xAP Data Collection and Charting

Overview of use of xAP for data collection, charting, plus an introduction to the xAP interface to Homeseer

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1 Introduction

1.1 Overview

This guide is intended to show the setup process to collect sensor data via xAP nodes, store the data in a database, and generate charts from this database. Sensor data is collected from local sensors or internet weather data. It is stored in SQL Server or Access database. It is charted on request from a browser or jpg files produced on xAP messages requests. The schema supported in this scenario are xapbsc, xap-x10, and weather.report.

The setup requires at least one component for each of the following categories

xAP Sensor Node

a. Temp05 / Temp08	xapmcsTemp0x
b. DS90907U / DS9490	xapmcs1Wire
c. Quasar 3145	xapmcsK3145
d. AWS Weather Net	xapmcsWeatherAWS
e. Weather.com	xapmcsWeatherXML
f. MSNBC weather	xapmcsWeatherMSNBC
g. RF W800	xapmcsW800
h. RF CM19A	xapmcsCM19A
i. X10 CM11A	xapmcsCM11A
j. X10 ADI Ocelot	xapmcsADIOcelot

xAP Data Collection Node

xapmcsDatabase

xAP Charting Node

xapmcsChart

xAP Hub

xapmcsHub

This guide is not intended to provide all the options available for the setup process, but is intended to illustrate the basic flow and the primary setup considerations necessary to achieve the objective of collecting data and producing a trend chart.

A section is also provided to show how to include Homeseer for those that prefer a more centralized access.

1.2 Architecture

Standard xAP schema are used to perform the data collection and charting. To simplify the setup and user interactions some conventions have been adopted for the structure of addresses and sensor identification.

1.2.1 Sensor Data Delivery

The primary schema for delivery of sensor data is xapbsc version 1.3. The source address field of this message is comprised of a thee-part address and 3 or 4 part subaddress. The address, per xAP standards is Vendor.Application.Instance. The mcs-supplied nodes will use “mcs” as the vendor and the computer network name as the instance. The application will be unique per application.

The subaddress convention adopted is Name.ID.Type.Channel. Name will typically be some variant of user-entered information. The ID is a fixed length 16 character field. In the case of 1-wire sensors the ID will be the same as the ROM ID or serial number. The type field is an enumeration from the following list:

"Temperature",
"WindDirection",
"WindSpeed",
"WindGust",
"RainToday",
"RainRate",
"Humidity",
"HumidityRate",
"Barometer",
"BaroTrend",
"Lightning",
"Switch",
"Relay",
"Index",
"Distance",
"User0",
"User1",
"User2",
"User3",
"Thermochron",
"Voltage",
"Unused",
"HVAC",
"Moisture",
"Minutes",
"Status",
"RainMonth",
"DewPoint",

"Text",
"WaterFlow",
"WaterFlowRate",
"WattageToday",
"WattageRate",
"HubSwitch",
"X10",
"Sunlight"

The Channel field will only be present when the sensing device has more than one measurement of the same type. In this case a sequential number is used to identify the channel.

1.2.2 Chart Request

A jpg chart file can be generated by delivery of a message using the “Chart.Draw” schema. The section name is “Chart.Line”. Body keys are “Duration”, “Name”, and ”File”. The duration is an enumeration from the following:

"Daily",
"Weekly",
"Monthly",
"Yearly",
"6Hour",
"24Hour",
"72Hour",
"Week",
"2Week",
"Month",
"2Month",
"3Month",
"6Month",
"Year",

The first four of these will aggregate all data in the database over the seleted period. These will not normally be used.

The Name key is used to identify the name of the Trend Group that has been previoulsy setup to identify the items to be included in the chart. The Filename is the full path to where the generated jpg file will be deposited.

1.2.3 Data Storage

Data is stored in one of two formats. Discrete data is stored as one sensor per table where entries in the table reflect the each ON/OFF 0/1 received. These tables are prefixed with “d” with the remainder of the table name being the 16 character ID.

Continuous data is stored in a single table with fields added for each new sensor accepted. The field names will be prefixed with "a" followed by the 16 character ID. These naming conventions will be used by xapmcsDatabase when data is stored and by mcsxapchart when data is drawn. xapmcsDatabase assumes sensor types of "X10", "Switch" or "Relay" are discrete data. The xapmcsDatabase browser interface allows the discrete/continuous to be specified on individual sensors.

Data received from the Weather.Report schema is saved in one of two tables. Forecast data is stored a dedicated table where each field is prefixed with "f" followed by a 16 character ID formed from the key in the Weather.Report body. The other data is stored in the continuous data table using an "a" prefix and 16 character ID as the field names.

Data received fromt the xap-x10 schema is treated as ON/OFF data stored in tables named with a "d" prefix followed by 16 character formed from the source computer name and X10 code.

2 Application Setup

An PC-based xAP environment consists of one of one or more xAP-cognizant applications on one or more networked PCs. Each PC will run an xAP hub application to distribute data among the other xAP applications on the same PC.

It is a good practice to start the xAP hub before any other xAP applications because some applications will try to act as a hub if they are the first to start. For all "mcs" xAP applications the order of startup does not matter since only the xAP hub will try to perform a hub service. There are a variety of xAP hubs available and any should be able to be used.

The xAP Viewer from xapFramework.net is a useful tool to observe xAP message traffic. Figure 2 and Figure 3 show a typical display for messages summaries and message detail that is available from a Window's GUI. When using the xAP viewer and a dedicated hub one needs to be careful to start the dedicated hub before the viewer otherwise the hub will not be able to gain access to the xAP port on the primary interface.

2.1 xapmcsHub Setup

Three checkboxes are provided for setup of xapmcsHub. The typical configuration will be as shown in Figure 1 where only xAP will be processed, an icon will appear in the tray and no backup hub function will be spawned. Once stable operations are achieved the tray icon may be removed if one desires a less-cluttered tray.

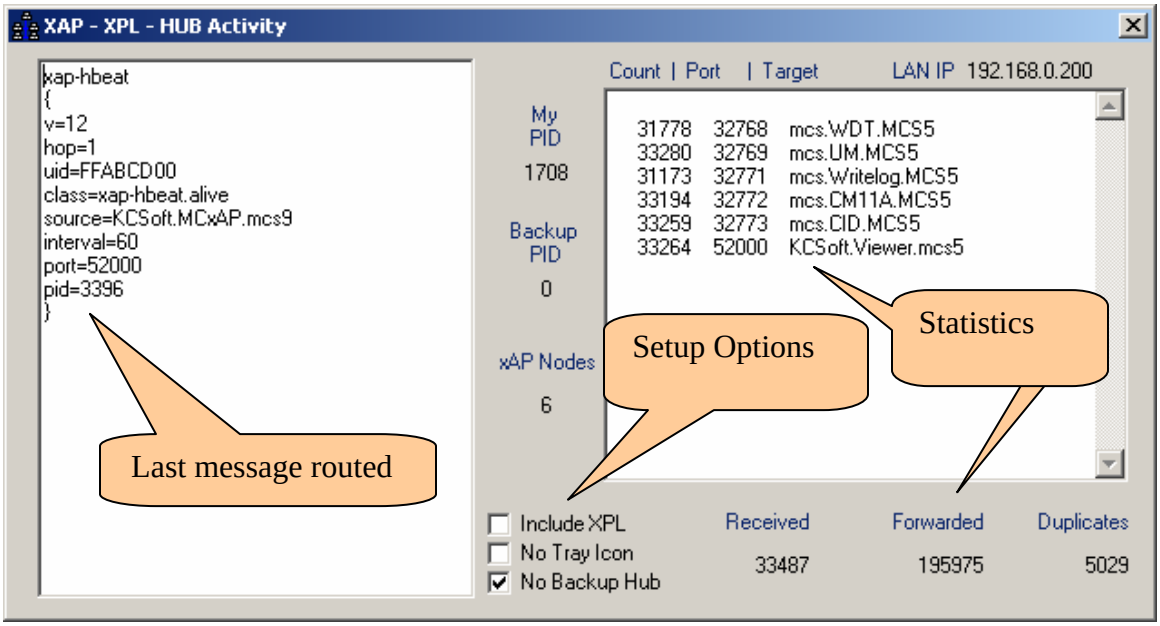


Figure 1 xAP Hub Activity Form

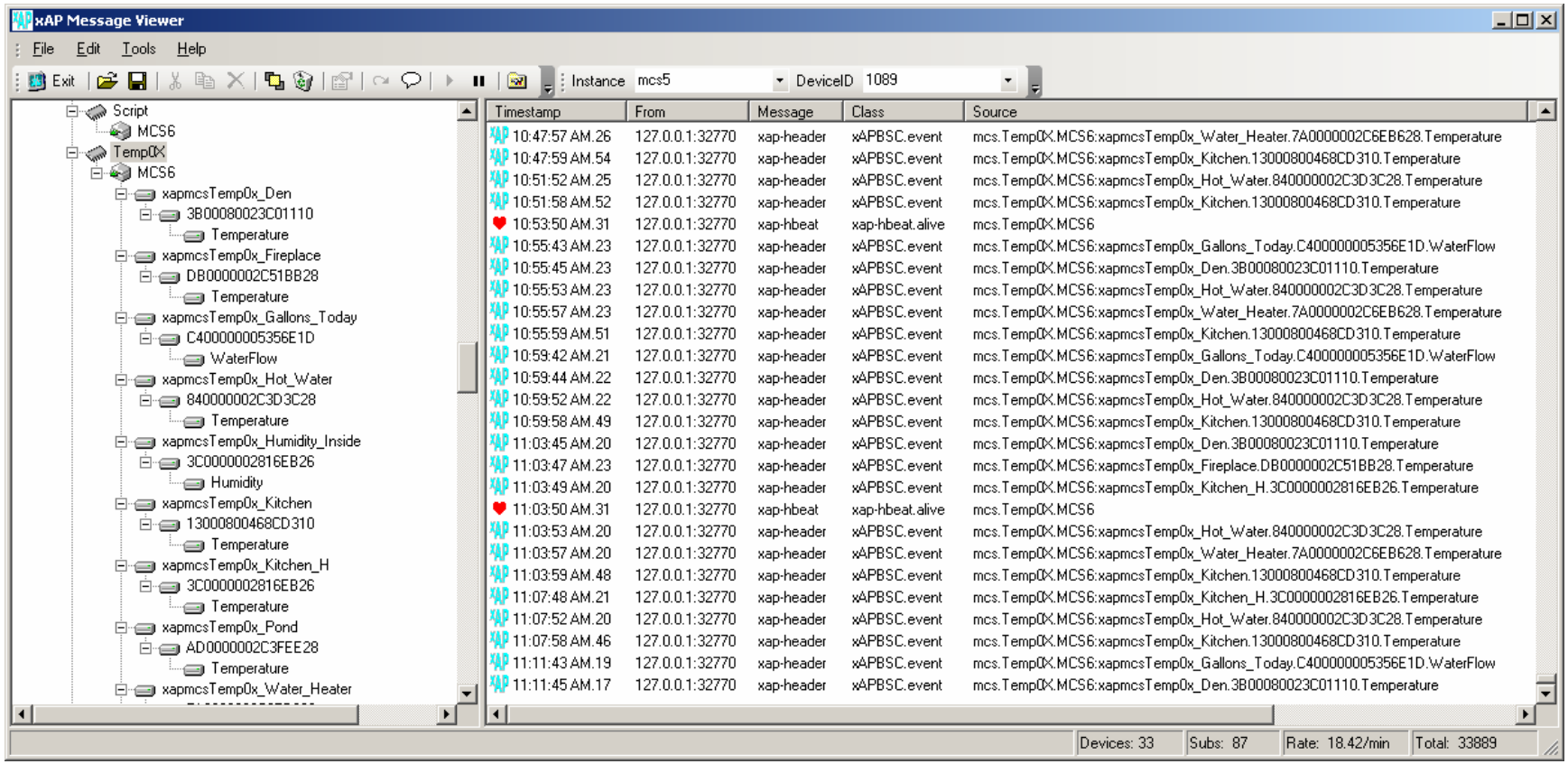


Figure 2 xAP Viewer

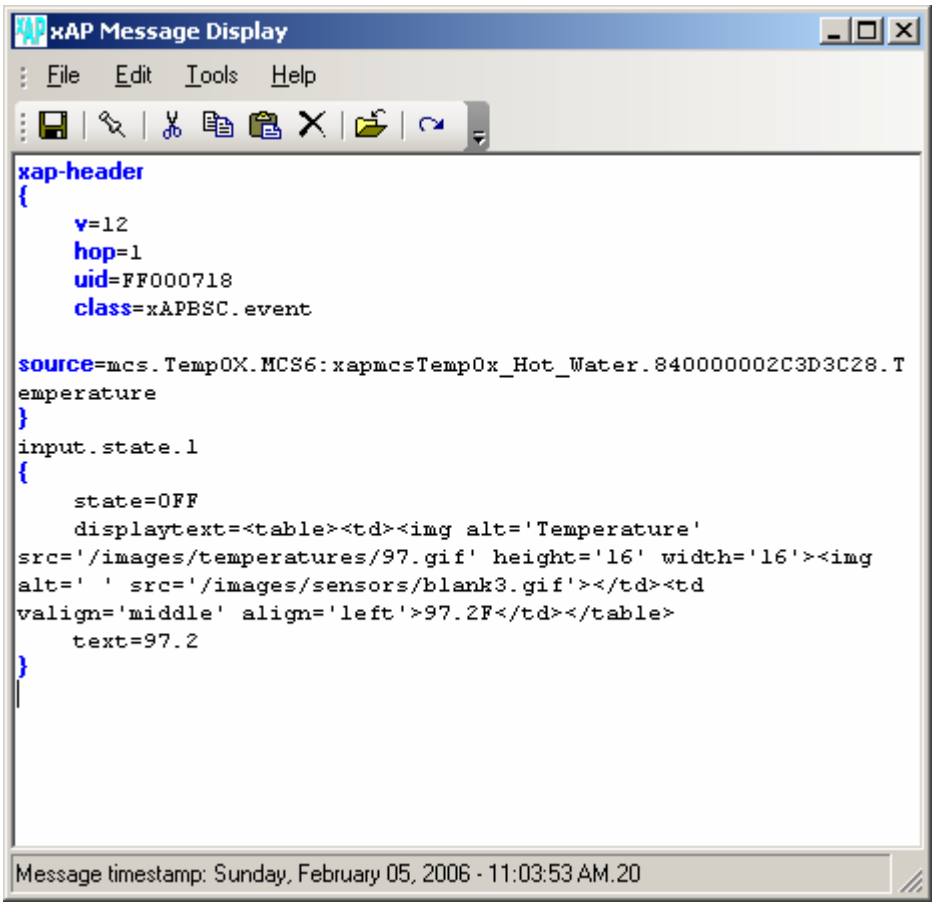


Figure 3 xAP Viewer Message Detail

2.2 xapmcsDatabase Setup

Setup is performed from a browser interface with the default URL being http://localhost:8011/status. This URL port can be changed as part of the setup shown in Figure 4.

The selection of a database is made between Access or SQL Server. If SQL server is selected and the default server is to be changed then its name is entered in the text box after the SQL Server selection radio.

The names of the database and tables can be entered, but consistency needs to be maintained with the names used in xapmcschart which is sharing the same database.

The continuous data table records are stored periodically independent of when data from various source is received. The frequency of this storage can be changed from the default of 5 minuts.

The options in the “HTTP / Browser” section apply to the browser user interface. The “Show Only Accepted BSC” checkbox is used to restrict the detail list to only those lines that have been selected for inclusion in the database.

When a new items is to be added to the database then this checkbox should be unchecked so it will be visible in the list. After the desired ones are accepted into the database then this checkbox can be checked so the browser will only show those items that are being recorded. The detail list is shown in Figure 5.

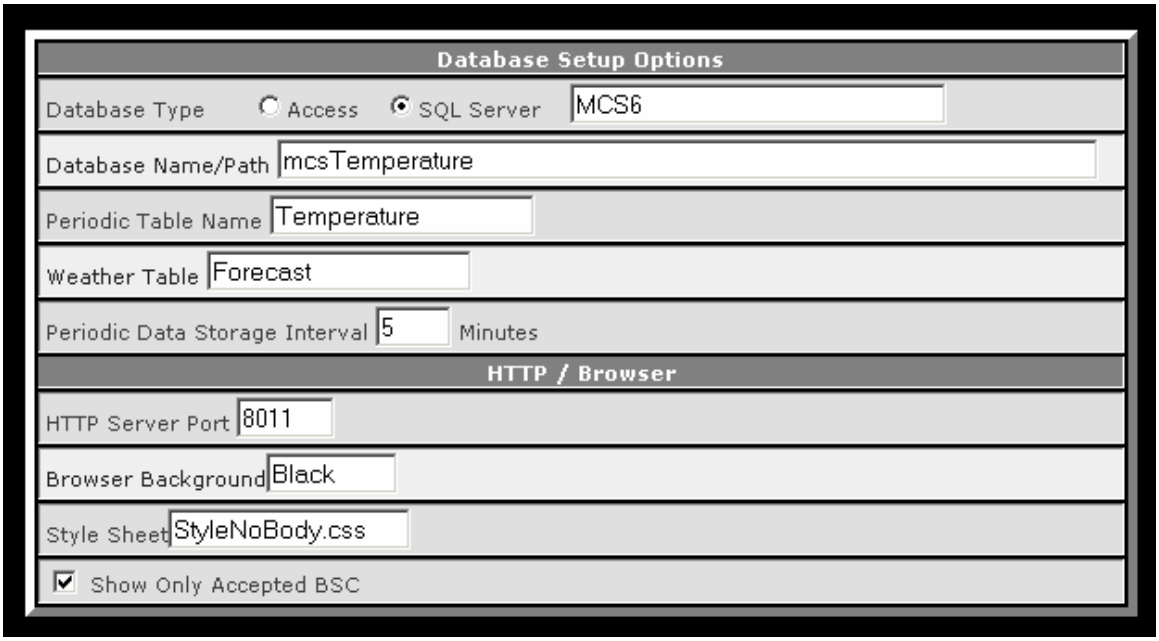
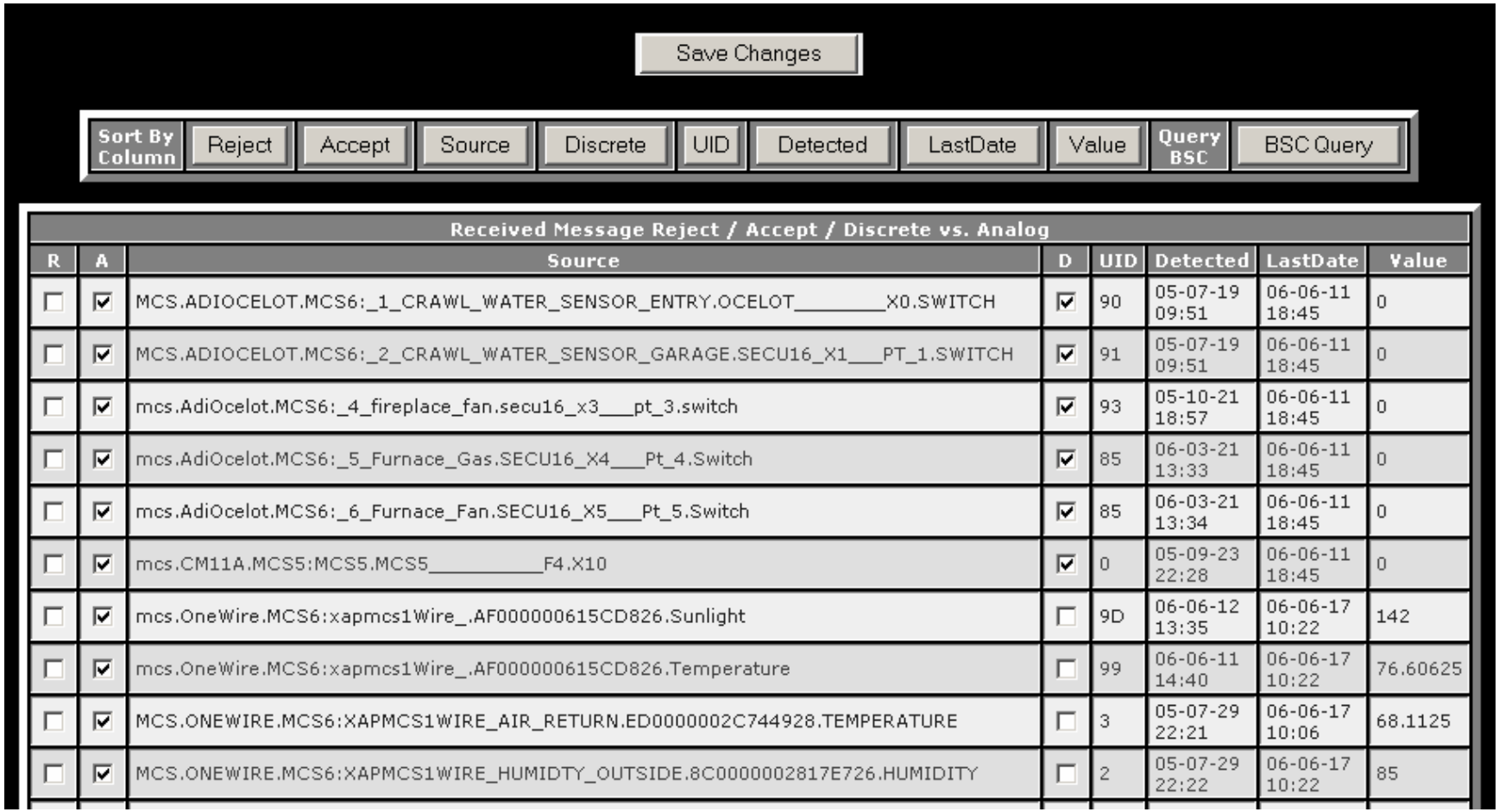


Figure 4 xapmcsDatabase Setup Options

Three user-entry checkboxes are provided for each item in the potential list of data that can be recorded in the database. The "R" column is checked to reject the message. This is typically used when the message is ill-formed or will never be of interest for historical reference. The "A" column checkbox is used to accept the item. When this happens either a field in a continuous table or a new discrete table is created and data from subsequent messages will be stored. Before the "Save Changes" button at the top is used the "D" column should be properly set so the data will be stored in the proper type of table. ON/OFF or 1/0 data should be placed in a Discrte table to conserve space and this also has flexibilty for charting.

The other columns are informational, but may be useful in concert with the sort buttons at the top of the form to organize the data in a preferred presentation format. Sorting by "Detected" date is usefull to find newly added sensors.



Received Message Reject / Accept / Discrete vs. Analog

R	A	Source	D	UID	Detected	LastDate	Value
☐	☑	MCS.ADIOCELOT.MCS6:_1_CRAWL_WATER_SENSOR_ENTRY.OCELOT_____X0.SWITCH	☑	90	05-07-19 09:51	06-06-11 18:45	0
☐	☑	MCS.ADIOCELOT.MCS6:_2_CRAWL_WATER_SENSOR_GARAGE.SECU16_X1___PT_1.SWITCH	☑	91	05-07-19 09:51	06-06-11 18:45	0
☐	☑	mcs.AdiOcelot.MCS6:_4_fireplace_fan.secu16_x3___pt_3.switch	☑	93	05-10-21 18:57	06-06-11 18:45	0
☐	☑	mcs.AdiOcelot.MCS6:_5_Furnace_Gas.SECU16_X4___Pt_4.Switch	☑	85	06-03-21 13:33	06-06-11 18:45	0
☐	☑	mcs.AdiOcelot.MCS6:_6_Furnace_Fan.SECU16_X5___Pt_5.Switch	☑	85	06-03-21 13:34	06-06-11 18:45	0
☐	☑	mcs.CM11A.MCS5:MCS5.MCS5_____F4.X10	☑	0	05-09-23 22:28	06-06-11 18:45	0
☐	☑	mcs.OneWire.MCS6:xapmcs1Wire_.AF000000615CD826.Sunlight	☐	9D	06-06-12 13:35	06-06-17 10:22	142
☐	☑	mcs.OneWire.MCS6:xapmcs1Wire_.AF000000615CD826.Temperature	☐	99	06-06-11 14:40	06-06-17 10:22	76.60625
☐	☑	MCS.ONEWIRE.MCS6:XAPMCS1WIRE_AIR_RETURN.ED0000002C744928.TEMPERATURE	☐	3	05-07-29 22:21	06-06-17 10:06	68.1125
☐	☑	MCS.ONEWIRE.MCS6:XAPMCS1WIRE_HUMIDTY_OUTSIDE.8C0000002817E726.HUMIDITY	☐	2	05-07-29 22:22	06-06-17 10:22	85

Figure 5 Database Inclusion List

2.3 xapmcsChart Setup

The setup of xapmcsChart is performed from a Window's GUI form and chart generation is performed from a browser interface or on demand from xAP messages. A tray icon that looks like a graph of red and black lines is used to access the GUI setup. This is shown in Figure 6. When first installed there will be a limited number of items shown from clicking on the tray icon. The first of these will be the GUI setup option. The System Config and System Status perform no function at this time. The Groups is the method to identify which sensors are grouped together for charting. The Exit closed the application. The other items in the list will be populated as Groups are defined.

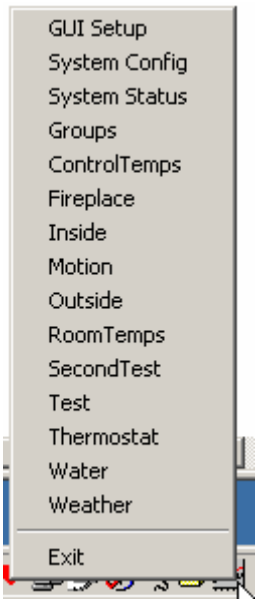


Figure 6 xapmcsChart Tray Icon

2.3.1 GUI Setup

The Main tab from the GUI Setup provides debug option checkboxes and the server port that supports the Browser interface.

The Data Collection tab shown in Figure 7 contains information that should be consistent with the setup performed on xapmcsDatabase. It needs to know what units of measure are used for data in the database so it can properly label the charts. It also provides provsions for user-defined labels for sensors types that have been recorded as user definded types.

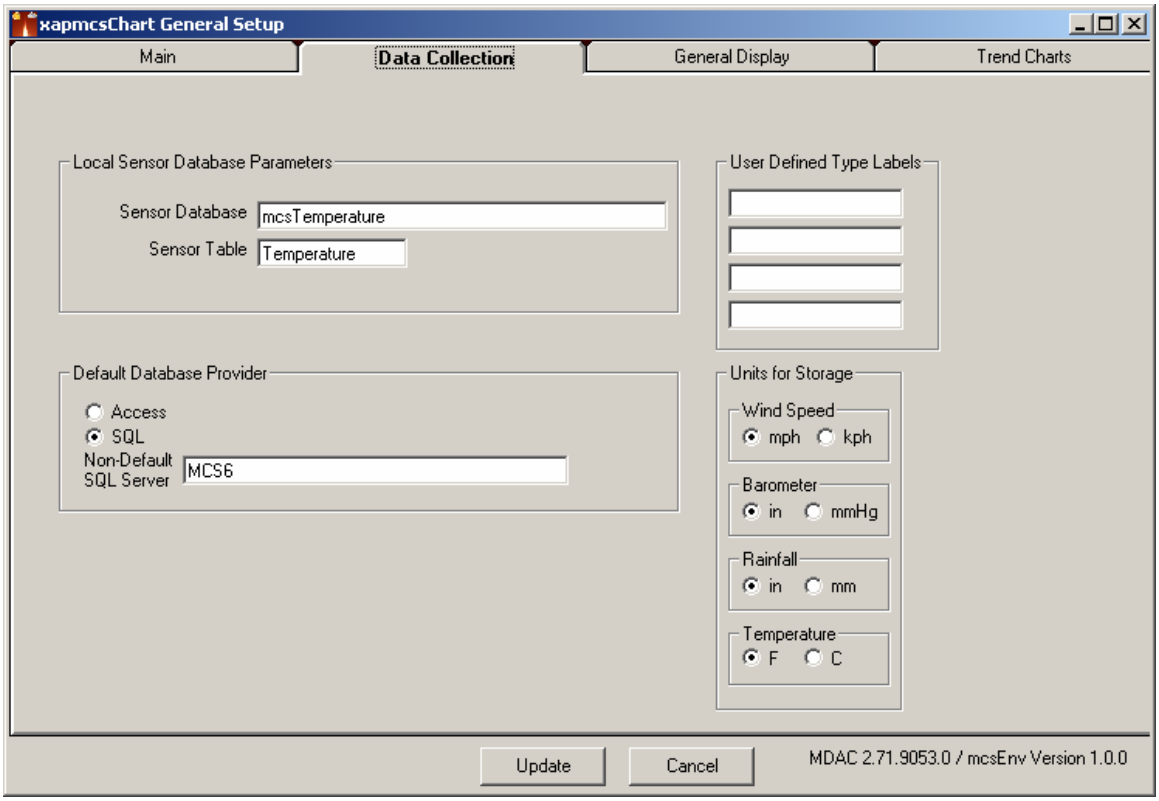


Figure 7 xapmcsChart Data Collection Setup Tab

The General Display tab shown in Figure 8 provides configuration information about how the browser and chart will appear.

xapmcsChart will support generation of charts for four diffent size client screens. The second, third, and fourth lines in the Client Screen Size area are used to identify a specific IP of the client and the size of the screen that should be formatted for this client. The screen size selection pulldown will be the list of screen size dimensions that is also user-configurable in the Screen and Chart Dimensions area. All other IP will use the default screen size.

A chart is drawn on a canvas of Overall Height and Overall Width. Inside the canvas will be a rectangle of size Chart Height and Chart Width in which the trend lines will be drawn. The area outside the inner box is used for labeling.

The Web Header Includes refers to an asp script developed by Jeff Farmer for Homeseer users to format the header and footer of browser pages. If this asp is to be used then it is placed in the \HTML\includes folder and the radio selected for its use. Otherwise xapmcsChart will use its own internally format for headers.

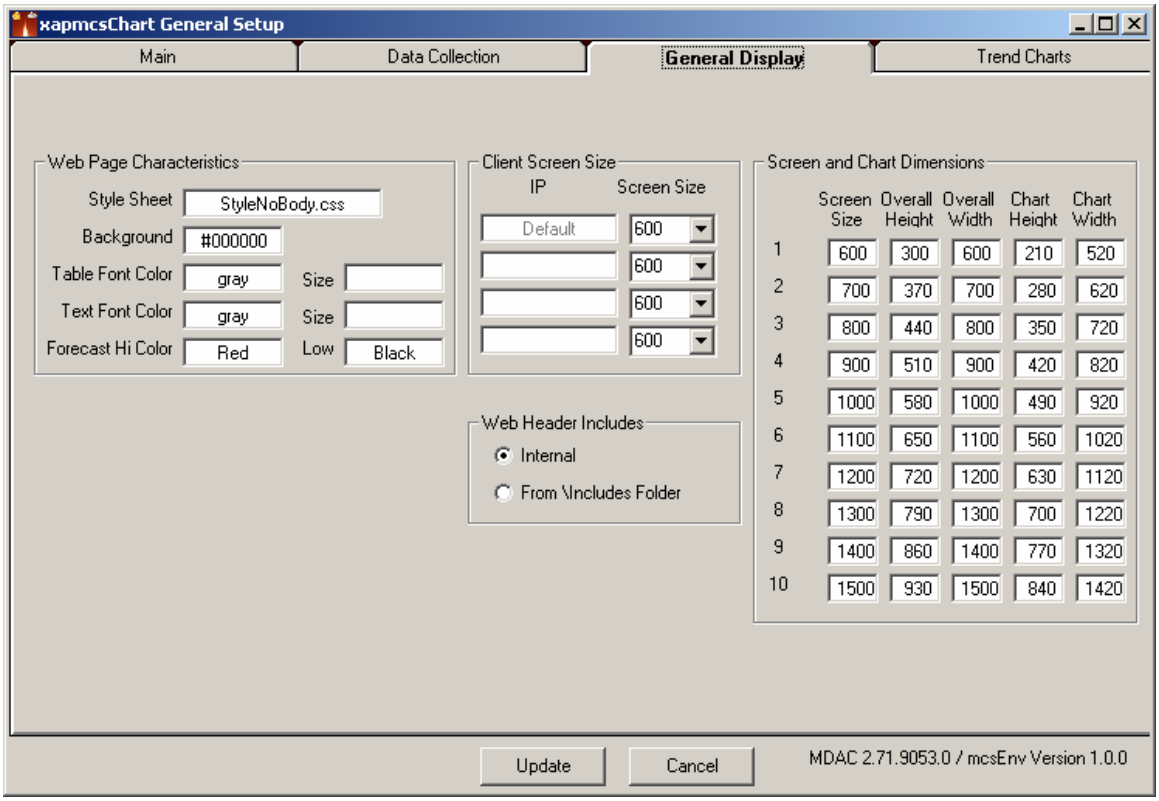


Figure 8 xapmcsChart General Display Setup Tab

The Trend Chart tab shown in Figure 9 is used to configure the appearance of the trend charts.

HTML page headers and footers can be excluded from browser display by using the Exclude Header and Footer checkbox. When this checkbox is checked then only the selection buttons, tables and charts will be displayed.

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.

Force Humidity scale 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.

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.

The Always Connect Dots of Line checkbox is used to display a contiguous trend line event when there is missing data samples. If not used then chart gaps will appear when data is missing.

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. The Color Intensity chart may not be available for selection.

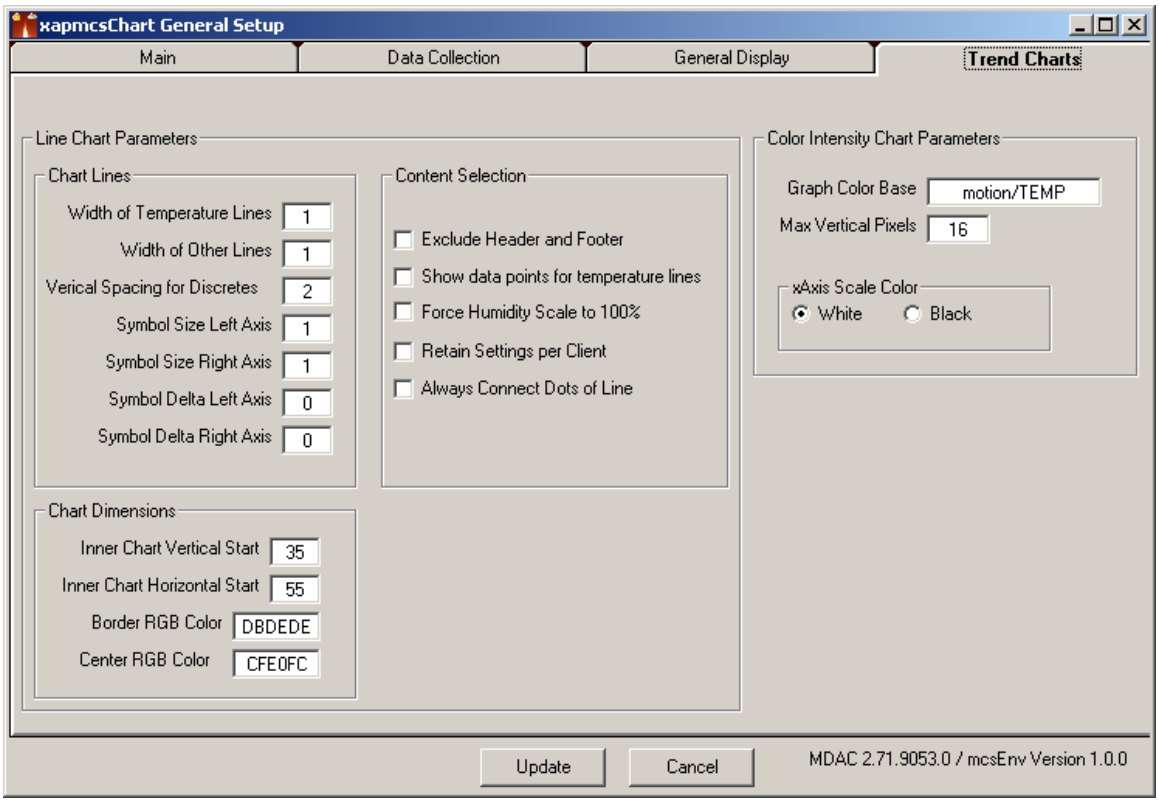


Figure 9 xapmcsChart Trend Chart Setup Tab

2.4 Browser Operations

2.4.1 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. xapmcsChart 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" tray icon or from the "Edit" option on a Trend page. When xapmcsChart 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 10, 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.

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. 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.

2.4.1.1 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.

2.4.1.2 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 1 - Graph Type Selection Nomenclature):

Table 1 - 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
Control	Shows composite continuous sensors, control discretes, and cumulative ON time for the control discretes
All	All elements displayed

xapmcsChart will automatically generate the X and Y asis of the chart based upon the data range being displayed. In some cases it may be desirable to use a fixed Y axis scaling. In that case the left Y axis and right Y axis scaling can be specfied with the text boxes in the setup.

Each sensor available for display is listed on the rows below the overall setup The sensors are obtained from the contents of the databse. This database is queried upon startup to identify all the discrete tables and fields in the continuous table. If the database schema has changed then the Query Database button can be used to refresh xapmcsChart without restarting it to get the current list of items available for charting.

Each item from the database is presented on a row. If the line is of no interest then it can be hidden from future viewing by using the Hide checkbox. If it is to be included as one of the sensors in this group then the Show checkbox is used. If is to be included on the chart when first drawn then the Draw checkbox is used. If Draw is not checked then it can be selected from the Trend Chart page without going back to the Group setup.

xapmcsChart will select colors automatically to distinguish sensors. If the RGB column is not blank then an RGB value that represents the desired fixed color can be entered. It is inn the format of RRGGBB where RR , GG and BB are hex values. 000000 is black and FFFFFF is white.

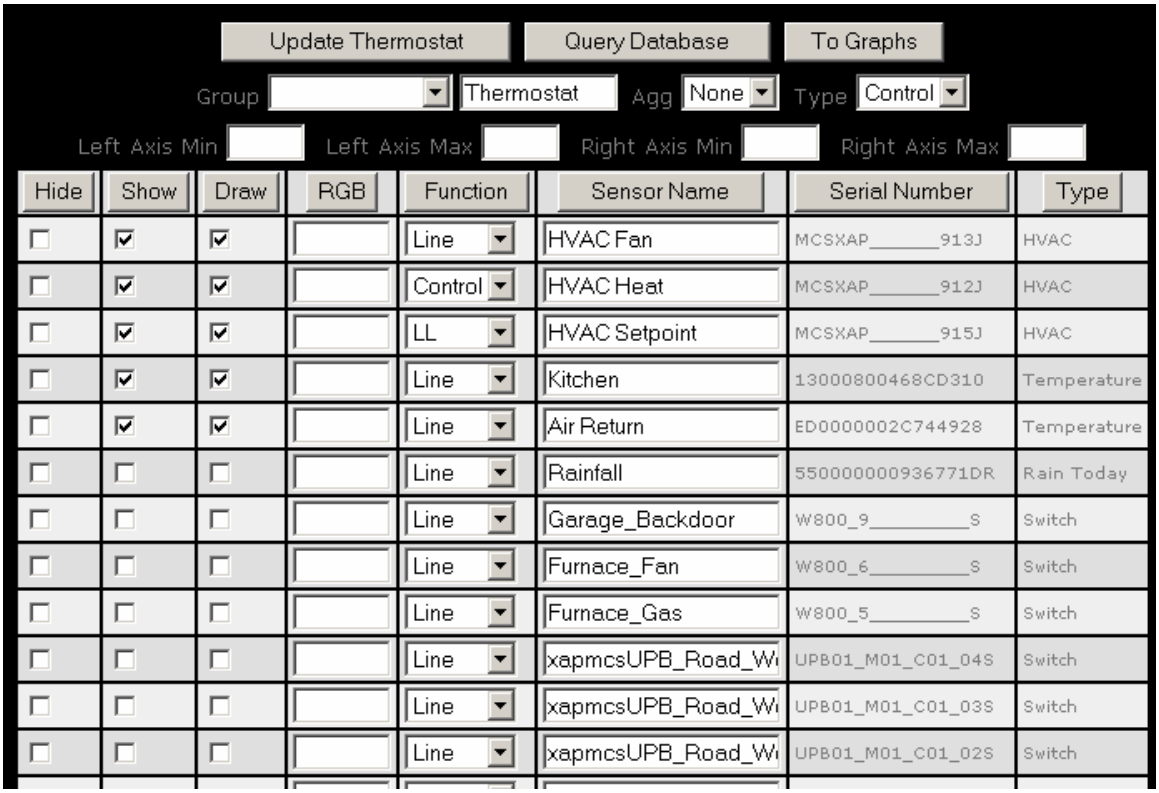
The function pulldown will primarily be a set to Line for standard trend charts. The Control, UL, and LL options are used to support the Control Trend chart. The Control graph type is a special chart that will result in a display similar to Figure 11. Their use will be illustrated based upon the Figure 11 image which is a chart of HVAC operation that includes a setpoint temperatue range, a discrete control for the heat source, and a room tempeature that is being controlled. This chart shows 3 months of the heating season where the thermostat setpoint was normally 58, but raised or lowered on occasion. It shows seven times when the furnace was turned on during that period and the cumulative ON time was 3300 minutes.

The orange line is the furnace ON/OFF control and is selected as the “Control” for the chart’s function. This means that the cumulative time ON and the actual ON/OFF controls will be displayed. The cumulative time will be labeled on the right Y axis and shown as a semitransparent area fill of the same color as the Control line color.

The setup is the green area of the chart. The setpoint is charted as a range of values specfied by the sensors identied as the UL (upper limit) and LL (lower limit) functions. If only one is specified then a delta of 1 will be used for the other. The UL and LL lines are solid and the area between the two is semi-transparent.

The red line on this chart is identified as a standard Line function. As many Line functions can be included on the chart as is desired. Only one UL, LL, Control set can be included on the chart.

The Sensor Name column will initially populate based upon the database field or table name. It can be changed here to reflect the desired label for the sensor on the chart.



Hide	Show	Draw	RGB	Function	Sensor Name	Serial Number	Type
☐	☑	☑		Line	HVAC Fan	MCSXAP_____913J	HVAC
☐	☑	☑		Control	HVAC Heat	MCSXAP_____912J	HVAC
☐	☑	☑		LL	HVAC Setpoint	MCSXAP_____915J	HVAC
☐	☑	☑		Line	Kitchen	13000800468CD310	Temperature
☐	☑	☑		Line	Air Return	ED0000002C744928	Temperature
☐	☐	☐		Line	Rainfall	550000000936771DR	Rain Today
☐	☐	☐		Line	Garage_Backdoor	W800_9_____S	Switch
☐	☐	☐		Line	Furnace_Fan	W800_6_____S	Switch
☐	☐	☐		Line	Furnace_Gas	W800_5_____S	Switch
☐	☐	☐		Line	xapmcsUPB_Road_W	UPB01_M01_C01_04S	Switch
☐	☐	☐		Line	xapmcsUPB_Road_W	UPB01_M01_C01_03S	Switch
☐	☐	☐		Line	xapmcsUPB_Road_W	UPB01_M01_C01_02S	Switch

Figure 10 Group Setup

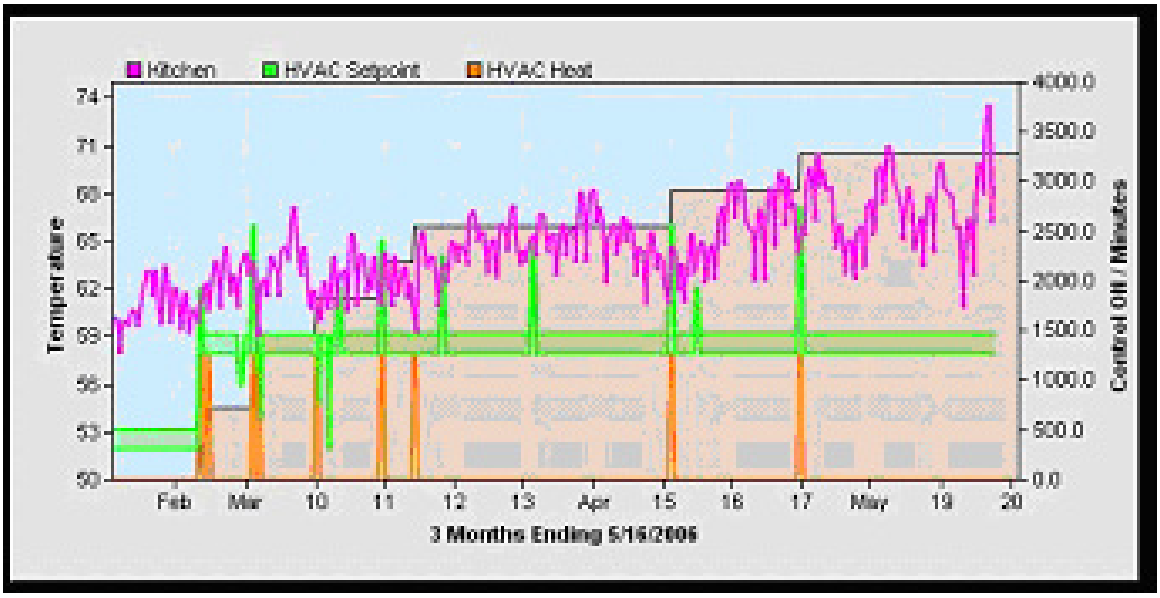


Figure 11 Control Trend Chart

Specific trend charts can be selected from the tray icon after the group has been setup or they can be selected directly from the group setup with the “To Graphs” button. A typical Trend page is shown in Figure 12.

The top of the page contains user selections that specify the nature of what is to be drawn. The table shows the statistics for the sensors selected for the group and when the table has a checkbox then the chart at the bottom will include that sensor. It is sometimes desirable to use the checkbox to unclutter and look at specific relatiionships.

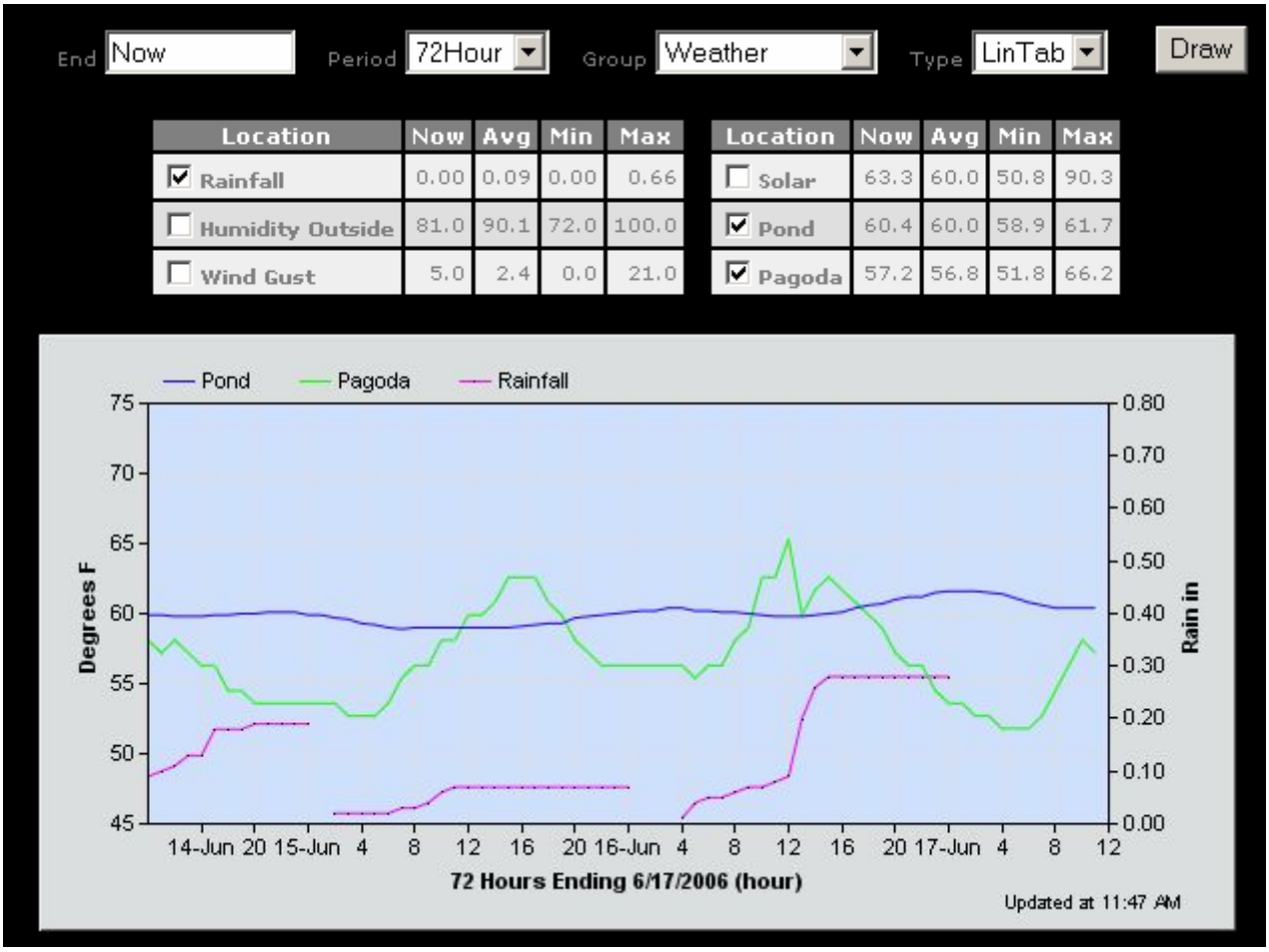


Figure 12 Typical Trend Chart

2.5 xAPmcsTemp0x

The bottom of the xapmcsTemp0x browser display contains the settings to configure the interface with the Temp05/Temp08 as shown in Figure 13.

Serial communication can be to a direct COM port or to an IP device that supports serial tunneling. When directly connected a port number is used. When connected to an IP device then the full IP address including the port is used such as is shown in Figure 13. Sample Interval and WDT string are not needed for basic setup.

The Temp05 was developed with version 4 and version 5 EPROM. xapmcsTemp0x will support either as well as the Temp08. Similarly the wind instrument was originally designed using switches and later versions use the A/D device for wind direction. The Temp05/08 will support either.

The Relay05 is a companion to the Temp05. Some timing considerations are needed when talking with it. 250 milliseconds delay between commands appears to be a reliable delay.

The Units of Measure section describes how the Temp05 has been configured and if xapmcsTemp0x will change the unit of measure received from the Temp05/08. The Temp05/08 returns a period decimal. If local settings use another character such as the comma then this substitution can be specified in this area.

The Formatting is for Browser presentation. The significant digits relate to the Temperature display.

The Temp05 has a wrapover problem with some version when delivering humidity so that it is possible to have values of 00 for 100% 02 for 102%. The setup provisions in this section deal with this problem.

The barometric pressure slow and fast rates are used to determine the barometric rate arrow direction. 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 than a current one

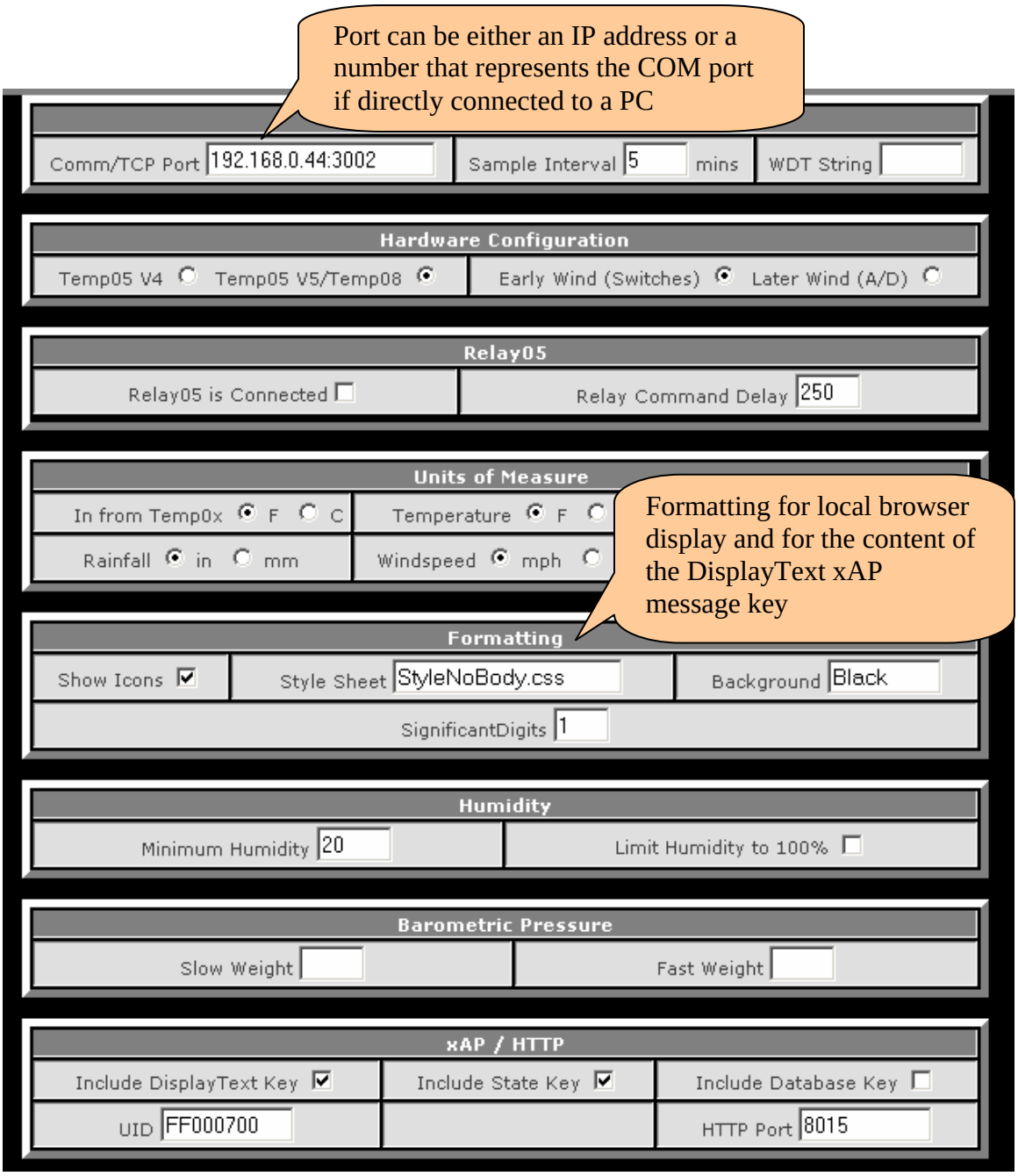


Figure 13 Temp05/08 Interface Setup

After communications are established with the Temp05/08 the software will capture received sensor readings. Each serial number and type will contain an entry. Note that faulty data received will also be captured as is shown in Figure 14. Faulty messages can be identified with a Serial number that does not conform to the 16 + 1 convention. There are identified to be ignored with a check in the "X" column.

Sensors that are to be communicated in xAP messages are given a name. Each time the value delivered by the Temp05/08 changes an xAPBSC.event message will be generated

with the new value. The state, text, and displaytext message keys are used such as is shown in Figure 15 .

xapmcsTemp0x will also accept xapBSC.Query schema requests to report the current status of individual or all sensors. In this case the response with be xAPBSC.info schema with the same message key format.

The state key will contain ON/OFF status for discrete (DS2405/DS2406) sensors and relays. For all others the state key conveys no meaning.

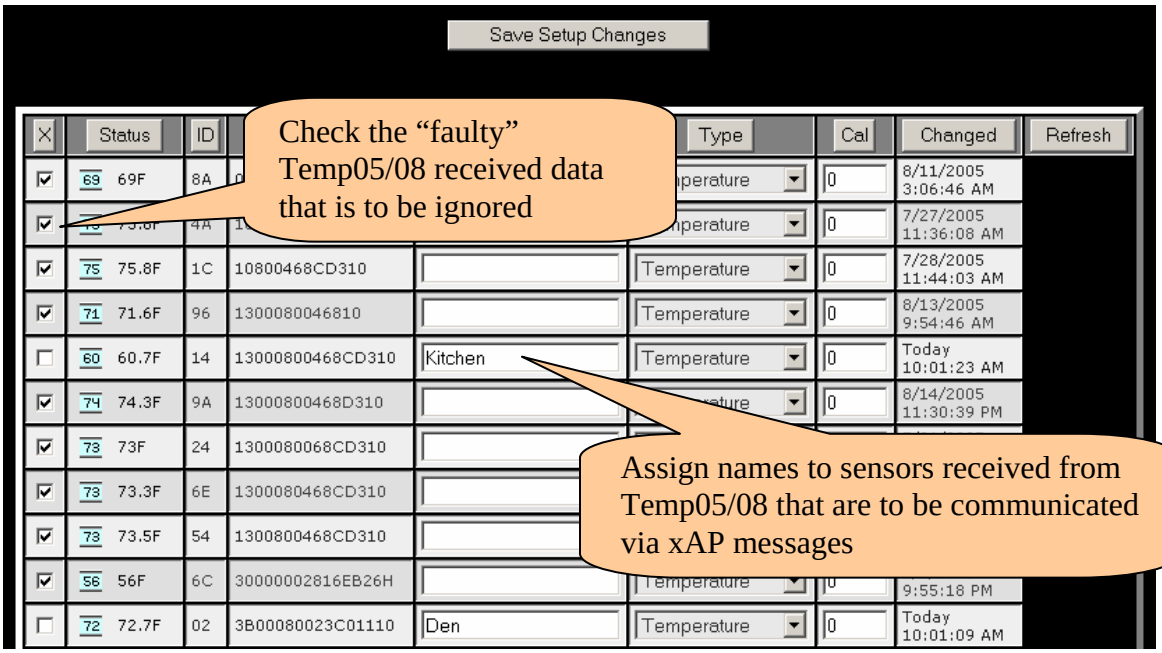


Figure 14 Sensors Received from Temp05/08

```
xap-header
{
    v=12
    hop=1
    uid=FF000704
    class=xAPBSC.event
    source=mcs.Temp0X.MCS6:xapmcsTemp0x_Den.3B00080023C01110.Temperature
}
input.state.1
{
    state=OFF
    displaytext=<table><td><img alt='Temperature'
src='/images/temperatures/73.gif' height='16' width='16'><img alt=' '
src='/images/sensors/blank3.gif'></td><td valign='middle'
align='left'>73.2F</td></table>
    text=73.2
}
```

Figure 15 xAP Event Message

2.6 xAPmcs1Wire

The setup of xapmcs1wire is sililar to xapmcsTemp0x. Its configuration options are shown in Figure 16.

The serial connection of the DS9490 or DS9097 is entered in the Comm Ports(s) box with a prefix of COM or USB followed by the port number. Multiple units are indicated with comma delimiters. The use of < and > around the port indicates that it is the default port that was defined when the 1-wire drivers were installed.

Sampling for data on the 1-wire bus is done at one or two rates. The basic sample interval is entered in terms of seconds. One is entered for each adapter installed with a comma delimiter. If a higher rate of polling is desired for switches then it can be entered. There are physical limits on the switch rate that appear to be an interval of about 300 milliseconds.

When polling switches advantage can be taken of the alarming feature of the DS2406 family of switches. If all switches produce alarms when activated then a faster sample can be done. This is indiated as part of the hardware configuration. The other configuration item in this section is for the bias on the North direction for the wind instrument. One of 16 positions on the compass can be selected to indicate the mounting location of the instrument.

Calibrations are available for various types of sensors. The defaults are 2 counts per mile per hour for wind speed, 1 count per 0.01 inch of rainfall, 1 count per gallon of water flow, and 1 count per watt of energy use. If the unerlying hardware has different scaling then these are entered in this area.

The barometric adjustments are used to support the AAG air pressure sensor. This sensor has a very inefficient interface for a general 1-wire network and will take about 30 seconds to deliver a sample.

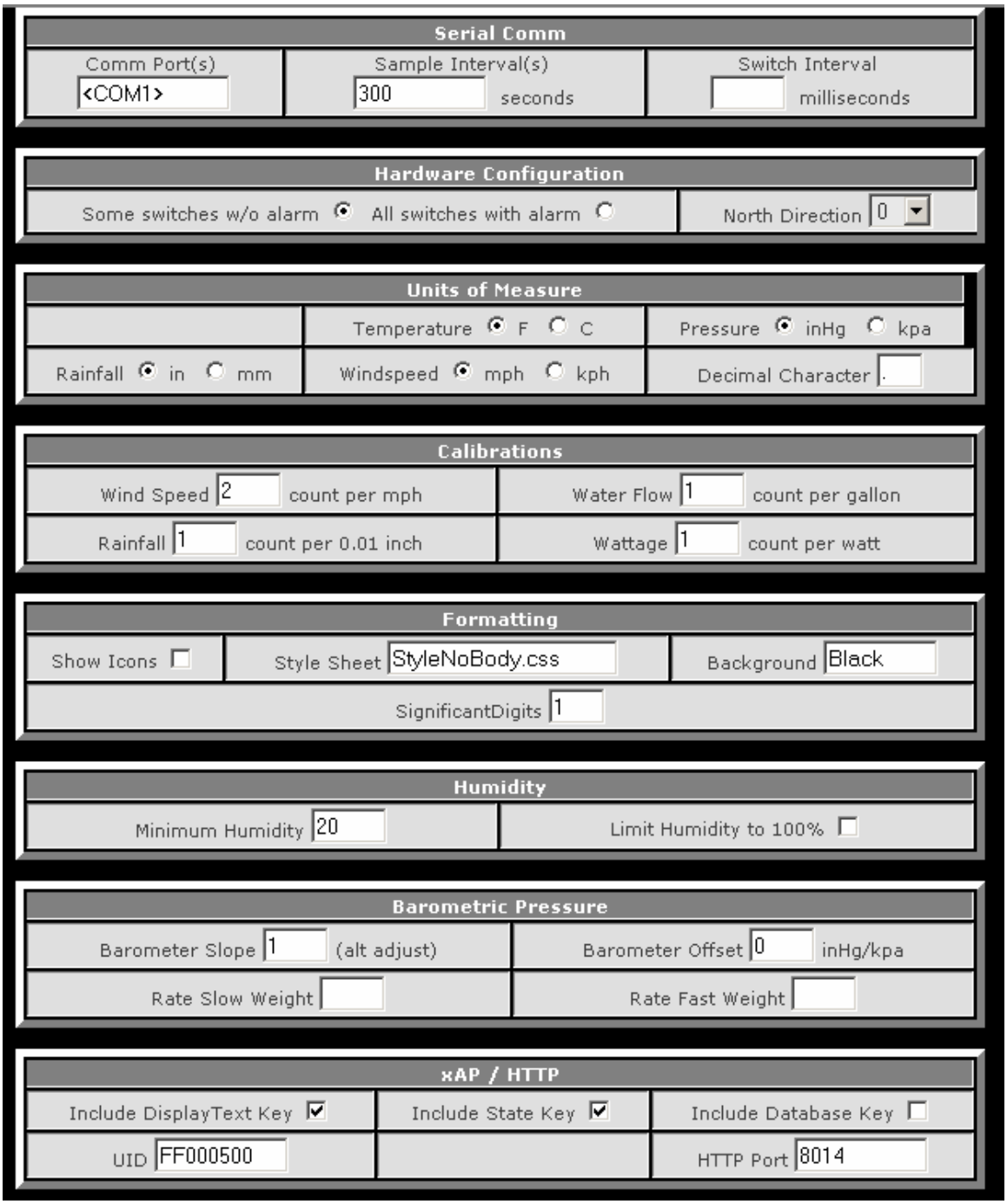


Figure 16 xapmcs1Wire Setup Options

The top part of the xapmcs1wire display will contain one row for each sensor reading. The “X” column is checked if the sensor should not be included in xAP messages that are sent when the value of the sensor changes.

The Name column is used to enter the name of the sensor that will be part of the subaddress of the xapbsc message.

The Type field is used to indicate how the sensor is being used. It will also form part of the message subaddress

The Cal field is used to bias the value for purpose of calibration. For some sensors the calibration is a multiplier rather than a bias.

The Res field is to toggle the resolution of the temperature sensors. When checked it will deliver minimum resolution to achive the fastest conversion times. Otherwise the maximum resolution supported by the device will be used.

Relay and Text devices provide a control column where the valve can be changed from the browser user interface. The values can also be changed using xapbxc.cmd schema.

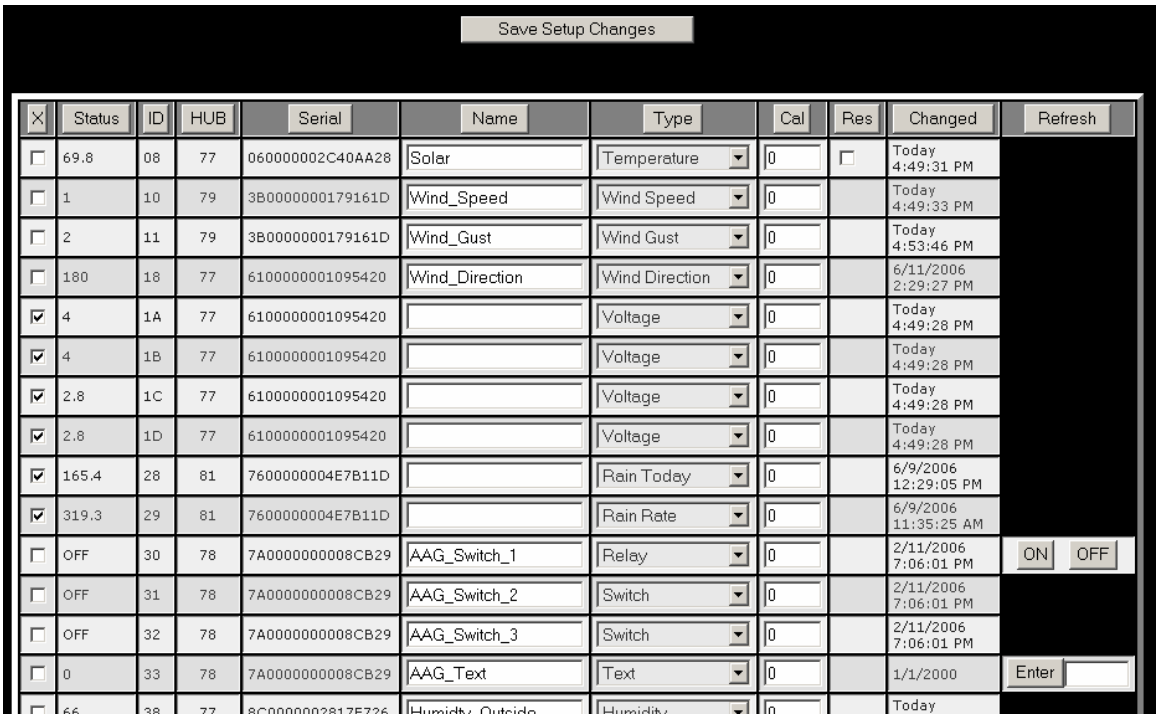


Figure 17 xapmcs1Wire device selections

2.7 Homeseer Interface

2.7.1 mcsXap Setup

Setup of Homeseer to collect Temp05/Temp08 using the xAP interface. A similar setup is used for 1-Wire/DS9097U, 1Wire-K3145, or any other interface that uses the xAPBSC messages schema.

Figure 18 shows the setting to be able to view the messages received from external sources such as xapmcsTemp0x.

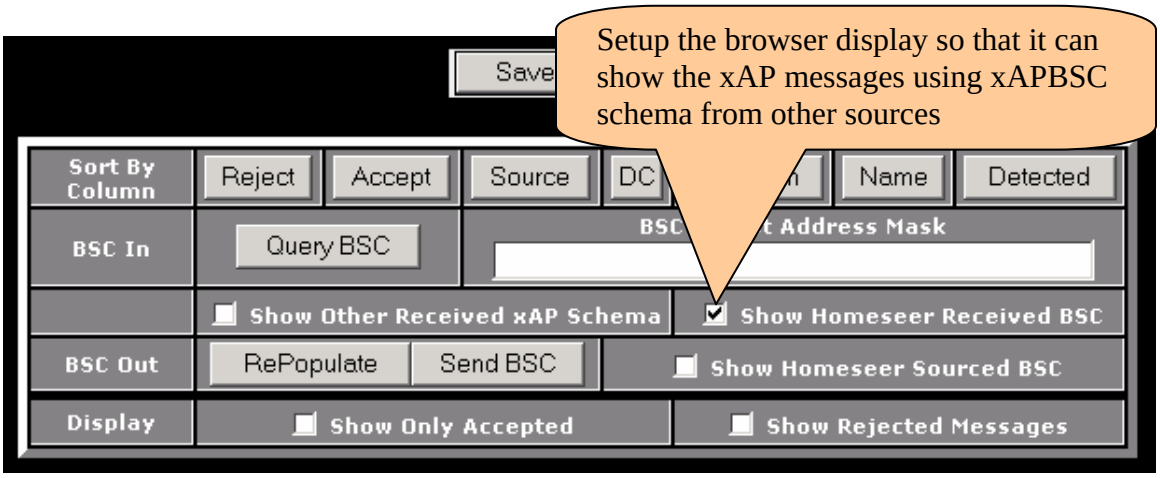


Figure 18 mcsXap Browser Message Selection

After xapmcsTemp0x has delivered a set of data via xAP, mcsXap will have recognized the xAPBSC schema messages and populated its internal database of candidate messages of interest. Depending upon the number of message sources there can be many messages of interest. The sort buttons in mcsXap can be used to organize these into easily workable groups. In this case a sort by messages source will put all the messages from xapmcsTemp0x together.

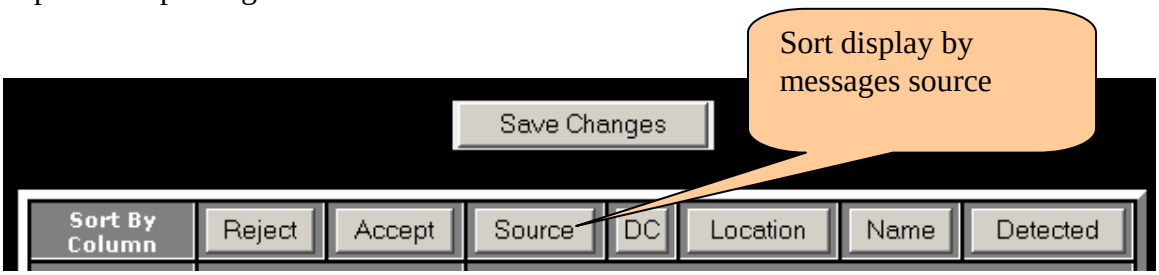


Figure 19 Message Display Sort Controls

Not all xAP messages will be of interest to Homeseer. The body of the browser view allows the user the abilty to Accept a message, Reject a message, or simply leave it for later decision. When Rejected, by placing a check in the “R” column, the message will not show in the list of messages unless the “Show Rejected Messages” checkbox is also checked at the top of the mcsXap browser display. It is possible to Reject a message then at some later time change your mind and then Accept it.

A message is Accepted by putting a check in the “A” column. After the “Save Changes” button is clicked the newly Accepted messages will be mapped into Homeseer devices. A Device Code will be assigned and default Location and Name properties will be assigned. These can be edited in the text box if the default nomenclature is not desired. Figure 20 shows the message selections.

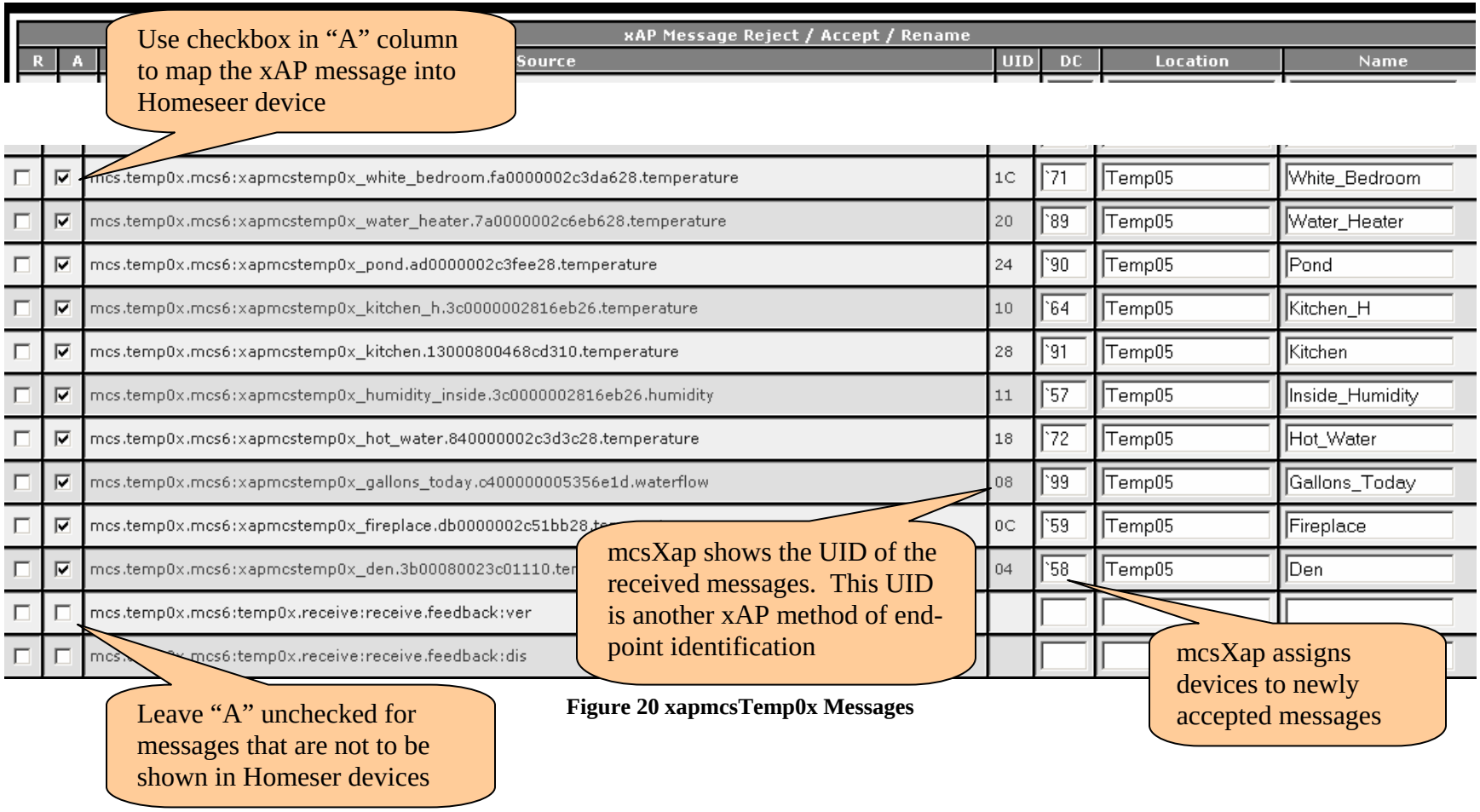


Figure 20 xapmcsTemp0x Messages

mcsXap is a generalized interface to Homeseer that has the essential purpose of exposing the Homeseer internals to the xAP network and accepting xAP network data into Homeseer. These general setup options are availabe from a Windows GUI or Browser with the Browser version shown in Figure 21.

Homeseer supports a single X10 interface. mcsXap can be this interface and it will direct X10 control over the xAP LAN. It will also allow a standard Homeseeer plugin to be used as well to give the effect of two X10 interfaces via Homeseer.

If mcsXap is to act as an X10 interface then the X10 checkbox is checked. If it is to also going to allow use of a standard X10 plugin then the name of the plugin is entered in the text box. This passthrough can also apply a filter so only certain house codes are routed through the passthrough plugin. X10 xAP nodes will typically allow similar filtering to restrict house codes to certain xAP X10 nodes.

The same approach is used for IR where Homeseer supports only one IR interface, but via xAP this can be extended to the xAP and a native IR plugin.

Homeseer supports various callbacks to provide notification of events. These can be selective enabled so that when the event occurs mcsXap will deliver a xAP message to notify the LAN of the event. Homeseer.Event schema is used for this notification.

While all xAP schema can be used with mcsXap to map into Homeseer devices, the primary schema used are xapbsc and xap-x10. There is also a non-standard SetIO schema that is being phased out. By using the checkbox in the schema selection the raw messages are interpreted to better map into the Homeseer internal architecure. In the case of xapbsc the mapping is:

xapBSC	**Homeseer**
State	DeviceStatus
Level / Text	DeviceValue
DisplayText	DeviceString

In the case of xap-x10 the mapping is:

Xap-x10	**Homeseer**
Command / Event	DeviceStatus
Brightness / Count	DeviceValue

Device changes within Homeseer for the X10 range of house codes are communicated by mcsXap using the xap-x10 schema. Changes for the plugin range of house codes are communicated by mcsXap using the xapbsc schema.

mcsXap can act as a proxy for Homeseer audio. It can be setup to remotely preform VR and it can be configured to put voice output on the LAN using xap.Voice schema. When

the Speak locally button is checked then it will also allow Homeseer to use its native audio output device.

mcsXap provide support for Homeseer event triggers that occur when a specific xAP message pattern is received or event actions that result in the delivery of xAP messages when the event occurs. When these checkboxes are not checked then Homeseer will not show these xAP entensions as part of its event setup.

There is checkbox for Send Writelog in the Miscellaneous Options section. When checked it sends the received Homeseer.Log schema messages to the Homeseer Log. This is a mechanism to use Homeseer to provide a centralized logging capabiltiy. There is also xapmcsWritelog which acts as a central log maintenance for all xAP nodes that use this schema. This application allows scrolling of current log messages and filtered selection of historical log messages from its database. A view of its scrolling window is shown in Figure 22.

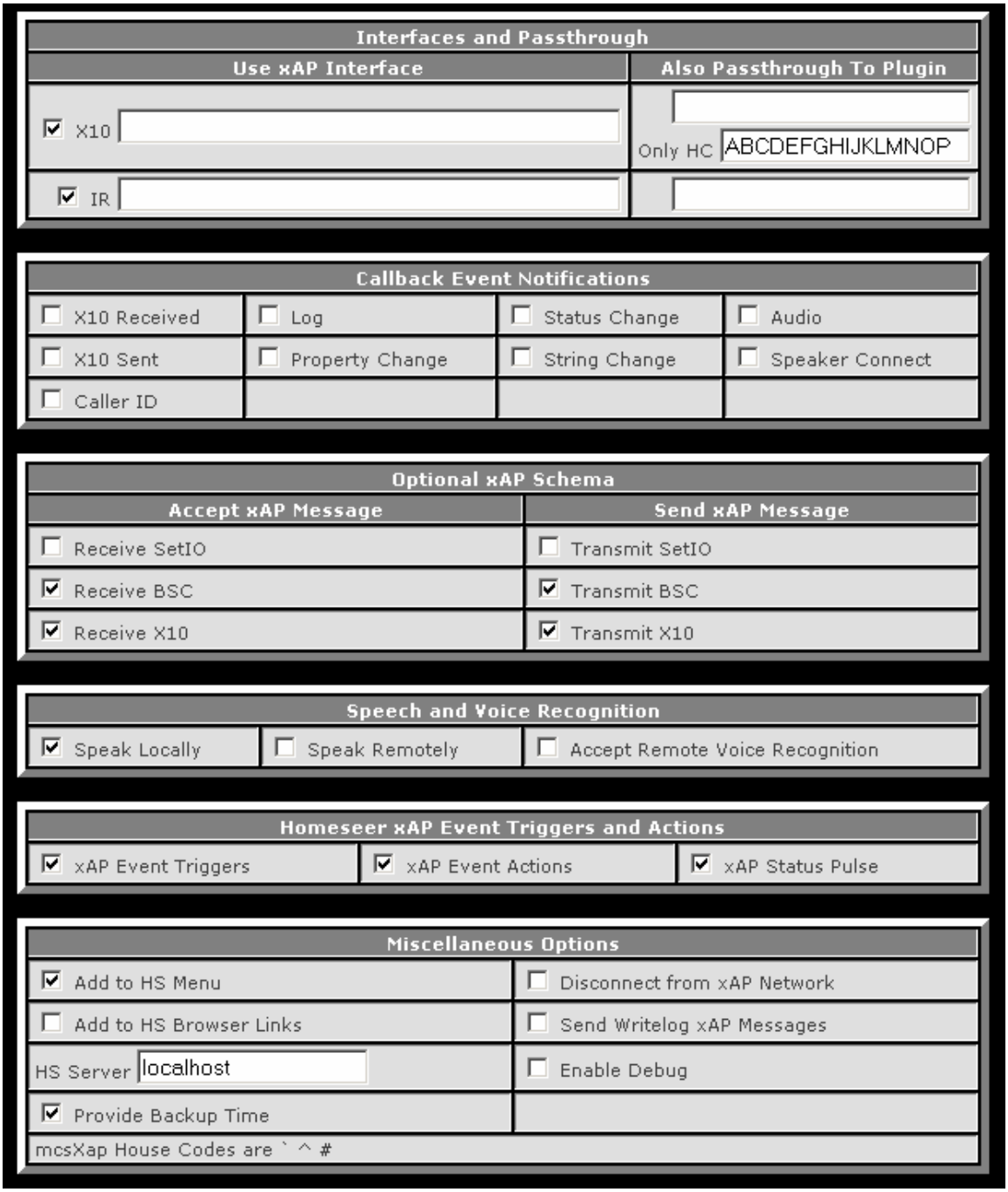


Figure 21 mcsXap setup options

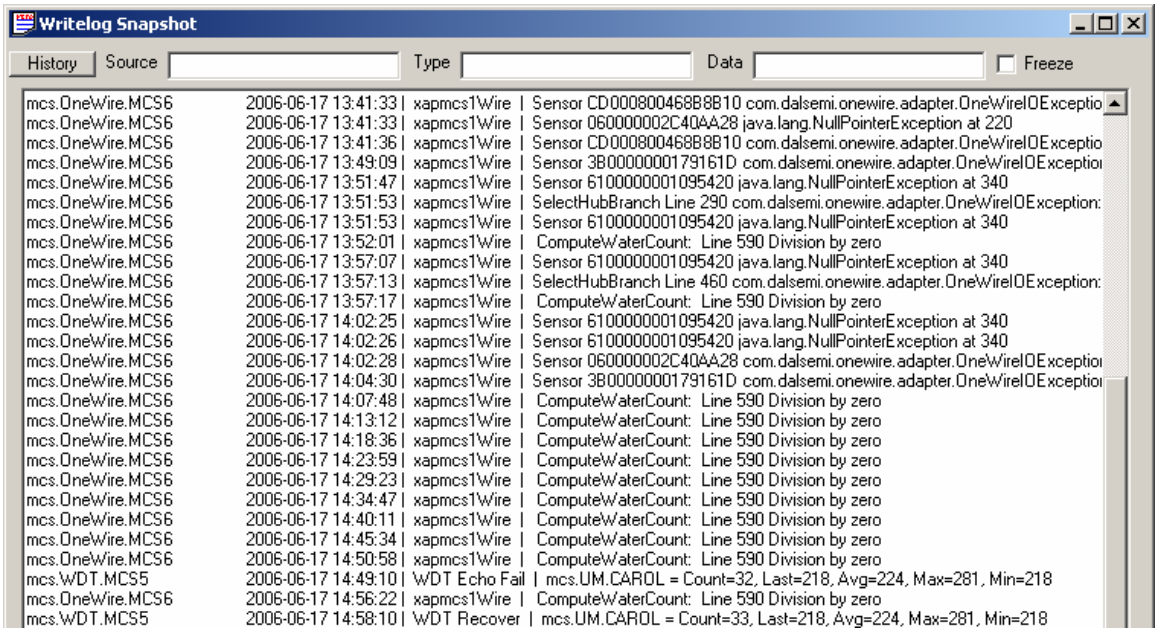


Figure 22 xapmcsWritelog View

2.7.2 mcsXap Control of Homeseer via xAP

The setup described how to map xAP messeages into Homeseer devices. Homeseer can also be controlled by xAP messages using the Homeseer.Command schema with the section also identified as Homeseer.Command. The commands supports are the set of scripting methods provided by Homeseer except those that use objects as parameters. The body of message will contain the key "command" to identify the scripting method. For example, to write to the Homeseer log the key value will be Writelog (i.e. command=writelog). The parameters are passed using the DataX key where X is the parameter number. To extend the Writelog example the body will be:

Command= Writelog
Data1=Error
Data2=Subscript out of bounds on line 100

2.7.3 mcsXap Scripting

For a scripting intererace mcsXap supports the following methods:

```
Public Sub RegisterXapCallback(sFile As String, sProcedure As String)
Public Sub UnRegisterXapCallback(sFile As String, sProcedure As String)
Public Sub onMessage()
Public Sub HSEvent(parms As Variant)
Public Property Get LastVoiceCommand() As String
Public Property Get LastVoiceEvent() As String
Public Property Let LastVoiceCommand(s As String)
Public Property Let LastVoiceEvent(s As String)
Public Property Get LastCommandSelected() As String
Public Function mcsXapAsp(RequestObject As Object, ResponseObject As
Object) As String
```

```
Public Sub SendTCP(sIP As String, iPort As Long, sData As String)
Public Sub SendXapMessage(sTarget As String, sClass As String, sSection
As String, sData As String, Optional sSubaddress As String, Optional
sUIDIn As String)
```

Of particular interest is SendXapMessage that allows a script to send xAP messages and SendTCP which makes a TCP connection and sends data over that connection.

2.7.4 mcsTemperature Setup

Devices are added to mcsTemperature from its setup page on the Analog, Discrete, and User/Misc tabs. The devices created by mcsXap will be identified by Device Code and that device code entered as the Virtual Device on the setup tab. A database field name is also provided on the tab so mcsTemperature will store the received data to a database and then be able to retrieve the information for charting

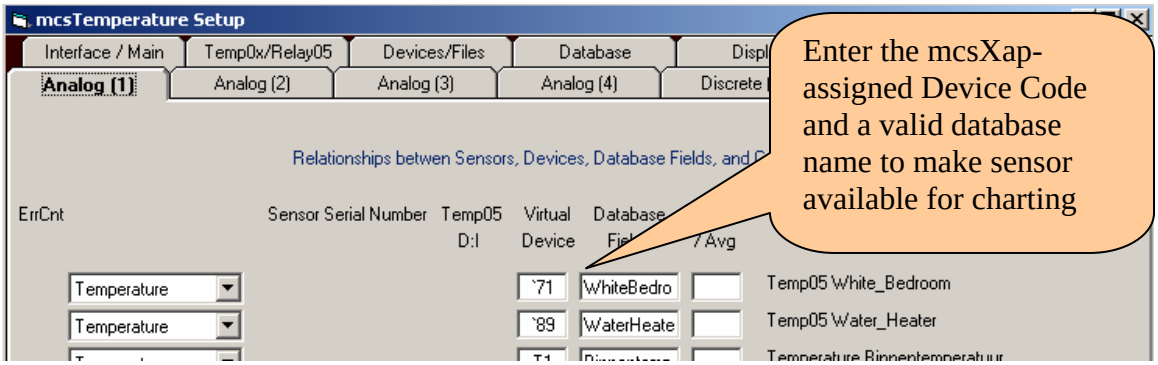


Figure 23 mcsTemperature Setup Page

After mcsTemperature has been informed of the device then it can be used on the Trend Group

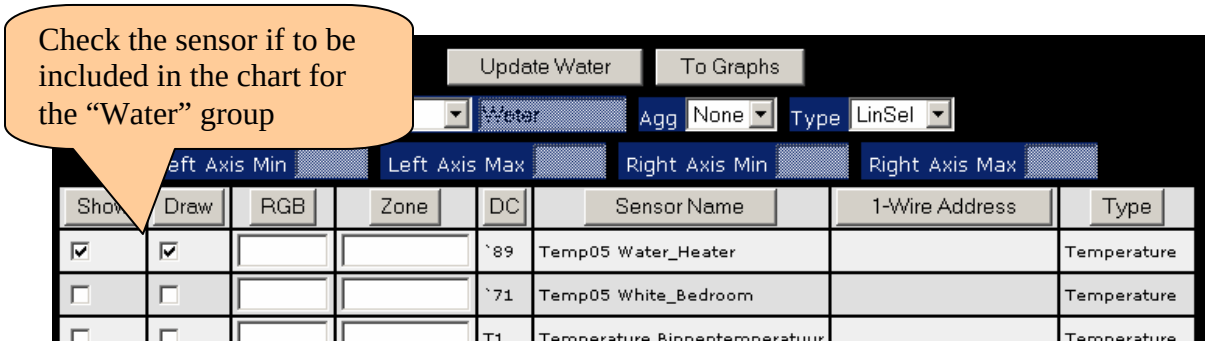


Figure 24 Trend Group Definition for Charting