

WxSolution

Software Reference Manual



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Table of Contents

Introduction	6
1. Installation	7
1.1 System Requirements	7
1.2 Installing WxSolution.....	8
1.2.1 Internet Download File	8
1.2.2 CD-ROM Installation.....	8
1.2.3 Initial Configuration.....	8
2. Configuration.....	9
2.1 Weather Computer	10
2.1.1 Custom Settings for the ID-4001	12
2.1.2 Extra Sensors.....	13
2.1.3 Extra Sensors Labels.....	14
2.2 Station Information	15
2.3 Fonts.....	16
2.4 Send Mail	17
2.5 FTP Reports.....	19
2.5.1 Additional Files.....	20
2.5.2 Edit FTP Files	21
2.6 Server Setup	22
2.7 APRSWxNet	23
2.8 Weather Underground	24
2.9 Weather For You	25
2.10 Anything Weather	26
2.11 METAR	27
2.12 Print Margins	29
2.13 Screen Configuration.....	30
2.14 Degree Days	31
2.15 Graphics Options	32
2.16 Miscellaneous Configuration Items	33
2.17 File Location	34
2.18 Pager Setup	35
2.18.1 Parameter Setup	35
2.18.2 Dialing Info	36
2.19 Calibration Settings	37
3. Menu and Function Reference	38
3.1 File	38
3.2 Edit.....	39
3.3 View	39
3.4 Data.....	39
3.5 Reports.....	40
3.6 Tools.....	41
3.7 Help.....	42

4. Using WxSolution Software	43
4.1 Monitor Screen	43
4.2 Detail Screen	45
4.3 Extra Sensors Screen	46
4.4 Graph Screen.....	47
4.5 Edit Forms	48
4.6 Viewing Past Hourly Data.....	49
4.7 Edit Hourly Data	51
4.8 Edit External Data	53
4.9 Edit Weather Computer Memory Data	54
4.10 Edit Hourly Observation Data	55
4.11 Edit Monthly LCD Data	56
4.12 Edit Annual LCD Data	57
4.13 Edit Strip Chart Data	59
4.14 Edit Normals and Records	60
4.15 Edit Extra Sensors Data	61
4.16 Edit Daily Notes.....	62
4.17 Creating LCD Reports.....	63
4.17.1 Daily Summary	64
4.17.2 Monthly Summary	64
4.17.3 Annual Summary	65
4.17.4 Report Format	66
4.18 Annual Report Setup	67
4.19 LCD Records Report.....	68
4.20 Calculating User-Defined Summations.....	70
4.21 Wind Rose Report	72
4.22 Strip Chart Report	73
4.23 Exporting Data.....	74
4.23.1 Export File Formats	76
4.23.1.1 Hourly Means and Extremes	76
4.23.1.2 Daily Weather Computer Data	76
4.23.1.3 Hourly Observations	77
4.23.1.4 External Data.....	77
4.23.1.5 LCD Monthly Data.....	77
4.23.1.6 LCD Annual Data.....	77
4.23.1.7 Extra Sensors Data	77
4.23.1.8 Normals and Records Data.....	78
4.23.1.9 Precipitation Data.....	78
4.24 Exporting Strip Chart Data.....	79
4.25 Import Data	80
4.25.1 Hourly/Daily Data.....	80
4.25.2 Memory Data	80
4.25.3 Observation Data.....	80
4.25.4 External Data.....	81
4.25.5 LCD Monthly Data	81
4.25.6 LCD Annual Data	81
4.25.7 Strip Chart Data	81
4.25.8 Archive Data	81
4.25.9 Extra Sensors Data	81
4.25.10 Normals and Records Data.....	81
4.26 Import WeatherLink Database	82
4.27 Import Weather Display Database.....	83
4.28 Import L'Weather Log.....	84
4.29 Download Archive.....	85

4.29.1 Saved File Format	86
4.30 Send File via FTP	87
5. Reference	88
5.1 Sample Data Files	88
5.2 Contact Information	88
5.3 Tag Reference	89
Current HTML Tag Reference	89
Current Conditions WML File Reference	104
Observations HTML File Reference	105
Appendix	106
A.1 Glossary	106
Instantaneous Rainfall Rate	106
Resultant Wind	106
A.2 Pager Format	106
A.3 Advanced Features	107
A.3.1 Running more than one copy of WxSolution Simultaneously	107
A.3.2 Sunshine Sensor for the Heathkit ID-5001	108
A.4 Special Installation Instructions	108
A.5 Data File Formats	109
A.5.1 Hourly Data	109
A.5.2 Daily Weather Computer Data	110
A.5.3 Extra Data	111
A.5.4 Observation Data	111
A.5.5 Precipitation Time	112
A.5.6 Extra Sensor Data	112
A.5.7 Normals and Records Data	113
A.6 WxServer Protocol Reference	115
A.6.1 Configuration Record	115
A.6.2 Current Data Values	116
A.6.3 Five, Hour, Day Statistics	117
A.6.4 Time	118
A.6.5 Sample Data Capture	118

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. Additionally, remote access to WxSolution is provided through a modem attached to the PC. 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.

To run WxSolution software you will need:

- Windows® 98/ME/2000/XP/Vista/7 with the latest service packs installed
- Microsoft® Internet Explorer® 6.0 or higher
- Microsoft Outlook® 2000 or Outlook Express® 6.0 or higher, or Windows (Live) Mail for email
- 10 MB hard disk space + approximately 5 MB per month of usage
- One serial port and cable connected to the weather computer
- WeatherLink® interface module required for all Davis systems
- Printer (recommended)
- Network connection (required for FTP, WxServer, and Internet data servers)

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

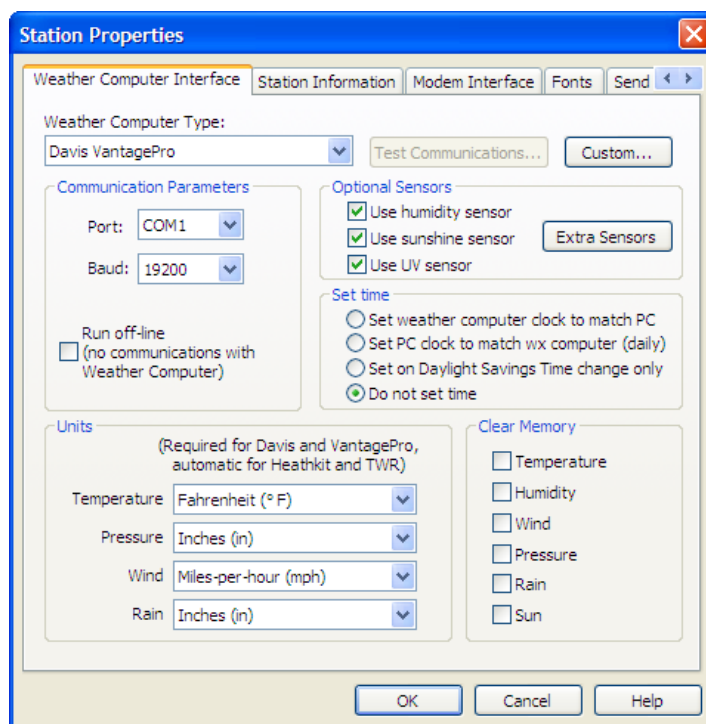
The first time WxSolution runs, the configuration screens in this section will be presented. You can also configure these parameters at any future time by selecting **File**→**Properties**→**Station Setup**.

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.



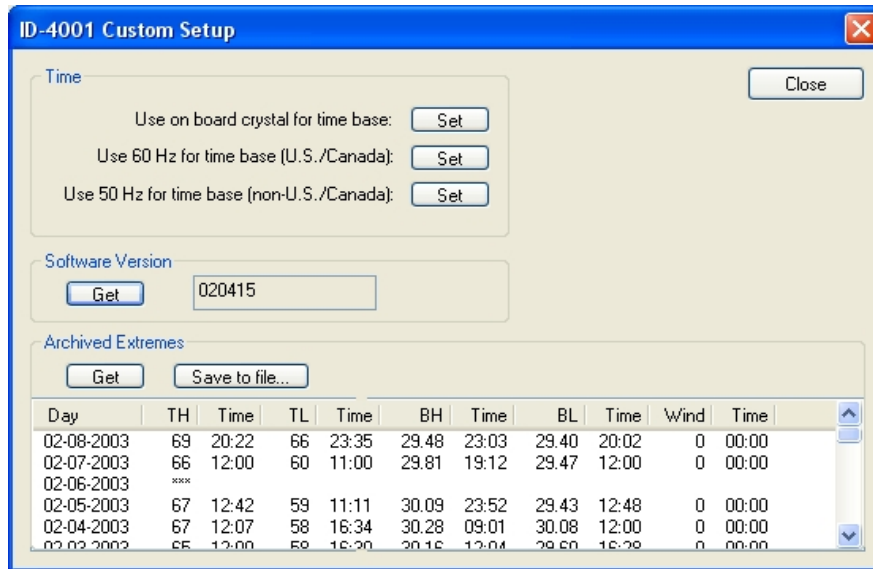
Changing the weather computer type, communications port or speed requires you to restart WxSolution before the changes take effect.

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 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 WM2: 2400 Davis Vantage Pro: 19200 Texas Weather Report: 19200 Ultimeter: 2400 WMR-968: 9600
Run Offline	When checked, WxSolution will not communicate with the weather computer.

Set Time	<p>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.</p> <ul style="list-style-type: none"> ☞ The Davis WM2 cannot automatically adjust for Daylight Savings 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 use seconds when setting or getting time. Time sets will be performed using the current minutes and 00 seconds. For the most accurate clock reading, set the time at the beginning of the minute. ☞ 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. (Currently only defined for the ID-4001).
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

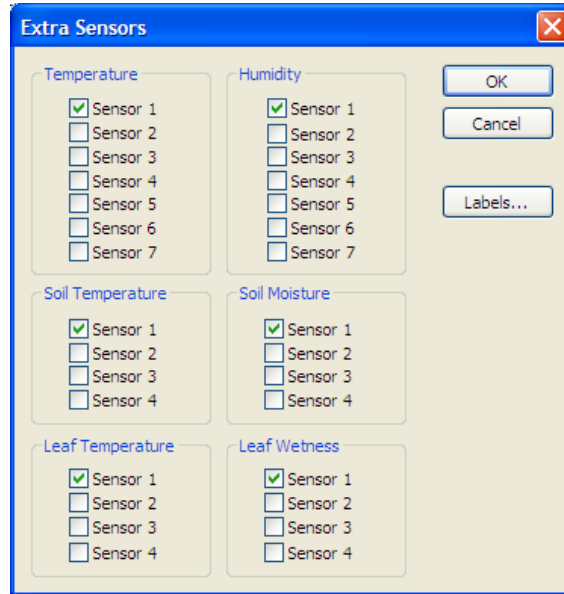
This feature allows you access and configure settings unique to the ID-4001.



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 Extra Sensors

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



Texas Weather Report

Temperature – Sensor 1	The auxiliary temperature sensor.
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Davis Vantage Pro

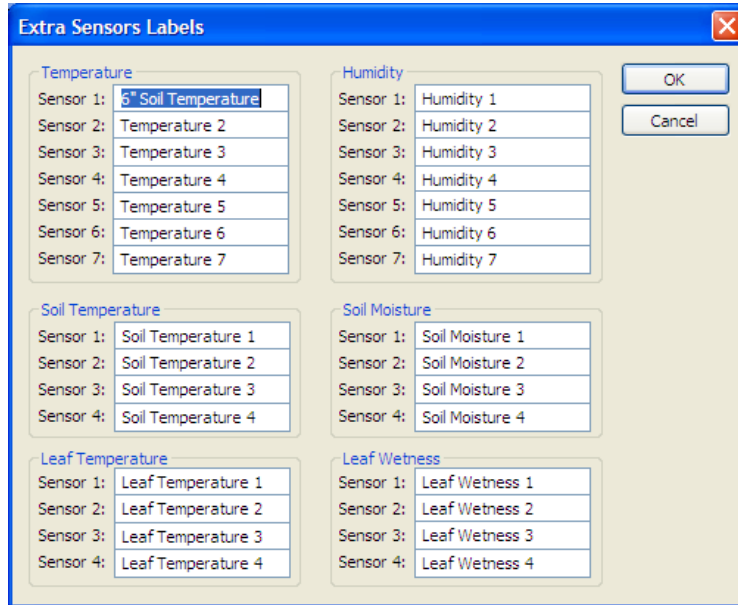
Temperature	Select sensor 1 - 7 in ascending order.
Humidity	Select sensor 1 - 7 in ascending order.
Soil Temperature	Select sensor 1 - 4 in ascending order.
Soil Moisture	Select sensor 1 - 4 in ascending order.
Leaf Temperature	Select sensor 1 - 4 in ascending order.
Leaf Wetness	Select sensor 1 - 4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

Notes:

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

2.1.3 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.
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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

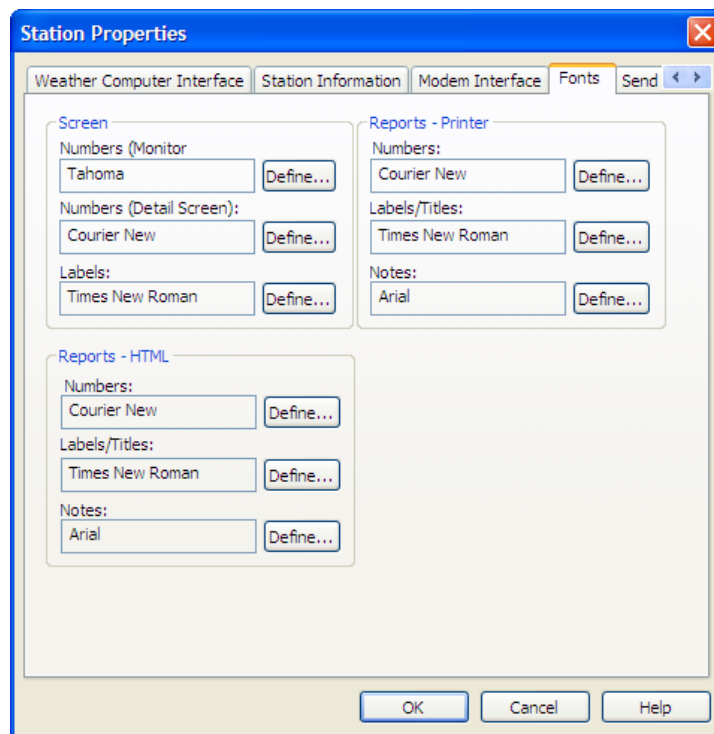
The Station Information screen prompts you for information about your station that will appear on the screen, on printed reports, and on remote access. You can also change this information at any future time.

The screenshot shows the 'Station Properties' dialog box with the 'Station Information' tab selected. The 'Name' field is filled with 'Taunton 2W - Davis VP'. Under the 'Location' section, the 'Latitude' is set to 41 degrees, 53 minutes, and 56 seconds North. The 'Longitude' is set to 71 degrees, 8 minutes, and 19 seconds West. The 'Elevation' is set to 50 feet. The 'Time Zone' is set to 'Eastern'. At the bottom of the dialog are 'OK', 'Cancel', and 'Help' buttons.

Name	The name you wish to assign 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 above sea level.
Time Zone	Enter the name of your time zone (WxSolution will retrieve the time zone name from Windows) but you may change the name.

2.3 Fonts

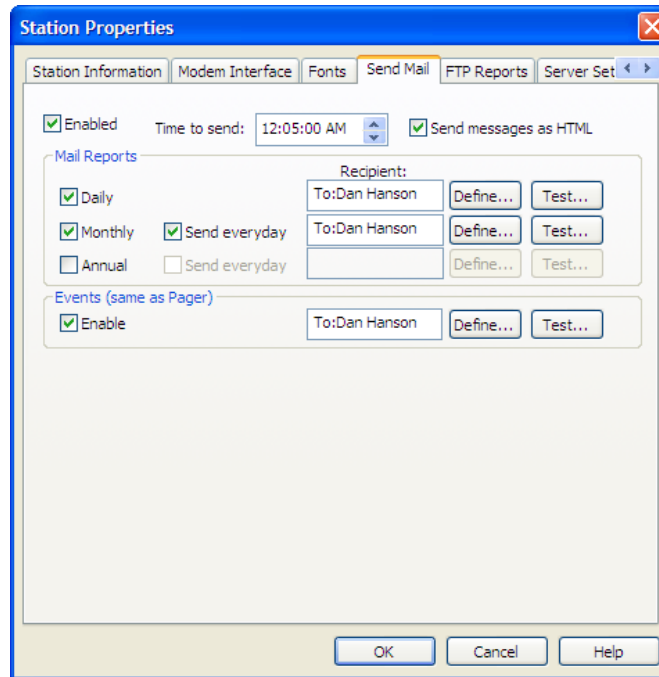
The Fonts screen allows you to customize the fonts that are used on the display and on the printed reports. Click the **Define** button beside each item to choose a different font. You can also select bold and italics attributes. Selecting a font size has no effect.



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 Outlook or Outlook Express 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.
- Must have a connection to the Internet.
- Must have contacts defined in the address book to send mail.
- For Outlook Express (OE) 6 users, you must configure OE 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.

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 2000 will be sent at 12:05:00 AM on January 1, 2001.
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, which is a text version of the numeric pager string. The configuration of the pager events is performed on the Pager configuration screen. You do not need to enter a phone number (unless you are also using a telephone-based pager).

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:

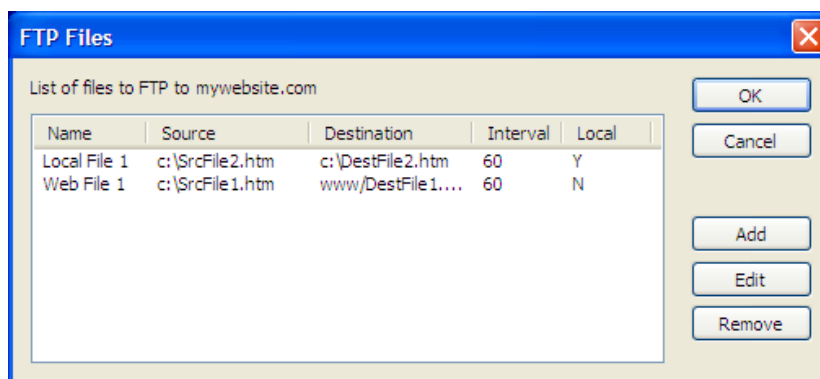
- Must have a connection to the Internet.
- Must have a user account on an FTP server.
- Refer to your ISP (Internet Service Provider) for instructions on how to FTP to your web site.

URL	Enter the URL to your FTP/web site. For example, ftp.mywebsite.com .
User name	Enter the user name that has permission to upload files to your web site. For example, myname .
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 (5, 10, 15, 30, or 60 minutes). Finally enter the destination file name to which to copy the file, for example, www/Current.html . Press Help to view the reference for customizing the Current report.

Current WML	Check Current WML to enable/disable sending the current conditions in WML format. Select the time interval for sending (5, 10, 15, 30, or 60 minutes). Finally enter the destination file name to which to copy the file, for example, www/Current.wml . WML for is an unformatted text file used for displaying text in devices such as web-enabled wireless phones and PDAs. 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, www/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, www/Month.html .
Monthly	Check Annual to enable/disable sending the current annual report. Enter the destination file name to which to copy the file, for example, www/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. Enter the destination file name to which to copy the file, for example, www/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, www/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.

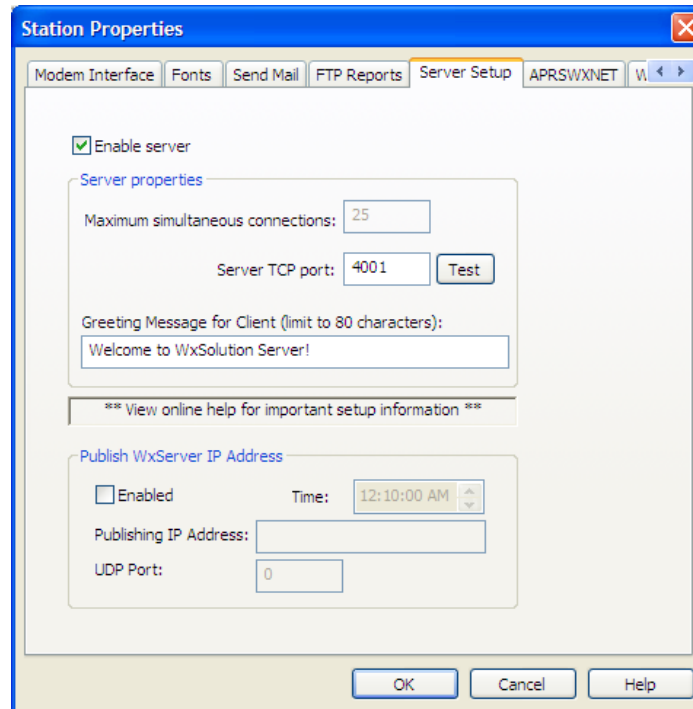
2.5.2 Edit FTP Files

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. <i>This item is currently not configurable.</i>
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, verify that the TCP port will not be blocked. If using a cable/DSL router, enable Port Forwarding in the 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 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 a broadband connection to the Internet.
- Must have an APRSWxNet account.

Enable	Check to enable/disable sending APRSWxNet data
ID Number	Enter your CW number (including CW) or radio identifier
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.

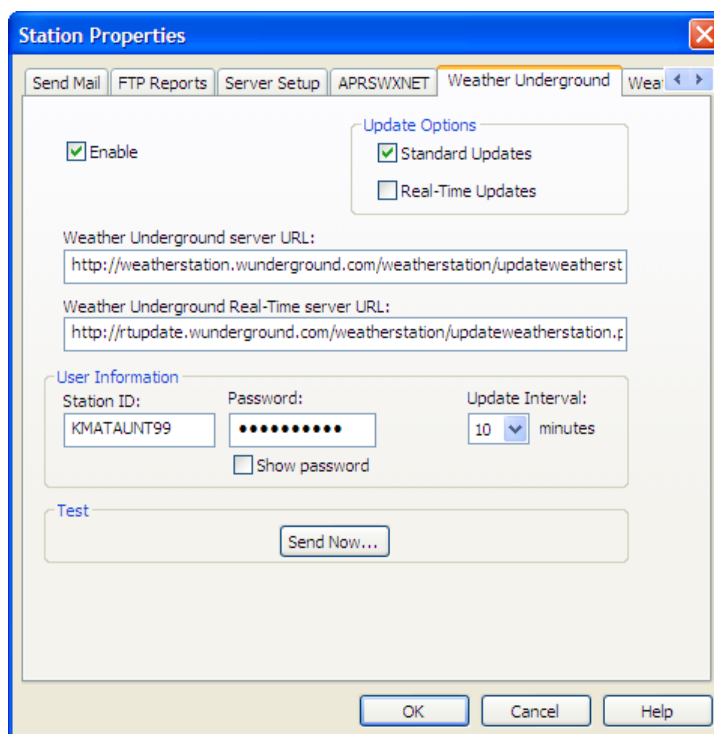
Only modify the addresses and ports of the APRSWxNet servers if you know that they have changed.

2.8 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 broadband connection to the Internet.
- 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, e.g., KMATAUNT99 .
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).

2.9 Weather For You

Weather For You (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 broadband connection to the Internet.
- 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, e.g., Taunton2W .
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 Anything Weather

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

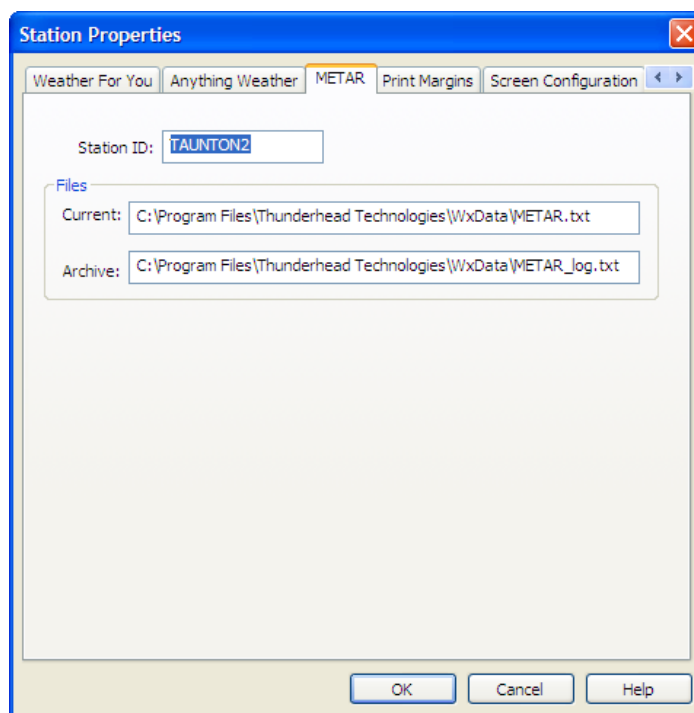
Prerequisites:

- * Must have a broadband connection to the Internet.
- * 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, e.g., MYSTATION .
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 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:

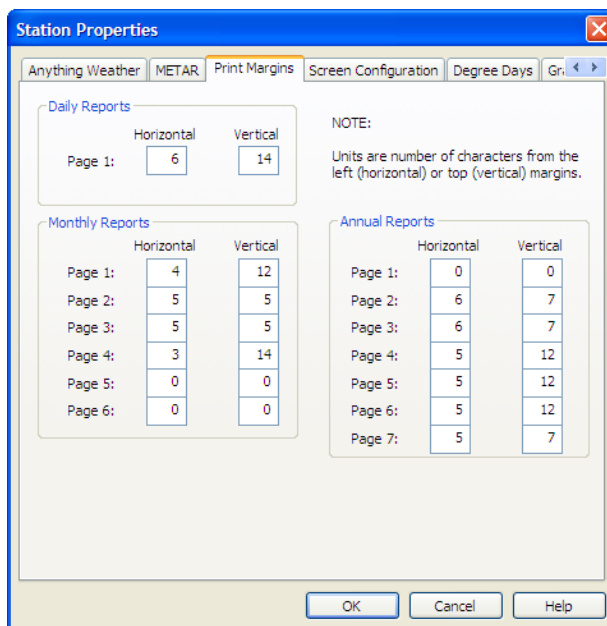
```
METAR TAUNTON2 280000Z AUTO 17002G06KT -RA 03/M02 A3018 RMK AO1 PK WND
01012/17 P0010 SLP220 T00321015 10104 21032 400411039 57004 60010
```

TAUNTON2	Station identifier
280000Z	28 th 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 in 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.

2.12 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

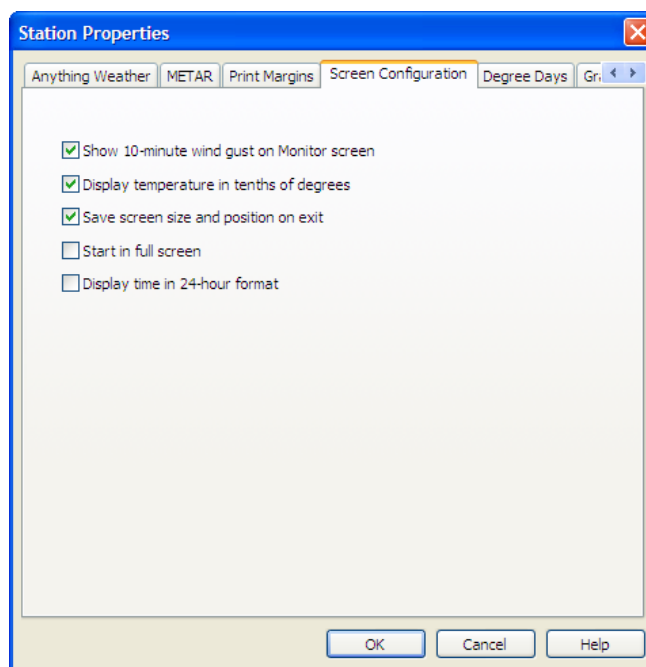
	Horizontal	Vertical
Page 1	4	12
Page 2	5	5
Page 3	5	5
Page 4	3	14
Page 5	0	0
Page 6	0	0

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

2.13 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	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). 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.

* Requires WxSolution to be restarted before change takes effect.

2.14 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.

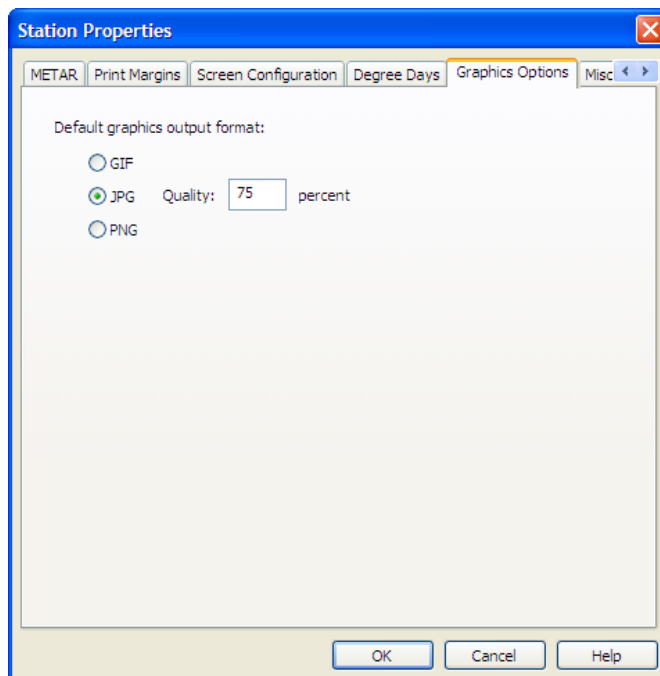
The screenshot shows the 'Station Properties' dialog box with the 'Degree Days' tab selected. It contains two sections: 'Heating' and 'Cooling'. In the 'Heating' section, the 'Base °F' is set to 55 and the 'Label' is 'Heating Degree Days'. In the 'Cooling' section, the 'Base °F' is set to 65 and the 'Label' is 'Cooling Degree Days'. The dialog has 'OK', 'Cancel', and 'Help' buttons at the bottom.

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".

2.15 Graphics Options

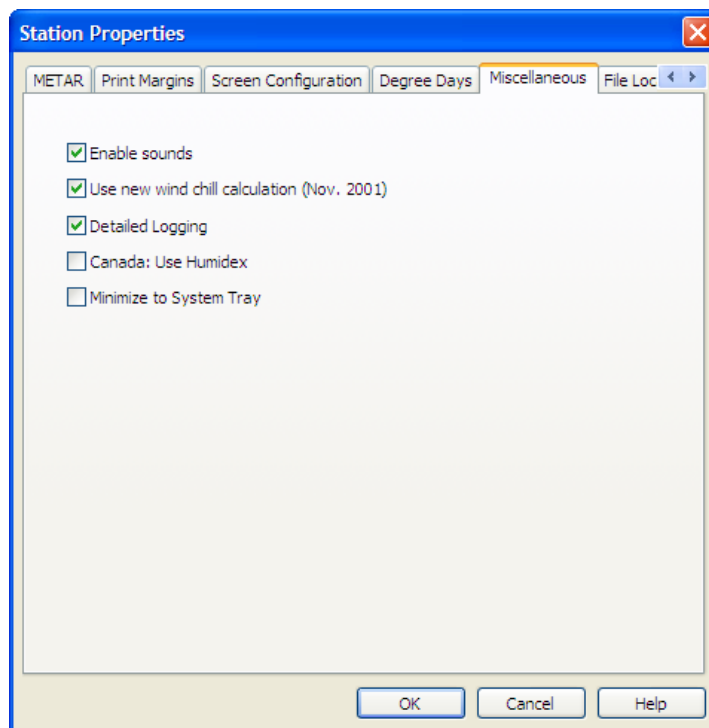
Configures the graphics file output option. This setting determines the format of the output file for the strip chart, windrose, and generate report items.

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.



2.16 Miscellaneous Configuration Items

The Miscellaneous screen contains several configuration items.



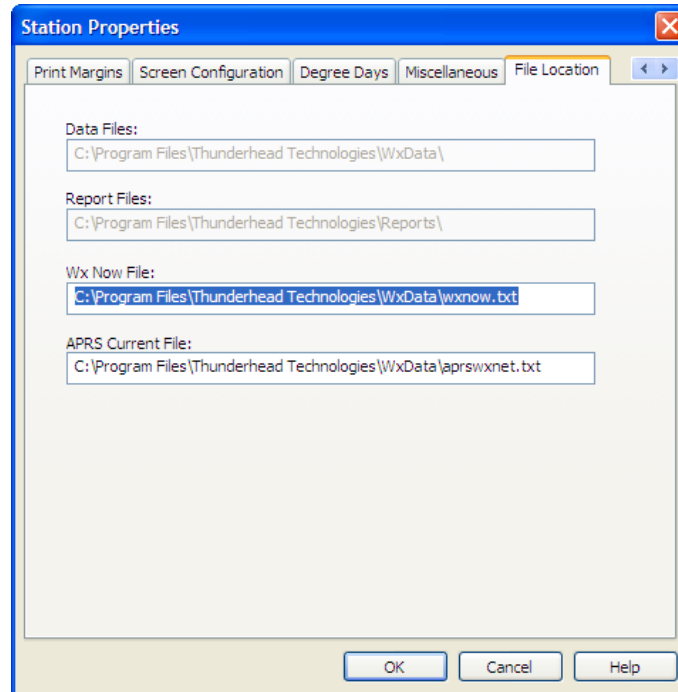
Enable sounds	Enables the playing of sounds for certain events: <ul style="list-style-type: none"> ▪ Modem ringing, log on, and log off. ▪ Server connection and disconnect. ▪ Weather computer communications errors. Default = unchecked.
Use new wind chill calculation	If checked, WxSolution displays the new (Nov. 2001) National Weather Service standard wind calculation. Unchecked, the wind chill calculated by the weather computer is displayed. Default = checked.
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.
Minimize to System Tray	If checked, WxSolution will minimize to the Windows System Tray and the WxSolution button will be removed from the Task Bar. To restore WxSolution once minimized, right-click the icon and select Restore. Default = unchecked.

* Requires WxSolution to be restarted before change takes effect.

2.17 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:

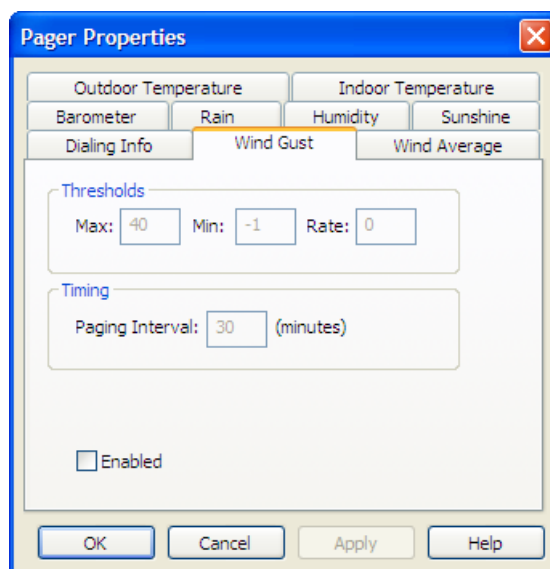
1. Shutdown WxSolution.
2. Use the Windows Registry editor, **regedit**, to change the entries DataPath and/or ReportPath under HKEY_LOCAL_MACHINE\SOFTWARE\Thunderhead Technologies\WxSolution in the registry.
3. Move all files from the old directory to the new directory.
4. Restart WxSolution.

2.18 Pager Setup

The Pager Properties set of screens will configure the pager feature of WxSolution. The modem must be enabled and configured to use the pager feature to send pages via the telephone. 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.

2.18.1 Parameter Setup

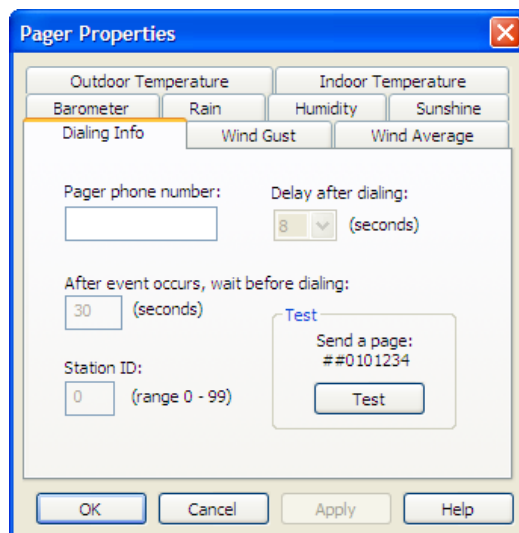
The values entered will determine if, when, and how often WxSolution pages you for each of the defined parameters. This screen is identical for each of the eight weather parameters.



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 <u>absolute</u> 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.

2.18.2 Dialing Info

The Dialing Information screen configures the phone number to dial for your pager and several dialing property parameters.



Pager phone number	The phone number WxSolution dials to reach your pager. You may include hyphens (-) in the number. You must specify a phone number to enable the pager feature via telephone. Be sure to include any special access codes such as 9 , to get an outside line.
Delay after dialing	All pagers require several seconds for arbitrary differences in the number of rings it takes the service to answer and other unpredictable delays in the phone system. You will need to experiment by manually dialing the pager several times and measuring the times required before entering the page digits. Default = 8 seconds.
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 sent, rather than just the first value to exceed the threshold. Default is 30 seconds.
Station ID	The first two (2) digits of the page. It indicates which station this is, in case you have several stations configured. See page format.

2.19 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.

	Slope (%)	Offset (±)
Temperature	100	0.0
Humidity	100	0
Pressure	100	0.00
Wind	100	0
Wind Direction		0
Rain	100	0.00
Sun	100	0

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 PC Time

Sets this computer's clock to match the clock on the weather computer. (If you are running Windows NT/2000/XP/Vista, the user account must have permission to set the computer's time.) WxSolution automatically synchronizes the clocks at startup and daily at 3:30AM if configured.

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 and modem 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 Forms

Edits the customizable HTML forms – **Current.html**, **Current.wml**, and **Observations.html** in the ...\\WxSolution\\Forms\\HTML folder.

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 E-15 LCD Report data.

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.

Import L'Weather Log

Imports L'Weather database export log.

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 the current day.

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.

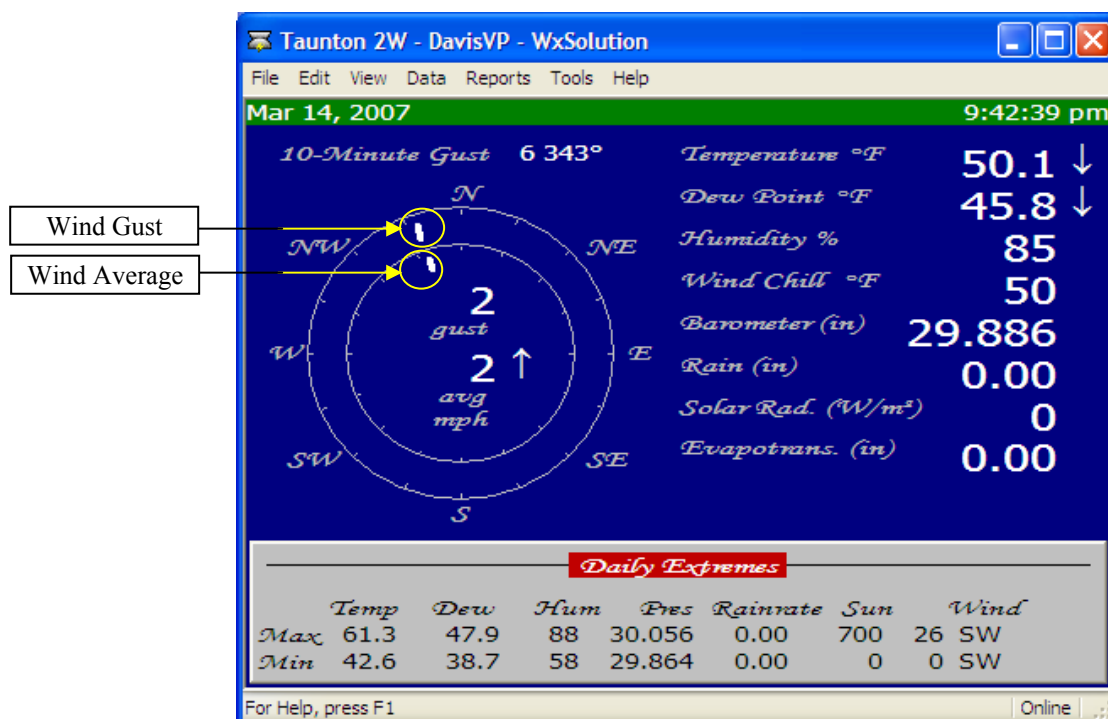
Register

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 the current day.

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”.

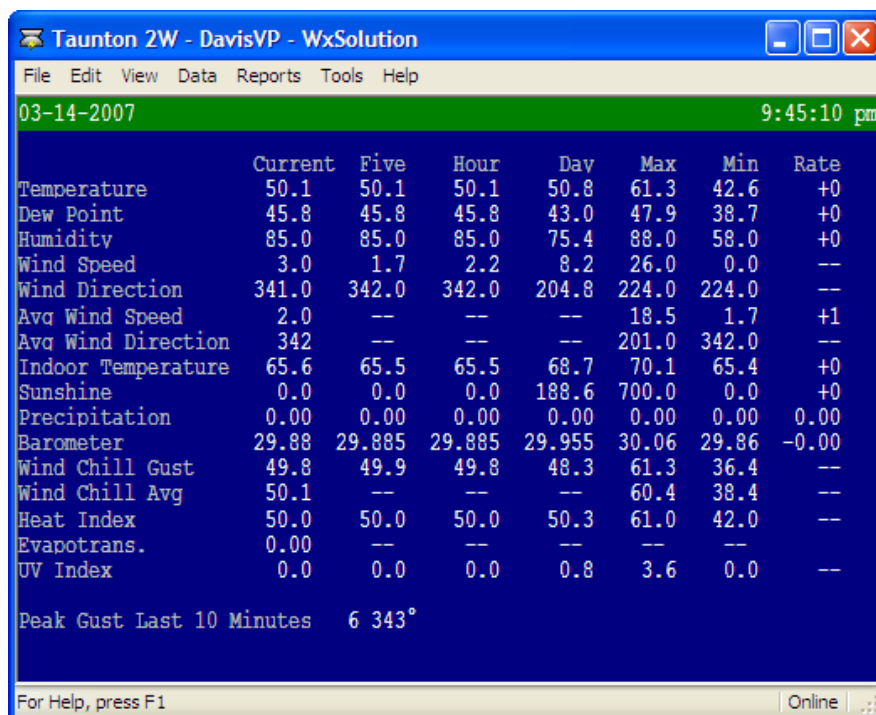
Server *n*

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	50.1	50.1	50.1	50.8	61.3	42.6	+0
Dew Point	45.8	45.8	45.8	43.0	47.9	38.7	+0
Humidity	85.0	85.0	85.0	75.4	88.0	58.0	+0
Wind Speed	3.0	1.7	2.2	8.2	26.0	0.0	--
Wind Direction	341.0	342.0	342.0	204.8	224.0	224.0	--
Avg Wind Speed	2.0	--	--	--	18.5	1.7	+1
Avg Wind Direction	342	--	--	--	201.0	342.0	--
Indoor Temperature	65.6	65.5	65.5	68.7	70.1	65.4	+0
Sunshine	0.0	0.0	0.0	188.6	700.0	0.0	+0
Precipitation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barometer	29.88	29.885	29.885	29.955	30.06	29.86	-0.00
Wind Chill Gust	49.8	49.9	49.8	48.3	61.3	36.4	--
Wind Chill Avg	50.1	--	--	--	60.4	38.4	--
Heat Index	50.0	50.0	50.0	50.3	61.0	42.0	--
Evapotrans.	0.00	--	--	--	--	--	--
UV Index	0.0	0.0	0.0	0.8	3.6	0.0	--
Peak Gust Last 10 Minutes	6 343°						

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	Five	Hour	Day	Max	Min	Rate
6" Soil Temperature	0	--	0.0	0.0	0	0	+0
Temperature 2	0	--	0.0	0.0	0	0	+0
Temperature 3	0	--	0.0	0.0	0	0	+0
Temperature 4	0	--	0.0	0.0	0	0	+0
Humidity 1	0	--	0.0	0.0	0	0	+0
Humidity 2	0	--	0.0	0.0	0	0	+0
Leaf Wetness 1	0	--	0.0	0.0	0	0	+0
Leaf Temperature 1	0	--	0.0	0.0	0	0	+0
Soil Moisture 1	0	--	0.0	0.0	0	0	+0
Soil Temperature 1	0	--	0.0	0.0	0	0	+0

For Help, press F1

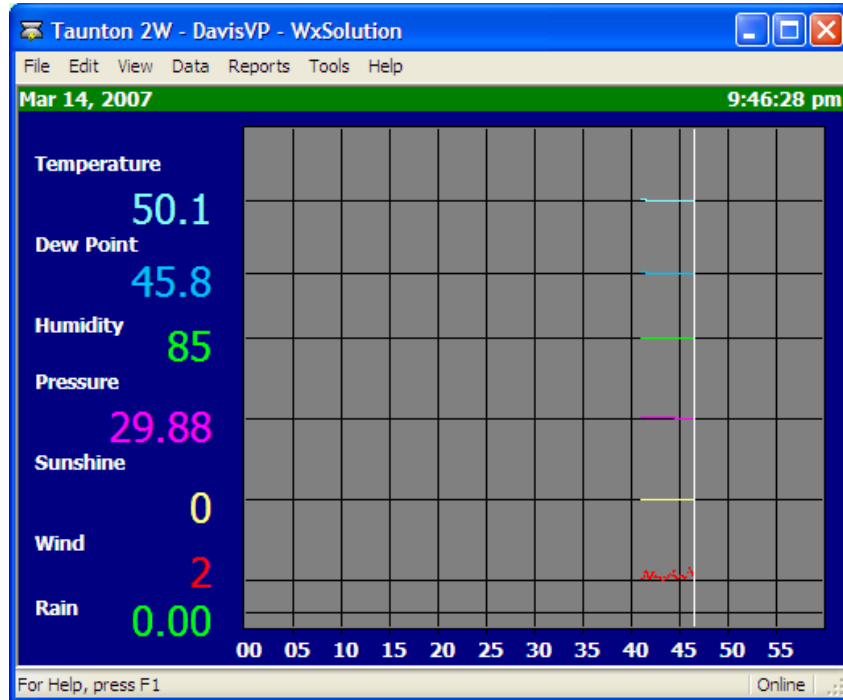
Offline

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.

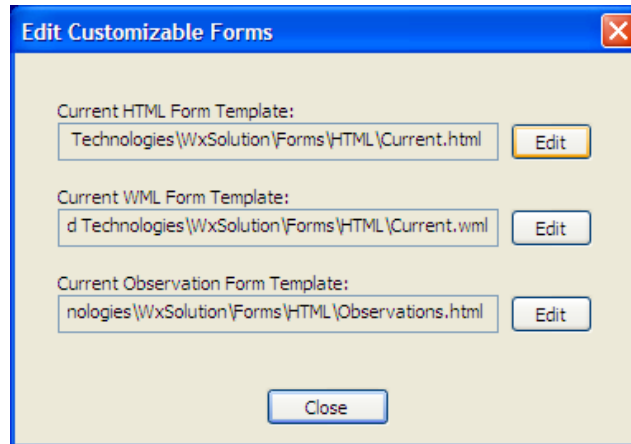
4.4 Graph Screen



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 Forms

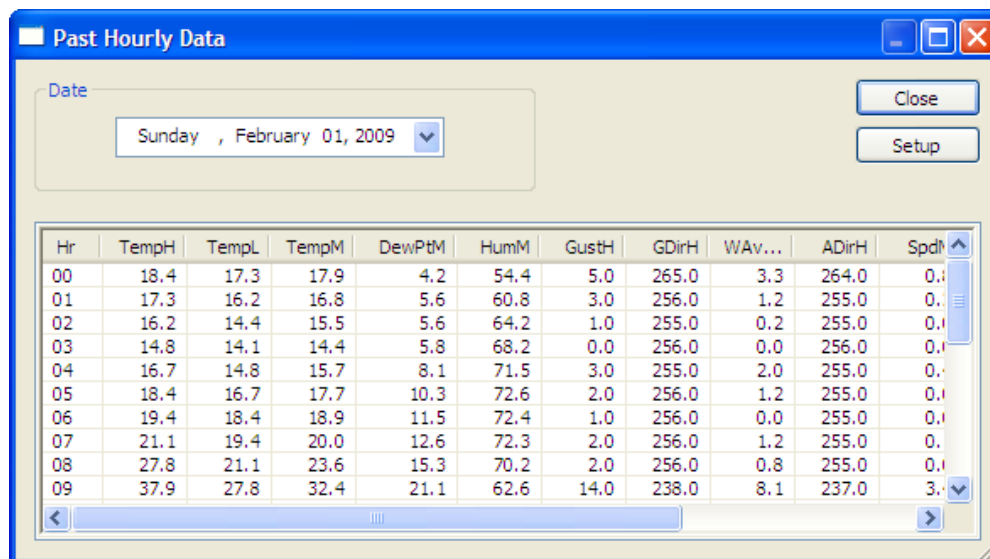
Use this screen to edit customizable forms. Pressing **Edit** will launch the default HTML editor.



Current HTML Form Template	Edit Current.html
Current WML Form Template	Edit Current.wml
Current Observation Form Template	Edit Observations.html

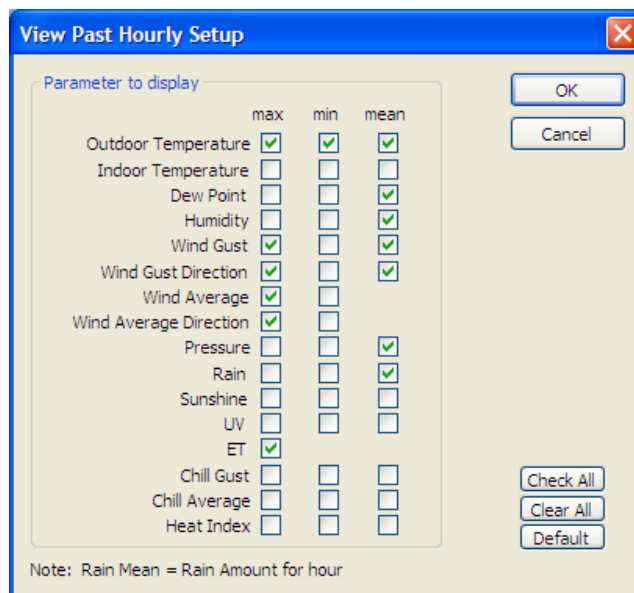
4.6 Viewing Past Hourly Data

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.



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.

	Max	Min	Mean
Temperature:	49.9	49.6	49.683
Dew Point:	44.653	44.209	44.333
Humidity:	83	81	81.740
Barometer:	29.872	29.864	29.868
Rain:	0.00	0.00	0.00
Sunshine (solar):	0	0	0
UV:	0	0	0
Evapotranspiration:	0.115	0.115	0.115
Wind Chill Gust:	49.8	42.714	46.135
Wind Chill Average:	47.779	44.039	45.962
Heat Index:	49	49	49

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

Notes:

- Hour 24 is the daily summary record. Values represent means and extremes for the entire day.
- 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.
- If no data exists for the hour, **** INVALID RECORD **** appears in the date/hour position above the Record Information field.
- To permanently delete a record, select **Delete**.
- 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.
- 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.

Edit Hourly Data - Times [Close]

February 1, 2009 14:00-14:59
Times in mm:ss

	Max	Min
Temperature:	55:27	08:39
Dew Point:	37:41	20:55
Humidity:	06:23	00:00
Barometer:	51:59	00:00
Rain:	00:00	00:00
Sunshine (solar):	00:00	59:31
UV:	00:00	57:59
Evapotranspiration:	00:57	00:00
Wind Chill Gust:	48:09	09:51
Wind Chill Average:	55:39	19:15
Heat Index:	00:00	03:11

Wind Gust

Max: 26:43
Min: 39:11

Wind Two-Minute Avg

Max: 19:15
Min: 03:25

Edit Hourly Data - Times [Close]

February 1, 2009 Summary
Times in hh:mm:ss

	Max	Min
Temperature:	14:55:27	03:16:13
Dew Point:	12:29:35	00:22:05
Humidity:	23:46:22	13:33:05
Barometer:	00:09:57	13:58:59
Rain:	00:00:00	00:00:00
Sunshine (solar):	10:18:31	00:00:00
UV:	11:22:45	00:00:00
Evapotranspiration:	20:00:58	01:00:00
Wind Chill Gust:	14:48:09	04:22:26
Wind Chill Average:	15:48:33	04:25:20
Heat Index:	13:57:53	02:44:57

Wind Gust

Max: 10:05:15
Min: 00:11:51

Wind Two-Minute Avg

Max: 10:05:41
Min: 00:16:19

Notes:

1. 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 .

4.9 Edit Weather Computer Memory 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.

Daily Weather Computer Data

Date: Sunday, February 01, 2009

Wind Gust			Wind One-Minute Average			Sunshine	
Max:	Direction	Time	Max:	Direction	Time	Max:	Time
29	0	10:04:00	0	0	00:00:00	566	10:17:00
Min:	Direction	Time	Min:	Direction	Time	Min:	Time
0	0	00:00:00	0	0	00:00:00	0	00:00:00

Temperature		Humidity		Barometer		Precipitation
Max:	Time	Max:	Time	Max:	Time	Total:
47.9	14:54:00	84	23:45:00	30.031	00:09:00	0.00
Min:	Time	Min:	Time	Min:	Time	
14.1	03:15:00	41	13:32:00	29.784	13:58:00	

Disabled fields are not provided by the weather computer.

February 1, 2009

Save and Exit Exit without Save

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 will be 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 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, precipitation in hundredths (0.01).
Season-to-date snow	Since July 1, snowfall in tenths (0.1).
Season-to-date heating degree days	Since July 1, heating degree days (base 65°F).
Season-to-date cooling degree days	Since January 1, cooling degrees-days (base 65°F).
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.

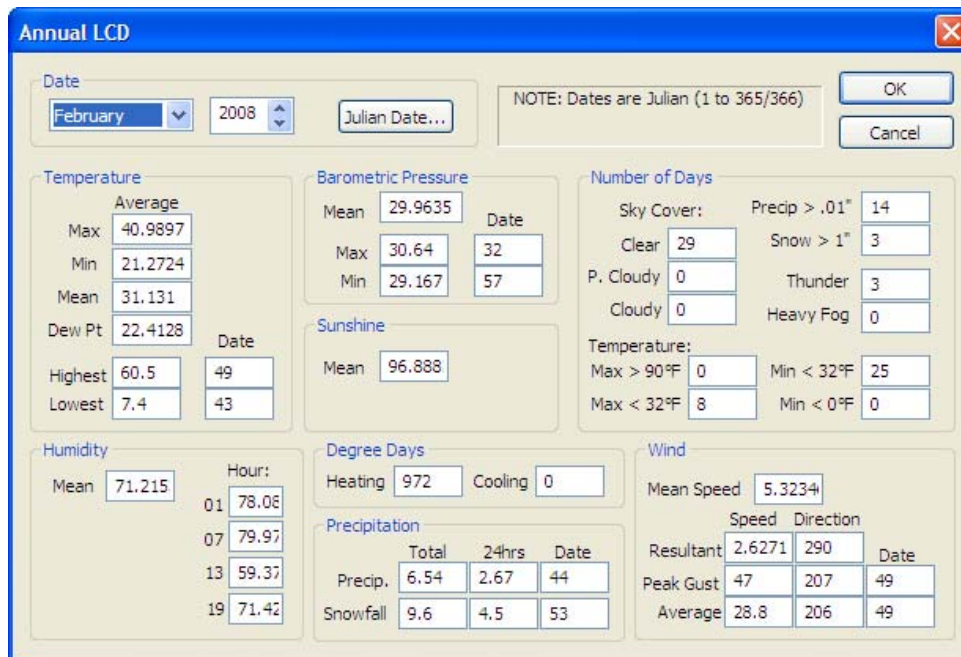
To calculate degree days, add the high and low temperatures in °F and divide by two. Round up the result to the nearest whole degree. If the result is greater than 65, subtract 65 from the result – these are cooling degree days. If the result is less than 65, subtract the result from 65 – these are heating 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:

- High = 80, low = 67. $(80+67) \div 2 = 73.5$. 73.5 rounds up to 74. Since 74 is greater than 65, $74-65 = 9$ cooling degree days.
- High = 45, low = 26. $(45+26) \div 2 = 35.5$. 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
Precip – 24 hrs/Date	Greatest 24-hour precipitation for the month and start date
Snowfall – total	Total snowfall for the month
Snowfall – 24 hrs/Date	Greatest one day snowfall for the month and start date

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

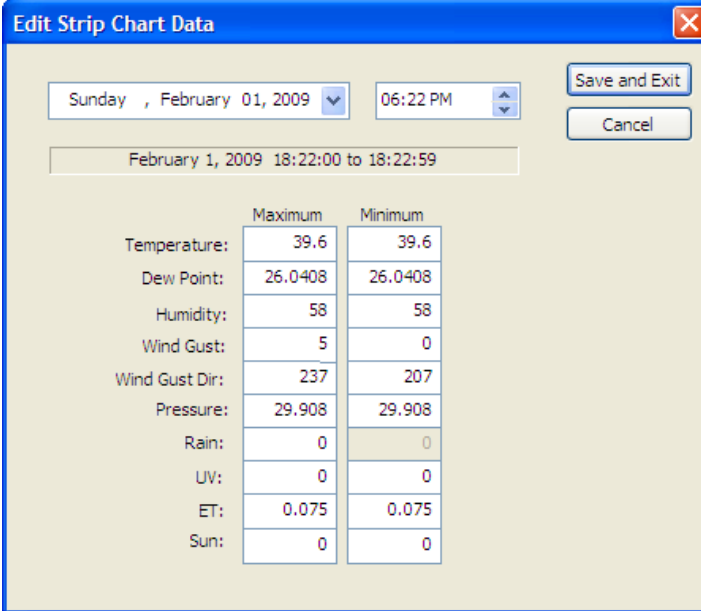
Temperature

Max \geq 90°F	Days with high temperature greater than or equal to 90°F
Max \leq 32°F	Days with high temperature less than or equal to 32°F
Min \leq 32°F	Days with low temperature less than or equal to 32°F
Min \leq 0°F	Days with low temperature less than or equal to 0°F
Precip \geq .01”	Days with precipitation greater than or equal to 0.01 inch
Snow \geq 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, 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. You can copy and paste this value into the appropriate date field.

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.

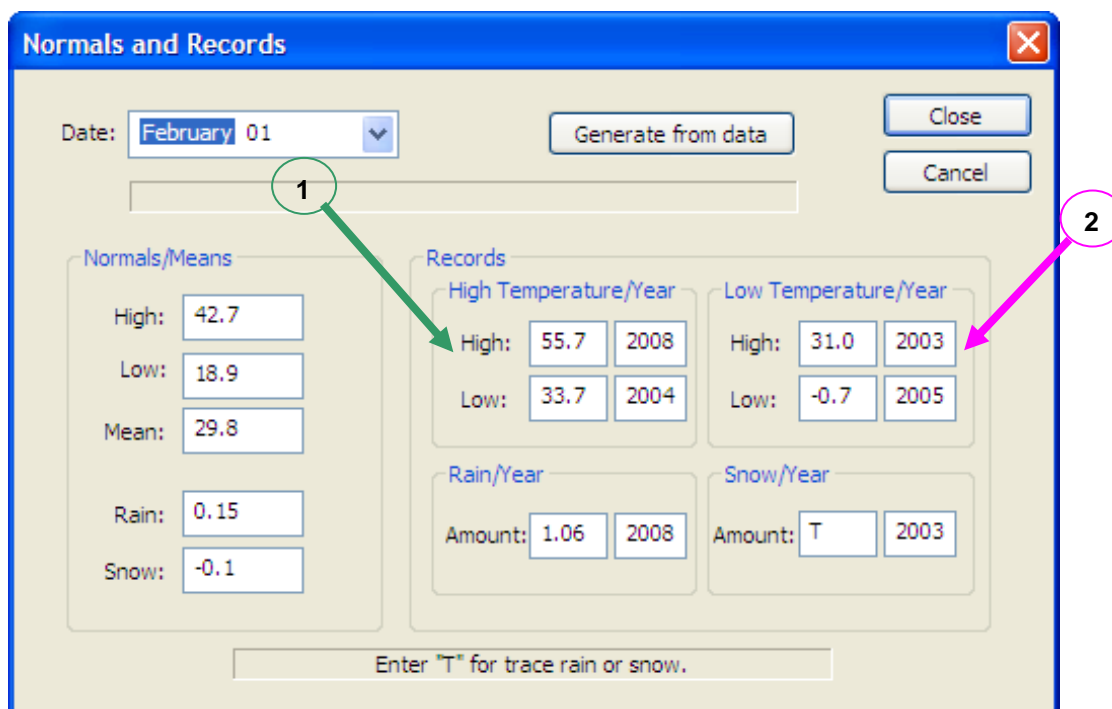


	Maximum	Minimum
Temperature:	39.6	39.6
Dew Point:	26.0408	26.0408
Humidity:	58	58
Wind Gust:	5	0
Wind Gust Dir:	237	207
Pressure:	29.908	29.908
Rain:	0	0
UV:	0	0
ET:	0.075	0.075
Sun:	0	0

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.

Edit Extra Sensors Data

Date: Wednesday, March 14, 2007 20
 03-14-2007 20 (Create)

Temperature			Humidity				
Sensor 1:	41	41	41.00C	Sensor 1:	0	0	0.00C
Sensor 2:	0	0	0.00C	Sensor 2:	0	0	0.00C
Sensor 3:	0	0	0.00C	Sensor 3:	0	0	0.00C
Sensor 4:	0	0	0.00C	Sensor 4:	0	0	0.00C
Sensor 5:	0	0	0.00C	Sensor 5:	0	0	0.00C
Sensor 6:	0	0	0.00C	Sensor 6:	0	0	0.00C
Sensor 7:	0	0	0.00C	Sensor 7:	0	0	0.00C

Soil Temperature			Soil Moisture				
Sensor 1:	0	0	0.00C	Sensor 1:	0	0	0.00C
Sensor 2:	0	0	0.00C	Sensor 2:	0	0	0.00C
Sensor 3:	0	0	0.00C	Sensor 3:	0	0	0.00C
Sensor 4:	0	0	0.00C	Sensor 4:	0	0	0.00C

Leaf Temperature			Leaf Wetness				
Sensor 1:	0	0	0.00C	Sensor 1:	0	0	0.00C
Sensor 2:	0	0	0.00C	Sensor 2:	0	0	0.00C
Sensor 3:	0	0	0.00C	Sensor 3:	0	0	0.00C
Sensor 4:	0	0	0.00C	Sensor 4:	0	0	0.00C

Buttons: OK, Cancel, Delete, New

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

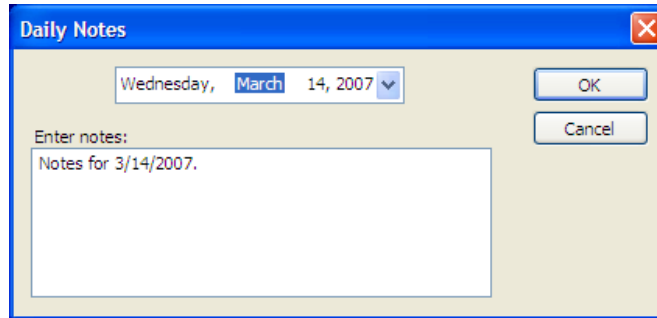
Notes:

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, **** INVALID RECORD **** 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 E-15 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.

Report Type

From/for: Wednesday, March 14, 2007 [Batch]

To: Wednesday, March 14, 2007

Report Type

Daily

Monthly

Annual

Report Format

Printer

HTML

Text

Graphics File

E15 - HTML

E15 - Text

< Back Next > Cancel Help

Use **Batch** when generating reports for more than one month at a time, for example, January 2002 to June 2002. 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.

Generate/Recalculate Data

Generate/recalculate the following data needed for monthly and annual LCD reports:

Monthly summary records

Monthly analysis data

LCD analysis data

NOTES:

1. If you imported or edited an item above, uncheck it, otherwise the changes will be overwritten.

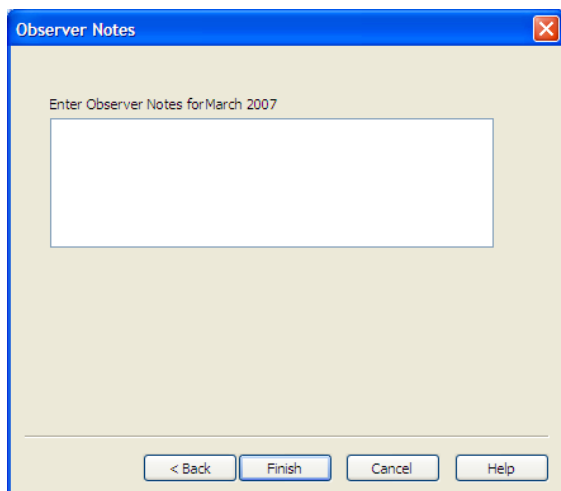
2. If a needed item does not exist, it must be generated (thus the item will be grayed-out).

< Back Next > Cancel Help

Calculate/Regenerate Data

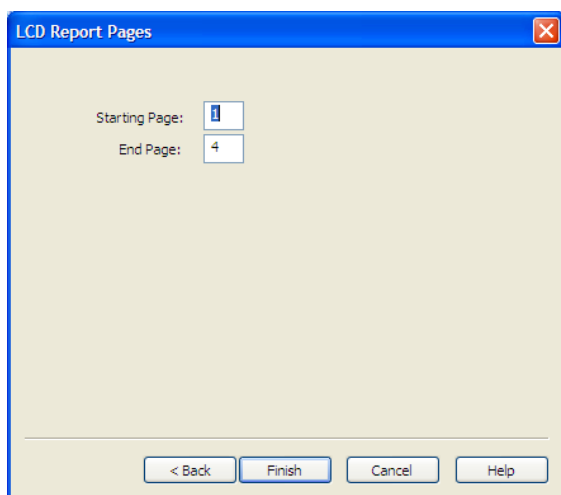
In order to create an LCD report, WxSolution needs to analyze the data. If one of the needed analysis files has not been created, the box will be checked and grayed since WxSolution needs to generate the analysis data. If an item is not needed for the report, it will be unchecked and grayed. Also, if 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 (Day 32), LCD analysis, or LCD annual analysis data, you should uncheck the item(s) as the data will be overwritten.

The screenshot shows a dialog box titled "Observer Notes" with a blue title bar and a close button (X) in the top right corner. The main area is light beige and contains the text "Enter Observer Notes for March 2007" above a large, empty white text input field. At the bottom, there are four buttons: "< Back", "Finish", "Cancel", and "Help".

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.

The screenshot shows a dialog box titled "LCD Report Pages" with a blue title bar and a close button (X) in the top right corner. The main area is light beige and contains two input fields: "Starting Page:" with a spinner box showing the number "1", and "End Page:" with a spinner box showing the number "4". At the bottom, there are four buttons: "< Back", "Finish", "Cancel", and "Help".

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 though 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 been 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 be 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 *mmmyyy_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 19-31) 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.

E-15 HTML

Generates an E-15 report for a web page (HTML document).

E-15 Text

Generates an E-15 report for plain text output (TXT document).

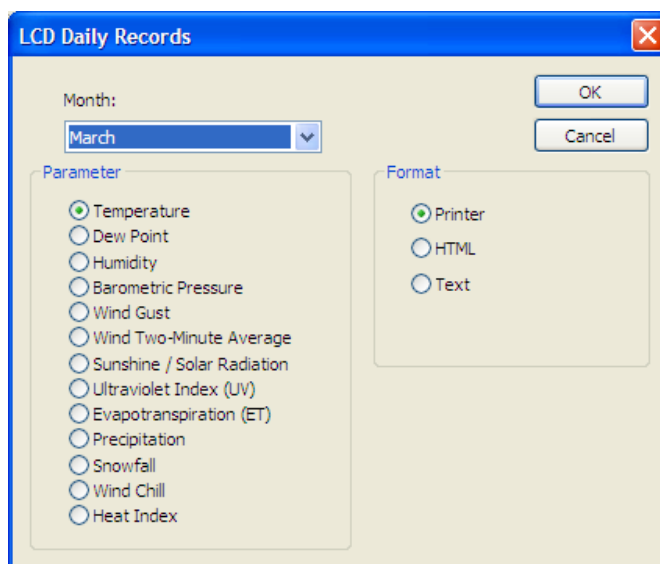
4.18 Annual Report Setup

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

Address	Enter the address information for the station.
County	Enter the county. This will be used on the E-15 report.
State	Enter the state. This will be used on the E-15 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 <i>mm/dd/yyyy</i> .
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.

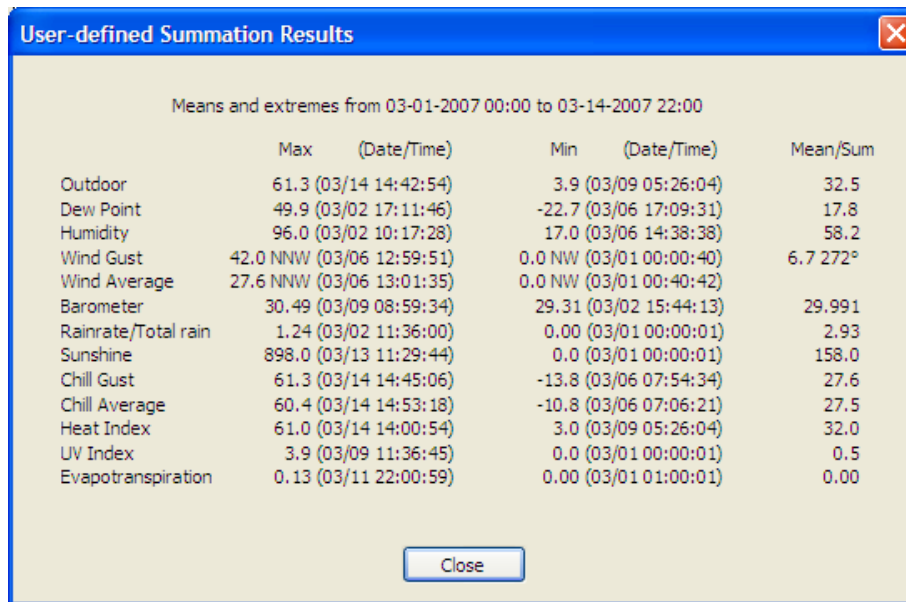


Enter the starting date and hour. If you want to sum the daily summary records, specify “24” as the hour. Enter the ending date and hour, again specifying “24” for daily data. Finally, choose whether to perform the summation on each hour in the interval or for the same hour in the interval.

Examples:

- To analyze every record from 12:00AM April 1, 2007 to 3:00PM April 7, 2007, enter the start date “April 1, 2007 00”, the end date “April 7, 2007 15”, and then select the summation type “Hourly”.
- To analyze daily records from April 6, 2007 to April 12, 2007, enter the start date “April 6, 2007 24”, the end date “April 12, 2007 24”, and then select the summation type “Daily”.
- To analyze all the 6:00AM records from April 1, 2007 to April 30, 2007, enter the start date “April 1, 2007 06”, the end date “April 30, 2007 06”, and then select the summation type “Daily”.

The Results Screen will appear like this:

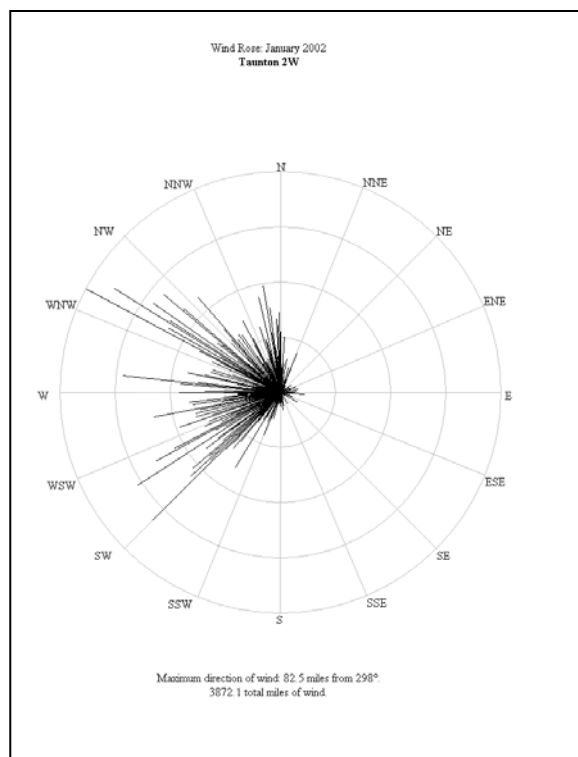
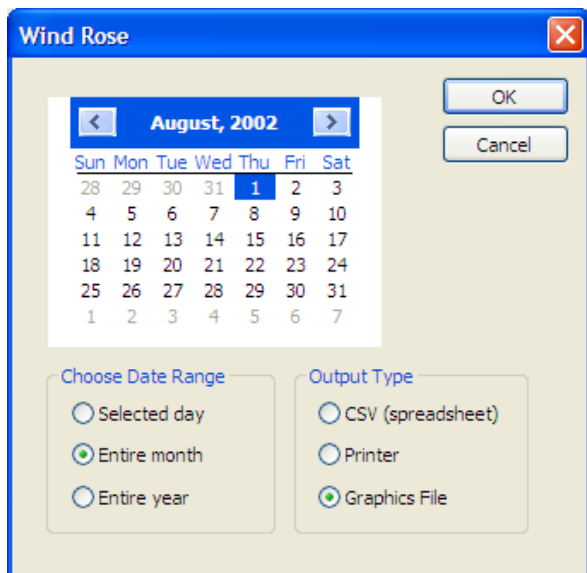


The image shows a software dialog box titled "User-defined Summation Results" with a close button in the top right corner. The dialog contains a table of weather data for the period from 03-01-2007 00:00 to 03-14-2007 22:00. The table has four columns: the parameter name, the maximum value with its date and time, the minimum value with its date and time, and the mean or sum value. A "Close" button is located at the bottom center of the dialog.

	Max (Date/Time)	Min (Date/Time)	Mean/Sum
Outdoor	61.3 (03/14 14:42:54)	3.9 (03/09 05:26:04)	32.5
Dew Point	49.9 (03/02 17:11:46)	-22.7 (03/06 17:09:31)	17.8
Humidity	96.0 (03/02 10:17:28)	17.0 (03/06 14:38:38)	58.2
Wind Gust	42.0 NNW (03/06 12:59:51)	0.0 NW (03/01 00:00:40)	6.7 272°
Wind Average	27.6 NNW (03/06 13:01:35)	0.0 NW (03/01 00:40:42)	
Barometer	30.49 (03/09 08:59:34)	29.31 (03/02 15:44:13)	29.991
Rainrate/Total rain	1.24 (03/02 11:36:00)	0.00 (03/01 00:00:01)	2.93
Sunshine	898.0 (03/13 11:29:44)	0.0 (03/01 00:00:01)	158.0
Chill Gust	61.3 (03/14 14:45:06)	-13.8 (03/06 07:54:34)	27.6
Chill Average	60.4 (03/14 14:53:18)	-10.8 (03/06 07:06:21)	27.5
Heat Index	61.0 (03/14 14:00:54)	3.0 (03/09 05:26:04)	32.0
UV Index	3.9 (03/09 11:36:45)	0.0 (03/01 00:00:01)	0.5
Evapotranspiration	0.13 (03/11 22:00:59)	0.00 (03/01 01:00:01)	0.00

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

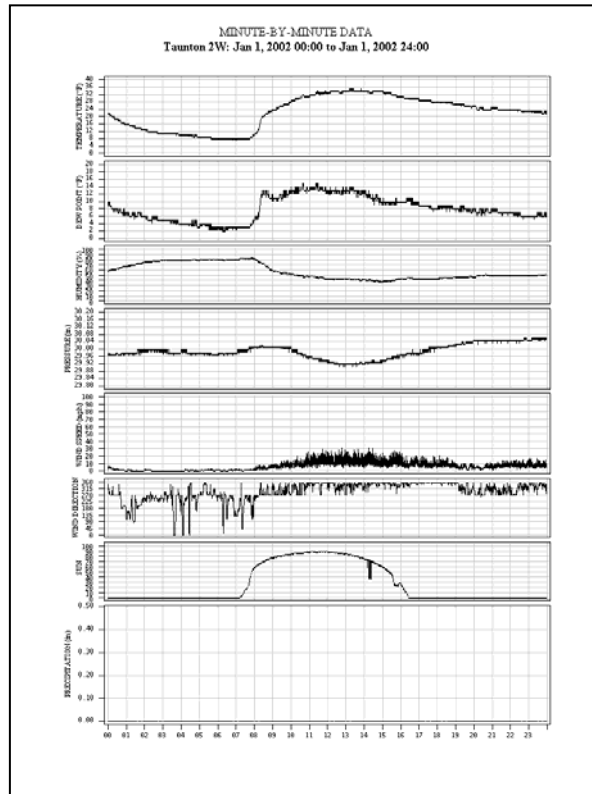
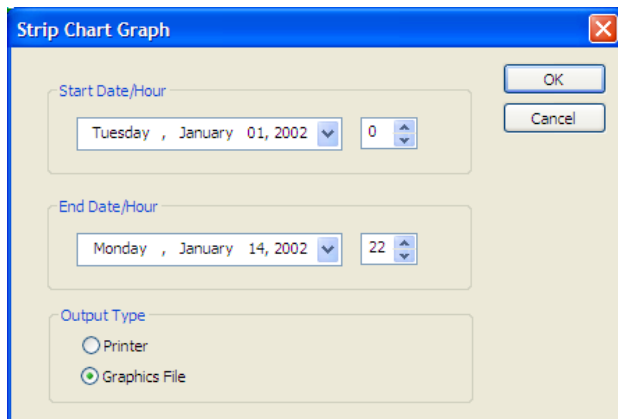
Selected day	Generates a report for just the selected day.
Entire month	Generates a report for the entire month selected.
Entire year	Generates a report for the entire year selected.

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

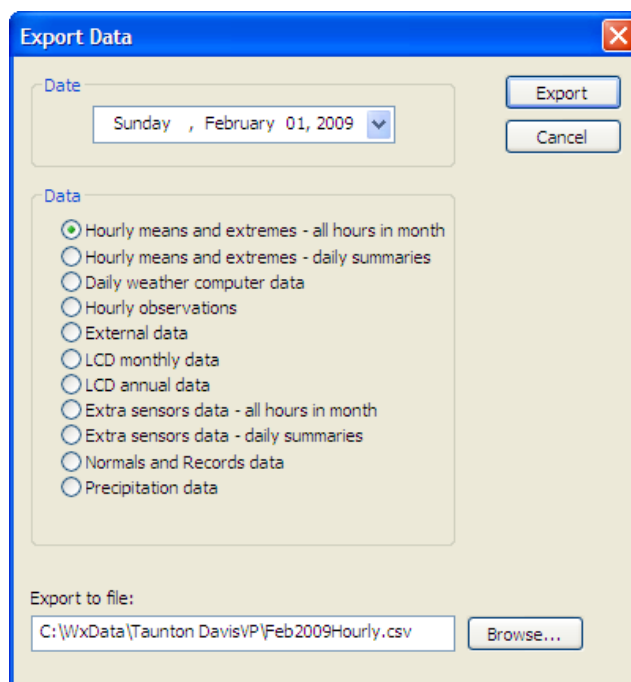
Month, day, year	The ending date.
Hour	The ending hour (exclusive).

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 *mmmyyyyHourly.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-yyyyDaily.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 *mmmyyyyObs.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 *mmmyyyyExternal.csv* (ex. Apr1998External.csv) in the selected folder.

LCD monthly data

Exports the monthly LCD data file. The data is saved to the file *mmmyyyyLcdMonth.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 *yyyyLcdAnnual.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 *mmmNormals.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 *mmmyyyyPrecip_db.csv* (ex. Jan2007Precip_db.csv) in the selected folder.

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:

08,31,2002,12,67.0,65.0,56.0,12.0,70,20.0,30.52,0.00,0.00,97.0,0.0,0.0

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,t1_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:

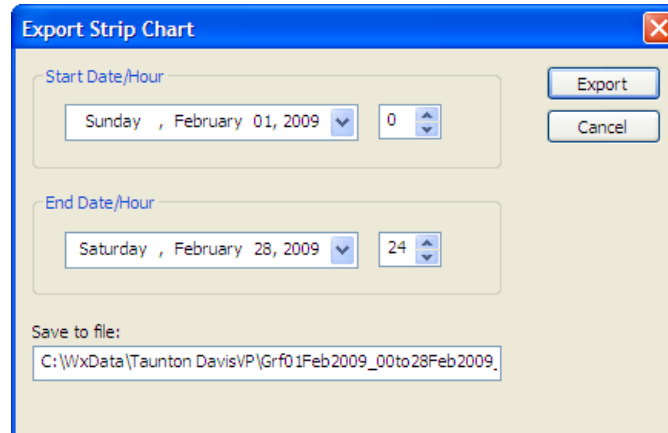
08,1998,80.870964,58.032257,69.451614,56.507198,88,35,24,13,12,140,18.621664,1,0,0,12,0,0,0,0,0,
0,30.059355,30.389999,29.660000,8,24,75.457161,88,80,60,75,3.540000,1.620000,17,0,0.000000,0.000
000,1,0,1.669392,4.080391,212,36,250,22,230,24,24

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,*

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:

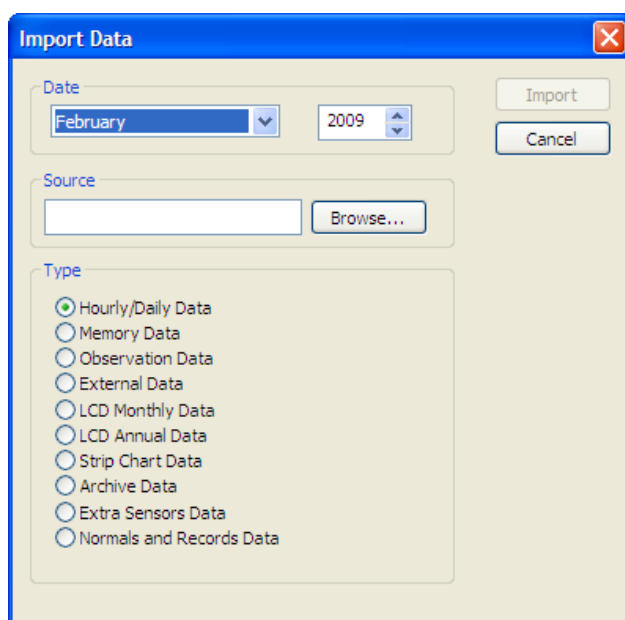
08-31-2007,00:00:00,55.0,54.0,50.0,49.0,83.0,83.0,30.27,30.27,0.0,310.0,0.0, 290.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0

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 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 <1/4 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.

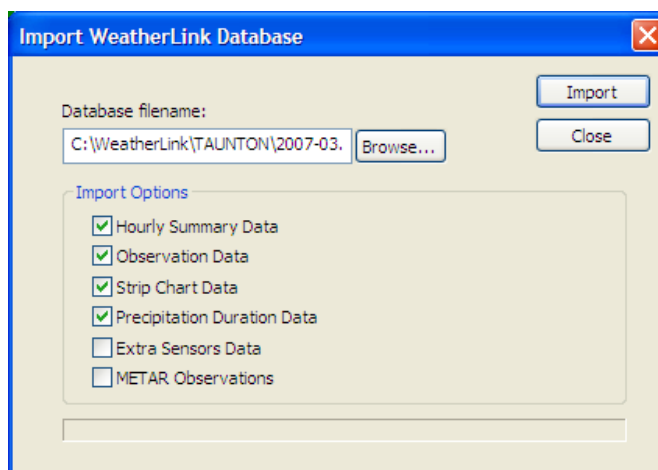
4.25.10 Normals and Records Data

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, 4.x, and 5.x (up to version 5.8.1).

WxSolution will import the WeatherLink database into its hourly summary, hourly observations, strip chart, and precipitation duration databases.



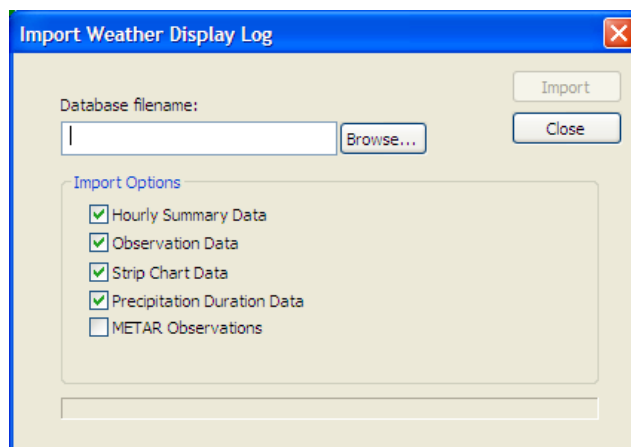
Database File name	Enter or browse for (click on "...") your WeatherLink database file. It will be located in the folder in which you installed WeatherLink such as C:\PCLINK or C:\WeatherLink. The files are located in a subfolder with the name of the your station. Finally, the actual files are named 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 .

Important: To import into the hourly summary database, WxSolution must delete the existing hourly summary database for that month. This is because duplicate records may result and the data will not be accurate. If there is any data that you need to save prior to import (data that will not be contained in the imported WeatherLink data), you should:

1. Export the hourly summary database.
2. Import the WeatherLink database.
3. Edit the export file with a text editor or a spreadsheet and remove any records that may be duplicates.
4. Import the WxSolution export file back into the hourly summary database.

4.27 Import Weather Display Database

Importing Weather Display log allows you to use your existing data captured by Weather Display in WxSolution to generate reports and graphs. WxSolution can import Weather Display logs into its hourly summary, hourly observations, and strip chart databases.



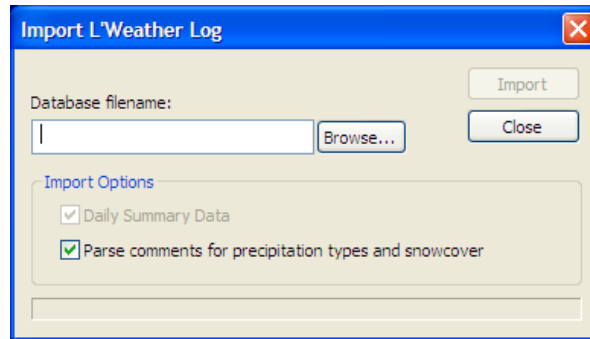
Database File name	Enter or browse for (click on "...") your Weather Display log file. It will be located in the folder in which you installed Weather Display such as C:\WDisplay\LogFiles. Finally, the actual files are named MYYYY.txt, where YYYY is the year, and M is the month.
Hourly Summary Data	Select 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".
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 .

Important: To import into the hourly summary database, WxSolution must delete the existing hourly summary database for that month. This is because duplicate records may result and the data will not be accurate. If there is any data that you need to save prior to import (data that will not be contained in the imported Weather Display data), you should:

1. Export the hourly summary database.
2. Import the Weather Display log.
3. Edit the export file with a text editor or a spreadsheet and remove any records that may be duplicates.
4. Import the WxSolution export file back into the hourly summary database.

4.28 Import L'Weather Log

Importing L'Weather databases allows you to use your existing data in WxSolution to generate reports and graphs. WxSolution will import the WeatherLink database into its hourly summary and extra data databases. Since no hourly observation or strip chart data is available, no data will be imported into these databases.

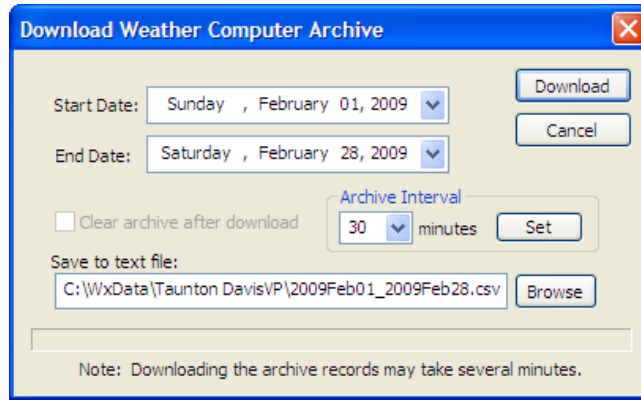


Database File name	Enter or browse for your L'Weather Log file. It will be located in the L'Weather folder such as C:\LWeather .
Daily Summary Data	Select to import data into hourly summary database. This is required for all reports.
Parse comments for precipitation types and snow cover	Select to import data precipitation types. The comments must use the standard numeric codes used in the LCD reports, or use words such as "Ice", "Hail", "Haze", etc. Snow cover amounts are denoted by a number with an asterisk (*) immediately after it. For example, 12* indicates 12" of snow cover.
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.

Important: Importing will overwrite the daily summary record and extra data (precipitation types) for each day.

4.29 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.

4.29.1 Saved File Format

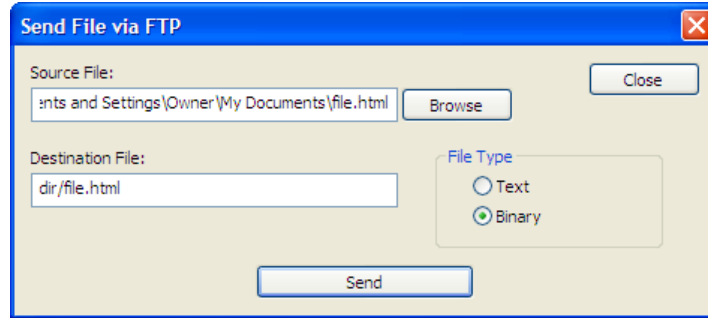
The archive file is a comma-separated-value (CSV) that can be imported into most spreadsheets and databases. You can also import the archive data into WxSolution using the Import Data feature (see Section 4.14).

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

4.30 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

5. Reference

5.1 Sample Data Files

Program Files\Thunderhead Technologies\WxSolution\WxData

Monthly data files (*sample for January 2002*):

Jan2002.hr2	<i>hourly summary data (version 2)</i>
Jan2002.da2	<i>daily data read from weather computer memory (version 2)</i>
Jan2002.ob2	<i>hourly observation data (version 2)</i>
Jan2002.mt2	<i>monthly analysis used for LCD reports (version 2)</i>
Jan2002.gr2	<i>minute-by-minute strip chart data (version 2)</i>
Jan2002.ext	<i>external data used for LCD reports</i>
Jan2002.exs	<i>extra sensors data</i>
Jan2002.pre	<i>monthly precipitation (time of each .01") for LCD reports - text</i>
Jan2002.prb	<i>monthly precipitation (time of each .01") for LCD reports - binary</i>
Jan2002.lc2	<i>monthly LCD data file used for LCD reports (version 2)</i>
Jan2002.txt	<i>observer notes for inclusion on LCD reports</i>
01Jan2002.txt	<i>observer notes for inclusion on LCD report for January 1, 1999</i>

Annual data files:

2002LCD.dat	<i>analysis data for the annual LCD report</i>
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5.2 Contact Information

Support for WxSolution

Support for WxSolution is available by email, voice, or the Internet.

Thunderhead Technologies
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\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, 2004)
\$CURDATE_MDY_S\$	Date (ex. Jan 1, 2004)
\$CURDATE_MD\$	Date (ex. January 1)
\$CURDATE_DMY\$	Date (ex. 1 January 2004)
\$CURDATE_DM\$	Date (ex. 1 January)
\$CURDATE_DMY_S\$	Date (ex. 1 Jan 2004)
\$CURDATE_DASH_MDY\$	Date (mm-dd-yyyy, ex. 01-15-2004)
\$CURDATE_SLASH_MDY\$	Date (mm/dd/yyyy, ex. 01/15/2004)
\$CURDATE_DASH_YMD\$	Date (yyyy-mm-dd, ex. 2004-01-15)
\$CURDATE_SLASH_YMD\$	Date (yyyy/mm/dd, ex. 2004/01/15)
\$CURDATE_DASH_DMY\$	Date (dd-mm-yyyy, ex. 01-15-2004)
\$CURDATE_SLASH_DMY\$	Date (dd/mm/yyyy, ex. 01/15/2004)
\$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”
\$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”, “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, 2004)
\$YD_DATE_MDY_S\$	Date (ex. Jan 1, 2004)
\$YD_DATE_DMY\$	Date (ex. 1 January 2004)
\$YD_DATE_DMY_S\$	Date (ex. 1 Jan 2004)
\$YD_DATE_DASH_MDY\$	Date (mm-dd-yyyy, ex. 01-15-2004)
\$YD_DATE_SLASH_MDY\$	Date (mm/dd/yyyy, ex. 01/15/2004)
\$YD_DATE_DASH_YMD\$	Date (yyyy-mm-dd, ex. 2004-01-15)
\$YD_DATE_SLASH_YMD\$	Date (yyyy/mm/dd, ex. 2004/01/15)
\$YD_DATE_DASH_DMY\$	Date (dd-mm-yyyy, ex. 01-15-2004)
\$YD_DATE_SLASH_DMY\$	Date (dd/mm/yyyy, ex. 01/15/2004)
\$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, 2004)
\$1YR_DATE_MDY_S\$	Date (ex. Jan 1, 2004)
\$1YR_DATE_DMY\$	Date (ex. 1 January 2004)
\$1YR_DATE_DMY_S\$	Date (ex. 1 Jan 2004)
\$1YR_DATE_DASH_MDY\$	Date (mm-dd-yyyy, ex. 01-15-2004)
\$1YR_DATE_SLASH_MDY\$	Date (mm/dd/yyyy, ex. 01/15/2004)
\$1YR_DATE_DASH_YMD\$	Date (yyyy-mm-dd, ex. 2004-01-15)
\$1YR_DATE_SLASH_YMD\$	Date (yyyy/mm/dd, ex. 2004/01/15)
\$1YR_DATE_DASH_DMY\$	Date (dd-mm-yyyy, ex. 01-15-2004)
\$1YR_DATE_SLASH_DMY\$	Date (dd/mm/yyyy, ex. 01/15/2004)
\$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, kmph, 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 (% or W/m ²)
\$USv\$	Units sunshine/solar (% or Watts-per-square-meter)

\$UECB\$	Units for estimated cloud base (feet or meters)
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Extra Sensors Labels

\$XTi_LABEL\$	Extra temperature sensor i ($i = 1$ to 7)
\$XHi_LABEL\$	Extra humidity sensor i ($i = 1$ to 7)
\$XLWi_LABEL\$	Leaf Wetness sensor i ($i = 1$ to 4)
\$XLTi_LABEL\$	Leaf Temperature sensor i ($i = 1$ to 4)
\$XSMi_LABEL\$	Soil Moisture sensor i ($i = 1$ to 4)
\$XSTi_LABEL\$	Soil Temperature sensor i ($i = 1$ to 4)

Current Values

\$GC\$	Wind gust (current instantaneous speed)
\$GDC\$	Wind gust direction
\$AC\$	Wind average
\$ADC\$	Wind average direction
\$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
\$DC\$	Dew point
\$UC\$	Ultraviolet
\$EC\$	Evapotranspiration
\$EX_Ti_C\$	Extra temperature sensor i ($i = 1$ to 7)
\$EX_Hi_C\$	Extra humidity sensor i ($i = 1$ to 7)
\$EX_LWi_C\$	Leaf Wetness sensor i ($i = 1$ to 4)
\$EX_LTi_C\$	Leaf Temperature sensor i ($i = 1$ to 4)
\$EX_SMi_C\$	Soil Moisture sensor i ($i = 1$ to 4)
\$EX_STi_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_mb\$	Barometric pressure

\$DAY_PM_I\$, \$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_mm\$, \$EC_cm\$	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
\$DC_RATE_A\$	\$DC_RATE_NUM\$	Dew point
\$UC_RATE_A\$	\$UC_RATE_NUM\$	Ultraviolet

Current Rates - Words

\$PRES_TRENDS\$	Pressure trend: R, RR, F, FR, S
\$PRES_TREND_WORD\$	Pressure trend: Rising, Rising Rapidly, Falling, Falling Rapidly, Steady

Note: Rising Rapidly is $\geq 0.06''/\text{hr}$, Falling Rapidly is $\geq 0.06''/\text{hr}$

Current Battery

\$BATTERY_CONSOLE\$	For Vantage Pro only. Displays voltage of console battery.
\$BATTERY_XMIT\$	For Vantage Pro only. Displays battery status transmitters. If low, the transmitter number is listed: "2 is low". Otherwise, "All OK".

Sky Conditions

\$CURR_SKY\$	Fair skies – no precipitation Light rain – rate $< 0.10''/\text{hr}$ Moderate rain – rate $0.10''$ to $0.30''/\text{hr}$ Heavy rain – rate $> 0.30''/\text{hr}$
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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 (July 1 - June 30)

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 (July 1 to June 30)
\$DD_COOL_SSN\$	Cooling degree days - season (January 1 to December 31)
\$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\$	\$HR_GM\$	\$DAY_GM\$	Wind gust
\$FIVE_GDM\$	\$HR_GDM\$	\$DAY_GDM\$	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_Ti_HM\$	\$EX_Ti_DM\$	Extra temperature sensor i ($i = 1$ to 7)
	\$EX_Hi_HM\$	\$EX_Hi_DM\$	Extra humidity sensor i ($i = 1$ to 7)
	\$EX_LWi_HM\$	\$EX_LWi_DM\$	Leaf Wetness sensor i ($i = 1$ to 4)
	\$EX_LTi_HM\$	\$EX_LTi_DM\$	Leaf Temperature sensor i ($i = 1$ to 4)
	\$EX_SMi_HM\$	\$EX_SMi_DM\$	Soil Moisture sensor i ($i = 1$ to 4)
	\$EX_STi_HM\$	\$EX_STi_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_GL\$	Wind gust and direction
\$HR_GDH\$	\$HR_GDL\$	
\$HR_AH\$	\$HR_AL\$	Wind average and direction
\$HR_ADH\$	\$HR_ADL\$	
\$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_Ti_HH\$	\$EX_Ti_HL\$	Extra temperature sensor i ($i = 1$ to 7)
\$EX_Hi_HH\$	\$EX_Hi_HL\$	Extra humidity sensor i ($i = 1$ to 7)
\$EX_LWi_HH\$	\$EX_LWi_HL\$	Leaf Wetness sensor i ($i = 1$ to 4)

\$EX_LT_i_HH\$	\$EX_LT_i_HL\$	Leaf Temperature sensor <i>i</i> (<i>i</i> = 1 to 4)
\$EX_SM_i_HH\$	\$EX_SM_i_HL\$	Soil Moisture sensor <i>i</i> (<i>i</i> = 1 to 4)
\$EX_ST_i_HH\$	\$EX_ST_i_HL\$	Soil Temperature sensor <i>i</i> (<i>i</i> = 1 to 4)

One-Hour Ago Values and Changes

<i>Value last hour</i>	
\$1HR_WIND\$	\$1HR_WINDDIR\$ Wind gust and direction
\$1HR_TEMP\$	Temperature
\$1HR_PRESS\$	Barometric pressure
\$1HR_RAIN\$	Precipitation
\$1HR_SUN\$	Sunshine index
\$1HR_HUM\$	Humidity
\$1HR_DEW\$	Dew point
\$1HR_UV\$	Ultraviolet
\$1HR_ET\$	ET
<i>Change from last hour</i>	
\$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_GL\$	Wind gust and direction
\$DAY_GDH\$	\$DAY_GDL\$	
\$DAY_GH_TIME\$	\$DAY_GL_TIME\$	
\$DAY_AH\$	\$DAY_AL\$	Wind average and direction
\$DAY_ADH\$	\$DAY_ADL\$	
\$DAY_AH_TIME\$	\$DAY_AL_TIME\$	
\$DAY_TH\$	\$DAY_TL\$	Temperature
\$DAY_TH_TIME\$	\$DAY_TL_TIME\$	
\$DAY_IH\$	\$DAY_IL\$	Indoor temperature
\$DAY_IH_TIME\$	\$DAY_IL_TIME\$	
\$DAY_BH\$	\$DAY_BL\$	Barometric pressure
\$DAY_BH_TIME\$	\$DAY_BL_TIME\$	
\$DAY_PH\$	\$DAY_PL\$	Precipitation
\$DAY_PH_TIME\$	\$DAY_PL_TIME\$	
\$DAY_CH\$	\$DAY_CL\$	Wind chill gust
\$DAY_CH_TIME\$	\$DAY_CL_TIME\$	
\$DAY_cH\$	\$DAY_cL\$	Wind chill average
\$DAY_cH_TIME\$	\$DAY_cL_TIME\$	
\$DAY_XH\$	\$DAY_XL\$	Heat index
\$DAY_XH_TIME\$	\$DAY_XL_TIME\$	

\$DAY_SH\$ \$DAY_SH_TIMES\$	\$DAY_SL\$ \$DAY_SL_TIMES\$	Sunshine/Solar
\$DAY_HH\$ \$DAY_HH_TIMES\$	\$DAY_HL\$ \$DAY_HL_TIMES\$	Humidity
\$DAY_DH\$ \$DAY_DH_TIMES\$	\$DAY_DL\$ \$DAY_DL_TIMES\$	Dew point
\$DAY_UH\$ \$DAY_UH_TIMES\$	\$DAY_UL\$ \$DAY_UL_TIMES\$	Ultraviolet
\$DAY_EH\$ \$DAY_EH_TIMES\$		Evapotranspiration
\$EX_Ti_DH\$ \$EX_Ti_DH_TIMES\$	\$EX_Ti_DL\$ \$EX_Ti_DL_TIMES\$	Extra temperature sensor i ($i = 1$ to 7)
\$EX_Hi_DH\$ \$EX_Hi_DH_TIMES\$	\$EX_Hi_DL\$ \$EX_Hi_DL_TIMES\$	Extra humidity sensor i ($i = 1$ to 7)
\$EX_LWi_DH\$ \$EX_LWi_DH_TIMES\$	\$EX_LWi_DL\$ \$EX_LWi_DL_TIMES\$	Leaf Wetness sensor i ($i = 1$ to 4)
\$EX_LTi_DH\$ \$EX_LTi_DH_TIMES\$	\$EX_LTi_DL\$ \$EX_LTi_DL_TIMES\$	Leaf Temperature sensor i ($i = 1$ to 4)
\$EX_SMi_DH\$ \$EX_SMi_DH_TIMES\$	\$EX_SMi_DL\$ \$EX_SMi_DL_TIMES\$	Soil Moisture sensor i ($i = 1$ to 4)
\$EX_STi_DH\$ \$EX_STi_DH_TIMES\$	\$EX_STi_DL\$ \$EX_STi_DL_TIMES\$	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_TIMES\$	\$YD_GL\$ \$YD_GDL\$ \$YD_GL_TIMES\$	\$YD_GM\$ \$YD_GDM\$	Wind gust and direction
\$YD_AH\$ \$YD_ADH\$ \$YD_AH_TIMES\$	\$YD_AL\$ \$YD_ADL\$ \$YD_AL_TIMES\$		Wind average and direction
\$YD_TH\$ \$YD_TH_TIMES\$	\$YD_TL\$ \$YD_TL_TIMES\$	\$YD_TM\$	Temperature
\$YD_IH\$ \$YD_IH_TIMES\$	\$YD_IL\$ \$YD_IL_TIMES\$	\$YD_IM\$	Indoor temperature
\$YD_BH\$ \$YD_BH_TIMES\$	\$YD_BL\$ \$YD_BL_TIMES\$	\$YD_BM\$	Barometric pressure
\$YD_PH\$ \$YD_PH_TIMES\$	\$YD_PL\$ \$YD_PL_TIMES\$	\$YD_PM\$	Precipitation
\$YD_CH\$ \$YD_CH_TIMES\$	\$YD_CL\$ \$YD_CL_TIMES\$	\$YD_CM\$	Wind chill gust
\$YD_cH\$ \$YD_cH_TIMES\$	\$YD_cL\$ \$YD_cL_TIMES\$	\$YD_cM\$	Wind chill average
\$YD_XH\$ \$YD_XH_TIMES\$	\$YD_XL\$ \$YD_XL_TIMES\$	\$YD_XM\$	Heat index

\$YD_SH\$ \$YD_SH_TIMES\$	\$YD_SL\$ \$YD_SL_TIMES\$	\$YD_SM\$	Sunshine/Solar
\$YD_HH\$ \$YD_HH_TIMES\$	\$YD_HL\$ \$YD_HL_TIMES\$	\$YD_HM\$	Humidity
\$YD_DH\$ \$YD_DH_TIMES\$	\$YD_DL\$ \$YD_DL_TIMES\$	\$YD_DM\$	Dew point
\$YD_UH\$ \$YD_UH_TIMES\$	\$YD_UL\$ \$YD_UL_TIMES\$	\$YD_UM\$	Ultraviolet
\$YD_EH\$ \$YD_EH_TIMES\$		\$YD_EM\$	Evapotranspiration
		\$YD_SUNMINUTES\$	Sunshine minutes
\$YD_EX_Ti_H\$ \$YD_EX_Ti_H_TIMES\$	\$YD_EX_Ti_L\$ \$YD_EX_Ti_L_TIMES\$	\$YD_EX_Ti_M\$	Extra temperature sensor i ($i = 1$ to 7)
\$YD_EX_Hi_H\$ \$YD_EX_Hi_H_TIMES\$	\$YD_EX_Hi_L\$ \$YD_EX_Hi_L_TIMES\$	\$YD_EX_Hi_M\$	Extra humidity sensor i ($i = 1$ to 7)
\$YD_EX_LWi_H\$ \$YD_EX_LWi_H_TIMES\$	\$YD_EX_LWi_L\$ \$YD_EX_LWi_L_TIMES\$	\$YD_EX_LWi_M\$	Leaf Wetness sensor i ($i = 1$ to 4)
\$YD_EX_LTi_H\$ \$YD_EX_LTi_H_TIMES\$	\$YD_EX_LTi_L\$ \$YD_EX_LTi_L_TIMES\$	\$YD_EX_LTi_M\$	Leaf Temperature sensor i ($i = 1$ to 4)
\$YD_EX_SMi_H\$ \$YD_EX_SMi_H_TIMES\$	\$YD_EX_SMi_L\$ \$YD_EX_SMi_L_TIMES\$	\$YD_EX_SMi_M\$	Soil Moisture sensor i ($i = 1$ to 4)
\$YD_EX_STi_H\$ \$YD_EX_STi_H_TIMES\$	\$YD_EX_STi_L\$ \$YD_EX_STi_L_TIMES\$	\$YD_EX_STi_M\$	Soil Temperature sensor i ($i = 1$ to 4)

24-Hour Ago Values and Changes

<i>Value 24 hours ago</i>	
\$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
<i>Change from 24 hours ago</i>	
\$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_Ti_H\$ \$1YR_EX_Ti_H_TIME\$	\$1YR_EX_Ti_L\$ \$1YR_EX_Ti_L_TIME\$	\$1YR_EX_Ti_M\$	Extra temperature sensor i ($i = 1$ to 7)
\$1YR_EX_Hi_H\$ \$1YR_EX_Hi_H_TIME\$	\$1YR_EX_Hi_L\$ \$1YR_EX_Hi_L_TIME\$	\$1YR_EX_Hi_M\$	Extra humidity sensor i ($i = 1$ to 7)
\$1YR_EX_LWi_H\$ \$1YR_EX_LWi_H_TIME\$	\$1YR_EX_LWi_L\$ \$1YR_EX_LWi_L_TIME\$	\$1YR_EX_LWi_M\$	Leaf Wetness sensor i ($i = 1$ to 4)
\$1YR_EX_LTi_H\$ \$1YR_EX_LTi_H_TIME\$	\$1YR_EX_LTi_L\$ \$1YR_EX_LTi_L_TIME\$	\$1YR_EX_LTi_M\$	Leaf Temperature sensor i ($i = 1$ to 4)
\$1YR_EX_SMi_H\$ \$1YR_EX_SMi_H_TIME\$	\$1YR_EX_SMi_L\$ \$1YR_EX_SMi_L_TIME\$	\$1YR_EX_SMi_M\$	Soil Moisture sensor i ($i = 1$ to 4)

\$1YR_EX_STi_H\$ \$1YR_EX_STi_H_TIMES\$	\$1YR_EX_STi_L\$ \$1YR_EX_STi_L_TIMES\$	\$1YR_EX_STi_M\$	Soil Temperature sensor <i>i</i> (<i>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_PM\$	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_Ti_MH\$ \$EX_Ti_MH_DATE\$	\$EX_Ti_ML\$ \$EX_Ti_ML_DATE\$	\$EX_Ti_MM\$	Extra temperature sensor <i>i</i> (<i>i</i> = 1 to 7)
\$EX_Hi_MH\$ \$EX_Hi_MH_DATE\$	\$EX_Hi_ML\$ \$EX_Hi_ML_DATE\$	\$EX_Hi_MM\$	Extra humidity sensor <i>i</i> (<i>i</i> = 1 to 7)
\$EX_LWi_MH\$ \$EX_LWi_MH_DATE\$	\$EX_LWi_ML\$ \$EX_LWi_ML_DATE\$	\$EX_LWi_MM\$	Leaf Wetness sensor <i>i</i> (<i>i</i> = 1 to 4)
\$EX_LTi_MH\$ \$EX_LTi_MH_DATE\$	\$EX_LTi_ML\$ \$EX_LTi_ML_DATE\$	\$EX_LTi_MM\$	Leaf Temperature sensor <i>i</i> (<i>i</i> = 1 to 4)
\$EX_SMi_MH\$ \$EX_SMi_MH_DATE\$	\$EX_SMi_ML\$ \$EX_SMi_ML_DATE\$	\$EX_SMi_MM\$	Soil Moisture sensor <i>i</i> (<i>i</i> = 1 to 4)
\$EX_STi_MH\$ \$EX_STi_MH_DATE\$	\$EX_STi_ML\$ \$EX_STi_ML_DATE\$	\$EX_STi_MM\$	Soil Temperature sensor <i>i</i> (<i>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_PM\$	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_Ti_YH\$ \$EX_Ti_YH_DATE\$	\$EX_Ti_YL\$ \$EX_Ti_YL_DATE\$	\$EX_Ti_YM\$	Extra temperature sensor i ($i = 1$ to 7)
\$EX_Hi_YH\$ \$EX_Hi_YH_DATE\$	\$EX_Hi_YL\$ \$EX_Hi_YL_DATE\$	\$EX_Hi_YM\$	Extra humidity sensor i ($i = 1$ to 7)
\$EX_LWi_YH\$ \$EX_LWi_YH_DATE\$	\$EX_LWi_YL\$ \$EX_LWi_YL_DATE\$	\$EX_LWi_YM\$	Leaf Wetness sensor i ($i = 1$ to 4)
\$EX_LTi_YH\$ \$EX_LTi_YH_DATE\$	\$EX_LTi_YL\$ \$EX_LTi_YL_DATE\$	\$EX_LTi_YM\$	Leaf Temperature sensor i ($i = 1$ to 4)
\$EX_SMi_YH\$ \$EX_SMi_YH_DATE\$	\$EX_SMi_YL\$ \$EX_SMi_YL_DATE\$	\$EX_SMi_YM\$	Soil Moisture sensor i ($i = 1$ to 4)
\$EX_STi_YH\$ \$EX_STi_YH_DATE\$	\$EX_STi_YL\$ \$EX_STi_YL_DATE\$	\$EX_STi_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_GL\$	Wind gust and direction
\$ALL_GDH\$	\$ALL_GDL\$	
\$ALL_GH_DATE\$	\$ALL_GL_DATE\$	
\$ALL_AH\$	\$ALL_AL\$	Wind average and direction
\$ALL_ADH\$	\$ALL_ADL\$	
\$ALL_AH_DATE\$	\$ALL_AL_DATE\$	
\$ALL_TH\$	\$ALL_TL\$	Temperature
\$ALL_TH_DATE\$	\$ALL_TL_DATE\$	
\$ALL_DH\$	\$ALL_DL\$	Dew Point
\$ALL_DH_DATE\$	\$ALL_DL_DATE\$	
\$ALL_HH\$	\$ALL_HL\$	Humidity
\$ALL_HH_DATE\$	\$ALL_HL_DATE\$	
\$ALL_SH\$	\$ALL_SL\$	Sunshine/Solar
\$ALL_SH_DATE\$	\$ALL_SL_DATE\$	
\$ALL_PH\$		Precipitation
\$ALL_PH_DATE\$		
\$ALL_EH\$		Evapotranspiration
\$ALL_EH_DATE\$		
\$ALL_UH\$	\$ALL_UL\$	UV
\$ALL_UH_DATE\$	\$ALL_UL_DATE\$	
\$ALL_BH\$	\$ALL_BL\$	Barometric pressure
\$ALL_BH_DATE\$	\$ALL_BL_DATE\$	
\$EX_Ti_AH\$	\$EX_Ti_AL\$	Extra temperature sensor i ($i = 1$ to 7)
\$EX_Ti_AH_DATE\$	\$EX_Ti_AL_DATE\$	
\$EX_Hi_AH\$	\$EX_Hi_AL\$	Extra humidity sensor i ($i = 1$ to 7)
\$EX_Hi_AH_DATE\$	\$EX_Hi_AL_DATE\$	
\$EX_LWi_AH\$	\$EX_LWi_AL\$	Leaf Wetness sensor i ($i = 1$ to 4)
\$EX_LWi_AH_DATE\$	\$EX_LWi_AL_DATE\$	
\$EX_LTi_AH\$	\$EX_LTi_AL\$	Leaf Temperature sensor i ($i = 1$ to 4)
\$EX_LTi_AH_DATE\$	\$EX_LTi_AL_DATE\$	
\$EX_SMi_AH\$	\$EX_SMi_AL\$	Soil Moisture sensor i ($i = 1$ to 4)
\$EX_SMi_AH_DATE\$	\$EX_SMi_AL_DATE\$	
\$EX_STi_AH\$	\$EX_STi_AL\$	Soil Temperature sensor i ($i = 1$ to 4)
\$EX_STi_AH_DATE\$	\$EX_STi_AL_DATE\$	

Wind Run

\$WINDRUN_UNITS\$	Wind run units (miles, kilometers, nautical miles, meters)
\$WINDRUN_DAY\$	Wind run for current day
\$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 $\geq 0.01''$
\$NUM_DAYS_SNOW_MTH\$	Days of snow $\geq 0.1''$
\$NUM_DAYS_HFOG_MTH\$	Days of heavy fog
\$NUM_DAYS_THUNDER_MTH\$	Days of thunder
\$NUM_DAYS_HI90F_MTH\$	Days of high temperature $\geq 90^{\circ}\text{F}$
\$NUM_DAYS_LO32F_MTH\$	Days of low temperature $\leq 32^{\circ}\text{F}$
\$NUM_DAYS_HI32F_MTH\$	Days of high temperature $\leq 32^{\circ}\text{F}$
\$NUM_DAYS_LO0F_MTH\$	Days of low temperature $\leq 0^{\circ}\text{F}$
\$NUM_DAYS_CLOUDY_MTH\$	Cloudy days
\$NUM_DAYS_PLOUDY_MTH\$	Partly cloudy days
\$NUM_DAYS_CLEAR_MTH\$	Clear days

Number of Days this Year

\$NUM_DAYS_RAIN_YR\$	Days of rain $\geq 0.01''$
\$NUM_DAYS_SNOW_YR\$	Days of snow $\geq 0.1''$
\$NUM_DAYS_HFOG_YR\$	Days of heavy fog
\$NUM_DAYS_THUNDER_YR\$	Days of thunder
\$NUM_DAYS_HI90F_YR\$	Days of high temperature $\geq 90^{\circ}\text{F}$
\$NUM_DAYS_LO32F_YR\$	Days of low temperature $\leq 32^{\circ}\text{F}$
\$NUM_DAYS_HI32F_YR\$	Days of high temperature $\leq 32^{\circ}\text{F}$
\$NUM_DAYS_LO0F_YR\$	Days of low temperature $\leq 0^{\circ}\text{F}$
\$NUM_DAYS_CLOUDY_YR\$	Cloudy days
\$NUM_DAYS_PLOUDY_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 high temperature and year
\$RECORD_TEMP_HI_MAX_YR\$	
\$RECORD_TEMP_HI_MIN\$	Record low high temperature and year
\$RECORD_TEMP_HI_MIN_YR\$	
\$RECORD_TEMP_LO_MAX\$	Record high low temperature and year
\$RECORD_TEMP_LO_MAX_YR\$	
\$RECORD_TEMP_LO_MIN\$	Record low temperature and year
\$RECORD_TEMP_LO_MIN_YR\$	
\$RECORD_RAIN_AMT\$	Record rainfall and year
\$RECORD_RAIN_AMT_YR\$	
\$RECORD_SNOW_AMT\$	Record snowfall and year
\$RECORD_SNOW_AMT_YR\$	

Alarms

\$ALARMS\$	For the Davis Vantage Pro:		For the Heathkit ID-5001:
	Falling Barometer	Low Wind Chill	Fog
	Rising Barometer	THSW Index	Alert
	Low Inside Temperature	High Solar Radiation	Warning
	High Inside Temperature	High UV	
	Low Inside Humidity	High UV Dose	
	High Inside Humidity		
	Time	Extra Temperature Low <i>i</i>	
	High Rain Rate	Extra Temperature High <i>i</i>	
	15-Minute Rain	Extra Humidity Low <i>i</i>	
	24-Hour Rain	Extra Humidity High <i>i</i>	
	Storm Rain		
	Daily ET	Leaf Wetness Low <i>i</i>	
	Low Outside Temperature	Leaf Wetness High <i>i</i>	
	High Outside Temperature	Soil Moisture Low <i>i</i>	
	Wind Speed	Soil Moisture High <i>i</i>	
	10-Minute Wind Average	Leaf Temperature Low <i>i</i>	
	Low Dew Point	Leaf Temperature High <i>i</i>	
	High Dew Point	Soil Temperature Low <i>i</i>	
	Heat Index	Soil Temperature High <i>i</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 the current day - entered via Daily LCD Reports
\$YD_NOTES\$	Observer notes for yesterday - entered via Daily LCD Reports
\$METAR\$	Current METAR observation.

Current Conditions WML File Reference

The Current Conditions HTML file (**C:\Program Files\Thunderhead Technologies\WxSolution\Forms\HTML\Current.wml**) 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\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_ES

Date/Time

\$O_DATE_MDY\$	Date (ex. January 1, 2004)
\$O_DATE_MDY_S\$	Date (ex. Jan 1, 2004)
\$O_DATE_DMY\$	Date (ex. 1 January 2004)
\$O_DATE_DMY_S\$	Date (ex. 1 Jan 2004)
\$O_DATE_DASH_MDY\$	Date (mm-dd-yyyy, ex. 01-15-2004)
\$O_DATE_SLASH_MDY\$	Date (mm/dd/yyyy, ex. 01/15/2004)
\$O_DATE_DASH_YMD\$	Date (yyyy-mm-dd, ex. 2004-01-15)
\$O_DATE_SLASH_YMD\$	Date (yyyy/mm/dd, ex. 2004/01/15)
\$O_DATE_DASH_DMY\$	Date (yyyy-mm-dd, ex. 2004-01-15)
\$O_DATE_SLASH_DMY\$	Date (yyyy/mm/dd, ex. 2004/01/15)
\$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_ES\$	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

Following is the format of the 9-digit, numeric pager message.

iiptsvvvv

where:

ii = two-digit station ID

p = one-digit parameter identifier:

- | | | | |
|---|---------------------|---|----------|
| 1 | Wind Gust | 5 | Pressure |
| 2 | Wind Average | 6 | Rain |
| 3 | Outdoor Temperature | 7 | Humidity |
| 4 | Indoor Temperature | 8 | Sunshine |

t = one-digit event type:

- 1 max
- 2 min
- 3 rate

s = one-digit sign:

- 0 positive
- 1 negative

vvvv = four-digit value of parameter

Note: the decimal point is removed from pressure and rain.

Examples:

	<u>i</u>	<u>i</u>	<u>p</u>	<u>t</u>	<u>s</u>	<u>vvvv</u>	
021100058	02	1	1	0	0058		Station 2, max wind gust of 58.
043210020	04	3	2	1	0020		Station 4, min outdoor temperature of -20.
015310015	01	5	3	1	0015		Station 1, pressure rate change of -0.15 per hour.

A.3 Advanced Features

A.3.1 Running more than one copy of WxSolution Simultaneously

If you have more than one weather computer, you can run WxSolution with each by performing the following steps:

1. Copy the **Program Files\WxSolution** folder and all its subfolders to another folder such as **\Program Files\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\Thunderhead Technologies\WxSolution** naming it something appropriate such as **WxComp2**.
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**:
 - Change the folder of the application from `\Program Files\WxSolution` to `\Program Files\WxSolution2` using the name chosen in step 1.
 - At the end of the command, insert a space and the parameter `/c=WxComp2` using the name chosen in step 2.
 The modified **Target** should look like:
`"C:\Program Files\WxSolution2\WxSolution.exe" "/c=WxComp2"`
 - f. Modify **Start-in** using the new folder from step 1:
`C:\Program Files\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

Installing on a computer that logs on to a network

When installing on a computer that logs on to a network, a few steps must be taken so that WxSolution starts automatically. Specifically, the normal logon process (the logon dialog box) must be bypassed.

If installing on a corporate computer, always consult your company's network policies and your system administrator before implementing these changes. Thunderhead Technologies cannot assume responsibility for any violation of your company's security policies.

On a Windows 98/ME system:

- * Go to the **Network** applet in the Control Panel (Start→Settings→Control Panel→Network).
- * On the **Configuration** tab under **Primary Network Logon**, select **Windows Logon**. Click OK to save this change.
- * Go to the **Passwords** applet in the Control Panel.
- * On the **Change Passwords** tab, click **Change Windows Password**. Enter your current password, then change the new password to be empty (i.e., blank).
- * On the **User Profiles** tab in Passwords, select "All users of this PC...".
- * Logoff or reboot. Windows should no longer ask you for a password.

On a Windows NT4, 2000, XP system:

- * Consult with your system administrator before making any login changes.

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
Station Name	C	40	Example: "Taunton 2W"
Reserved	C	76	Reserved for future use

Data Record

Field	Type	Length	Notes
Record Number	N	2	
Number of Observations	N	4	Number of observations used in calculating means
Edited	C	1	'Y' or 'N' - denotes if the record has been edited
Units - Temperature	C	1	'F' = Fahrenheit, 'C' = Celsius
Units - Wind	C	1	'M' = miles/hr, 'K' = knots, 'L' = km/hr, 'm' = m/s
Units - Pressure	C	1	'I' = inches Hg., 'M'=millibars
Units - Rain	C	1	'I' = inches, 'C' = centimeters, 'M' = millimeters
Date/Time	SF2		(See below)
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	N	2	16-bit cyclic redundancy check

Subfield 1 (SF1)

Field	Type	Length	Notes
Maximum	F	4	
Minimum	F	4	
Mean	F	4	
Max_time	N	4	Number of seconds since 1/1/1970
Min_time	N	4	
Mean_time	N	4	(Not used)
Enabled	C	1	(Not yet implemented)

Subfield 2 (SF2)

Field	Type	Length	Notes
Year	N	2	
Month	N	2	
Day	N	2	
Hour	N	2	

Minute	N	2	Always zero
Second	N	2	Always zero
Millisecond	N	2	Always zero

N = integer

F = floating-point number

C = character

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
Station Name	C	40	Example: "Taunton 2W"
Reserved	C	76	Reserved for future use

Data Record

Field	Type	Length	Notes
Max Outdoor Temperature	F	4	
Min Outdoor Temperature	F	4	
Max Indoor Temperature	F	4	
Min Indoor Temperature	F	4	
Max Wind Gust	F	4	
Max Wind Gust Direction	F	4	
Min Wind Gust	F	4	
Min Wind Gust Direction	F	4	
Max Wind Average	F	4	
Max Wind Average Direction	F	4	
Min Wind Average	F	4	
Min Wind Average Direction	F	4	
Max Humidity	F	4	
Min Humidity	F	4	
Max Sunshine (Indoor Humidity)	F	4	
Min Sunshine (Indoor Humidity)	F	4	
Max Barometric Pressure	F	4	
Min Barometric Pressure	F	4	
Rainfall	F	4	
Max Outdoor Temperature - Time	N	4	Number of seconds after midnight
Min Outdoor Temperature - Time	N	4	
Max Indoor Temperature - Time	N	4	
Min Indoor Temperature - Time	N	4	
Max Wind Gust - Time	N	4	
Min Wind Gust - Time	N	4	
Max Wind Average - Time	N	4	
Min Wind Average - Time	N	4	
Max Humidity - Time	N	4	
Min Humidity - Time	N	4	
Max Sunshine (Indoor Humidity) - Time	N	4	
Min Sunshine (Indoor Humidity) - Time	N	4	
Max Barometric Pressure - Time	N	4	
Min Barometric Pressure - Time	N	4	
CRC	N	2	16-bit cyclic redundancy check

N = integer

F = floating-point number

C = character

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

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
Station Name	C	40	Example: "Taunton 2W"
Reserved	C	76	Reserved for future use

Data Record

Field	Type	Length	Notes
Date/Time	SF1		(See below)
Outdoor Temperature	F	4	
Humidity	F	4	
Dew Point	F	4	
Wind Average	F	4	
Wind Average Direction	F	4	
Wind Gust	F	4	
Sunshine	F	4	
Barometric Pressure	F	4	
Evapotranspiration	F	4	
Ultraviolet Index	F	4	
Wind Chill Average	F	4	
Heat Index	F	4	
Rain to Date	F	4	
Rain Rate	F	4	
CRC	N	2	16-bit cyclic redundancy check

Subfield 1 (SF1)

Field	Type	Length	Notes
Year	N	2	
Month	N	2	
Day	N	2	
Hour	N	2	
Minute	N	2	Always zero
Second	N	2	Always zero
Millisecond	N	2	Always zero

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	Length	Notes
Time	N	4	Seconds since January 1, 1970

.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
Station Name	C	40	Example: "Taunton 2W"
Reserved	C	76	Reserved for future use

Data Record

Field	Type	Length	Notes
Record Number	N	2	
Number of Observations	N	4	Number of observations used in calculating means
Edited	C	1	'Y' or 'N' - denotes if the record has been edited
Units - Temperature	C	1	'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	<i>SF1</i>		
Leaf Temperature 4	<i>SF1</i>		
Soil Moisture 1	<i>SF1</i>		
Soil Moisture 2	<i>SF1</i>		
Soil Moisture 3	<i>SF1</i>		
Soil Moisture 4	<i>SF1</i>		
Soil Temperature 1	<i>SF1</i>		
Soil Temperature 2	<i>SF1</i>		
Soil Temperature 3	<i>SF1</i>		
Soil Temperature 4	<i>SF1</i>		
CRC	N	2	16-bit cyclic redundancy check

Subfield 1 (SF1)

Field	Type	Length	Notes
Maximum	N	2	
Minimum	N	2	
Mean	F	4	
Max_time	N	4	Number of seconds since 1/1/1970
Min_time	N	4	
Mean_time	N	4	(Not used)
Enabled	C	1	(Not yet implemented)

Subfield 2 (SF2)

Field	Type	Length	Notes
Year	N	2	
Month	N	2	
Day	N	2	
Hour	N	2	
Minute	N	2	Always zero
Second	N	2	Always zero
Millisecond	N	2	Always zero

N = integer

F = floating-point number

C = character

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	Length	Notes
Record Number	N	2	
Date/Time	<i>SF1</i>		(See below)
Units - Temperature	C	1	'F' = Fahrenheit, 'C' = Celsius
Units - Rain	C	1	'I' = inches, 'C' = centimeters, 'M' = millimeters
Normal Rainfall	F	4	-1 for trace
Normal Snowfall	F	4	-1 for trace
Normal High Temperature	F	4	
Normal Low Temperature	F	4	
Normal Mean Temperature	F	4	
Record High Temperature	<i>SF2</i>		
Record Low Temperature	<i>SF2</i>		
Record Rainfall	<i>SF3</i>		-1 for trace

Record Snowfall	SF3		-1 for trace
CRC	N	2	16-bit cyclic redundancy check

Subfield 1 (SF1)

Field	Type	Length	Notes
Year	N	2	Not used
Month	N	2	
Day	N	2	
Hour	N	2	Not used
Minute	N	2	Not used
Second	N	2	Not used
Millisecond	N	2	Not used

Subfield 2 (SF2)

Field	Type	Length	Notes
Maximum	F	4	
Minimum	F	4	
Max_time	N	4	Year
Min_time	N	4	Year

Subfield 3 (SF3)

Field	Type	Length	Notes
Amount	F	4	
Amt_time	N	4	Year

N = integer

F = floating-point number

C = character

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

Syntax:

```
[WXCONFIG]»Elev=n»UseHum=n»UseSun=n»UseRain=n»UseET=n»UseUV=n»StnID=s»Data=s»
TZ=s»Units=cccc»CompType=n»Version=n»Tenths=n»DisplayMsg=s»XTn=s»XHn=s»XSTn=s
»XSMn=s»XLtn=s»XLMn=s«
```

Parameter	Description	Syntax	Meaning	Example
Elev	Station Elevation	<i>N</i>	(Not used)	Elev=50
UseHum	Use humidity value	<i>N</i>	0=no, 1=yes	UseHum=1
UseSun	Use sunshine value	<i>N</i>	0=no, 1=yes	UseSun=1
UseRain	Use rain value	<i>N</i>	0=no, 1=yes	UseRain=1
UseET	Use ET value	<i>N</i>	0=no, 1=yes	UseET=1
UseUV	Use UV value	<i>N</i>	0=no, 1=yes	UseUV=1
StnID	Station identifier	< <i>string</i> >	User-defined	StdID=Taunton 2W
Data	Path to data files	< <i>string</i> >	(Not used)	Data=C:\
TZ	Time zone	< <i>string</i> >	User-defined	TZ=Eastern
Units	Units specifier	<i>Rain Pressure Temp Wind</i>	(See units below)	Units=IIFM
CompType	Computer type	<i>n</i>	1=Heathkit ID-4001 2=Heathkit ID-5001 3=Davis WM2 4=Davis Vantage Pro 5=Texas Weather Report 6=Peet Bros. Ultimeater 7=Campbell	CompType=4
Version	Protocol Version	<i>n</i>	2 for this version	Version=2
Tenths	Display data in tenths	<i>n</i>	0=no, 1=yes	Tenths=1
DisplayMsg	Greeting display message	< <i>string</i> >	User-defined	DisplayMsg=Welcome to WxSolution!
XTn	Extra temperature <i>n</i>	< <i>string</i> >	User-defined label for extra temp <i>n</i>	North Field Temperature

XHn	Extra humidity n	<string>	User-defined label for extra humidity n	North Field Humidity
XSTn	Soil temperature n	<string>	User-defined label for soil temp n	6" Soil Temperature
XSMn	Soil moisture n	<string>	User-defined label for soil moisture n	6" Soil Moisture
XLTn	Leaf temperature n	<string>	User-defined label for leaf temp n	North Field Leaf Temperature
XLMn	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:

“»“ character denotes the tab character.

“«“ character denotes CR/LF.

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

A.6.2 Current Data Values

Syntax: <current>item1;item2;...</current>«

	Description	Syntax	Example
T	Outdoor Temperature	n.nF C	T=12.3F
I	Indoor Temperature	n.nF C	I=23.4C
D	Dew Point	n.nF C	D=12.3F
H	Humidity	n	H=56
W	Wind Gust and Direction	n.nM K L mDn	W=12.3MD234
w	Wind Average and Direction	n.nM K L mDn	w=23.4KD345
B	Barometric Pressure	n.nI M	B=29.92I
R	Daily Rainfall	n.nI C M	R=1.23I
r	Instantaneous Rainfall Rate	n.nI C M	r=0.12I
C	Wind Chill Gust	n.nF C	C=-6.7F
c	Wind Chill Average	n.nF C	c=1.2F
X	Heat Index	n.nF C	X=102.7F
S	Sunshine	n	S=99
E	Evapotranspiration	nI M	E=0.12I
U	Ultraviolet Index	n	U=8.5
Tr	Outdoor Temperature Hourly Rate	n.nF C	Tr=12.3F
Ir	Indoor Temperature Hourly Rate	n.nF C	Ir=12.3F
Dr	Dew Point Hourly Rate	n.nF C	Dr=12.3F
Hr	Humidity Hourly Rate	n	Hr=12
Ar	Wind Speed Hourly Rate	n.nM K L m	Ar=5L
Br	Barometric Pressure Hourly Rate	n.nI M	Br=-0.12M
Rr	Rainfall Hourly Rate	n.nI C M	Rr=0.23C
Sr	Sunshine Hourly Rate	n	Sr=-21
G	5-second Wind Speed	n	G=14
g	10-minute Peak Wind Gust	n	g=26
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:

“«“ character denotes CR/LF.

Optional Extra Sensor Data

	Description	Syntax	Example
xTi	Extra Temperature <i>i</i>	<i>n</i>	XT1=73
xHi	Extra Humidity <i>i</i>	<i>n</i>	XH2=94
xSTi	Soil Temperature <i>i</i>	<i>n</i>	XST1=67
xSMi	Soil Moisture <i>i</i>	<i>n</i>	XSM3=8
xLTi	Leaf Temperature <i>i</i>	<i>n</i>	XL2=58
xLWi	Leaf Wetness <i>i</i>	<i>n.n</i>	XLW1=14.3

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

“«“ character denotes CR/LF.

Optional Extra Sensor Data

Syntax:

```
<xsensorF>item1;item2;...</xsensorF>«
<xsensorH>item1;item2;...</xsensorH>«
<xsensorD>item1;item2;...</xsensorD>«
```

Parameter	Description	Syntax	Example
XTHi,XTLi,XTMi	Extra Temperature <i>i</i>	<i>n</i>	XTH3=72
XHHi,XHLi,XHM	Extra Humidity <i>i</i>	<i>n</i>	XHM2=89
XSTHi,XSTLi,XSTMi	Soil Temperature <i>i</i>	<i>n</i>	XSTL1=78
XSMHi,XSMLi,XSMMi	Soil Moisture <i>i</i>	<i>n</i>	XSMH1=12
XLTHi,XLTLi,XLTMi	Leaf Temperature <i>i</i>	<i>n</i>	XLTH2=74
XLWHi,XLWLi,XLWMi	Leaf Wetness <i>i</i>	<i>n.n</i>	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)»
Data=D:\Program Files\Thunderhead Technologies\WxSolution\WxData\»TZ=EASTERN Units=IIFM»
CompType=3»Version=2» Tenths=1»DisplayMsg=Station is now using the Davis Vantage Pro wireless
weather computer.»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>2002/01/22|21:19:13</time><<
PAUSE
<current>T=24.3F;</current><<
<time>2002/01/22|21:19:14</time><<
PAUSE
<current>T=24.2F;W=1.0MD216;</current><<
<hour>TH=24.9;</hour><<
<time>2002/01/22|21:19:15</time><<
PAUSE
```

Notes:

“»“ character denotes the tab character.

“«“ character denotes CR/LF.

PAUSE denotes a break in data in flow.

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