mcsTEMPERATURE

Homeseer Support for Temperature Recording and Display of Local Sensors and Web-based Meteorological Data

By Michael McSharry and Bill Walton
April 27, 2003 / Dec 8, 2005

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1 Introduction

mcsTemperature is a Homeseer plug-in that supports data collection, storage, and display of temperature and other meteorological data, event control based on the data, and a web interface that will display the collected data numerically and graphically. Temperature, humidity, rain, barometric pressure, and wind data are supported.

Data are collected from local sensors and the web. The local sensor data can be obtained using internal drivers to the one-wire bus for the Temp05, Temp08, DS9097, DS9490, and Quasar 3145 interfaces; from multiple delimited text files; or from other custom drivers such as the Temp05 and 1-Wire Homeseer plug-ins. Combinations of the interface methods are also supported to maximize the flexibility for data collection. Forecasted temperature and publicly-available current conditions are based on data obtained from the MSNBC web site.

Two user web interfaces are provided to view and compare collected data. One is a graphical interface that allows selected data to be viewed over a period of time. The charting is done with either line graphs or color intensity charts. Historical as well as actual vs. forecasted behavior charts are available.

The second web interface shows the current and forecasted conditions, with both public and local sensor data values presented. All web interfaces are designed for both 640x480 touchscreen and typical PC layouts.

Control is event-based with triggers available for limits, bands, rate of change, and divergence. Control loop actions can also be specified that define the on and off conditions based upon limit bands.

This manual is organized to provide three views into the information. The first is a Quick Start (see Section 2) that discusses the minimum necessary actions required to start using the plug-in. The second is a functional view consisting of Data Collection (see Section 3), the Trigger Control (see Section 4), Data Display (see Section 5), Scripting (see Section 6), and the Database(s) (see Section 7). The third is a detailed discussion of the setup options (see Section 8).

This manual was last updated as of version 4.23.4 of the plug-in.

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2 Quick Start

2.1 Overview

Quick start setup of the mcsTemperature plug-in consists of the following:

1. Install the plug-in from the Homeseer Updater;
2. select one or more interfaces on the Interfaces/Main tab of the Setup GUI;
3. optionally ask the plug-in to create its own virtual devices on the Devices tab of the setup GUI;
4. close the setup GUI with the Update button and wait for a data collection cycle; and
5. navigate to one of two URLs with your browser to display data after some has been collected.

While this is all that is needed for a quick start there are many customizations that can be selected from the setup page. See Section 8 for a full discussion of Setup Options. There are also some cases where user-configuration information may be needed to achieve correct operation for non-default environments.

2.2 Installation Actions

Installation starts with the download from the Homeseer Updater. Add the mcsTemperature plug-in to Homeseer by selecting it from the Homeseer GUI. In Homeseer, for HS Version 1.X, select the View, Options… menu item and go to the Interfaces tab. In the section labeled RF, I/O, Security, Custom interface, use the control Select device to add: and select mcsTemperature. In Homeseer, for HS Version 2.X, the Interfaces button is used and mcsTemperature selected as an IO interface. You will need to restart Homeseer following this step. Once Homeseer restarts, you should see a new menu item on the Homeseer menu: mcsTemperature. Under this menu item is the General Setup menu selection, among others. Don't try to use anything but General Setup and Help until you have completed at least a minimal setup as described below in paragraph 2.3.

If you use the DS9097 as your 1-wire interface then a Java VM must be installed on your computer. If one is not already installed, you should be able to obtain one from Microsoft or Sun. Court antitrust rulings have prohibited Microsoft from distributing its version and the Sun implementation will not work in some situations. Scan the Homeseer message board (http://ubb.homeseer.com/) under the MCS Temperature forum (under 3rd Party Plug-Ins) for more discussion on this subject.

The download from the Homeseer Updater contains all files necessary to run the plug-in with the exception of the device drivers for the DS9097 interface, the drivers for the line graphs, and the Java Virtual Machine (Java VM). The DS9097 and line graph drivers will be downloaded automatically when first needed, as determined by the setup page settings. *This means that the first time the Update button is clicked on the Setup page there will be one or two downloading processes spawned* which will eventually need some user attention to complete the installation. In these cases the default response to the install prompts will produce adequate results. Before full functionality is achieved these installations must complete.

If for some reason the automatic download of these components fails, see sections 10.1 and 10.2 for reference to the URLs where you may manually download them.

2.3 User Configuration Actions

You don't need to do a complete configuration in order to get started. As a minimum, you need to select one or more data collection interfaces on the Interface/Main tab; define the database where the collected data are stored on the Database tab; set up Housecodes for virtual devices on the Devices/Files tab, and set up a few devices (where these are defined depends on which Interface(s) you select). You can extend and revise your configuration at any time.

Once you have added the plug-in to Homeseer via the Homeseer UI, as described above in section 2.2, you should be able to proceed to the Setup page via menu item mcsTemperature, General Setup. Before you begin the setup, please read and understand the following setup basics.

The mcsTemperature plug-in is able to collect sensor data from virtual devices (which might be populated by other plug-ins); from delimited text data files (which might be written by other programs); from a public weather data web site; and from devices on the one-wire bus using either the Temp05/Temp08/Quasar 3145 or the DS9097U/DS9490 physical interface (or both). Any or all of these methods may be used. The selection of which set of interfaces are to be enabled is made from the Interfaces/Main tab of the mcsTemperature setup page. The plug-in will do very little until at least one data interface is selected.

If you are using other means to populate data into virtual devices, and then using mcsTemperature to read the data into the mcsTemperature database (the Virtual Devices interface), you need to define those virtual devices to mcsTemperature. You should enter the known House and Unit codes on the appropriate Analog, Discrete, or User Defined tabs. You can define one or two to start and add the rest later.

The mcsTemperature plug-in will create and use virtual devices to store data collected from the physical interfaces or data files. The plug-in will manage two house codes (up to 128 devices) assigned to it, but these will only be created and used if that option is selected. Unless there is some reason you do not want to use plug-in house codes (special codes which appear as special characters such as], /, ‘, [etc.) then the plug-in should be configured to manage its own house codes. This is done from the Create Plug-in Devices button on the Devices/Files tab of the setup page. If this is not done then the default house code of "R" will be used to store sensor information collected from the interfaces selected.

The mcsTemperature plug-in is able to control discrete (i.e. on/off) devices and relays on the one-wire bus. The relays connected to the Temp05/Temp08 through the add-on Relay05 device are enabled from the Temp0x/Relay05 tab of the setup GUI. The discrete output devices connected to the DS9097/DS9490 are enabled as output devices on the Discrete tab of the setup GUI. This aspect of the setup can be deferred. The setup can be re-entered as often as desired so if something is not configured on the initial setup then it can be done later.

The mcsTemperature plug-in is able to (and needs to) record sensor analog and discrete data to a database. The database to be used for this data storage is specified on the Database tab of the setup GUI. The specific database fields are editable on the Analog, Discrete, and User Defined tabs of the setup GUI. Defaults for all of these settings will be used so this aspect of the setup can be deferred until later (or can be totally ignored in many cases).

The mcsTemperature plug-in is able to display data collected in the database on two web pages. These web pages are viewed by setting the browser's URL to the homeseer server's address and port with Temperture.asp or Forecast.asp as the file to view. For example: http://myHomeseerComputer:8080/Temperature.asp. Before data can be viewed on the web page it first

must be collected into the database, and of course before data appears in the database one or more data collection interfaces need to be specified as discussed above.

The mcsTemperature plug-in collects information about sensors connected on the one-wire bus and automatically updates the configuration information. The user is able to alter the configuration information while the setup page is open. To prevent contention and assure integrity of the configuration data the plug-in will not update the configuration while the setup page is open. This means that the setup page should be closed using the Update button after making the initial selections and then some time given for the plug-in to collect data prior to opening it again or trying to display collected data. How long you should wait depends on the update interval selected in the setup. You should probably allow at least 3 or 4 data collection cycles.

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3 PLUG-IN DATA COLLECTION

The mcsTemperature plug-in collects data from various sources, stores the data in one or more databases, provides means to view and analyze the data in several ways, allows for the use of collected data in Homeseer control actions, and exposes some of its internal functions for scripts to use. This chapter will discuss the supported sources of data and briefly describe how to configure the plug-in to interface with them.

3.1 Plug-in Data Sources

The mcsTemperature plug-in is able to access data from devices on the 1-wire bus by directly controlling the Midon Design Temp05 or Temp08 One-wire interface connected to a serial port. Means are provided to initialize the Temp05/Temp08 and to interactively set parameters or respond to queries from the device when necessary.

The Quasar 3145 is another serial interface that can be managed. For this interface there are no interactive commands needed.

In addition mcsTemperature can access data from devices on the One-wire bus by controlling the Dallas Semiconductor DS9097U or DS9490 interface connected to a serial port or USB port, respectively. To do so, it needs a Java VM (either pre-installed or installed separately by the user) and the Dallas Semiconductor device drivers, which will be downloaded and installed by the plug-in when the DS9097 or DS9490 has been selected in Setup.

The plug-in can accept data from up to three separate text data files. The format of these files is configurable, within limits. Typically, these files are written by a program that interfaces with a weather station and exports the data to a delimited file. The mcsTemperature plug-in can be configured to delete the files when the data have been written to its database.

The mcsTemperature plug-in is also able to accept data using a virtual interface via Homeseer virtual devices. These virtual devices can be populated from a variety of sources, including (for example) the Temp05 or DS9097 being driven by scripts or other plug-ins, web site data collected and parsed by scripts or other plug-ins, or devices connected through other interfaces (thermostats, transducers, relays and switches, etc.).

In addition to these “local” data sources, the mcsTemperature plug-in uses weather condition and forecast information from the MSNBC weather website and will average the data provided from up to 3 WeatherPLUG reporting sites.

3.2 Setting up the Data Interfaces

There is a Setup dialog (the setup GUI) which provides visual access to the mcsTemperature.ini and mcsForecast.ini files in which user setup preferences are stored. To access the setup dialog, use the Homeseer GUI menu item mcsTemperature, General Setup (or menu item View, Options…, Interfaces tab, mcsTemperature, Setup button). See Section 8 for a complete discussion of the setup GUI.

The setup GUI is organized into a set of tabbed panels that each contain related information. The Interface/Main tab contains the high level specification of the type of input interface(s) that will be used. The Temp0x/Relay05 tab provides the setup for the Temp05/Temp08 and associated Relay05. The Devices/Files tab contains supporting interface information and defaults for newly detected sensors. The Database tab is used to identify the database(s) and tables that will be used to save sampled data, and also contains controls to manage the database(s). The Forecast tab is used to provide the setup information for weather information that will be gathered from the Web. The Display tab is used to specify preferences on the appearance of the web pages that will be drawn for the sensors trends and weather forecast displays.

The tabs Analog (1), Analog (2), Analog (3), Analog (4), Discrete (1), Discrete (2), Discrete (3), and User Defined specify the relationship of the sensors to virtual devices and database fields. Except for the virtual interface devices, these tabs will only be used after the plug-in has had a chance to process at least one cycle of the sensor data from the interface(s). As it does so, it will populate the information in these panels based upon the sensors it detects.

3.2.1 Configure Your Interface(s)

The Interface/Main tab contains a checkbox for each of the interface types that may be utilized, except the virtual interface, which is always enabled. Any or all of the interfaces can be active at the same time.

To the right of the checkboxes are entry fields to specify other information about the interface selected. In the case of the Temp05/Temp08 there is additional information that is needed, specified on the Temp0x/Relay05 tab. For the text file interface, additional information about the format of the text file is specified on the Devices/Files tab.

3.2.1.1 Temp05 / Temp08 Interface

If the Temp05 or Temp08 is to be used then the Interface/Main tab checkbox for this interface needs to be checked and the line of information completed for the Temp05/Temp08. The remainder of the Temp05/Temp08 setup is done on the Temp0x/Relay05 tab.

The update interval specified and the C vs. F scaling is entered on the setup page. However, these settings are not immediately put into effect. The actual update interval and scaling is driven by data received from the Temp05/Temp08. Before the Temp05/Temp08 begins to update at this rate an interactive command sequence must be executed. This is done on a second setup window and is described in Section 3.2.2.

The plug-in supports Temp05 firmware versions V4.x and V5.x and all Temp08 versions. The checkbox is used to specify which applies. If a 1-wire weather instrument is installed that uses the DS2401 method for wind direction detection then only the V4.x firmware supports it. This configuration is identified with a checkbox.

The Temp05 and Temp08 provide two means to identify sensors. One is an index and the other is the serial number of the sensor. The mcsTemperature plug-in utilizes the serial number method. This requires that the Temp05 or Temp08 be configured to deliver this information. This configuration is done automatically by the plug-in for the V4.x firmware. If the plug-in detects that the V5.x (or

Temp08) firmware is not properly configured it will pop up a GUI window on the Homeseer computer which will guide the user through this configuration. See paragraph 3.2.2 for use of the IO Stream Window (the Echo Window). This window can be disabled on the Temp0x/Relay05 tab.

Certain commands to the Temp05/Temp08 require a delay between the command verb and the command parameter. Output to discrete controls and relays are examples. The amount of delay is not well understood so it can be specified in the setup GUI to fit individual installation characteristics. If the configured delay is too short then this type of command will not operate reliably. If the delay is set too long then excess time will be taken to deliver the command.

Version 5.x of the Temp05 firmware and the Temp08 firmware both provide a prompt and then wait for user or plug-in response when they detect a sensor that can be configured to serve different functions. This is a common situation on initial installation and upon power cycles, or when new devices have been added to the One-wire bus. The mcsTemperature plug-in implements a watchdog timer function for the Temp05/Temp08 which will be activated if three Temp05/Temp08 update intervals have elapsed without any data returned by the Temp05/Temp08. The plug-in will send a character sequence to the Temp05/Temp08 in this situation. The sequence of characters that should be delivered is specified on the Interface/Main tab of the setup GUI. Experimentation will be necessary to determine what characters to send to the Temp05 or Temp08. You should be able to do this by cycling power on the Temp05/Temp08 when the Temp05/Temp05 Data Receive Echo window is showing. As it starts up, the Temp05/Temp08 will prompt for input(s). Each of these should be provided and this same sequence then entered for the WDT function input. A “W” or “H” (without quotes) is a typical response to tell the Temp05/Temp08 that the sensor it sees is a Wind or Humidity device. See Table 2 - Sensor Types (page 13) for the complete list. If this field is left blank then no watchdog auto-recovery will be attempted. Auto-recovery should not be needed for Temp05/Temp08 firmware versions starting with 5.11 since a timeout is implemented within the Temp05 to prevent lockup waiting for user input.

The Temp05 and Temp08 return a decimal (“.”) to separate the fractional part of a reading. There are some international locations that use other delimiters for this purpose. If this needs to be changed then the desired delimiter can be specified in the setup GUI.

3.2.1.2 DS9097 / DS9490 Interface

The DS9097 / DS9490 device driver, which should be downloaded and installed automatically by the plug-in, should detect and configure the serial port to which it is connected. This port is recognized and used by the plug-in. The port number will be shown on the Interface/Main tab (and cannot be changed). Also on this tab are the fields where the polling intervals for the DS9097 / DS9490 are specified. Two cycles are supported. One is the main cycle where all sensors on the 1-wire bus are queried. The second is optional and applies to only DS2405 and DS1990A sensors. If you have no such sensors connected to the DS9097 / DS9490 then leave this field blank.

The update rate has a direct impact on CPU load. However, the limiting factor is usually the speed of the 1-wire bus and serial port. The minimum polling interval is about 300 milliseconds for the faster update interval even if a lower value is entered in the text box. The DS2406 discrete sensor has the ability to signal an alarm if the state of the switch changes. The DS2405 does not have this capability. If all switches are of the type DS2406 then the checkbox to poll only alarming devices should be

checked to provide improved response times. If any connected switch does not have alarm capability, then all switches will need to be polled the brute force way.

Updates from the 1-wire are transferred to virtual devices for all sensors except the DS1921. Data transfers from these virtual devices will occur at the interval specified for database update. Data from DS2405, DS1990A, and DS1921 will be transferred to the database immediately after detecting a change or a dump of the mission data (explained in section 3.2.12 below).

3.2.1.3 Quasar 3145 Interface

The Quasar 3145 is a special 1-wire serial interface which provides a basic interface for up to four temperature sensors. When using this interface the 4th sensor must be utilized - any of the other three are optional. The 3145 should be physically configured to deliver temperature in centigrade which is the factory default.

3.2.1.4 Text File Interface

The text data file interface is intended to allow stand-alone programs, such as those often provided with weather instrument packages, to pass data to mcsTemperature.

Custom text data file formats can be specified on the Devices/Files tab. Each set of readings will be contained on one line of a text file. The various fields of interest in the text file are indicated by a sensor specifier. Each specifier consists of four entries, separated by a delimiter. The first of these is the House and Unit code of the Virtual Device into which the data will be transferred. The second is the name of the database field into which the data will be recorded. The third is a number to specify the type of sensor. Default sensor types are specified in Table 1 - Device Type Codes. Additional sensor types can be entered on the setup page Devices/Files tab. The fourth entry is the scaling that should be applied before the number is stored in a virtual device. This scaling will be applied only to numeric values. The very first character entered into the text box is the delimiter that will be used to separate sensor data in the text file and the sensor specifier fields in the text box. For example, assume a text file contains data for three sensors: The first two are temperature sensors and the third is a barometer. Only the first temperature and barometer are to be used by the plug-in. A comma is used to separate the data in the file. The following is the specification for the file format using virtual devices T5 and T2 and database fields WaterTemp and BaroPressure (notice the four null placeholder fields for the second temp sensor):

```
,T5,WaterTemp,0,1,,,,,T2,BaroPressure,8,1
```

The specification string can be directly entered on the setup page text box. For longer specifications the text box should specify the file name where this specification is located. The data in the file can contain multiple lines. It is usually easiest to enter one sensor per line. Even when multiple lines are used it is still necessary to insert a comma between each field. This includes the last field at the end of the line.

Data is read from each text file at the frequency specified. The last sample of the file is recorded to the virtual device with a timestamp indicating the time of transfer. Unless the Do not delete after reading box is checked the file will be deleted after the data transfer. If it is checked then the same data will need to be re-read each time which will affect performance if the file becomes large.

Table 1 - Device Type Codes

Code	Description		Code	Description
0	Temperature		15	User 0
1	Wind direction		16	User 1
2	Wind speed		17	User 2
3	Wind gust		18	User 3
4	Rain today		19	Thermocron
5	Rain rate		20	VoltageA
6	Humidity		21	VoltageB
7	Humidity rate		22	Thermostat
8	Barometric pressure		23	Moisture
9	Barometric pressure rate		24	Minutes
10	Lightning		25	Status
11	Switch/Discrete		26	Rain Month
12	Relay		27	Dew Point
13	Index		28	Text
14	Distance		29	Gallons Today
			30	Gallon Rate

3.2.1.5 Virtual Device Interface

No interface setup is required when using virtual devices to input data to mcsTemperature. A virtual device code is manually entered on any of the tabs containing device to database field mappings (i.e. Analog, Discrete, User Defined) to have mcsTemperature read data from the device string and record it in the database so it will be available for Temperature.asp display. For example, the Current Temperature from the Weatherman script can simply be defined in one of the Analog Sensor entries by entering its house code and unit code plus a database field name. Once each collection interval its value will be saved in the database along with whatever other sensors are defined.

The numeric information contained in a virtual device string is transferred to the database. All information between HTML delimiters “<” and “>” is discarded. The “ ” tag is discarded. Any non-numeric characters appended to a numeric value are discarded. The resulting numeric value is multiplied by 100 (so two significant digits after the decimal are retained) and the result is stored in the database field as an integer.

The Devices/File tab contains a button that can be used to create a new plug-in house code to be used for storage of sensor data. If the house code is reserved then its value will be shown in the default house code box and any new device that is detected will be placed in the preferred location based upon the device map defined for use by the Temp05 Plug-in. Two house codes are actually generated with the Create Plugin House Code and Devices button. Both values will always be shown in the lower left of the setup page. Neither of these needs to be the default house code specified in the text box.

The default house code is used when new sensors are detected. If the default is the first plug-in house code then device unit codes will be allocated according to the virtual device code map defined in Table 8 - Virtual Device Code Map. If the default code is alphabetic or a house code belonging to another plug-in then the device will be allocated the next available device code within that house code.

3.2.1.6 Relay05 Interface

The Relay05 is an adjunct to the Temp05 or Temp08, containing eight relays which can be controlled through the plug-in. The mcsTemperature plug-in can manage this interface if the mcsTemperature house code has been defined for the plug-in. A house code is allocated via a button on the Devices/Files tab as described in section 3.2.1.5 above.

If this interface is present then the Relay05 Connected checkbox (on the Temp0x/Relay05 tab) should be checked. Eight virtual devices will be created per the device map shown in Section 9. The device names and other properties can be changed from the Homeseer GUI, if desired.

The plug-in will query the Temp05 or Temp08 for the current state of each relay and update the virtual device string and status to match the values provided by the Temp05/Temp08. This query will be done on Homeseer startup and each time the Update button is clicked on the setup GUI.

Each of the eight relays can be set to the on or off state by setting the device on or off. This can be done via the Homeseer GUI, Web Server, Homeseer events, or script. The mcsTemperature plug-in will convey the status change to the Temp05/Temp08 and update the Homeseer device status when the Relay05 returns acknowledgement of the change in relay state.

The relay status can be displayed on the Temperature.asp page and any changes in the relay state can be recorded to database tables. These selections are made via checkboxes on the Temp0x/Relay05 tab.

3.2.2 I/O Stream Display Window and Command Buttons

When the setup page is opened a second GUI window will also be displayed (the 1-Wire Data Monitor Window) that contains a window into data received from the 1-wire interface and a mechanism by which commands can be sent to the Temp05 or Temp08. This window may be behind the main setup window. If it is not detected then you should attempt to move the primary setup GUI window.

The left side pane shows the status code from the serial port associated with each event on the port (see Table 3 - Communication Status Codes for status code details). The middle pane shows the data received from the 1-wire interface. Each line is prefixed with a time stamp in hh:mm:ss format, for reference. Sometimes this time stamp does not appear, depending upon the nature of the data received from the Temp05/Temp08.

Data that is intended to be sent to the Temp05 or Temp08 is staged in a text box at the bottom of the window. Next to this box is a checkbox to indicate if the command should be followed by a carriage return/line feed (CrLf). Any data in this text box will be sent to the Temp05/Temp08 when the Send to Temp0x button is clicked. The sent data will be reflected in the middle pane as well as any response provided by the Temp05/Temp08. Generally the CrLf checkbox is not needed.

A set of pre-programmed buttons are located to the right of the window. When any of these are clicked the data for the command is placed in the staging box, ready for user action to click the Send to Temp0x button. After each click the staging box will be updated to reflect the suggested next command to the Temp05. If at any time the response from the Temp05 does not correlate with the suggested command provided by the plug-in then the text box can be changed manually before using the send button.

The Set Sample Interval button sends the `SET` command and delivers the parameters currently defined on the setup page for each of the prompts from the Temp05/Temp08 (setting a number of things, not just the Sample Interval).

The Poll for Devices button sends the `INI` command which queries the 1-wire bus for devices. During this sequence the version 5.x firmware will ask for device types when it encounters "ambiguous" devices (such as the DS2438 or the DS2423). The plug-in will not know how to respond and manual user entry will be required to complete the remainder of the sequence. Responses are shown in Table 2 - Sensor Types.

Table 2 - Sensor Types

Designation	Description	Device
H	Humidity Sensor	DS2438
B	Barometric Sensor	DS2438
L	Lightning Sensor	DS2423
W	Wind Speed Sensor	DS2423
R	Rain Sensor	DS2423
V	Voltage Sensor	DS2438

The Calibrate North button sends the `NOR` command which establishes the point of reference for the VWS wind vane. It helps to have an assistant to climb a ladder and hold the wind vane so that it is pointing North when this command is sent (or to click the button, if your assistant can't handle ladders).

The Reset Rain Gauge button sends the `RST` command which resets the rain gauge counter. This will also reset the internal counters maintained within the plug-in (there really is no reason to reset this counter since the plug-in contains the logic to reset its internal counters at the start of each day, but it's there anyway…).

Table 3 - Communication Status Codes

Name	Value	Description
comEventBreak	1001	A Break signal was received.
comEventFrame	1004	Framing Error. The hardware detected a framing error.
comEventOverrun	1006	Port Overrun. A character was not read from the hardware before the next character arrived and was lost.
comEventRxOver	1008	Receive Buffer Overflow. There is no room in the receive buffer.
comEventRxParity	1009	Parity Error. The hardware detected a parity error.
comEventTxFull	1010	Transmit Buffer Full. The transmit buffer was full while trying to queue a character.
comEventDCB	1011	Unexpected error retrieving Device Control Block (DCB) for the port.
Communications events		
comEvSend	1	There are fewer than S threshold number of characters in the transmit buffer.
comEvReceive	2	Received Rthreshold number of characters. This event is generated continuously until you use the Input property to remove the data from the receive buffer.
comEvCTS	3	Change in Clear To Send line.
comEvDSR	4	Change in Data Set Ready line. This event is only fired when DSR changes from 1 to 0.
comEvCD	5	Change in Carrier Detect line.
comEvRing	6	Ring detected. Some UARTs (universal asynchronous receiver-transmitters) may not support this event.
comEvEOF	7	End Of File (ASCII character 26) character received.

3.2.3 Select the Mapping of Sensors to Virtual Devices and Database Fields

When sensors are first detected by the mcsTemperature plug-in they will be made available for view on the appropriate tabs available to configure the sensors (listed in section 3.2 above and in the next paragraph below). This detection will occur after the first update cycle of the Temp05/Temp08, the first periodic polling of the DS9097/ DS9490, or when the Text file format is specified, depending on the interfaces being used. In the case of the Temp05, Temp08, DS9097, and DS9490 the setup page must be closed before any sensor information will be detected by the plug-in. This is done to prevent editing and detection occurring at the same time.

The newly detected sensors will be assigned a virtual device using the virtual device house code and database field prefix defaults that are setup in the Devices/Files and Database tabs, respectively. These assignments can be changed on the Analog (1), Analog (2), Analog (3), Analog (4), Discrete (1), Discrete (2), Discrete (3) and User Defined tabs to select a different virtual device or a different field name in the database. The plug-in will rename the database field in the database and alter the Homeseer device definition. The Homeseer GUI can be used to change the name of the virtual device or to change its location. These changes will be reflected in the setup GUI the next time it is opened.

When the virtual interface is used then no sensor serial number will be associated, but it is still possible to enter the virtual device and corresponding database fields. If it is a temperature sensor then it is entered in any blank line of the Analog (x) tabs. If it is not a temperature sensor, simply select the appropriate tab and use any blank line to specify a new device.

If there is a one-wire sensor detected by the plug-in which you no longer want to utilize, you can remove it from processing by setting the box that identifies its virtual device code to blank. The virtual device will be removed from Homeseer and data will no longer be collected for it. The database text box name can also be cleared, but it will have no actual effect since the plug-in never deletes fields from the database. Once manually removed in this manner the plug-in will not reassign the same one-wire sensor to a virtual device when the sensor is seen on the one-wire bus. It can be re-enabled by manually entering an appropriate virtual device code in the text box.

3.2.4 Select English vs. Metric Display and Storage Units

Temperature data collected from the Temp05 or Temp08 can be in either Celsius or Fahrenheit ("C" or "F"). This selection is made on the Interface/Main tab in the line that specifies the use of the Temp05/Temp08. Note that this setting only takes effect when the Set Sample Interval button (in the IO Stream Data Receive Echo Window) is used to configure the Temp05/Temp08, as part of the interactive setup of the Temp05 or Temp08 parameters. The normal process to perform this setup is from the small setup window that provides an echo of the data stream between the plug-in and the Temp05. The Set Sample Interval button is clicked and the plug-in will provide the suggested command to send to the Temp05/Temp08 to accomplish the setup specified in other segments of the setup page. These suggested commands are shown at the middle bottom of this window. The Send to Temp0x button is used for each response required by the Temp05/Temp08. The prompts provided by the Temp05/Temp08 will vary depending upon the sensors it detects on the 1-wire bus. It is important to view those prompts in the center window and change the suggest information in the text box, if necessary, before responding to the Temp05/Temp08 with the Send to Temp0x button. See section 3.2.2 above for a more complete description of this functionality.

All other data received from the Temp05, Temp08, DS9097, DS9490, text files, and virtual interface are considered to be in English units. The data can be converted by the plug-in to Metric units before transfer to virtual devices and subsequent storage in the database. The four checkboxes on the Interface/Main tab provide for selective conversion of each of the types of sensors. The forecast temperature from the MSNBC web site is provided in English units by default, but can be changed to Metric with the checkbox on the Forecast tab.

3.2.5 Sensor Calibration

Each line on the Analog Sensor (x) tabs contains a Cal /Avg box that is available to calibrate any device that contains a sensor serial number (it does not apply to devices that are managed via the virtual interface). The value in the box is added to Temperature sensor reading to calibrate for a bias. The value is used as an averaging filter for other non-counting sensor types. A value of .75 will apply a weight of 75% to prior readings and 25% to the current reading. Values between .99 and .01 are accepted as the filter weight. For counting type sensors such as rain the value is ignored.

3.2.6 Humidity Limiting

It is possible for humidity sensors to be out of calibration and a value of greater than 100% may be provided by the sensor. The Temp05/Temp08 will only return the last two digits for values over 100%. Provision is made to recognize very low humidity readings and convert these to the actual reading near 100% (real humidity readings are seldom near zero in most parts of the world). The minimum reasonable humidity reading may be entered if you wish to apply this adjustment. Any reading below this point will be considered to actually be 100% greater. This setup is done on the Interface/Main tab.

Any humidity reading of 35 will be ignored since this typically represents a conversion error of the DS2438 device. No errors are reported for this situation since it is a normal event for which no maintenance action is needed.

3.2.7 Special Weather Device Setup

A special device is available to capture the highest wind detected. The wind gust from the Temp05/Temp08 or the Wind Speed from other sources will be used to compare to the string value of this high wind device. A reset button is also available that will reset the high wind reading to zero. The high wind controls are on the Devices/Files tab.

Wind direction instruments need to be calibrated for a North wind direction. With the Temp05/Temp08 this is done on the Echo window by using the NOR command. With the DS9097/DS9490 it is done by entering the index from 0 to 15 of the North direction vane position. This setting is on the Devices/Files tab. The proper index can be determined empirically (i.e. by trial and error).

Trend arrows for the Forecast.asp display are generated based upon the algorithmic parameters defined on the Devices/Files tab for trend arrows. The two weight parameters will be used to determine the importance of older samples relative to that of current samples to determine a trend. A large ratio of Fast to Slow will result in potentially noisy signals. If the ratio is too small then the indication becomes more of a trailing indicator that a current one.

The result of the calculation will be a positive or negative magnitude value. This will be scaled by the rate parameters to determine the height of the arrow icon in the display. A very large value will cause the icon to appear and disappear. A value in the operational range will cause the arrow height to be proportional to the rate of change of the rain, humidity, and barometric pressure.

3.2.8 Virtual Device Formatting

The mcsTemperature plug-in stores the information received from non-virtual sources into virtual devices. The device value will contain the integer portion of the numeric component of the data received from the interface. The device string will contain either of two formats. One is the raw number without any formatting, but will include any fractional content. The number of significant digits for Temperature type sensors can be selected by the user on the Display tab of the setup GUI. The user can also elect to have the virtual device string formatted with HTML icons and a units-of-measure suffix. This setup is also selected on the Display tab.

3.2.9 Database Setup and Management

The Database tab is used to identify the databases and tables to be used and contains tools to manage these tables. mcsTemperature uses one table to store web-sourced data and one table to store local sensor data. A third table is created to manage the relationship of these two data sources internally. These can all be located in the same database or the web-sourced forecast data can be stored in a separate database. When the Update button is clicked, the Setup will create the database(s) and tables required based on the settings on the Database tab, if they are not already present. If additional devices are discovered, then new tables (for discrete devices and relays) or variables will be created in the database.

The strategy suggested for management of the database is to utilize a database (or two databases) dedicated to this application. This will assure independence and avoid conflicts that may occur when trying to compact the database. Another consideration is the location of the database(s) to facilitate easy backup of data. When only database file names are entered then the database will be located in the Homeseer root directory which is likely not convenient for backup. The plug-in will recognize filenames that include either the full path or a path relative to the Homeseer root. A full path is recognized as a string containing either a colon or double backslash. (e.g. `C:\data\mcsTemperature.mdb` or `MyServer\\d\sensorData.mdb`).

When mcsTemperature goes through its initialization during a Homeseer startup it will establish contact with both the temperature and forecast tables and report the date of the last recorded sample. Problems with database connectivity will be detected at this stage and reported in the Homeseer log.

A set of buttons and controls are available to manage the Temperature database. These buttons will allow the following capabilities:

1. Compact the database
2. Reduce the size by effectively reducing the sample interval of older data
3. Restore table from backup
4. Delete and Recreate tables

The compaction of the database utilizes internal Microsoft Access procedures to do “garbage collection”. It depends upon the plug-in having an exclusive connection with the database. The weeding-out of data is performed by selectively removing older records from the database. The degree of “thinning” is specified by a set of text boxes.

The first text box identifies how old the data needs to be before any record deletion will be performed. Records collected that are less than this number of days old will not be touched. The second box specifies the maximum interval that will be used in the weeding-out process. The third specifies how old data need to be before the maximum interval is reached. All data in the database between these two points will be weeded-out on a prorated basis.

For example, assume data has been collected at 1 minute intervals. You want to retain data for 30 days at this resolution. Data older than 150 days will be retained at 1 hour resolution. The data between these two dates will be weeded-out based the aging between these two end points. Hence (150-30)/(60-1) = 2 days per minute. Data collected in the last 30 days will not be changed. Data

between 30 and 32 days old will have one sample every two minutes. Data between 32 and 34 days old will have one sample per three minutes, etc., until the sample interval is 60 minutes which will be data that is 150 days old. All data older than 150 days will be retained with one sample per 60 minutes.

Microsoft Access is the default database format used by the plug-in. SQL can be selected from the Database tab. A specific SQL Server can also be entered on the same setup GUI location.

3.2.10 Forecast Setup

The information displayed on the Forecast.asp web page is specified on the Forecast setup tab. The Forecast setup will require a little investigation on your part to identify the city code for which the forecast data will be obtained and to determine the radar image location. The city code is called the ACCID code. For many locations the ZIP code can be used for the ACCID code and the following procedure is not needed.

1. Look for your city ACCID code at the URL: http://www.msnbc.com/news/wea_front.asp?ta=y&tab=BW&tp=&ctry=&cp1=1 (look for the code at the end of the URL once you finish your city selection – it may be 3 to 10 characters long). Alternatively you can select an ACCID code for another location and when viewed on the Forecast.asp web page it will show forecast and current information for the alternate location compared to the weather information collected by local sensors.
2. The radar image (or whatever other map graphic is desired) is specified as the Radar URL. One is available at Weather.com for Washington State area at the URL:

   `http://maps.weather.com/web/radar/us_sea_closeradar_small_usen.jpg`

   Variants of this URL should be available for most localities.

The collection of weather conditions and forecast data is enabled on the Interface/Main tab via a checkbox. The update interval is also specified there. MSNBC updates their site hourly. The radar image update will depend upon your source. Only new data will be stored in the database so no database update will occur unless MSNBC has updated the data since the last time it was stored in the database.

The Forecast.asp display will show the local temperature, up to two humidity readings, and wind, rain, and barometer information collected from local sensors, for comparison to MSNBC data. In the case of the temperature and the humidity the virtual devices that contain the desired measurements are specified on the Forecast tab. mcsTemperature will use the first wind, barometer, and rain gauge found on the Analog tab to obtain the data for these sensors. If only local temperature is desired then check the box labeled Do not Display Local Wind, Rain and Baro. In lieu of this local data the forecast.asp page will show additional information from the MSNBC site.

The MSNBC data is collected based upon Eastern Time Zone, USA. For other locations a time zone offset can be entered so the time stamps in the database will correlate with the local time. Negative value should be used for time zones to the west of the Eastern USA zone.

Many of the data items provided from the web site can also be formatted for display in virtual devices and be used as candidates for graphing on the Temperature.asp page. If a plug-in house code has been assigned, then default virtual devices will be assigned for these data items (see Table 8 - Virtual Device

Code Map). These device codes can be changed (on the Forecast tab) or if there is no plug-in house code defined then you can manually define virtual device codes for them. Selecting the Store in Virtual Device checkboxes will result in the data being stored in the virtual devices when weather data is updated or available for display on the asp page.

3.2.11 Switch / Discrete Input/Output Processing

The Temp05 or Temp08 interface polls for DS2405 family devices, which provide an open/closed switch indication. A change in switch status is provided to the mcsTemperature plug-in as an interrupt which is serviced by setting the state, value, and string of the associated virtual device if the new information received from the Temp05/Temp08 is different than the current virtual device information.

When a switch is first detected on the 1-wire bus the mcsTemperature plug-in will select a virtual device to be used to reflect the current switch state. This will be determined from the default device map (see Table 8 - Virtual Device Code Map) if an internal house code is used or the next available virtual device if a general house code is used.

A database table will also be created with the default name of "tbl" followed by the 1-wire serial number of the device. Each transition of 1 to 0 or 0 to 1 will be recorded in this table. The virtual device, database table name, and election of display on the Temperature.asp page can be edited on the setup GUI Discrete (x) tab.

The DS9097/DS9490 interface supports the DS2406, DS2405 and the DS1990A devices. The DS2405 and DS2406 level changes are reflected in virtual devices just as is done with the Temp05/Temp08 interface. The DS1990A virtual device is created upon first detection of the DS1990A. Subsequently, if the corresponding DS1990A is seen on the bus, the virtual device will be reflected as ON and if the device is not present it is reflected as OFF.

The Homeseer device status will reflect ON for an ON Temp05/Temp08, or a True DS9097/DS9490 switch position. This can be reversed with the Reverse Polarity checkbox on one of the three Discrete (x) tabs.

The DS2405 and DS2406 can operate as either input or output devices. When first detected the device is assumed to be an input. If it is wired as an output device, this can be indicated by checking the Output checkbox. As an output it can assume an initial value at plug-in startup. This initial value is entered as ON, 1, OFF, or 0 in the "Init" text box. If the field is left blank then no initialization will take place.

When the device is configured as an input, the plug-in will initialize the DS2405 or DS2406 output latch to OFF/false.

Discrete data is stored in individual tables of the Temperature database (the database specified on the Database tab). This is in contrast with other data that is stored as individual fields of the same table. Only transitions are stored to minimize the size of these tables. Data is only stored if a name is provided for the Database Table. The default table name assigned by mcsTemperature is the sensor serial number prefixed with the string "tbl".

3.2.12 Thermocron Operation

The DS1921 has the ability to independently collect temperature data over a period of time. There are a number of parameters that can be programmed to describe the nature of the data collection that is to be performed. These are entered on the "Mission" form. This same form is also used to dump data previously collected by the device.

When the DS1921 device is first detected it is assigned a virtual device and database table. On the setup GUI it will appear in one of the Analog (x) tabs and contain a button to access the "Mission" form. The fields on the form can be altered and these will be retained in the mcsTemperature.ini file and associated with that specific DS1921.

When the initialize button is pressed on the "Mission" form the values from this form will be transferred to the DS1921 on the next polling cycle of the DS9097/DS9490. When the dump button is pressed then the data stored in the DS1921 will be transferred to the database on the next polling cycle. At all other times the DS1921 will be recognized on the 1-wire bus, but no activity performed with it.

The data from the DS1921 is appended to its table each time the dump button is pressed. This data can be viewed with Line charts on the Temperature.asp or it can be processed with an independent application.

3.2.13 User Defined Data

User defined data provides an extension of the plug-in's capability to accept data from virtual devices, store it in the database table, and graph it using chart labels specified by the user. Provisions for 4 labels exist on the Display tab. Once a label is entered it is then available as a pull-down function on the User Defined tab. This label will also show up on the Y axis of a line chart.

The User Defined tab is organized like the Analog tab where the device, database, and display relationships are entered. It is not expected that the Sensor Serial Number or Temp0x fields will ever contain any information.

3.2.14 Data Display Attributes

The Display tab contains a number of parameters that can be configured to change the overall appearance or specific elements of the data being displayed. Most of these relate to the appearance of either the Homeseer status page, which contains virtual device strings, or the Temperature.asp or Forecast.asp pages.

3.2.14.1 Client Screen Size and Chart Aspect Ratio

The client screen is assumed to be a 640x480 display such as a modest touchscreen. The Forecast.asp layout uses only this screen size, however the temperature.asp can be configured to a custom size and this size can be setup to be a function of a client's IP address. The Client Screen Size section of the Display tab contains provisions for a default client and three specific IP addresses for which the scaling will be adjusted. The scaling is selected from a set of pull-downs that provide a general indication of the width of the display.

The specific scaling that is applied is performed on the Line chart to the outer box and the inner box in which the lines are drawn. A default set of heights and widths are generated by the plug-in, but these can be edited to change the size or the aspect ratio. The values to be edited are contained in the mcsTemperature.ini file and can be changed by editing the mcsTemperature.ini file with a text editor. The default values are shown below:

```
ClientChartScreenSize=   " 600, 700, 800, 900, 1000, 1110, 1200, 1300, 1400, 1500"
ClientChartOverallWidth= " 600, 700, 800, 900, 1000, 1110, 1200, 1300, 1400, 1500"
ClientChartWidth=        " 520, 620, 720, 820,  920, 1020, 1120, 1220, 1320, 1420"
ClientChartOverallHeight=" 300, 370, 440, 510,  580,  650,  720,  790,  860,  930"
ClientChartHeight=       " 210, 280, 350, 420 , 490,  560,  630,  700,  770,  840"
ClientChartLegendSize=      "8, 8, 8, 8, 8, 8, 8, 8, 8, 8"
ClientChartUpdateTimeSize=  "7, 7, 7, 7, 7, 7, 7, 7, 7, 7"
ClientChartAxisTitleSize=   "8, 8, 8, 8, 8, 8, 8, 8, 8, 8"
ClientChartAxisSize=        "8, 8, 8, 8, 8, 8, 8, 8, 8, 8"
```

The ClientChartScreenSize value is a list of 10 numbers that appear in the Chart Width pull-down field. Choosing one of these values selects the index for looking up the numeric pixel value to be used for the other eight characteristics: ClientChartOverallWidth, ClientChartWidth, ClientChartOverallHeight, ClientChartHeight, ClientChartLegendSize, ClientChartUpdateTimeSize, ClientChartAxisTitleSize, and ClientChartAxisSize. The first four of these describe the relationship of the chart outer and inner boxes. The last four describe the font size for the elements drawn within the outer box. By thoughtfully modifying the values for these characteristics, you can customize the chart display to exactly suit your preferences.

3.2.14.2 Sensor Names

Temperature.asp charts show sensors identified with either their name or their name and location. The name only is useful for small screens where space is limited. Using location and name is useful when the same sensor names are used with the differences identified by location. This checkbox is on the Display tab and is labeled Always Show Only Device Name.

3.2.14.3 Headers and Footers

Headers and Footers per the Homeseer standard are generated on both the Temperature.asp and Forecast.asp pages. The Forecast.asp does not contain an abbreviated version if the target display is a touchscreen. If the pages are being drawn inside another display environment then the headers and footers can be removed by checking the Exclude Header and Footer checkbox on the Display tab.

The headers and footers are generated internally by the plug-in to provide basic functionality. If external “Includes” are available and desired to be used to include potentially other header and footer features then the “Compatibility” checkbox can be selected. The CustomHeader and CustomFooter calls will then be made to external asp scripts rather than the internal procedures.

3.2.14.4 Color Scheme and Graphics

The color scheme used by Temperature.asp is set up on the Display tab. The style sheet contains the overall setup. StyleNoBody.css is provided with the plug-in and is used as the default. This stylesheet contains no background specification. Instead, the background color is specified on the Background field. This is the color behind the chart and tables. The color can be specified as an RGB hex value or as a named color.

The font color used within Temperature.asp can be different within a table or for the labels. The best font color to use will depend upon the background selected. Their values are specified in the Table Font Color and Text Font Color fields (again, as either an RGB hex value or a named color). They can be adjusted to provide the desired contrast.

A font color can also be selected for the data showing in the virtual devices of the Homeseer status page to provide the desired contrast. This is entered under the Virtual Device Format of the Display tab, in the Text Color field.

The Temperature.asp can show horizontal color bars to indicate temperatures over time (a "Color" style chart). The height of this bar and the directory containing the color gradient can be specified; however it is likely there will never be a need to change the default.

Likewise, the location of these can be either on the client's computer or on the server computer. Normally the server location is the most convenient. The Audrey has a server and the bandwidth used over the IP connection can be reduced if the graphics are drawn locally rather than serving them. This does require the "Graph Color Base" selected set of symbols to be installed on the client's computer in the same relative location. The Localhost for Touchscreen checkbox is used to specify this mode of operation.

Other graphics are used by the plug-in to augment the virtual devices and to display conditions on the Forecast.asp. These .gif and .jpg files are located in the `\HTML\Images` subdirectories `\Weather`, `\Temperature`, and `\Sensors`. Generally the graphics provided as part of the plug-in will be adequate, but any file can be changed as long as the file name is not altered.

3.2.14.5 Virtual Device Display Format

Virtual device strings can be formatted by the plug-in to provide a pleasing HTML output. This format consists of a leading graphic icon followed by the numeric portion of the sensor value and then a suffix indicating the units of measure. This format is selected with the HTML with Icons checkbox on the Display tab. If the checkbox is not checked then the virtual device string will contain just the numeric portion of the sensor value.

The icon is scaled to be a consistent size. This size can be entered in the Number of Pixels for Icon text box.

For temperature readings two additional options are available. One is the number of digits to the right of the decimal to be shown (Significant Digits for Temperature Displays) and the second applies when

HTML formatting is used. In this case the Only Temperature Icon box, when checked, will result in the text portion of the temperature not being shown. The integer portion is embedded in the icon.

3.2.15 Error Handling

Error counters are maintained within the plugin that account for errors reported on the serial interface and errors detected from the sensor. A Temp05/Temp08 interface error is recognized as a "???" for a sensor reading from the Temp05/Temp08. A sensor error is the characteristic 85 C reading. A count of each error associated while reading a sensor is displayed on the setup tab where the sensor is defined. It is in the leftmost column of the sensor's row. If the plugin house code has been defined then devices 60 through 63 will be used to report aggregate error counters. These devices can be used for event triggering if desired.

Individual counts are maintained for readings from the DS9097/DS9490 interface, from the Temp05/Temp08 interface, and for invalid sensor readings. A fourth computed value shows the error rate of change. The rate of change will increase as errors are first detected and will decay to zero as long as new sensor errors are not detected. A sensor that has gone bad will be detected. The rate of change algorithm will exclude it from subsequent reporting until it has again become good.

The error counts can all be reset to zero with a button on the Interface/Main GUI tab.

3.2.16 Debug Controls

A variety of debug statements is sprinkled throughout the plug-in code based upon prior user experiences and information necessary to understand causes of unexpected behavior. These statements are enabled by the General Debug Log and Special Debug Log checkboxes on the Interface/Main tab, and their use will cause the plug-in to log a great deal of additional information to the Homeseer log. Generally the information will not be useful to the end user, but will be of value to the developer in diagnosing problems.

The Show Raw Data toggle command button on the Interface/Main tab will echo the data received from the Temp05/Temp08 to the Homeseer log file. It is useful for debugging. It provides a more permanent record than that available from the Echo Window that displays the data from the 1-wire bus.

The Reset Comm Port command button will close and reopen the serial port to which the Temp05/Temp08 is connected. This should never need to be used unless in a debugging mode where operation of the port is in question.

The Reset Error Counts command button on the Interface/Main tab will be active and is used to reset the error counts of each 1-wire sensor. The error counts are shown on the leftmost column of the various sensor tabs. The "Update" button also needs to be used to actually store the reset values.

4 Temperature Control and Action Event Interface

The mcsTemperature plug-in adds a Temperature Actions and a Temperature Control trigger type to Homeseer (if Enable Temperature Control Triggers is selected on the Interface/Main tab to enable this capability).

4.1 Temperature Controls Trigger

When enabled, the trigger type on an event can be set to Temperature Controls and a screen such as Figure 1 will be available.

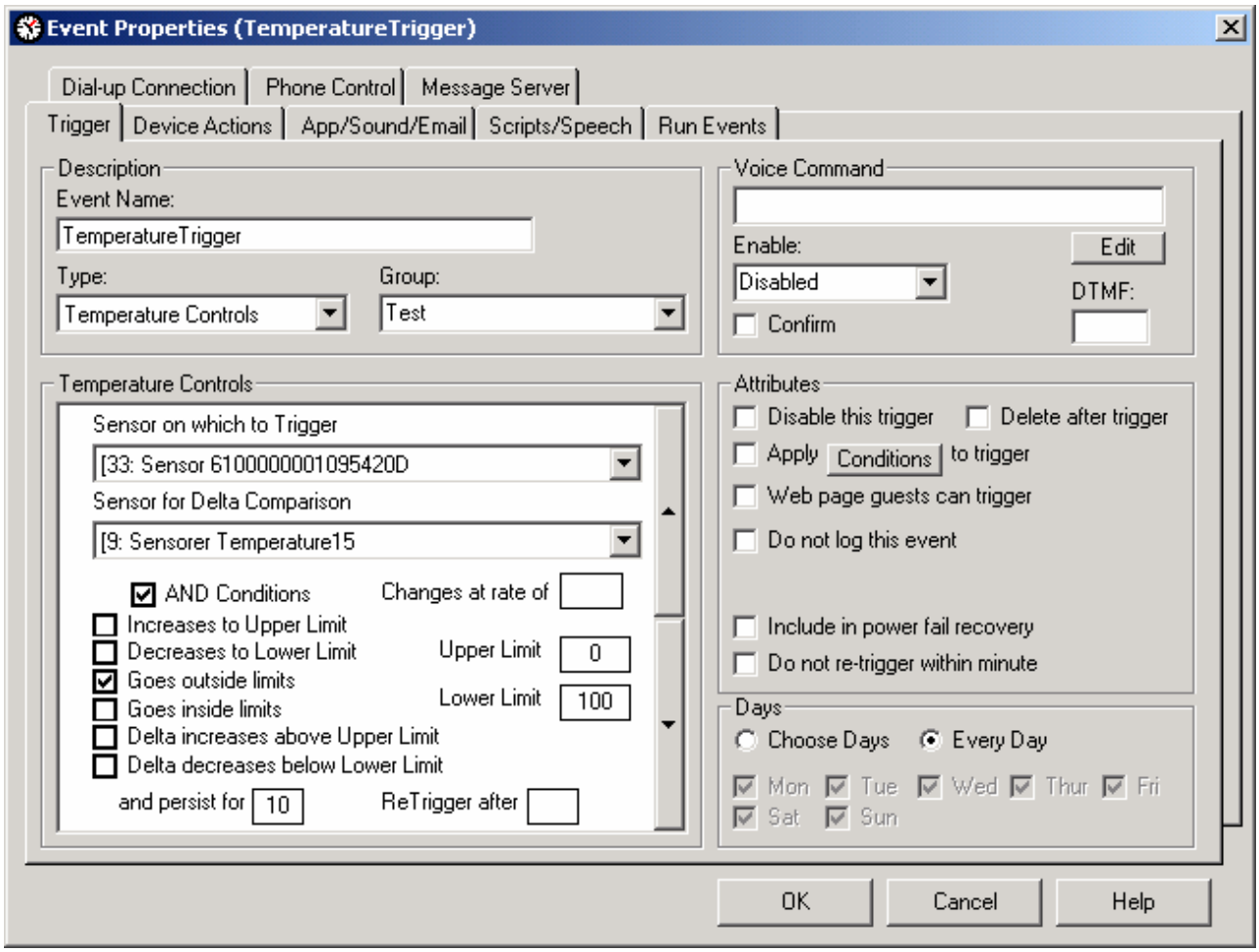


Figure 1 - Temperature Controls Trigger Setup

4.1.1 Trigger Sensor

The primary sensor involved in the trigger event is labeled Sensor on which to Trigger. The sensors that are managed by this plug-in are available in this pull-down. The Sensor for Delta Comparison or

Averaging pull-down is used in one of two modes. If one of the two Delta… checkboxes (Delta increases… or Delta decreases…) is checked then this sensor's value is the one used in the delta computation. If neither of these are checked then this sensor's value is averaged with the value of the primary sensor and this average is used for the rate, limit, and band evaluations. If the second sensor is selected as blank then only the primary sensor's value is used.

4.1.2 Rate of Change Trigger

Seven "OR'd" or "AND'd" conditions are available to be applied to the selected sensor. The first is a rate of change in units per minute. If a numeric value is placed in the Changes at rate of text box then a trigger event will be generated if the sensor string value changes at a rate greater than this value. If the value is a virtual device code then the string of this virtual device will be used for evaluation instead of a fixed value. This check is performed once per minute.

4.1.3 Limit Trigger

The limit trigger operates as a check as a sensor increases or decreases until a threshold is reached. The Increases to Upper Limit and Decreases to Lower Limit checkboxes select the active limit mode(s). The thresholds are specified in the Lower Limit and Upper Limit text boxes. The upper or lower limit entry can be either a numeric value or a virtual device code (in which case the value in its device string will be used).

4.1.4 Band Trigger

The band trigger operates as a check as a sensor values goes inside of a range or outside of a range. The Goes outside limits and Goes inside limits checkboxes select the active band mode. Both checkboxes checked would not make sense (as this will occur 100% of the time). The band limits are specified in the Lower Limit and Upper Limit text boxes. The upper and lower limit entries can each be either a numeric value or a virtual device code (in which case the value in its string will be used).

4.1.5 Delta Trigger

The delta trigger computes the difference between two sensor values and triggers when this difference reaches the limit thresholds. It operates the same as the Limit Trigger, except it uses the difference between two sensors rather than the absolute value of a single sensor.

4.1.6 Dwell/De-bounce Filter

The trigger is qualified by the and persists for text box at the bottom of the pane. This is in essence a de-bounce operator to filter out transient conditions. It has the corollary effect of delaying the trigger until this period has elapsed. The entry can be either a numeric value or a virtual device code (in which case the value in its device string will be used).

4.1.7 Re-Trigger Filter

A trigger definition can allow a re-trigger to occur as long as the condition continues to exist, or it can require that the trigger only occurs on new instances of the event. If a value is place in the ReTrigger after box then the event will be triggered again at that number of minute intervals during which the other conditions remain active. If the ReTrigger after box is blank then the triggering condition(s) must first go below (or outside, or above, or inside) the specified threshold and again exceed it before another trigger will occur.

4.2 Temperature Actions

The Temperature Actions tab on the Homeseer events dialog appears as shown in Figure 2 - Temperature Actions Setup. A Temperature Action is a basic control loop where up to three output devices are controlled by the range of values of one or two input sensors and conditioned upon the ON of OFF state of up to six discrete inputs.

You can create virtual analogs of real control devices using this Temperature Actions functionality. For example, a virtual thermostat or a virtual humidistat could each be specified as a Temperature action. Control devices are not limited to “temperature” inputs – any control input can be used. The label “Temperature Actions” is used to indicate that these actions are provided by the mcsTemperature plug-in.

When a Temperature Action is created there will also be plugin device created if the plugin house code has been made from the General Setup. This device will appear upon the first activation of the Temperate Action.

The status device will have the same device name as the event name when initially created. Only 1 status device is created per event and it belongs to the 1st of the potential 3 control loops of the DeviceAction.

The status device will be ON when the control loop is active and will show this status in the DeviceString as well as the set point limits, current control value, and state of the controlled device. A typical string content will be:

```
Control Active Limits 10-20  Now 5 (B1:On)
```

This is feedback that the control loop is active. It has control limits of 10 and 20. The device is now 5 (i.e. within control limits), and the output device is B1 that is currently ON.

When the DeviceStatus is OFF then the DeviceString will show "Control Inactive".

During HS startup the prior state of the control loop will be restored. Prior to this the control loop always was inactive during startup and it required a trigger action to start it.

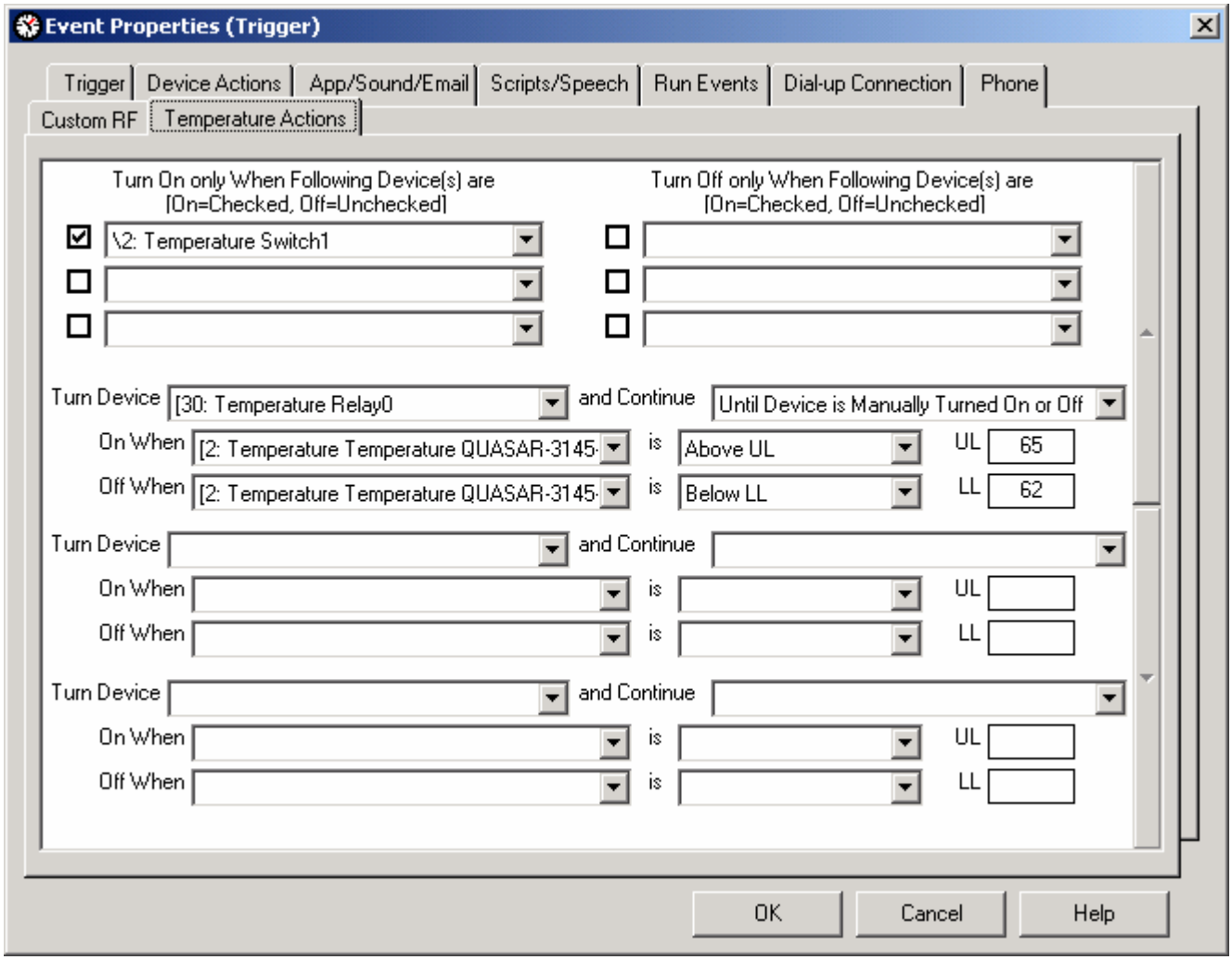


Figure 2 - Temperature Actions Setup

4.2.1 Control Loop

The controlled device of the control loop is selected in the Turn Device selection. This is the device to which ON/OFF commands will be sent. The control loop can persist for just the trigger time, for one ON/OFF or OFF/ON cycle, or be started by the trigger and persist indefinitely. In this mode it is stopped by manually setting the controlled device to ON or OFF.

The controlled device is turned on based upon the conditions selected for the On When input sensor. This sensor's parameters can be above/below a value, within some proximity of a value, or its status is ON/OFF. When the parameter is associated with an upper or lower limit then these limits are specified in the UL and LL boxes to the right of the parameter selection.

Up to three independent control loops can be associated with one trigger event. It is likely, however, that most applications will utilize only one per event.

It is often the case that no particular trigger is needed to start the control loop. In this case the event can be manually triggered or can be triggered by something like a startup script.

4.2.2 Turn On and Turn Off Conditions

Once a control loop has been triggered then its actions can be conditioned based upon the values of other devices or input sensors. Up to three can be used for each ON or OFF. When these discretes become active then the control loop actions are prohibited. For example, a fan control may be based upon a humidity range, but the control only enabled when a light switch is turned on.

A control loop can be started by triggering the event or it can be started by turning ON the status device associated with the control loop. This second option is only available for control loops that persist for more than one cycle (i.e. Until Device Is Manually Turned On of Off).

A control loop can be stopped by manually turning OFF the device that is being controlled or it can be turned off by turning the control loop status device to OFF. A control loop status device will only exist for control loops that persist for more than one cycle.

5 WEB INTERFACE

The plug-in provides two application interfaces. One is `TemperatureASP` and the other is `ForecastASP`. When either is called from an ASP page, the string returned will be the HTML code of the corresponding web page. The `Forecast.asp` and `Temperature.asp` sample files provided with the plug-in call the application interface using code similar to the following:

```
Response.Write hs.plugin("mcsTemperature").TemperatureASP(request, response)
```

Each is exercised from a browser with the URL pointing to Homeseer's HTTP server and one of these two ASP pages. For example:

http://192.168.0.1:8080/Temperature.asp

It may also be desirable to edit your local links.htm and/or links_touchscreen.htm files to include Temperature.asp and Forecast.asp to facilitate quick access to these pages. The application interface calls can be used from any ASP page. The sample pages will suffice for most users, but some may wish to develop their own wrapper ASP to contain the calls.

The setup GUI contains several user-selectable preferences that affect the appearance of the displayed images. These are contained on the Display tab of the setup page.

The hspi_mcsTemperature plug-in provides an interface to the Temperature and Forecast web pages that allow these to be produced in a thread independent of Homeseer. The graph-producing capability consumes significant resources so execution in a separate thread will allow Homeseer to better manage its scheduling.

5.1 Temperature

`Temperature.asp` calls the web interface via the mcsTemperature plug-in. Three forms of data display are supported with selections available for the date range and for the method by which data is aggregated. The appearance of the display can be controlled at several levels. On the Setup GUI you can choose whether each device is available to be displayed on the ASP. From the `Temperature.asp` itself, Display Profiles can be defined which identify which of the available devices to include on the display, which form(s) of display to use, the color of the line for each device, etc.

The basic layout of the page is shown in Figure 3 and Figure 4. When `Temperature.asp` is first requested no chart is displayed. It is also possible to display both the line and color charts at the same time. The mcsTemperature plug-in's setup GUI has provision on the Display tab to alter the appearance of the web page. The use of specific style sheets or exclusion of the headers and footers are typical setup capabilities.

Figure 3 - Page Layout with Line Chart

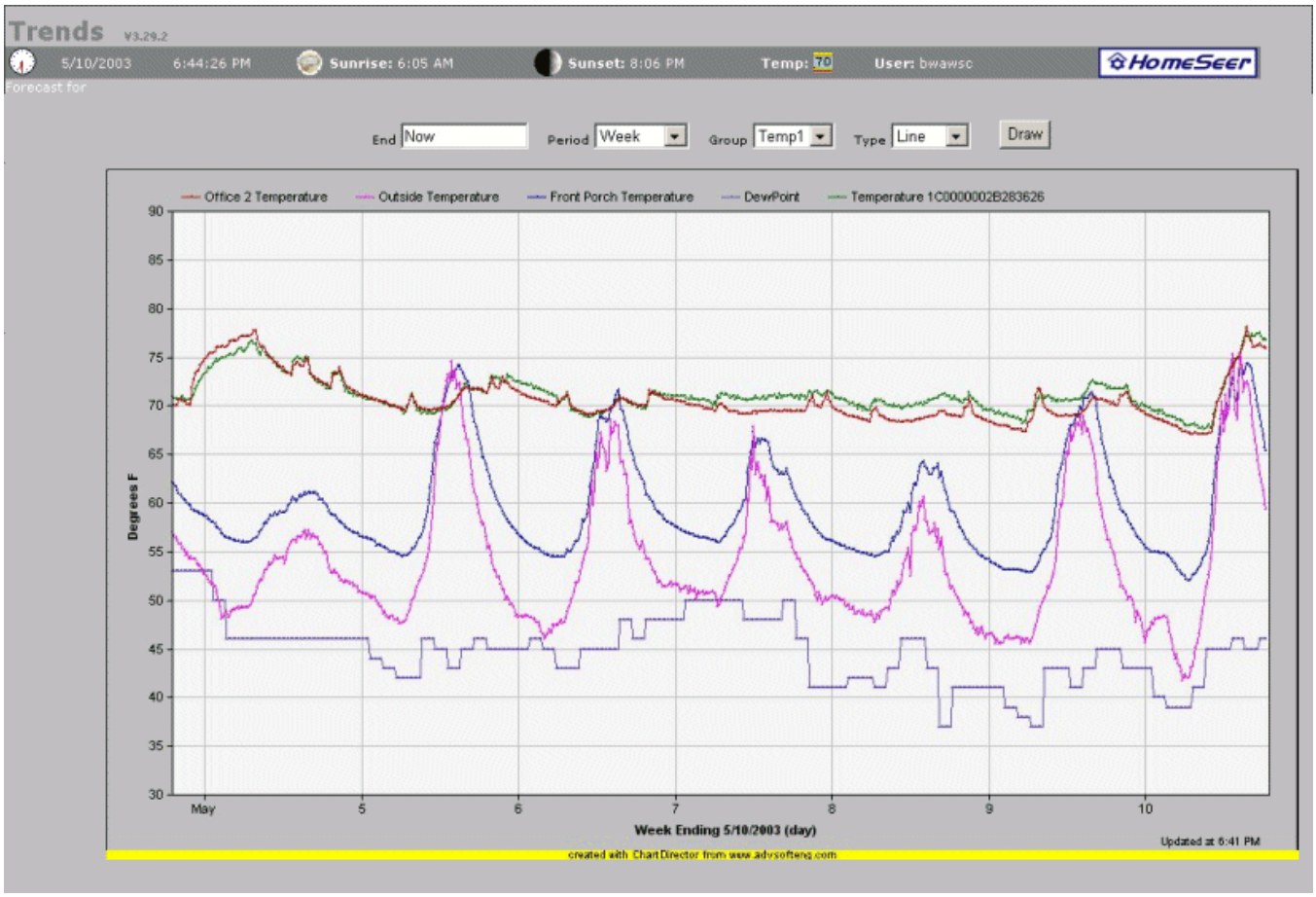


Figure 4 - Page Layout with Color Chart

In addition to the graphic displays it is also possible to observe tabular statistics about the period of interest. The table will show the average reading and the minimum and maximum readings over the period. In the case of discrete data the display will show the number of transitions over the period and the maximum and minimum accumulation of ON time for hour or day intervals. For example, a maximum discrete reading of 3:24/h indicates that the sensor was on a maximum of 3 minutes and 24 seconds in one of the 1-hour intervals in the period of interest.

The asp page uses the `header.asp` and `style.asp` files included in the consolidated Includes files, as referenced in paragraph 10.2. These ASP includes can be obtained from the Homeseer Message Board or the Updater, or you can use equivalent functionality that is implemented internally within the plug-in. The Setup GUI Display tab allows selection of "Compatibility" mode, which causes the plug-in use the local version of these files rather than the internal equivalents.

A custom style sheet (StyleNoBody.css) is also included in the distribution, but it can be changed via the Display tab of the setup GUI. If you change this setting from the default, then you must provide the style sheet that will be used as the alternate (note that you can use the provided StyleNoBody.css file as a starting point, and simply modify those elements you want to appear differently). If you want to use a customized version of this style sheet, you should change its filename. Otherwise it will be over-written by the Updater whenever a new version of the plug-in is downloaded.

5.1.1 Period Selection

The date range for which temperature information will be displayed is specified on the Temperature.asp page by the End and Period selection fields. The End field will always default to "Now", which is equivalent to the current day and the current hour plus one. The hour is based on a 24 hour clock. (i.e. if it is "now" 10:27 PM, the default ending hour for the display is 23). This can be changed to any valid prior date. Simply type in a date followed by a space and an hour value (note: not HH:MM, just the hour).

The Period field contains a set of predefined ranges. The basic periods are "6Hours", "24Hours", "72Hours", "Week", "2Week", "Month", "2Month", "3Month", "6Month", and "Year". This selection will be subtracted from the End date to define the beginning time for the set of data that will be used for both statistics and graph display.

Four additional periods, "Daily", "Weekly", "Monthly", and "Yearly" supercede the End field's value. For each of these settings all of the data contained in the database will be used. When looking at the statistics, the values will be essentially the same for each of these four selections since all of the data in the database is processed. There will be slight differences due to how data is aggregated, but these will not be significant.

The graph displays, however, will be significantly different for each of these four charts. A "Daily" graph will show the minute-by-minute/hour-by-hour changes in temperature. With this you are able to see the change that is attributable to the effect of the rotation of the earth (sunrise/sunset). A "Yearly" graph will show the day-by-day/month-to-month changes in temperature that is attributable to the inclination of the earth (season). The "Monthly" chart is somewhere in between. The "Weekly" chart shows trends that result from human behavior, such as heating/cooling periods for inside temperatures, etc.

In addition to the 10 fixed periods and the four periodic charts, a special “Period” is provided, called “Forecast”. When the “Forecast” period is selected, the data that will be presented is all of the data in the database about the forecasted temperatures, including the Forecast table. The statistics table will show the day statistics for the local reading, the current reading, and the forecasted reading for each of 1 to 5 day forecasts.

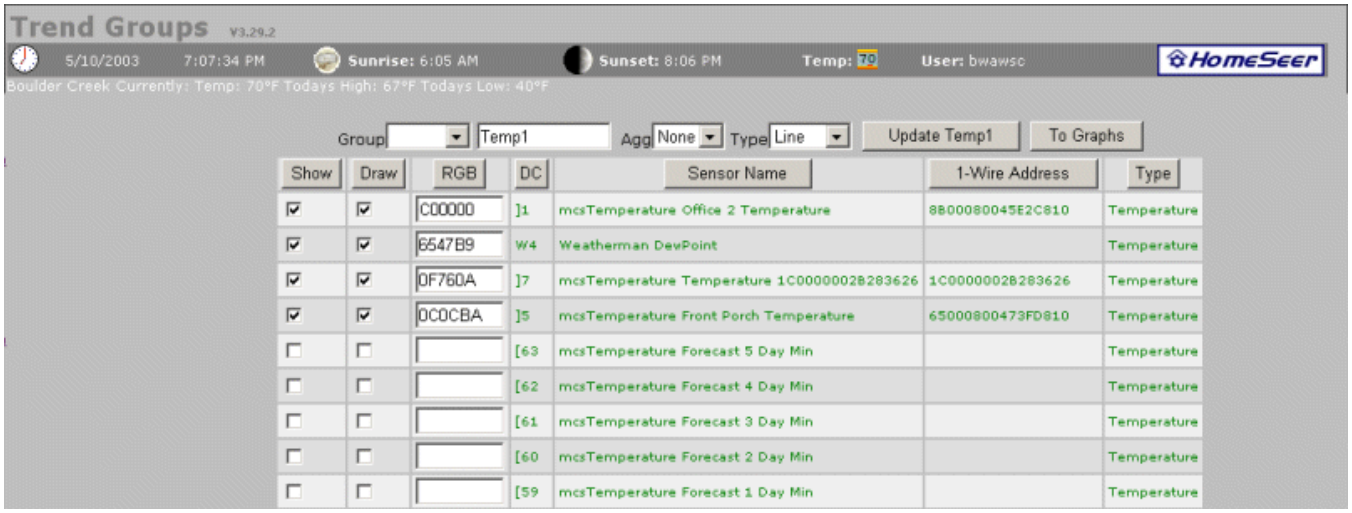
The statistics are aggregated for daily temperatures and the maximum and minimum temperature is calculated. This is done for the local temperature, the current temperature from MSNBC, and each of the five forecasted days. You can view a variety of graphs by selecting groupings of readings to compare. For example the variance between the local reading and the reading reported at the weather station can be observed. Another possibility is the high and low temperature bands, which are obtained by selecting the min and max of the same values. A third approach is a view of the quality of the forecast such as how close the 3 day forecast is to the actual temperature 3 days in the future of the forecast.

Each of these information displays can be generated by using the checkboxes in the statistics table to select the group of data fields to display then clicking the redraw button. The End, Group, and Type selections are ignored when the “Forecast” period is selected.

5.1.2 Trend Groups

In many systems, there will be a lot of sensors of various types – too many to display all together, and different enough that it doesn’t make sense to try to put them on the same chart. The Temperature.asp display can utilize Trend Groups – sets of sensors that are selected together and use a common format for the display. The setup page for Trend Groups is a web page, accessed through the Group drop-down box on the Temperature.asp page. When the plug-in is freshly installed, there are no Trend Groups, and the Group box displays the word Default. When you click the triangle on the Group box, it will drop down to display any Trend Groups that have been defined (only Default, initially), plus the word Edit. Selecting Edit will take you to the Trend Groups page (shown in Figure 5 - Trend Groups page, below). On this page, you can choose an existing Trend Group to edit (from the Group box), or type in a new group name in the name text box immediately to the right of the Group box.

Figure 5 - Trend Groups page



All of the sensors and other devices that you have defined are listed on the Trend Groups page. In the leftmost column is a checkbox to select the sensor or device to be displayed as part of the Trend Group named in the name box. Once you have selected devices to be part of the Trend Group, you can define the characteristics of the display of the group. The second column allows you to define whether the device data will be drawn (on a Line chart, say) or just presented in a table (if a table is part of the selected display). When presented only in a column then it will be available on the same page as the chart when it is drawn and at that time it can be selected to be included with the other lines on the chart. In the third column you can enter a color to be used for the line in a line chart (use RRGGBB hexadecimal color format). Leaving the color blank (for a device selected to be drawn) will result in a color being selected by the plug-in.

Aggregation of data can only be defined as part of a Trend Group. Chart Type can be selected as part of the Trend Group definition, in which case the selected Type is the default whenever the Trend Group is selected on the Temperature.asp page. Once you have finished defining the characteristics of the Trend Group, you can save the settings by clicking on the Update Groupname button. You can return to the Temperature.asp page and display the Trend Group by clicking on the To Graphs button.

5.1.2.1 Aggregation of Data (Agg)

When multiple samples of data represent the same point on a chart then the data must be aggregated so that a single value is used for that point on the graph. When the periods are short the aggregation is moot. When looking at a year's worth of data, however, it makes a difference as to what you want to observe. It is possible to look at daily minimums or daily maximums.

When using line charts of shorter time duration, it is usually appropriate to select "None" for the aggregation. For longer time durations more efficient operation may be obtained when the database access routines are allowed to aggregate data and reduce the number of data points that must be processed.

The color charts will always aggregate the data to match the pixels available on the screen. If "None" is selected for a color chart, then mean aggregation will automatically be performed.

5.1.2.2 Graph Type

Charts can be generated in one of three forms. One is a table of statistics, one is a line chart using ChartDirector where all lines are shown on the same chart, and the third is a color intensity chart using a gradient of 16 color samples with each sensor charted independently. The color chart is drawn to the right of the statistics table. The line chart is drawn below the statistics table. When first selected, a chart will display a statistics table, a line chart, or a line chart with selection controls. These are the defaults which will be selected based upon the prior Trend page drawn. The default can also be forced to always be the last selected page with the content selection checkbox on the setup page. Various combinations of these are available per the following nomenclature (Table 4 - Graph Type Selection Nomenclature):

Table 4 - Graph Type Selection Nomenclature

Selection	Description
Table	Statistics table and device selection controls. This is the primary default display where two columns of values are displayed.
Color	Color chart, statistics table, and device selection controls
Line	Line chart with no control selection. Lines to be drawn will be same as prior time lines were drawn. This is the secondary default.
LinSel	Line chart and device control selections. This is also the secondary default
LinTab	Statistics table, line chart, and device selection controls
All	All elements displayed

5.1.3 Color Analog Chart

The color analog chart is temperature-scaled from pink at the hottest to blue at the coolest sensor reading. The range is taken from all of the sensors selected – the high is the highest high and the low is the lowest low among the sensors selected and for the time period selected. The temperature pattern for each sensor will be individually scaled so that its full range occupies a vertical span of 16 pixels. The color of each pixel will reflect the sensor's temperature magnitude with respect to all sensors. The color graph provides a way of seeing trends in the data without the confusion of multiple intersecting lines.

While all sensors are shown on the color chart only those selected with the checkbox may participate in the determination of the minimum and maximum intensity scaling. The lowest minimum and the highest maximum of the checked sensors will determine the range of the pink to blue intensity scale. If the mcsTemperature.ini setting for enabling selective color scaling is not checked then the display color will scale to the maximum and minimum of all the temperature sensors.

The color chart is generated by vertically and horizontally stretching a single pixel color sample over the range of vertical and horizontal pixels in which the same color is to be displayed. Each 1-pixel color sample is stored as a jpg file in a subfolder under the Homeseer `HTML` folder (specified in the Graph Color Base field on the Display tab in the setup GUI – which actually includes both the subfolder name and the first part of the filename). There are many references made to the same set of 16 pixels and each one needs to be served to display the page. On slow clients, such as Audrey, it takes quite awhile to move the same .jpg file multiple times and Audrey does not cache them.

To reduce the drawing time it is possible to store the 16 1-pixel files on the local client and use the client's localhost server to feed these images. On Audrey they can be stored directly, or via the Windows share. The value of the field `AllowLocalHostForTouchscreen` in the mcsTemperature.ini file is set to true to perform this optimization (set via the Localhost for Touchscreen checkbox on the Display tab in the setup GUI). When set to true the `\motion\TEMP*.jpg` and `\motion\*.gif` files need to be moved to each client's server area or linked via the Windows share.

5.1.4 Color Digital Chart

The color digital chart is shown when a switch or relay type data is being displayed. It is also a 16-color gradient going from gray for OFF to red for ON. Each transition is shown as a vertical column of pixels. If multiple transitions occur within a pixel time the color of the bar reflects the percentage of time in each state.

The height of the bar is reduced by 1 pixel at the leading and trailing edges of the chart display where no transitions have occurred within the period being drawn.

5.1.5 Line Chart

The sensors with their checkbox checked in a Group selection will be included in the line chart. The chart will be scaled so that the upper and lower 10% of the chart will exceed the minimum and maximum for all sensors.

Each line is given a different color and labeled at the top of the graph. The advantage of the line chart is that it overlays all selected sensors on the same grid.

Digital data shown on this chart will be scaled to 20% of full scale unless only digital data is displayed in which case normal 90% scaling will be used. Digital data for the 6 Hour scale will show the actual 0 to 1 level of the sensor. Digital data for other scales will show the time the sensor is in the ON or 1 state. For periods under one week the magnitude will be the time per 1 hour intervals. For longer periods it will show the time per 1 day interval. This type of display is useful to show things such as the time a piece of equipment is ON.

The appearance of the lines on the chart can be changed with some of the Display tab parameters on the setup GUI. Each non-temperature data point is drawn as a symbol and a line is drawn if two symbols are in contiguous sample periods. A symbol can also be drawn for temperature data if specified on the Display tab.

Except for 6 hour displays and displays containing data from the Forecast, only lines between contiguous samples are drawn. Using this technique it is obvious when no data exists. The situation can also arise where very few lines are drawn when the data is sparse. If no temperature symbols are included then very little information will be on the chart.

Humidity data will normally be scaled based upon the range of the data in the display interval. This could result in undesired magnification. The Display tab checkbox can be used to force humidity to always be scaled between 0 and 100%.

5.1.6 Images

The color graphs utilize single pixel color samples. Three color schemes are provided in the archive and they are noted by the start of each file name. The `TEMP*.jpg` files use a blue to pink gradient. The `MOTION*.jpg` files use red to gray gradient. The `DUSK*.jpg` files use an amber to black scheme. Any of the three can be utilized based upon the mcsTemperature.ini setting.

The images are stored in the Homeseer `\HTML\Motion` directory.

5.2 Forecast

Forecast.asp contains the web interface via the mcsTemperature plug-in that displays the data collected from the MSNBC web site. If WeatherPLUG is also enabled, then the current conditions are obtained from there rather than from MSNBC. It is also possible to import a text file in the MSNBC format. If the file Homeseer\Data\mcsTemperatureGetWeatherIn.txt is present then it will use the data from this file otherwise it will go to the MSNBC web site. The original of this file was obtained from the Homeseer message board c/o Carlos (CarlosHome.com) with some modifications made to support integration with the 1-wire data collection. The following changes were made:

1. Added ability to obtain displayed data from a database
2. Added web selection for date for which forecast is to be displayed (from historical database)
3. Adjusted screen to accommodate a radar image
4. Added line for sensor data collected locally to contrast with web data
5. Added local time offset to normalize from Eastern time zone

The screen is sized for display on a 640 x 480 Audrey or equivalent display. Layout of the display screen is shown in Figure 6. Display characteristics are altered slightly when using IE or equivalent browser.

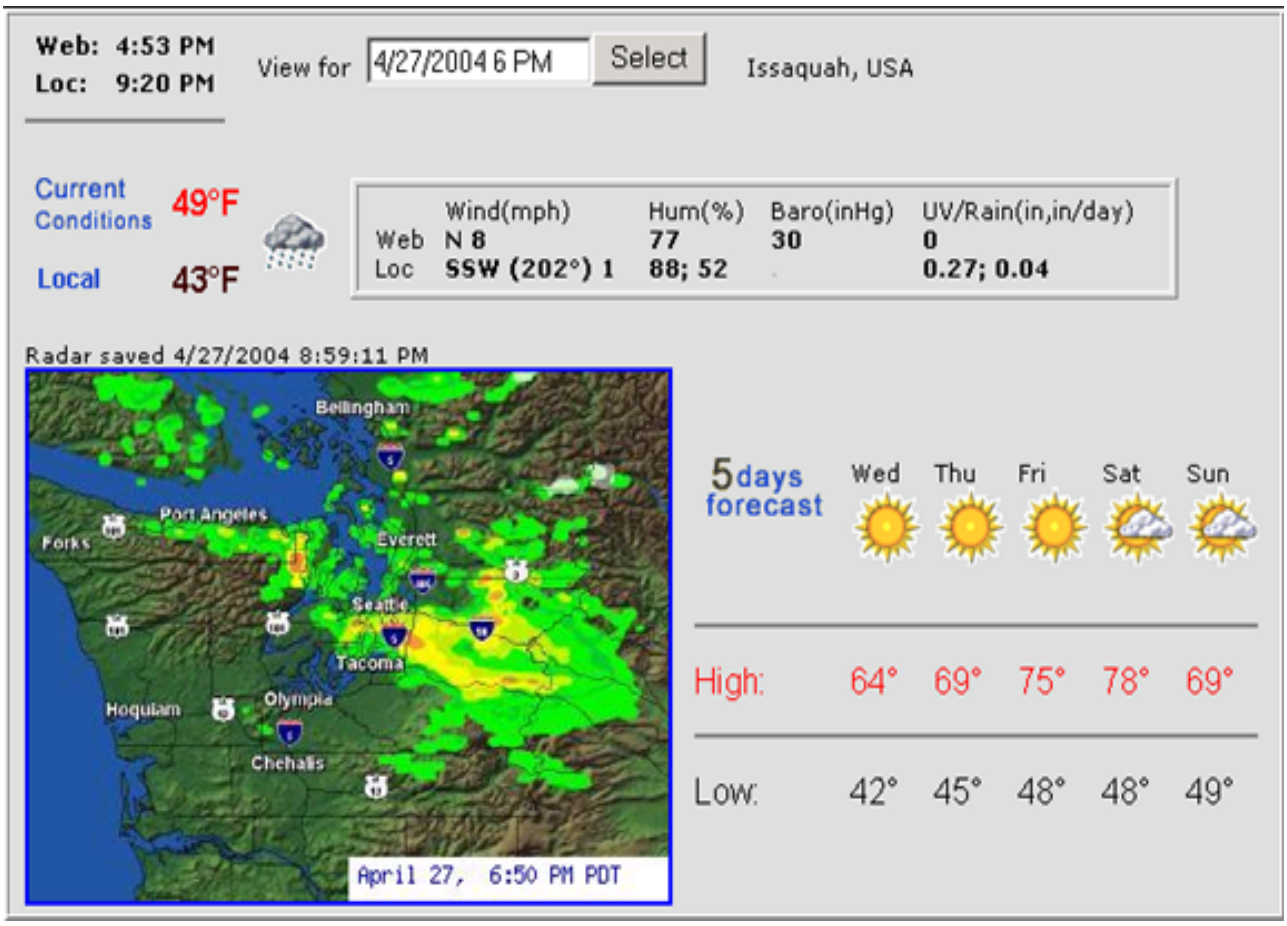


Figure 6 - Weather Forecast Web Display

Most of the information on the page is obtained from the MSNBC or WeatherPLUG sites either directly or via the database recording of the same information. The Radar image is tagged with the date/time at which it was recorded onto the local hard drive. The actual date/time at which the Radar image was taken is not included on the display. This was a design decision to minimize the time on the web. Weather.com is a slow web site.

The Local Temperature value is obtained from the local sensor specified as the Temperature Device in the Forecast tab of the setup GUI. The same area contains the entry for up to two humidity sensors to be included on the `forecast.asp` display.

The current weather-related information is presented in a tabular format with the first row of the table showing information from the web site and the second row showing information collected by local sensors. For the last column of the table the web data shows UV index and the local data shows the daily rain.

Proof-of-concept implementation exists for showing humidity, barometer, and rain rates of change as an up/down arrow graphic with the height of the arrow representing the magnitude of the change rate. Control of these icons is specified in the Forecast tab of the setup GUI.

The radar image to be used is specified in the setup GUI as the Radar URL.

The Date Selection text box is the only user input that can be performed on the page. It will default to the current day, when the page is initially displayed. If the value is changed and the Select button clicked, then data for the selected date will be retrieved from the database. The display then will be showing what the forecast was at some date in the past. The radar image and local temperature display, however, will remain as the latest available.

5.2.1 Images / Icons

Images are utilized to visually represent the current and forecasted conditions. Some icons are also used for preformatted text display. Two sets of images (obtained from the MSNBC website) are included and stored locally. Those that end with "`_w.gif`" are the pre-August/2002 indexed images. Those that are all numeric are post-July/2002 images. The remaining images are for preformatted text. All images are stored in the Homeseer `\HTML\Images\Weather\` folder when they are expanded from the archive by the Updater.

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6 SCRIPT INTERFACE

The scripting interface is optional for most users, but in some user configurations there may be a need to gain access to methods provided by the mcsTemperature plug-in to record temperature data. Use of the plug-in properties and methods can enable innovative interaction between plug-ins and greatly enhance Homeseer's functionality in unexpected ways.

Two database tables are used to maintain historical sensor and forecast information. The layout of these tables is defined in paragraphs 7.1.3 (Table 5 - Temperature Data Table Structure) and 7.2.3 (Table 6 - Forecast Database Table Structure). The methods `SaveSensors` and `SaveForecast` can be used to add records containing sensor and forecast information respectively. Data from these tables will be used by the ASP pages. The version of the plug-in is also available as a property. The methods `CreateDiscrete` and `StoreDiscrete` can be used to set up and use individual tables for digital data from otherwise-unsupported devices (e.g. motion sensors, security system devices, etc.). The `SetRelays` method sends control signals to an attached Relay05 unit.

The mcsTemperature plug-in's object can be obtained from Homeseer by declaring the object name in the following format:

```
Set mcs = hs.GetPlugin("mcsTemperature")
```

Once declared the plugin object's methods and properties can be accessed. For example:

```
mcs.SaveSensors SensorString
status = mcs.SaveForecast (ForecastString)
version = mcs.Version
```

6.1 CreateDiscrete

This method is used to create a table in the same database as the temperature data. The table will consists of an autoincrement ID field, a date field, and an Integer field.

Input: String containing table name

Output: None

6.2 StoreDiscrete

This method is used to store a data sample in a discrete data table

Input1: String containing table name
Input2: Integer (0 or 1)
Output: None

6.3 SaveData

A record of data can be appended to any database and any table using SaveData method. The first two elements of the database table are the ID and Date/Time fields and the data for these fields will be generated by the SaveData method. The remaining fields are comma separated values where each is stored in its separate field

Input1: String containing comma separated data values
Input2: String containing name of the database
Input3: String containing name of the table in the database
Output: Success return false. Fail return true

6.4 SetRelays

The SetRelays method is used to send a command to the Relay05 to turn all eight relays on or off. A single string parameter is used to indicate the on or off state. “on” or “off” is used to turn all relays on or off respectively. Any other value will be interpreted as an 8 bit character where the most significant bit corresponds to the desired state of relay 8. A 1 turns it on, 0 is off. The other 7 bits control relays 7 through 1.

Input1: String with “on” or “off” or chr(bits)

6.5 Version

The version property returns a string containing the version number of the plug-in. This same number is displayed in the title bar of either ASP page.

6.6 LastTriggerDevice

The lastTriggerDevice property returns the device code of the device that generated the last Temperature trigger event.

6.7 GetPositionlessWeatherData

The GetPositionlessWeatherData function returns a data string per APRS Protocol Reference, 29 August 2000 for positionless weather report. The WX unit is mcsT.

Each field in the returned string will be completed based upon the sensors detected by the plug-in. In the case of humidity the sensor selected will be the first one specified for the forecast display from the setup page. For all other sensors it will be the first one detected by the plug-in should there be multiple ones.

Any sensor that is not present will have data returned as dots per the APRS specification.

No input parameters.

Positionless Weather Report Format				
_	Time MDHM	Positionless Weather Data	APRS Software s	WX Unit uuuu
Bytes: 1	8	n	1	2-4

Example
_10090556c220s004g005t077r000p000P000h50b09900wRSW
report derived from Radio Shack WX station data.

Positionless Weather Data								
Wind Direction cccc	Wind Speed sss	Gust ggg	Temp tttt	Rain Last Hr rrrr	Rain Last 24 Hrs pppp	Rain Since Midnight PPPP	Humidity hhh	Barometric Pressure bbbbb
Bytes: 4	4	4	4	4	4	4	3	5

Figure 7 - APRS Positionless Weather Report Format

6.8 GetCompleteWeatherReport

The GetCompleteWeatherReport function returns a data string per APRS Protocol Reference, 29 August 2000 for complete weather report with timestamp. The WX unit is mcsT and the packet identified is “@”.

Input 1: Latitude as 7 character string

Input 2: Longitude as 8 character string

Each field in the returned string will be completed based upon the sensors detected by the plug-in. In the case of humidity the sensor selected will be the first one specified for the forecast display from the setup page. For all other sensors it will be the first one detected by the plug-in should there be multiple ones.

Any sensor that is not present will have data returned as dots per the APRS specification.

Note that wind speed and direction are separated from the Weather data contained in the positionless report and encoded in a seven character field rather than the two four-character fields.

Complete Weather Report Format — with Lat/Long position and Timestamp									
/ or @	Time DHM / HMS	Lat	Sym Table ID	Long	Symbol Code _	Wind Directn/ Speed	Weather Data	APRS Software s	WX Unit uuuu
Bytes: 1	7	8	1	9	1	7	n	1	2-4
Example @092345z4903.50N/07201.75W_220/004g005t-07r000p000P000h50b09900wRSW									

Figure 8 - APRS Complete Weather Report Format

7 DATA STORAGE / DATABASE

Database tables are used for the Temperature and Forecast. These tables can be located in the same database or different databases. This is specified in the setup GUI on the Database tab.

7.1 Temperature (Local Sensor Information)

Two temperature tables are utilized. One collects the local sensor data and is updated every sample interval. The second is updated when the Temperature web page is accessed for a forecast display. This table contains a normalization of the daily forecast and local data so that all data values in a record represent the same point in time. This is in contrast with the Forecast table in which one record contains the data for six days.

7.1.1 Forms

None.

7.1.2 Queries

None.

7.1.3 Tables

Name: Defined by the user on the Database tab of the setup GUI.

Schema: The first two fields of the table contain an autonumber index and a time-stamp field. The rest of the fields are dynamically created as new sensors are added to the database.

Table 5 - Temperature Data Table Structure

Name	Data Type	Comment
ID	AutoNumber	
User Specified	Date/Time	Date & Time of Recording
User Specified	Integer	1st Sensor Data scaled by 100

7.2 Forecast

The Forecast database stores the data recorded from the MSNBC web site.

Any Microsoft Access database can be used to hold the table. The schema for the tables is fixed and is created by the plug-in. The name of the Forecast data table is specified on the Database tab in the setup GUI.

7.2.1 Forms

None.

7.2.2 Queries

None.

7.2.3 Tables

Name: Defined by the user on the Database tab of the setup GUI.

Schema: All Integer values scaled by 100

Table 6 - Forecast Database Table Structure

Name	Data Type	Comment
ID	Autonumber	
Time	Date/Time	Time data entered in table
V_Temp	Integer	Current Temperature
V_Cicon	Integer	Numeric code for the temperature icon
VWindsS	Integer	Wind Speed
VwindD	Integer	Wind Direction
Vbarometer	Integer	Barometric Pressure
Vhumidity	Integer	Humidity
V_Read	Integer	Feels Like
VUV	Integer	Ultra Violet
VVisibility	Integer	Visibilitiy
VlastUp	Date/Time	Time of last update by MSNBC
Vforecast	Text	Record Structure with each value separated by “|”
	1..5	Unused
	6..10	Unused
	11..15	5 Days of Forecasted Icon Numbers
	16..20	Unused
	21..25	5 Days of Forecasted High Temperatures
	26..30	Unused
	31..35	Unused
	36..40	Unused
	41..45	5 Days of Forecasted Low Temperatures
Fmax1	Integer	Forecast Temperature 1 Day
Fmax2	Integer	Forecast Temperature 2 Day
Fmax3	Integer	Forecast Temperature 3 Day
Fmax4	Integer	Forecast Temperature 4 Day
Fmax5	Integer	Forecast Temperature 5 Day
Fmin1	Integer	Forecast Temperature 1 Day
Fmin2	Integer	Forecast Temperature 2 Day
Fmin3	Integer	Forecast Temperature 3 Day
Fmin4	Integer	Forecast Temperature 4 Day
Fmin5	Integer	Forecast Temperature 5 Day

7.3 Discrete Tables

Discrete data such as DS2405 switches is stored in an individual table for each discrete sensor. The default table name is the string “tbl” followed by the 1-wire ID serial number of the device.

7.3.1 Forms

None.

7.3.2 Queries

None.

7.3.3 Tables

Name: User Specified in Setup GUI with default of “tbl” followed by sensor serial number

Schema:

Table 7 - Discrete Database Table Structure

Name	Data Type	Comment
ID	Autonumber	
User Specified	Date/Time	Date & Time of Recording
Discrete	Integer	0 or 1 for off / on

8 Setup GUI Reference

After the initial setup is performed then the configuration parameters can be viewed and modified from the Homeseer GUI. The setup dialog can be accessed in one of two ways. From the View menu, select Options..., then on the Interfaces tab under Active Interfaces select mcsTemperature and click the Setup... button. As a much more convenient alternative, on the Menu bar select mcsTemperature, Setup. The setup dialog contains the configuration parameters that are stored in the `\Config\mcsTemperature.ini` and `\Config\mcsForecast.ini` files. Note that it is possible for the setup page to become hidden behind the Homeseer window and it may be necessary to minimize the Homeseer GUI to be able to see this page. The setup GUI consists of a set of tabbed panels as shown in Figure 9 - mcsTemperature Setup GUI, below.

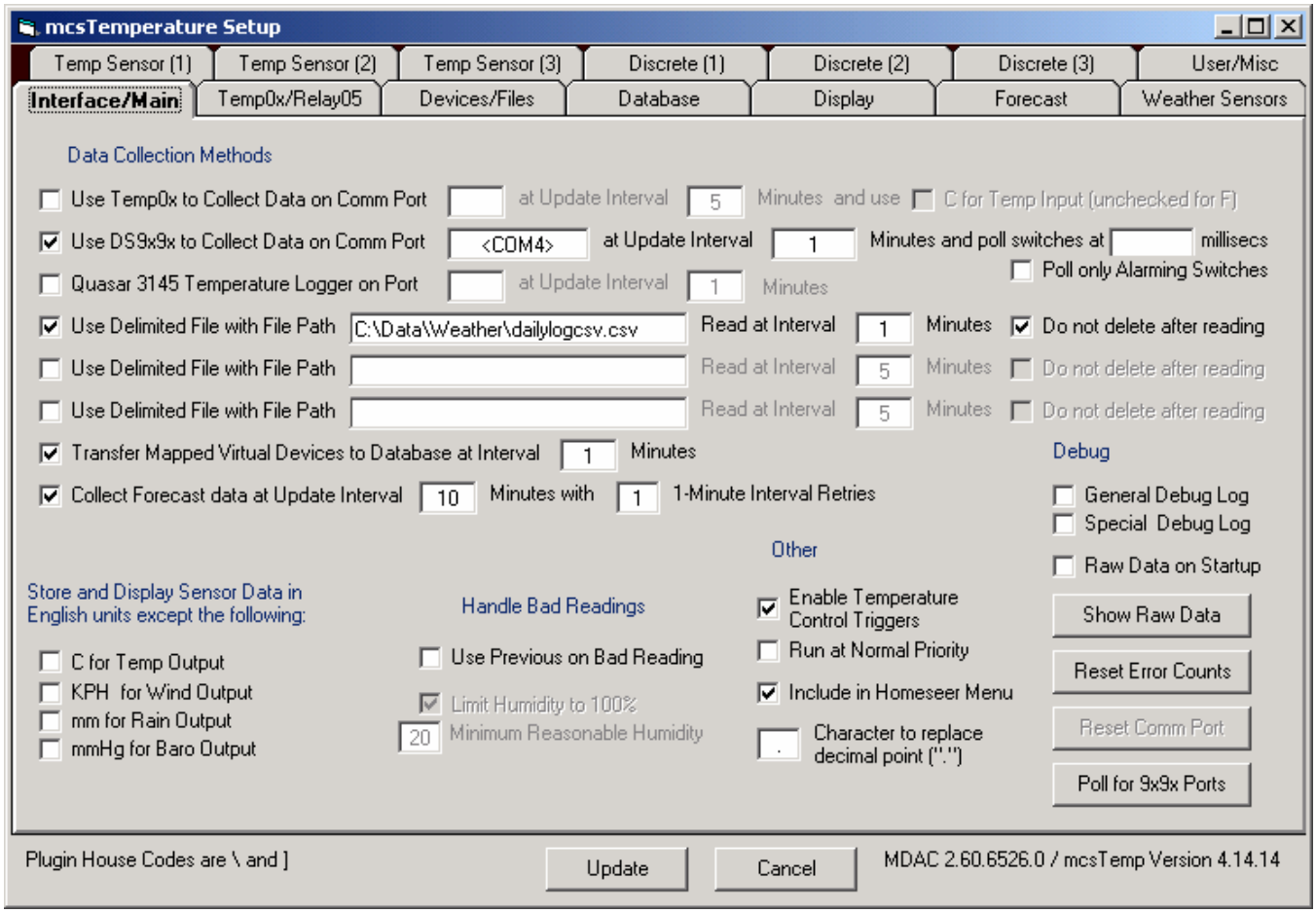

Figure 9 - mcsTemperature Setup GUI

8.1 Interface/Main

8.1.1 Data Collection Methods

8.1.1.1 Use Temp0x to Collect Data

Refer to Figure 9 - mcsTemperature Setup GUI, above, which shows the Interface/Main tab. The first line on this tab starts with a checkbox that is used to indicate that a Midon Design Temp05 or Temp08 is connected on the specified serial communications port. The Temp05/Temp08 will be user-configured to send data at intervals of the specified number of minutes and the Temp05/Temp08 will be user-configured to deliver its temperature readings in degrees C if the last checkbox is checked (or in degrees F if it is not). User-configuration of update interval and temperature scaling is done using the IO Stream Data Receive Echo Window as described in paragraph 3.2.2.

8.1.1.2 Use DS9x9x to Collect Data

The second line on the Interface/Main tab starts with a checkbox that is used to indicate that one or more Dallas Semiconductor DS9097 and DS9490 are connected. The port(s) used are best filled-in by using the Poll for 9x9x Ports button on this same tab. The default port is specified during the installation of the TMEX drivers, and is shown here with < and > encasing it. Other ports are comma-separated. All one-wire devices connected to this interface will be polled at the specified update interval and the discrete input devices on this interface, in addition to the basic polling, will be queried at the specified switch update rate. If different rates are to be used for the different comm ports then use commas to separate each rate specification. Note that the general polling is in minutes and the high speed polling is in milliseconds. Periods of under approximately 300 milliseconds will never be achieved due to the limitations of the one-wire architecture. If a period less that 300 milliseconds is entered then continuous polling will be done. Polling times for switches can be improved if only DS2406 switches are used since they have an alarming feature which eliminates the need to explicitly address each switch. The checkbox for polling alarming devices is checked if this mode of operation is to be used for switch polling. Note that if DS2405 switches are used in this mode then they will never be recognized by the plugin as having changed state during a high-speed poll.

8.1.1.3 Use Quasar 3145 to Collect Data

The Quasar is a 1 to 4 input temperature sensor serial interface. The comm port and update interals are the only user-configurable parameters and these are entered on this line. The interface hardware should be configured to deliver Centigrade readings.

8.1.1.4 Use Delimited File

The fourth, fifth, and sixth lines on this tab begin with a checkbox used to indicate that data from a file is to be read periodically. Up to three files can be processed at the specified interval. If the last checkbox on the line is unchecked then the file will be deleted after the data is transferred to the virtual device. Only the last line in the data file will be transferred to the virtual device in either case. The input format for these files is specified on the Devices/Files tab.

8.1.1.5 Transfer Mapped Virtual Devices to Database

The seventh line on this tab contains a checkbox used to indicate that data stored in virtual device strings is to be appended to the database at the specified interval. If the Temp05 or Temp08 is the interface then the data will be transferred at the time the Temp05/Temp08 reads temperature sensor #1, otherwise it will be stored using an internal timer. A watchdog is implemented should the Temp05/Temp08 stop delivering data and other interfaces are used. In this case the internal timer is used. If unchecked then no periodic data is stored in the database.

8.1.1.6 Collect Forecast Data

The eighth line on this tab contains a checkbox used to indicate that weather data should be obtained from a web site and stored in the database at the interval specified. If the data from the web site has not changed since the prior download then the data is discarded.

8.1.2 English vs. Metric Units

Data received from the interfaces is assumed to be sampled in English units. These data will be converted to metric units by the plug-in before transfer to a virtual device if the checkbox is checked. Four checkboxes are provided, allowing separate treatment of Temperature devices, wind instruments, rain gauges and barometers. The checkboxes for devices not present in the configuration will not be active. In each case, if the checkbox is not checked then no conversion will be performed between the sampled data and the stored data. No provisions exist for sampling in Metric and conversion to English.

8.1.3 Handle Bad Readings

8.1.3.1 Use Previous

For various reasons data may not be valid when received at the plug-in. The plug-in will either not change the virtual device where the previous sample was stored or it will store a zero for the bad reading, based upon the checkbox setting. The zero is a special-case condition for the graphs. Zero values will not be plotted so the chart will show gaps where no valid data exists. If the previous value is retained then there will be no indication that invalid data is being retained and displayed.

8.1.3.2 Humidity

The Temp05 delivers humidity readings in a two-character format. It is possible for the sensor to report readings over 100% due to tolerances and calibration, but since the readings are limited to two characters, they will appear to be very low readings. This checkbox is used to indicate that the humidity reading should be limited to 100% and readings below the specified value should actually be readings of 100%. If a value of 10 is given for the threshold, and the checkbox is checked, then the plug-in will report humidity readings in the range of 10 to 100. Readings of 0 to 9 will be recorded as 100.

8.1.4 Other

8.1.4.1 Event Triggers

The mcsTemperature plug-in can provide a Temperature Control Trigger that is available on the Homeseer Event Trigger menu. This trigger will only appear on that menu if this checkbox is checked.

8.1.4.2 Process Priority

The plugin runs in an independent process from Homeseer and can be configured to run at the same priority as Homeseer when the checkbox is checked or at a notch higher priority if unchecked. The primary effect of this is the responsiveness of the setup page interaction.

8.1.4.3 Homeseer Menu

The Homeseer menu can contain a selection of menu items from a plugin. When this checkbox is checked then one will be entered for mcsTemperature and it will contain quick links to the various capabilities provided by the plugin as well as links to each of the Trend groups defined.

8.1.4.4 Decimal Point Character

External interfaces may always provided fractional sensor reading with a "." character used to delimit the whole from the fractional component of the number. The "." is a regional setting which may not always indicate this purpose. If a different value is used as the regional setting then this alternate value should be placed in the text box and the plug-in will perform the substitution as the data is read from the external interface or csv file.

8.1.5 Debug

8.1.5.1 Debug Log & Special Debug Log

Debug code is sprinkled throughout the plug-in's execution sequence to help isolate unexpected behavior. There are two debug checkboxes that will enable sets of debug statements that write data to the Homeseer log to assist in diagnosing a specific malfunction. The meaning of the output to Homeseer's log is only of value to the developer. The contents of the log output will change with version of the plug-in.

8.1.5.2 Show Raw Data

When this button is clicked, data received from the Temp05 or Temp08 is dumped to the Homeseer log, prior to processing by the plug-in. Note that the same information can be seen interactively when the echo window is displayed as part of the setup page. This is a toggle button and its current value is only maintained until the plug-in is restarted (at which time it reverts to "don't dump" mode).

8.1.5.3 Reset Comm Port

Clicking this button will close and open the communications port used by the Temp05 or Temp08.

8.1.5.4 Poll for 9x9x Ports

Multiple DS9097 and DS9490 ports can be used on comm ports 1 to 16 and logical USB ports 1 through 15. This button will query these ports looking for adapters. It will populate the comm ports text box on the second line of this tab. Use of this button is the best way to find and confirm adapter connectivity.

8.2 Temp0x/Relay05

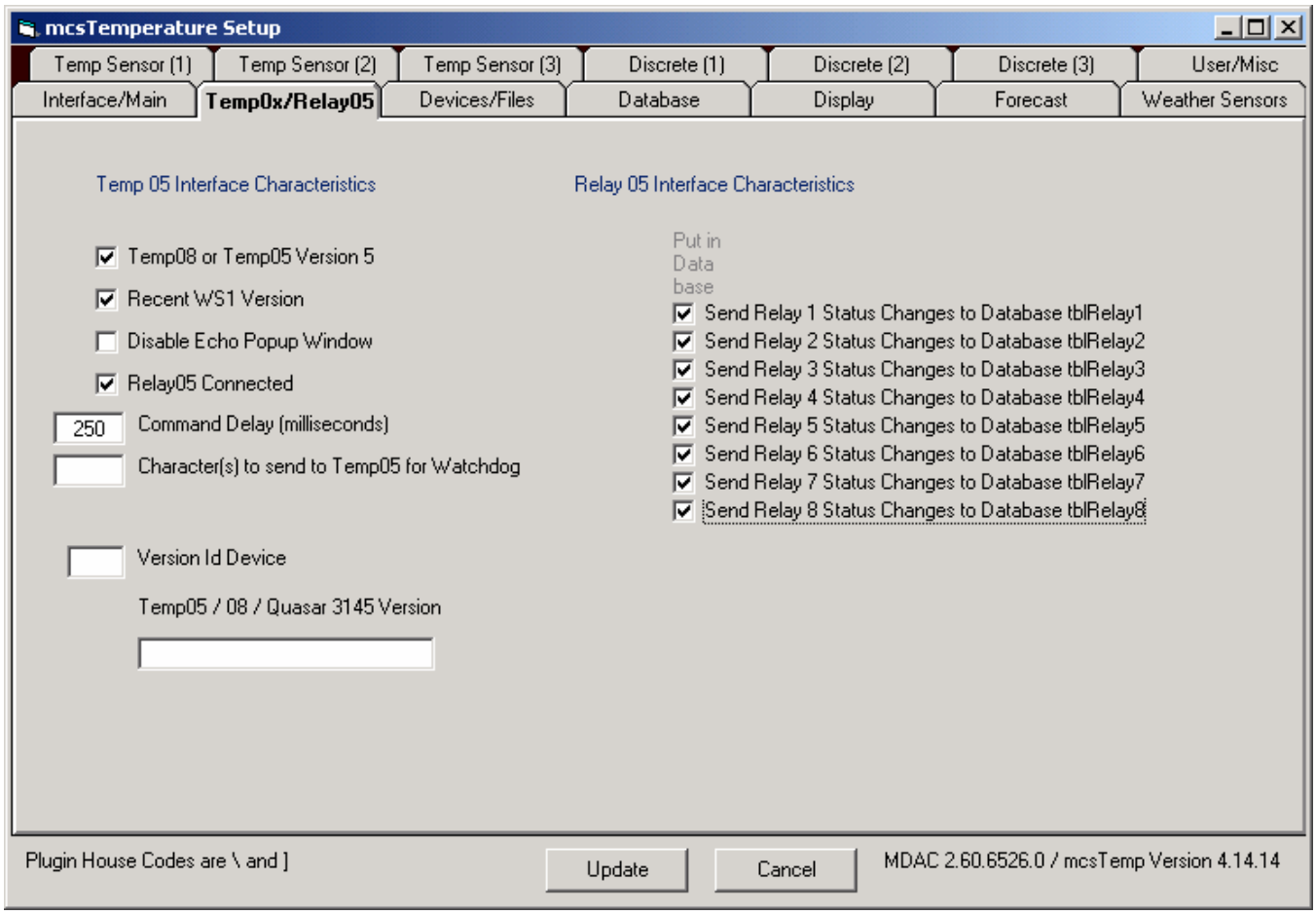

Figure 10 - Temp05/Relay05 setup tab

8.2.1 Temp05 Interface Characteristics

8.2.1.1 Version

The Version checkbox is used to indicate if the connected device is a Temp08, or a Temp05 with firmware version V5.x (checked) or V4.X (unchecked).

8.2.1.2 WS1 Version

This checkbox applies to V4.X and its support for the WS1 weather station. The early version of this device used switches to measure direction.

8.2.1.3 Disable Popup

The plug-in requires device addresses to be returned by the Temp05 or Temp08. If it is not and V5.x is used then the popup will appear to allow you to configure the Temp05 to return the address.

8.2.1.4 Relay05 Connected

Use this checkbox if a Relay05 is connected to your Temp05 or Temp08. This will enable the relay controls on the right side of the setup panel.

8.2.1.5 Command Delay

The Temp05 is not able to accept the full command string in one full-speed burst for relay or discrete outputs. The delay specified in this text box will be inserted in the middle of the command so it can be recognized by the Temp05.

8.2.1.6 WDT

The V5.x firmware of the Temp05 will wait for user response following a power-cycle when it sees certain weather sensors which can be used for more than one purpose. The WDT string provides an automated response to this prompt should a power cycle occur when unattended. Responses such as H, W, etc. are appropriate, but will be specific to the sensors connected. See Table 2 - Sensor Types for the full list of responses. If you have only one of these devices (or only one type) and therefore know the appropriate response, this can help automate a return to full functionality after an unattended power failure.

8.2.1.7 Version Id

This will display the firmware version received from the Temp05 or Temp08 (for information only – this is not an input field).

8.2.2 Relay05 Interface Characteristics

The Relay05 contains eight relays. The mcsTemperature plug-in will support these if the plug-in housecode has been assigned. It will also store the on/off transitions in the database if the right checkbox is checked and will make these on/off transitions available for display on the Temperature.asp page if the left checkbox is checked.

8.3 Devices / Files

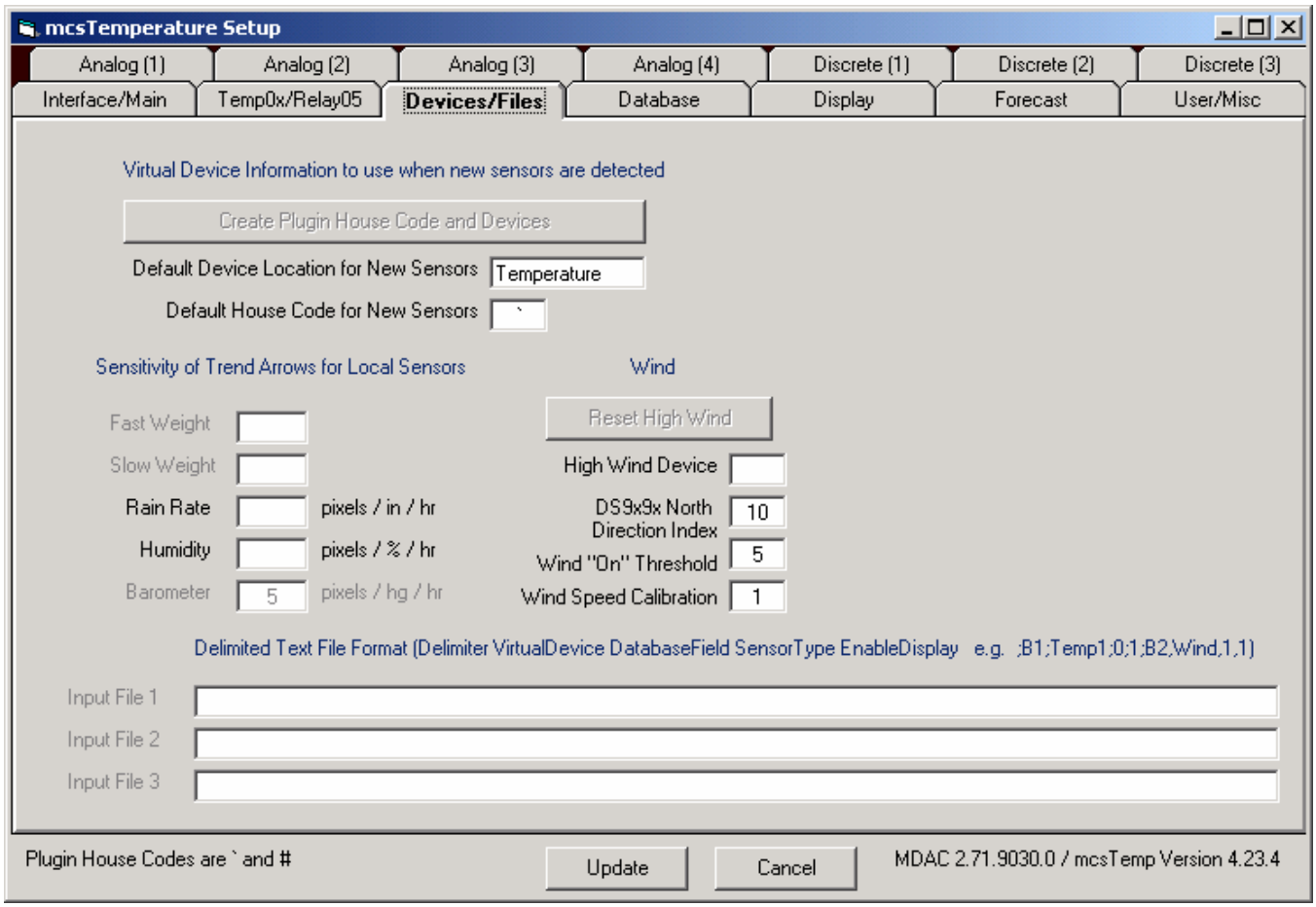

Figure 11 - Devices/Files setup tab

8.3.1 Virtual Device Information

8.3.1.1 Create Plug-in House Code and Devices

The mcsTemperature plug-in can manage its own virtual devices or it can utilize the virtual devices provided by native Homeseer or other plug-ins. The preferred mode of operation is to utilize its own devices. This is enabled by using the Create Plugin House Code button. It will be grayed-out after use and the house codes will be displayed on the lower left of the setup page.

8.3.1.2 Default Device Location for New Sensors

As new sensors are detected by the plug-in it will assign them to virtual devices, give them a name, and assign them a location. The location to be used is entered in this box.

8.3.1.3 Default House Code for New Sensors

New sensors will be assigned a house code. If the plug-in has its own house codes defined then it will pretty much know where to put the new ones. If it does not have its own house codes then it needs to know which one to use. It is specified here.

8.3.2 Sensitivity of Trend Arrows

The Forecast.asp page will display an up- or down-arrow after the local barometer measurement. The direction of the arrow and the height of the arrow are determined by the parameters contained in this section. Provisions for rain and humidity trends are also available on the setup tab, but are not implemented on the Forecast.asp page. See paragraph 3.2.7 for more insight into the algorithm.

8.3.3 Wind

8.3.3.1 High Wind

The plug-in will monitor wind speed reading and capture the highest reading and store it in the specified high wind device. This value can be reset to zero at any time with the Reset High Wind button.

8.3.3.2 North Index

The north index is needed to associate the physical mounting of the weather vane with a true direction orientation. The Temp05 and Temp08 north index is set up via the IO Stream Receive Echo Window per paragraph 3.2.2. If your wind device is connected via a DS9097 or DS9490 then you will use the DS9x9x North Direction Index setting on this tab to calibrate it. It is calibrated by changing the number in this box between 1 and 16 until the reading from the plug-in corresponds to the direction of the vane.

8.3.4 Delimited Text File Format

Data can be read from up to three text files with each line in the file representing one sample set. The composition of this set of data is specified as a delimited string where the first character defines the delimiter. In groups of three the virtual device, the field name, and the sensor type are specified with the delimiter between each. Paragraph 3.2.1.4 contains a more complete description.

8.3.5 Wind Speed Calibration

The conversion from counts to wind speed on a DS9097/DS9490 interface is

1.2265 * Counts / Sample Interval * WindCalibration

For a standard AAG wind instrument that operates normally the WindCalibration is 1. Adjustments can be made in the upward direction by increasing the calibration in integer increments.

8.3.6 Water Flow Calibration

The default water flow meter is one count per gallon. If the resolution of the meter is actually 0.1 gallon per count then a value of 0.1 is entered into the text box. If it is 10 gallons per count, then the value entered is 10. Other values can also be used for other count resolutions.

8.4 Database

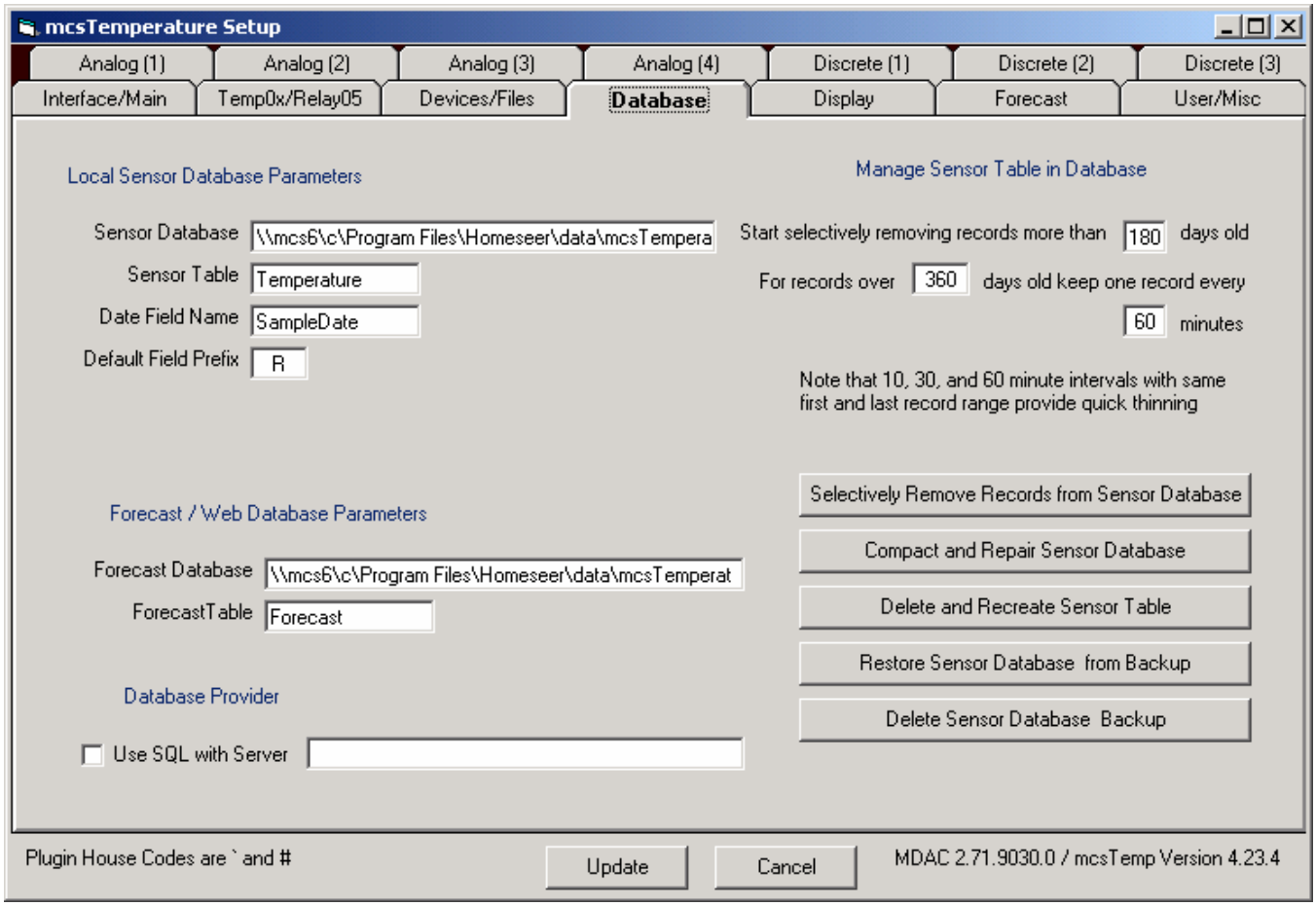

Figure 12 - Database setup tab

8.4.1 Local Sensor Database Parameters

This section defines the database which will be used to store data collected from local sensors. The defaults for the local sensor database will normally work for most users. You can change these settings at any time. If you do so, be aware that if you have existing databases with data you want to remain available to the plug-in, you will need to copy the data to the new location(s) manually using your own tools. No provision is made for automatically moving old data into a new location.

8.4.1.1 Sensor Database

This field contains the path and filename of the database which will store the local sensor data collected from the non-web interfaces. The database location can be entered as a full path or just the database name. If only a name is provided then the Homeseer root directory is assumed to be the path. If SQL is used then the file type should not be specified.

8.4.1.2 Sensor Table

This field specifies the name of the table for periodic data storage within the Sensor Database.

8.4.1.3 Date Field Name

This field specifies the name of the field that contains the date and time when each record was written.

8.4.2 Forecast / Web Database Parameters

This section defines the database and table names for data collected from the Web. If the database name does not contain a file path then it is assumed to be the Homeseer root directory. You can use the same database for both Local Sensors and Forecast/Web data – but be sure the table names are different if you do so.

8.4.3 Database Provider

Microsoft Access is the default database provider. Microsoft Access does not need to be installed on the Homeseer computer in order to use an Access database. If you prefer, an SQL database can be used. SQL can be selected with the checkbox and the specific SQL server entered into the text box. Some form of SQL provider is required to use an SQL database.

8.4.4 Manage Sensor Table in Database

It is possible to retain data indefinitely within the storage constraints of the disk. As the database becomes larger, Access performance degrades. SQL is designed to handle larger databases and will perform better under these circumstances.

It is possible to selectively remove records from an Access database with the plug-in. The algorithm assumes that older data does not need the same sample resolution as current data and will remove records to achieve the effect of a longer sample interval.

The first text box is used to enter the number of days of data that should be retained without modification. The second box indicates the age for which all records older will be retained with the sampling interval specified in the third text box. Data with ages between these two values will be sampled at a linearly proportional interval. The process of computing this proportional sampling is CPU intensive so some special case values have been implemented that are quite efficient. These are 10, 30, and 60 minute intervals with no proportional interval computations. It is possible to make multiple passes with the first being 10 minute, then 30 minute using an older date, and a third with 60 minute with a yet older date.

8.4.4.1 Selectively Remove Records

The Selectively Remove Records button activates the selections made in the text boxes. Prior to running the algorithm the database will be copied to a backup. If the button is pressed twice then the original backup will be lost. To prevent this, the database file should be adequately protected using Windows Explorer or other file navigation tool.

8.4.4.2 Compact and Repair

After the process of selectively removing records the database is automatically compacted. This compacting and repairing operation can be manually performed at any time by using the Compact and Repair button. Note that exclusive use of the database must exist for this operation to be performed. If the database shares tables with UltraLog or other applications then compacting from within the plug-in is not possible.

8.4.4.3 Delete and Recreate

If you get to the point where the database contains “garbage” then it can be deleted and a fresh start made using the Delete and Recreate button.

8.4.4.4 Restore from Backup

A single backup file is created when records are selectively removed. The last backup can be restored using the Restore from Backup button.

8.4.4.5 Delete Backup

A large database can consume a lot of disk space. The backup will consume just as much. It can be deleted with the Delete Backup button if there is no need to ever restore it.

8.5 Display

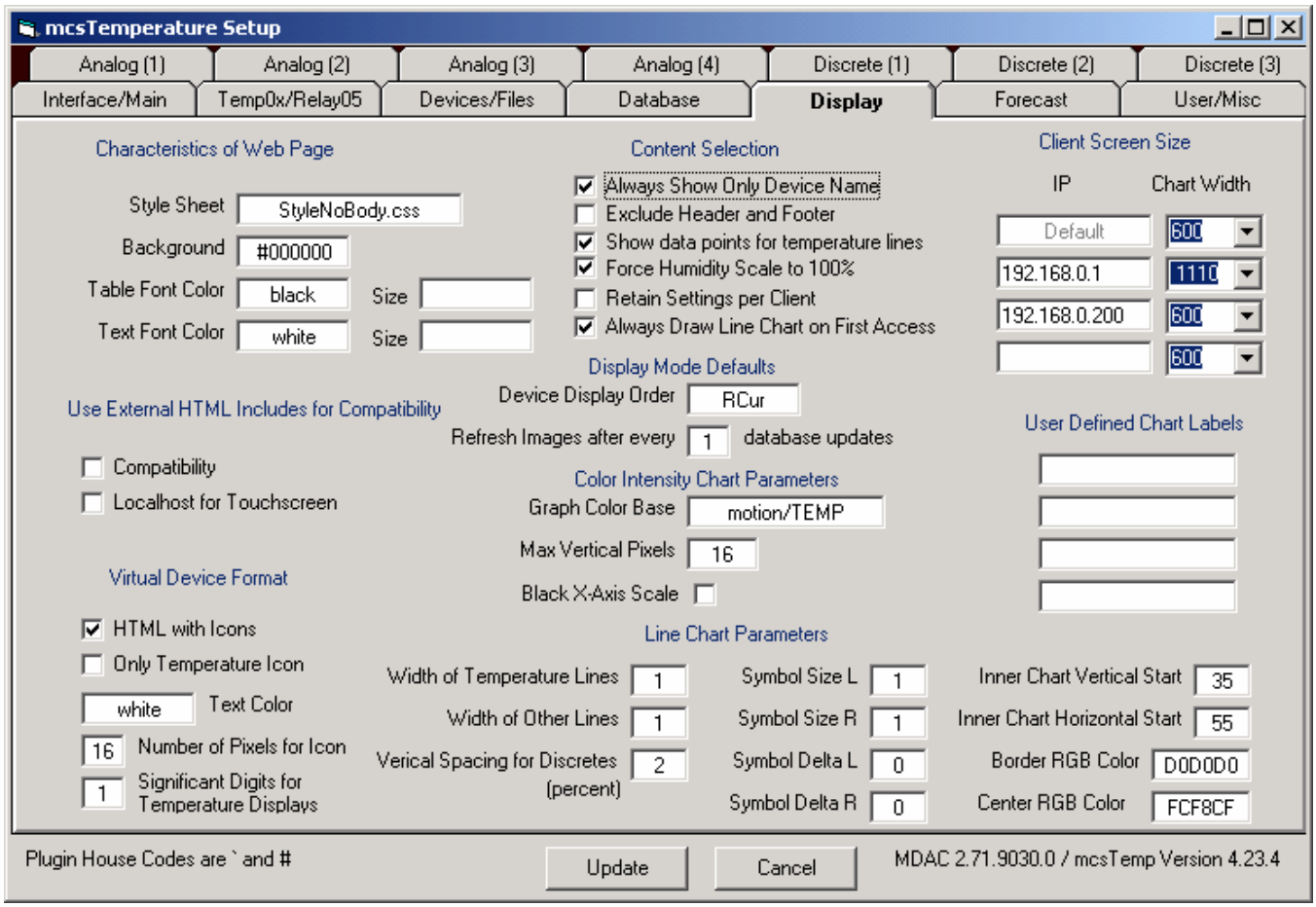

Figure 13 - Display setup tab

8.5.1 Characteristics of Web Page

8.5.1.1 Style Sheet

The style sheet defines the overall look of an HTML page. Style.css is the default used by Homeseer Includes. StyleNoBody.css is provided with mcsTemperature. This can be changed to local preferences.

8.5.1.2 Background

This text box contains the background color of the web page, using either a color name or hexadecimal color number format. Depending on what is contained in a user-provided style sheet, the style sheet may supercede the background color specified here.

8.5.1.3 Table Font Color and Size

This field contains the color used for table labels on Temperature.asp. Color name or RRGGBB hexadecimal format color number may be used. The size parameter, if not left blank, is the font size to be used for all table text.

8.5.1.4 Text Font Color and Size

This field specifies the color used for field text within a table on Temperature.asp. The size parameter, if not left blank, is the font size to be used for all body text.

8.5.2 Display Mode Defaults

The display order setting reflects the last selection made on Temperature.asp. Display order defines the sort order in which the statistics table is presented on Temperature.asp. The sensors can be organized by name or sensor value. The Refresh Images value defines how often the chart display is updated when using Now as the End date/time. The basis is the data update frequency. When this value is set to "1" the chart will refresh whenever new data is available. By using a higher value you can indicate how many data update cycles should pass before the display is automatically refreshed.

8.5.3 Use External HTML Includes for Compatibility

8.5.3.1 Compatibility

Headers and Footers can be internally generated. However, if you prefer to use external includes for compatibility with scripts and web pages designed to use a common set of user-community-supported include files (see section 10.2 below), the plug-in can be configured to use them. Check the Compatibility box. These includes (the "Includes") are available from the Homeseer Updater.

8.5.3.2 Localhost for Touchscreen

The color charts on Temperature.asp are graphics intensive. However, they use only a limited number of files. Some browsers will cache the files and others will not. A client such as the Audrey has the ability to serve the graphics locally, if the graphics are stored on the client. If you have a remote client and you have copied the graphics files to it, check the Localhost checkbox to enable local host graphics. See section 5.1.3 above for more detail.

8.5.4 Content Selection

8.5.4.1 Always show Only Device Name

The labels used to identify sensors on the Temperature.asp page can be shown as "Location + Name" or "Name". Using the name only has the advantage of using less screen real estate. Depending on how you have chosen to name devices and identify their locations, the location-name may be necessary to fully identify a sensor. This checkbox allows you the flexibility to choose what works best for you.

8.5.4.2 Exclude Header and Footer

As distributed, Temperature.asp is a bare-bones container used to call the plug-in to get the entire display page HTML code for the page. If you choose to call the TemperatureASP procedure directly from another page that contains its own context information, you may not need the headers. When this checkbox is checked then only the selection buttons, tables and charts will be displayed. See the beginning of section 5 for more detail.

8.5.4.3 Data points for Temperature Lines

The line chart temperature lines are by default smooth lines that contain no markers to indicate where a data sample is located. They also only show lines between two consecutive data samples. If a sample is missing, and no markers are shown for the data points then segments of the graph may appear to be missing. This checkbox will enable display of a dot for each data point on a temperature line.

8.5.4.4 Force Humidity Scale to 100%

This checkbox is used to force the humidity scale to be from 0 to 100%. If not checked it will be dynamically determined based upon the range of humidity values over the displayed period. If the box is unchecked, the effect is a magnification of changes in humidity readings. In some cases, when humidity doesn't change very much, the resulting chart can be quite strange.

8.5.4.5 Retain Settings per Client

When a trend chart is drawn it uses the settings from the previous time the trend chart was drawn. By default this is independent of the client. If two clients are trying to show different charts at the same time then when the chart is refreshed it will draw the same chart on both clients based upon the client that last made the selection. The memory as to the last settings can be made to track a client to allow different clients to display different trend charts at the same time. This checkbox allows you to retain settings for each IP address that accesses the plug-in.

8.5.4.6 Always Draw Line Chart on First Access

First access to a Trend chart will draw a Table, Line, or Line with selection controls based upon which of these were last selected. This set of "defaults" can be expanded to include all possible chart types when this checkbox is checked.

8.5.5 Color Intensity Chart Parameters

The color intensity chart uses color samples (single-pixel .jpg files) covering a 16 point color gradient and stretches these samples to be one pixel wide by the number of pixels specified in the setup box. The parameters in this section control the desired vertical height and the storage location of the color samples.

8.5.6 Line Chart Parameters

A line chart consists of lines of a specified thickness drawn on a center box which is encased in a larger box. The thickness of the individual lines (in pixels), and the background color to be used for the center

and outer boxes can be changed from their defaults. RRGGBB hexadecimal nomenclature is used for color specifications. The lines on the chart have default colors, which can be modified on the TrendGroup page that is accessed via the Temperature.asp or Homeseer GUI menu for mcsTemperature.

The non-temperature and non-discrete lines are drawn with symbols included at each data point. The symbol size increases for each type of sensor that is drawn on the same chart so each type of sensor can be distinguished by both symbol size and line color. The symbol starting size can be altered by the "Symbol Size L" field for the lines associated with the left Y axis. "Symbol Size R" is for the right Y axis. The delta size for each subsequent symbol on the axis is controlled by "Symbol Delta L" and "Symbol Delta R". A value of 1 for size and 0 for delta will result in lines without symbols plotted.

The legend for the lines in the chart is located at the top of the line chart and is allocated 35 vertical pixels and 55 horizontal pixels by default. If long names are used then the legend may encroach upon the chart area. Additional vertical spacing can be allocated by increasing the value beyond 35 pixels. The horizontal spacing can be increased if the chart label font sizes are increased and additional space is needed.

Discrete signals are drawn with the "1" value starting at 20% of chart full-scale. The second discrete on the same chart is increased by the specified discrete spacing so the horizontal lines will not occupy the same pixels. The specified number is a percentage of full scale delta.

8.5.7 Client Screen Size

The default client display is 640 x 480 pixels. The default can be changed and up to three specific IP addresses can be selected to have their own specific screen size layout. For example, assume that there are a number of 640x480 touchscreens on the LAN and one desktop with a screen size that will support a 1400 pixel width screen. The IP of the desktop unit would be entered and the chart with of 1400 selected for it. Requests from the touchscreen devices (using the default) will be presented in 640x480. Requests from the desktop will be scaled to the larger size.

The line chart scales linearly. The color chart has as break at 1000 pixel width. Screens over 1000 pixels will have an expanded color chart. Smaller screens will have the standard width color chart.

The aspect ratio of the screen can also be manually altered. See paragraph 3.2.14.1.

8.5.8 User Defined Chart Labels

The Y axis of the line charts are labeled with the type of sensor that is being drawn on its axis. In addition to the pre-defined sensors, the plug-in supports up to four user-defined sensor types. These are entered here and they will then be available for use on the User Defined tab.

8.6 Forecast

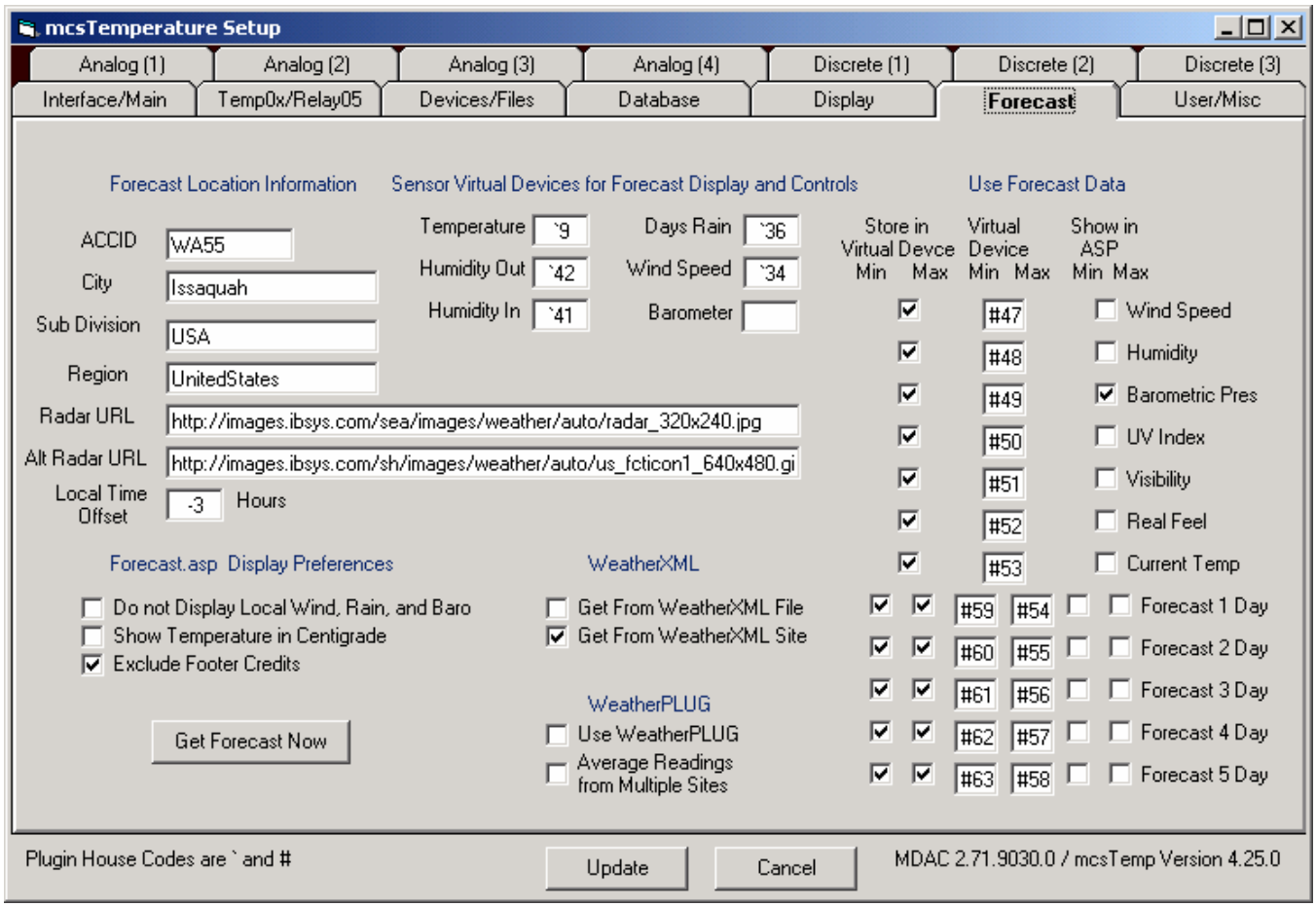

Figure 14 - Forecast setup tab

8.6.1 Forecast Location Information

8.6.1.1 ACCID

The ACCID is a code used by MSNBC to identify the weather reporting location. Often this can be the zip code. See section 3.2.10 for more information.

8.6.1.2 City, Subdivision, Region

This is just textual information that will be displayed on the Forecast.asp web page

8.6.1.3 Radar URL, alt Radar URL

The Radar URL is a fully-qualified URL to retrieve an image for display on the Forecast.asp web page. If the primary site does not deliver an image then the alternate will be used. In addition, if you click on

the radar image on the Forecast.asp page, you will “click through” to the alternate URL. The image is downloaded to the local computer at the forecast update interval and the time of the download is noted on the Forecast.asp page.

8.6.1.4 Local Time Offset

Data from MSNBC is reported based upon the USA Eastern Time Zone (GMT –5). In order to adjust the time of the data to local time an offset value is entered. For example, a value of 3 is used for USA Pacific time, and a value of –5 would adjust to GMT.

8.6.2 Forecast.asp Display Preferences

8.6.2.1 Do not Display Local Wind, Rain and Baro

This checkbox will eliminate the Forecast.asp table that presents both local-sourced and web-sourced meteorological data. When checked the page will show only the web-sourced data.

8.6.2.2 Show Temperature in Centigrade

MSNBC data is provided in English units. Check this box to convert it to degrees C, leave it unchecked for degrees F. This setting applies to both current and forecasted temperature displays.

8.6.2.3 Footer Credits

The bottom of the Forecast.asp page shows credits for the lineage of the displayed page. Checking the checkbox suppressed these.

8.6.3 Sensor Virtual Devices for Display and Control

It is possible to have multiple sensors of the same type and the plugin will not know how to distinguish the one to be used for display or as a control sensor. The text boxes in this section are used to identify the primary sensor of each type.

8.6.4 WeatherXML

Forecast data is obtained by default from an MSNBC site. In lieu of this source Weather.com can be utilized if registration has been performed to obtain the Weather XML data. A WeatherXML script is available from the Homeseer updater and contains all the information needed to get setup using this source of weather information.

The plugin will support two modes of WeatherXML operation. The first is to use the file that is downloaded by the WeatherXML script. It is located in the file \data\weathercom.xml. The second is to download the same file from weather.com. When downloaded, it will store the result in this same file for use by other applications. If the plugin does the download then the script should not be used to accomplish the same objective. The plugin will restrict the download to once every 30 minutes per the term of the license arrangement.

If the plugin is used to perform the download directly from weather.com then it is the users responsibility to add 4 keys to the \config\mcsForecast.ini file in the [WeatherXML] group. These are:

[WeatherXML]

CodeArea=yourData

PartnerID=yourData

License=yourData

Units=s

mintime=30

lastran=2004-06-04 08:57:09

8.6.5 WeatherPLUG

WeatherPLUG is another Homeseer plug-in that will retrieve meterological data from nearby reporting stations. Data from WeatherPLUG can be substituted for the equivalent MSNBC data by checking the Use WeatherPLUG checkbox. This includes all current information. MSNBC is always used for forecasted data.

WeatherPLUG is able to retrieve data from three locations. mcsTemperature will average the data from these three locations and store the result in its device map starting at the second house code device 71. The checkbox is used to specify this operation. It will only be recognized if a version of Homeseer that supports at least 99 devices within a house code is installed.

8.6.6 Use Forecast Data

This section of the setup is used to indicate which, if any, of the items collected from the web should also be stored individually in virtual devices and be made available for display on the Temperature.asp page. For any given item the virtual device can be specified in the text box. The left checkbox instructs the plug-in to store the data in the virtual device when it is obtained from the web. The right checkbox selects it as part of the default display contents for line and color graphs. The forecast data consists of both maximum and minimum forecast temperatures which are individually selected. The min is on the left and the max is on the right.

8.6.7 Get Forecast Now

The Get Forecast Now button forces download of data immediately rather than waiting for the scheduled time.

8.7 Analog Sensor (1)/(2)/(3)/(4)

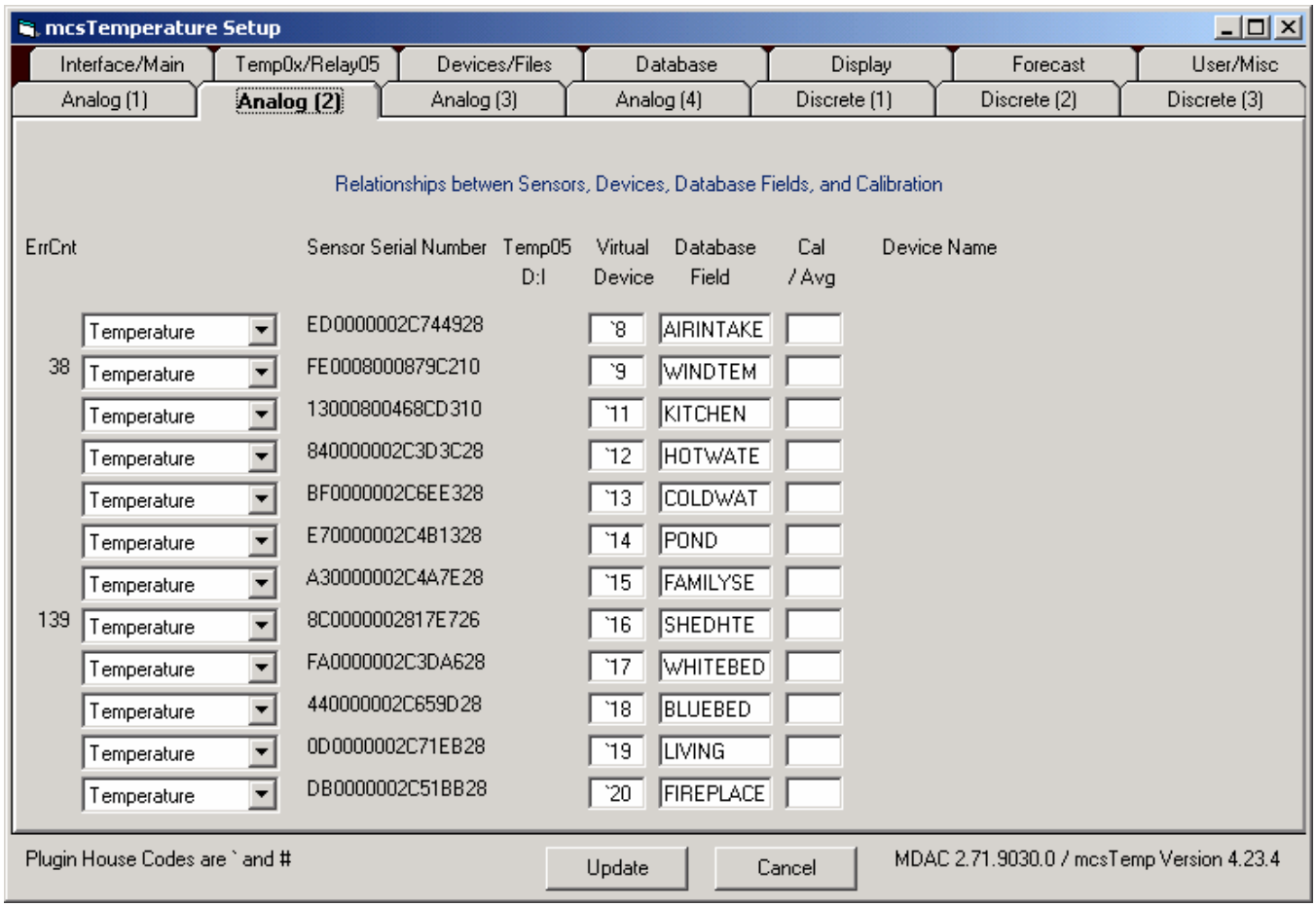

Figure 15 – Analog setup tab

Up to 49 sensors can be specified on these four tabs. When the plug-in sees an analog sensor on the one-wire bus it will add it to the next position on one of these tabs. After it is added it can be reassigned to a different virtual device and the name of its database field changed to be more descriptive. The virtual device can be edited, to give a more descriptive name. A calibration bias or filter averaging parameter can also be specified, in the column labeled Cal/Avg. For temperature sensors, a positive or negative number can be entered, which will be added to the measured temperature before the result is stored into the virtual device and database. For non-temperature, non-counting sensors, a value between 0 and 0.99 can be entered, representing an averaging filter weight. If the value is 0 (or blank) the plug-in will use the raw data from the sensor. If the value of the filter weight is between 0.01 and 0.99, then the previous stored data value will be multiplied by the filter weight, and will be added to the product of the current sensor reading and the difference between 1.00 and the filter weight. The result will be stored as the new data item value. For example, imagine a Windspeed item, with the filter weight set to 0.75. If the previous stored value was 4 mph and the new measured value is 8 mph, the new stored value will be 5 mph (4*0.75 + 8*0.25). The effect is to dampen the impact of extreme values.

The leftmost column contains the Error Count. An error is accumulated when an attempt is made to obtain data from the sensor and the transaction was not 100% successful. It is not unusual to have intermittent errors. Persistent errors are an indication that some attention is needed to the physical interface or the sensor itself. Device codes 60 through 63 of the first plugin house code contain composite error information that can be used for quick observation or event triggers.

In the case of the Thermochron a Mission button will appear. When clicked it will bring up another page where the mission can be programmed or the data dumped from the last mission. See paragraph 3.2.12 for the Thermochron operation.

It is also possible to enter virtual devices directly, that do not correspond to devices on the one-wire bus. In this case the user is responsible for populating values into the virtual device and these values will be transferred to the database when other sensor information is recorded.

8.7.1 Conversion Resolution

Temperature reading resolution from some 1-wire devices can be set programmatically. Lower resolution readings will occur faster and consume less power at the sensor. The default is to read at maximum resolution. This can be changed by editing the mcsTemperature.ini file in the \Config folder. The section [Devices] contains one line for each sensor. The 5th entry on the sensor's line is an index index into the sensor's resolution table. A value of 0 is full resolution. For the DS18B20 the sensor supports 4 resolutions

3 = 0.5
2 = 0.25
1 = 0.125
0 = 0.006

For example to set sensor to 0.5 resolution on conversion.
[Devices]
BF0000002C6EE328="]17,97,0,0,3"

Discrete (1)/(2)/(3)

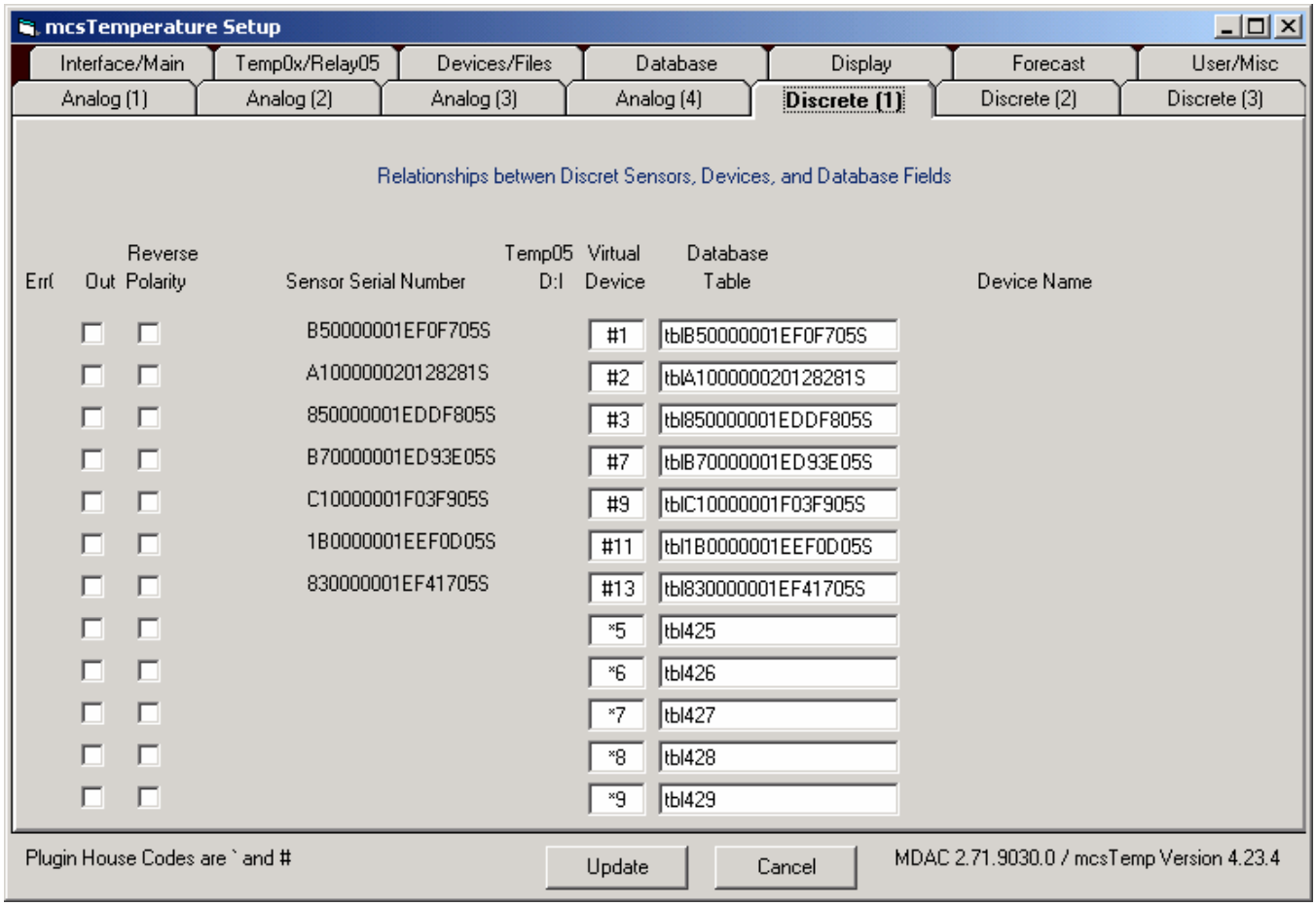

Figure 16 - Discrete setup tab

The discrete is also similar to the Analog setup with the addition of three fields for a discrete sensor.

8.7.2 Relationships

8.7.2.1 Output Checkbox

The output checkbox (in the column labeled Out), when checked, will change the device type from an input device to an output device. This will enable commands to be sent to it from the Homeseer GUI or other control sources.

8.7.2.2 Reverse Polarity

The reverse polarity checkbox is used to specify the sense of the device. When unchecked then a 0 sensed will be reported as OFF and the OFF control output will send a 0. When checked the 0 input will report an ON and the ON control output will send a 0.

8.8 Update / Cancel / X

The Update button is used to record all changes made on any of the setup tabs. The Cancel button and the Window control X are used to discard any changes that may have been made. The Cancel button will close both the IO Stream Data Receive Echo window and the setup box, while the X will only close the setup box.

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9 Virtual Device Code Map

If you use the Create Plugin House Code and Devices button (on the Devices/Files tab of the setup GUI) to create two plug-in House Codes, when the plug-in detects new devices it will assign them Unit codes based on the Virtual Device Code Map. The user can leave the sensors in their assigned locations or edit the sensor to virtual device relationships on the setup page. Two house codes are used. The first is based on the device layout of the Temp05 plug-in (by Ken Mitchell) and contains primarily Temperature and Weather sensors. The second contains discrete devices, forecast data, and room for some miscellaneous entries.

Table 8 - Virtual Device Code Map (First House Code) and Table 9 - Virtual Device Code Map (Second House Code) contain a device number which is appended to the plug-in's allocated house code to form the Homeseer device code. The "Type" is a numeric value used internally by the plug-in to identify the function performed by the sensor.

If no house code for the plug-in has been created then new sensors will be assigned sequential numbers within the default house code specified in the setup. The default if no user action is taken is house code "R".

Table 8 - Virtual Device Code Map (First House Code)

Device	Type	Function
1 – 31	0	Temperature Sensor
32	10	Lightening
33	1	Wind Direction
34	2	Wind Speed
35	3	Wind Gust
36	4	Rain Today
37	8	Barometer
38	5	Rain Rate (per hour)
39	9	Barometer Rate (per hour)
40	7	Humidity Rate (per hour) different function in Temp05 plug-in
41 – 49	6	Humidity
50		High Wind different function in Temp05 plug-in
51 – 58	12	Relay
59		Relay Timer
60		Composite Error Rate
61		Composite DS9x9x Inteface Error Count
62		Composite Temp05 Interface Error Count
63		Composite Sensor Error Count
64		Reserved and contains version number of plugin when first installed

Table 9 - Virtual Device Code Map (Second House Code)

Device	Type	Function
1-36	11/12	Switch (Discrete)
37-46		Miscellaneous / Overflow
47	2	Forecast Wind Speed
48	6	Forecast Humidity
49	8	Forecast Barometric Pressure
50	14	Forecast UV Index
51	15	Forecast Visibility
52	0	Forecast Real Feel
53	0	Forecast Current Temperature
54		Forecast 1 Day Max
55		Forecast 2 Day Max
56		Forecast 3 Day Max
57		Forecast 4 Day Max
58		Forecast 5 Day Max
59		Forecast 1 Day Min
60		Forecast 2 Day Min
61		Forecast 3 Day Min
62		Forecast 4 Day Min
63		Forecast 5 Day Min
64-70		Reserved
71		WeatherPLUG Average Temperature
72		WeatherPLUG Average Wind Direction
73		WeatherPLUG Average Wind Speed
74		WeatherPLUG Average Wind Gust
75		WeatherPLUG Average Rain Today
76		WeatherPLUG Average Rain Rate
77		WeatherPLUG Average Barometer
78		WeatherPLUG Average Humidity
79		WeatherPLUG Average Temperature
80		WeatherPLUG Average Temperature
81		WeatherPLUG Average Location
82		WeatherPLUG Average Dew Point
83		WeatherPLUG Average Real Feel
84		WeatherPLUG Average Month Rain
85		WeatherPLUG Average Text

10 Resources

10.1 Required

- Chart Director V2.5 or later to prepare line charts
  http://www.advsofteng.com/download.html.

10.2 Optional

- Run time environment for DS9097U or DS9490 internal interface
  ftp://ftp.dalsemi.com/pub/auto_id/licensed/Install_1_Wire_Drivers_v400b3.exe
- The “Includes” files
  Homeseer Updater

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