Weather Station Data Logger

User Manual

Version 3.4.2

January, 2010

Preface

This version (3.4) contains changes intended to support a wider range of Windows regional language settings. Versions prior to this may not have worked with language settings other than English (United States). This version is intended to better support other language settings. Please refer to the Release Notes, Options and Log file sections elsewhere in this manual for more details.

This program has a lot of advanced features, but all the default settings are designed to be appropriate for the majority of users. Therefore, if you don't want to get into all the messy details, just follow the steps in the "Getting Started" section and you should be fine.

Please Read This Fine Manual!

If you were looking for a simple program that just copies WRM100 data to the hard drive on your PC, you came to the wrong place! This program is much more than that.

You can install and use the program without reading this manual, but it won't be long before you start having questions. You might not understand what you are seeing, or think that there is a bug in the program. That will be your clue that you need to come back here and start reading!

Here is a small sampling of questions that are answered in this manual:

- I just reset the WMR100 rainfall totals, but the data logger is still showing the same total rainfall as before. What's up with that?
- What are all those different wind values reported by the program?
- Why does the wind graph appear to show different numbers than the wind readout?
- I have extra temperature sensors but they don't show up on the temperature graph. Why?
- Why doesn't the WMR100's comfort level or weather forecast (cloudy/rainy/sunny) show up in the log file?

The manual is organized into three main parts. First is an introduction and quick start guide. Next is a description of important program features. This is followed by detailed reference information.

Philosophy

You'll soon realize that much of this manual has information that may be beyond the level of novice users. Attempts have been made to include tutorial information to help the novice user understand and make use of the more advanced features.

As WSDL grows, it tends to add more and more advanced features. However, it is a constant goal to provide a program that novices will also find valuable. Please feel free to post feedback on the SourceForge forums (Open Discussion or Help) related to this idea. What did you find confusing? How can this program be made easier to use for new users?

The program default settings are chosen to be appropriate for the average novice user. Tabs in the options window are arranged from left-to-right in order of interest to novice users – start at the left and work to the right.

Following the steps under “Getting Started” below should get you going quickly. Later feel free to explore the more advanced aspects of this program at your leisure. It’s much easier to go slow and take small bites instead of trying to understand everything all at once.

License Information

Part I

Introduction

The Weather Station Data Logger software provides the ability to view, archive, analyze and share data from Oregon Scientific weather stations. Starting with beta version 2.9.5.1, the WMR100, WMR200, WMRS200 and RMS300 stations are supported. Support for the WMR200 is new and may not be fully bug free yet. Please post bugs on the SourceForge help forum.

This software provides the following capabilities:

- Data capture of all important weather station measurements.
- Recording and archival of weather data in a portable CSV format.
- Analysis of recorded data.
- Display of captured and analyzed data with up to sixteen simultaneous graphs.
- Web upload capability to the Weather Underground web site and CWOP servers.
- Web page generation with FTP upload to web servers.

History data logged inside the WMR200 is not used by WSDL, although future versions may offer some level of support for this.

This software is available free of charge and is licensed as indicated on the previous page.

Users are encouraged to post bugs, comments and feedback on the software project's forum, which can be found at this URL:

http://sourceforge.net/projects/wmrx00/forums

The project also maintains a web page at this URL:

http://wmrx00.sourceforge.net

Contributions to the project from users is welcomed; please post ideas or offers for help on the forum.

As of August, 2009 this project is under active development by the author. This will not always be the case. If you have any feedback or enhancement ideas that could improve the program, please post something in one of the forums soon!

The appendicies that were contained in earlier versions of this document have gotten rather large and have been moved to separate documents. The appendicies can be downloaded separately from SourceForge. Look under the “Documentation” folder in the full file listing.

System and Hardware

This software was written to support the Oregon Scientific WMR100, WMR200, WMRS200 and RMS300 wireless weather stations. The WeatherJack barometer can optionally be used in place of the built-in barometer in the Oregon Scientific units.

Support is provided for data collected from the main external sensor package (anemometer, thermometer, hygrometer), and external rain gage and the main inside console unit (temperature, barometer, clock). Full support is also provided for up to 9 additional wireless temperature sensors.

Partial support is provided for the THWR800A water temperature sensor.

Support is now provided for the external UV sensor. This includes graphing of data and internet upload.

There are a few data items which are not used (or only partially used) by the program, such as the “smiley” weather trend and sun or rain forecast information.

The software is known to run on Windows 2000, XP, Vista and Windows 7. It requires at least the Microsoft .NET runtime version 2.0 with service pack 2 (SP2). Both 32 and 64-bit versions of XP, Vista and Windows 7 are supported.

If you are using a 64-bit version of Windows, be sure you have the latest updates to the Microsoft .NET Framework. Crashes have been known to occur otherwise.

Not much memory or disk space is necessarily required by this program. A full year's worth of data in a weather log takes less than 50MB of storage. On the other hand, frequent log file backups can cause a fair amount of disk usage depending on the trimmed log size.

Battery state indicators for the WMR200 may be inaccurate. Work is going on to fix this problem and a new release will be made available if and when it gets fixed.

Getting Started

Here are a recommended set of steps to follow in getting the data logger software configured and running.

First, read the rest of this document. If your eyes start to glaze over on certain sections, skip them but try to remember the topics for future reference. Then, plan to experiment for a while with the software. You may decide to delete weather logs and options, etc. a few times before settling on a configuration you are happy with.

1. Decide where on the computer's hard drive you are going to store weather logs and backups. It is a good idea to store backups on a different physical disk if possible.

2. Install the program and start it – but do not connect the weather station yet. Open the options window and select the units you want for display and for the log file. Unless you have a good reason to do otherwise, choose identical units for both the display and log file (except time zones). For example avoid using degrees F for display and degrees C in the log file.

   Choose whatever time zone you prefer for display. ***DO NOT*** choose local time, and instead select a fixed UTC offset (zero offset is not a bad idea) for the log file units. These settings are highly recommended to avoid trouble down the road. Don't change them unless you need a different behavior and understand the consequences. You'll find more on this topic in the reference section of this manual where the Options Window is explained.

3. Feel free to experiment with all other option settings – except for the one to share USB devices (turning that one on often causes trouble). If you change the log file directory, make a note of the prior setting so you can find the old log file again.

4. When you click “Save” in the options window, one or more warnings may come up telling you that log file units or other items have been changed. Read the explanation and click “OK” – the program may exit if certain options have been changed.

5. Start the program again. If you did not change the weather log directory, you'll get a dialog with OK/Cancel buttons. Press Cancel. A file dialog will pop up – use it to delete the weather log file (WxLog.csv). Close the file dialog. Either way, at this point, you should get a notice telling you that a new weather log has been created, and the units have been initialized. If you look at options again, you should see the same units you set earlier. If instead, you get a warning that your changes to weather log units have been discarded, it means you did not delete, move or rename the old weather log. If you have trouble with this, read the chapter about the log file.

6. Don’t run more than one copy of WSDL at a time, and don’t try to run any other programs which talk to the weather station simultaneously (like VWS or WD). The programs sometimes end up “competing” for USB data and will corrupt each other’s USB data streams. Well okay, later on you can try this if you want and it might work – but don’t confuse things at first and just keep it simple.

7. Turn on the weather station. Set the proper time zone and station elevation (altitude). Wait for the altitude change to take effect on the barometer reading (this can take up to 15 minutes).

8. Connect the weather station to the computer and the program should start displaying data within a minute or so. If you don't get data try a kick start (in the File menu) and check the message log (View menu) for more information. It will require several minutes worth of data before all of the displays become active and fully functional.

9. If something doesn’t seem to work, check back here first. Many problems are simply due to improper option settings or a lack of understanding about program operation. WSDL will not do everthing it is capable of “out-of-the-box” without setting up options for the desired features. Also check the project web site for an FAQ page that man help answer common questions.

Upgrading from Version 2.5

This should be mostly automatic – except for the issue of option settings.

Version 2.5 was the first version to use the ability of Microsoft's .NET framework to store settings in XML files (in the user's Documents and Settings directory). Programs are (in theory) capable of importing options from earlier versions – if all the details are managed correctly. You can probably guess where this is heading – version 2.5 did not get all the details just right.

The details have been straightened out in version 2.8. However, as a result the program may need a little help from the user to import settings from version 2.5. The upgrade might just work, but here are some tips to ease the way, just in case:

1. Before installing the new version, disconnect the weather station USB cable and make a backup copy of the current weather log file.

2. Open the options dialog in the old version, and write down any settings you can't remember. This is in case you need to manually set options for version 2.8.

3. The new version will attempt to find the options from version 2.5. In many cases this will succeed.

4. If this does not work, read the chapter below regarding options. You may still be able to copy the "user.config" XML file from version 2.5 into the options directory.

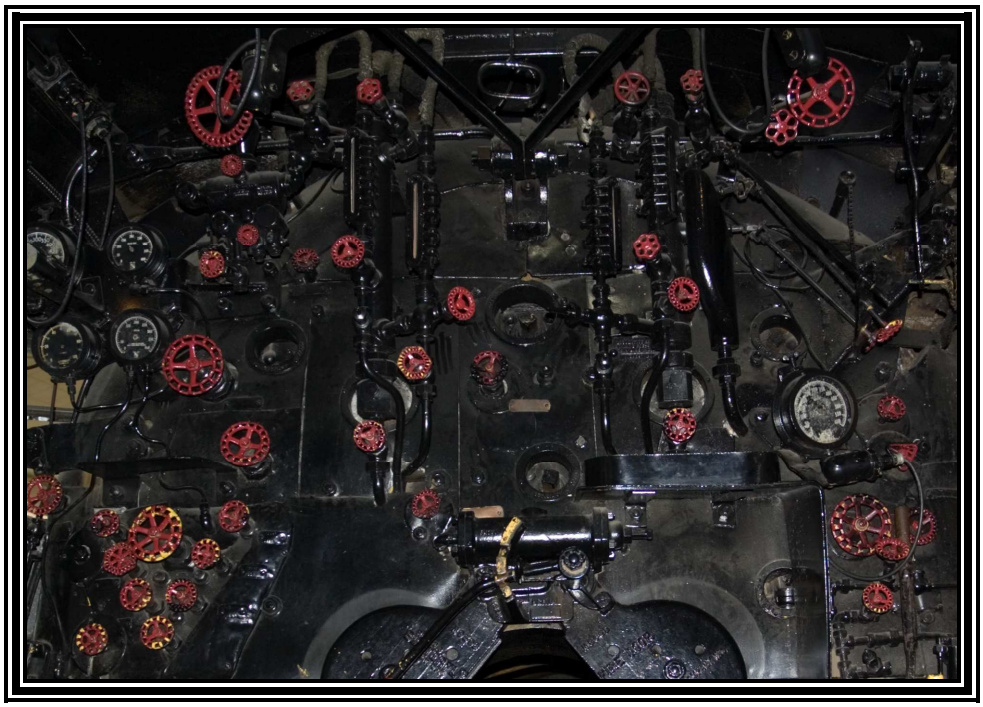
5. If that fails, the options will need to be set manually.

These problems should not occur in the future when updating from version 2.8 to later releases.

The weather log will be upgraded the first time version 2.8 is run. After the upgrade, version 2.5 will no longer be able to read the weather log. If you wish to return to version 2.5, the backup saved before the upgrade must be reinstated manually.

Part II

Program Features



Anemometer Data

An explanation of wind data processing is provided here. This type of weather data goes through a significant amount of processing by the software.

The WMR100 reports two different wind speeds – gust and average. However, the gust value appears to be collected over a fairly short time period and is often observed to be less than the average value. As a result, it was decided that the gust reading would be treated as if it were the current wind speed – not a gust value.

Every time a wind message is received from the weather station, the raw data (current and average speed plus direction) is stuffed into a 10-minute buffer. That is, at any given time the most recent 10 minutes of raw wind data is available.

Once a minute, prior to updating the weather log file, the wind data buffer is analyzed to produce several results.

1. The largest wind reading in the last minute (1-minute gust). This is based on current wind data, not the average data.

2. A 2-minute average of direction and average speed readings. Being an average of the averages reported by the weather station, the effective averaging period may be longer than two minutes. If someone can figure out what the wind averaging period is, it would be possible to massage this data to reflect a true 2-minute average. Please post a message to the wmrx00 forum on SourceForge if you have this information!

3. Minimum and maximum wind direction in the last 2 minutes, plus a flag indicating whether a variable direction METAR report is warranted.

4. The largest wind reading in the last 10 minutes. Again, this is based on current wind data, not the average data.

5. Based on the largest variation in current speed over the last 10 minutes, a gusting flag is set. This is used in the generation of METAR reports.

Analyzed results are used in three places.

1. On-screen METAR display.

2. The weather log file records 1-minute gust and 2-minute average information.

3. Reports uploaded to Weather Underground contain 2-minute average and 10-minute gust values.

Further analysis of data from the weather log is used to produce the 1-hour gust on-screen reading. As mentioned elsewhere in this manual, data from the log file is passed through a 30-minute sliding window and filtered prior to being graphed.

Rainfall Data Processing

Data received from the weather station includes rainfall rate, rain during the current hour, rain during the past 24 hours (this does not appear to include the current hour) and total rain (since the total was last reset). Also available is the date and time when total rain was last reset.

Only rain rate and total rain reported by the WMR100 is stored in the weather log since the hourly and daily totals can be computed from changes in total rain.

The total rain reset-date is not stored in the weather log. Programs used to post-process the weather log can detect total-rain reset events and arbitrarily compute total rain since any desired point in the weather log.

Starting with version 2.5 of the program, rain data displays and graphs can use data from the weather log instead of directly using the weather station's reported values. This choice has a couple of benefits; rain total resets are handled better, and daily rain is displayed instead of a 24-hour rain total.

When the weather station is reset, total rain amount is also reset. Sometimes, the station must be reset due to a communications failure or other reason. This resets the rain total to zero even if that was not desired. Choosing to source rain data from the weather log eliminates this problem. When total rain resets appear in the weather log file, the software essentially ignores the reset event and keeps building the total rain amount without interruption. The software only resets rain totals on November 1st of each year – when annual rainfall totals are normally reset.

Another effect of sourcing rain data from the log file is seen in the rain data readout. While the WMR100 reports rain in the last 24 hours, the data logger software will now display rain since midnight, or "Rain Today". Midnight is taken in the context of the display time zone.

The hour at which daily rainfall totals are reset varies quite a bit around the world. In the UK, it is 09:00 GMT. Australia uses 9AM local time. In the U.S. there does not seem to be a standard – in some places 4PM local time is used; elsewhere it is midnight local time. For now, this program resets at midnight local time. A future version will allow user control of the reset hour.

It is worth mentioning that the log file always contains the raw total rain amounts reported by the weather station. Total rain resets can always be seen in the log data and are never actually removed from the log. Instead, when software reads the log file, it detects rainfall reset events and artificially removes them from readouts and plots. Leaving the original total rain data intact allows for more flexibility in post-processing the log file. Total rain data is multiplied by the user-supplied calibration factor prior to being written to the log file.

Users wishing to use log file data in other applications must detect and remove rain reset events themselves. Another option is to use the rain processing tool to write a "processed" log file (available in the "Tools" menu).

Program versions starting with 2.8 offer the option of counting rain bucket tips where the user provides a calibrated bucket tip amount. See the appendices for more information on this option (the appendices are a separate download on SourceForge).

Temperature, Dew Point and RH Processing

The Weather Station Data Logger processes raw temperature and relative readings a certain amount prior to display and logging of this data. The user has control over how relative humidity data is handled – it can be used verbatim, or adjusted slightly when humidity rises above 80%.

Temperature

The most recent temperature readings are used for display and logging purposes. Except for FTP web page uploads, a five-minute average of temperature is used instead. Therefore, the data you see on either Weather Underground or MADIS may differ slightly from the displayed or logged values. The five minute averaging process is recommended by CWOP.

Starting with version 3.0, a calibration offset can optionally be added to temperature readings. Each sensor can have a different offset amount.

Dew Point

WMR100 sensors report temperature and dew point in degrees Celcius. Relative humidity is reported in percent. Temperature is reported with a resolution of 0.1C (or 0.18F), and humidity has a resolution of 1%.

If dew point data from the WMR100 is examined carefully, it appears quite “chunky” and although the data resolution is 0.1C, the actual resolution appears to be much larger than this. For reasons of aesthetics mostly, the WSDL program uses reported temperature and relative humitidy to re-compute a dew point value. The resulting dew point graphs are smoother and there is no reason to expect they are any less accurate than dew points reported by the WMR100.

Conversion between relative humidity and dew point is not trivial, and WSDL uses some fairly advanced and accurate formulas and curve fits to implement the conversion (details below).

Web uploads to CWOP contain the relative humidity, but do not include dew point. Uploads to Weather Underground use a 5-minute average value for dew point.

Relative Humidity

As recommended by CWOP, relative humidity is reported using a one-minute average – but since the wireless sensors only report about once per minute this usually amounts to no averaging at all.

Beginning in version 3.0, an optional calibration offset can be added to RH readings. Each sensor can have a different offset.

You may have noticed that when it's raining or foggy outside, relative humidity is not reported as 100%, but perhaps only 95% or 98%. The WMR100’s console unit and the dedicated outdoor sensor (channel 1) will report a maximum of 98%, while the THGR810 wireless sensor’s maximum reported RH is somewhere between 95% and 98% (see below).

WSDL offers the option (enabled by default) to adjust humidity readings so that a reported value of say, 98% will be displayed and logged as 100%. This is partly provided for aesthetic purposes, and there is reason to belive that accuracy may be slightly improved in the process.

Relative humidity sensors are most accurate over the middle part of the scale – say from 30% to 70% for example. These sensors tend to be much less accurate above 80% and below 20% RH.

The author has spent some time observing RH sensor readings as the air becomes saturated (due to rain and/or fog). The WMR100 sensors do seem to report steadily increasing RH values right up to the point of saturation. It is therefore reasonable to conclude that the sensor can distinguish for example, between 100% and 98% RH conditions. If on the other hand, the sensor's reading actually max'ed-out at say 95% RH, then you would expect to see the 95% reading reported before the atmosphere was actually saturated.

Finally, users should not get the impression this is guaranteed improve the accuracy of the RH sensor. Although unlikely, it could even make the readings less accurate! Remember, these corrections are only applied in increasing amounts as the RH exceeds 80%. No corrections are applied below 80% RH.

Watching the RH readings while fog forms, you can get an idea whether to use the RH calibration feature. The humidity will not truly be 100% until there is visible moisture in the air, so if your sensor continues to show increasing readings right up to the point where fog forms, then you will probably get some benefit from this feature. Also, keep in mind that the RH sensor readings are not instantaneous – there is a time lag of a few minutes.

These corrections will always have the effect of "bumping up" the dew point reading. To keep things in perspective, if the RH calibration setting is 98%, the maximum upward correction in dew point will be no more than 0.7 deg F. For a RH maximum setting of 95%, dew point will be adjusted upwards by no more than 1.7 deg F. These values are really worst case as they were figured for an outdoor temperature of 100 deg F, and will be significantly less at lower temperatures.

The calibration offset is applied before the high-RH adjustment is made. For example if the sensor is reporting 79% RH and the calibration offset is +3% the adjusted RH will be 82%. This is larger than 80%, so the high-RH adjustment will also be applied in this case.

The THGR810 Sensor

The author recently acquired a couple of these sensors. They have been installed outdoors in shielded enclosures. Oregon Scientific may not have intended these to be operated in a protected outdoor environment – time will tell if they will hold up!

Anyway, at first neither of them would read above 95% RH even in the fog. After a few weeks of intermittent exposure to foggy weather, one of them will now read as high as 98% while the other one won't go above 96%. A few couple more weeks later and both are going right up to 98% in the fog. The point is that it probably makes sense to watch them for a while to see where they settle in (if they do settle in).

Some More Details

For those interested in the details of computing dew point, WSDL now uses equations published by Arden L. Buck (NCAR) in 1981. These include a small correction factor for moist air which improves accuracy slightly over what was used in releases prior to 2.8.8. The improvement is very slight – previous versions of WSDL were plenty accurate without this change.

For the maximum RH tweaks, a linear correction is created which starts at zero for an 80% RH reading from the WMR100, and linearly increases such that the user-specified reading becomes 100%. If the raw reading exceeds the user specified maximum, the RH value is clipped to 100%.

The WMR100 Barometer

The WMR100 console provides two different barometer values. The first is called “station pressure”, also known as QFE; this is simply the actual pressure being measured by the WMR100’s barometer. The second value is (probably) “sea level pressure” (SLP) which is determined by mathematically simulating the atmosphere – in essence guessing what the barometer would measure if it were lowered to sea level through an imaginary hole drilled in the ground. This “guess” is based on (among other things) an elevation which the user enters into the WMR100 console.

SLP

The act of “guessing” what sea level pressure (SLP) would be based on station pressure is tricky. In fact, the higher your elevation is, the trickier it gets. There are several ways to do it and none of them can really be considered the “correct” method.

There is some confusion about the WMR100’s SLP reading, as the user manual only makes a vague reference to “sea level”. The author has attempted to reduce the WMR100’s station pressure reading to sea level with commonly used formulas, and none of the results agree with the WMR100’s sea level reading – that is unless the ***indoor*** temperature is used in the formulas. If this analysis is correct, the SLP reading provided by the WMR100 will only agree with accepted methods when the indoor and outdoor temperatures are equal. So, if you live at a high elevation (Colorado, for example), the WMR100’s seal level reading will be way off on a cold winter day when the console is indoors at a comfortable 68 degF.

Because of this suspected mistake, WSDL offers the option to compute SLP independently from the WMR100. WSDL incorporates the same method used by National Weather Service ASOS stations. This method for reducing station pressure to SLP uses the station elevation, current temperature and dew point plus a 12-hour temperature average. Also, if the elevation is above 1000 feet, the station’s ***normal annual temperature and dew point*** (more on this below) are required.

For WSDL to properly compute SLP, the user must enter two additional pieces of information into the options dialog window. First, the elevation of the WMR100 console must be entered in the Upload tab under the CWOP information section. This should be the elevation of the console – if it is 15 feet above ground level this should be taken into account.

The second piece of information is only required if the elevation is 1000 feet or more. It is the ***normal temperature*** where you live. This is not easily figured out – but luckily WSDL provides a tool for this purpose. In theory, a normal annual dew point is also required, but WSDL deals with that behind the scenes automatically. For ASOS stations (which report SLP), meteorologists experimentally determine these values on a station-by-station basis. You probably won’t have a lot of luck getting a team of NOAA meterologists to come out and determine your “normal temperature”.

So what can you do? If your elevation is 1000 feet or less, you don’t need to worry about it. Otherwise, locate a nearby airport that has a METAR report that includes SLP. On the aviationweather.gov website, you can get individual METAR reports plus cycle files that will contain the 12-hour old data you’ll need. In WSDL’s tools menu, select the normal temperature calculator option. Follow the directions and you will have your normal temperature. The performance of this method is still under investigation by the author. While the end result is not known, this method is in all likliehood more accurate than the SLP value from the WMR100. This manual will be updated as more is learned.

QNH

Another way that station pressure can be reduced is called “altimeter setting” or QNH. This pressure value is used extensively by pilots – it is the number they must dial into an aircraft’s altimiter so that it reads correctly when on the runway. It is common to see a difference between QNH and SLP and this difference can become larger at higher elevations.

Reducing QFE to QNH is much simpler than computing SLP. The formula only considers the station elevation and does not take temperature or humidity into account.

Data uploads to CWOP require that QNH be reported instead of QFE or SLP. Therefore, WSDL includes the ability to reduce station pressure to QNH. This process uses the station elevation entered into the CWOP portion of the options dialog (see the Upload tab). If you choose to display QNH in the barometer window, then be sure an accurate elevation has been entered into the CWOP portion of the options window – otherwise the QNH readout will be wrong.

The WeatherJack Barometer

The WMR100 barometer has a resolution of 1 mb or 0.039 inHg. This is a fairly coarse resolution and is useful for watching major storm systems coming through. On the other hand, normal diurnal (twice daily) fluctuations in pressure are difficult or impossible to discern. Also, the pressure only updates once every 15 minutes.

There is another inexpensive alternative however – the WeatherJack barometer. This barometer has a resolution of 0.004 inHg – roughly ten times that of the WMR100! Experiments by the author have shown this can indeed be a very accurate and sensitive addition to your weather station, and you'll get a new reading every minute instead of once every 15 minutes.

To get the excellent performance this unit is capable of however requires a rather technical user, construction of a precision power supply and temperature calibration. Because of this limitation the details are only presented in an appendix to the user's manual. Those interested should download the appendix from SourceForge for further information. It is available in the "Documentation" section of the download area.

Unless you are using the WeatherJack barometer, the WeatherJack tab in the options dialog should be ignored.

Weather Underground

Versions of the program starting with 2.5 can upload weather station data to Weather Underground on a periodic basis. Although Weather Underground does not have strict requirements for the installation of your weather station, it is still highly recommended that you spend some time making sure the station is properly "sited" if you plan to upload weather data. The Weather Underground web site has some good information on this topic.

The following data is uploaded.

- Outdoor temperature (5-minute average), dew point (5-minute average) and relative humidity (1-minute average).
- The "Sea Level Pressure" reported by the WMR100. This is computed internally by the WMR100 using the altitude you enter into the WMR100 base unit.
- Wind (two minute average and 10-minute gust).
- Rain (since midnight and within the last hour).

Version 2.5 required all data to be valid before an upload would occur. Starting with version 2.8, uploads require only one piece of data in the above list to be valid. Data which is invalid will be omitted from the upload request.

Versions after the initial 2.8 release allow the temperature/dew point data to come from a user-specified wireless sensor. The original WMR100 used a temperature sensor integrated with the anemometer. The ideal location of the anemometer (10m high) conflicts with the ideal temperature sensor location (5 feet high). Some users may wish to install a THGR800 or THGR810 sensor in a custom radiation shield at the proper height and use this data instead.

Uploads can be configured and enabled in the options window. If you are going to be uploading data to CWOP it would be somewhat redundant to also configure Weather Underground uploads – WU will pick up the data feed from CWOP automatically. See the CWOP section below for more information.

Occasionally, uploads will fail. Upload failures are logged in the message log. The program tries to make an assessment as to the nature of the failure: is it transitory or permanent (fatal)? If an upload fails and the cause is determined to be permanent, further uploads will be automatically disabled and the options are updated to reflect this. Transitory errors are logged, but otherwise ignored and upload attempts will continue.

One example of a "fatal" error is an invalid Weather Underground user ID or password. This is not likely to get fixed until the user edits the stored information, so further uploads will be disabled. The user will need to correct the ID and/or password, then re-enable uploads.

A failed Internet connection to the Weather Underground web site is considered non-fatal. In this case, the program will continue to attempt periodic uploads as long as the feature is enabled.

Citizen Weather Observer Program

Versions of the program starting with 2.8.8 can also upload data to the Citizen Weather Observer Program (CWOP). This data finds its way onto NOAA MADIS servers and is used by NWS forecast offices and professional meteorologists. You can find out a lot more about CWOP from this web page:

http://www.wxqa.com

Since the data sent to CWOP is used by NOAA and professional meteorologists, you will want to be sure your weather station is properly installed, or "sited". The following wiki page will give you complete instructions for setting everything up correctly:

http://info.aprs.net/index.php?title=Weather

A very good guide (CWOP_Guide.pdf) can be downloaded from this page. Be sure to read through this document carefully, and make sure you feel comfortable with the guidelines before proceeding.

Once the weather station is properly installed, you will need to accurately determine the latitude, longitude and elevation of the station. There are many ways to do this, including:

- Internet mapping programs such as GoogleEarth
- Handheld GPS receivers (CWOP recommends against determining elevation using GPS)
- USGS topographical maps

Next, obtain a station ID from CWOP – use the "Join CWOP" link on the first web site listed above. You will receive an e-mail with your new station ID, instructions and some very useful links.

Now the CWOP setup information can be filled in on the options dialog window. Select the "Web" tab and see instructions elsewhere in this manual for the dialog. The "Test" button will send some canned weather readings to the CWOP server. The instructions from the e-mail will explain how to determine if the upload worked.

Once everything is working and your data is being passed onto the NOAA MADIS server, Weather Underground should automatically pick up the feed from MADIS, although it may take a week or two. The only difference between this and direct uploads to WeatherUnderground is that MADIS data is sent to WU on a fixed time-table that you have no control over. The MADIS feeds are identified as "APRSWXNET" in the Weather Underground listings. If after a few weeks your site does not show up on Weather Underground, then drop them an e-mail and ask if you need to do anything else. Even if the station does not show in the W.U. listings, you may be able to access it with a URL like this (replace "WC1234" with your actual CWOP ID).

http://www.wunderground.com/weatherstation/WxDailyHistory.asp?ID=WC1234

Of course, over time, this URL may change and become invalid!

As recommended by CWOP, the temperature data is a five minute average of the outdoor sensor readings. Similarly, relative humidity is a one minute average.

Elevation must be entered into the options dialog accurately. CWOP needs barometric pressure reported as an “altimeter setting”. The WMR100 does not offer readout of altimeter setting, so WSDL uses station pressure reported by the WMR100 and computes the altimeter setting internally. This calculation is done using the same formula used by ASOS stations. The formula can be found at the following web sites:

http://www.srh.noaa.gov/epz/wxcalc/wxcalc.shtml
http://wahiduddin.net/calc/refs/ASOS_Pressure.htm

The altimeter setting will not be accurate unless you have entered an accurate elevation. Since the WMR100 reports pressure with a resolution of 1mbar, your elevation should be accurate to 30 feet or better.

Be sure to check out the quality control feedback available on your weather data. This can help you determine if your station is properly installed and accurate. The quality control page URL can be formed by dropping the first character of your station ID as shown below. For example, a station ID “WC1234” would use this URL:

http://weather.gladstonefamily.net/site/C1234

As before, this URL may change over time and become invalid.

If you determine that your barometer reading is off by a small amount, the elevation in the CWOP options dialog can be tweaked a little bit to compensate. If the barometer is off by a lot, this technique may not work so well.

Web Page Upload

A new capability in version 3.0 is the ability to generate and upload HTML web pages to web servers. A description of this feature is provided here along with a short tutorial for those who are wondering how this might be of some use. Please be sure to read the discussion of FTP security issues in the reference section of this manual in the "Options Window" section.

HTML

HTML (or "Hyper Text Markup Language") is the computer language that web pages are written in. WSDL is now capable of creating HTML files that contain data from your weather station. If these files are then uploaded to a web server (WSDL can do this), your weather will be available as a web page on the internet.

If you want to learn more about HTML, try searching the internet for things like "HTML for dummies" and the like. If you don't want to bother, WSDL includes a couple of basic templates so you never have to even look at HTML (almost). One good place to learn a little HTML on the internet is here:

http://www.w3schools.com

Web pages can also be generated with HTML editors or web page generation programs. These generated pages should also work as long as the WSDL tags are included. The "Arachnophilia" HTML editor was used to produce the HTML examples included with WSDL.

Javascript

Some of the examples include a little Javascript. Novices should probably just skip over this until they have a little familiarity with HTML. The same web site mentioned above is also a good place to learn about Javascript.

How does this work?

So, here's how it works. You provide WSDL with a "template file" – which mostly contains HTML, but also contains a few placeholders (called "tags") for actual weather data. Here's an example of what this might look like:

```
<p>The current barometer reading is [StationBarometer] [BaroUnits].</p>
```

Everything in the line above is HTML except for "[StationBarometer]" and "[BaroUnits]", which are placeholders that WSDL will replace with the actual barometer reading and the units (like "inHg" or "hPa"). After being processed by WSDL (and being saved in a different file), it will look like this:

```
<p>The current barometer reading is 28.88 inHg.</p>
```

WSDL has replaced the two tags with the actual weather station barometer reading and units.

Periodically (as specified in the options window), WSDL will create a new HTML web page with your current weather information as follows:

1. Grab a copy of the template file.

2. Replace the various placeholders in the template file with your current weather data.

3. Save the result as a new file – this is now a valid HTML file (web page).

4. Transfer the new file to a web server of your choice. This (optional) step automatically makes the new web page available on the internet.

Web Servers

So where you ask, can I get a web server? The answer is simpler than you may think. If you have an ISP (internet service provider) account, then you most likely have access to a web server. Most ISP accounts allow you to setup a web site associated with your account. Contact your ISP or visit their web site to learn more.

WSDL uses something called “FTP” to transfer files to web servers over the internet. “FTP” stands for “File Transfer Protocol” and this is just another way that computers can talk to each other. Most web servers provided to customers by ISPs will offer the ability to upload files using FTP.

Let’s continue by assuming you don’t already have a web site setup on your ISP’s web server. Check with your ISP for instructions on setting up a web site – they will usually have at least some basic information available. Pay particular attention to information about FTP file tranfer.

For example, with my ISP there are two ways to get to the web page directory. From the ftp login directory, I can access the web page directory through the “public_html” directory. Alternatively, I can access the same location from the root directory as “/home/WWW_pages/<user>/” where <user> is my user id. FTP uses forward slash characters “/” to separate directories instead of the back-slash “\” used by Windows.

Once you know where the web home directory is you’ll probably need to create a file called “index.htm” or “index.html” that will contain your weather page. Again, your ISP should have information on this.

That’s all the information you should need. Let’s assume my user id with my ISP is “fred”. The FTP tab in the WSDL options window has a field called “URL”. For me there are two values I could enter here that would work:

ftp://ftp.isp.com/public_html/index.htm

ftp://ftp.isp.com//home/WWW_pages/fred/index.htm

The difference between upper and lower-case letters is often significant on web servers, so pay attention to this. The second link contains two “/” characters before the word “home”. This navigates to the ISP’s root directory, while omitting the second “/” will navigate from your FTP login home directory instead.

That’s probably the worst of it. To begin with if you just want to use one of the supplied template files, they are in a zip file located in the same directory that WSDL itself is installed into. For the Result file, you can specify any file name anywhere on your computer. However, it might make sense to pick a new filename in the same directory as the template. DO NOT choose the template file name for the result file – this will over-write the template, destroying it. It would be a good idea to make a copy of one of the supplied template files in some other directory for your experimentation.

Examples and Testing

Several examples of web pages are provided as a separate download on SourceForge. If you are a beginner, then start with the simple example and work up from there. The test page just shows all of the different tags that are available.

The example weather icons were obtained from the www.gstudio.us website and are copyrighted – they are for personal use only – commercial use is prohibited! You don't need to use these icons – there are lots of weather icons out there on the internet. Moon phase icons are licensed under the LGPL.

To get started, make a copy of the simple example template in a new directory somewhere. In the options dialog, choose the template and result files, but leave the FTP URL blank. The result file should be in the same directory as the template, but with a different name. Then push the "Test" button. This will create the web page output file, but the FTP upload will be skipped (because the URL field is blank). Now, you can double-click on the result file (in your computer browser window) to see what the resulting web page will look like. You can also right-click on the result and open it with notepad or wordpad to see the raw HTML. Much of the weather information here is just "dummy" data. The dummy data uses fixed units (not your current display units setting) so don't be alarmed if the units are not what you expected.

To move testing to the next level, open the options window and set the FTP upload interval to something short (like one minute) and check the box to enable uploads. Uploads will still not take place. However, once a minute a new web page will be created containing current weather data instead of dummy data. This may help in fine tuning the web page.

Once the web page looks good the actual FTP upload can be tested. The more complicated examples will require that all of the example files (except the template file) be transferred to the web server first. If you are not sure how to do this, ask a web-experienced friend for help.

Going Live

Once this is working, then you can fill in the FTP URL field, user id and password and check the SSL connection box. Don't check the box to allow unsafe certificates at first. Try the Test button again. If it works, you should be able to view the same web page on the internet now. If the upload fails, double-check the URL, name and password. Also try checking the option to allow unsafe certificates. As a last resort, un-check the SSL connection option. Unless the SSL connection option works, the password is sent over the internet un-encrypted. This means it can be intercepted and used to "hack" into your ISP account. If this is a concern, consider creating a separate account with your ISP that will only be used for the weather web site – this will limit the potential damage if someone does manage to grab the password. If the SSL connection option works, the risk is substantially reduced. See the description of this option in the reference section below for more information.

Firewalls, anti-virus programs and routers (wireless or wired) can often cause problems getting FTP with and without the SSL option to work. These problems are beyond the scope of this manual but they are always good suspects to start with.

Once you are happy, choose an upload interval and check the "Enable Updates" check box. Save options, and enjoy!

That's about all the help that can be provided here – if you need more, try talking to a friend who is computer savvy.

Template File Processing

The template file is processed as a text file. It will usually contain HTML, although this is not required. Any string in the file matching one of the tags listed below will be replaced with the indicated information in the output file. Data will be output in the same units as are being displayed by WSDL on screen. It's as simple as that.

Oh yes, the tags are actually case-insensitive. For example, you can use either "[Location]" as a tag, or for the eclectic folks, "[lOCAtiOn]" will work also.

Some of these values require that certain options be set, such as longitude, latitude, elevation and "normal temperature". See the reference section of this manual for more details on these options.

Tag	*Will be replaced with*	*Tag*	*Will be replaced with*
[Location]	Station description from WSDL options window	[QnhBarometer]	Altitude-corrected pressure (altimeter setting) †
[UpdateSeconds]	How many seconds between web page updates	[SlpBarometer]	Sea Level Pressure †
[Date]	Date of the weather report	[StationBarometer]	Station pressure, sometimes called QFE †
[DayOfWeek]	Name of today (e.g. "Tuesday")	[QnhForecast]	Forecast text based on WMR100's sea level pressure**
		[QnhRate]	Pressure change rate (per hour), computed using 3 hours of data.
[Time]	Time of the weather report	[StationForecast]	Forecast text based on altitude pressure**
[TimeZone]	Long name of the display timezone	[RainRate]	Current rain rate
[TZ]	Short name of the display timezone	[RainThisHour]	Rain received in the last 60 minutes
[DayNight]	Either "Day" or "Night" *	[RainThisDay]	Rain received since midnight in the display time zone
[Sunrise]	Hour and minute of next sunrise (e.g. "6:43 AM") *	[TotalRain]	Total rain as displayed on the WMR100 console
[Sunset]	Hour and minute of next sunset *	[RainSince]	Reset time for total rain on the WMR100 console
[GustSpeed]	Current wind gust speed directly from the WMR100	[AnnualRain]	Rain for the current year as computed by WSDL
[AverageSpeed]	Average wind speed directly from the WMR100	[AnnualRainSince]	Reset date for the annual rain total
[Direction]	Wind direction directly from the WMR100	[RainUnits]	Unit of measure for rainfall

Tag	*Will be replaced with*	*Tag*	*Will be replaced with*
[2minAvgSpeed]	2-minute average of reported speeds	[WindUnits]	Unit of measure for wind speed
[2minAvgDirection]	2-minute average of reported directions	[BaroUnits]	Unit of measure for barometric pressure
[10minGustSpeed]	Maximum gust over the last 10 minutes	[Uv]	Current UV Index
[10minGustDirection]	Direction of the 10-minute maximum wind gust	[WUid]	Weather Underground station ID
[CWOPid]	CWOP station ID	[MADISid]	This is the CWOP ID with the "W" removed (see below)
[MoonRise]	Time of today's moonrise	[MoonSet]	Time of today's moonset
[MoonUp]	"Up" or "Down"	[MoonPhase]	One of the strings listed below.#
[NewMoon]	Date of next new moon	[FullMoon]	Date of next full moon
[TempUnits]	Temperature display units	[RhUnits]	Relative humidity display units
[SensorName<n>]	User specified name for wireless sensor 'n' ††	[AppTemp<n>]	Apparent temperature for wireless sensor 'n' †† ***
[Temperature<n>]	Temperature, sensor 'n' ††	[HeatIndex<n>]	Heat index, sensor 'n' ††
[DewPoint<n>]	Dew point, sensor 'n' ††	[WindChill<n>]	Wind chill, sensor 'n' †† ***
[RH<n>]	Relative humidity (percent), sensor 'n' ††		
[TempRate<n>]	Temperature change per hour, computed using 15-minutes of data, for sensor 'n'	[DewPtRate<n>]	Dew Point change per hour, computed using 15-minutes of data, for sensor 'n'
[Date<d>]	Date for min/max data on day 'd' ‡	[Temp<n>Min<d>]	Minimum temperature for sensor 'n' on day 'd' †† ‡
[DayOfWeek<d>]	Day of week for min/max data on day 'd' ‡	[Temp<n>Max<d>]	Maximum temperature for sensor 'n' on day 'd' †† ‡
[UvMin/Max<d>]	Minimum or maximum UV reading for day 'd' ‡	[DewPt<n>Min/Max<d>]	Minimum or maximum daily dew points on day 'd' †† ‡
[GustMax<d>]	Maximum wind gust, day 'd' ‡	[Rh<n>Min/Max<d>]	Minimum or maximum relative humidities on day 'd' †† ‡
[QfeMin/Max<d>]	Minimum or maximum station pressure for day 'd' ‡	[SlpMin/Max<d>]	Minimum or maximum sea level pressure for day 'd' ‡

Tag	*Will be replaced with*	*Tag*	*Will be replaced with*
[GraphTitle<m>]	Title text for the m'th graph‡‡	[GraphFile<m>]	***Local*** file name for the PNG file corresponding to the m'th graph‡‡

* Calculations of sunrise, sunset and determination of day or night require accurate latitude and longitude values in the CWOP Upload options panel. These times are approximate and may be in error by several minutes, especially at higher latitudes.

† Barometer readings are taken from the WMR100 unless the WeatherJack barometer is enabled. QNH (altimeter) values are always calcualted by WSDL using the station. SLP values are taken from the WMR100 unless the option to override these is enabled or if the WeatherJack barometer is in use. In that case WSDL calculates SLP.

** These tags will be replaced with one of the five following values: { Sunny PartlyCloudy Cloudy Rainy Snowy }.

*** These values are computed using the current anemometer (wind) reading, and will not be appropriate for indoor sensors, or those sensors not located in wind environments identical to that of the anemometer.

†† The values which include the designation "<n>" refer to the different temperature sensors, on channels 0 through 10. Zero is the WMR100 console temperature reading, channel 1 is the dedicated outdoor sensor, and the remaining channels apply to optional temperature/humidity sensors. For example, the tag "[DewPoint2]" refers to the dew point measurement on channel two.

‡ Some min/max tag entries including the string "Min/Max", and this indicates that one of these must be chosen. For example, "[UvMin/Max]" means that valid tags are "[UvMin]" and "[UvMax]". Min/max data is accessed through a "day number", shown as <d> above. The number zero represents the latest day, "-1" refers to the next older day (usually yesterday), "-2" to the day before that and so on. For example, the tag [Temp3Max0] is the current day's maximum temperature on sensor channel #3. Similarly, [DewPt1Min-4] refers to the minimum dew point on sensor channel #1, four days ago. The numbered date/day tags (e.g. [DayOfWeek-1] or [Date-3]) are refer to the days associated with min/max data.

A maximum of 30 past days can be accessed through min/max data tags. However, if there are days in the weather log with no data, fewer than 30 days will be available. Also, note that the relative day number (<d>) may skip a day if log file data is missing. For example if today is Wednesday and there is no data in the log for Tuesday, then [DayOfWeek-1] will be "Monday" – not "Tuesday" as would normally be the case.

‡‡ Tags containing a graph number (<m>) refer to one of up to sixteen graphs displayed on the screen. The legal values of <m> are 1,2,3,...15,16. If the graph number exceeds the actual number of graphs currently being displayed, tags will be replaced with data indicating the graph is not available. A file name of "NoGraph.png" will be substituted in this case. The GraphFile tag is intended for local (non-FTP) use only. For FTP use, it is recommended the graph files be re-named during the upload process using a CSV list file (see below for details).

Possible moon phase strings: { New, WaxingCrescent, FirstQuarter, WaxingGibbous, Full, WaningGibbous, LastQuarter, WaningCrescent }

If the CWOP id is of the form “xWnnnn” where “x” is any character and “n” is any single digit, then a version of this (called the MADIS ID) is formed by removing the “W”. For example, the corresponding MADIS ID for “CW1234” would be “C1234”. This is provided because some web site links for weather station data require the MADIS ID instead of the CWOP ID. If your CWOP ID does not fit these rules, then the MADIS ID will be exactly equal to the CWOP ID.

Tags such as [DayNight], [MoonUp] and [MoonPhase] can be used to select different images for display on the web page. For example if there are two PNG files named “xyz_Day.png” and “xyz_Night.png”, then adding the following HTML snippet would result in different images on the web page during day or night:

<img src=”xyz_[DayNight].png” ..... >

Graph Images

Copies of the weather graphs can be saved as PNG files and uploaded too. As with web page generation, this occurs in two stages – first generation of PNG files on the local computer, then upload to the FTP server.

Stage 1: Two conditions must be met before PNG files will be generated.

- FTP graphics must be enabled in FTP tab of the options window.
- A result file must be specified in the FTP tab of the options dialog. The actual file specified does not matter, but the directory must exist – this is the directory in which the PNG files will be created.

Stage 2: The PNG files can only be uploaded if a CSV list file is specified as the template file in the FTP tab of the options dialog. See the section “Processing Multiple Files” below, which includes an example of uploading an automatically generated PNG file.

PNG file names are automatically determined by WSDL. For web pages that will be viewed on the local computer, the [GraphFile<m>] tag can be used to reference these images from an HTML web page.

However, if PNG files are to be uploaded they will be re-named during upload and in this case the [GraphFile<m>] tag may not be appropriate. This is because during the upload, PNG files will be renamed to user-specified names.

If necessary, it is possible to create a single template which will work both on the local computer and with the uploaded files on the web server. A template can be created that works both locally and after upload by using “WxGraph-mm.png” for the graph file names (mm is the 2-digit graph number between 1 and 16 [01,02,...,16]). The only downside to this is that if WSDL ever changes the graph file names (not likely, but possible), the template will stop working locally.

By default, graph images are sized to be 400 pixels wide and 300 pixels high, and it is possible to change this size in FTP tab of the Options window.

To create the FTP graphics, WSDL maintains a hidden set of windows – one for each graph in the main window. These windows use significant computer resources, so there is a way to disable FTP graphics on computers with limited resources (memory, etc). First of all, the hidden windows are only created when FTP uploads are enabled. In addition, there is another setting in the FTP tab of the Options window that completely disables graphics generation.

Processing Multiple Files

You can also have more than one file processed and/or uploaded by WSDL. To do this, create a CSV text file containing three columns. Each line in the file specifies (in the three columns) a template file name, the corresponding result file name and the FTP URL for upload. The columns must be separated single comma or tab characters.

The first column contains the template file name. This must be the full name including the drive letter and full directory path. If this column is left blank, no tag processing will occur, but an ftp upload can still be specified. This is useful for uploading files which are generated outside of WSDL.

The second column contains the result file name and cannot be blank. Like the template file name it must be a full name with drive letter and all directories. This is where the output from tag processing will be stored. It is also the file which will be uploaded via FTP – even if the template file name (1st column) is left blank.

As a special case, if this column contains "Graph<m>" where m is between 1 and 16, it is a reference to one of the automatically generated graph files (a PNG file). Valid examples of this are "Graph7" and "Graph13".

The third column contains the URL for FTP upload. This column can be blank if FTP uploading will not be performed. To perform tag processing without FTP uploading, make the FTP URL entry in the options window blank.

When uploading multiple files with a CSV list file, specify the CSV file as the Template file name in the options window. The Result file name in the options window is still required, but it is only used to determine the directory for creation of PNG graph files.

FTP uploading is enabled when the FTP URL entry in the options window is non-blank. When using a CSV list file, the FTP URL entry in the options window is not actually used for upload – it can contain any characters as long as it is not blank. For example, just put an "X" there if you want.

Below is are some sample lines for a CSV list file.

```
C:\WxTemplates\C\index.htm,G:\WxResults\index.htm,ftp://ftp.myisp.net/public_html/index.htm
C:\WxTemplates\A\hilow.htm,G:\WxResults\hilow.htm,ftp://ftp.myisp.net/public_html/hilow.htm
,Graph2,ftp://ftp.myisp.net/public_html/windgraph.png
,G:\WxGraphics\wxicon.png,ftp://ftp.myisp.net/public_html/currentwx.png
C:\WxTemplates\local.htm,C:\WxTemplates\private.htm,
```

The first line will process a template file named "index.htm" on the C: drive, writing the result onto the G: drive. The second line is similar. The next two lines will do no tag processing because the first column is blank.

The third line will upload an automatically generated graph. Note the source file (Graph2) does not include a full path or drive letter – this is a tag for WSDL which refers to one of the automatically generated graphs (the 2nd one).

The last line will perform tag processing on another file ("local.htm"), but the result will not be uploaded because the third column is blank. Notice that a trailing comma is used to signify that the last column is blank.

The last line will upload a PNG file (currentwx.png) that was generated by some program other than WSDL.

Things are a bit complicated when uploading multiple files, so here is a short checklist to help make sure everything is set correctly.

1. Create a CSV file which specifies all the files to be uploaded.

2. Specify the CSV file as the “Template” file in the options window.

3. Set the “Result” file in the options window – this will determine which directory PNG files will be written to. The actual file name specified is not important – only the directory part of the path is used.

The Log File

Versions of WSDL prior to 3.4 may not have worked with Windows language settings other than English (United States). One of the major reasons for this was the comma separator used for data fields in the log file. In many countries, the comma is used instead of a period to separate the integer and fractional parts of numbers. This causes obvious problems when data fields are also separated by commas. Starting with version 3.4, language-specific characters are used to separate fields in the log file. For example in Finland, a semi-colon (";") is used instead of the comma.

Another regional variation is the way dates are represented. For example, in the United States of America, the first day of the month of May in the year 2000 is represented as "5/1/2000". In Finland, this changes to "1.5.2000".

As a result of these changes, weather log files are now language-specific. A log file created with the computer's regional language set to Finnish should load properly if the computer's regional language is changed to English (US). It is a good idea to exit WSDL before changing the language setting, and restart it afterwards. When it starts again, WSDL will backup your log file and then convert it according to the new language setting. If there are any problems with this, you can always restore the backup copy of the log file and change the language back to what it was before. Please report any problems encountered on one of the SourceForge discussion forums.

General

Once every minute, weather station values are written to a CSV-format log file. For the most part, data in the log file is identical to what is displayed in the main window. A little more explanation is required for wind data.

Two types of wind information are saved in the log, average and gust. Average wind data is a two-minute average of speed and direction – the same speed and direction as shown in the METAR display. Gust data represents the highest wind speed (and its direction) observed in the last minute. Gust data as saved in the log is not shown directly in any of the main window readouts.

The first two lines in the log file define the units in which data is stored. When the program starts, a check is made to see if the log file exists. If there is no log file, a new log file is created using log file units specified in the options. Otherwise, the existing log file is loaded and units specified in the log file are used, overriding any option settings – with one exception, discussed below.

When the log file is opened at program startup, if the units used in the log file are different than the current option settings, a warning dialog will pop up. It will give you a choice of either overriding the option settings or walk you through the process of deleting, renaming or moving the existing log file.

Changing log file units must be done in distinct steps:

1. Use the options button and dialog to make the changes. When the changes are saved a warning dialog comes up and the program terminates after you press the OK button.

2. Restart the program. A warning will pop up explaining the units mismatch condition. To continue changing log file units, the Cancel button must be pressed.

3. A file dialog will now pop up, showing the contents of the current log file directory. Use this window to delete, rename or move the log file (WxLog.csv). When finished close the dialog – it does not matter if you press the "Open" or "Cancel" button – just close the window somehow. If you changed your mind and don't want to alter the log file, then close the window w/o making any changes (you'll get the window a second time an must close that one too.)

4. Another dialog will appear telling you that a new weather log file has been created. You should check the options again to make sure the log file units are set as desired.

What can I do with the log file?

The CSV format is one of the most widely accepted data file formats in use today.

To begin with, explore the contents of the log file using a text editor, like WordPad or Notepad. Just right-click on the file and choose "Open With...".

Spreadsheet programs such as Open Office "Calc" and Microsoft Excel can read CSV files. However, these programs are limited to handling about 65,000 log entries – which is equivalent to roughly 45 days of weather information. OK, so these programs may not be all that useful.

If you have the ability to write computer programs, CSV files are easy to read and parse.

Another program that reads CSV files is Matlab from Math Works. The number of log entries will only be limited by your computer's memory. The downside is, Matlab costs a ton of money. Well, if you have it, then use it. For those who don't have it, there is FreeMat on SourceForge. Either program is extremely powerful and well worth the effort to learn. These two programs are the recommended way to do cool things with the log file data.

Many database programs can read CSV files. Check the projects SourceForge open discussion forum as some other tools have been discussed there also.

Log File Extensions

With version 2.8 of the program, two extensions have been added to the log file. The 3rd and 4th lines now contain initial rain total information which is required to keep track of rain totals after the log file is trimmed.

Optionally, computed rain gage bucket tip counts can now be stored in the log file. See the appendix topic on rain gage calibration for information about why you might want to do this. The program can also try to add bucket tip counts to an existing log file. To achieve this, enable tip counting in the Options dialog, then exit and restart the program. You will be offered a chance to augment the weather log with tip counts.

Tip counts added by this method are not guaranteed to be accurate. Compare the displayed total rain amounts with adjusted for resets to the tip counting method to see if there are any problems. If this does not work you may need to start a new log file instead.

The tip count field contains two pieces of information. The value in the file is equal to the sum of the number of tips since the last log entry and a new rain bucket tip amount, divided by 10. If the rain bucket tip size did not change in since the previous log entry, this part is omitted. Most of the entries will be integers: 0,1,2 and so on depending on how many times the bucket tipped since the last log entry. If the rain bucket tipping amount is changed, the first log entry made with the new tip size will contain a fractional part equal to the tip size divided by 10.

For example, assume the tip amount is changed to 0.0123456 inches. After accepting this change the program will exit. After restarting the program, the first new entry in the log file (assuming no rain has occured meanwhile) would be 0.00123456. This value represents zero bucket tips plus on tenth of the new bucket size. If one bucket tip had occurred the value would be 1.00123456.

Beginning with version 3.4 of WSDL, a new header line (the first line) will appear in the log file defining the computer's language setting used with the file. This extra line makes the log file incompatible with earlier versions of WSDL – however simply removing the first line will restore compatibility.

The Message Log

Everything written to the message window is also recorded in a message log file (WxMessageLog.txt). This occurs whether the message window is visible or not.

The message log is in the same directory as the weather log.

If you are having a problem with the software, it can be helpful to review the message log file with a text editor.

Beginning with version 3.4, wireless communications statistics are written to the log file once per hour. This data contains estimates and should not be assumed to be 100% accurate. The data is useful for determining the general health of the wireless connection to the various sensors.

Based on how often each sensor reports over the USB connection, WSDL tries to determine an average value for each sensor. The average will vary based on the sensor, and even varies if you change the channel number of a sensor. Then, using the estimated average WSDL attempts to keep track of missing updates from each sensor. Once every hour, a summary of this data is written to the message log file, and the totals are reset to zero again.

Don't get all worried if you are missing as many as 3-5 readings per hour – this could be normal. Even larger counts are normal from the anemometer. Once the count starts getting larger than this however, you might have a problem. Watching for trends is useful. If a sensor normally shows fewer than 5 missed readings per hour and then starts creeping up, look for something that has changed – low batteries, something physically moved, etc. There could even be some problem developing in the senor, but you will need to take that up with the manufacturer – and they may or may not put much faith in the statistics from WSDL.

The other obvious cause of a lot of missed readings is that the sensor is just too far away, or there are too many walls, trees, etc. between the sensor and the indoor console.

The Weather Station Clock

The weather station has a clock that can synchronize itself to a broadcast standard time signal. This makes the clock pretty darn accurate, but this program does not offer an option to set the computer's time-of-day clock from the weather station clock. Why not?

There are currently a few reasons for this.

- There is an unknown amount of delay in the transmission of the USB data to the computer. Although it is likely less than a second or two it is still an unknown.

- The clock does not automatically know the proper time zone – it must be set by the user. It would be more useful if the clock always reported time in UTC.

- Windows Vista may have issues with user programs trying to adjust the system clock. This is not known for sure by the author, but until that can be resolved there would not be much point in adding the capability.

- Quite often, the computer running the WSDL software will have a live internet connection. In this case, it makes more sense to use NTP (network time protocol) to keep the computer's clock accurate.

In summary, it would not be difficult to add this feature, but it is of questionable value.

Battery Status

The accuracy of battery status indicators for the WMR200 may be inaccurate. The project is working to get this fixed as soon as practical.

By clicking on the “Details” button below battery information in the main window, a battery status panel will pop-up. This panel shows the status of each set of batteries in the weather station. This includes:

- The indoor console battery
- Anemometer battery
- Wireless temperature sensor batteries ***
- Rain gage battery
- UV sensor battery

*** The WMR100N has a separate outdoor temperature sensor while the older WMR100 had the temperature sensor integrated into the anemometer. The temperature sensor battery reading for channel #1 is only valid for the WMR100N and WMR200 models. WMR100 owners should ignore the status indicator for channel #1.

It also indicates whether the indoor console is connected to an AC power source.

If a wireless sensor has not been heard from for a while (i.e. it has “timed out”) the battery status will indicate this fact. The timeout period can be adjusted in the options window (under the “Hardware tab).

Program Options

Version 3.4

This version changes the formatting of numeric data and date/time information in the user.config file (and the WxLogger.exe.config file also).

Previous versions used the computer's current language setting for some of the data in these files. Starting with version 3.4, this data is always formatted according to English (United States) customs. The change was necessary so that WSDL will work properly in a wider range of language settings.

Efforts have been made to ensure that WSDL will correctly import options from earlier versions with different language settings. However, if this fails previous option setting files will not be altered. If options fail to import successfully, users can examine a previous options file (user.config) to manually recover the old settings. Also, it is possible to un-install version 3.4 and re-install the previous version of WSDL. The previous options should load without any problems in this case.

General

Options are independent for each user account on the computer. Program options are stored in an XML file located in an automatically determined directory. Most users will not need to know even this much. The rest of this section contains more detailed information about the storage of program options.

Each version of WSDL released will keep option settings in a different sub-directory – named after the program version (e.g. "2.8.8.1"). When a new version is installed it will offer the user an option to copy options from the previous version. It is always a good idea to check the imported options for accuracy, and to see what new options might be present.

Early Versions of WSDL

Versions of the program prior to 2.5 used the registry to store option settings. Everything was kept under the key HKLM/Software/WMR100. During program startup, if this key does not exist it will be created and populated with default values. If the registry key does exist, values for display and log file units are loaded into the program. Among other things, values in the registry are used to specify display and log file units and backup configuration settings. Registry values have meaningful names, so it is worthwhile examining the WMR100 registry key with regedit.

Versions 2.5 and later store option settings in an XML text file in the user's local settings directory. This change was necessary for non-privileged users to use the program on Windows Vista.

The full path to the XML settings file may contain some oddly named directories. It can usually be located by starting in the following sub-folder of the Documents and Settings folder:

Local Settings\Application Data\WMRx00

If you cannot find it there, search the Documents and Settings folder for a sub-folder named WMRx00.

Versions 2.5 and later are designed to copy registry settings from earlier versions the first time the program is run. These settings are then saved in the XML file and the old registry settings can be deleted manually if desired.

Changes in version 2.8

This program version will store the XML options file in a different directory. In some cases, it might require a bit more effort to transfer options from version 2.5. Versions after 2.8 should not have this problem.

If the options fail to upgrade, try looking for a “user.config” file from version 2.5. Manually copy this file to the version 2.8 directory.

Editing Options

The options file can be viewed in a text editor or an XML editor. It is tempting to try editing this file by hand for some folks. This can work, but can also result in a corrupt options file. Therefore, before making any manual changes like this, be sure to save a backup copy somwehere.

To repeat – users are generally discouraged from hand-editing the user.config file. However, since “easter eggs” may be hidden in this file, there may be a need to do this. If you decide to to this, then please pay heed to the following.

In the file there are setting names and values. Changing the settings names is not recommended. Changing the values can work if the new value is legal.

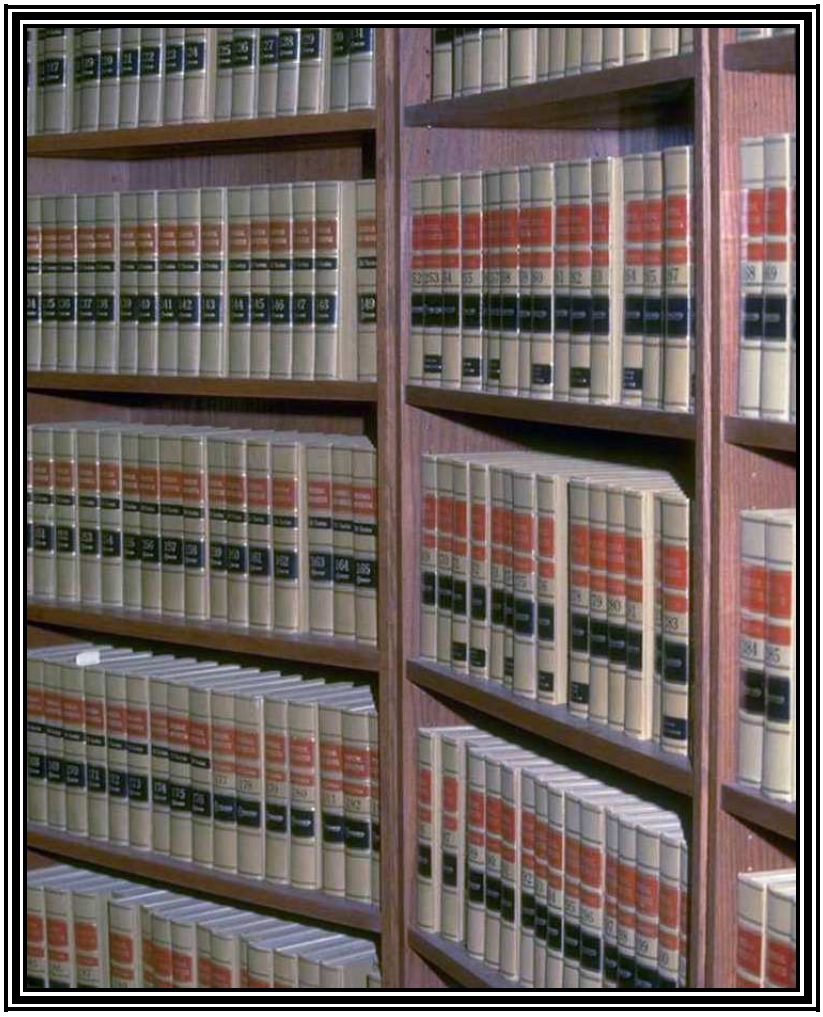
On last warning – this file is not your normal text file. It uses a special character coding standard called “UTF-8”. For most keyboard characters this is no different than a normal (meaning ASCII) text file. However, there are some characters that cause problems. For example adding the ‘ ä ’ character to this file with a text editor will cause it to become corrupt. The UTF-8 character coding standard uses a different method to represent this character than your text editor does.

If you have a good XML editor, it may be able to correctly add such special characters. Just be sure to make a backup copy before trying it out.

All numeric, date and time information MUST be formatted using US English standards. Unlike the log file, the formatting of data in this file is invariant – it does not change if the language setting of the computer is altered.

Part III

Reference



The Menu

File...Write Daily Extremes

This function has been enhance in version 3.0. The old version only produced extremes for two temperature sensors (indoor and outdoor). All wireless sensors are now supported. It was necessary to re-arrange columns in the output file, and this may effect compatability for some users.

Selecting “Write Daily Extremes” in the “File” menu will cause the current log file to be analyzed, and daily extreme values for each day in the log file will be written to a new CSV file in the weather log directory. The new file name will indicate the range of dates covered by the data. This file is in log file units, except for dates and times (which use the display time zone or UTC offset).

The log file name will be based on the range of dates and times in the log file (using the log file time zone or UTC offset). Dates actually written to the file however will use the current display time zone or UTC offset.

This function will re-read the entire log file from disk – so it may take a while to finish if the log file is large.

File...Kick Start

Once the program is running and receiving data from the WMR100 console, there is usually no need for the PC to send data to the console. The WMR100 will send a continuous stream of data to the PC without any periodic prompting from the PC.

There are times at which the console might need a “kick start” to get the data stream started. This is accomplished by two mechanisms within the program. First, there is a timer which will automatically kick start the console if a certain amount of time lapses (around 30 seconds or so) with no valid messages from the console. There is also a “Kick Start” selection under the “File” menu which will force a kick start when pressed. In most cases, forcing a manual kick start should not be necessary.

View...Temperatures...Left/Right

These menus configure which temperature sensors are displayed in the text boxes showing current temperatures and 15-minute temperature rates. Since the labels in these boxes are user defined, it is possible for the text to overflow if long sensor names are chosen.

View...Barometer...SLP/QNH

The barometer display always shows station pressure on the left. The readout on the right can be configured to display either sea level pressure (SLP) as reported by the WMR100 console, or alitimeter setting (QNH) as calculated by WSDL. The QNH calculation uses the elevation entered into the CWOP setup (see the Upload tab in the options dialog). To learn more about the barometer values, see the section titled “The WMR100 Barometer” earlier in this manual.

View...Message Window

This menu choice will make a text window visible at the bottom of the screen, containing various informational and error messages.

View...Enable

This brings up a sub-menu which gives you some control over what messages are shown in the message window. With all of the choices disabled, only error messages are shown. Error messages cannot be disabled. There are two choices in the view menu for convenience which will enable or disable all choices at once.

View...Enable...Data Messages

This causes decoded messages from the weather station to be logged.

View...Enable...Raw Records

Complete messages will be shown in hexadecimal format before being decoded.

View...Enable...Received Data

Raw data received through the USB port is shown in hexadecimal form, prior to being split into separate messages.

View...Enable All / Disable All

These choices will turn all messages listed above either on or off with a single operation.

Graph...Show Temperature / Show RH / Show Dew Point

Since the temperature graph can get cluttered at times, temperature, relative humidity and/or dew point can be omitted from the plot. These menu picks allow you choose what is plotted. It is not possible to turn off all items (temperature, dew point and RH) at once. For example, to change from graphing only temperature to graphing only RH, you must first turn the RH graph ON, then turn the temperature graph OFF.

Graph...Show Sensors

Use this menu to choose which temperature sensors are graphed. Graph colors, and the way in which they are assigned to sensors can be configured in the options dialog. It is not possible to turn of graphing of all sensors. If only one sensor is being graphed and you want to switch to a different sensor, you must first turn the other sensor on, then turn off the original sensor. See the description of the graph window for more information.

Graph...Show Rain Rate

Selecting this option enables a second Y axis for the precipitation graph which shows the rain rate as reported by the WMR100.

Graph...Wind Gust

There are three choices for the wind gust graph curve. The default is averaged data which is what was graphed in WSDL versions prior to 3.0. The data is averaged over a 30-minute window. The data looks much smoother, but actual peak gust values will be attenuated.

The second choice shows wind gusts filtered through a 10minute peak-hold process with a slow decay period. This still keeps the data looking fairly smooth, and actual peak gust values are never attenuated.

The third choice displays raw, unfiltered one-minute peak gust data directly from the weather log. This graph option usually results in a cluttered display, but you can zoom in and see the actual 1-minute peak gust readings when that is of interest.

Graph...Wind Direction Origin

The Y-axis off the wind direction graph normally runs from 0 degrees (North), through 90 (E), 180 (S), 270 (W) and finally to 360 (North again). As the wind direction moves from NW through N to NE, the graphed line will “wrap around”, or jump from the top of the chart to bottom.

If you live in an area where the wind frequently crosses through north, this can result in a lot of “clutter” in the graph. This menu feature allows the bottom-top wrap-around point of the graph to be set to another direction, effectively minimizing the “clutter”. It is helpful to experiment with this feature to understand what it does, and discover what setting works best for you.

Graph...Barometer...SLP/QNH/QFE

Starting in version 3.0, it is now possible to graph one of three different pressure readings, sea level pressure (SLP), altimeter setting (QNH) or raw station pressure (QFE).

Tools...Options...

This brings up the options dialog window (see below).

Tools...Write Processed Log...

Normally, the weather log file only contains the rain amounts reported by the base station, plus optional rain bucket tip counts. The rainfall total display however can show totals with “reset processing” or based on cumulative bucket tip counts (see the chapter on the options window for more detail).

This utility will take the data from a weather log and compute rainfall totals using “reset processing” and tip counts. A new CSV file is then written which contains these additional computed rainfall totals. This is handy when you want to create graphs or perform other data analysis on the logged rain data. Without the utility, you would have to compute these totals yourself, which is tedious and error-prone.

A file dialog will pop up and you can specify any valid weather log file for processing. For example, previously saved backup files can be specified, or the currently active weather log can be selected.

The new CSV output file contains all of the data in the original file, except rain data is replaced with computed totals. As such, this file is not suitable for use by the Weather Station Data Logger as a log file.

The original log file is not altered – a new filename is created by appending "-Processed" to the original name. The new file is always created in the same directory as the original file. If a processed log already exists, the utility will abort.

As an example, if you choose to process "WxLog.csv", the new, processed file will be named "WxLog-Processed.csv".

The Main Display Window

The main window contains several groups of numeric displays and controls, plus a large X-Y graph. Each group of displays or controls is in an outlined, labeled box. Each section below is organized by the box's title.

Starting with version 2.8, the main window can be resized to a larger size (there is a minimum size, however). The advantage of making the window larger is that the size of the graph area is increased, making cluttered graphs with a lot of data easier to read. The other displays on screen do not change size and are simply re-positioned to make room for the larger graph.

Data Color Legend

Most data displays in the application window are color coded to indicate their “age”. When the program first starts, data displays are not visible until at least one update has been received from the station console. Green represents current data, yellow (gold) indicates aging data and red is used to flag data that has not been updated for at least a couple of minutes.

Individual data values in the weather log will be omitted by outputting empty CSV fields if a particular piece of data has become too old.

Temperatures

This group displays the current readings from two temperature sensors. The most current reading from each sensor is shown under the “Temperatures” heading, where three rows of numbers are shown. The first row contains temperatures, followed by dew points and relative humidity.

You can choose which two sensors are displayed. See the View...Temperatures menu description above for more information.

Since the names for these sensors are user defined, it is possible the text labels will overflow the available space for display. This can be fixed by shortening the name to fit within available space.

Temperature Rates

To the right of temperature data is rate-of-change information for temperature and dew point, under the heading “15-min Rates”. Temperature rates are computed over a 15-minute interval using linear regression to estimate a an hourly rate-of-change.

Rates are shown for the same two sensors chosen for the “Temperatures” group above.

Anemometer

There are three different wind displays, stacked vertically. The top display shows the most recent weather station readings. In the middle is a METAR report and on the bottom displays the largest gust within the last hour.

WMR100 wind data contains current speed and direction, plus an averaged speed. This data is displayed as the top readout.

The middle of the three readouts contains a METAR-format wind report. The METAR report can either be “strict”, or less formal, showing more information. METAR data is computed using a 2-minute averaging period and a 10-minute window for reporting wind gusts. The strict version attempts to comply with known standards for METARs. The non-strict option removes some of the thresholds for reporting gusts and variable wind which shows more information if you live in an area without a lot of wind. The strict option can be turned on or off in the options window.

The bottom readout shows the largest wind speed and its direction recorded during the last hour.

Barometer

Two pressure readings are received from the weather console – a raw “station” pressure (QFE) plus a reading corrected for altitude (probably an improperly computed version of SLP output by the WMR100). The corrected reading will not be accurate unless the user has set the station's elevation correctly on the weather console. After setting the station elevation on the WMR100 console, it can take up to 15 minutes for the corrected reading to adjust.

The corrected reading defaults to SLP (as reported by the WMR100) but there is an option to display altimeter setting (QNH) instead. Starting in version 3.0, an option is provided to have WSDL compute SLP and display that instead of the WMR100’s reported SLP. Details are contained elsewhere in this manual.

Rate of change for pressure is computed over a 3-hour interval and displayed as an hourly rate. Versions prior to 2.5 used a 15-minute interval to compute rate. Version 2.5 used a 2-hour interval. This turned out to be too short a period, partly because the WMR100's barometer has a low resolution (1mb or 0.03 inHg). Because of this relatively low resolution, changes occurring in a 15-minute period are usually too small to be seen. Version 2.8 uses a 3-hour period because that averaging period is also used in METAR reports.

Precipitation

The Weather Station Data Logger offers a significant advantage in its ability to track yearly rainfall totals regardless of any reset operations performed on the WMR100 console unit. Because of this, the data displayed in this group of readouts may be different than what is shown on the WMR100 console. Please read the chapter on “Rainfall Data Processing” for an explanation of the options available.

When rainfall reset processing is disabled in the options window, this readout will be identical to the weather console data. Otherwise, the data is processed as described in the chapter on “Rainfall Data Processing”.

Station Clock

The most recently received clock value from the console is displayed under the “Station Clock” heading. An indicator below the time and date indicates whether the clock is synchronized to a time standard radio signal or not.

For now, the station clock value is not used anywhere else in the program. Time stamps associated with logged data use the computer's time and date. The data logger program does not offer the ability to set the computer's clock from the station clock.

Battery Status

There are batteries in the main weather station console, the outdoor anemometer, any extra wireless sensors, and the rain bucket. The battery status for each of these units is indicated by a colored rectangle. There are only two states or colors, okay (green) and low (red).

Battery state for all extra wireless temperature sensors is combined into a single readout. If all sensor batteries are okay, it will be bright green. If one or more of the extra sensors is not communicating, but the remaining sensor batteries are okay the color will be a dim green. Finally, if any of the sensors are reporting a low battery state the color will be red.

When there is a low battery condition on an extra sensor, the user must scroll through the sensors on the WMR100 console to determine which sensor(s) have a low battery condition.

If the WeatherJack barometer is enabled, its battery state is also shown here.

Counters / Timers

This area displays counters for USB data messages received from the weather station plus the number of internet uploads made since the program was started. There are separate counters for Weather Underground, CWOP and FTP uploads.

For internet uploads, there is also a clock display which shows how much time has elapsed (minutes and seconds) since the last successful upload. The color of the label will stay green until the next upload is due, at which time it will become yellow. If one minute has passed after the upload was due without a successful upload, the timer label will turn red.

The internet counters and timers will only be visible when the corresponding upload option has been enabled in the options dialog window.

Forecasts

The so-called weather forecasts displayed on the WMR100 console are shown in this window. Due to limited real-estate in the display this window is only visible the size of the main window is past a certain point. With some very small display monitors, it may not be possible to make the window large enough for this readout to appear.

There are two forecasts: “Station” and “QNF” (or “SLP”) forecasts. The exact difference between these two readouts is not known exactly. It is reasonable to surmise they are both based on the barometer reading, and may also include information from indoor and/or outdoor temperature/humidity sensors. The station forecast probably uses the QFE barometer (station pressure) while other forecast may use the computed SLP pressure (sometimes also called QNF) barometer reading.

The Graph(s)

Up to sixteen X-Y graphs are provided which can be used to graph temperature, pressure, wind, precipitation or UV data. A group of radio buttons on the right side of the graph allows the graph data to be selected.

All data for the graph comes from the current weather log file, and the graph is updated once per minute after the log file updates.

Under the “Graph” menu are selections to control graphing of relative humidity, dew point, barometric pressure, wind data and rain rate.

Changes made to the graph type and configuration options described above will be reflected in FTP graphics beginning with the next FTP upload operation.

Wind data tends to be extremely noisy, and graphing the data is often visually confusing. Therefore, an advanced filtering technique is used to remove some of this noise and make it easier to see trends in the data. The filtering technique uses a sliding 30-minute window and requires at least 30 minutes worth of wind data to get results. This graph is labeled “Average Speed”. As a result of this filtering process, don't expect changes in the numeric wind readout to show up immediately in the graph.

There are three choices for graphing wind gust data – averaged, peak hold and raw. As with average wind speed, raw gust data is quite noisy. The peak hold option graphs the largest gust in a 10-minute window followed by a slow decay afterwards. The averaging option will provide a lot of smoothing for gust data but gust peaks will be diminished significantly.

Starting with version 2.8, users can choose which temperature sensors are graphed (in the View menu), and the colors used to graph each sensor’s data (in the Options dialog window). Graphing of temperature, dew point and relative humidity data can be individually enabled or disabled.

The program will not allow graphing of all sensors to be turned off at once, as this would result in a blank graph. For example let’s say you are graphing only the indoor sensor and wish to change to graphing only the outdoor sensor. You must first enable graphing of the outdoor sensor and then disable graphing of the indoor sensor. If you were to first disable the indoor sensor graph, then all graphs would be turned off – and WSDL does not allow this.

Rain rate can now be (optionally) shown on the precipitation graph.

The graph menu also allows the origin of the right-side Y axis representing wind direction to be changed. See the description of the Graph menu for details.

The X-axis length can be set anywhere from ½ day to 30 days. The graph length up/down buttons will change the length in ½ day increments. Alternatively, any decimal number between 0.5 and 30.0 may be entered directly into the control. When the graph length is changed, the current weather log is re-loaded and the in-memory copy of the log is trimmed to the requested time span. The X-axis then becomes a sliding window, always showing the most recent set of data in the weather log.

The graph window is interactive, so try click-drag operations and right-clicking in the window to explore it's capabilities.

Multiple Graphs

Several (up to sixteen) graphs can be displayed in the WSDL window simultaneously. This is configured in the options dialog (under the "Misc" tab). Each graph can be independently configured with a different graph type, graph length and display options. WSDL remembers these settings until you change them again.

When multiple graphs are displayed, only one of them is "active" at any given time. The active graph is identified by the addition of a black border. The active graph can be changed by clicking on the desired graph. If one or more graphs has "Insufficient Data", it can still be selected by clicking on the "Insufficient Data" text label.

When you change the graph type, graph length or any of the options in the "Graph" menu, those changes are applied to the active graph. WSDL will remember the settings you make even after the active graph is changed. There is no need to "save" anything – WSDL saves the new settings anytime a graphing option is changed.

When a different active graph is selected, all of the controls used to set graph options are updated to reflect the stored settings for the newly actived graph.

This setup is extremely flexible. Play around with it a bit and you'll discover that just about any combination of graph data can be setup. Remember, each graph can have its own time length, graph type and set of options (such as temperature sensor list, barometer data type, etc).

The graphing package used here is called "ZedGraph", written by J. Champion. This is a very nice, versatile package and is available free of charge under the LGPL license from the Code Project. Hats off to J. Champion for this great package!

Graph Colors

In addition to being able to choose colors for temperature graphs, WSDL versions 3.2 and later contain some "easter eggs" for changing other graph colors, including background and grid-line colors. These changes will also appear in the PNG files generated for FTP upload.

The ability to completely control *all* colors used by WSDL would be part of a larger "skins" enhancement effort – but for now, the user cannot change any other colors in the WSDL window.

To change these colors users must manually edit the user.config file with a text editor. Be sure to run the WSDL program at least once after upgrading to version 3.2 or later – before you attempt to edit this file. See the section on "Easter Eggs" in the "Release Notes" chapter for details on how to find the correct config file.

Now, save a backup copy of the user.config file in case you want to undo all your changes.

In addition to colors for the various data graphs, there are settings for background and grid colors. The default color values are partially transparent – which allows the color beneath the graph itself (which is slate gray) to show through. Most users will find it easier to omit the transparency and just use fully opaque colors for the background and grid lines.

After saving the modified user.config file, the new colors will not appear automatically. There are two ways to cause the updated colors to appear:

1. Exit and restart WSDL.

2. Change the WSDL window size. Changes made to background and grid colors should appear immediately. To see changes made to graph colors, the graph in question must be made to update – one way to do this is to change the graph type to something else, then back again – or wait up to one minute for the graph to automatically update. If you have trouble getting the new colors to appear, just exit WSDL and restart it.

Remember – if any invalid color specifications are entered into the user.config file, that particular color will default to "Black". This is your clue that the color you entered is probably invalid.

If the colors get totally messed up you can recover in several ways:

1. Restore the backup copy of user.config that you made (you did make a backup, didn't you?)

2. Delete the user.config file completely and restart WSDL. A new user.config file will be created from WxLogger.exe.config in the installation directory.

3. If you edited WxLogger.exe.config and don't have a backup copy, then delete that file and run the WSDL install package. Select the "Repair" option if available – otherwise, un-install and then re-install WSDL.

The list of valid color names recognized by windows is the same as explained elsewhere in this manual. See the following web site for the list:

http://msdn.microsoft.com/en-us/library/aa358802(VS.85).aspx

Or search the internet for "colors by name". You can also specify hexadecimal colors – preceed the color name with a "#" character and enter either exactly six or eight hexadecimal characters. With six characters, the data is RRGGBB. Use eight characters to include some transparency where the data is AARRGGBB (AA is the alpha or opaqueness value).

One final note – the color entry named "RawBarometerColor" is only used with the WeatherJack barometer – it will not have any effect unless WeatherJack is enabled in the options window.

The Options Window

Units Tab

There are two independent sets of units available, log and display units. Display units effect the displayed numeric values in the program window, and may be changed at any time by clicking on the “Tools” menu and selecting “Options”. Saved changes will be reflected immediately.

Log units effect the numeric data stored in the log file. In most cases, you will want the display units to be the same as the log units (except for time zone). Changing log units is a bit complicated. When the program starts up, a preexisting log file will normally override any changes you have made in the options window. This has the effect of discarding your changes – and you will be notified of this event. To avoid this, the program would have to convert all data in the log file into the new units and then re-write the log file. Instead, the more simple approach is taken – once a weather log file is created, its units cannot be changed.

If you want changes to log file units to “stick”, the old log file must be deleted, renamed or moved before the program is restarted. Changing the log file directory will also accomplish this (assuming the new directory does not contain a weather log file). The program will attempt to help you through this process with some dialog windows. See the section about the log file for more details.

Starting with version 2.5, the computer's local time zone may be chosen instead of a fixed offset from UTC.

The hour of the day used as a cutoff for computing daily extremes is set here. This value is always interpreted in the display time-zone – not the log time-zone. Normally, you should set this to zero (midnight), especially if you are uploading data to Weather Underground.

See the section covering the “Anemometer” display group for a discussion of the “Strict” METAR wind format check-box. This setting does not effect the data uploaded to Weather Underground.

Time Zones

It is recommended that the log file be kept in the UTC time zone (zero UTC offset). A fixed UTC offset is also okay. Users are highly discouraged against keeping the log file in the computer's local time zone. If you follow this suggestions, you can skip the rest of this section. For the curious, read on...

Time can be either kept in the computer's local time zone (which might include periods of daylight savings time), or with a fixed hour offset from UTC (static – no daylight savings time). If you select the local time zone for log file data, things will not work correctly if you change the computer's time zone setting. Log file data will be interpreted in the new time zone without any conversion – which of course is wrong.

A discussion of how Windows manages time will help. Windows keeps time internally in the local time zone, which unfortunately can be effected by daylight savings time shifts. This means that in the spring, a full hour is skipped – times between 2AM and 3AM are invalid. In the fall, a full hour is repeated – for example, 1:30AM occurs twice in one day! So the questions arises – if you are told it is 1:30AM the morning daylight savings time goes off in the fall, which

version of 1:30AM is it -- the one that occurred before the time switch (90 minutes after midnight), or the one that occurred after the time switch (150 minutes after midnight)? The answer to this question is either 1:30AM PDT (90 minutes after midnight) or 1:30AM PST (150 minutes after midnight) – but this program (and Windows for that matter) is not really setup to deal with this correctly.

Although ambiguous time values might be okay on the computer monitor (you are smart enough to sort this out in your head), it can play havoc with the data in the log file. A much better solution is to keep the log file in a time zone that does not observe daylight savings time. Perhaps the best choice is what used to be called GMT (Greenwich Mean Time) and is now called UTC (Universal Coordinated Time – yeah the acronym seems wrong, but that's what they use). With this choice, time never goes backwards or skips an hour in the log file, and it can be easily and unambiguously converted into any other time zone for display (including time zones that use daylight savings time).

Rainfall Data Source

There are now three choices for rain data processing. The first choice (no reset processing) just uses the (calibrated) rain data from the WMR100. The other two choices use data stored in the weather log with additional processing.

The “Adjusted for resets” option uses calibrated WMR100 data from the weather log, with reset events removed. A “reset event” occurs when the WMR100’s rainfall total is reset to zero. This is detected by the software whenever a new rain total is less than a the previous value. When a reset event is detected, the software adds a numeric offset to new rain totals to effectively remove the reset event. For example, assume this series of rain totals is in the log file: {6.55, 6.56, 6.56, 0.00, 0.03}. A reset event is detected at the 4th value and an offset of 6.56 will be applied to all subsequent readings. The adjusted readings are now: {6.55,6.56,6.56,6.56,6.59}. After removing all detected resets, the software will go back through the data and force new resets to zero on November 1st of each year – this is the date when annual rainfall totals are normally reset to zero. After this processing is complete, the rainfall data shown in displays and graphs represents annual total amounts.

Opting for “Rain bucket tip counting” should only be used if you have performed a custom calibration of your WMR100 rain gage. This option is grayed-out unless the option to count bucket tips in the log file is enabled (Log tab) AND the log file includes bucket tip data. See the appendix on calibration for more information. The appendices have been moved to a separately downloadable document.

Log Tab

The directory used to store weather log files, and the message log is set here.

If you enable the option to count rain bucket tipping in new log files, existing log files will not be automatically altered. If you are not interested in this, you should leave the box un-checked. Generally, after checking this box and saving options, WSDL should be exited and re-started. When the program starts, if this option is set and the current log does not contain bucket tipping counts, a dialog will offer the option to add tip counts to the current log file. See the section on calibration for more information about counting rain bucket tips.

Backup Tab

Automatic backups of the weather log file are provided. The options window allows separate directories to be selected for the log and log backups. This is useful, as the backups can be on a different disk drive for a higher level of safety.

Backups are generated at the same (user-specified) hour every “n” days -- “n” is also user specified. The backup hour is interpreted in the display time-zone – not the log file time-zone. However, the backup filename will include the backup time in the log's time-zone. If the displayed time-zone is different from the log time-zone this might be a surprise at first sight.

If the 7-Zip utility is installed, the option to compress backups can be used. It is not uncommon for the compressed backup to be less than 10% of the original size. WSDL uses registry entries to locate the 7-Zip program. If 7-Zip is not installed or WSDL has problems compressing the log, a backup is still created but it will be un-compressed.

There is an option to trim the size of the log file after a backup, to a user-specified size in days. The user can also specify the interval between trim operations, and it can be different than the backup interval. The trim operation is performed after a successful backup, if the time since the last trim operation is at least equal to the trim interval.

Another option allows the message log to be trimmed to a size specified in MB after a successful backup. There is no option to backup the message log.

Here you can also choose the directory used to store the weather log backups. For safety, it is wise to store these on a different physical disk than is used for the weather log itself. That way, if one disk goes belly-up, you'll still have something left over.

Hardware Tab

Starting in version 2.8, users can specify the number of external temperature sensors and give custom names to each sensor.

External Temperature Sensors

A total of up to 11 temperature sensors is supported. The zero-th sensor is always the base station unit and the first sensor is co-located with the anemometer. This is always on channel 1 and cannot be changed. The new WMR100N has a separate external sensor and it is unknown if that sensor’s channel is settable.

Set the number of wireless sensors in this dialog to the highest channel number in use, which might be different from the number of wireless sensors you have. For example, if you have sensors on channels 1,2 and 5 then choose “5” for the number of wireless sensors. The program always assumes you have at least one wireless sensor and you cannot set the number to zero.

Each sensor can be given a custom name which will appear in the temperature readouts and graphics. If these names are too long, some of the readout labels may overflow and look funny.

The weather log file is capable of handling a different number of sensors with each entry; changing the number of entries does not require any special processing of the log file. Custom sensor names are ***NOT*** stored in the log file – you must keep track of this separately.

Sensor Number for Web Uploads

Normally, the dedicated outdoor temperature sensor data is used for web data uploads. This is pre-assigned to channel 1. If you have installed a separate wireless sensor in a custom radiation shield, it can be used for upload data instead. Set the value here to reflect which sensor should be used for web data uploads.

Earlier versions of the WMR100 have the temperature/humidity sensor combined with the anemometer. This undesirable – the ideal height for the anemometer is 30 feet while the temperature sensor should be at a height of 5 feet. The radiation shielding provided is also perhaps not all that it should be. Users of these models may wish to use a THGR810 wireless sensor installed in a custom radiation shield for their outdoor readings.

Newer WMR100 models (WMR100N) come with a separate shielded temperature sensor.

UV Sensor Enable

If there is a wireless UV sensor in your system, check this box to show UV data in the main window.

Wireless Sensor Timeout

It is not uncommon to experience flaky communications from your wireless sensors. Occasionally, the indoor console may miss one or two transmissions from a sensor. This causes WSDL to eventually flag the data as “aged” or “old”. This option allows the timeout limit for wireless sensors to be adjusted anywhere from 60 seconds to 600 seconds (10 minutes). Earlier versions of WSDL used values around 130 seconds or so. This new option will default to 150 seconds. If you frequently get sensor timeouts and cannot fix it by relocating or re-orienting the indoor console, this value can be increased to help the situation.

It is suggested that the timeout be kept less than your internet upload interval.

USB Options

There is an option to allow the USB connection to the weather station to be “shared”. The recommended setting for this option is un-checked – which does not allow the weather station device to be shared.

Experiments have shown that enabling this check box may cause problems when additional USB devices are added to or removed from the system. If such problems are experienced, make sure this check box is not checked.

After changing this setting, the program should be restarted.

Colors Tab

With the ability to graph temperature, relative humidity and dew point for up to 11 sensors, the temperature graph can get very cluttered. Maximizing the readability of these graphs requires careful choice of colors – which can also be dependent on the capabilities of the display monitor, your eyeballs, and personal taste. For these reasons, staring in version 2.8 users can select which colors are used for the temperature graph.

There are separate color lists for temperature, dew point and RH. Up to 11 colors may be specified in each list. Colors can either be specified by their name in the Windows operating system, or by RGB values (with support for alpha or transparency).

The “Default Colors” button replaces all three lists with default values – overwriting any existing data. Don’t worry if you accidentally push this button -- you can still cancel the options dialog without losing the currently stored color options.

Graph Color Assignment Policy

Colors are assigned to sensors in a cyclical manner. Say there are four colors in the list and five sensors. The first four sensors will get four unique colors from the list. For the fifth sensor, the program just recycles the list starting again with the first color.

Colors will be assigned dynamically or statically at the user’s discretion. For static assignment, the choice of color depends on the sensor’s channel number only. With dynamic assignment, colors are assigned cyclicly only to those sensors which are being graphed. An example will help to understand the difference.

Assume there are four colors in the list and nine sensors (on channel numbers zero through eight). Sensor numbers three and six are enabled for graphing. Now, think of the four colors as having numbers zero through three. The first color is color number 0 and the fourth color is color number 3.

If static color assignment is used, the color choice for sensor three is equal to “3 modulo the-number-of-colors (4)” which is still three (this is the fourth color). The color for sensor six is “6 modulo 4” or two (the third color).

With dynamic assignment, colors are still assigned cyclicly, but only those sensors being graphed are counted. The first sensor to be graphed is sensor 3 and it will get the first color (color number 0). The second sensor to be graphed is sensor 6 and it will get the second color (color number 1).

Now let’s say graphing is enabled for another sensor – sensor number 0. With static color assignment, the new sensor’s color is “0 modulo 4” or zero – the first color. The color of the other two sensor’s graphs will not change. With dynamic color assignment things are different; sensor 0 will now get the first color with sensors 3 and 6 receiving the 2nd and 3rd colors respectively.

Color Specification Formats

The set of named colors that are recognized by windows can be found in many places on the internet. Here is one URL that worked as of February, 2009:

http://msdn.microsoft.com/en-us/library/aa358802(VS.85).aspx

If this link does not work for you, try searching Microsoft’s web site (or the whole internet) for the string: “colors by name”.

In addition to named colors you can enter RGB or ARGB values in hexadecimal format. The string must start with a “#” character, and be followed by exactly 6 or 8 hexadecimal characters (letters may be upper or lower case). For RGB values the string looks like this (don’t enter the quotes): “#RRGGBB”. As an example, pure saturated red would be “#FF0000”.

You can specify transparency (also called alpha) in the color – assuming your graphics hardware supports this capability. In this case, preceed the RGB values with two hex characters for the alpha value like this: "#AARRGGBB". For example, a 25% grey which is also 50% transparent would be "#80404040".

Station Tab

This tab contains information about your geographic location for several purposes. The tab itself is new in release 3.1 and contains information previously found in the Upload and Calibration tabs. Here is a summary of the different features in WSDL that require this tab's data to be valid:

- CWOP uploads require latitude, longitude and elevation.
- Proper calculation of altimeter setting (QNH) requires an accurate elevation.
- Over-riding the WMR100's calculation of SLP requires elevation and (if the elevation is 1000 feet or more) normal temperature.
- HTML tag values for almanac (sun and moon) information require latitude and longitude.

Latitude, Longitude and Elevation

Latitude and longitude can be entered in one of three commonly used formats:

- Decimal degrees, to four decimal places (DD.dddd). For example, "109.4892"
- Degrees and decimal minutes, to two decimal places (DD:MM.mm). For example, "93:35.89".
- Degrees, minutes and (integer) seconds (DD:MM:SS). For example, "102:01:59".

Click the radio button corresponding to whichever format is most convenient. The current values will be automatically converted if the format is changed. For those concerned with minutae, there is a slight difference in resolution with these options – decimal degrees has the highest resolution (about 36 feet in latitude) followed by decimal minutes (61 feet) and then integer seconds (101 feet). Unless you live on the equator, the resolution in longitude will always be better than these numbers.

Elevation can be entered in either feet or meters. The other value will be automatically updated to reflect the entered value. For example, entering an elevation of 1000 meters will cause the display of elevation in feet to read 3281.

Sea Level Pressure (SLP)

This group of settings is used to over-ride the WMR100's calculation of SLP. See the section about the barometer in the "Program Features" section of this manual for more details.

Upload Tab

This is where Weather Underground and CWOP uploads can be configured. If you are uploading data to the CWOP server, it is likely that Weather Underground will automatically pick up the feed – there is no need to also configure Weather Underground uploads in this case. This assumes that you have arranged for the CWOP upload to be passed on to the NOAA MADIS server.

Weather Underground

The station ID assigned by Weather Underground, and password for your Weather Underground account are entered here. Be sure to enter the identifier code assigned to your weather station here – do not enter your Weather Underground login ID. The password should be the password associated with your Weather Underground login.

For example, assume your login ID is “joe” with password “123456”. You have registered a weather station which has been assigned a station ID of “KCABURKE999”. Enter the station ID “KCABURKE999” in the Station ID field, and “123456” in the password field. Do not enter “joe” for the station ID – it will not work!

There is absolutely no security in this program to protect your password, and it is sent out on the Internet without encryption. If this makes you nervous then create a separate account with Weather Underground for these uploads. And for heaven's sake, don't use the same password here that you use for things like your bank account!

The default URL for the upload should be correct, but can be changed if necessary.

After entering station ID and password, try a test upload with the “Test” button. A dialog will pop up and let you know if the test worked. This test sends simulated weather data – not the actual data currently being reported by the weather station. If the test is successful, set the desired upload interval and click the “Enable” check-box.

Uploads will begin as soon as you save the new settings.

CWOP

Be sure to read the section on CWOP below before trying to use this option.

Setup for the Citizen Weather Observer Program (CWOP) is similar to Weather Underground. When you sign up for this program you will be assigned a station ID which will probably consist of two capital letters followed by four decimal digits (something like “AB1234” for example). Enter this identifier in the Station ID box.

The default CWOP server URL should be correct. Don’t change this unless you have trouble with the uploads. There is a button to reset the URL to the default setting.

The Port setting (TCP port number) should also be correct. Don’t change this unless you know what you are doing or have some instructions from the CWOP folks asking you to do this. There is a button to reset the port back to the default value.

Part of the CWOP upload data includes the geographic coordinates of your weather station (latitude and longitude). This must be set accurately (see the “Station” options tab). The CWOP web pages have information to help you determine these values. An accurate elevation

must be entered into this dialog as well – otherwise barometer readings reported to CWOP will be off. Ideally the elevation should be accurate to 10 feet or better.

Since CWOP data can be sent to NOAA, you should be picky about the quality of this data. In some cases, it may not be possible to properly site all of your weather station components. For example if the station is located within a stand of tall trees, the wind information may not be usable. For this reason, there are check boxes to disable reporting of various sensor readings.

If some of your sensors are not operational there are some check-boxes that can be used to omit some of the data in the upload to CWOP. For example, some folks may take the rain gauge indoors during the dry season and remove the batteries – disabling rain bucket data would make sense here.

Requiring a Valid Temperature

When data is uploaded, WSDL will omit certain pieces of data if the data is “aged” or “old” – in otherwords, the wireless sensor providing that data has timed out. Although both WU and CWOP allow this, some of their online graphs may look funny if it contains reports with omitted temperature readings. This problem really belongs to WU and CWOP, but for those who are bugged by this, there is a check box which will prevent uploads from occuring if temperature data is stale. You can also mitigate this problem by increasing the wireless sensor timeout interval (see the “Hardware” options tab).

FTP Tab

This allows you to setup HTML file creation and uploads to a web server. The upload step is optional if you have a web server running on the same computer as WSDL.

Security

There is absolutely no security in this program to protect your FTP password, and it is sent out on the Internet without encryption (unless you check the SSL box – see below). If this makes you nervous then create a separate account for these uploads. And for heaven's sake, don't use the same password here that you use for things like your bank account!

Normally, the user name and password for FTP login is sent over the internet un-encrypted. Malicious people who monitor the internet can capture this information, and gain access to your account on the web server.

The check box to enable SSL on the FTP operation will encrypt the user name an password for a higher level of security. However, this capability has not been fully verified yet in WSDL. It would be safest to assume this is not working until proven otherwise.

There is one more issue with the SSL option. FTP servers often supply what are called “self-signed” encryption certificates for the secure connection. This kind of certificate can be intercepted and forged by hackers, and you would never know the difference. This is called a “man in the middle” attack. The result is the same; the hacker would again learn your user id and password on the web server. On the other hand, this option is still more secure than no encryption at all.

Now you can understand that other check box – the one about allowing unsafe SSL certificates. If your web server supports SSL encryption for FTP, then try it without the “unsafe” option first. If that doesn’t work then try checking the unsafe box.

Files

The “Files” section allow you to specify a template file and an output file. The template file is processed as described earlier in this manual, and the result is saved as the result, or output file. If you specify a “.csv” list file here, the result file option will still be used to determine the directory for graph image storage.

The “Station Description” entry will be used to replace the “[Location]” tag in the input file.

FTP Connection

Here you can enter your user id and password for FTP uploads. WSDL does not protect your id or password from others snooping on your computer.

The URL should specify the web server’s FTP address plus the path to the file you want to save on the server. If the URL field is blank, then an HTML output file will be created, but no FTP upload will take place. The URL should always start with the string:

ftp://

When uploading multiple files (using a “.csv” list file in place of an HTML template file), leaving this field blank will disable FTP uploads but tag processing will still occur. To enable FTP upload in this case, any non-blank data can be entered for the URL.

Graphics

The size (in pixels) of PNG files generated for upload is adjustable here. FTP graphics are generated by hidden windows – this is necessary to allow independent control of the size. These hidden windows can suck up computer resources and if you find the computer runs slower it is possible to disable generation of the PNG files. This will close all of the hidden windows used for FTP graphics.

Upload Control

Here you specify how often you want FTP uploads to occur and enable or disable the upload capability.

Internet Tab

This area offers the option to have a dial-up internet connection established each time a data upload is ready. After the data upload completes, the connection will hang-up. This can be useful for those with dial-up connections who don’t want the phone line busy up all the time. Getting this to work can be a bit tricky, so follow the directions below carefully!

To use this feature, you must first configure a dialup internet connection that can be completed without user intervention. To do this, go to the Network Connections window (in the control panel). Either create a new connection or select an existing dial-up connection. A valid username and password must be saved as part of the connection. Right-click the connection and select “Properties”. Under the “Options” tab for the dialup connection properties window, make sure the check boxes to prompt for name and phone number are un-checked. Also, set the redial attempts to a large number (say 99), the time between redial attempts to something reasonable and un-check the box to re-dial if the line is dropped. If there is a dialing problem and the re-dial attempts run out, then Windows will pop up a dialog that requires human intervention – at this point uploads will not occur until the dialog is closed.

Finally, make a note of the dialup connection's name – as shown in the Network Connections window. Enter the connection name where indicated in the data logger options window and then check the enable box. If the name here does not match the internet connection's name exactly, then uploads will fail.

If two uploads occur around the same time (e.g. WeatherUnderground and CWOP), WSDL will attempt to share the connection between the two uploads to avoid having to dial out twice.

If the phone line is busy or in use when the dialing attempt occurs, the data upload will be retried every so often (whatever you specified above). Attempts to upload data will continue on schedule. So, if you're talking on the phone for a while, no data uploads will occur until you get off the phone – but then they will continue normally.

Some modems do a poor job of detecting the dial tone (they seem to mistake the human voice for a dial tone) – in this case you may notice the computer will try to dial your ISP while you are talking on the phone. This is annoying as heck. There is no good fix for this problem other than to try a different modem.

Calibration Tab

Starting with program version 2.5, two different aspects of the weather station can be "calibrated" -- relative humidity maximum and rain bucket readings. One could argue that "calibration" is too strong a word for this feature.

In version 2.8 there is a second option for rain gage calibration, described in the appendices. Please download and read the appendices if you wish to use rain bucket tip counting and the related calibration setting.

Relative Humidity Maximum

Using this calibration setting, you can specify the maximum RH reading you get when it is raining or foggy. For example if you set this value to 98%, then a value of 98% reported by the WMR100 will be "bumped-up" to a 100% reading.

There are separate settings for the WMR100 console (channel 0), the dedicated outdoor sensor (channel 1). There is also one setting that is applied identically to all additional wireless sensors (channels 2-10).

Rain Gage Scale Factor

This factor should be used if you've manually calibrated the rain gage, or if the sensitivity has been altered as described in the appendices.

One of the attributes of a rain gage is the amount of rain required to make the measuring bucket tip. While some gages might require 0.01 inch of rain to tip the bucket, the WMR100's unit requires about 0.03 inches.

At the end of a storm, the rain gage's bucket will be half-way to the next tipping point (on average). If there is enough time for this water to evaporate before the next storm, then one-half bucket's worth of rain will not get counted (again, on average). Furthermore, small rain events – less than one bucket – will not be counted.

The rain gage can be modified to have a higher resolution. The scale factor option is intended to account for such modifications. All rain gage readings from the weather station are multiplied by this number before being displayed, logged or graphed.

Although this technique reduces the amount of un-measured rain, it can increase other measurement uncertainties. Users must judge for themselves if the increased resolution is worth the cost in terms of increased uncertainty. See Appendix I for more information, and an example of a modified rain gage.

Setting this value to 1.0000 effectively disables the scale factor.

Bucket Tip Amount

For reasons described in the appendix covering rain gage calibration, another method to process rain data has been provided. This option actually counts the number of times the rain bucket tips and therefore effectively bypasses the WMR100's built in calibration. Please see the appendix to learn some of the pros and cons of this option.

This calibration value specifies the amount of rain collected by one tip of the tipping bucket rain gage. The value can be entered in inches or mm in the appropriated place. Entering a value in inches will automatically update the value in mm, and vice-versa.

Misc Tab

One option here is a check-box which causes the WSDL window to be minimized to the Windows notification area (the far-right side of the bar at the bottom of the screen) instead of to the task bar, where minimized program windows are usually shown.

Graph layout can also be configured here. The default configuration has a single graph displayed in the WSDL window. This can be changed to display up to sixteen graphs (four rows and four columns). Although most users will not find this many graphs useful, this does provide a lot of flexibility. See the description of the graph window in the Program Features section for more information.

WeatherJack Tab

This is of interest to those who choose to add the WeatherJack barometer to their weather station. This is mostly for advanced users, and details for these option settings are covered in the WeatherJack appendix which can be downloaded separately from SourceForge.

Building the Software

This software has been successfully built using Visual Studio .NET versions 2005 and 2008. In both cases, version 2 of the .NET runtime was used. Solution and project files in SVN on SourceForge are of the 2005 vintage, so those users running VS.NET 2008 will need to convert them.

The software is usually delivered without the ZedGraph library. ZedGraph source may be obtained from the SourceForge. Versions 5.1.4 and 5.1.5 are known to work. It should be possible to link directly against a compiled ZedGraph DLL, although this has not been tried.

To make use of the ZedGraph source distribution, unpack the zip file in a separate directory. Inside the version directory for the source, there are two subdirectories (“source” and “web”), and a VS solution file. Copy the entire contents of the “source” directory into the “ZedGraph” sub-directory of the WMR100 solution directory. The WMR100 Visual Studio solution should now load without errors. If there are problems, try removing the ZedGraph project from the solution and then add it back again.

In order to make options upgrade more reliably, all assemblies are now strong-named. If the strong name changes, then the option upgrade process will break. To avoid this do not change any identifying information in AssemblyInfo.cs (except version numbers). Also, do not regenerate the signing key file.

Release Notes

Easter Eggs

From time to time, a few early-release features may be included in WSDL. These will not be documented and must be enabled or changed by hand-editing the "user.config" options file. These are usually items that will (probably, but not always) be in a future release and are not fully tested. If you do try one out, feedback in one of the SourceForge forums would be appreciated.

Please note that numeric values stored in the options file (user.config) are always formatted according to English (United States) rules. For example, periods (".") ***must*** be used for decimal separators – do not use commas (",") even if your country normally does this.

There may be several versions of the user.config file floating around. The version containing default settings is in the installation directory and is named "WxLogger.exe.config". This is the default or backup file and is used:

1. When the program is first installed and the user has not set any options yet.

2. When the program is updated and new options have been added.

3. After resetting all options.

Whenever the default file is used, a copy will be made and stored in a local user directory. From this point on, only the local user copy is referred to – so any changes made to the default file at this point will NOT have any effect. If you make changes to the default file then – you must do it after upgrading WSDL but before running it for the first time.

The other versions of the config file are stored in the "Documents and Settings" folder, under "Local Settings" and "wmrx00" for the current logged in user account. Drill down to find the file and you'll discover a separate directory for each version of WSDL that has been installed on the computer. Refer to the "user.config" file for the version of WSDL you are running – changes made to other versions will not have any effect.

Version 3.4.2

More bug fixes in this release:

1. The tool to write a processed log file was failing.

2. The log backup procedure got stuck in an infinite loop if the time zone had a positive UTC offset.

3. Temperature-only wireless sensors were not properly recognized and processed.

4. Decoded temperatures above 25.5C or below -25.5C were in error by 0.1C. Temperatures above 51.1C or below -51.1C would have been in error by 0.2C (although it is unlikely many users actually experienced temperatures this extreme).

Version 3.4.1

Three minor fixes are in this release.

1. Dates for new and/or full moon may have been off by one day. This should be more accurate now most of the time – but still may be off by one day occasionally. A future release may improve on the accuracy.

2. The tool which creates a processed log file was failing.

3. If a log file backup fails, the next backup is now scheduled as if the backup had worked. Diagnostic information about the failure will be available in the message log.

Version 3.4

User options are now stored in an invariant format (English (United States)). WSDL should be able to read option files (user.config) which used European formatting although this has not been tested with all language settings. Existing user.config files will not be altered, so in the worst case, users will not lose previous option settings (they will still be contained in the previous version of "user.config").

These changes may also effect option settings, however there is no danger that previous settings will be lost. If problems occur, the previous user.config file will not be damaged and settings can be recovered. Please see the section above about Easter Eggs, and the section on Program Options in the "Program Features" chapter for more information.

- The biggest change is the ability to show multiple graphs in the WSDL window. Look in the Options window under the "Misc" tab for more information.

- Graphs are now saved as PNG files and can be uploaded via FTP. See the FTP section in this manual for details.

- Another large change is support for regional language settings with different numeric formats than used in the United States of America. Specifically, many countries in Europe (among other places) use a comma (",") instead of a period (".") to separate the integer and fractional parts of numbers. Versions of WSDL prior to 3.4 do not work in these situations.

- Some new tags have been added for FTP upload. See the tag list elsewhere in this manual for details.

- Various bug fixes. Rain rate was not properly decoded from WMR200 weather stations.

- Graph colors (besides temperature/dewpoint/RH) can now be changed, including graph background color. However this is only available as an "Easter Egg". See the sub-section "The Graph(s)" in the Reference section of this manual for details.

- Estimated wireless sensor communications statistics have been added to the message log.

- Formatting of the message log has been improved for multi-line messages and the font used in the message panel has been changed to one with fixed spacing for better readability. The message sub-window's font has not been altered.

- A bug which caused the date of the next full or new moon to be off by one day was fixed.

Version 3.1

- Option to compress log file backups with 7-zip added (this was an “Easter Egg” in the original 3.0 release).
- New option tab added for the weather station’s geographic location. Several items were moved from the Upload and Calibration tabs, as these tabs were a bit crowded. Data entry for latitude and longitude was modified to be a bit less confusing.
- A couple of bugs in the options window were fixed which caused incorrect display of user options, and/or the inability to change those options.
- A crash bug when changing some options with an empty weather log file was fixed.
- Bugs with display and/or web page output for daily rain totals fixed.
- Bug with possible log file inconsistencies fixed. This might manifest as bad UV and/or temperature/RH/dew point graph values or web page numbers. WSDL will detect and repair any problems with the log file; there should be no loss of data from the log.
- Web page output for temperature, RH and dew point no longer includes the units directly with numbers. Two new tags, [TempUnits] and [RhUnits] should be used to append units to these numbers.
- Scrambled channel number labels in options “Hardware” tab fixed.
- Added display of rain rate to main window.

Version 3.0

- Support for WMR200 weather stations. Battery and forecast icon indications may not be accurate yet, however.
- Support for WeatherJack barometer
- Web page (HTML) generation and FTP upload capabilities
- Temperature and humidity calibration options
- WSDL can compute SLP and override the WMR100’s SLP value
- Display of weather forecast from WMR100 (requires making the WSDL window larger)
- Full support for external UV sensors
- Partial (might be buggy) support for THWR800 water temperature sensor
- Auto-dial option for dial-up internet connections
- Messages can now be viewed in a separate window (“panel”)
- Barometer graph can show one of three different values, station pressure, altimeter setting or sea level pressure

- Wind gust graph can now display averaged data (as in earlier versions), a 10-minute peak hold or raw gust data.
- Support for 64-bit operating systems (XP, Vista and Windows 7)
- The “Write Daily Extremes” function has been enhanced to output extremes for all configured wireless sensors. The order of columns in the output file has also been changed to be more compatible with a variable number of wireless sensors.
- Many miscellaneous bug fixes.

Version 2.9.7.1

- Fixed problems with 64-bit versions of Windows
- Added hecto-Pascals (hPa) for barometer units
- Changed text of meters/second from “MPS” to “m/s”
- Several problems with temperature and relative humitidy calibration settings fixed.
- Miscellaneous other bug fixes.
- New HTML examples.

Version 2.9.5.1 (Beta)

- Support for WMR200
- HTML web page generation capability with optional FTP upload
- Adjustable timeout period for wireless sensors
- Option to delay uploads if temperature data is stale
- Messages can now be displayed in a separate window
- Full support for UV sensor (display in window plus graphing)
- Ability to compute more accurate version of SLP than WMR100
- WeatherJack barometer support
- Display of battery status for all optional wireless sensors (including UV)
- Many minor tweaks and bug fixes that I forgot to write down

Version 2.8.8.1

- Added the ability to display QNH in the barometer readout area. It is not possible to graph QNH at this point. This displays the value that will be reported to CWOP.

- A problem with W.U. uploads and certain types of internet connections was found. Some proxy servers may occasionally respond to the W.U. upload request with their own HTML instead of passing the request through to W.U. Previously WSDL considered this to be a fatal error and disabled uploads. This has been changed to a non-fatal error so upload attempts will continue.

- Dew point calculations are now made using slightly better formulas. The improvement is very slight and most users won't notice any change at all.

- Software name (WSDL) and version added to W.U. upload data.

Version 2.8.7.2 BETA

- Capability to upload data to CWOP servers was added. Setup options for CWOP were added to the "Web" tab of the options dialog.

- Temperature and dew point upload data is now a 5-minute average of WMR100 data. Relative humidity data uploaded is a 1-minute average. This averaging is recommended by the CWOP.

- Logged temperature, humidity and dew point are now 1-minute averages of data reported by the WMR100. This helps to reduce "noise" a little bit.

- For those with dial-up internet connections, there is an option to have the dial-up connection dialed and then hang-up for each data upload.

- Wind graph origin now saved in settings.

- Temperature display age colors did not reflect the chosen sensors.

- Increased some aging timeouts slightly to allow one missing wireless reading before going yellow. Four readings must be missing before going red.

- Temperature aging labels were incorrect if the default sensors being displayed were changed. This has been fixed.

- A single separate RH calibration setting is now available for any extra outdoor sensors on channels 2-10.

Version 2.8

- Support for the maximum number of wireless temperature sensors.
    - Graphic display
    - Text readouts
    - Sensor Names
    - Temperature graph colors for each sensor

- Window size is now adjustable.

- Rain-processed log file conversion utility.
- Rain-rate added to precipitation graph.
- Option to count rain bucket tips with user-specified bucket tip amount.
- Weather Underground updates are not delayed if some information is invalid.
- Corrupt or invalid weather log files caused the program to silently exit with no explanation. An error dialog will pop up now to explain the problem.
- Graphs may have shown backwards lines if the log file UTC offset was negative instead of zero. There were probably other issues for positive offsets. These problems are fixed.

Version 2.5

- Changing graph time scale no longer re-loads the weather log from disk. This was taking a long time with large log files. Instead, 30-days worth of data is kept in memory for faster access.
- Weather Underground upload support added.
- Rainfall data can now be sourced from the weather log instead of what the station is reporting. Daily rainfall (rain since midnight) is reported instead of rain over the last 24-hour period.
- Windows Vista now supported. The sole change that allows this was moving option settings out of the registry.
- Rain gage and relative humidity calibration added.
- Pressure rate is now computed over a 2-hour period instead of 15-minutes.
- Windows 2000 USB data errors are reduced in frequency.
- Bugs having to do with computing daily extremes from log file data fixed.
- Dialogs added to help users with option settings. Several related problems fixed.
- Dates/times in the daily extreme output file are now use the display time zone or UTC offset. The naming convention for the file (GMT) has not changed.
- The distribution is built with ZedGraph version 5.1.5.