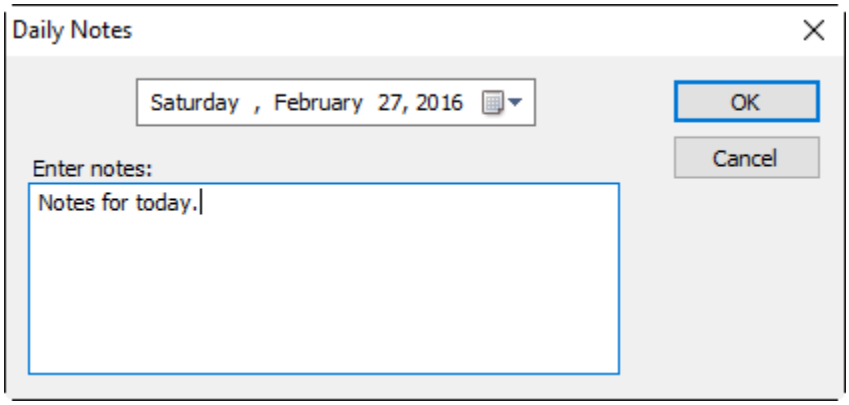
Notes:

1. Hour 24 is the daily summary record. Values represent means and extremes for the entire day.
2. If no data exists for the hour, **** NO DATA AVAILABLE **** appears in the date/hour position above the Record Information field.
3. To permanently delete a record, select Delete.
4. To create a new record if no data exists, select New. For creating many new records, it may be easier to first export this month's hourly data file, edit the data using a spreadsheet, and then import the records back into WxSolution.

Be sure to select Sum Extra Sensors Records from the Data menu after editing a record to update the daily summary record.

4.16 Edit Daily Notes

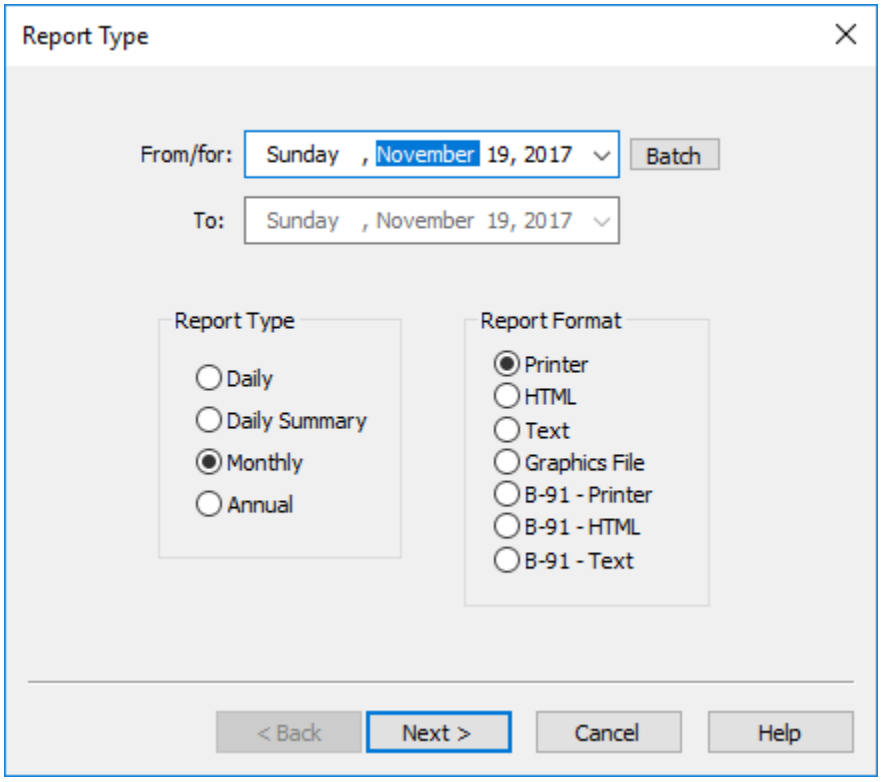
Use this screen enter the observer notes for each day. The notes are used on the LCD Daily Reports and the monthly E15 reports.



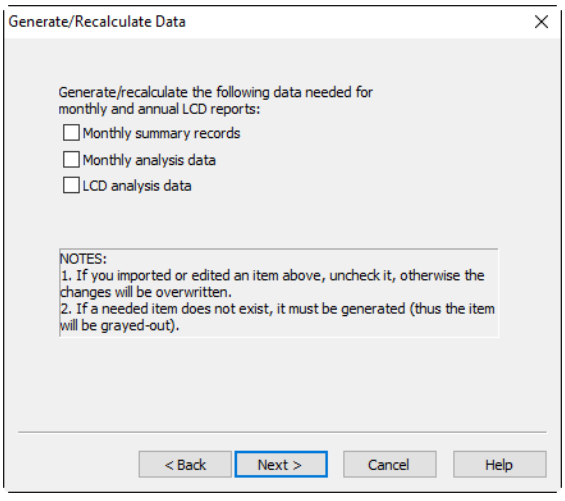
Date	Select the month, date, and year.
Enter notes	Enter notes for the day. For the B-91 form, limit the text to 51 characters including spaces, and no line breaks.

4.17 Creating LCD Reports

This screen allows you to create Local Climatological Data (LCD) reports, which are very similar to the reports, produced by the National Climatic Data Center. Only months that have hourly summary data will appear in the month, day, and year selections.



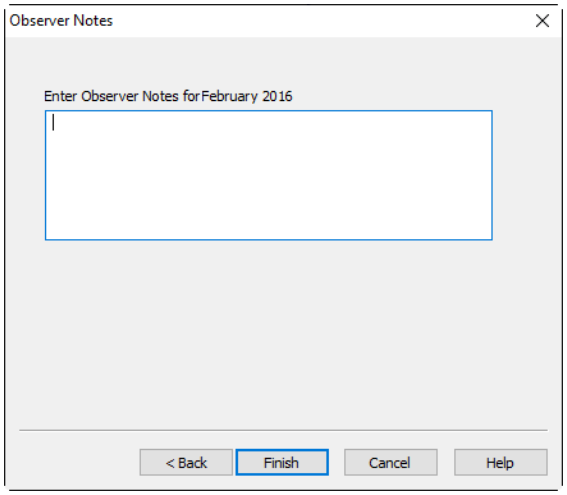
Use **Batch** when generating reports for more than one month at a time, for example, January 2015 to June 2015. Do not select **Batch** when generating a report for only one month. When generating an Annual report, only the year portion of the date is relevant. When generating a Monthly report, only the month and year are used.



Calculate/Regenerate Data

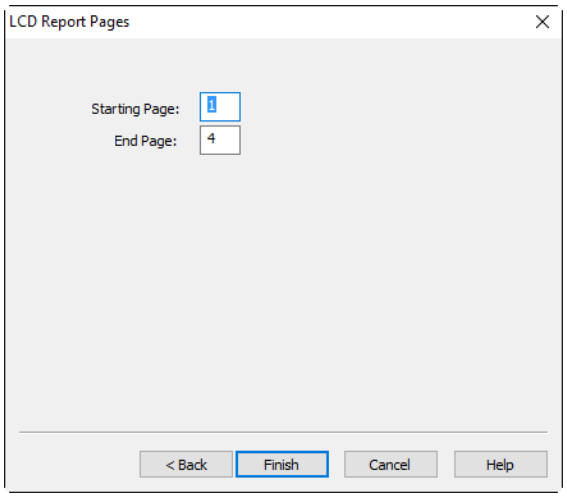
In order to create an LCD report, WxSolution needs to analyze the data. If one of the needed analysis files has not been created, the box will be checked and grayed since WxSolution needs to generate the analysis data. If an item is not needed for the report, it will be unchecked and grayed. Also, if you created a report prior to the end of the month, you must check all to recalculate the data.

If you imported edited monthly summary records, LCD analysis, or LCD annual analysis data, you should uncheck the item(s) as the data will be overwritten.



Observer Notes

Enter any notes you wish to appear at the bottom of the first page of the daily or monthly report. The text should be limited to 6 lines and a maximum of 128 characters per line.



LCD Report Pages

This screen allows you to select the page range for the generation of the HTML and Text report formats. The page numbers correspond to the printed page numbers for the LCD report even enough the HTML and Text report is only one "page". This page does not appear when generating Print reports.

4.17.1 Daily Summary

Creates a one-page report for one day. This report requires that external data (snowfall, precipitation types, sky cover) exist. If these data have not defined, you will be prompted to enter it before creating the report.

4.17.2 Monthly Summary

Creates a six-page report for one month. This report requires that external data (snowfall, precipitation types, sky cover) exist. If the external data have not been defined, you will be prompted to enter it before creating the report. If no data exists for the previous month, (and it will not the first time you create a monthly report) then you will be prompted for additional LCD data.

WxSolution will then compare the data in the hourly records to the daily weather data to look for differences between the extremes for that day. If any differences are found, then the file *mmmyyyy*_**DIFF.txt** (ex. Sep1998_DIFF.txt) is created and stored in the **Reports** subdirectory. You can then view the text file and edit the hourly data files to eliminate the differences.

Enter any observer notes or comments you wish to have appear on the bottom of page 1 of the report.
When presented with the Print Dialog, you can select whether to print all six pages or range of the six pages.

Report Contents

Page 1
Daily statistics and monthly totals, averages, and extremes.
Page 2
3-hour observations (days 1-18) and maximum precipitation duration.
Page 3
3-hour observations (days 19-last) and summary of 3-hour observations for the month.
Page 4
Hourly precipitation table for the month.
Page 5
Hour-by-hour plot of the temperature, dew point, humidity, barometric pressure, wind gust and direction, sunshine index, and precipitation.
Page 6
Monthly wind rose.

Note: Pages 5 and 6 do not appear in the HTML and text reports.

4.17.3 Annual Summary

Creates a seven-page report for one year. This report requires that monthly data exist for at least one month. If there is no monthly data, no report can be created.

Be sure to configure the Annual Report Setup first.

When presented with the standard Windows Print Dialog, you can select whether to print all seven pages or range of the seven pages.

Report Contents

Page 1
Plot of daily temperatures, barometric pressure, and precipitation for the year.
Page 2
Means and extremes for the year.
Page 3
Means and extremes for the entire station record.
Page 4
Monthly precipitation and snowfall tables for the entire station record.
Page 5
Monthly temperature and heating degree days tables for the entire station record.
Page 6
Monthly cooling degree days table for the entire station record.
Page 7
Station location and instrumentation information.

Note: Page 1 does not appear in the HTML and text reports.

4.17.4 Report Format

Select which report format:

Printer

Formats for and prints to the selected Windows printer.

HTML

Formats for a web page (HTML document). This is an optional format that can be used in Send Mail.

Text

Formats for plain text output (TXT document). This is the default format used in Send Mail.

Graphics File

Generates a JPG file that contains the graphics portion of the report. Monthly: hour-by-hour data plot, Annual: day-by-day data plot.

B-91 Printer

Generates a B-91 report for a web page (HTML document).

B-91 HTML

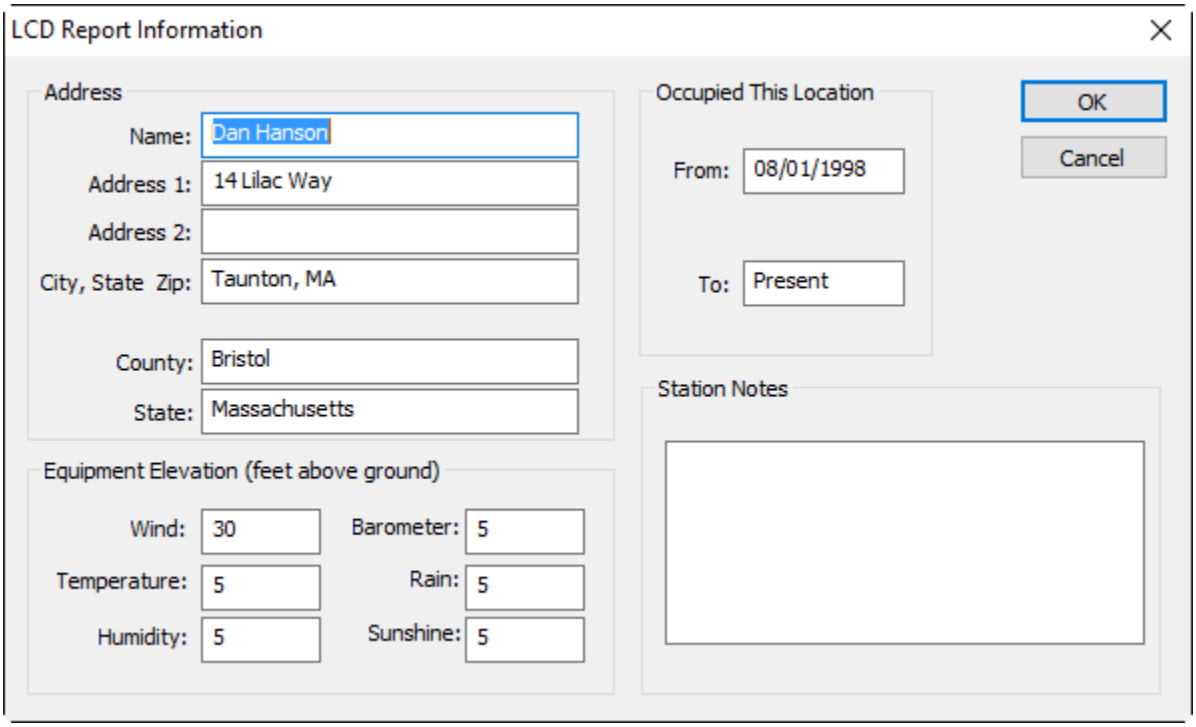
Generates a B-91 report for a web page (HTML document).

B-91 Text

Generates a B-91 report for plain text output (TXT document).

4.18 Annual Report Setup

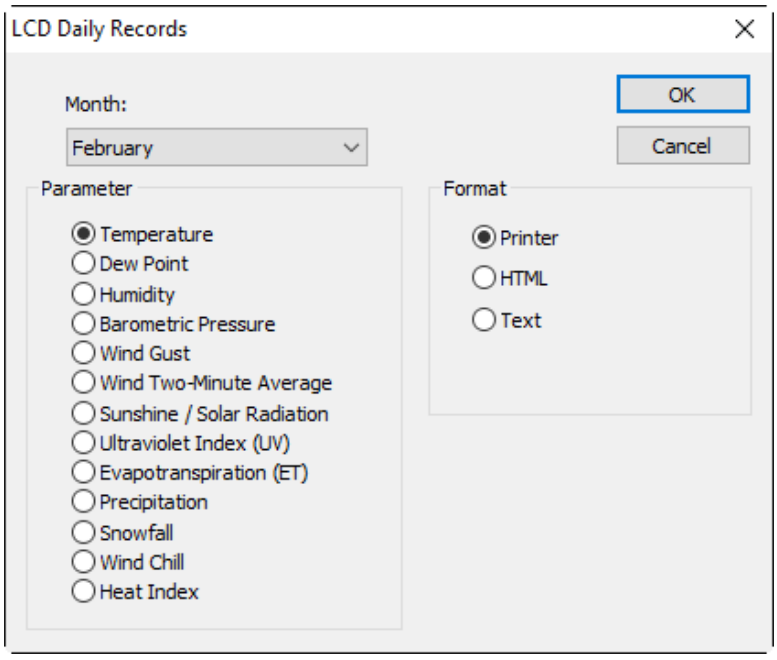
This screen configures information that appears on the last page of the annual LCD report.



Name	Enter the name of the observer.
Address	Enter the address information for the station.
County	Enter the county. This will also be used on the B-91 report.
State	Enter the state. This will also be used on the B-91 report.
Equipment Elevation	Enter the elevation of the instruments in feet above the ground. The ground elevation is entered in the station information section.
Occupied This Location	Enter the date that records began at this station. Use the date format *mm/dd/yyyy*.
Station Notes	Enter any notes you wish to appear in the Notes section of the last page.

4.19 LCD Records Report

LCD Records Report creates a report of record high, lows, and means of selected parameters for each day of the selected month. This is accomplished by scanning the daily extremes for each of the select month for all years in the station record. The reports can be rendered to a **Printer**, **HTML** file, or a **Text** file.



The parameters are:

Temperature	Extremes and averages of temperature
Dew Point	Extremes and averages of dew point
Humidity	Extremes and averages of humidity
Pressure	Extremes and averages of barometric pressure
Wind Gust	Extremes and averages of wind gusts
Wind Average	Extremes and averages of two-minute wind speed
Sunshine/Solar	Extremes and averages of sunshine index or solar radiation
UV	Extremes and averages of ultraviolet radiation
ET	Extremes and averages of evapotranspiration
Precipitation	Extremes and averages of precipitation
Snow	Extremes and averages of snowfall
Wind Chill	Extremes and averages of wind chill (gust)
Heat Index	Extremes and averages of heat index

Each monthly contains the following columns in the report:

Record High	The highest value recorded for that day
Record Min High	The minimum highest value recorded for that day
Mean High	The average highest value recorded for that day
Record Max Low	The maximum lowest value recorded for that day
Record Low	The lowest value recorded for that day
Mean Low	The average lowest value recorded for that day
Highest Daily Mean	The highest daily mean value recorded for that day
Lowest Daily Mean	The lowest daily mean value recorded for that day
Average Daily Mean	The average daily mean value recorded for that day

Special Case Reports

For Precipitation, only the following columns are displayed:

Record High Rate	The highest instantaneous rainfall rate recorded for that day
Highest Daily Total	The highest daily precipitation recorded for that day
Lowest Daily Total	The lowest daily precipitation recorded for that day
Average Daily Total	The average daily precipitation recorded for that day

For Snow, only the following columns are displayed:

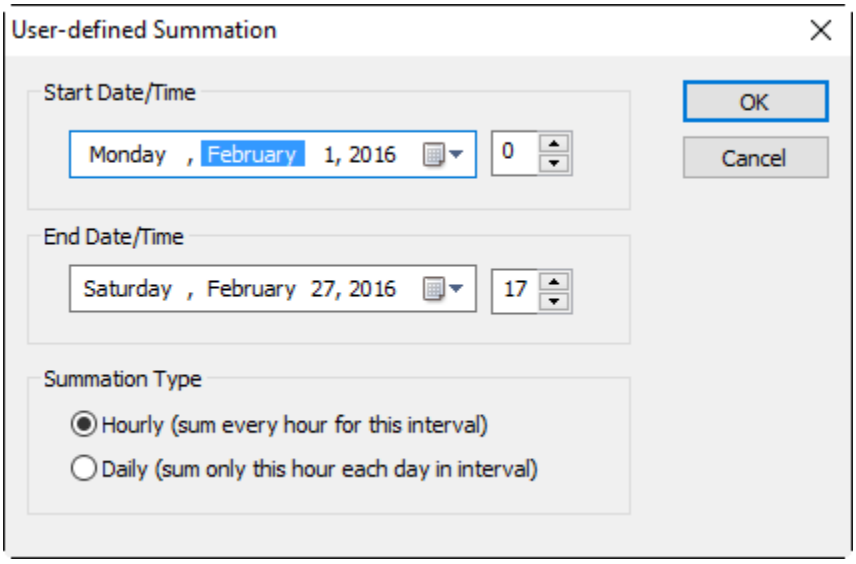
Highest Daily Total	The highest daily snowfall recorded for that day
Lowest Daily Total	The lowest daily snowfall recorded for that day
Average Daily Total	The average daily snowfall recorded for that day

For ET, only the following columns are displayed:

Highest Daily Total	The highest daily ET recorded for that day
Lowest Daily Total	The lowest daily ET recorded for that day
Average Daily Total	The average daily ET recorded for that day

4.20 Calculating User-Defined Summations

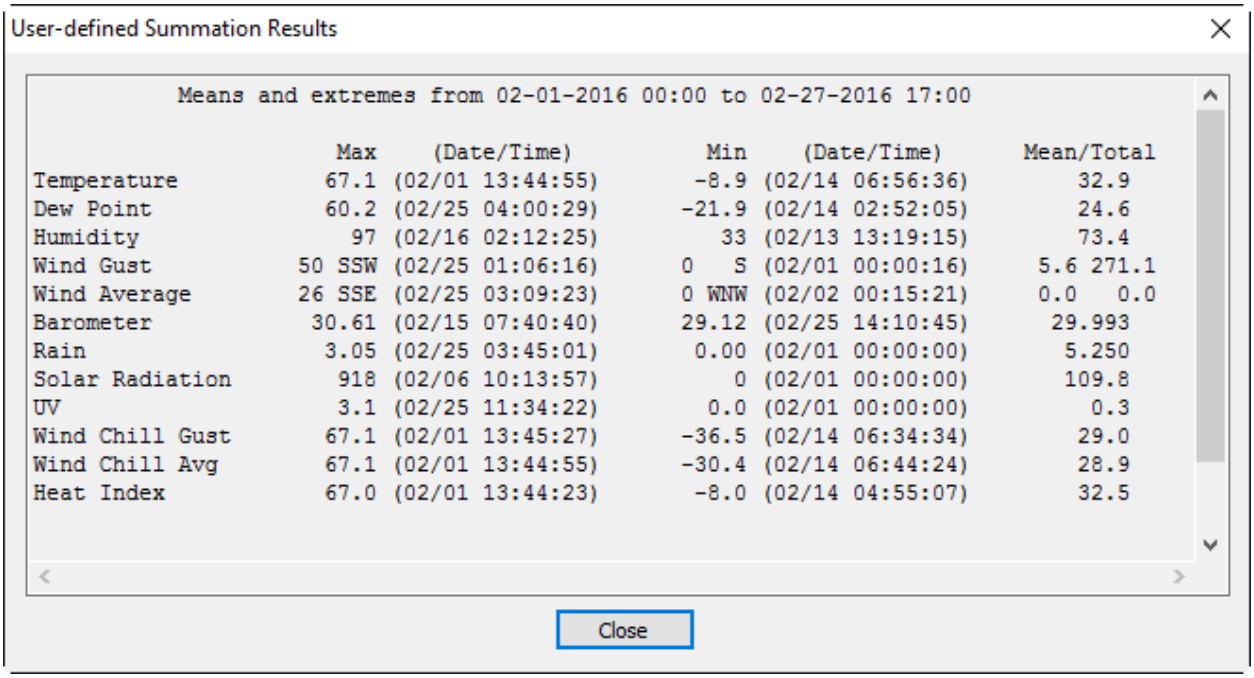
This feature allows you to calculate means and extremes on a specified date range.



Enter the starting date and hour. If you want to sum the daily summary records, specify "24" as the hour. Enter the ending date and hour, again specifying "24" for daily data. Finally, choose whether to perform the summation on each hour in the interval or for the same hour in the interval.
Examples:

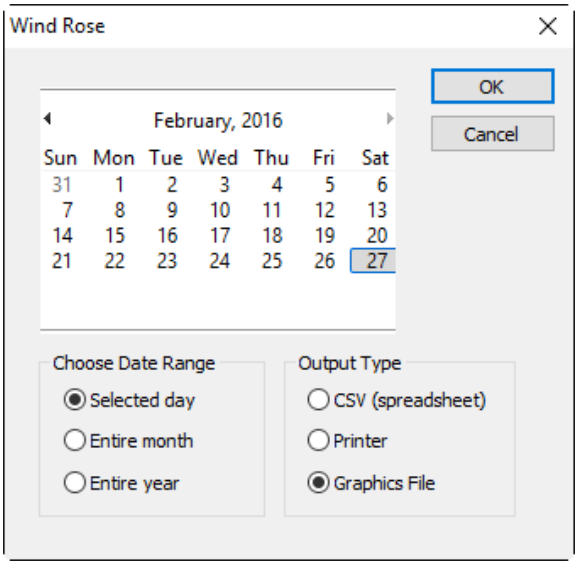
- To analyze every record from 12:00AM February 1, 2016 to 3:00PM February 7, 2016, enter the start date "February 1, 2016 00", the end date "February 7, 2016 15", and then select the summation type "Hourly".
- To analyze daily records from February 6, 2016 to February 12, 2016, enter the start date "February 6, 2016 24", the end date "February 12, 2016 24", and then select the summation type "Daily".
- To analyze all the 6:00AM records from February 1, 2016 to February 29, 2016, enter the start date "February 1, 2016 06", the end date "February 29, 2016 06", and then select the summation type "Daily".

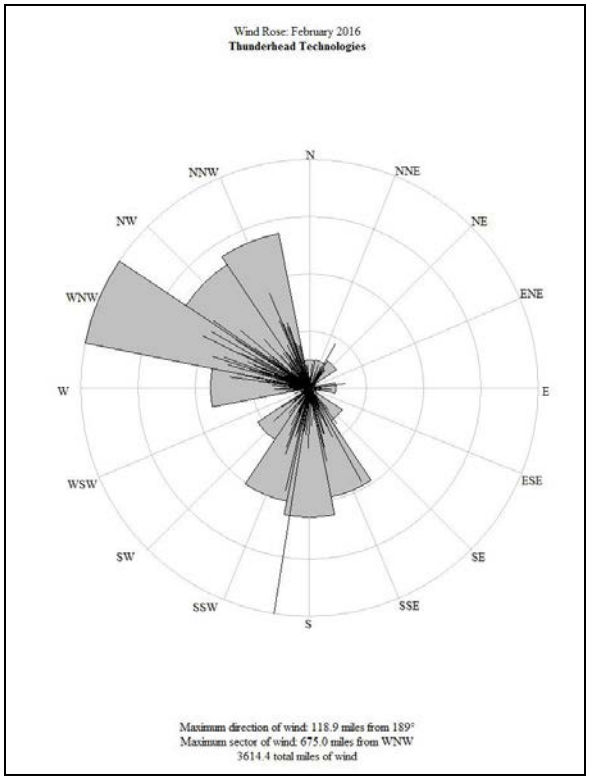
The Results Screen will appear like this:



4.21 Wind Rose Report

The Wind Rose screen allows you to generate a wind rose. A wind rose is a summation of wind speed from each direction on the compass that is rendered in a circular graph (see below). The wind rose allows easy visualization of the prevailing wind.





Choose Date Range

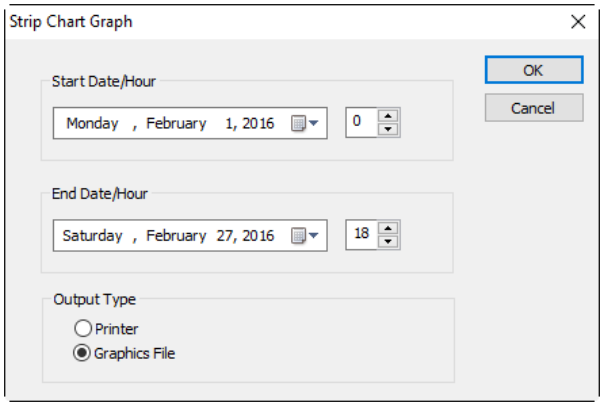
Selected day	Generates a report for just the selected day.
Entire month	Generates a report for the entire month selected.
Entire year	Generates a report for the entire year selected.

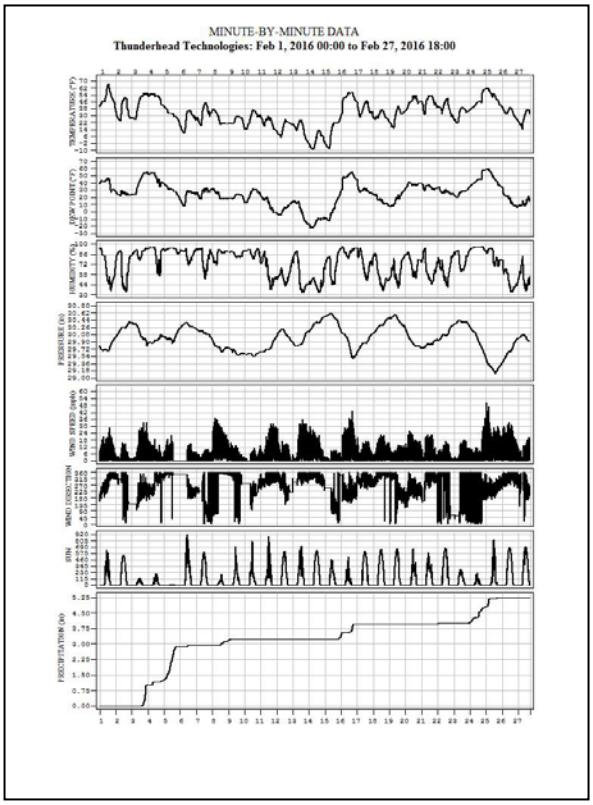
Output Type

CSV (spreadsheet)	Generates a comma-separated value file suitable for use in a spreadsheet.
Printer	Renders the wind rose on a printer.
Graphics File	Renders the wind rose to a Bitmap, GIF, or JPEG graphics file.

4.22 Strip Chart Report

The Strip Chart Graph screen allows you to generate graphs of one-minute strip chart data. A strip chart graph can be created in one-hour increments up to a maximum of one month.





Start Date/Hour

Month, day, year	The starting date.
Hour	The starting hour.

End Date/Hour

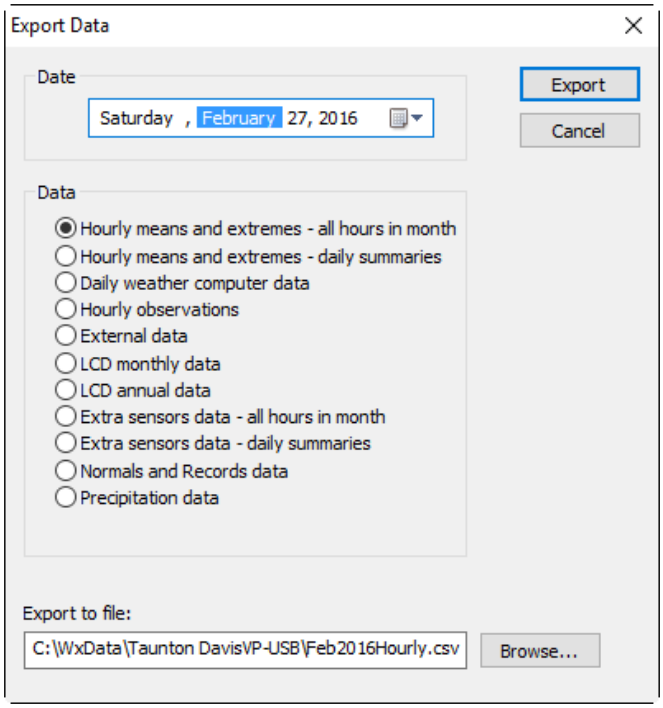
Month, day, year	The ending date.
Hour	The ending hour (exclusive).

Output Type

Printer	Renders the strip chart on a printer.
Graphics File	Renders the strip chart to a Bitmap, GIF, or JPEG graphics file.

4.23 Exporting Data

This screen allows you to export the data files to use in other software applications such as databases and spreadsheets.



Hourly means and extremes – all hours in month
Exports the 24 hourly data records for each day of the month. The data is saved to the file *mmmyyyy*Hourly.csv (ex. Apr1998Hourly.csv) in the selected folder.

Hourly means and extremes – daily summaries
Exports only the daily summary record (hour 24) for each day for each month. The data is saved to the file *mmmyyyy*-Hourly.csv (ex. Apr1998Hourly.csv) in the selected folder.

Daily weather computer data
Exports the daily weather computer memory data for each day for each month. The data is saved to the file *mmm-yyyy*Daily.csv (ex. Apr1998Daily.csv) in the selected folder.

Hourly observations
Exports the daily summary records for each day of every month. The data is saved to the file *mmmyyyy*Obs.csv (ex. Apr1998Obs.csv) in the selected folder.

External data
Exports the external records for each day of every month. The data is saved to the file *mmmyyyy*External.csv (ex. Apr1998External.csv) in the selected folder.

LCD monthly data
Exports the monthly LCD data file. The data is saved to the file *mmmyyyy*LcdMonth.CSV (ex. Apr1998LcdMonth.csv) in the selected folder.

LCD annual data

Exports the annual LCD data for every month in the year. The data is saved to the file *yyyy*LcdAnnual.csv (ex. 1998LcdAnnual.csv) in the selected folder.

Extra Sensors Data – all hours in month

Exports the 24 hourly extra sensors data records for each day of the month. The data is saved to the file *mmmyyyy* Apr1998ExtraSensors.csv (ex. Apr1998ExtraSensors.csv) in the selected folder.

Extra Sensors Data – daily summaries

Exports only the daily summary record (hour 24) for each day for each month. The data is saved to the file *mmmyyyy*-Apr1998ExtraSensors.csv (ex. Apr1998ExtraSensors.csv) in the selected folder.

Normals and Records Data

Exports the normals and records data for the month. The data is saved to the file *mmm*Normals.csv (ex. JanNormals.csv) in the selected folder.

Precipitation Data

Exports the record of each 0.01" of precipitation data for the month. The data is saved to the file *mmmyyyy*Precip_db.csv (ex. Jan2007Precip_db.csv) in the selected folder.

4.23.1 Export File Formats

Comma-separated value (CSV) - one record per line, no spaces. Line breaks are shown for clarity only.

4.23.1.1 Hourly Means and Extremes

Month, Day, Year, Hour, NumObs,
OutTemp_max, OutTemp_min, OutTemp_mean,
InTemp_max, InTemp_min, InTemp_mean,
DewPoint_max, DewPoint_min, DewPoint_mean,
Humidity_max, Humidity_min, Humidity_mean,
WindGust_max, WindGustDir_max, WindGust_min, WindGustDir_min,
WindAvg_max, WindAvgDir_max, WindAvg_min, WindAvgDir_min,
WindGust_mean, WindGustDir_mean,
Pressure_max, Pressure_min, Pressure_mean,
Rain_max, Rain_min, Rain_amt,
Sun_max, Sun_min, Sun_mean,
UV_max, UV_min, UV_mean,
ET_max, ET_min, ET_mean,
OutTemp_maxtime, OutTemp_mintime, OutTemp_meantime,
InTemp_maxtime, InTemp_mintime, InTemp_meantime,
DewPoint_maxtime, DewPoint_mintime, DewPoint_meantime,
Humidity_maxtime, Humidity_mintime, Humidity_meantime,
WindGust_maxtime, WindGust_mintime, WindAvg_maxtime, WindAvg_mintime, WindGust_meantime,
Pressure_maxtime, Pressure_mintime, Pressure_meantime,
Rain_maxtime, Rain_mintime, Rain_amttime,
Sun_maxtime, Sun_mintime, Sun_meantime,
UV_maxtime, UV_mintime, UV_meantime,
ET_maxtime, ET_mintime, ET_meantime
**Hour for daily summaries is always 24.*

Example:

```
08,31,2012,00,3387,55.0,52.0,53.732212,78.0,76.0,77.902565,50.0,47.0,48.731030,85.0,82.0,83.62739
6,2.0,260.0,0.0,310.0,1.0,300.0,0.0,320.0,0.157957,261.712158,30.29,30.25,30.276579,0.00,0.00,0.0
00000,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0,2909,0,0,3076,0,0,2909,0,2530,64,0,2851,0,1264,0,0,29
77,65,0,0,0,0,0,0,0,0,0,0,0,0
```

4.23.1.2 Daily Weather Computer Data

```
Month,Day,Year,
OutTempMax,Time, OutTempMin,Time,
InTempMax,Time, InTempMin,Time,
WindGustMax,Dir,Time, WindGustMin,Dir,Time,
WindAvgMax,Dir,Time, WindAvgMin,Dir,Time,
PressureMax,Time, PressureMin,Time,
HumidityMax,Time, HumidityMin,Time,
SunshineMax,Time, SunshineMin,Time,
Rain
```

Example:

```
08,31,2012,
69.0,”12:46:10”, 45.0,”23:07:04”,
78.0,”00:00:01”, 73.0,”07:07:58”,
29.0,56.0,”12:49:00”, 0.0,293.0,”00:00:01”,
15.0,56.0,”11:36:17”, 0.0,315.0,”00:00:01”,
30.56,”19:57:04”, 30.25,”00:01:02”,
96.0,”07:41:07”, 47.0,”16:53:27”,
99.0,”10:39:29”, 0.0,”00:00:01”,
0.00
```

4.23.1.3 Hourly Observations

Month, Day, Year, Hour, OutTemp, DewPoint, Humidity, WindAvg ,WindAvgDir, WindGust, Pressure, Rain_ToDate, Rain_Rate, Sun, ET, UV

Example:
08,31,2012,12,67.0,65.0,56.0,12.0,70,20.0,30.52,0.00,0.00,97.0,0.0,0.0

4.23.1.4 External Data

Month, Day, Year, Snowcvr, Snowfall, PTypes, SkyCover, TracePrecip

Example:
11,01,1999,0,0.0,.2....7..,C,N

4.23.1.5 LCD Monthly Data

month,year,
sum_hitemp,sum_lotemp,sum_sun,
ddheat,ddcool,s_ddheat,s_ddcool,
maxscvr_amt,maxrain_day,maxsnow_day,maxscvr_day,
maxhitemp_day,minlotemp_day,
maxavgtemp_day,minavgtemp_day,
maxrain_amt,maxsnow_amt,ttl_snow,ytd_rain,ytd_snow,
num_rain,num_snow,num_hfog,num_thunder,
num_hi90,num_lo32,num_hi32,num_lo0,
num_cloudy,num_pcloudy,num_clear,
m_hipres,m_lopres,m_higust,m_hiavg,m_hicvr,m_snow,m_precip

Example:
12,1999,746,451,482,382,0,1606,665,0,7,1,1,5,13,6,1,1.69,0.0,0.0,44.01,0.1,6,0,0,0,0,10,0,0,0,0,1
5,0,0,0,0,0,0,1

4.23.1.6 LCD Annual Data

month,year,
tmax,tmin,tmean,dewpt,
thi,tlo,thi_date,tlo_date,
ddheating,ddcooling,
sun, days_clear,days_pcloudy,days_cloudy,days_precip,days_snow,days_thunder,
days_hfog,days_hi90,days_hi32,days_lo32,days_lo0,
pmean,phi,plo,phi_date,plo_date,
hmean,hhr01,hhr07,hhr13,hhr19,
rtotal,rhr24,rdate,r_mdate,
sntotal,snhr24,sndate,sn_mdate,
wrspeed,wmean,wrdir,whi,whidir,wone_hi,wone_hidir,whidate,wone_hidate

Example:
08,1998,80.870964,58.032257,69.451614,56.507198,88,35,24,13,12,140,18.621664,1,0,0,12,0,0,0,0,0,0
,0,30.059355,30.389999,29.660000,8,24,75.457161,88,80,60,75,3.540000,1.620000,17,0,0.000000,0.000
000,1,0,1.669392,4.080391,212,36,250,22,230,24,24

4.23.1.7 Extra Sensors Data

Month,Day,Year,Hour,NumObs,
T1_H,T1_L,T1_M,T2_H,T2_L,T2_M,T3_H,T3_L,T3_M,T4_H,T4_L,T4_M,T5_H,T5_L,T5_M,T6_H,T6_L,T6_M,T7_H,
T7_L,T7_M,H1_H,H1_L,H1_M,H2_H,H2_L,H2_M,H3_H,H3_L,H3_M,H4_H,H4_L,H4_M,H5_H,H5_L,H5_M,H6_H,H6_L,
H6_M,H7_H,H7_L,H7_M,ST1_H,ST1_L,ST1_M,ST2_H,ST2_L,ST2_M,ST3_H,ST3_L,ST3_M,ST4_H,ST4_L,ST4_M,
SM1_H,SM1_L,SM1_M,SM2_H,SM2_L,SM2_M,SM3_H,SM3_L,SM3_M,SM4_H,SM4_L,SM4_M,
LT1_H,LT1_L,LT1_M,LT2_H,LT2_L,LT2_M,LT3_H,LT3_L,LT3_M,LT4_H,LT4_L,LT4_M,
LW1_H,LW1_L,LW1_M,LW2_H,LW2_L,LW2_M,LW3_H,LW3_L,LW3_M,LW4_H,LW4_L,LW4_M,
T1_HT,T1_LT,T1_MT,T2_HT,T2_LT,T2_MT,T3_HT,T3_LT,T3_MT,T4_HT,T4_LT,T4_MT,T5_HT,T5_LT,T5_MT,T6_HT,
T6_LT,T6_MT,T7_HT,T7_LT,T7_MT,H1_HT,H1_LT,H1_MT,H2_HT,H2_LT,H2_MT,H3_HT,H3_LT,H3_MT,H4_HT,H4_LT,

H4_MT,H5_HT,H5_LT,H5_MT,H6_HT,H6_LT,H6_MT,H7_HT,H7_LT,H7_MT,
ST1_HT,ST1_LT,ST1_MT,ST2_HT,ST2_LT,ST2_MT,ST3_HT,ST3_LT,ST3_MT,ST4_HT,ST4_LT,ST4_MT,
SM1_HT,SM1_LT,SM1_MT,SM2_HT,SM2_LT,SM2_MT,SM3_HT,SM3_LT,SM3_MT,SM4_HT,SM4_LT,SM4_MT,
LT1_HT,LT1_LT,LT1_MT,LT2_HT,LT2_LT,LT2_MT,LT3_HT,LT3_LT,LT3_MT,LT4_HT,LT4_LT,LT4_MT,
LW1_HT,LW1_LT,LW1_MT,LW2_HT,LW2_LT,LW2_MT,LW3_HT,LW3_LT,LW3_MT,LW4_HT,LW4_LT,LW4_MT

Example:

```
04,20,2012,17,44,58,58,58.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000
,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0
.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.00000
0,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,0.000000,0,0,
0.000000,0,0,0.000000,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,7
62,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0,762,762,0
```

4.23.1.8 Normals and Records Data

Month,Day,Temp_max,Temp_min,Temp_mean,TempHigh_max,TempHigh_maxtime,TempHigh_min,TempHigh_mintime,TempLow_max,TempLow_maxtime,TempLow_min,TempLow_mintime,Rain_amt,RainHigh_amt,RainHigh_amttime,Snow_amt,SnowHigh_amt,SnowHigh_amttime

Example:

```
01,01,38.3,21.6,30.0,64.0,1973,12.0,1918,44.0,1966,-3.0, 1918,0.140000,1.890000,1961,0.260000,6.500000,1971
```

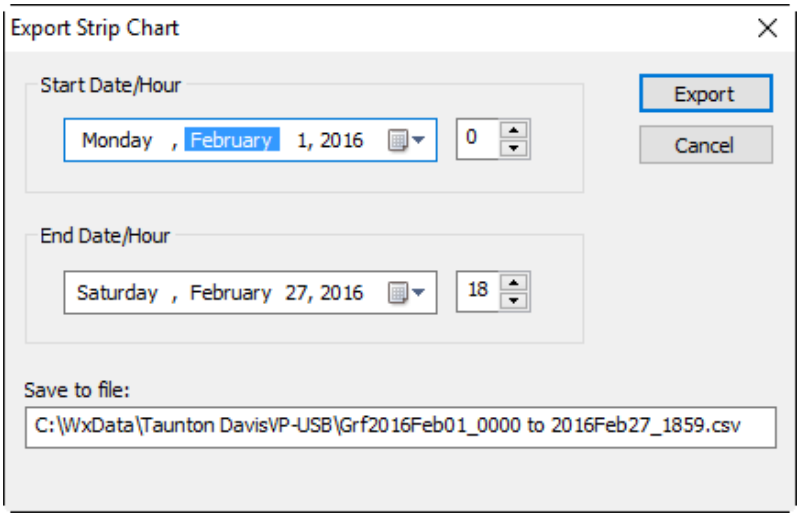
4.23.1.9 Precipitation Data

Example:

```
03/02/2012 03:38:58
03/02/2012 03:58:16
03/02/2012 04:06:38
```

4.24 Exporting Strip Chart Data

The feature will export the one-minute extremes that you can then import into a spreadsheet to edit (and then import back into WxSolution) or to generate custom graphs of weather data using another application.



Specify the date and hour you wish to export. The export file will be saved in the WXDATA folder as ***mmmyyyy*-Grf.csv**, (ex. Apr2007Grf.csv).

Export Data File

Format (comma-separated value):

```
Date,Time,Temp.max,Temp.min,Dew.max,Dew.min,Hum.max,Hum.min,Pres.max,Pres.min,Gust.max,
GustDir.max,Gust.min,GustDir.min,Sun.max,Sun.min,UV.max,UV.min,ET.max,ET.min,Rain
```

Example:

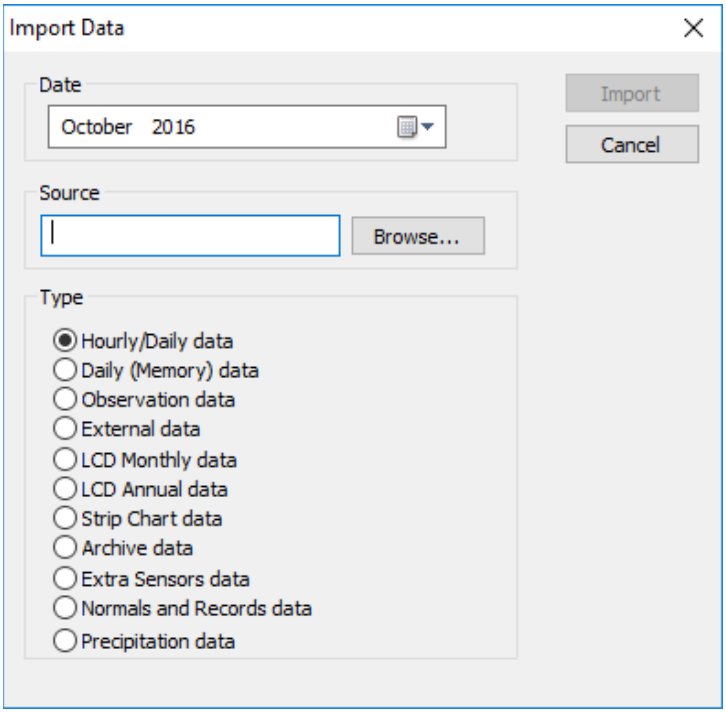
08-31-2007,00:00:00,55.0,54.0,50.0,49.0,83.0,83.0,30.27,30.27,0.0,310.0,0.0, 290.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.00

4.25 Import Data

Importing data allows the user to enter old weather data into WxSolution or to more easily edit a large number of records. The minimum data necessary for the generation of LCD reports is the hourly/daily summary file. By importing data for hour 24 (the summary record), data will appear in the LCD reports.

Import data must be in comma-separated-value (CSV) files. CSV files can be created using a spreadsheet, database, or text editor. Each type of data file must have the exact number of fields otherwise the import will fail. It is recommended that you create an export file to use as a template. This is far easier than trying to create a file from scratch, and it assures that the proper fields appear and their order is correct.

See Export Data for the format of the import/export files.



Source	Type the name of the file containing the import file, or click browse to locate the file.

4.25.1 Hourly/Daily Data

This file contains hour-by-hour records of maximums, minimums, and means of all parameters recorded by the weather computer (temperature, humidity, wind, pressure, rainfall, and sunshine). This is data must be imported if you intend to generate monthly LCD reports for the past months. To import only daily records, which is the case for old data, use one record for the day and specify 24 as the hour. Use the average of the maximum and minimum in the mean field if you do not have a true mean for the parameter.

4.25.2 Memory Data

Memory data is read from the memory of the weather computer. Though this data is not displayed in the reports, it is used to verify the maximums and minimums in the hourly/daily data. The DateTime field of each parameter must be of the format: “hh:mm:ss”, Example: “13:55:54”

4.25.3 Observation Data

Observation data is data captured that the beginning of each hour and displayed on pages 2 and 3 of the monthly LCD report.

4.25.4 External Data

External data is the parameters that are not measured by the weather computer: snowfall, snow cover, precipitation types, and sky cover. This data is used in the generation of daily, monthly, and annual reports. The precipitation type field (PTypes) is exported as a 9-character string with each position in the string corresponding to a numeric precipitation type. If the type did not occur, a dot (.) is placed in the position. For example, the string "**..3..6..9**" means precip types 3, 6, and 9 occurred that day. To import, format the field as either the dotted-string above or just specify the digits of the occurring types without spaces (as 369 in the above example). The numeric equivalents to the precip types are:

1	Fog	6	Glaze (freezing rain)
2	Heavy fog (visibility <¼ mile)	7	Dust storm
3	Thunder	8	Smoke, haze
4	Ice pellets, snow	9	Blowing snow
5	Hail		

The SkyCover field uses:

C	Clear
P	Partly cloudy
L	Cloudy

Enter **T** in the Snowcvr and/or Snowfall fields if a trace amount occurred that day.
The TracePrecip field uses **Y** when a trace of rainfall occurred that day and **N** when it did not.

4.25.5 LCD Monthly Data

LCD monthly data is usually calculated by WxSolution from the hourly and external data and used in the monthly and annual LCD reports. Though it is possible to import this data, importing this data is intended for editing any erroneous calculations.

4.25.6 LCD Annual Data

LCD annual data is usually calculated by WxSolution from the LCD monthly data and used in the annual LCD report. Importing this data provides a convenient way to import old monthly summaries into WxSolution without having to import data for each day of the month.

4.25.7 Strip Chart Data

Strip chart data that was exported and edited can be imported here.

4.25.8 Archive Data

This is the weather computer archive data. The archive will be imported into the hourly observation and hourly means/extremes files. **Existing records in these files will be replaced**.

- **Observation File**: The record that falls on the 00 minute will be imported, the other records are ignored.
- **Hourly Means and Extremes Files**: For archive intervals less than one hour, the records will be averaged and the extremes will be merged into an hourly record.

4.25.9 Extra Sensors Data

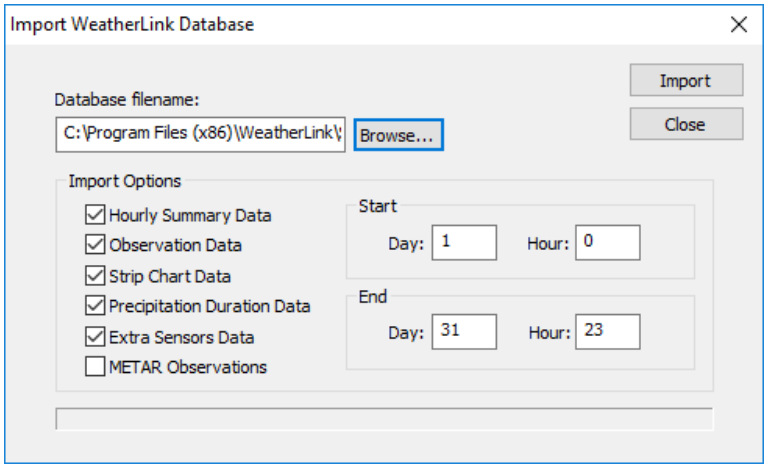
This file contains hour-by-hour records of maximums, minimums, and means of all extra sensors parameters. This data is currently not used on any reports.

4.25.10 Normals and Records Data

This file contains daily records of normal temperatures and precipitation and record temperatures and precipitation.

4.26 Import WeatherLink Database

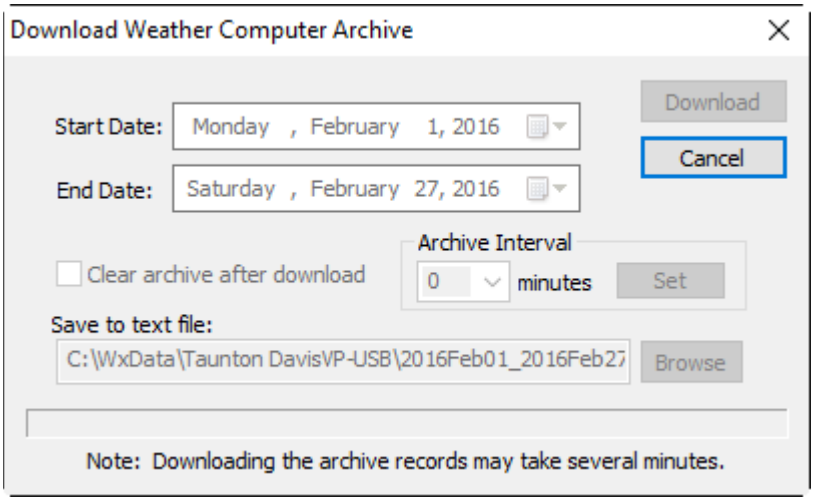
Importing WeatherLink databases allows you to use your existing data captured by WeatherLink in WxSolution to generate reports and graphs. WxSolution can import WeatherLink 3.x through 6.0.3. WxSolution will import the WeatherLink database into its hourly summary, hourly observations, strip chart, and precipitation duration databases.



Database File name	Enter or browse for (click on "...") your WeatherLink database file. It will be located in the folder in which you installed WeatherLink such as C:\PCLINK or C:\WeatherLink. The files are located in a subfolder with the name of the your station. Finally, the actual files are named **YYYY-MM.ext**, where *YYYY* is the year, *MM* is the month, and "*ext*" are the first three letters of your station name. For WeatherLink 5.x, "*ext*" will be **wlk**.
Hourly Summary Data	Select to import into hourly summary database. This is required for all reports.
Observation Data	Select to import into hourly observation database. This is required for monthly LCD reports.
Strip Chart Data	Select to import into strip chart database. This is required for strip chart reports.
Precipitation Duration Data	Select to extrapolate the precipitation duration data that appears on the second page of the Monthly LCD report under "Maximum Short Duration Precipitation".
Extra Sensors	Select to import extra sensors data into extra sensors database.
METAR Observations	Select to import data into METAR observations database.
Import	Once you have entered a file name, click **Import** to read the database file and import it into WxSolution.
Close	When you are finished importing the databases, click **Close**.
Start	Select the starting day and hour.
End	Select the ending day and hour.

4.27 Download Archive

This feature allows you download archive data from the Weather Computer. Only the Davis family of weather computers is current supported.



Start Date	Select start date.
End Date	Select end date (inclusive).
Clear archive after download	Check to clear archive after download.
Save to file	Destination file for archive data.
Interval	Current archive period (minutes).
Set	Set a new archive interval.
Browse	Browse for destination file.

Sample data file contents (one archive record per line):

Davis Weather Monitor II (WM2)/Vantage Pro

```
Date, Time, TempOut, TempHi, TempLo, DewPt, HumOut, WndChl, HeatIdx, Wind, WindDir,
WindHi, Barom, Rain, TempIn, HumIn, SolarRad, UV, ET

" 6-01-03", "12:30a", 59.9, 59.9, 59.8, 57.9, 93, 59.9, 59.4, 2.0, 112, 10.0,
29.594, 0.00, 75.2, 44, 0, 0.0, 0.000
```

Heat Index, Solar Radiation, UV and ET are not defined for the WM2.

4.27.1 Saved File Format

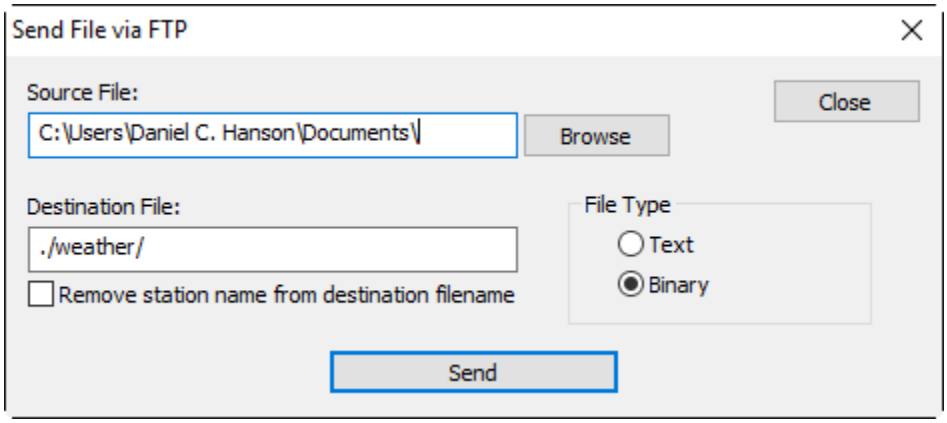
The archive file is a comma-separated-value (CSV) that can be imported into most spreadsheets and databases. You can also import the archive data into WxSolution using the Import Data feature (see Section 4.14).

Fields in file:

Date	Date of record
Time	Time of record
TempOut	Outdoor Temperature
TempHi	High Outdoor Temperature
TempLo	Low Outdoor Temperature
DewPt	Dew Point
HumOut	Outdoor Humidity
WndChl	Wind Chill
HeatIdx	Heat index
Wind	Wind Speed
WindDir	Wind Direction
WindHi	High Wind Speed
Barom	Barometer
Rain	Rainfall
TempIn	Indoor Temperature
HumIn	Indoor Humidity
Intv	# minutes in archive period
SolarRad	Solar Radiation
UV	Ultraviolet Index
ET	Evapotranspiration

4.28 Send File via FTP

This feature allows you upload a file to your FTP (Web) server. The FTP user and connection information must be configured on the FTP Reports screen.



Source File	Select the source file
Destination File	Enter the destination file and path
File Type	Text – for text files (not recommended) Binary – recommended format
Remove station from destination filename	Check this option if uploading LCD reports printed as PDF documents (PDF filename usually includes Station Name)

5. Reference

5.1 Sample Data Files

C:\Program Files (x86)\Thunderhead Technologies\WxSolution\WxData

Monthly data files *(sample for January 2012)*:

Jan2012.hr2	*hourly summary data*
Jan2012.da2	*daily data read from weather computer memory*
Jan2012.ob2	*hourly observation data*
Jan2012.mt2	*monthly analysis used for LCD reports*
Jan2012.gr2	*minute-by-minute strip chart data*
Jan2012.ext	*external data used for LCD reports*
Jan2012.exs	*extra sensors data*
Jan2012.pre	*monthly precipitation (time of each .01") for LCD reports - text*
Jan2012.prb	*monthly precipitation (time of each .01") for LCD reports - binary*
Jan2012.lc2	*monthly LCD data file used for LCD reports*
Jan2012.txt	*observer notes for inclusion on LCD reports*
01Jan2012.txt	*observer notes for inclusion on LCD daily report for January 1, 2012*

Annual data files:

2012LCD.dat	*analysis data for the annual LCD report*

5.2 Contact Information

Support for WxSolution

Support for WxSolution is available by email or the Internet support pages.

Thunderhead Technologies LLC
14 Lilac Way
Taunton, MA 02780-2267

support@ThunderheadTech.com
http://www.ThunderheadTech.com

5.3 Tag Reference

Current HTML Tag Reference

The Current Conditions HTML file (**C:\Program Files (x86)\Thunderhead Technologies\WxSolution\Forms\HTML\Current.html**) is fully customizable using the tags listed below. When WxSolution processes the current conditions, it substitutes the appropriate data value for each of tags listed below. You may use the same tag more than once. The tags are **case-sensitive**.

Station Information, Current Date/Time

$STNNAME$	Station name
$CURDATE_MDY$	Date (ex. January 1, 2012)
$CURDATE_MDY_S$	Date (ex. Jan 1, 2012)
$CURDATE_MD$	Date (ex. January 1)
$CURDATE_DMY$	Date (ex. 1 January 2012)
$CURDATE_DM$	Date (ex. 1 January)
$CURDATE_DMY_S$	Date (ex. 1 Jan 2012)
$CURDATE_DASH_MDY$	Date (mm-dd-yyyy, ex. 01-15-2012)
$CURDATE_SLASH_MDY$	Date (mm/dd/yyyy, ex. 01/15/2012)
$CURDATE_DASH_YMD$	Date (yyyy-mm-dd, ex. 2012-01-15)
$CURDATE_SLASH_YMD$	Date (yyyy/mm/dd, ex. 2012/01/15)
$CURDATE_DASH_DMY$	Date (dd-mm-yyyy, ex. 01-15-2012)
$CURDATE_SLASH_DMY$	Date (dd/mm/yyyy, ex. 01/15/2012)
$CURTIME_HMS$	Time (ex. 12:00:00 AM)
$CURTIME_HM$	Time (ex. 12:00 AM)
$CURTIME24_HMS$	24-hour time (ex. 00:00:00)
$CURTIME24_HM$	24-hour time (ex. 00:00)
$DAYOFWEEK$	Day of week (“Sunday” – “Saturday”)
$DAYOFWEEK_S$	Day of week (“Sun” – “Sat”)
CUR_JULIAN_DAY	Julian day (1-366)
$CUR_JULIAN_DAY_TH$	Julian day (1st, 2nd, 3rd, etc.)
LAT	Latitude (degrees, minutes, seconds, hemisphere)
$LONG$	Longitude (degrees, minutes, seconds, hemisphere)
$ELEV$	Elevation (feet is assumed)
$TIMEZONE$	Time zone name
$TIMEZONE_DST$	Time zone name – includes either “Standard Time” or “Daylight Saving Time”
$TIMEZONE_DST_S$	Time zone name short – abbreviation of TIMEZONE_DST. For example EDT for Eastern Daylight Saving Time.
$UPDATE$	Update interval in minutes
$REFRESH$	Refresh interval in seconds (for META refresh tag)
$WXCOMPUTER$	Weather computer in use: “Heathkit ID-4001”, “Heathkit ID-5001”, “Davis Weather Monitor II”, “Davis Vantage Pro/Vue”, “Texas Weather Report”, “Peet Bros.”, or “WMR-968”.

$PROD_VERS$	The current version information of WxSolution

Yesterday Date, Time

YD_DATE_MDY	Date (ex. January 1, 2012)
$YD_DATE_MDY_S$	Date (ex. Jan 1, 2012)
YD_DATE_DMY	Date (ex. 1 January 2012)
$YD_DATE_DMY_S$	Date (ex. 1 Jan 2012)
$YD_DATE_DASH_MDY$	Date (mm-dd-yyyy, ex. 01-15-2012)
$YD_DATE_SLASH_MDY$	Date (mm/dd/yyyy, ex. 01/15/2012)
$YD_DATE_DASH_YMD$	Date (yyyy-mm-dd, ex. 2012-01-15)
$YD_DATE_SLASH_YMD$	Date (yyyy/mm/dd, ex. 2012/01/15)
$YD_DATE_DASH_DMY$	Date (dd-mm-yyyy, ex. 01-15-2012)
$YD_DATE_SLASH_DMY$	Date (dd/mm/yyyy, ex. 01/15/2012)
$YD_DAYOFWEEK$	Day of week (“Sunday” – “Saturday”)
$YD_DAYOFWEEK_S$	Day of week (“Sun” – “Sat”)

One Year Ago Date, Time

$1YR_DATE_MDY$	Date (ex. January 1, 2012)
$1YR_DATE_MDY_S$	Date (ex. Jan 1, 2012)
$1YR_DATE_DMY$	Date (ex. 1 January 2012)
$1YR_DATE_DMY_S$	Date (ex. 1 Jan 2012)
$1YR_DATE_DASH_MDY$	Date (mm-dd-yyyy, ex. 01-15-2012)
$1YR_DATE_SLASH_MDY$	Date (mm/dd/yyyy, ex. 01/15/2012)
$1YR_DATE_DASH_YMD$	Date (yyyy-mm-dd, ex. 2012-01-15)
$1YR_DATE_SLASH_YMD$	Date (yyyy/mm/dd, ex. 2012/01/15)
$1YR_DATE_DASH_DMY$	Date (dd-mm-yyyy, ex. 01-15-2012)
$1YR_DATE_SLASH_DMY$	Date (dd/mm/yyyy, ex. 01/15/2012)
$1YR_DAYOFWEEK$	Day of week (“Sunday” – “Saturday”)
$1YR_DAYOFWEEK_S$	Day of week (“Sun” – “Sat”)

Units

UT	Units temperature (F or C)
UTv	Units temperature (Fahrenheit or Celsius)
UW	Units wind (mph, km/hr, knots, or m/s)
UWv	Units wind (miles-per-hour, kilometers-per-hour, knots, or meters-per-second)
UB	Units barometric pressure (inches Hg., millibars, millimeters, hecto-pascals)
UBa	Units barometric pressure (in, mb, mm, hp)
UBs	Units barometric pressure (”, mb, mm, hp)
UBv	Units barometric pressure (inches, millibars, millimeters, hecto-pascals)
UP	Units precipitation (inches, cm, mm)
UPa	Units precipitation (in, cm, mm)
UPs	Units precipitation (”, cm, mm)
UPv	Units precipitation (inches, centimeters, millimeters)
US	Units sunshine/solar (W/m^2)

USv	Units sunshine/solar (Watts-per-square-meter)
$UECB$	Units for estimated cloud base (feet or meters)

Extra Sensors Labels

$XT*i*_LABEL$	Extra temperature sensor *i* (*i* = 1 to 7)
$XH*i*_LABEL$	Extra humidity sensor *i* (*i* = 1 to 7)
$XLW*i*_LABEL$	Leaf Wetness sensor *i* (*i* = 1 to 4)
$XLT*i*_LABEL$	Leaf Temperature sensor *i* (*i* = 1 to 4)
$XSM*i*_LABEL$	Soil Moisture sensor *i* (*i* = 1 to 4)
$XST*i*_LABEL$	Soil Temperature sensor *i* (*i* = 1 to 4)

Current Values

GC	Wind gust (current instantaneous speed)
GDC	Wind gust direction – compass (e.g., WNW)
$GDCn$	Wind gust direction – numeric
AC	Wind average
ADC	Wind average direction – compass (e.g., WNW)
$ADCn$	Wind average direction – numeric
$BEAUFORT_NUM$	Beaufort wind scale - numeric (0-12)
$BEAUFORT_DESC$	Beaufort wind scale - word
TC	Temperature
IC	Indoor temperature
BC	Barometric pressure
PC	Precipitation
CC	Wind chill gust
cC	Wind chill average
XC	Heat index
$PG10$	Peak gust last 10 minutes
$PG10DIR$	Peak gust last 10 minutes direction
SC	Sunshine/Solar
HC	Humidity
hC	Indoor Humidity
DC	Dew point
UC	Ultraviolet
EC	Evapotranspiration
EX_T*i*_C	Extra temperature sensor *i* (*i* = 1 to 7)
EX_H*i*_C	Extra humidity sensor *i* (*i* = 1 to 7)
EX_LW*i*_C	Leaf Wetness sensor *i* (*i* = 1 to 4)
EX_LT*i*_C	Leaf Temperature sensor *i* (*i* = 1 to 4)
EX_SM*i*_C	Soil Moisture sensor *i* (*i* = 1 to 4)
EX_ST*i*_C	Soil Temperature sensor *i* (*i* = 1 to 4)

Current Values (forced units)

GC_mph, GC_knots, GC_kmph, GC_ms	Wind gust

AC_mph, AC_knots, AC_kmph, AC_ms	Wind average
TC_F, TC_C	Temperature
IC_F, IC_C	Indoor temperature
BC_I, BC_in, BC_mb	Barometric pressure
DAY_PM_I, DAY_PM_in, DAY_PM_mm, DAY_PM_cm	Precipitation (daily total)
CC_F, CC_C	Wind chill gust
cC_F, cC_C	Wind chill average
XC_F, XC_C	Heat index
DC_F, DC_C	Dew point
EC_I, EC_in, EC_cm, EC_mm	Evapotranspiration

Current Hourly Rates - Arrows (↑, ↓), Numeric

AC_RATE_A	**AC_RATE_NUM**	Wind average
TC_RATE_A	**TC_RATE_NUM**	Temperature
IC_RATE_A	**IC_RATE_NUM**	Indoor temperature
BC_RATE_A	**BC_RATE_NUM**	Barometric pressure
PC_RATE_A	**PC_RATE_NUM**	Precipitation
SC_RATE_A	**SC_RATE_NUM**	Sunshine index
HC_RATE_A	**HC_RATE_NUM**	Humidity
hC_RATE_A	**hC_RATE_NUM**	Indoor Humidity
DC_RATE_A	**DC_RATE_NUM**	Dew point
UC_RATE_A	**UC_RATE_NUM**	UV

Current Rates - Words

$PRES_TREND$	Pressure trend: R, RR, F, FR, S
$PRES_TREND_WORD$	Pressure trend: Rising, Rising Rapidly, Falling, Falling Rapidly, Steady
$PRES_TREND_3HR$	3-Hour Pressure trend: R, RR, F, FR, S
$PRES_TREND_3HR_WORD$	3-Hour Pressure trend: Rising, Rising Rapidly, Falling, Falling Rapidly, Steady

Note: Rising rapidly is ≥ 0.06”/hr, falling rapidly is ≥ 0.06”/hr

Current Battery

$BATTERY_CONSOLE$	For Vantage Pro/Vue only. Displays voltage of console battery.
$BATTERY_XMIT$	For Vantage Pro/Vue only. Displays battery status transmitters. If low, the transmitter number is listed: for example, “2 is low”. Otherwise, “All OK”.

Current Forecast

$FORECAST$	For Vantage Pro/Vue only. Displays forecast text from Davis.

Sky Conditions

$CURR_SKY$	**Fair** – no precipitation **Light rain** – rate < 0.10”/hr **Moderate rain** – rate 0.10” to 0.30”/hr **Heavy rain** – rate > 0.30”/hr **Windy** – average wind speed ≥ 20 mph **Breezy** – average wind speed ≥ 15 mph

Observed Conditions

$PRECIP_TYPES$	Zero or more of the following: Fog, Heavy Fog, Thunder, Ice Pellets, Hail, Glaze/Freezing Rain, Dust storm, Smoke/Haze, Blowing Snow
$SNOWCOVER$	Snowcover in inches
$SNOWFALL$	Snowfall for current day
$MTH_SNOWFALL$	Snowfall for the current month
$SNOWSEASON$	Snowfall for the season

Other Calculated Parameters

EMC	Equilibrium Moisture Content
$TEMPHUM_INDEX$	Temperature-Humidity Index
WET_BULB	Wet Bulb
MIX_RATIO	Mixing Ratio (g/kg)
$SATUR_MIX_RATIO$	Saturation Mixing Ratio (g/kg)
$AIR_DENSITY$	Air Density (kg/m^3)
$DENSITY_ALT$	Density Altitude (for °C = meters, °F = feet)
EST_CLOUD_BASE	Estimated potential cloud base (for °C = meters, °F = feet)

Degree Days

DD_HEAT_DAY	Heating degree days - today
DD_COOL_DAY	Cooling degree days - today
DD_HEAT_MTH	Heating degree days - month total
DD_COOL_MTH	Cooling degree days - month total
DD_HEAT_SSN	Heating degree days – season
DD_COOL_SSN	Cooling degree days - season
DD_HEAT_BASE	Heating degree days - base (default is 65°F)
DD_COOL_BASE	Cooling degree days - base (default is 65°F)
YD_DD_HEAT	Heating degree days - yesterday
YD_DD_COOL	Cooling degree days - yesterday
$1YR_DD_HEAT$	Heating degree days - one year ago
$1YR_DD_COOL$	Cooling degree days - one year ago

Last 5 Minutes, Current Hour, Current Day Mean

$FIVE_GM$ **$FIVE_GDM$**	**HR_GM** **HR_GDM**	**DAY_GM** **DAY_GDM**	Wind gust Wind gust direction
$FIVE_TM$	**HR_TM**	**DAY_TM**	Temperature
$FIVE_IM$	**HR_IM**	**DAY_IM**	Indoor Temperature
$FIVE_BM$	**HR_BM**	**DAY_BM**	Barometric pressure
$FIVE_PM$	**HR_PM**	**DAY_PM**	Precipitation
$FIVE_CM$	**HR_CM**	**DAY_CM**	Wind chill
$FIVE_XM$	**HR_XM**	**DAY_XM**	Heat index
$FIVE_SM$	**HR_SM**	**DAY_SM**	Sunshine/Solar
$FIVE_HM$	**HR_HM**	**DAY_HM**	Humidity
$FIVE_DM$	**HR_DM**	**DAY_DM**	Dew point
$FIVE_UM$	**HR_UM**	**DAY_UM**	Ultraviolet
	EX_T*i*_HM	**EX_T*i*_DM**	Extra temperature sensor *i* (*i* = 1 to 7)
	EX_H*i*_HM	**EX_H*i*_DM**	Extra humidity sensor *i* (*i* = 1 to 7)
	EX_LW*i*_HM	**EX_LW*i*_DM**	Leaf Wetness sensor *i* (*i* = 1 to 4)
	EX_LT*i*_HM	**EX_LT*i*_DM**	Leaf Temperature sensor *i* (*i* = 1 to 4)
	EX_SM*i*_HM	**EX_SM*i*_DM**	Soil Moisture sensor *i* (*i* = 1 to 4)
	EX_ST*i*_HM	**EX_ST*i*_DM**	Soil Temperature sensor *i* (*i* = 1 to 4)
		DAY_PM_I	Precipitation inches
		DAY_PM_cm	Precipitation centimeters
		DAY_PM_mm	Precipitation millimeters
		DAY_EM	Evapotranspiration
		$DAY_SUNMINUTES$	Sunshine minutes

Current Hour Maximums, Minimums

HR_GH **HR_GDH**	**HR_GL** **HR_GDL**	Wind gust and direction
HR_AH **HR_ADH**	**HR_AL** **HR_ADL**	Wind average and direction
HR_TH	**HR_TL**	Temperature
HR_IH	**HR_IL**	Indoor temperature
HR_BH	**HR_BL**	Barometric pressure
HR_PH	**HR_PL**	Precipitation
HR_CH	**HR_CL**	Wind chill gust
HR_cH	**HR_cL**	Wind chill average
HR_XH	**HR_XL**	Heat index
HR_SH	**HR_SL**	Sunshine/Solar
HR_HH	**HR_HL**	Humidity
HR_DH	**HR_DL**	Dew point
HR_UH	**HR_UL**	Ultraviolet
EX_T*i*_HH	**EX_T*i*_HL**	Extra temperature sensor *i* (*i* = 1 to 7)
EX_H*i*_HH	**EX_H*i*_HL**	Extra humidity sensor *i* (*i* = 1 to 7)
EX_LW*i*_HH	**EX_LW*i*_HL**	Leaf Wetness sensor *i* (*i* = 1 to 4)

EX_LT*i*_HH	**EX_LT*i*_HL**	Leaf Temperature sensor *i* (*i* = 1 to 4)
EX_SM*i*_HH	**EX_SM*i*_HL**	Soil Moisture sensor *i* (*i* = 1 to 4)
EX_ST*i*_HH	**EX_ST*i*_HL**	Soil Temperature sensor *i* (*i* = 1 to 4)

One-Hour Ago Values and Changes

Value last hour	
$1HR_WIND$ $1HR_WINDDIR$	Wind gust and direction
$1HR_TEMP$	Temperature
$1HR_PRES$	Barometric pressure
$1HR_RAIN$	Precipitation
$1HR_SUN$	Sunshine index
$1HR_HUM$	Humidity
$1HR_DEW$	Dew point
$1HR_UV$	Ultraviolet
$1HR_ET$	ET
Change from last hour	
$1HR_WIND_RATE$	Wind speed
$1HR_TEMP_RATE$	Temperature
$1HR_PRES_RATE$	Barometric pressure
$1HR_RAIN_RATE$	Precipitation
$1HR_SUN_RATE$	Sunshine index
$1HR_HUM_RATE$	Humidity
$1HR_DEW_RATE$	Dew point
$1HR_UV_RATE$	Ultraviolet

Current Day Maximums, Minimums and Time (Hour: Minute)

DAY_GH **DAY_GDH** **DAY_GH_TIME**	**DAY_GL** **DAY_GDL** **DAY_GL_TIME**	Wind gust and direction
DAY_AH **DAY_ADH** **DAY_AH_TIME**	**DAY_AL** **DAY_ADL** **DAY_AL_TIME**	Wind average and direction
DAY_TH **DAY_TH_TIME**	**DAY_TL** **DAY_TL_TIME**	Temperature
DAY_IH **DAY_IH_TIME**	**DAY_IL** **DAY_IL_TIME**	Indoor temperature
DAY_BH **DAY_BH_TIME**	**DAY_BL** **DAY_BL_TIME**	Barometric pressure
DAY_PH **DAY_PH_TIME**	**DAY_PL** **DAY_PL_TIME**	Precipitation
DAY_CH **DAY_CH_TIME**	**DAY_CL** **DAY_CL_TIME**	Wind chill gust
DAY_cH **DAY_cH_TIME**	**DAY_cL** **DAY_cL_TIME**	Wind chill average
DAY_XH **DAY_XH_TIME**	**DAY_XL** **DAY_XL_TIME**	Heat index

DAY_SH **DAY_SH_TIME**	**DAY_SL** **DAY_SL_TIME**	Sunshine/Solar
DAY_HH **DAY_HH_TIME**	**DAY_HL** **DAY_HL_TIME**	Humidity
DAY_DH **DAY_DH_TIME**	**DAY_DL** **DAY_DL_TIME**	Dew point
DAY_UH **DAY_UH_TIME**	**DAY_UL** **DAY_UL_TIME**	Ultraviolet
DAY_EM **DAY_EH_TIME**		Evapotranspiration
EX_T*i*_DH **$EX_T*i*_DH_TIME$**	**EX_T*i*_DL** **$EX_T*i*_DL_TIME$**	Extra temperature sensor *i* (*i* = 1 to 7)
EX_H*i*_DH **$EX_H*i*_DH_TIME$**	**EX_H*i*_DL** **$EX_H*i*_DL_TIME$**	Extra humidity sensor *i* (*i* = 1 to 7)
EX_LW*i*_DH **$EX_LW*i*_DH_TIME$**	**EX_LW*i*_DL** **$EX_LW*i*_DL_TIME$**	Leaf Wetness sensor *i* (*i* = 1 to 4)
EX_LT*i*_DH **$EX_LT*i*_DH_TIME$**	**EX_LT*i*_DL** **$EX_LT*i*_DL_TIME$**	Leaf Temperature sensor *i* (*i* = 1 to 4)
EX_SM*i*_DH **$EX_SM*i*_DH_TIME$**	**EX_SM*i*_DL** **$EX_SM*i*_DL_TIME$**	Soil Moisture sensor *i* (*i* = 1 to 4)
EX_ST*i*_DH **$EX_ST*i*_DH_TIME$**	**EX_ST*i*_DL** **$EX_ST*i*_DL_TIME$**	Soil Temperature sensor *i* (*i* = 1 to 4)

Yesterday Observed Conditions

YD_PRECIP_TYPES	Zero or more of the following: Fog, Heavy Fog, Thunder, Ice Pellets, Hail, Glaze/Freezing Rain, Dust storm, Smoke/Haze, Blowing Snow
$YD_SNOWCOVER$	Snow cover in inches
$YD_SNOWFALL$	Snowfall for yesterday

Yesterday Maximums, Minimums and Time (Hour: Minute), Mean

YD_GH **YD_GDH** **YD_GH_TIME**	**YD_GL** **YD_GDL** **YD_GL_TIME**	**YD_GM** **YD_GDM**	Wind gust and direction
YD_AH **YD_ADH** **YD_AH_TIME**	**YD_AL** **YD_ADL** **YD_AL_TIME**		Wind average and direction
YD_TH **YD_TH_TIME**	**YD_TL** **YD_TL_TIME**	**YD_TM**	Temperature
YD_IH **YD_IH_TIME**	**YD_IL** **YD_IL_TIME**	**YD_IM**	Indoor temperature
YD_BH **YD_BH_TIME**	**YD_BL** **YD_BL_TIME**	**YD_BM**	Barometric pressure
YD_PH **YD_PH_TIME**	**YD_PL** **YD_PL_TIME**	**YD_PM**	Precipitation
YD_CH **YD_CH_TIME**	**YD_CL** **YD_CL_TIME**	**YD_CM**	Wind chill gust
YD_cH **YD_cH_TIME**	**YD_cL** **YD_cL_TIME**	**YD_cM**	Wind chill average
YD_XH **YD_XH_TIME**	**YD_XL** **YD_XL_TIME**	**YD_XM**	Heat index

YD_SH **YD_SH_TIME**	**YD_SL** **YD_SL_TIME**	**YD_SM**	Sunshine/Solar
YD_HH **YD_HH_TIME**	**YD_HL** **YD_HL_TIME**	**YD_HM**	Humidity
YD_DH **YD_DH_TIME**	**YD_DL** **YD_DL_TIME**	**YD_DM**	Dew point
YD_UH **YD_UH_TIME**	**YD_UL** **YD_UL_TIME**	**YD_UM**	Ultraviolet
YD_EH **YD_EH_TIME**		**YD_EM**	Evapotranspiration
		$YD_SUNMINUTES$	Sunshine minutes
$YD_EX_T*i*_H$ **$YD_EX_T*i*_H_TIME$**	**$YD_EX_T*i*_L$** **$YD_EX_T*i*_L_TIME$**	**$YD_EX_T*i*_M$**	Extra temperature sensor *i* (*i* = 1 to 7)
$YD_EX_H*i*_H$ **$YD_EX_H*i*_H_TIME$**	**$YD_EX_H*i*_L$** **$YD_EX_H*i*_L_TIME$**	**$YD_EX_H*i*_M$**	Extra humidity sensor *i* (*i* = 1 to 7)
$YD_EX_LW*i*_H$ **$YD_EX_LW*i*_H_TIME$**	**$YD_EX_LW*i*_L$** **$YD_EX_LW*i*_L_TIME$**	**$YD_EX_LW*i*_M$**	Leaf Wetness sensor *i* (*i* = 1 to 4)
$YD_EX_LT*i*_H$ **$YD_EX_LT*i*_H_TIME$**	**$YD_EX_LT*i*_L$** **$YD_EX_LT*i*_L_TIME$**	**$YD_EX_LT*i*_M$**	Leaf Temperature sensor *i* (*i* = 1 to 4)
$YD_EX_SM*i*_H$ **$YD_EX_SM*i*_H_TIME$**	**$YD_EX_SM*i*_L$** **$YD_EX_SM*i*_L_TIME$**	**$YD_EX_SM*i*_M$**	Soil Moisture sensor *i* (*i* = 1 to 4)
$YD_EX_ST*i*_H$ **$YD_EX_ST*i*_H_TIME$**	**$YD_EX_ST*i*_L$** **$YD_EX_ST*i*_L_TIME$**	**$YD_EX_ST*i*_M$**	Soil Temperature sensor *i* (*i* = 1 to 4)

24-Hour Ago Values and Changes

Value 24 hours ago	
$24HR_WIND$ $24HR_WINDDIR$	Wind gust and direction
$24HR_TEMP$	Temperature
$24HR_PRES$	Barometric pressure
$24HR_RAIN$	Precipitation
$24HR_SUN$	Sunshine index
$24HR_HUM$	Humidity
$24HR_DEW$	Dew point
$24HR_UV$	Ultraviolet
$24HR_ET$	ET
Change from 24 hours ago	
$24HR_WIND_RATE$	Wind speed
$24HR_TEMP_RATE$	Temperature
$24HR_PRES_RATE$	Barometric pressure
$24HR_RAIN_RATE$	Precipitation
$24HR_SUN_RATE$	Sunshine index
$24HR_HUM_RATE$	Humidity
$24HR_DEW_RATE$	Dew point
$24HR_UV_RATE$	Ultraviolet

One-Year Ago Observed Conditions

$1YR_PRECIP_TYPES$	Zero or more of the following: Fog, Heavy Fog, Thunder, Ice Pellets, Hail, Glaze/Freezing Rain, Dust storm, Smoke/Haze, Blowing Snow
$1YR_SNOWCOVER$	Snow cover in inches
$1YR_SNOWFALL$	Snowfall for yesterday

One-Year Ago Maximums, Minimums and Time (Hour: Minute), Means

$1YR_GH$ **$1YR_GDH$** **$1YR_GH_TIME$**	**$1YR_GL$** **$1YR_GDL$** **$1YR_GL_TIME$**	**$1YR_GM$** **$1YR_GDM$**	Wind gust and direction
$1YR_AH$ **$1YR_ADH$** **$1YR_AH_TIME$**	**$1YR_AL$** **$1YR_ADL$** **$1YR_AL_TIME$**		Wind average and direction
$1YR_TH$ **$1YR_TH_TIME$**	**$1YR_TL$** **$1YR_TL_TIME$**	**$1YR_TM$**	Temperature
$1YR_IH$ **$1YR_IH_TIME$**	**$1YR_IL$** **$1YR_IL_TIME$**	**$1YR_IM$**	Indoor temperature
$1YR_BH$ **$1YR_BH_TIME$**	**$1YR_BL$** **$1YR_BL_TIME$**	**$1YR_BM$**	Barometric pressure
$1YR_PH$ **$1YR_PH_TIME$**	**$1YR_PL$** **$1YR_PL_TIME$**	**$1YR_PM$**	Precipitation
$1YR_CH$ **$1YR_CH_TIME$**	**$1YR_CL$** **$1YR_CL_TIME$**	**$1YR_CM$**	Wind chill gust
$1YR_cH$ **$1YR_cH_TIME$**	**$1YR_cL$** **$1YR_cL_TIME$**	**$1YR_cM$**	Wind chill average
$1YR_XH$ **$1YR_XH_TIME$**	**$1YR_XL$** **$1YR_XL_TIME$**	**$1YR_XM$**	Heat index
$1YR_SH$ **$1YR_SH_TIME$**	**$1YR_SL$** **$1YR_SL_TIME$**	**$1YR_SM$**	Sunshine/Solar
$1YR_HH$ **$1YR_HH_TIME$**	**$1YR_HL$** **$1YR_HL_TIME$**	**$1YR_HM$**	Humidity
$1YR_DH$ **$1YR_DH_TIME$**	**$1YR_DL$** **$1YR_DL_TIME$**	**$1YR_DM$**	Dew point
$1YR_UH$ **$1YR_UH_TIME$**	**$1YR_UL$** **$1YR_UL_TIME$**	**$1YR_UM$**	Ultraviolet
$1YR_EH$ **$1YR_EH_TIME$**		**$1YR_EM$**	Evapotranspiration
		$1YR_SUNMINUTES$	Sunshine minutes
$1YR_EX_T*i*_H$ **$1YR_EX_T*i*_H_TIME$**	**$1YR_EX_T*i*_L$** **$1YR_EX_T*i*_L_TIME$**	**$1YR_EX_T*i*_M$**	Extra temperature sensor *i* (*i* = 1 to 7)
$1YR_EX_H*i*_H$ **$1YR_EX_H*i*_H_TIME$**	**$1YR_EX_H*i*_L$** **$1YR_EX_H*i*_L_TIME$**	**$1YR_EX_H*i*_M$**	Extra humidity sensor *i* (*i* = 1 to 7)
$1YR_EX_LW*i*_H$ **$1YR_EX_LW*i*_H_TIME$**	**$1YR_EX_LW*i*_L$** **$1YR_EX_LW*i*_L_TIME$**	**$1YR_EX_LW*i*_M$**	Leaf Wetness sensor *i* (*i* = 1 to 4)
$1YR_EX_LT*i*_H$ **$1YR_EX_LT*i*_H_TIME$**	**$1YR_EX_LT*i*_L$** **$1YR_EX_LT*i*_L_TIME$**	**$1YR_EX_LT*i*_M$**	Leaf Temperature sensor *i* (*i* = 1 to 4)
$1YR_EX_SM*i*_H$ **$1YR_EX_SM*i*_H_TIME$**	**$1YR_EX_SM*i*_L$** **$1YR_EX_SM*i*_L_TIME$**	**$1YR_EX_SM*i*_M$**	Soil Moisture sensor *i* (*i* = 1 to 4)
$1YR_EX_ST*i*_H$ **$1YR_EX_ST*i*_H_TIME$**	**$1YR_EX_ST*i*_L$** **$1YR_EX_ST*i*_L_TIME$**	**$1YR_EX_ST*i*_M$**	Soil Temperature sensor *i* (*i* = 1 to 4)

Monthly Maximums, Minimums and Times (Month Day Hour: Minute), Means

MTH_GH **MTH_GDH** **MTH_GH_DATE**	**MTH_GL** **MTH_GDL** **MTH_GL_DATE**	**MTH_GM** **MTH_GDM**	Wind gust and direction
MTH_AH **MTH_ADH** **MTH_AH_DATE**	**MTH_AL** **MTH_ADL** **MTH_AL_DATE**		Wind average and direction
MTH_TH **MTH_TH_DATE**	**MTH_TL** **MTH_TL_DATE**	**MTH_TM**	Temperature
MTH_DH **MTH_DH_DATE**	**MTH_DL** **MTH_DL_DATE**	**MTH_DM**	Dew Point
MTH_HH **MTH_HH_DATE**	**MTH_HL** **MTH_HL_DATE**	**MTH_HM**	Humidity
MTH_SH **MTH_SH_DATE**	**MTH_SL** **MTH_SL_DATE**	**MTH_SM**	Sunshine/Solar
MTH_PH **MTH_PH_DATE**		**MTH_PTTL**	Precipitation
MTH_EH **MTH_EH_DATE**		**MTH_EM**	Evapotranspiration
MTH_UH **MTH_UH_DATE**	**MTH_UL** **MTH_UL_DATE**	**MTH_UM**	UV
MTH_BH **MTH_BH_DATE**	**MTH_BL** **MTH_BL_DATE**	**MTH_BM**	Barometric pressure
EX_T*i*_MH **$EX_T*i*_MH_DATE$**	**EX_T*i*_ML** **$EX_T*i*_ML_DATE$**	**EX_T*i*_MM**	Extra temperature sensor *i* (*i* = 1 to 7)
EX_H*i*_MH **$EX_H*i*_MH_DATE$**	**EX_H*i*_ML** **$EX_H*i*_ML_DATE$**	**EX_H*i*_MM**	Extra humidity sensor *i* (*i* = 1 to 7)
EX_LW*i*_MH **$EX_LW*i*_MH_DATE$**	**EX_LW*i*_ML** **$EX_LW*i*_ML_DATE$**	**EX_LW*i*_MM**	Leaf Wetness sensor *i* (*i* = 1 to 4)
EX_LT*i*_MH **$EX_LT*i*_MH_DATE$**	**EX_LT*i*_ML** **$EX_LT*i*_ML_DATE$**	**EX_LT*i*_MM**	Leaf Temperature sensor *i* (*i* = 1 to 4)
EX_SM*i*_MH **$EX_SM*i*_MH_DATE$**	**EX_SM*i*_ML** **$EX_SM*i*_ML_DATE$**	**EX_SM*i*_MM**	Soil Moisture sensor *i* (*i* = 1 to 4)
EX_ST*i*_MH **$EX_ST*i*_MH_DATE$**	**EX_ST*i*_ML** **$EX_ST*i*_ML_DATE$**	**EX_ST*i*_MM**	Soil Temperature sensor *i* (*i* = 1 to 4)

Monthly Means and Totals – Other

MTH_TAVG	Temperature: (high+low) ÷ 2
MTH_GRD	Wind resultant direction
$MTH_SUNMINUTES$	Sunshine minutes

Yearly Maximums and Minimums (Month Day Hour: Minute), Means

YR_GH **YR_GDH** **YR_GH_DATE**	**YR_GL** **YR_GDL** **YR_GL_DATE**	**YR_GM** **YR_GDM**	Wind gust and direction
YR_AH **YR_ADH** **YR_AH_DATE**	**YR_AL** **YR_ADL** **YR_AL_DATE**		Wind average and direction
YR_TH **YR_TH_DATE**	**YR_TL** **YR_TL_DATE**	**YR_TM**	Temperature
YR_DH **YR_DH_DATE**	**YR_DL** **YR_DL_DATE**	**YR_DM**	Dew Point
YR_HH **YR_HH_DATE**	**YR_HL** **YR_HL_DATE**	**YR_HM**	Humidity
YR_SH **YR_SH_DATE**	**YR_SL** **YR_SL_DATE**	**YR_SM**	Sunshine/Solar
YR_PH **YR_PH_DATE**		**YR_PTTL**	Precipitation
YR_EH **YR_EH_DATE**		**YR_EM**	Evapotranspiration
YR_UH **YR_UH_DATE**	**YR_UL** **YR_UL_DATE**	**YR_UM**	UV
YR_BH **YR_BH_DATE**	**YR_BL** **YR_BL_DATE**	**YR_BM**	Barometric pressure
EX_T*i*_YH **$EX_T*i*_YH_DATE$**	**EX_T*i*_YL** **$EX_T*i*_YL_DATE$**	**EX_T*i*_YM**	Extra temperature sensor *i* (*i* = 1 to 7)
EX_H*i*_YH **$EX_H*i*_YH_DATE$**	**EX_H*i*_YL** **$EX_H*i*_YL_DATE$**	**EX_H*i*_YM**	Extra humidity sensor *i* (*i* = 1 to 7)
EX_LW*i*_YH **$EX_LW*i*_YH_DATE$**	**EX_LW*i*_YL** **$EX_LW*i*_YL_DATE$**	**EX_LW*i*_YM**	Leaf Wetness sensor *i* (*i* = 1 to 4)
EX_LT*i*_YH **$EX_LT*i*_YH_DATE$**	**EX_LT*i*_YL** **$EX_LT*i*_YL_DATE$**	**EX_LT*i*_YM**	Leaf Temperature sensor *i* (*i* = 1 to 4)
EX_SM*i*_YH **$EX_SM*i*_YH_DATE$**	**EX_SM*i*_YL** **$EX_SM*i*_YL_DATE$**	**EX_SM*i*_YM**	Soil Moisture sensor *i* (*i* = 1 to 4)
EX_ST*i*_YH **$EX_ST*i*_YH_DATE$**	**EX_ST*i*_YL** **$EX_ST*i*_YL_DATE$**	**EX_ST*i*_YM**	Soil Temperature sensor *i* (*i* = 1 to 4)

Yearly Means and Totals - Other

YR_TAVG	Temperature: (high+low) ÷ 2
YR_GRD	Wind resultant direction
$YR_SUNMINUTES$	Sunshine minutes

All-time Maximums and Minimums (Month Day Year, Hour: Minute)

ALL_GH **ALL_GDH** **ALL_GH_DATE**	**ALL_GL** **ALL_GDL** **ALL_GL_DATE**	Wind gust and direction
ALL_AH **ALL_ADH** **ALL_AH_DATE**	**ALL_AL** **ALL_ADL** **ALL_AL_DATE**	Wind average and direction
ALL_TH **ALL_TH_DATE**	**ALL_TL** **ALL_TL_DATE**	Temperature
ALL_DH **ALL_DH_DATE**	**ALL_DL** **ALL_DL_DATE**	Dew Point
ALL_HH **ALL_HH_DATE**	**ALL_HL** **ALL_HL_DATE**	Humidity
ALL_SH **ALL_SH_DATE**	**ALL_SL** **ALL_SL_DATE**	Sunshine/Solar
ALL_PH **ALL_PH_DATE**		Precipitation
ALL_EH **ALL_EH_DATE**		Evapotranspiration
ALL_UH **ALL_UH_DATE**	**ALL_UL** **ALL_UL_DATE**	UV
ALL_BH **ALL_BH_DATE**	**ALL_BL** **ALL_BL_DATE**	Barometric pressure
EX_T*i*_AH **$EX_T*i*_AH_DATE$**	**EX_T*i*_AL** **$EX_T*i*_AL_DATE$**	Extra temperature sensor *i* (*i* = 1 to 7)
EX_H*i*_AH **$EX_H*i*_AH_DATE$**	**EX_H*i*_AL** **$EX_H*i*_AL_DATE$**	Extra humidity sensor *i* (*i* = 1 to 7)
EX_LW*i*_AH **$EX_LW*i*_AH_DATE$**	**EX_LW*i*_AL** **$EX_LW*i*_AL_DATE$**	Leaf Wetness sensor *i* (*i* = 1 to 4)
EX_LT*i*_AH **$EX_LT*i*_AH_DATE$**	**EX_LT*i*_AL** **$EX_LT*i*_AL_DATE$**	Leaf Temperature sensor *i* (*i* = 1 to 4)
EX_SM*i*_AH **$EX_SM*i*_AH_DATE$**	**EX_SM*i*_AL** **$EX_SM*i*_AL_DATE$**	Soil Moisture sensor *i* (*i* = 1 to 4)
EX_ST*i*_AH **$EX_ST*i*_AH_DATE$**	**EX_ST*i*_AL** **$EX_ST*i*_AL_DATE$**	Soil Temperature sensor *i* (*i* = 1 to 4)

Wind Run

$WINDRUN_UNITS$	Wind run units (miles, kilometers, nautical miles, meters)
$WINDRUN_DAY$	Wind run for today
$WINDRUN_MTH$	Wind run for current month
$WINDRUN_YR$	Wind run for current year

Sunrise, Sunset, Moon rise, Moon set

$SUNRISE$	Sunrise
$SUNSET$	Sunset
$MOONRISE$	Moon rise
$MOONSET$	Moon set
TW_START	Twilight start
TW_END	Twilight end

Number of Days of Rain

$LAST_DATE_RAINFALL$	Date of last rainfall
$DAYS_SINCE_RAINFALL$	Number of days since last rainfall

Number of Days this Month

$NUM_DAYS_RAIN_MTH$	Days of rain ≥ 0.01”
$NUM_DAYS_SNOW_MTH$	Days of snow ≥ 1”
$NUM_DAYS_HFOG_MTH$	Days of heavy fog
$NUM_DAYS_THUNDER_MTH$	Days of thunder
$NUM_DAYS_HI90F_MTH$	Days of high temperature ≥ 90°F
$NUM_DAYS_LO32F_MTH$	Days of low temperature ≤ 32°F
$NUM_DAYS_HI32F_MTH$	Days of high temperature ≤ 32°F
$NUM_DAYS_LO0F_MTH$	Days of low temperature ≤ 0°F
$NUM_DAYS_CLOUDY_MTH$	Cloudy days
$NUM_DAYS_PCLOUDY_MTH$	Partly cloudy days
$NUM_DAYS_CLEAR_MTH$	Clear days

Number of Days this Year

$NUM_DAYS_RAIN_YR$	Days of rain ≥ 0.01”
$NUM_DAYS_SNOW_YR$	Days of snow ≥ 1”
$NUM_DAYS_HFOG_YR$	Days of heavy fog
$NUM_DAYS_THUNDER_YR$	Days of thunder
$NUM_DAYS_HI90F_YR$	Days of high temperature ≥ 90°F
$NUM_DAYS_LO32F_YR$	Days of low temperature ≤ 32°F
$NUM_DAYS_HI32F_YR$	Days of high temperature ≤ 32°F
$NUM_DAYS_LO0F_YR$	Days of low temperature ≤ 0°F
$NUM_DAYS_CLOUDY_YR$	Cloudy days
$NUM_DAYS_PCLOUDY_YR$	Partly cloudy days
$NUM_DAYS_CLEAR_YR$	Clear days

Normals

$NORMAL_TEMP_HI$	Normal high temperature
$NORMAL_TEMP_LO$	Normal low temperature
$NORMAL_TEMP_MEAN$	Normal mean temperature
$NORMAL_PRECIP$	Normal rainfall
$NORMAL_SNOW$	Normal snowfall

Records

$RECORD_TEMP_HI_MAX$ **$RECORD_TEMP_HI_MAX_YR$**	Record high temperature and year
$RECORD_TEMP_HI_MIN$ **$RECORD_TEMP_HI_MIN_YR$**	Record low high temperature and year
$RECORD_TEMP_LO_MAX$ **$RECORD_TEMP_LO_MAX_YR$**	Record high low temperature and year
$RECORD_TEMP_LO_MIN$ **$RECORD_TEMP_LO_MIN_YR$**	Record low temperature and year
$RECORD_RAIN_AMT$ **$RECORD_RAIN_AMT_YR$**	Record rainfall and year
$RECORD_SNOW_AMT$ **$RECORD_SNOW_AMT_YR$**	Record snowfall and year

Alarms

$ALARMS$	**For the Davis Vantage Pro:**		**For the Heathkit ID-5001:**
	Falling Barometer	Heat Index	Fog
	Rising Barometer	Low Wind Chill	Alert
	Low Inside Temperature	THSW Index	Warning
	High Inside Temperature	High Solar Radiation	
	Low Inside Humidity	High UV	
	High Inside Humidity	High UV Dose	
	Time	Extra Temperature Low *i*	
	High Rain Rate	Extra Temperature High *i*	
	15-Minute Rain	Extra Humidity Low *i*	
	24-Hour Rain	Extra Humidity High *i*	
	Storm Rain	Leaf Wetness Low *i*	
	Daily ET	Leaf Wetness High *i*	
	Low Outside Temperature	Soil Moisture Low *i*	
	High Outside Temperature	Soil Moisture High *i*	
	Wind Speed	Leaf Temperature Low *i*	
	10-Minute Wind Average	Leaf Temperature High *i*	
	Low Dew Point	Soil Temperature Low *i*	
	High Dew Point	Soil Temperature High *i*	
	If no alarms: None		

Other

$RAIN24$	Rainfall for last 24 hours - including current hour
$STORMRAIN$	For Vantage Pro only. Displays storm rain total as calculated by VP.
DAY_NOTES	Observer notes for today - entered via Daily LCD Reports
YD_NOTES	Observer notes for yesterday - entered via Daily LCD Reports
$METAR$	Current METAR observation
$SUNMINUTES_THRES$	Sunshine minutes threshold

Current Conditions #2 HTML File Reference

The Current Conditions #2 HTML file (**C:\Program Files (x86)\Thunderhead Technologies\WxSolution\Forms\HTML\Current.html**) is fully customizable using the tags listed above. When WxSolution processes the current conditions, it substitutes the appropriate data value for each of tags listed above. You may use the same tag more than once. The tags are **case-sensitive**. (See above.)

Observations HTML File Reference

The Observations HTML file (**C:\Program Files (x86)\Thunderhead Technologies\WxSolution\Forms\HTML\Observations.html**) is fully customizable using the tags listed above and below. When WxSolution processes the observation history report, it substitutes the appropriate data value for each of tags listed above and below. You may use the same tag more than once. The tags are **case-sensitive**.

The Observation History Report uses the following row as the default template (in **...\Forms\HTML\Observations.html**) for all rows in the observation table:

```
$O_DATE_MDY_S$ $O_TIME24_HM$ $O_T$ $O_D$ $O_H$ $O_W$ $O_B$ $O_R$ $O_RR$ $O_S$ $O_U$ $O_E$
```

Date/Time

O_DATE_MDY	Date (ex. January 1, 2012)
$O_DATE_MDY_S$	Date (ex. Jan 1, 2012)
O_DATE_DMY	Date (ex. 1 January 2012)
$O_DATE_DMY_S$	Date (ex. 1 Jan 2012)
$O_DATE_DASH_MDY$	Date (mm-dd-yyyy, ex. 01-15-2012)
$O_DATE_SLASH_MDY$	Date (mm/dd/yyyy, ex. 01/15/2012)
$O_DATE_DASH_YMD$	Date (yyyy-mm-dd, ex. 2012-01-15)
$O_DATE_SLASH_YMD$	Date (yyyy/mm/dd, ex. 2012/01/15)
$O_DATE_DASH_DMY$	Date (yyyy-mm-dd, ex. 2012-01-15)
$O_DATE_SLASH_DMY$	Date (yyyy/mm/dd, ex. 2012/01/15)
O_TIME_HM	Time (ex. 12:00 AM)
O_TIME24_HM	24-hour time (ex. 00:00)

Values

O_W	Wind: "*Dir Avg* G *Gust*" (ex. WNW 15 G 25), or "Calm"
O_T	Temperature
O_I	Indoor temperature
O_B	Barometric pressure
O_R	Daily total rainfall
O_RR	Rate of rainfall at observation
O_S	Sunshine/solar
O_H	Humidity
O_D	Dew point
O_U	Ultraviolet
O_E	Evapotranspiration

You can add and remove columns and change the order in which they appear. WxSolution searches for the HTML comment tags **<!-- BEGIN TEMPLATE ROW -->** and **<!-- END TEMPLATE ROW -->** as the beginning and ending of the template row. **Do not modify or delete these tags**. WxSolution will repeat this table row definition for each of the rows added to the table.

Appendix

A.1 Glossary

Instantaneous Rainfall Rate

Precipitation max/min are the maximum and minimum instantaneous rainfall rate calculated by the weather computer. The rate is calculated by timing 0.01" pulses from the rain gauge and interpolating an hourly rate.

For example, if two pulses occur 60 seconds apart, then the instantaneous rainfall rate is 0.60"/hr. (0.01"/minute × 60 minutes/hour = 0.60"/hr). Another way to calculate the rate is to divide 36 by the number of seconds between pulses. In the previous example, 36 ÷ 60 = 0.60.

Light rain is defined as a rainfall rate less than 0.10" per hour, moderate rain is between 0.10" and 0.30" per hour, and heavy rain is greater than 0.30" per hour.

Note: The Davis WM2 only reports rainfall every 15 seconds. Therefore, WxSolution can only ever report a maximum rainfall rate of 2.40"/hr (36 ÷ 15 = 2.4).

Resultant Wind

Resultant wind is calculated by summing the wind vectors to produce a single wind speed and direction that represents the prevailing wind. The equation is:

$$\theta_R = \tan^{-1} \frac{\sum_{i=0}^{n} w_i (\sin \theta_i)}{\sum_{i=0}^{n} w_i (\cos \theta_i)}$$

$$w_R = \sqrt{\left(\sum_{i=0}^{n} w_i (\sin \theta_i) \right)^2 + \left(\sum_{i=0}^{n} w_i (\cos \theta_i) \right)^2}$$

where w_i is the wind speed, θ_i is the wind direction, w_R is the resultant wind speed, θ_R is the resultant wind direction, and n is the number of samples.

A.2 Pager Format

The numeric pager feature is no longer implemented. Pages are text and sent by email.

A.3 Advanced Features

A.3.1 Running more than one copy of WxSolution simultaneously

Note: For 32-bit Windows, use PF=**Program Files**, For 64-bit Windows, use PF=**Program Files (x86)**.
If you have more than one weather computer, you can run WxSolution with each by performing the following steps:

1. Copy the ***PF*\WxSolution** folder and all its subfolders to another folder such as ***PF*\WxSolution2**. (Right-click the WxSolution folder in Windows Explorer, select Copy, then select Paste, and finally rename "Copy of WxSolution" to the new name.)

2. Run **regedit.exe** to add a new key under **HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Thunderhead Technologies\WxSolution** naming it something appropriate such as **WxComp2**. For 32-bit Windows, exclude "Wow6432Node".
3. Modify Windows Startup of WxSolution:
   a. Right-click the Windows **Start** button, select open.
   b. Double-click **Programs**, and double-click **Startup**.
   c. Make a copy of the shortcut for WxSolution renaming it appropriately (select the WxSolution icon, select **Copy** from the Edit menu, select **Paste** from the Edit menu, then select **Rename** from the File menu).
   d. Select **Properties** from the File menu, and the select the Shortcut tab.
   e. Modify the **Target**:
   f. Change the folder of the application from `\PF\WxSolution` to `\PF\WxSolution2` using the name chosen in step 1.
   g. At the end of the command, insert a space and the parameter **`/c=WxComp2`** using the name chosen in step 2.
   h. The modified **Target** should look like:
   `"C:\PF\WxSolution2\WxSolution.exe" "/c=WxComp2"`
   i. Modify **Start-in** using the new folder from step 1:
   `"C:\PF\WxSolution2"`
4. Run the new copy of WxSolution (double-click the icon in the Startup folder) to configure it.

A.3.2 Sunshine Sensor for the Heathkit ID-5001

The Sunshine Sensor measures ambient outdoor light levels and can be used to determine the intensity of solar radiation. It consists of a simple solar cell that replaces the indoor humidity sensor on the ID-5001.

One source of the solar cell is Radio Shack. Order part number **980-0878** (1.5V, 200mA Solar Module) - either from the *Radio Shack Answers Catalog* by calling 1-800-THE-SHACK, or order online. The part is not carried in the retail stores.

To calibrate the Sunshine Sensor, expose the sensor to full sunlight at noon. Attach the **Positive** lead to **SRC (WHT)**, **Negative** lead to **GND**. Turn **R458** (*Indoor Humidity Slope*) fully counterclockwise. Then turn **R458** clockwise until the display just changes from 98 to 99 (units with **ROM 444-475-3** and higher do not register values greater than 99 even if the value is greater than 99).

Use the Sunshine Sensor at your own risk. Thunderhead Technologies will not be responsible for any damages associated with the installation or usage of the Sunshine Sensor.

A.4 Special Installation Instructions

A.4.1 Automatic logon on startup

To ensure that WxSolution starts automatically, the PC must be configured to log on automatically.
On Windows XP and higher systems:

- Use Start → Run (or Win+R) and enter "control userpasswords2" to configure auto-logon. Select an account to use.

Note: On XP, if only one account has been created and it has no password, then Windows will start automatically.

A.4.2 Automatic PC power on

To ensure that the PC starts automatically after a power loss, the BIOS must be configured. This setting varies

between manufacturers so consult your PC's documentation. Look for a category such as "AC Recovery" and for a setting as "Power on".

A.4.3 Disable sleep and hibernate

The PC must be configured to not go to sleep or hibernate. Go to Windows Control Panel and Power Settings (location varies between Windows versions). Modify the power plan so that the PC will not sleep after idle. It is OK for the monitor to turn off.

A.4.4 Remote access setup for WxClient

To allow access to this station via the Internet, you must have a broadband connection to the Internet.

1. Configure WxServer to select a TCP/IP port.
2. The PC needs to be configured with either a static IP address (e.g., 192.168.1.50 or some address outside the DHCP address pool) or preferably configured with a DHCP reserved address. DHCP reservation configuration varies by manufacturer. Consult your router's documentation.
3. Configure your broadband router for Port Forwarding of the TCP/IP port specified in Configure WxServer to your PC's IP address. Port forwarding configuration varies by manufacturer. Consult your router's documentation.

A.4.5 WxSolution Configuration Backup

WxSolution configuration information is stored in the Windows Registry. To backup this information:

1. Launch the Registry Editor by pressing Win+R (Windows key and then R). Type **regedit** then press OK.
2. On 32-bit Windows, browse to "HKEY_LOCAL_MACHINE\SOFTWARE\Thunderhead Technologies\WxSolution"; on 64-bit browse to "HKEY_LOCAL_MACHINE\SOFTWARE\WOW6432Node\Thunderhead Technologies\WxSolution".
3. Right-click the "WxSolution" key in the left pane and select **Export**. Specify a filename. Copy this file to a backup location.

To restore the configuration, double-click on the file in Windows Explorer. Confirm the prompt to save information to the Registry.

A.5 Data File Formats

A.5.1 Hourly Data

There is one record per hour for each hour in the month, plus the daily summary record. Day 1, hour 0 is record 1. Day 1, hour 24 (summary record) is record 25. Day 31, hour 24 is record 775 (25 x 31). Summary records (day 32, hours 0 – 24) are records 776 – 800. (If *last day* is less than 31, then summary records begin at *last day* + 1.)

File Header

Field	Type	Length	Notes
Identification string	C	8	"HRY"
Version	N	4	0x0200 (pre 1.9), 0x0300 (1.9)
Station Name	C	40	Example: "Taunton 2W"
Reserved	C	76	Reserved for future use

Data Record

Field	Type	Notes
Record Number	W	
Number of Observations	N	Number of observations used in calculating means
Edited	C	'Y' or 'N' – denotes if the record has been edited
Year	W	
Month	W	
Day	W	
Hour	W	
Minute	W	*Always zero*
Second	W	*Always zero*
Millisecond	W	*Always zero*
Units – Temperature	C	'F' = Fahrenheit, 'C' = Celsius
Units – Wind	C	'M' = miles/hr, 'K' = knots, 'L' = km/hr, 'm' = m/s
Units – Pressure	C	'I' = inches Hg., 'M'=millibars
Units – Rain	C	'I' = inches, 'C' = centimeters, 'M' = millimeters
Outdoor Temperature	***SF1***	(See below)
Indoor Temperature	***SF1***	
Dew Point	***SF1***	
Humidity	***SF1***	
Sunshine	***SF1***	
Wind Gust	***SF1***	
Wind Gust Direction	***SF1***	
Wind Average	***SF1***	
Wind Average Direction	***SF1***	
Pressure	***SF1***	
Rainfall	***SF1***	
Wind Chill Gust	***SF1***	
Wind Chill Average	***SF1***	
Heat Index	***SF1***	
Evapotranspiration (ET)	***SF1***	
Ultraviolet Index (UV)	***SF1***	
CRC	W	16-bit cyclic redundancy check

W = 16-bit integer, N = 32-bit integer
C = character (8 bits)

Subfield 1 (SF1)

Field	Type	Notes
Maximum	F	
Minimum	F	
Mean	F	
Max_time	N,L	Number of seconds since 1/1/1970. 32-bit integer 1.9, 64-bit integer 1.9.
Min_time	N,L	
Mean_time	N,L	(Not used)
Enabled	C	(Not yet used)

N = 32-bit integer, L=64-bit integer
F = floating-point number (32 bits)
C = character (8 bits)

A.5.2 Daily Weather Computer Data

One record for each day in the month.

File Header

Field	Type	Length	Notes
Identification string	C	8	"DAY"
Version	N	4	0x0200 (pre 1.9), 0x0300 (1.9)
Station Name	C	40	Example: "Taunton 2W"
Reserved	C	76	Reserved for future use

Data Record (pre version 1.9)

Field	Type	Notes
Max Outdoor Temperature	F	
Min Outdoor Temperature	F	
Max Indoor Temperature	F	
Min Indoor Temperature	F	
Max Wind Gust	F	
Max Wind Gust Direction	F	
Min Wind Gust	F	
Min Wind Gust Direction	F	
Max Wind Average	F	
Max Wind Average Direction	F	
Min Wind Average	F	
Min Wind Average Direction	F	
Max Humidity	F	
Min Humidity	F	
Max Sunshine (Indoor Humidity)	F	
Min Sunshine (Indoor Humidity)	F	
Max Barometric Pressure	F	
Min Barometric Pressure	F	
Rainfall	F	
Max Outdoor Temperature – Time	N	Number of seconds after midnight
Min Outdoor Temperature – Time	N	
Max Indoor Temperature – Time	N	
Min Indoor Temperature – Time	N	
Max Wind Gust – Time	N	
Min Wind Gust – Time	N	
Max Wind Average – Time	N	
Min Wind Average – Time	N	
Max Humidity – Time	N	
Min Humidity – Time	N	
Max Sunshine (Indoor Humidity) – Time	N	
Min Sunshine (Indoor Humidity) – Time	N	
Max Barometric Pressure – Time	N	
Min Barometric Pressure – Time	N	
CRC	W	16-bit cyclic redundancy check

W = 16-bit integer, N = 32-bit integer
F = floating-point number (32 bits)
C = character (8 bits)

Data Record (version 1.9 and later)

Field	Type	Notes
Max Outdoor Temperature	F	
Max Outdoor Temperature – Time	L	Number of seconds after midnight
Min Outdoor Temperature	F	
Min Outdoor Temperature – Time	L	
Max Indoor Temperature	F	
Max Indoor Temperature – Time	L	
Min Indoor Temperature	F	
Min Indoor Temperature – Time	L	
Max Humidity	F	
Max Humidity – Time	L	
Min Humidity	F	
Min Humidity – Time	L	
Max Sunshine (Indoor Humidity)	F	
Max Sunshine (Indoor Humidity) – Time	L	
Min Sunshine (Indoor Humidity)	F	
Min Sunshine (Indoor Humidity) – Time	L	
Max Barometric Pressure	F	
Max Barometric Pressure – Time	L	
Min Barometric Pressure	F	
Min Barometric Pressure – Time	L	
Max Wind Gust	F	
Max Wind Gust Direction	F	
Max Wind Gust – Time	L	
Min Wind Gust	F	
Min Wind Gust Direction	F	
Min Wind Gust – Time	L	
Max Wind Average	F	
Max Wind Average Direction	F	
Max Wind Average – Time	L	
Min Wind Average	F	
Min Wind Average Direction	F	
Min Wind Average – Time	L	
Rainfall	F	
Units - temperature	C	
Units - wind	C	
Units – pressure	C	
Units - rain	C	
CRC	W	cyclic redundancy check

W = 16-bit integer, N = 32-bit integer, L=64-bit integer
F = floating-point number (32 bits)
C = character (8 bits)

A.5.3 Extra Data

One record for each day in the month.

Field	Type	Length	Notes
Snowcover	C	3	“0” to “99”, and/or “T”
Snowfall	C	5	“0” to “99.9”, and/or “T”
Precipitation Types	C	10	Coded string = “123456789”, with ‘.’ for non-occurring events, e.g., “..3.5....”
Sky Cover	C	1	“C”, “P”, or “L”
Trace Precipitation	C	1	“Y” or “N”

C = character (8 bits)

A.5.4 Observation Data

One record per hour per day.

File Header

Field	Type	Length	Notes
Identification string	C	8	"OBS"
Version	N	4	0x0200 (pre 1.9), 0x0300 (1.9)
Station Name	C	40	Example: "Taunton 2W"
Reserved	C	76	Reserved for future use

Data Record

Field	Type	Notes
Year	N	
Month	N	
Day	N	
Hour	N	
Minute	N	*Always zero*
Second	N	*Always zero*
Millisecond	N	*Always zero*
Units - temperature	C	
Units - wind	C	
Units – pressure	C	
Units - rain	C	
Outdoor Temperature	F	
Humidity	F	
Dew Point	F	
Wind Average	F	
Wind Average Direction	F	
Wind Gust	F	
Sunshine	F	
Barometric Pressure	F	
Evapotranspiration	F	
Ultraviolet Index	F	
Wind Chill Average	F	
Heat Index	F	
Rain to Date	F	
Rain Rate	F	
CRC	W	cyclic redundancy check

W = 16-bit integer, N = 32-bit integer, L=64-bit integer
F = floating-point number (32 bits)
C = character (8 bits)

A.5.5 Precipitation Time

.PRB File: One record for each 0.01" pulse from the rain gauge. For the Davis, if the rainfall rate is greater than 0.01" per 15 seconds, then only one record will appear per 15 seconds. This is because the Davis only reports rainfall every 15 seconds. This file is generated from the .PRE precipitation file.

Field	Type	Notes
Time	N,L	Number of seconds since 1/1/1970. 32-bit integer 1.9, 64-bit integer 1.9.

N = 32-bit integer, L=64-bit integer

.PRE File: One record for each 0.01" pulse from the rain gauge. You can edit this file to remove erroneous rain pulses.

```
Time»date hh:mm:ss
```

Where *Time* is the time in seconds since 1/1/1970, » is the tab character, *date* is the 2-digit day, and *hh:mm:ss* is the 24-hour time of occurrence.

A.5.6 Extra Sensor Data

There is one record per hour for each hour in the month, plus the daily summary record. Day 1, hour 0 is record 1. Day 1, hour 24 (summary record) is record 25. Day 31, hour 24 is record 775 (25 x 31). Summary records (day 32, hours 0 – 24) are records 776 – 800. (If last day is less than 31, then summary records begin at last day + 1.)

File Header

Field	Type	Length	Notes
Identification string	C	8	"EXS"
Version	N	4	0x0100 (pre 1.9), 0x0200 (1.9)
Station Name	C	40	Example: "Taunton 2W"
Reserved	C	76	Reserved for future use

Data Record

Field	Type	Notes
Record Number	W	
Number of Observations	N	Number of observations used in calculating means
Edited	C	'Y' or 'N' – denotes if the record has been edited
Units – Temperature	C	'F' = Fahrenheit, 'C' = Celsius
Date/Time	***SF2***	(See below)
Temperature 1	***SF1***	(See below)
Temperature 2	***SF1***	
Temperature 3	***SF1***	
Temperature 4	***SF1***	
Temperature 5	***SF1***	
Temperature 6	***SF1***	
Temperature 7	***SF1***	
Humidity 1	***SF1***	
Humidity 2	***SF1***	
Humidity 3	***SF1***	
Humidity 4	***SF1***	
Humidity 5	***SF1***	
Humidity 6	***SF1***	
Humidity 7	***SF1***	
Leaf Wetness 1	***SF1***	
Leaf Wetness 2	***SF1***	
Leaf Wetness 3	***SF1***	
Leaf Wetness 4	***SF1***	
Leaf Temperature 1	***SF1***	
Leaf Temperature 2	***SF1***	
Leaf Temperature 3	***SF1***	
Leaf Temperature 4	***SF1***	
Soil Moisture 1	***SF1***	
Soil Moisture 2	***SF1***	
Soil Moisture 3	***SF1***	
Soil Moisture 4	***SF1***	
Soil Temperature 1	***SF1***	
Soil Temperature 2	***SF1***	
Soil Temperature 3	***SF1***	
Soil Temperature 4	***SF1***	
CRC	W	cyclic redundancy check

W = 16-bit integer, N = 32-bit integer
F = floating-point number (32 bits)
C = character (8 bits)

Subfield 1 (SF1)

Field	Type	Notes
Maximum	N	
Minimum	N	
Mean	F	
Max_time	N,L	Number of seconds since 1/1/1970. 32-bit integer 1.9, 64-bit integer 1.9.
Min_time	N,L	
Mean_time	N,L	(Not used)
Enabled	C	(Not yet implemented)

N = 32-bit integer, L=64-bit integer
C = character (8 bits)

A.5.7 Normals and Records Data

There is one record per day in the month, plus the monthly summary record.

File Header

Field	Type	Length	Notes
Identification string	C	8	"NRM"
Version	N	4	0x0100
Station Name	C	40	Example: "Taunton 2W"
Reserved	C	76	Reserved for future use

Data Record

Field	Type	Notes
Record Number	W	
Date/Time	***SF1***	(See below)
Units – Temperature	C	'F' = Fahrenheit, 'C' = Celsius
Units – Rain	C	'I' = inches, 'C' = centimeters, 'M' = millimeters
Normal Rainfall	**F**	-1 for trace
Normal Snowfall	F	-1 for trace
Normal High Temperature	**F**	
Normal Low Temperature	**F**	
Normal Mean Temperature	**F**	
Record High Temperature	***SF2***	
Record Low Temperature	***SF2***	
Record Rainfall	***SF3***	-1 for trace
Record Snowfall	***SF3***	-1 for trace
CRC	W	16-bit cyclic redundancy check

W = 16-bit integer, N = 32-bit integer
F = floating-point number (32 bits)
C = character (8 bits)

Subfield 1 (SF1)

Field	Type	Notes
Year	W	Not used
Month	W	
Day	W	
Hour	W	Not used
Minute	W	Not used
Second	W	Not used
Millisecond	W	Not used

W = 16-bit integer

Subfield 2 (SF2)

Field	Type	Notes
Maximum	F	
Minimum	F	
Max_time	N	Year
Min_time	N	Year

N = 32-bit integer
F = floating-point number (32 bits)

Subfield 3 (SF3)

Field	Type	Notes
Amount	F	
Amt_time	N	Year

N = 32-bit integer
F = floating-point number (32 bits)

A.6 WxServer Protocol Reference

The WxSolution WxServer protocol has been designed to be flexible so that it may be easily implemented by a variety of clients, such as executable programs and Java applets, and by using a text-based protocol, on a variety of different computing platforms and operating systems. Currently, the WxServer protocol is strictly **one-way** from the server to the client.

WxSolution WxServer is configured to "listen" for client connection requests on a specific TCP port. Upon receiving a connection, WxServer will immediately begin sending data to the client. The following information is sent:

- Configuration record
- Current data values
- Five-minute statistics
- One-hour statistics
- Daily statistics
- Time

After the initial data above is sent, any data values that change are sent once-per-second. The time record is also transmitted once-per-second.

A.6.1 Configuration Record

All characters are ANSI (single byte).

Syntax:
[WXCONFIG]»Elev=*n*»UseHum=*n*»UseSun=*n*»UseRain=*n*»UseET=*n*»UseUV=*n*»StnID=*s*»TZ=*s*»Units=*cccc*»CompType=*n*»Version=*n*»Tenths=*n*»DisplayMsg=*s*»Battery=*s*»XT*n*=*s*»XH*n*=*s*»XST*n*=*s*»XSM*n*=*s*»XLT*n*=*s*»XLM*n*=*s*«

Parameter	Description	Syntax	Meaning	Example
Elev	Station Elevation	*N*	(Not used)	Elev=50
UseHum	Use humidity value	*N*	0=no, 1=yes	UseHum=1
UseSun	Use sunshine value	*N*	0=no, 1=yes	UseSun=1
UseRain	Use rain value	*N*	0=no, 1=yes	UseRain=1
UseET	Use ET value	*N*	0=no, 1=yes	UseET=1
UseUV	Use UV value	*N*	0=no, 1=yes	UseUV=1
StnID	Station identifier	*<string>*	User-defined	StdID=Taunton 2W
TZ	Time zone	*<string>*	User-defined	TZ=Eastern
Units	Units specifier	*Rain|Pressure|Temp|Wind*	(See units below)	Units=IIFM
CompType	Computer type	*n*	1=Heathkit ID-4001 2=Heathkit ID-5001 3=Davis WM2 4=Davis Vantage Pro 5=Texas Weather Report 6=Peet Bros. Ultimeter 7=WMR-918/968	CompType=4
Version	Protocol Version	*n*	2 for this version	Version=2
Tenths	Display data in tenths	*n*	0=no, 1=yes	Tenths=1
DisplayMsg	Greeting display message	*<string>*	User-defined	DisplayMsg=Welcome to WxSolution!
Battery	Battery Status	*<string>*	Indicates low battery on console and/or transmitter(s). Blank if all OK.	1 is low
XT*n*	Extra temperature *n*	*<string>*	User-defined label for extra temperature *n*	Vineyard Temperature

Parameter	Description	Syntax	Meaning	Example
XH*n*	Extra humidity *n*	*<string>*	User-defined label for extra humidity *n*	Vineyard Humidity
XST*n*	Soil temperature *n*	*<string>*	User-defined label for soil temp *n*	6” Soil Temperature
XSM*n*	Soil moisture *n*	*<string>*	User-defined label for soil moisture *n*	6” Soil Moisture
XLT*n*	Leaf temperature *n*	*<string>*	User-defined label for leaf temp *n*	North Field Leaf Temperature
XLM*n*	Leaf Wetness *n*	*<string>*	User-defined label for leaf wetness *n*	North Field Leaf Wetness

Units: I=inches, M=millibars or millimeters or miles/hour, F=Fahrenheit, C=Celsius or centimeters, K=knots, L=kilometers/hour, m=meters/sec.

Notes:

“»” denotes the tab character

“«” denotes CR/LF (carriage return/line feed)

Extra sensor data (XT, XH, XST, XSM, XLT, and XLM) only transmitted if supported and enabled.

A.6.2 Current Data Values

Syntax: **<current>***item1;item2;…***</current>**«

	Description	Syntax	Example
T	Outdoor Temperature	*n*F|C	T=12.3F
I	Indoor Temperature	*n*F|C	I=23.4C
D	Dew Point	*n*F|C	D=12.3F
H	Humidity	*n*	H=56
W	Wind Gust and Direction	*n*M|K|L|mD*n*	W=12.3MD234
w	Wind Average and Direction	*n*M|K|L|mD*n*	w=23.4KD345
B	Barometric Pressure	*n*I|M	B=29.92I
R	Daily Rainfall	*n*I|C|M	R=1.23I
r	Instantaneous Rainfall Rate	*n*I|C|M	r=0.12I
C	Wind Chill Gust	*n*F|C	C=-6.7F
c	Wind Chill Average	*n*F|C	c=1.2F
X	Heat Index	*n*F|C	X=102.7F
S	Sunshine	*n*	S=99
E	Evapotranspiration	*n*I|M	E=0.12I
U	Ultraviolet Index	*n*	U=8.5
Tr	Outdoor Temperature Hourly Rate	*n*F|C	Tr=12.3F
Ir	Indoor Temperature Hourly Rate	*n*F|C	Ir=12.3F
Dr	Dew Point Hourly Rate	*n*F|C	Dr=12.3F
Hr	Humidity Hourly Rate	*n*	Hr=12
Ar	Wind Speed Hourly Rate	*n*M|K|L|m	Ar=5L
Br	Barometric Pressure Hourly Rate	*n*I|M	Br=-0.12M
Rr	Rainfall Hourly Rate	*n*I|C|M	Rr=0.23C
Sr	Sunshine Hourly Rate	*n*	Sr=-21
g	10-minute Peak Wind Gust	*n*D*n*	g=15D315
A	Alert Conditions	a|w|f	A=f

Units: I=inches, M=millibars or millimeters or miles/hour, F=Fahrenheit, C=Celsius or centimeters, K=knots, L=kilometers/hour, m=meters/sec

Notes:

“«” denotes CR/LF

Optional Extra Sensor Data

	Description	Syntax	Example
xT*i*	Extra Temperature *i*	*n*	XT1=73
xH*i*	Extra Humidity *i*	*n*	XH2=94
xST*i*	Soil Temperature *i*	*n*	XST1=67
xSM*i*	Soil Moisture *i*	*n*	XSM3=54
xLT*i*	Leaf Temperature *i*	*n*	XLT2=58
xLW*i*	Leaf Wetness *i*	*n*	XLW1=14

A.6.3 Five, Hour, Day Statistics

Syntax:

<**five**>*item1;item2;…*</**five**>«
<**hour**>*item1;item2;…*</**hour**>«
<**day**>*item1;item2;…*</**day**>«

Parameter	Description	Syntax	Example
TH,TL,TM	Outdoor Temperature	*n*F|C	TH=12.3F
IH,IL,IM	Indoor Temperature	*n*F|C	IM=23.4C
DH,DL,DM	Dew Point	*n*F|C	DH=12.3F
HH,HL,HM	Humidity	*n*	HM=56.7
WH,WL	Wind Gust and Direction	*n*M|K|L|mD*n*	WH=12.3MD234
AH,AL,AM	Wind Average and Direction	*n*M|K|L|mD*n*	AM=23.4KD345
BH,BL,BM	Barometric Pressure	*n*I|M	BL=29.92I
RH,RL,RM	Daily Rainfall	*n*I|C|M	RM=1.23I
CH,CL,CM	Wind Chill Gust	*n*F|C	CH=-6.7F
cH,cL,cM	Wind Chill Average	*n*F|C	cL=1.2F
XH,XL,XM	Heat Index	*n*F|C	XM=102.7F
SH,SL,SM	Sunshine	*n*	SM=99.9
EH,EL,EM	Evapotranspiration	*n*	EH=0.21
UH,UL,UM	Ultraviolet Index	*n*	UM=6.9

Units: I=inches, M=millibars or millimeters or miles/hour, F=Fahrenheit, C=Celsius or centimeters, K=knots, L=kilometers/hour, m=meters/sec

Notes:

No extremes are calculated for the five-minutes, only the means.

"«" denotes CR/LF.

Optional Extra Sensor Data

Syntax:

<xsensorF>*item1;item2;…*</xsensorF>«
<xsensorH>*item1;item2;…*</xsensorH>«
<xsensorD>*item1;item2;…*</xsensorD>«

Parameter	Description	Syntax	Example
XTH*i*,XTL*i*,XTM*i*	Extra Temperature ***i***	*n*	XTH3=72
XHH*i*,XHL*i*,XHM*i*	Extra Humidity ***i***	*n*	XHM2=89.6
XSTH*i*,XSTL*i*,XSTM*i*	Soil Temperature ***i***	*n*	XSTL1=78
XSMH*i*,XSML*i*,XSMM*i*	Soil Moisture ***i***	*n*	XSMH1=12
XLTH*i*,XLTL*i*,XLTM*i*	Leaf Temperature ***i***	*n*	XLTH2=74
XLWH*i*,XLWL*i*,XLWM*i*	Leaf Wetness ***i***	*n*	XLWM3=9.7

A.6.4 Time

Syntax:

<time>*year/month/day|hour:minute:second*</time>«

A.6.5 Sample Data Capture

```
[WXCONFIG]»Elev=50»UseHum=1»UseSun=0»UseRain=1»UseET=0»UseUV=0»StnID=Taunton 2W (Davis)
(REMOTE)»TZ=EASTERN Units=IIFM»CompType=3»Version=2»Tenths=1»DisplayMsg=Station is using the
Davis Vantage Pro2»Battery=1 is low»XT1=North Field Temp»«
<current>T=24.2F;I=71.2F;D=20.6F;H=86;W=0.0MD58;w=0.0MD58;B=30271I;R=10I;r=0I;C=24.2F;c=24.2F;
X=24F;S=0;E=0.0;U=0.0;Tr=0;Ir=1;Dr=0;Hr=1;Ar=0;Br=-2;Rr=0;Sr=0;G=0;g=1;A=a;A=w;A=f;
xT1=31</current>«
<five>TH=0.0;TL=0.0;IH=0.0;IL=0.0;DH=0.0;DL=0.0;HH=0;HL=0;WH=0.0D0;WL=0.0D0;AH=0D0;AL=0D0;
BH=0.000;BL=0.000;RH=0.00;RL=0.00;CH=0.0;CL=0.0;cH=0.0;cL=0.0;XH=0;XL=0;SH=0;SL=0;EH=0;EL=0;
UH=0;UL=0;G5=0;TM=23.0;IM=67.0;DM=17.7;HM=81.7;WM=0.9D162.5;BM=30.324;RM=0.00;CM=23.4;cM=21.7;
XM=23.0;SM=0.0;EM=0.0;UM=0.0;</five>«
<xsensorF>XT1H=33;XT1L=31;XT1M=32.5;</xsensorF>«
<hour>TH=25.0;TL=24.2;IH=71.2;IL=69.9;DH=21.4;DL=20.6;HH=86;HL=85;WH=1.0D58;WL=0.0D58;AH=0D57;
AL=0D58;BH=30.279;BL=30.271;RH=0.00;RL=0.00;CH=25.0;CL=24.2;cH=25.0;cL=24.2;XH=25;XL=24;SH=0;
SL=0;EH=0;EL=0;UH=0;UL=0;G5=1;TM=24.7;IM=70.4;DM=20.9;HM=85.4;WM=0.0D58.0;BM=30.277;RM=0.00;
CM=24.7;cM=24.7;XM=24.2; SM=0.0;EM=0.0;UM=0.0;</hour>«
<xsensorH>XT1H=33;XT1L=31;XT1M=32.5;</xsensorH>«
<day>TH=43.8;TL=24.2;IH=72.6;IL=67.2;DH=29.1;DL=18.7;HH=87;HL=37;WH=30.0D351;WL=0.0D243;
AH=21D313;AL=0D251;BH=30.279;BL=29.697;RH=0.02;RL=0.00;CH=43.6;CL=21.9;cH=41.6;cL=23.5;XH=43;
XL=24;SH=0;SL=0;EH=0;EL=0;UH=0;UL=0;G5=28;TM=35.9;IM=70.0;DM=23.5;HM=61.7;WM=6.2D291.6;
BM=30.002;RM=0.10;CM=31.8;cM=31.6;XM=35.4;SM=0.0;EM=0.0;UM=0.0;</day>«
<xsensorD>XT1H=33;XT1L=31;XT1M=32.5;</xsensorD>«
<time>2012/01/22|21:19:13</time>«
PAUSE
<current>T=24.3F;</current>«
<time>2012/01/22|21:19:14</time>«
PAUSE
<current>T=24.2F;W=1.0MD216;</current>«
<hour>TH=24.9;</hour>«
<time>2012/01/22|21:19:15</time>«
PAUSE
```

Notes:

“»” denotes the tab character.

“«” denotes CR/LF.

PAUSE denotes a break in data in flow.

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