AN-319

Configuring Temperature and Humidity Sensors in Protege GX

Application Note

Last Published: 12-Jan-24 3:49 PM

Contents

Introduction

The Protege Temperature and Humidity Sensor (PRT-ATH1) can extend your Protege GX system by providing temperature, humidity and dew point readings. These can be used for a range of applications, from monitoring sensitive equipment to providing input for integrated HVAC systems.

This application note outlines how to program the temperature and humidity sensor in Protege GX.

The PRT-ATH1 is a legacy product (end-of-life: July 2022) and is not available for order. As an alternative for temperature and humidity sensing, consider third-party integrations such as Modbus (AN-353), BACnet (AN-318) or C-Bus (AN-289).

For information on installing the unit and connecting it to the Protege system, see the Protege Temperature and Humidity Sensor Installation Manual.

Configuring the Analog Expander

Connect the sensor module to the Protege RS-485 module network according to the instructions provided in the installation manual. The module can then be addressed and programmed as an analog expander in Protege GX.

Addressing the PRT-ATH1

The sensor module must be addressed using the DIP switch on the module. Ensure that switches **7 and 8** are set to **OFF** so that the device is running in Protege mode. Then set the address according to the instructions in the installation manual.

When the sensor is connected to a Protege GX controller, it must be given an address from 1-32. Ensure that the address is unique, i.e. not shared with any other analog expander connected to the same controller.

Creating the Analog Expander

Once the module has been addressed, an analog expander record with the same address must be created.

1. Navigate to **Expanders | Analog Expanders** and select the **Controller** that the PRT-ATH1 is connected to.
2. Click **Add** to create a new analog expander and assign a descriptive name (e.g. Server Room Temp/Humidity Sensor).
3. Set the **Expander Personality** to PRT-ATH1.
4. Set the **Physical Address** to the address of the sensor module configured above.
5. Click **Save**.
6. The **Configure Module** window indicates that the software will create the four outputs and two trouble inputs required for this device.
   You can enable or disable **Prepend Controller name to added records**, depending on the naming requirements for your site.

Configuring the Input Channels

Now you can configure each analog input channel that is monitored by the sensor.

The channels available on the PRT-ATH1 are:

Channel	Sensor Type	Scaling
1	Internal Temperature	Input Value = (Temperature (°C) x 100) + 4000
2	Humidity	Input Value = Relative Humidity x 100
3	Dew Point	Input Value = (Temperature (°C) x 100) + 4000
4	External Temperature	Input Value = (Temperature (°C) x 100) + 4000

The data from each channel is received as an integer, based on the scaling equation above.
A temperature of -40°C (-40°F) corresponds to an input value of 0.

To enable a channel and record the input data with a data value:

1. Open the **Channel 1-4** tab for the channel you are configuring.
2. Check the **Enable Channel** option.
3. Configure how the channel will send input values to the controller. There are two methods available:

- By default, the channel sends data to the controller at fixed intervals. This ensures that the linked data value is updated at a set frequency, regardless of whether the input value has changed.

  The **Channel 1-4 Update Time** defines the frequency of updates, from every 5 seconds to every 24 hours.
- In diff mode, the channel only sends data to the controller when the input value has changed by a specified amount (diff) compared to the previous update.

  To use this method, enable the **Send ADC Value in Diff Mode** option.

  The **Channel 1-4 Diff Comparison Value** determines the maximum amount the input value can change before the data value is updated. For example, if this value is set to 100 (1°C) and the data value is currently 5000 (10°C), an input value of 5050 (10.5°C) will not trigger the data value to update, but an input value of 5100 (11°C) will update the data value.

4. Create a data value that will be used to record the input values in Protege GX:
   - Click the **ellipsis [...]** button beside **Channel 1-4 Data Value** to open the data values programming in a breakout window (or navigate to **Automation | Data Values**).
   - **Add** a new data value with a descriptive name (e.g. AE1.1 Server Room Internal Temperature).
   - No further configuration is required. Click **Save** and close the breakout window.
   - In the analog expander programming, set the **Channel 1-4 Data Value** to the record you just created.
5. If required, you can enable the **Log Channel Data** option to log an event each time the channel updates the data value. This is useful for initial calibration and troubleshooting, but should not be left enabled during normal operation, as it will generate a large number of events.
6. Repeat the above for any other channels that will be used.
7. Click **Save**.
8. Right click on the expander record and click **Update Module**.

Outputs and Trouble Inputs

When the analog expander was added, the software automatically created the outputs and trouble inputs available on the PRT-ATH1.

The outputs created in **Programming | Outputs** are:

- AExxx Output 1 (relay output)
- AExxx Output 2 (relay output)
- AExxx Output 3 (square LED output)
- AExxx Output 4 (triangle LED output)

You should give these outputs useful names that describe their function in the system.

The trouble inputs created in **Programming | Trouble Inputs** are:

- AExxx Power Supply Voltage Low
- AExxx Module Communication Fault

These should be assigned to a system area, with an input type such as Trouble Silent so that any faults can be reported to a monitoring station.

Viewing the Sensor Data

To view the sensor data in Protege GX, the data value for each channel must be assigned to a variable. Then the variables can be displayed on a status page or floor plan.

Creating the Variables

1. Navigate to **Automation | Variables**.
2. Create a new variable for one of the input channels with a relevant name (e.g. Server Room Internal Temperature).
3. Set the **Scale** and **Offset** values according to the table below:

Channel	Sensor Type	Scale	Offset
1	Internal Temperature	0.01 (Celsius) / 0.018 (Fahrenheit)	-40 (Celsius) / 40 (Fahrenheit)
2	Humidity	0.01	0
3	Dew Point	0.01 (Celsius) / 0.018 (Fahrenheit)	-40 (Celsius) / 40 (Fahrenheit)
4	External Temperature	0.01 (Celsius) / 0.018 (Fahrenheit)	-40 (Celsius) / 40 (Fahrenheit)

   This will allow you to view the temperature in either Celsius or Fahrenheit to two decimal places, and relative humidity as a percentage to two decimal places.
4. If you plan to view the variable as a linear gauge on a floor plan (see below), you must set the **Minimum Value** and **Maximum Value** for the gauge. For example, you might set a gauge to display the humidity on a scale from 0-100.

   These options only affect the display of the variable, not the actual data that can be recorded by the data value.
5. Select the required **Data Value**.
6. Disable the **Support Manual Commands** option, as input values should not be changed by the operator.
7. Click **Save**.
8. Repeat for the other analog channels as required.

Viewing on a Floor Plan

You can include any number of variables on a floor plan, allowing for easy viewing.

1. Navigate to **Monitoring | Setup | Floor Plan Editor**. Either select or create a floor plan to display the variables.
2. Expand the **Devices** section. Click **Add**.
3. In the popup window, set the **Device Type** to Variable.
4. Set the **Device Style** to either 7 Segment Display or Linear Gauge.

   For the linear gauge device style, the **Minimum / Maximum Value** must be set in the variable programming above.
5. Drag and drop each variable onto the floor plan.
6. Close the popup window. Now you can move and resize the variable displays for the desired configuration.

Viewing on a Status Page

Variables can be viewed on a status page via a status list, as follows:

1. Navigate to **Monitoring | Setup | Status Lists** and click **Add** to create a new status list.
2. In the **Devices** section, click **Add** to select devices.
3. Set the **Device Type** to Variable.
4. Check the boxes beside the desired variables, then click **OK** to include them in the status list.
5. Click **Save**.
6. Navigate to **Monitoring | Setup | Status Page Editor**. Either select or create a status page to display the variables.
7. Select a tile and set the **Type** to Status List.
8. Set the **Record** to the status list created above.
9. Click **Save**.

Using the Sensor Data

Analog input data such as temperature and humidity readings can have a wide range of uses in the Protege GX system.

The following programmable functions use input data values:

- **Value Compare**: Compares the input data with a set point value, and activates an output or output group when the input value goes above or below the set point.

  The function can use hysteresis to create a 'band' of acceptable values where no outputs will be activated, or prevent the output from being activated until the input value has remained above/below the set point for a defined length of time.

  For example, this might be used to activate a warning output when the temperature rises above a certain level, informing supervisors that equipment or personnel are at risk.
- **Average**: Calculates the average of up to eight data values and writes it to an output data value. This is useful for taking the average of temperature and humidity readings in several different locations.
- **Variable Output Compare**: Compares an input data value to a series of set points. As the input value reaches each set point, an output data value is updated to a known quantity.

  This could be used to create a simplified scale for temperature or humidity. For example, an input range of 0-15°C might be mapped to an output value of 1 ('Cool'), 15-20°C to 2 ('Normal'), 20-25°C to 3 ('Hot') and so on.

In addition, the **Roof Top Heat Pack** and **Floor Temping** programmable functions specifically use temperature and humidity readings to monitor the current state of the zone or building. This information helps the system decide whether heating, cooling or dehumidification is required.

For more information on programming and using these programmable functions, see the Protege GX Operator Manual or application help.

Programming Example: Temperature Warnings

In this programming example, we will use the value compare programmable function to activate a warning output when the temperature in the server room gets too high or too low. The server room should ideally be kept at 16-20°C.

For this scenario we will use the data value AE1.1 Server Room Internal Temperature, which is assigned to channel 1 of the PRT-ATH1. It is assumed that there are two outputs available for use as Server Room Over Temp Warning and Server Room Under Temp Warning. These could be the LED indicators on the PRT-ATH1.

Creating the Set Point Data Value

To begin, we need a set point data value that represents the median acceptable temperature for the server room (18°C).

1. Navigate to **Automation | Data Values** and create a new data value with the name Server Room Set Point (18C).
2. Enable **Preset Power Up** and **Preset Value**. These options ensure that the data value is set to the same value when the controller first powers up, and each time programming is downloaded.
3. Enter the **Preset Value**. This is (18 x 100) + 4000 = 5800, based on the PRT-ATH1's temperature scaling (see page 5).
4. Click **Save**.

Creating the Hysteresis Data Values

Two more set point data values are required to control the hysteresis operation of the programmable function.

First, the hysteresis data value indicates the range of acceptable temperatures before the warning outputs are activated. This should be 2°C to either side of the set point, giving a total temperature range of 16-20°C.

1. Add a new data value with the name Server Room Hysteresis Temp (2C).
2. Enable **Preset Power Up** and **Preset Value**.
3. Enter the **Preset Value**. This should be (2 x 100) + 4000 = 4200.
4. Click **Save**.

The hysteresis time data value will be used to impose a delay on the warning operation, so that the temperature must be above or below the set point for 30 seconds before the warning is activated.

1. Add a new data value with the name Server Room Hysteresis Time (30s).
2. Enable **Preset Power Up** and **Preset Value**.
3. Enter the **Preset Value**. The hysteresis time is measured in intervals of 500ms, so the data value must be set to 30 x 2 = 60.
4. Click **Save**.

Creating the Programmable Function

A value compare programmable function will be used to compare the server room temperature to the set point, and activate an output if it is too high or too low. The programmable function will use the hysteresis feature to create a band of acceptable temperatures and prevent false alarms for brief temperature spikes.

1. Navigate to **Automation | Programmable Functions** and set the **Controller** to the one with the sensor attached.
2. Add a new programmable function with the name Server Room Temp Warning.
3. Set the **Type** to Value Compare.
4. In the **Value Compare** tab, enter the warning outputs:
   - **Activate Output when Above Set Point**: Server Room Over Temp Warning
   - **Activate Output when Below Set Point**: Server Room Under Temp Warning
5. Set the **Analog Input Data Variable Register**. This is the input data value for the function, in this case AE1.1 Server Room Internal Temperature.
6. Set the **Set Point Data Value** to the Server Room Set Point (18C) created above.
7. Set the hysteresis values:
   - **Hysteresis Data Value**: Server Room Hysteresis Temp (2C)
   - **Hysteresis Time Data Value**: Server Room Hysteresis Time (30s)

   Hysteresis Timer is a legacy option and has no effect.
8. Click **Save**.
9. Wait for the programming to be downloaded to the controller, then right click on the programmable function and click **Start**.

Testing the Function

When the programmable function is running, you should see the following results:

- When the temperature is in the range of 16-20°C, no outputs should be activated.
- If the temperature is below 16°C for more than 30 seconds, the Server Room Under Temp Warning output should be activated.
- If the temperature is above 20°C for more than 30 seconds, the Server Room Over Temp Warning output should be activated.

To test this function without waiting for real temperature changes, you can create a dummy data value for testing.

1. Create a new data value for testing.
2. Assign the data value to a variable with manual commands allowed.
3. Place the variable on a floor plan (see page 7).
4. Temporarily add the test data value as the input value for your programmable function.
5. When viewing the floor plan, right click on the variable, enter a number and click **Set Variable** to change the current value. This allows you to test the system's response to a range of temperatures.

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