Programming

Tracer™ MP580/581 Programmable Controller

CNT-SVP01C-EN

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CNT-SVP01C-EN
November 2005

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Revision history

Document number and date	Description
CNT-SVP01C-EN November 2005	• Thumbwheel linear resistance values table added

Note: This document, in printed form or as an electronic file on a product CD, is accurate as of its publication date. The electronic version of this document may display a more current publication date and a higher revision level than this document.

NOTICE:

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully:

⚠WARNING

Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION

Indicates a situation that may result in equipment or property-damage-only accidents.

The following format and symbol conventions appear at appropriate sections throughout this manual:

IMPORTANT

Alerts installer, servicer, or operator to potential actions that could cause the product or system to operate improperly but will not likely result in potential for damage.

Note:
A note may be used to make the reader aware of useful information, to clarify a point, or to describe options or alternatives.

Contents

Chapter 1

Overview

The Tracer MP581 programmable controller is a general-purpose, input/output device. The controller provides direct digital control of a variety of HVAC equipment.

The Tracer MP580 is factory-installed on Modular Climate Changer and on T-Series air handlers. The controller is factory wired to all sensors, actuators, valves, starters, and other items shipped with the air handler.

Use this programming guide to configure and program the Tracer MP580/581.

Tracer MP580/581 plug-in

The Rover service tool is the setup and configuration tool for the Tracer MP580/581. It is analogous to PCM Edit for the PCM and UPCM Edit for the UPCM. For more information about the Rover service tool, see the *Rover Operation and Programming* guide (EMTX-SVX01E-EN).

To access the device through the Rover service tool, you must have the Tracer MP580/581 plug-in. The plug-in is a software file that Rover connects with internally to display information and set up configuration for the device. The plug-in also contains extensive online Help to help you access and change device information.

The Tracer MP580/581 plug-in can be run with Rover Version 4 and higher. You cannot run the Tracer MP580/581 plug-in with an earlier version of Rover. Updated versions of the Tracer MP580/581 plug-in may be released independently from the Rover software. Contact your local sales office for the latest versions of the Rover device plug-ins.

Using Rover service tool

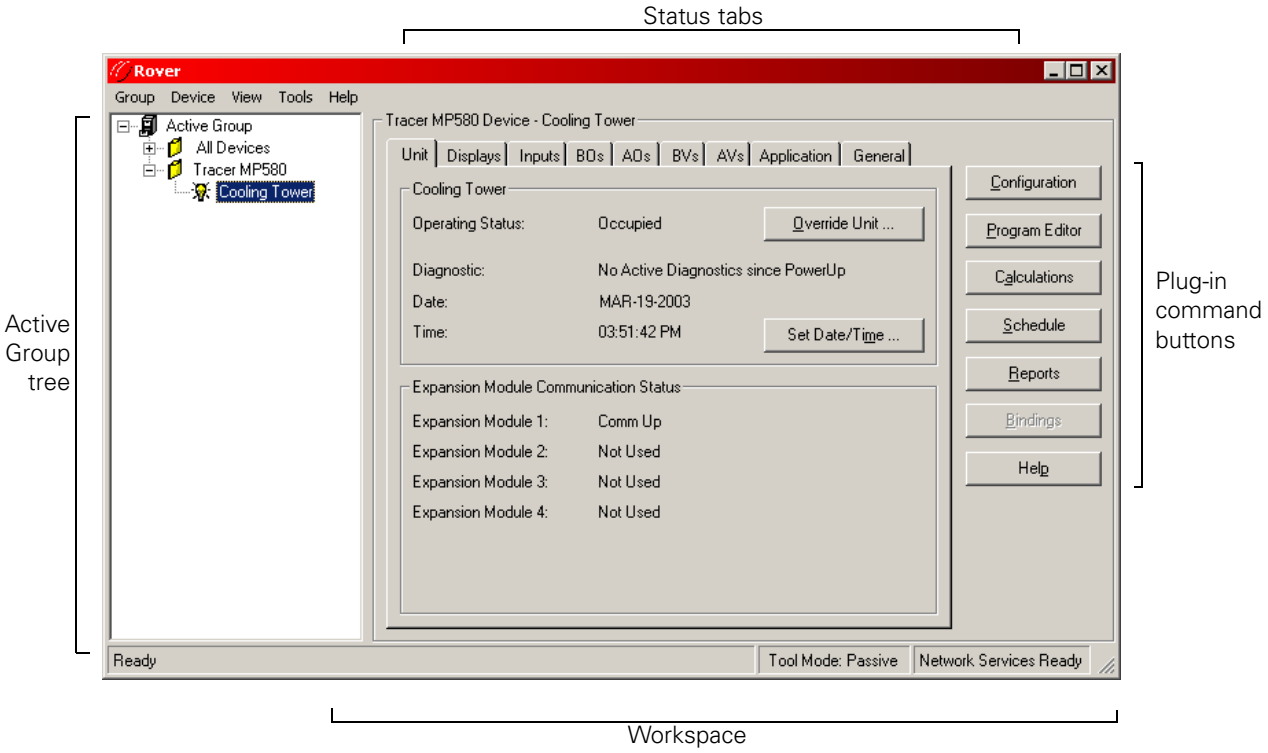
Within Rover, you can access not only status and configuration information but also other applications specific to the Tracer MP580/581.

Accessing the Tracer MP580/581

The Rover service tool communicates to Tracer MP580/581 controllers through a connection to a Comm5 communication link. Comm5 is Trane's implementation of LonTalk®. When you start Rover on an active Comm5 communication link, all communicating devices appear in the Active Group tree. To access information for a specific device, click that device in the tree. The device status information appears in the Active Device View

workspace (Figure 1). Use the nine tabs of status information, the seven command buttons, and this guide to work with the device.

Figure 1. Rover application window



Using online Help

The Rover service tool includes online Help for each screen and dialog box in the plug-in. The extensive online Help does not appear in this guide. To access Help for a tab or dialog box, click the Help button. For information about a screen element, such as a field, option, or command button, click the What's This? help question mark icon and then click a field. You can also choose What's This? from the Help menu and then click a field.

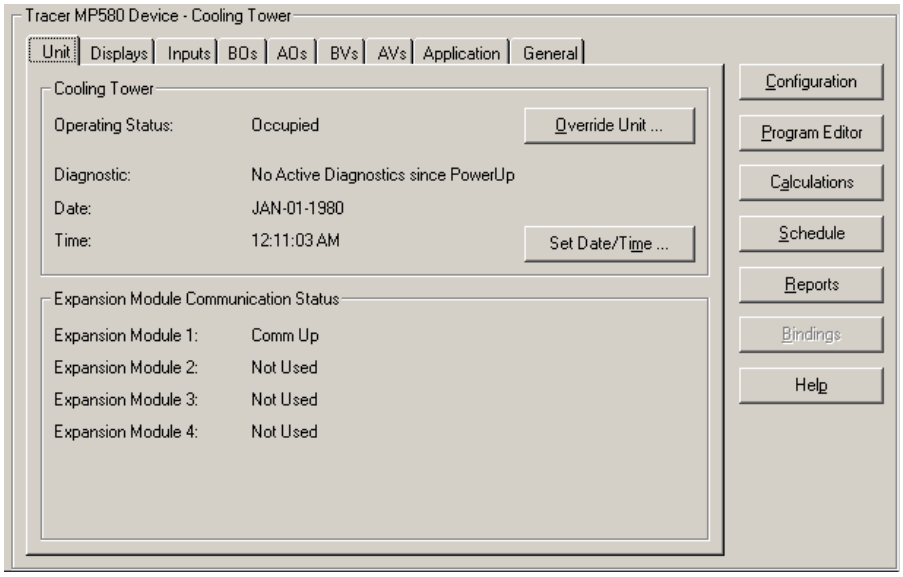
Chapter 2

Viewing status

Before viewing the status or configuration of a Tracer MP580/581 controller, you must first select the Tracer MP580/581 you are working with on the Comm5 link. To select the device, click the device name in the Active Group tree. The Active Device View appears in the workspace (Figure 2). The Active Device View contains nine tabs of status information. The Unit tab is displayed when you first access a device.

The Unit tab displays general status information about the device. The status information contains the operating status, today's date and time, active diagnostics, and expansion module communication status.

Figure 2. Tracer MP580/581 Active Device View in Rover service tool



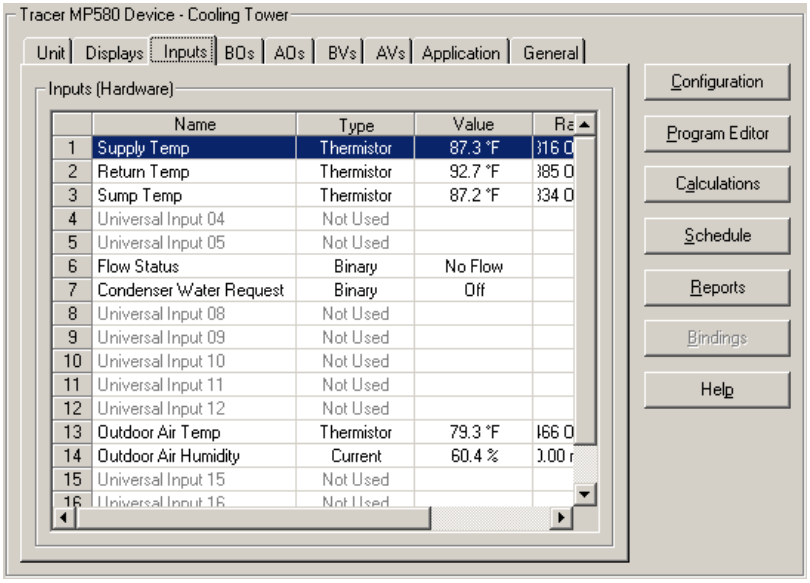
Viewing the status of inputs

Universal hardware inputs and an additional input for a pressure sensor are provided on the Tracer MP580/581 controller. The configurable inputs may be set up as analog or binary. Furthermore, analog inputs may be configured to accommodate resistance, voltage, or current. You can view the status of each input as well as its corresponding raw value. For information on configuring inputs, see “Configuring inputs” on page 21.

To view the status of inputs:

- In the Active Device View, click the Inputs tab (Figure 3).

Figure 3. Device status Inputs tab



Viewing the status of binary and analog outputs

You can view the current status of each hardware output, binary and analog, on the Tracer MP580/581. The status table includes what is currently controlling the output. Valid control sources, in order of priority, are as follows ("None" is displayed if there is no control source):

- Operator display or Rover service tool (highest priority)
- Program within the Tracer MP580/581 controller
- Tracer Summit building automation system

To view the status of binary and analog outputs:

◆ In the Active Device View, click the BOs tab (Figure 4) for the status of the binary outputs or the AOs tab (Figure 5 on page 6) for the status of the analog outputs.

Figure 4. Device status BOs tab

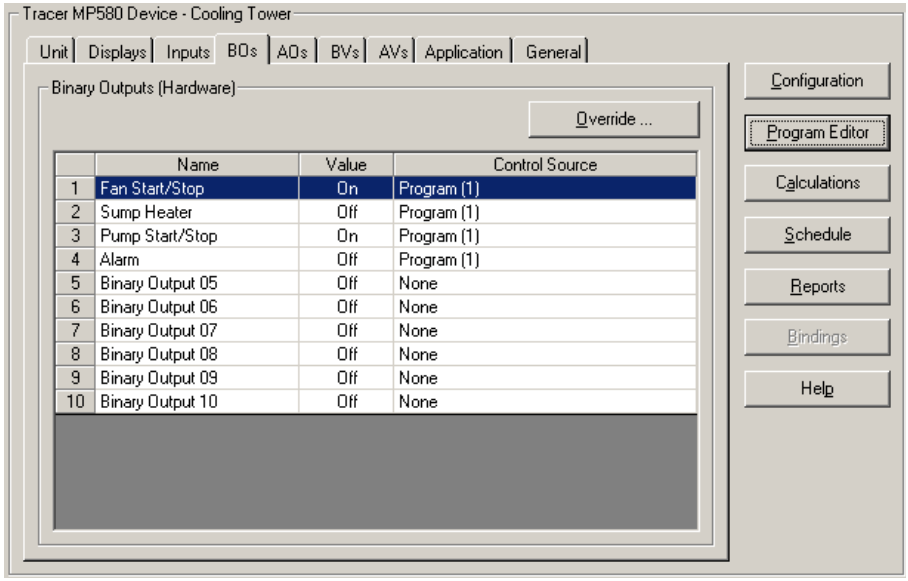
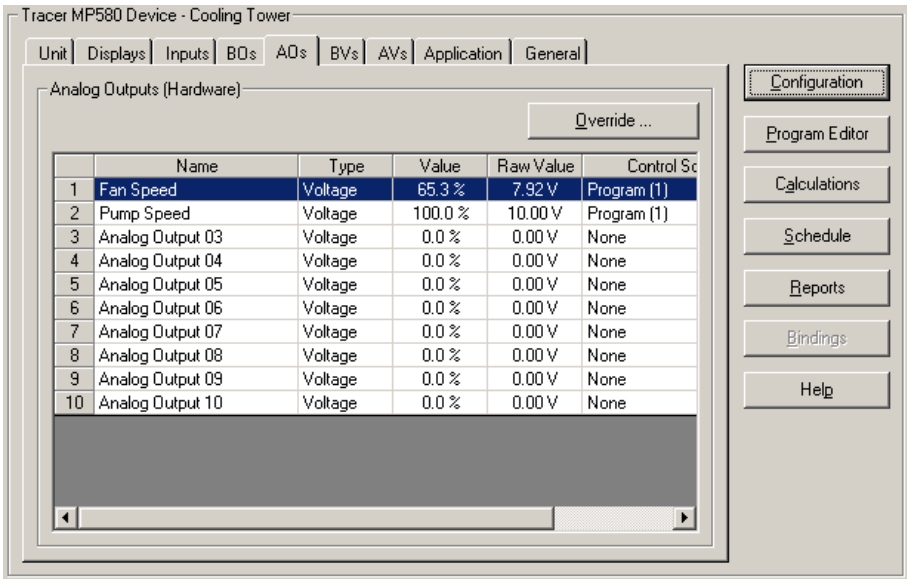


Figure 5. Device status AOs tab



Overriding binary and analog outputs

You can override both binary and analog outputs. Upon override, the selected output value changes to the override value. The control source of the output becomes the operator display/service tool so that other control sources cannot change the value of the output.

Note:
Overrides are maintained through a power loss.

To override a binary or analog output:

1. In the Active Device View, click the BOs tab to view the binary outputs or the AOs tab to view the analog outputs.
2. Click the name of the output in the table that you want to override.
3. Click the Override button. The Override Binary Output dialog box (Figure 6 on page 7) or the Override Analog Output dialog box (Figure 7 on page 7) appears.

Figure 6. Override Binary Output dialog box

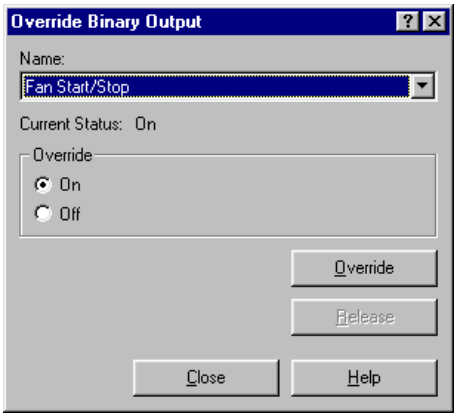
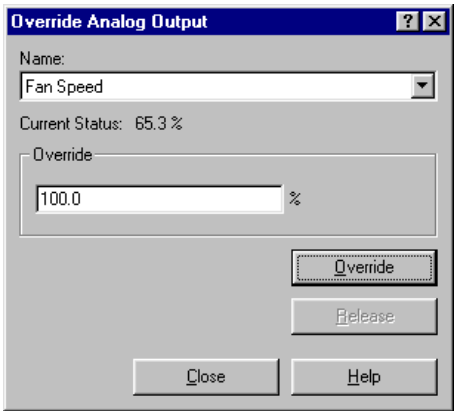


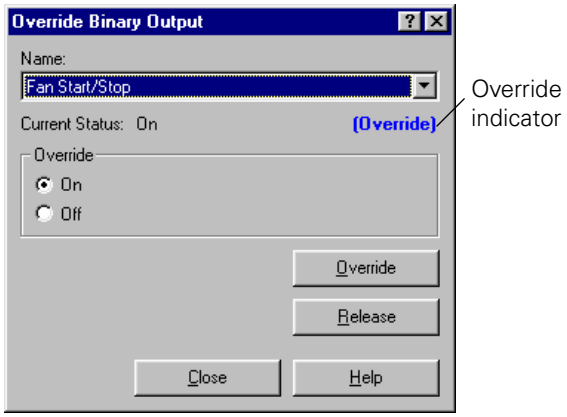
Figure 7. Override Analog Output dialog box



4. Click the desired override option for binary outputs (Figure 6) or type the desired override value for analog outputs (Figure 7).
5. Click the Override button. The Current Status field updates, and the word “Override” appears in bold, blue text (Figure 8 on page 8).

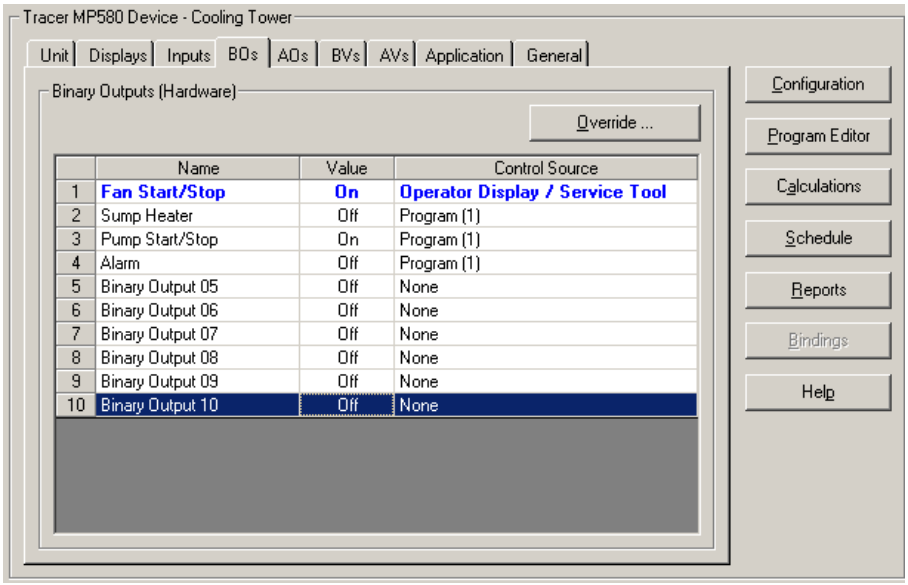
   The words “Minimum On/Off” may appear showing that the output must remain in its current state for the amount of time specified on the Configuration BOs tab.

Figure 8. Binary output with override



6. Click Close. The override status of the output appears in the table (Figure 9). The control source becomes the operator display/service tool.

Figure 9. BOs status table with an output override



Note:
You can also override a binary or analog output from the Displays tab. Binary and analog outputs must be designated as adjustable in the display configuration to apply an override to them. For more information on setting an output to adjustable, see “Configuring the operator display” on page 39.

Releasing binary and analog output overrides

You can release overrides of both binary and analog outputs. Upon release, the selected output value is released back to normal control. The control source of the output returns to its original source. To release a binary or analog output override:

1. In the Active Device View, click the BOs tab to view the binary outputs or the AOs tab to view the analog outputs.
2. Click the output in the table that has its value overridden.
3. Click the Override button. The Override Binary Output dialog box (Figure 8 on page 8) or the Override Analog Output dialog box appears.
4. Click the Release button. The Current Status field returns to its original value.
5. Click Close. The status of the output appears in the list.

Note:
You can also release a binary or analog output override from the Displays tab.

Viewing the status of binary and analog variables

Variables may be changed using a variety of methods. Variables can be communicated from the Tracer Summit system and changed using the Rover service tool. Variables may also be calculated in a program, or they may be made adjustable through the operator display. The Tracer MP580/581 accommodates 150 binary and 150 analog variables.

Tracer Summit variables 1 through 30 are reserved for use with the Tracer Summit building automation system. There are 120 variables controlled by the operator display/service tool and/or programs. These 120 variables are called local variables. You can view the status of each binary and analog variable.

To aid in troubleshooting, the status table includes the control source assigning the variable its value. For information on configuring binary

and analog variables, see “Configuring variables” on page 31. Valid control sources include the following:

- Operator display or Rover service tool
- Program within the Tracer MP580/581 controller
- Tracer Summit building automation system

Note:
When Tracer Summit is the control source, no graphical programming is required. The variable can be controlled directly.

To view the status of binary and analog variables:

1. In the Active Device View, click the BVs tab (Figure 10) for the status of the binary variables or the AVs tab (Figure 11 on page 11) for the status of the analog variables.
2. Click the Tracer Summit Binary Variables option, the Local Binary Variables option, the Tracer Summit Analog Variables option, or the Local Analog Variables option to view the list of variables you want.

   Uploading the variables may take a few seconds.

Figure 10. Device status BVs tab displaying local binary variables

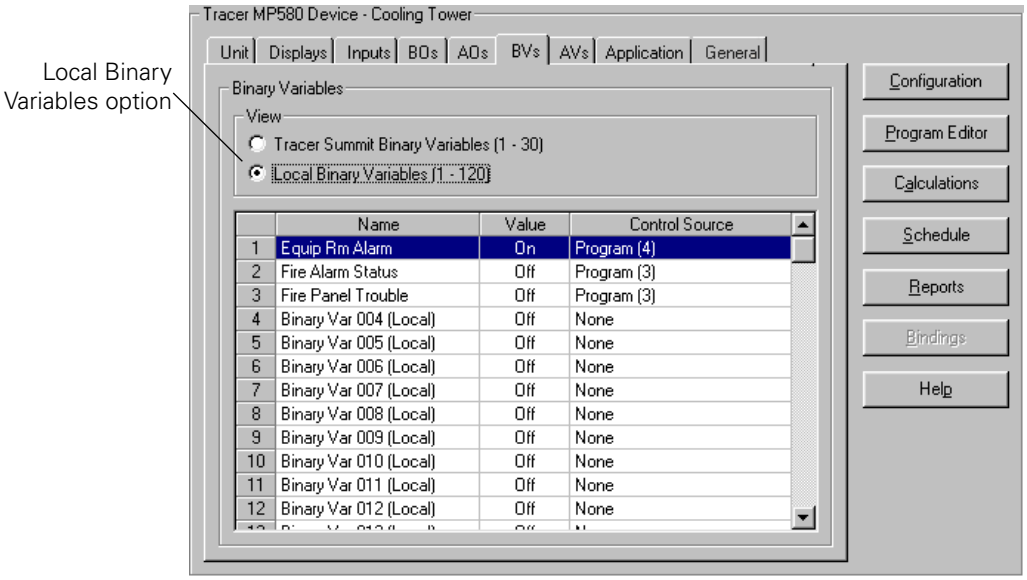
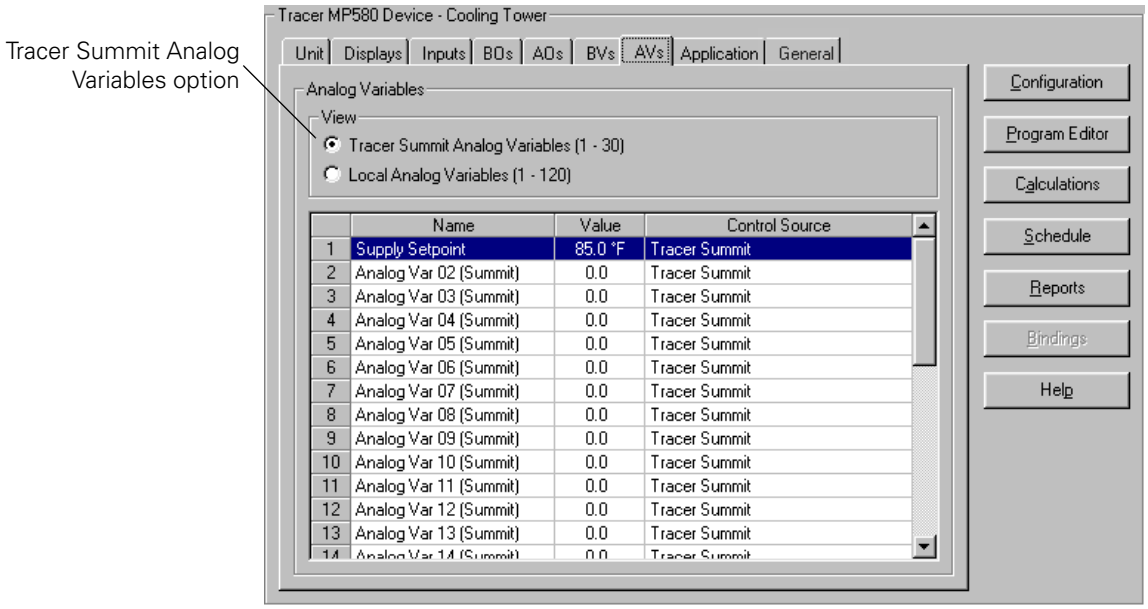


Figure 11. Device status AVs tab displaying Tracer Summit analog variables



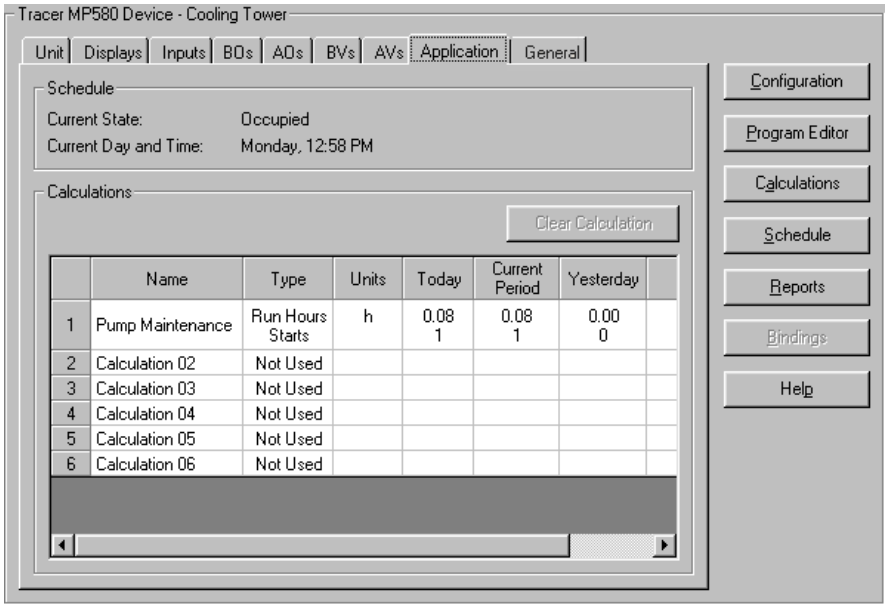
Viewing application status

You can view the status of the Schedule and standard Calculations applications. On the Application tab under Schedule, view the current occupancy state of the controller as well as the day and time in the controller. Under Calculations, view the table that displays the calculations present in the controller as well as the calculation type, units, and values.

To view the application status:

- In the Active Device View, click the Application tab (Figure 12).

Figure 12. Device status Application tab

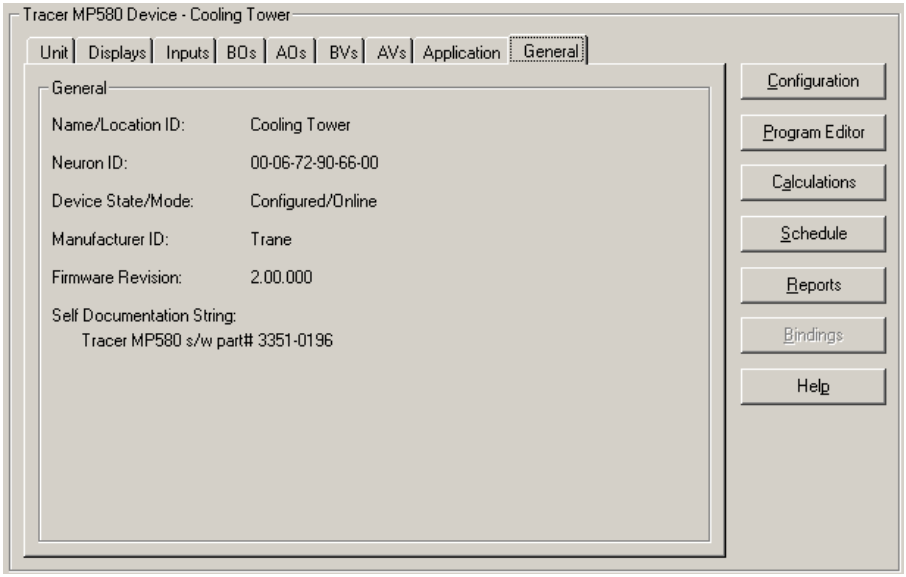


Viewing Comm5 parameters

To view information about the Tracer MP580/581 controller Comm5 parameters:

- In the Active Device View, click the General tab. Comm5 information specific to the selected Tracer MP580/581 controller is displayed (Figure 13).

Figure 13. Device status General tab



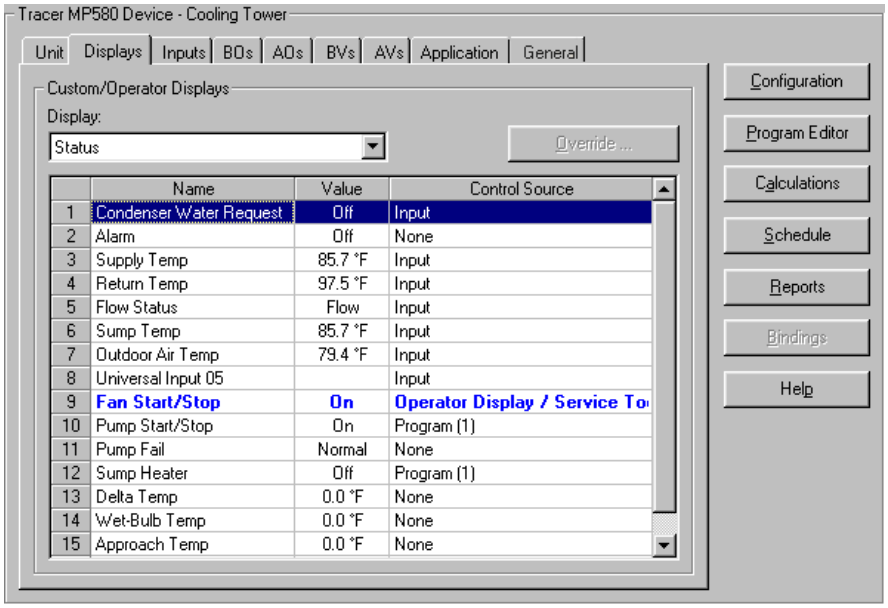
Viewing custom displays

You can set up custom displays for the Tracer MP580/581 operator display through the Rover service tool. A custom display is a group of inputs, outputs, and variables saved under a descriptive name. You can view the status of the items in the group from the operator display or Rover by accessing the custom display name. Variables and outputs may also be changed or overridden from the display if they are configured as adjustable. For more information on configuring custom displays, see “Configuring custom displays” on page 41.

To view custom displays:

1. In the Active Device View, click the Displays tab.
2. In the Display drop-down list, click the custom display you want to view. The names, values, and control sources for the items in the group appear (Figure 14).

Figure 14. Device status Displays tab



Changing binary and analog variables

Variables are often used for setpoints so that they can be changed by the building operator or owner from the operator display. In the Rover service tool, binary and analog variables can be changed from the Displays tab. To make a change from the Displays tab or from the operator display, the following must be true:

- The variable must be a local variable with the control source set to the operator display/service tool. For information on configuring binary and analog variables, see “Configuring variables” on page 31.
- The variable must be designated as adjustable in the display configuration. For information on setting a variable to be adjustable, see “Configuring custom displays” on page 41.

Note:
Variables cannot be changed from the home display on the operator display or in the Rover service tool.

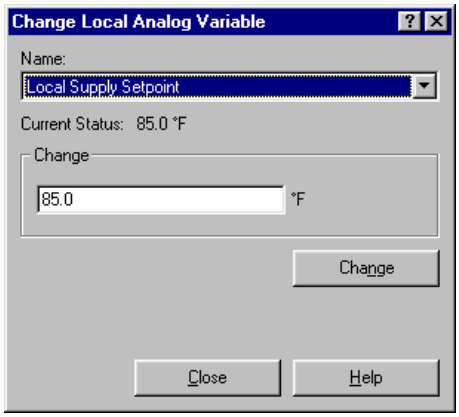
Upon changing, the selected variable value changes to the requested value. The control source of the variable does not change, so other control sources, such as the operator display, can still affect the value of the variable.

To change a binary or analog variable in the Rover service tool:

1. In the Active Device View, click the Displays tab.
2. In the Display list, click the name of the custom display that contains the variable you want to change.
3. In the table, click the name of the variable you want to change.
4. Click the Change button. The Change Local Analog Variable dialog box appears (Figure 15 on page 16).

Note:
If the Change button is not available, the variable you chose does not meet the criteria outlined previously.

Figure 15. Change Local Analog Variable dialog box



5. Click the desired state for binary variables or type the desired value for analog variables.
6. Click the Change button. The value of the variable is changed.
7. Click Close. The changed value appears in the table.

Overriding the occupancy mode

You can override the effective occupancy of the Tracer MP580/581 controller. An occupancy override from the operator display or the Rover service tool takes priority over all other occupancy requests.

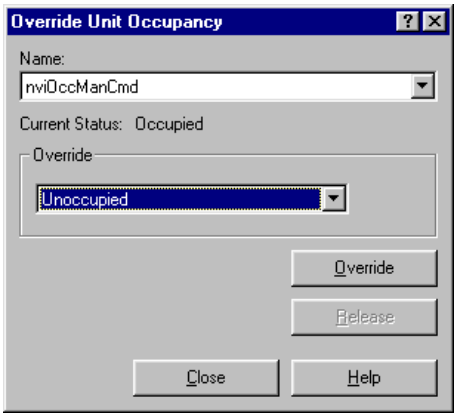
Applying an occupancy override

Upon override, the occupancy value of the Tracer MP580/581 controller changes to the override value. The control source of the output becomes the operator display/service tool, preventing other control sources from changing the occupancy.

To apply an occupancy override:

1. In the Active Device View, click the Unit tab.
2. Click the Override Unit button. The Override Unit Occupancy dialog box appears (Figure 16 on page 17).

Figure 16. Override Unit Occupancy dialog box



3. In the Override list, click the occupancy mode you want.
4. Click the Override button. The current status is changed to the override mode.
5. Click Close. The Override Unit Occupancy dialog box closes.

Releasing an occupancy override

You can release an occupancy override of the Tracer MP580/581. Upon release, the occupancy value of the selected device is released to normal control. The control source of the output becomes the normal source.

To release an occupancy override:

1. In the Active Device View, click the Unit tab.
2. Click the Override Unit Occupancy button. The Override Unit Occupancy dialog box appears.
3. Click the Release button. The current status is changed to the normal mode.
4. Click Close. The Override Unit Occupancy dialog box closes.

Chapter 3

Configuring the Tracer MP580/581

Use the information in this chapter to configure your Tracer MP580/581 controller. Select the Tracer MP580/581 you want to configure from the Active Group tree and then click the Configuration button. The Configuration dialog box appears with the same tab selected as the tab that was showing in the Active Device View. You can jump from tab to tab within the Configuration dialog box without going back to the status tabs in the Active Device View.

Configuring EX2 expansion modules

The EX2 expansion module is a field-installed expansion module for the Tracer MP580/581 programmable controller.

Note:
This feature applies to only Tracer MP580/581 Firmware Revision 2 or higher. Follow the procedure for "Viewing Comm5 parameters" on page 13 to view your current revision number.

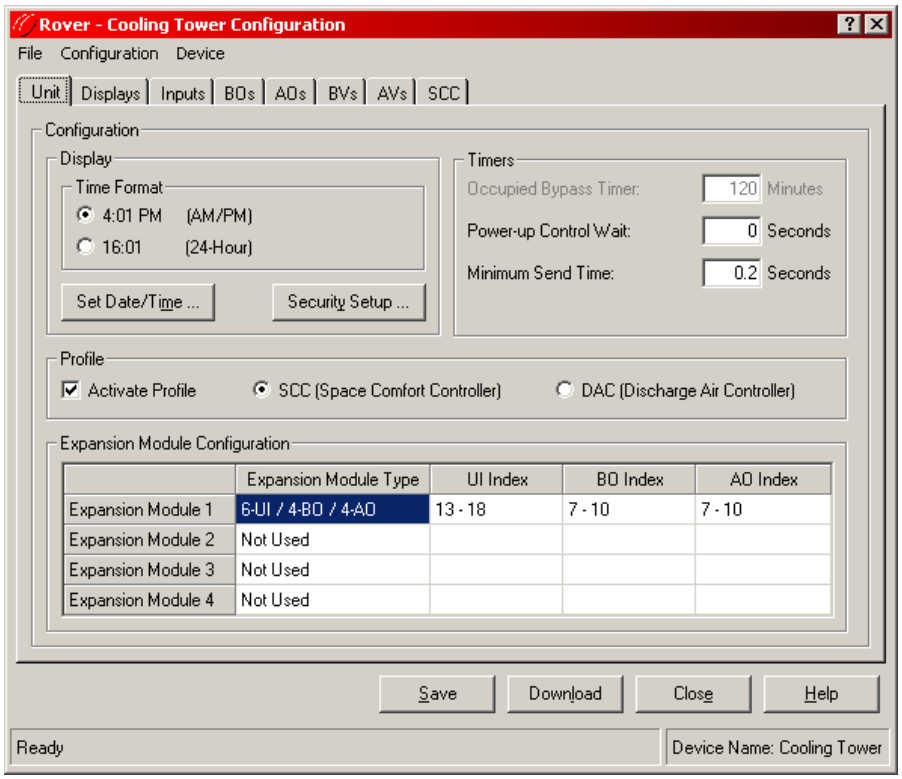
Up to four EX2s can be connected to a Tracer MP580/581. Each EX2 adds the following inputs and outputs to a Tracer MP580/581:

- 6 universal inputs
- 4 binary inputs
- 4 analog outputs

To set up an EX2 expansion module that has been connected to a Tracer MP580/581:

1. In the Active Device View, click the Unit tab. The status information for the controller appears.
2. Click the Configuration button. The Configuration dialog box appears with the Unit tab displayed (Figure 17 on page 20).
3. Under Expansion Module Configuration, in the Expansion Module Type column, choose the expansion module row for the module you want to configure. In the list, click the appropriate module type. The rest of the row fills in with indexes for universal inputs, binary outputs, and analog outputs.

Figure 17. Device configuration Unit tab



The expansion module number is configured by setting the DIP switch on the module. See the *Tracer MP581 Programmable Controller Hardware Installation* guide (CNT-SVN01B-EN) for more information.

4. Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box.
5. See “Configuring inputs” on page 21 and “Configuring outputs” on page 28 for instructions on configuring inputs and outputs for the expansion modules.

Configuring inputs

Universal hardware inputs and an additional input for a pressure sensor are provided on the Tracer MP580/581 controller. The configurable inputs on the controller may be set up as analog or binary. You can configure all inputs on the controller and any of the expansion modules with the name and type information. Futhermore, you can configure analog inputs to accommodate various temperature sensors or to accept a linear resistance, voltage, or current signal. For example, on a zone temperature sensor the linear resistance values for a thumbwheel are displayed in Table 1:

Table 1. Thumbwheel linear resistance values

Temperature (°F)	Value (Ω)
50°F	889.4 Ω
90°F	110.6 Ω

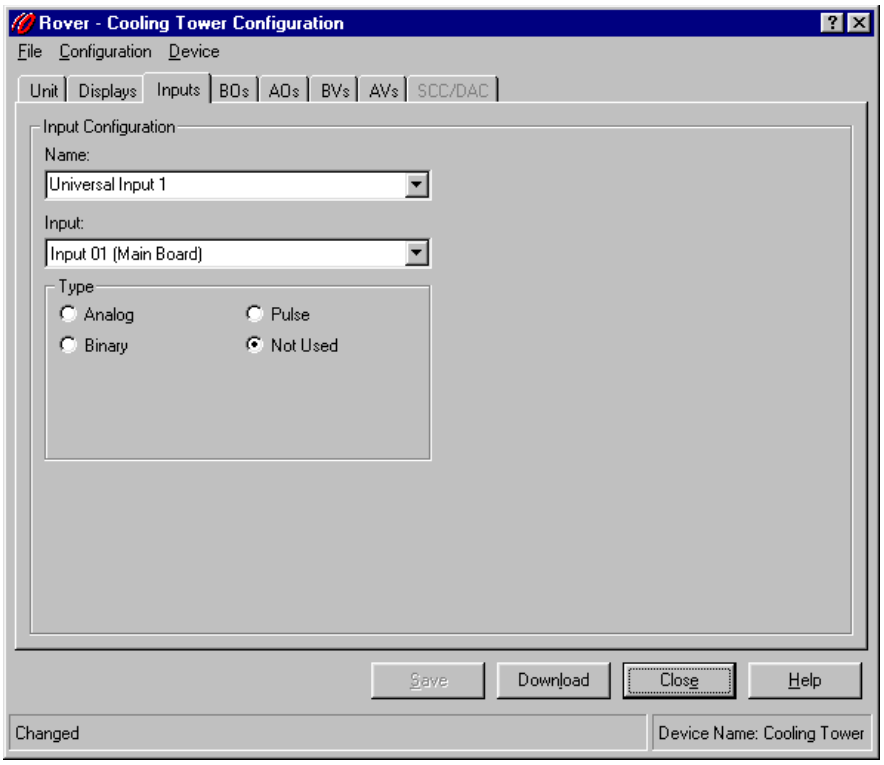
Configuring binary inputs

A binary input detects whether a circuit is open or closed, indicating on or off status.

To set up a binary input:

1. In the Active Device View, click the Inputs tab. The status information for the inputs appears.
2. Click the Configuration button. The Configuration dialog box appears with the Inputs tab displayed (Figure 18, page 22).

Figure 18. Device configuration Inputs tab



3. In the Name list, click the input you want to configure. The configuration information for that input appears in the tab.

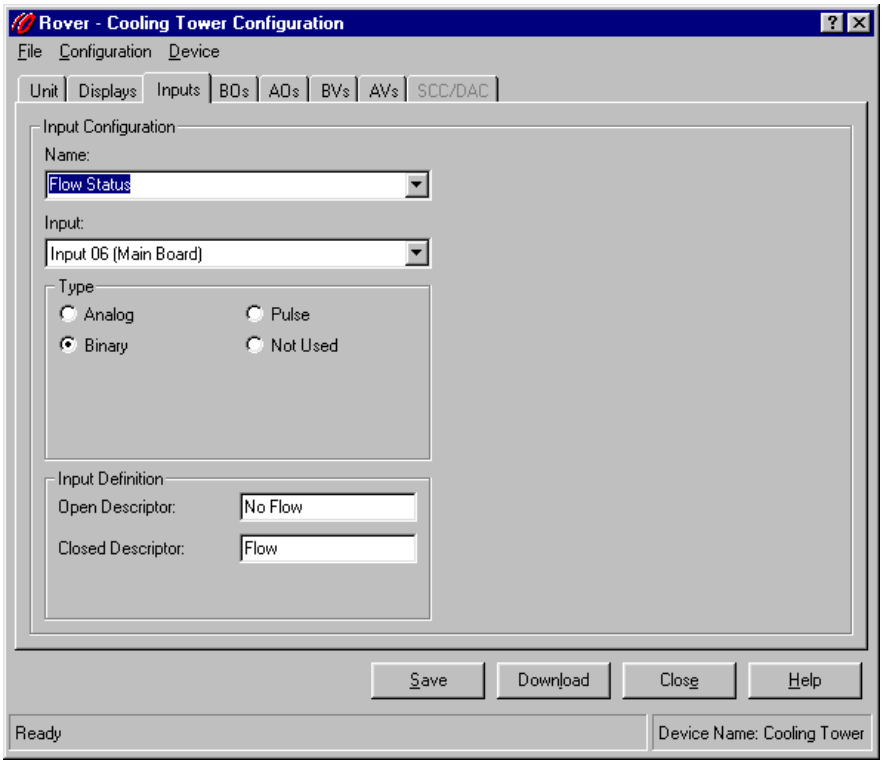
   You can also select the input by clicking the input number in the Input list. The Name and Input lists are linked so that input name and input number are always displayed together.

4. If you want to change the input name, highlight the text and type a new name.

   Use a descriptive name because it appears in custom displays and programs.

5. Under Type, click the Binary option. The binary input configuration information appears (Figure 19).

Figure 19. Device configuration binary input



6. Under Input Definition, type descriptors for the open and closed states of the binary input.

   Use descriptive terms because they appear on the operator display and the Rover status displays.

7. Complete one of the following options:
   - Click another input name in the Name list to edit another input.
   - Click another tab to set up another item.
   - Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box.

Configuring analog inputs

An analog input is a varying voltage, current, or resistance signal that can be converted to units of measurement, such as temperature, pressure, and humidity.

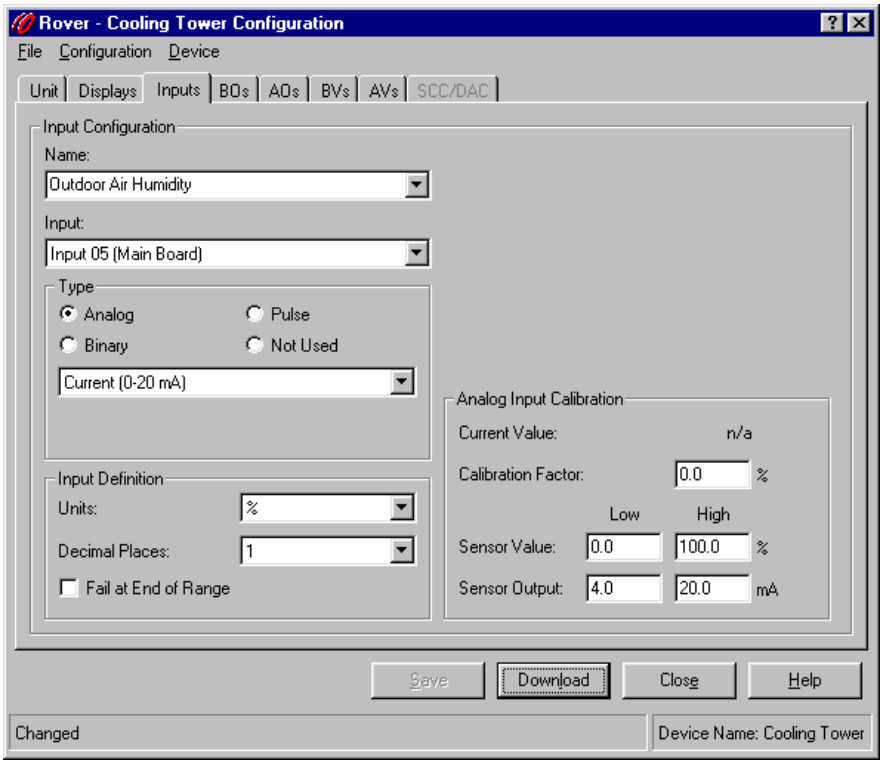
To set up an analog input:

1. In the Active Device View, click the Inputs tab. The status information for the inputs appears.
2. Click the Configuration button. The Configuration dialog box appears with the Inputs tab displayed (Figure 18 on page 22).
3. In the Name list, click the input you want to configure. The configuration information for that input appears in the tab.

   You can also select the input by clicking the input number in the Input list. The Name and Input lists are linked so that input name and input number are always displayed together.
4. If you want to change the input name, highlight the text and type a new name.

   Use a descriptive name because it appears in custom displays and programs.
5. Under Type, click the Analog option. The analog input configuration information appears (Figure 20 on page 25).

Figure 20. Device configuration analog input



6. In the Type list, click the input type.

Note:
Only the first four universal inputs (Input 01 to Input 04) can be configured as a Balco or platinum resistance temperature detector (RTD). Only the first two universal inputs on each EX2 expansion module can be configured as Balco or platinum RTDs.

7. In the Units list, click the units associated with the input.
8. In the Decimal Places list, click the number of digits you want to appear to the right of the decimal when displaying the input value.

   Determine how many digits appear to the right of the decimal in the Rover Active Device View and on the Tracer MP580/581 operator display. Use the resolution of the sensor to determine the number of decimal places. For example, if a temperature sensor is accurate to 0.1°F, do not display more than one decimal place. However, a differential pressure sensor input may need to display two or three decimal places.

9. Click to select the Fail at End of Range check box if you want the controller to generate a diagnostic whenever the analog input is within 3% of the end of its range.

   For example, a 0–10 V sensor will generate a diagnostic whenever its raw value is less than 0.3 V or greater than 9.7 V.

10. If the input requires calibration, type the amount you want to adjust the value of the input in the Calibration Factor field.

    For example, if you know a temperature sensor is reading 1°F too high, type a calibration factor of –1°F.

11. For linear-voltage, -current, or -resistance inputs, type the low and high sensor values and sensor outputs in the Low and High Sensor Value and Sensor Output fields.

    The Sensor Value Low is the lowest reading the sensor can provide, while the Sensor Value High is the highest reading the sensor can provide. For example, a humidity sensor provides a 4–20 mA signal corresponding to 0–100% relative humidity. Type 0 as the low sensor value and 100 as the high sensor value in this case. The sensor calibration is determined by these four parameters. In this example, type 4 mA as the low sensor output and 20 mA as the high sensor output.

12. Complete one of the following options:
    - Click another input name in the Name list to edit another input.
    - Click another tab to set up another item.
    - Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box.

Configuring pulse inputs

A pulse input measures the number of contact closures over time. Typical origins of contact closures include electric, gas, and water meters. The meter must have a dwell time of 200 ms and a maximum pulse rate of 3 pulses per second.

To set up a pulse input:

1. In the Active Device View, click the Inputs tab. The status information for the inputs appears.
2. Click the Configuration button. The Configuration dialog box appears with the Inputs tab displayed (Figure 18 on page 22).
3. In the Name list, click the input you want to configure. The configuration information for that input appears in the tab.

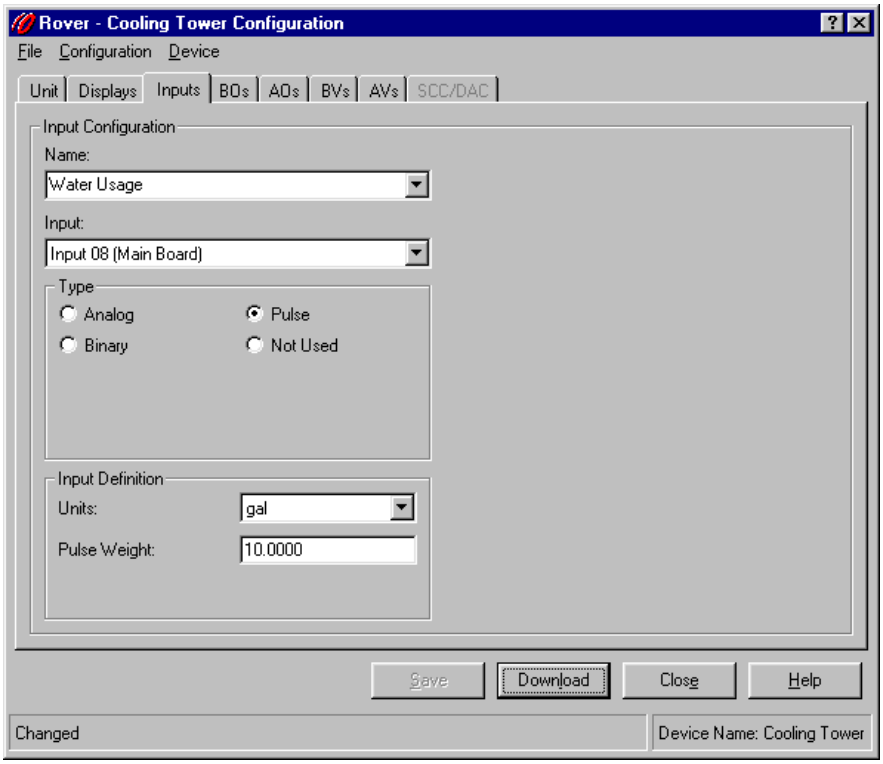
   You can also select the input by clicking the input number in the Input list. The Name and Input lists are linked so that the input name and input number are always displayed together.

4. If you want to change the input name, highlight the text and type a new name.

   Use a descriptive name because it appears in custom displays and programs.

5. Under Type, click the Pulse option. The pulse input configuration information appears (Figure 21).

Figure 21. Device configuration pulse input



6. In the Units list, click the units associated with the input.
7. In the Pulse Weight field, type the value per contact closure from the meter.
8. Complete one of the following options:
   - Click another input name in the Name list to edit another input.
   - Click another tab to set up another item.
   - Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box.

Configuring outputs

The Tracer MP580/581 and expansion modules include binary and analog hardware outputs.

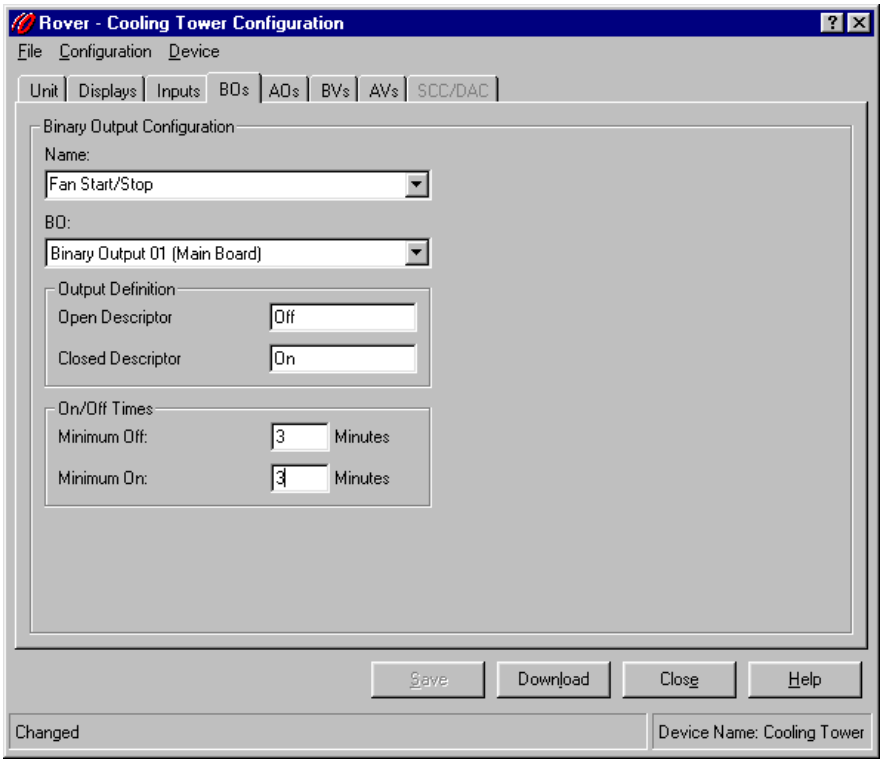
Configuring binary outputs

You can name binary outputs, specify open and closed descriptors, and set minimum on and off times.

To set up a binary output:

1. In the Active Device View, click the BOs tab. The status information for the binary outputs appears.
2. Click the Configuration button. The Configuration dialog box appears with the BOs tab displayed (Figure 22).

Figure 22. Device configuration BOs tab



3. In the Name list, click the output you want to configure. The configuration information for that output appears in the tab.

   You can also select the output by clicking the output number in the BO list. The Name and BO lists are linked so that the output name and output number are always displayed together.

4. If you want to edit the output name, highlight the text and type a new name.

   Use a descriptive name because it appears in custom displays and programs.

5. Under Output Definition, type descriptors for the open and closed states of the binary output.

   Use descriptive terms because they appear on the operator display and the Rover status displays.

6. Under On/Off Times, type the minimum on and off times.

   The minimum off time is the least amount of time the output must be off before it can go to on. The minimum on time is the least amount of time the output must be on before it can go to off.

7. Complete one of the following options:
   - Click another output name in the Name list to edit another output.
   - Click another tab to set up another item.
   - Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box.

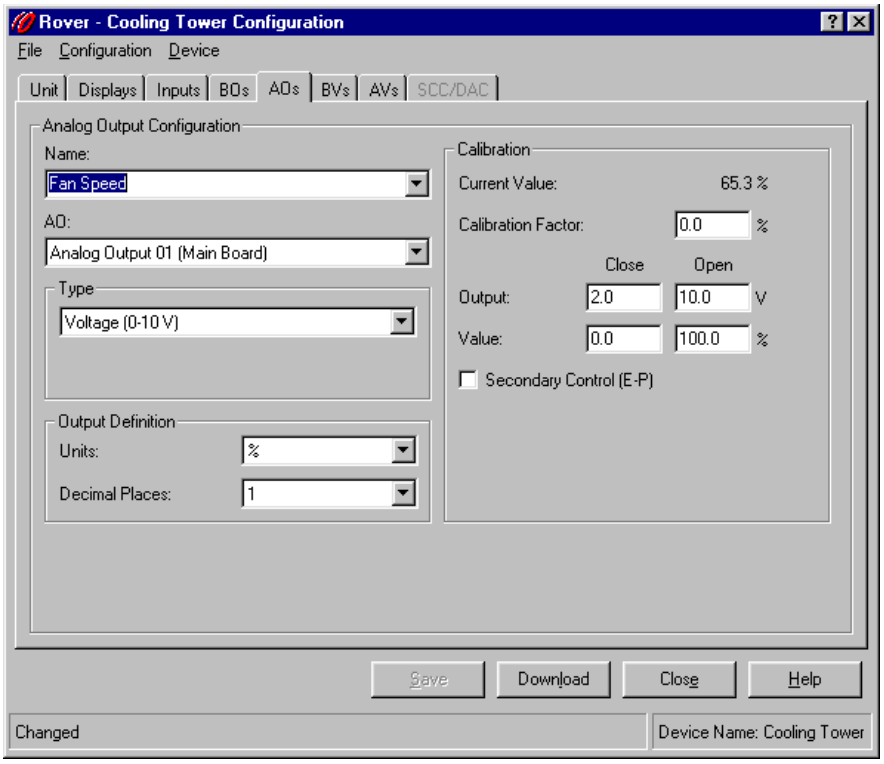
Configuring analog outputs

You can name an analog output, specify its type, display its units and numeric format, and perform calibration.

To set up an analog output:

1. In the Active Device View, click the AOs tab. The status information for the analog outputs appears.
2. Click the Configuration button. The Configuration dialog box appears with the AOs tab displayed (Figure 23 on page 30).

Figure 23. Device configuration AOs tab



3. In the Name list, click the output you want to configure. The configuration information for that output appears in the tab.

   You can also select the output by clicking the output number in the AO list. The Name and AO lists are linked so that output name and output number are always displayed together.

4. If you want to change the output name, highlight the text and type a new name.

   Use a descriptive name because it appears in custom displays and programs.

5. In the Type list, click the analog output type. This selection sets the default values under Calibration.

6. In the Units list, click the appropriate units.

7. In the Decimal Places list, click the number of digits you want to appear to the right of the decimal.

   You determine how many digits appear to the right of the decimal in the Rover Active Device View and on the Tracer MP580/581 operator display.

8. If the output requires calibration, type the amount by which you want to adjust the value of the output in the Calibration Factor field.

9. Verify the open and close values and the open and close outputs, and type new values in the Close and Open Output and Value fields if necessary.

   The output values are the hardware output voltage or current corresponding to the open and closed states of the wired device. The analog output calibration is determined by these four parameters.

10. Click to select the Secondary Control (E-P) check box if a secondary control device is used and type the open and close values and outputs for the secondary control device.

11. Complete one of the following options:

    - Click another output name in the Name list to edit another output.
    - Click another tab to set up another item.
    - Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box.

Configuring variables

Variables may be changed using a variety of methods. Variables can be communicated from the Tracer Summit system and changed using the Rover service tool. Variables may also be calculated in a program, or they may be made adjustable through the operator display. The Tracer MP580/581 accommodates 150 binary variables and 150 analog variables.

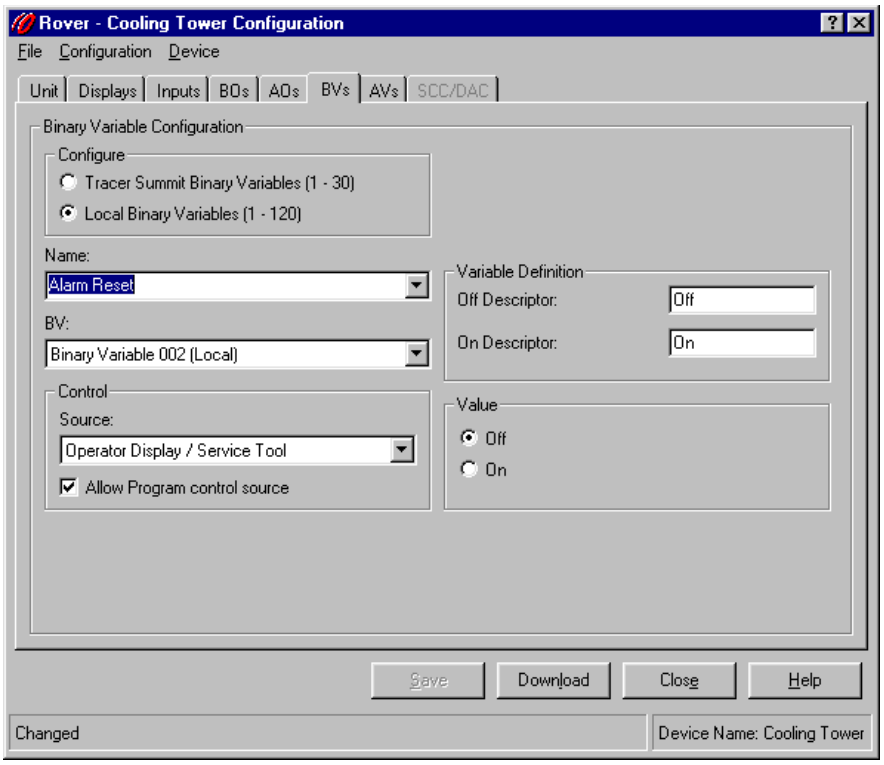
Configuring binary variables

Tracer Summit binary variables 1 through 30 are reserved for use with the Tracer Summit system. Use local binary variables 1 through 120 as local variables. You can edit the Tracer Summit variables or the local variables. For each binary variable, specify a name, control source, off and on descriptors, and a communications loss value or initial value.

To set up a binary variable:

1. In the Active Device View, click the BVs tab. The status information for the binary variables appears.
2. Click the Configuration button. The Configuration dialog box appears with the BVs tab displayed.
3. Click the Tracer Summit Binary Variables option or the Local Binary Variables option to view the type of variable you want to edit (Figure 24 on page 32).

Figure 24. Device configuration BVs tab



4. In the Name list, click the variable you want to configure. The configuration information for that variable appears in the tab.

   You can also select the variable by clicking the variable number in the BV list. The Name and BV lists are linked so that the variable name and variable number are always displayed together.

5. If you want to change the variable name, highlight the text and type a new name.

   Use a descriptive name because it appears in custom displays and programs.

6. If the variable is not a Tracer Summit variable, click the control source for the variable in the Source list.

7. If the variable is local and is controlled by the operator display/service tool, click to select the Allow Program Control Source check box if you want to also control this variable within a program.

   It is not recommended you select this unless you have a specific purpose in mind, for example, you are using the program to return an alarm reset variable to normal.

8. Under Variable Definition, type descriptors for the on and off states of the binary variable.

   Use descriptive terms because they appear on the operator display and the Rover status displays.

9. If the variable has Tracer Summit as its control source, under Communications Loss Value, click the On or Off option to determine what value you want to appear as the value if Tracer Summit communications are lost to the Tracer MP580/581.
10. If the variable has the operator display and service tool as its control source, under Value, click the On or Off option to determine what value you want the variable to have.

Note:
The variable value is saved once every 24 hours. If a power loss occurs, the variable value is set to the last saved value.

11. Complete one of the following options:
    - Click another variable name in the Name list to edit another variable.
    - Click another tab to set up another item.
    - Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box.

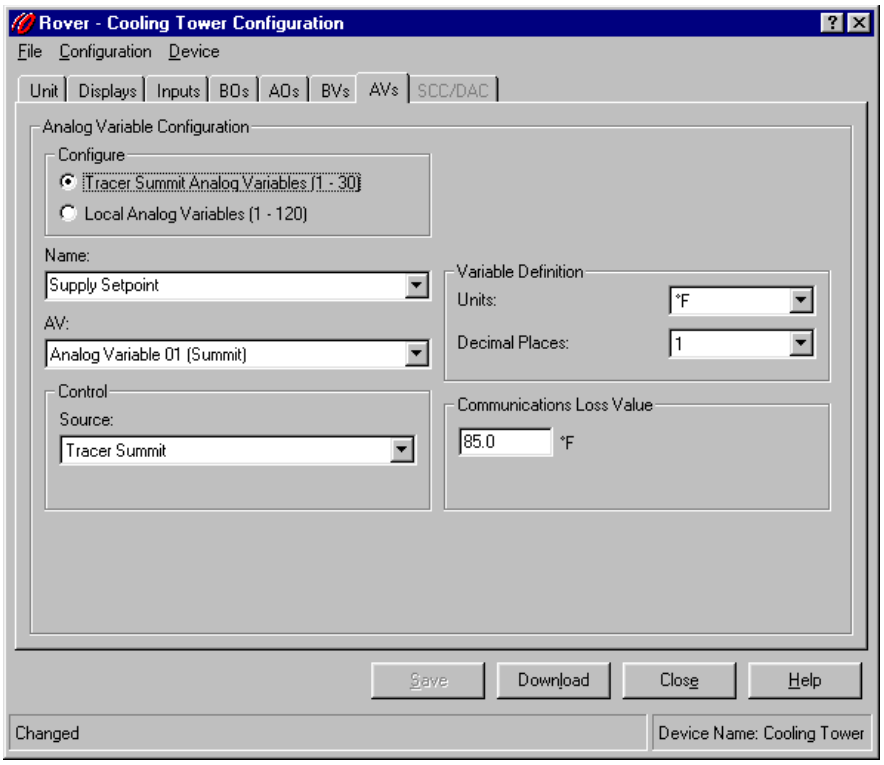
Configuring analog variables

Tracer Summit analog variables 1 through 30 are reserved for use with the Tracer Summit system. The 120 local analog variables are to be used as local variables. You can edit the Tracer Summit variables or the local variables. For each analog variable, specify a name, control source, display units, numeric format, and communications loss or initial value.

To set up an analog variable:

1. In the Active Device View, click the AVs tab. The status information for the analog variables appears.
2. Click the Configuration button. The Configuration dialog box appears with the AVs tab displayed (Figure 25 on page 34).

Figure 25. Device configuration AVs tab



3. Click the Tracer Summit Analog Variables option or the Local Analog Variables option to view the type of variable you want to edit.
4. In the Name list, click the variable you want to configure. The configuration information for that variable appears in the tab.

   You can also select the variable by clicking the variable number in the AV list. The Name and AV lists are linked so that the variable name and variable number are always displayed together.
5. If you want to change the variable name, highlight the text and type a new name.

   Use a descriptive name because it appears in custom displays and programs.
6. If the variable is not a Tracer Summit variable, click the control source for the variable.
7. If the variable is local and is controlled by the operator display/service tool, click to select the Allow Program Control Source check box if you want to also control this variable within a program.

   It is not recommended you select this unless you have a specific purpose in mind.
8. In the Units list, click the appropriate units.

9. In the Decimal Places list, click the number of digits you want to appear to the right of the decimal when the variable value is displayed.
10. If the variable has Tracer Summit as its source, under Communications Loss Value, type the value you want to appear if Tracer Summit communications are lost to the Tracer MP580/581.
11. If the variable has the operator display and service tool as its source, under Value, type the value you want the variable to have.

Note:
The variable value is saved once every 24 hours. If a power loss occurs, the variable value is set to the last saved value.

12. Complete one of the following options:
    - Click another variable name in the Name list to edit another variable.
    - Click another tab to set up another item.
    - Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box.

Configuring user security

A user who has security supervisor access can set up security privileges for up to eight users, giving each different access privileges, for both the Tracer MP580/581 operator display and the Rover service tool. Any user can view all displays on the Tracer MP580/581 operator display; however, a security supervisor can set up security to prevent unauthorized users from changing variables or overriding outputs at the operator display.

A security supervisor can also set up security to prevent unauthorized users from downloading or deleting variables, overriding inputs, downloading or deleting a Tracer graphical program, clearing memory on the controller, and performing a flash download to the controller.

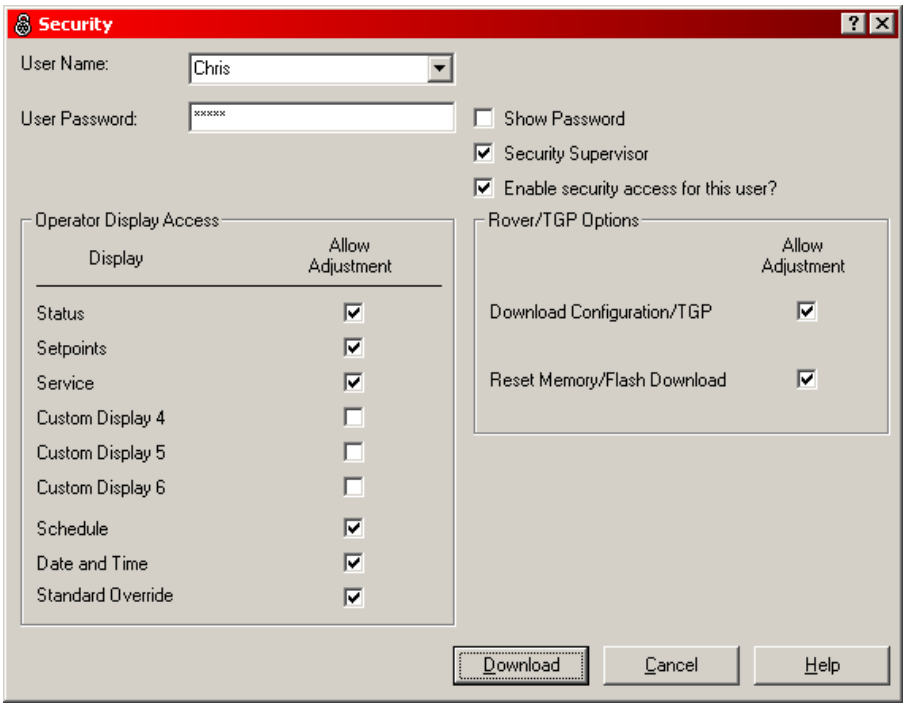
After security is established, users are prompted to log on with a password when they attempt to perform security-protected functions.

Note:
A logged-on user loses access to security-protected functions if an action is not performed for 30 minutes.

To configure security:

1. In the Active Device View, click the Unit tab. The status information for the controller appears.
2. Click the Configuration button. The Configuration dialog box appears with the Unit tab displayed.
3. Click the Security Setup button. The Security dialog box (Figure 26) appears.

Figure 26. Security dialog box



4. In the User Name list, click the user name for which you want to set up security.
5. If you want to change the user name, type the user's name in the User Name field.

   The user name can be up to 24 characters long.
6. In the User Password field, type a four-digit password.

   The password can be only numbers; no letters or special characters are allowed.
7. Click to select the Show Password check box to display the password for the selected user name.

8. If needed, click to select the Security Supervisor check box to set the selected user as a security supervisor.

   At least one user must be declared a security supervisor. After any default settings have changed, only a security supervisor can change the security configuration.

9. Under Operator Display Access, click to select the check boxes for the displays and items you want the selected user to be able to adjust. Click to clear the check boxes for the displays and items this user is not allowed to adjust.

   The first six check boxes are for the custom displays. The last three check boxes are for standard displays.

10. Under Rover/TGP Options, click to select the check boxes to allow the selected user to modify configurations and TGP programs and to be able to clear memory or download a new program to the Tracer MP580/581.

11. Repeat steps 4–10 to set up additional users.

12. Click the Download button to send your changes to the Tracer MP580/581. If the Security Logon dialog box appears, log on. Click Close to close the Configuration dialog box.

Setting the time and date

Set the time and date for the Tracer MP580/581 and the format in which you want the time to appear in the Rover service tool and on the operator display.

To set the time and date:

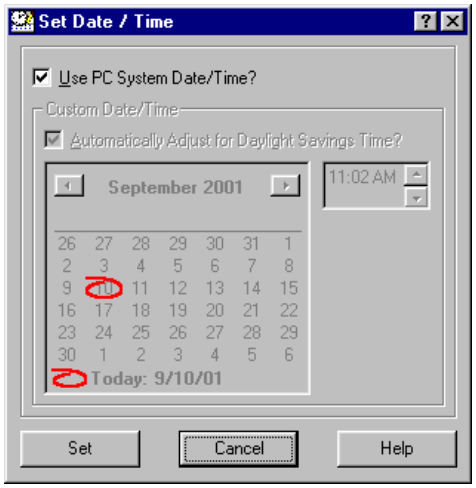
1. In the Active Device View, click the Unit tab. The status information for the controller appears.

2. Click the Configuration button. The Configuration dialog box appears with the Unit tab displayed (Figure 17 on page 20).

3. Under Time Format, click the option for the format in which you want the time to appear.

4. Under Display, click the Set Date/Time button. (If the Security Logon dialog box appears, log on.) The Set Date/Time dialog box appears (Figure 27 on page 38).

Figure 27. Set Date/Time dialog box



5. To select the date and time you want to use, choose one of the following options:
   - If you want to apply the current date and time settings of the PC to the controller, click to select the Use PC System Date/Time check box.
   - If you want to set the date and time for the controller yourself, click to clear the Use PC System Date/Time check box. Then click the date in the calendar and type the time. Click to select the check box if you want to automatically adjust the time for Daylight Savings Time.
6. Click the Set button to apply your changes.
7. Click the Download button to send your changes to the Tracer MP580/581. If the Security Logon dialog box appears, log on. Click Close to close the Configuration dialog box.

Configuring timers

Set up the occupied bypass, power-up control wait, and minimum send times for the Tracer MP580/581.

To set up timers:

1. In the Active Device View, click the Unit tab. The status information for the controller appears.
2. Click the Configuration button. The Configuration dialog box appears with the Unit tab displayed (Figure 17 on page 20).
3. In the Occupied Bypass Timer field, type the amount of time you want the controller to remain in occupied bypass mode.

   When a user overrides the controller to occupied bypass mode, it stays in this mode for the time specified here. This field is not available if

an SCC or DAC profile is active. If a profile is active, you must set the occupied bypass timer on the SCC or DAC Configuration tab.

4. In the Power-up Control Wait field, type the amount of time after power-up you want the controller to wait before controlling analog or binary outputs.
5. In the Minimum Send Time field, type the minimum number of seconds between the automatic output of network variable transmissions. Only one output network variable can be updated within a single minimum-send-time period.
6. Click the Download button to send your changes to the Tracer MP580/581.
7. Click Close to close the Configuration dialog box.

Configuring the operator display

You can view custom displays from the Rover service tool as well as from the Tracer MP580/581 operator display. So, custom displays are useful even when the Tracer MP580/581 does not have a local operator display connected. In addition, a portable operator display temporarily connected to the device uses the custom displays.

Use custom displays to logically group the information available in the Tracer MP580/581. Seven custom displays are available. The first display is a home display that contains a name and two items. The home display name appears as the title on the operator display. You can also name the other six custom displays. Each custom display consists of four screens of four items, for a total of up to 96 items.

Within a custom display, assign each line to display an input, output, or variable. Leave a display item blank to break a display into subgroups. Custom displays allow you to group information by category or by equipment, rather than by point type. For example, all the information pertinent to the cooling tower may be shown on one custom display. Variables and outputs may be changed or overridden from the custom displays if the items are configured as adjustable.

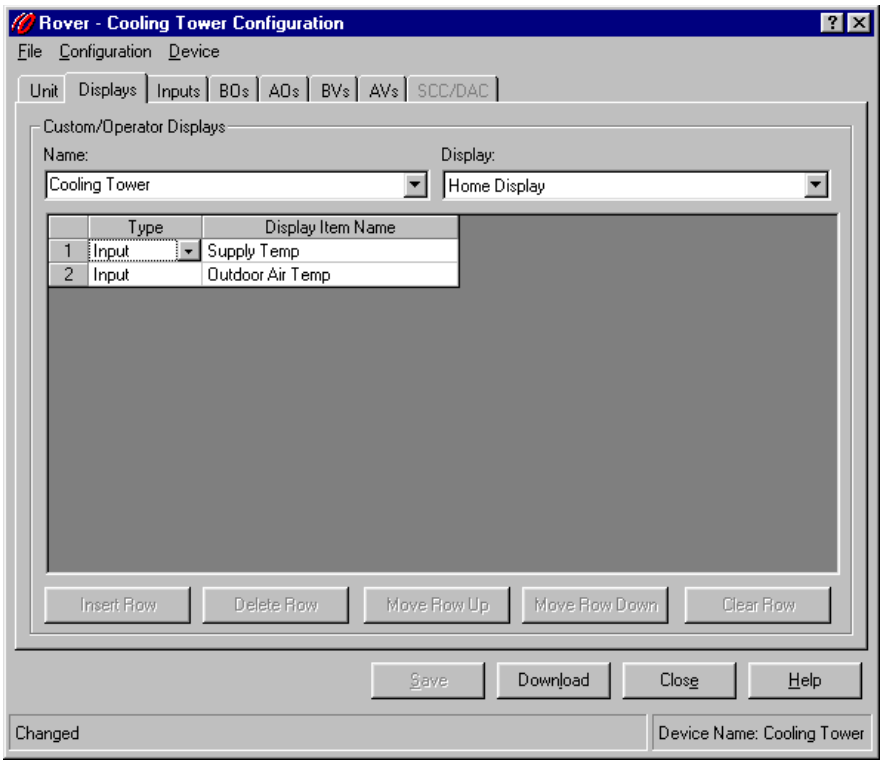
Configuring the home display

The home display contains a name or title and two items. The home display name appears as the title on the home screen of the operator display. The status of the two items is displayed on the home screen as well.

To set up the home display:

1. In the Active Device View, click the Displays tab. The status information appears for the custom displays.
2. Click the Configuration button. The Configuration dialog box appears with the Displays tab displayed (Figure 28).

Figure 28. Device configuration Displays tab



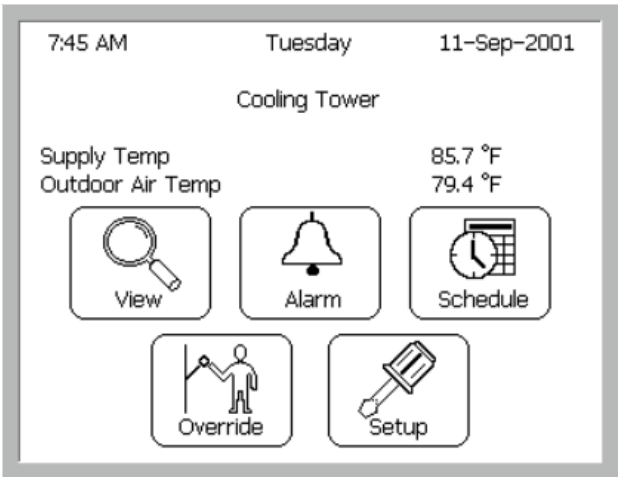
3. In the Name list, click Home Display. The configuration information appears in the tab.
4. If you want to change the display name, highlight the text and type a new name.

   Use a descriptive name because it appears on the operator display and the Active Device View workspace.
5. Click in the first row of the Type column. Click the down arrow. The Type list appears.
6. In the Type list, click the type of item you want to display.

   The types include: inputs, outputs, and variables.
7. Click in the first row of the Display Item Name column. Click the down arrow. The Display Item Name list appears.
8. In the Display Item Name list, click the name of the item you want to display.
9. Repeat steps 5–8 for row 2.
10. Complete one of the following options:
    - Click another display name in the Name list to edit another display.
    - Click another tab to set up another item.

- Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box. The changes appear on the operator display touch screen (Figure 29).

Figure 29. Home display on the operator display



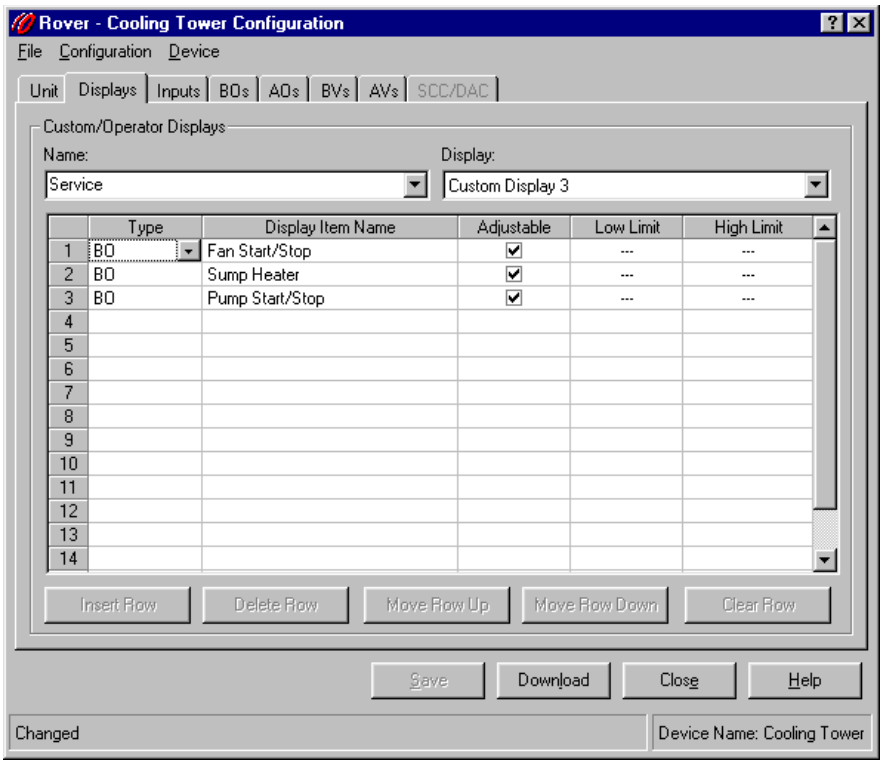
Configuring custom displays

You can set up six custom displays to be displayed in the Rover Active Device View workspace or on the operator display. Give each display a descriptive name and assign up to 16 items to the display.

To set up custom displays:

1. In the Active Device View, click the Displays tab. The status information for the custom displays appears.
2. Click the Configuration button. The Configuration dialog box appears with the Displays tab displayed (Figure 30 on page 42).

Figure 30. Device configuration Displays tab custom display



3. In the Name list, click the display you want to configure. The configuration information for that display appears in the tab.

   You can also select the display by clicking the display number in the Display list. The Name and Display lists are linked so that display name and display number are always displayed together.

4. If you want to change the display name, highlight the text and type the new name.

   Use a descriptive name because it appears on the operator display and the Active Device View workspace.

5. Click in the first row of the Type column. Click the down arrow. The Type list appears.

6. In the Type list, click the type of item you want to display.

   The types include: inputs, output, and variables.

7. Click in the first row of the Display Item Name column. Click the down arrow. The Display Item Name list appears.

8. In the Display Item Name list, click the name of the item you want to display.

9. For outputs and variables with an operator display/service tool control source, click to select the check box in the Adjustable column if you want the item to be adjustable.

   If a variable is adjustable, it can be changed from the operator display. For information on setting a variable control source, see “Configuring variables” on page 31. If an output is adjustable, it can be overridden from the operator display.

10. If the item is an analog output or variable, and it is adjustable, type the low and high limits in the columns.

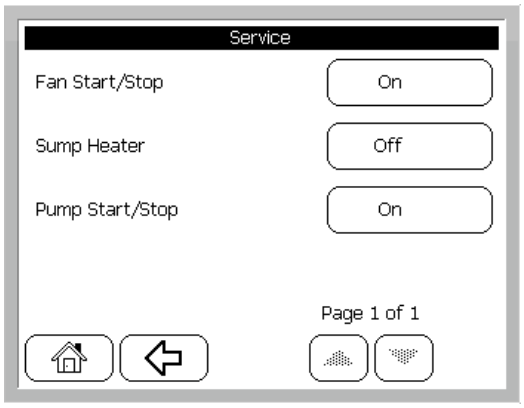
11. Repeat steps 5 through 10 for additional items you want in the custom display.

    Leave blank rows to separate groups of items in the display. Four items appear per screen on the operator display.

12. Complete one of the following options.

    - Click another display name in the Name list to edit another display.
    - Click another tab to set up another item.
    - Click the Download button to send your changes to the Tracer MP580/581. (If the Security Logon dialog box appears, log on.) Click Close to close the Configuration dialog box. The changes appear on the operator display custom screen (Figure 31).

Figure 31. Custom screen on the operator display



Configuring an SCC or DAC profile

You can set up the Tracer MP580/581 to provide a network interface according to the Space Comfort Controller (SCC) or Discharge Air Controller (DAC) profile. To implement a one of these profiles, you must complete the following:

- Activate the profile.
- Configure the interface.
- Write a program to implement the configured information. See sample programs in the Tracer graphical programming library.

To set up an SCC or DAC profile:

1. In the Active Device View, click the Unit tab. The status information for the controller appears.
2. Click the Configuration button. The Configuration dialog box appears with the Unit tab displayed (Figure 17 on page 20).
3. Click to select the Activate Profile check box.
4. Click the SCC option to provide a network interface following the SCC profile or click the DAC option to provide a network interface following the DAC profile.
5. Complete one of the following options:
   - Click the SCC or DAC tab to set up the interface. See the following sections for more information on configuring the interface.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Configuration dialog box

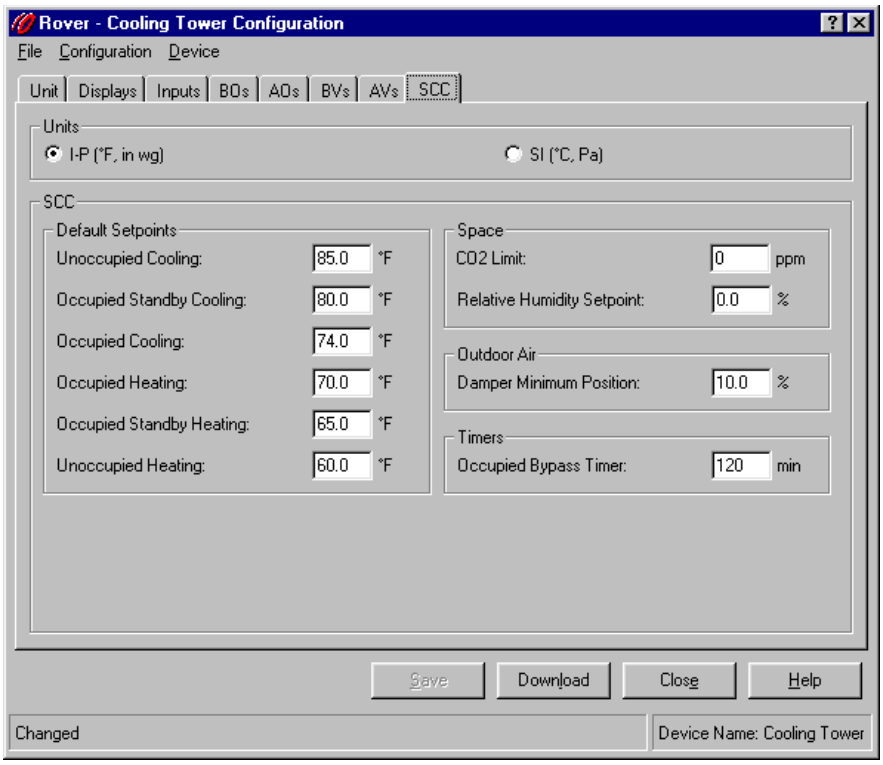
Configuring the SCC interface

To set the configuration parameters associated with the SCC profile:

1. In the Active Device View, click the Configuration button. The Configuration dialog box appears.
2. Click the SCC tab. The SCC configuration information appears (Figure 32).

Note:
This tab is available only when the SCC profile is active in the Tracer MP580/581.

Figure 32. Device configuration SCC tab



3. Under Units, click the display units option for the SCC profile configuration data.
4. Under Default Setpoints, type the heating and cooling default setpoints for the occupied, unoccupied, and standby modes.

Note:
You need to address only those fields that are used in the program to control the air-handling unit.

5. Under Space, type the CO_2 limit and the relative humidity setpoint.
6. In the Damper Minimum Position field, type the lowest position you want the outdoor air damper to reach.
7. In the Occupied Bypass Timer field, type the amount of time you want the controller to remain in occupied bypass mode.

   When a user overrides the controller to occupied bypass mode, it stays in this mode for the time specified here.
8. Click the Download button to send your changes to the Tracer MP580/581.
9. Click Close to close the Configuration dialog box.

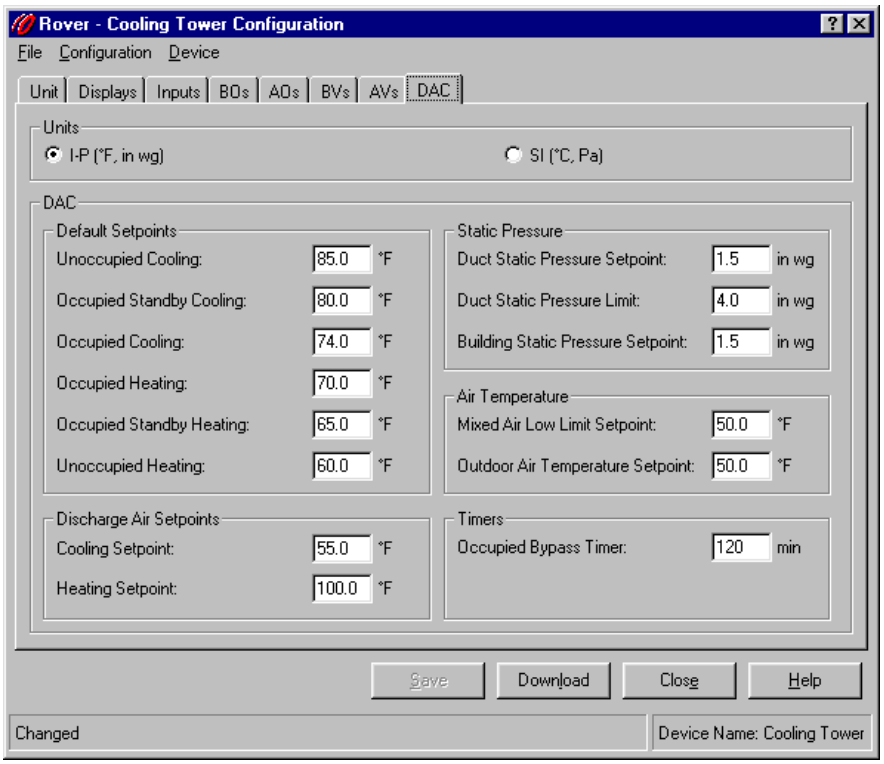
Configuring the DAC interface

To set the configuration parameters associated with the DAC profile:

1. In the Active Device View, click the Configuration button. The Configuration dialog box appears.
2. Click the DAC tab. The DAC configuration information appears (Figure 33).

Note:
This tab is available only when the DAC profile is active in the Tracer MP580/581.

Figure 33. Device configuration DAC tab



3. Under Units, click the display units option for the DAC profile configuration data.
4. Under Default Setpoints, type the heating and cooling default setpoints for the occupied, unoccupied, and standby modes.

Note:
You need to address only those fields that are used in the program to control the air-handling unit.

5. Under Discharge Air Setpoints, type the discharge air setpoints for the DAC profile.
6. Under Static Pressure, type the duct static pressure setpoint and limit and the building static pressure setpoint.

7. Under Air Temperature, type the mixed air temperature low-limit setpoint and the outdoor air temperature setpoint.
8. In the Occupied Bypass Timer field, type the amount of time you want the controller to remain in occupied bypass mode.

   When a user overrides the controller to occupied bypass mode, it stays in this mode for the time specified here.
9. Click the Download button to send your changes to the Tracer MP580/581. Click Close to close the Configuration dialog box.

Configuration reports

After configuring the Tracer MP580/581 controller, you can save and print reports that include the configuration parameters set up for the controller. These reports can be used to verify the appropriate specifications for the consulting engineer or to document the specifications for the customer.

Saving configuration reports

To save a configuration report:

1. In the Active Device View, click the Reports button. The Report Selection dialog box appears.
2. Click to select the check boxes for the configuration items you want in the report.
3. Click the Save to File button. A Save As dialog box appears.
4. Select or enter a file name for the data that will be saved. Click OK. The file is saved as a comma-separated values (CSV) file. Use a spreadsheet program, such as Microsoft Excel, to view the report.

Printing configuration reports

To print a configuration report:

1. In the Active Device View, click the Reports button. The Report Selection dialog box appears.
2. Click to select the check boxes for the configuration items you want in the report.
3. Click the Print button. The Print dialog box appears.
4. Select the appropriate printer and set the print properties. Click OK.
5. Click OK. The report prints.

Memory reset

If you have security privileges to do so, you can reset the memory of the controller. Resetting the memory removes all data in the controller database and returns the controller settings back to factory defaults.

Note:
This features applies to only Tracer MP580/581 Firmware Revision 2 or higher. Follow the procedure for "Viewing Comm5 parameters" on page 13 to view your current revision number.

To reset memory:

1. In the Active Device View, click the Configuration button. The Configuration dialog box appears.
2. From the Devices menu, choose Reset Memory. The Reset Memory dialog appears. (If the Security Logon dialog box appears, log on.)
3. Click the Yes button. The Reset Memory dialog box closes, and the Rover service tool loses communication with the controller.
4. Click Close to close the Configuration dialog box.
5. From the Group menu, choose Discover to re-establish communication between the Rover service tool and the controller.

Unlocking controller for flash download

The Tracer MP580/581 controller is a host-based controller. Host-based controllers with flash memory can receive a flash download of new firmware. If security is enabled and you have security privileges, you can unlock the controller to enable flash downloading. If security is disabled for all users, unlocking is not required.

Note:
Unlocking the controller applies to only Tracer MP580/581 Firmware Revision 2 or higher. If you have a Revision 1.xx controller, you can perform a flash download without unlocking the controller. Follow the procedure for "Viewing Comm5 parameters" on page 13 to view your current revision number.

To unlock the controller:

1. In the Active Device View, click the Configuration button. The Configuration dialog box appears.
2. From the Devices menu, choose Unlock Device. (If the Security Logon dialog box appears, log on.)
3. Backup files as necessary.
4. For details regarding flash downloading (refer to "Performing a Flash Download" in the *Rover Operation and Programming* guide, EMTX-SVX01C-EN).

Chapter 4

Using the Schedule application

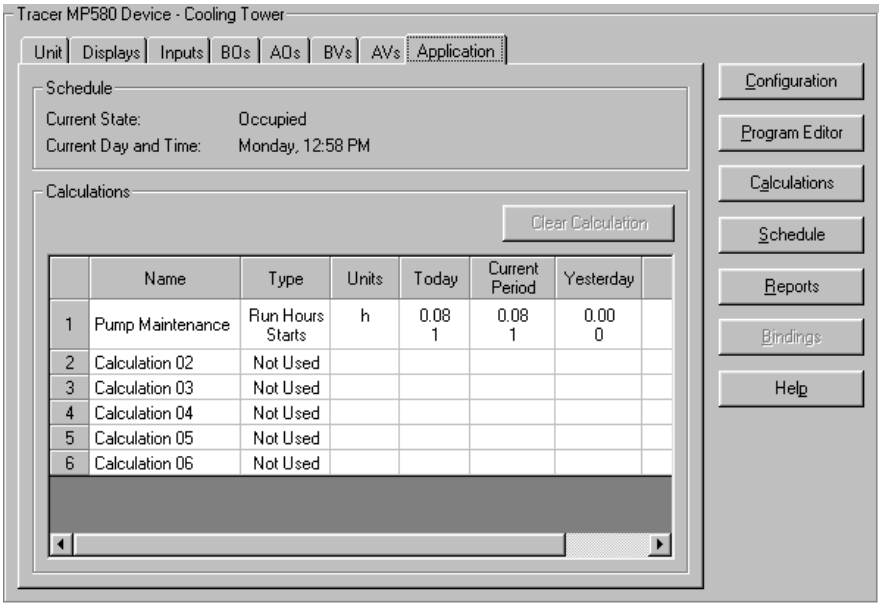
The Tracer MP580/581 plug-in includes a schedule application that you can use to set up a local schedule. The local schedule functions only when a non-portable operator display is connected the controller. The local schedule is used only if Tracer Summit is not communicating on the link. Use the information in this chapter to set up the local daily schedule and exceptions for the Tracer MP580/581 controller.

Viewing the status of the time-of-day schedule

To view the status of the time-of-day schedule:

- In the Active Device View, click the Application tab. The status of the Tracer MP580/581 applications appears. The current mode of the schedule and the current day and time of the controller appear under Schedule (Figure 34).

Figure 34. Time of day schedule status

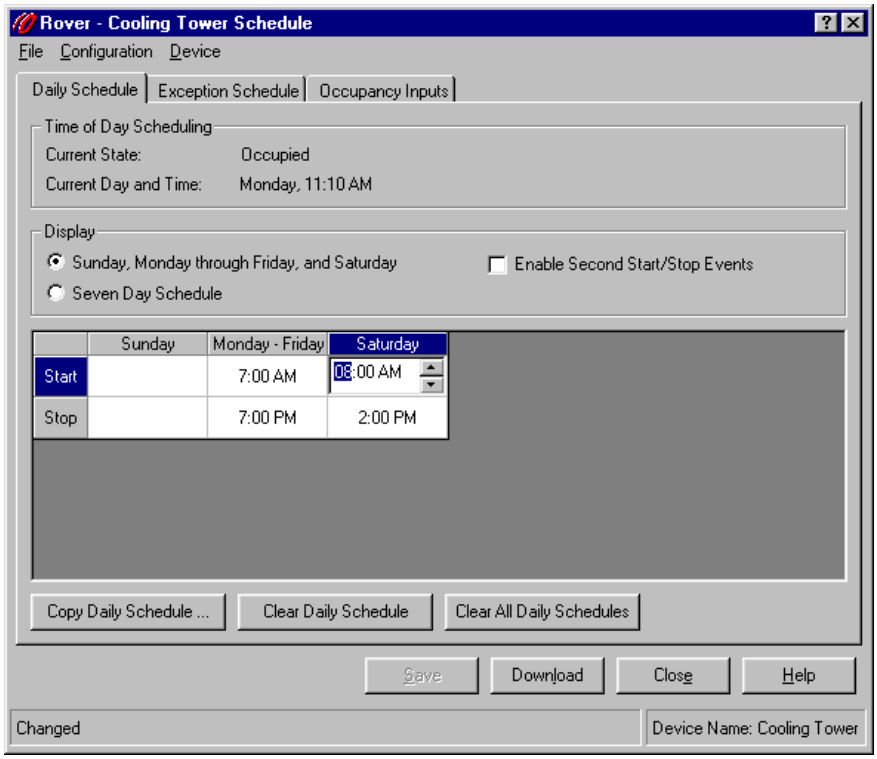


Setting up the daily schedule

To set up the daily schedule:

1. In the Active Device View, click the Schedule button. The Schedule dialog box appears (Figure 35).

Figure 35. Daily Schedule tab in Schedule application



2. Under Display, click the option for the type of schedule you want. The daily schedule table changes to include the appropriate number of columns.

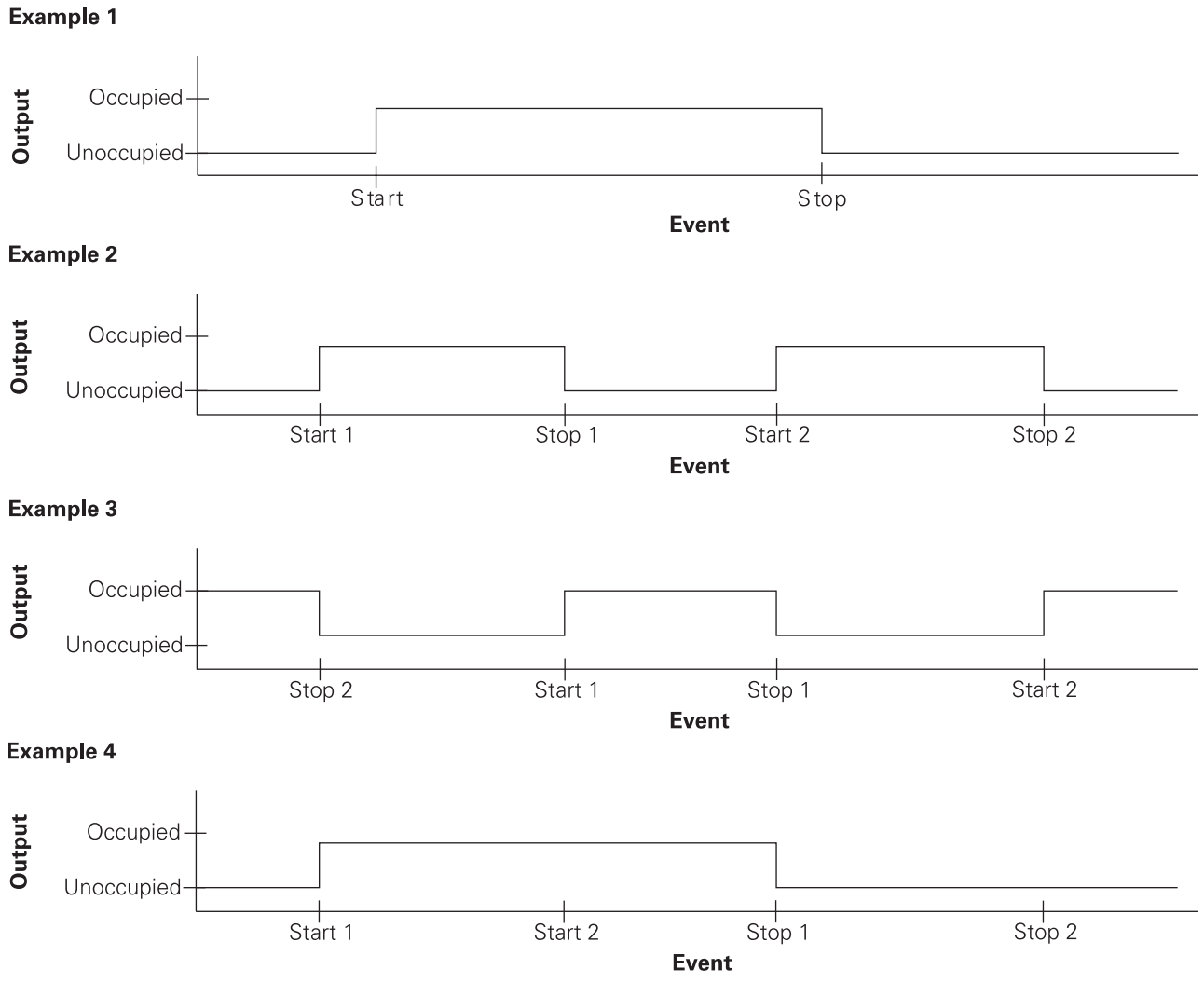
   If you want to use the same schedule for Monday through Friday, click the Sunday, Monday through Friday, and Saturday option. Click the Seven Day Schedule option if you want to specify a different schedule for each day of the week.

3. Under Display, click to select the Enable Second Start/Stop Events check box if you want to include a second set of start and stop times to

the daily schedules. Another set of Start and Stop rows appears in the daily schedule table.

Note:
The controller does not check event order. It always implements the last commanded mode. This implies that you could have two starts or two stops in a row in a single day. Figure 36 illustrates some examples of event orders. For Example 3, assume that the previous day ended with a start event. Example 4 shows the schedule output in the case of two start and stop events in a row. The second event of the same type is ignored.

Figure 36. Start and stop time examples



4. In the daily schedule table, click in the cell for the day-of-the-week start time.
5. Type the time you want the occupancy to start.

6. Repeat steps 4 and 5 until you have all the start and stop times you want entered.

   If you want no occupied time for a day, enter only a stop time for that day.

7. Complete one of the following options.
   - Make more changes.
   - Click another tab in the Schedule application.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Schedule dialog box.

Clearing a start or stop time

To clear a start or stop time:

1. In the Active Device View, click the Schedule button. The Schedule dialog box appears.
2. In the daily schedule table, select the start or stop time you want to clear.
3. Press the Delete key.
4. Complete one of the following options.
   - Make more changes.
   - Click another tab in the Schedule application.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Schedule dialog box.

Clearing the event times for a day

If event start and stop times have been entered for a particular day and you do not want any events scheduled for that day, clear the event times for that day.

To clear the event times for a day:

1. In the Active Device View, click the Schedule button. The Schedule dialog box appears.
2. In the daily schedule table, click the name of the day you want to clear.
3. Click the Clear Daily Schedule button. The start and stop times for that day are cleared.
4. Complete one of the following options.
   - Make more changes.
   - Click another tab in the Schedule application.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Schedule dialog box.

Clearing all daily event times

To remove all daily event times at once:

1. In the Active Device View, click the Schedule button. The Schedule dialog box appears.
2. Click the Clear All Daily Schedules button. All start and stop times are cleared from the table.
3. Complete one of the following options.
   - Make more changes.
   - Click another tab in the Schedule application.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Schedule dialog box.

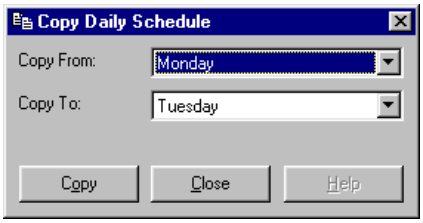
Copying a daily schedule

To speed set up and editing time, enter the start and stop times for one day and then copy that schedule to another day.

To copy a daily schedule:

1. In the Active Device View, click the Schedule button. The Schedule dialog box appears.
2. Click the Copy Daily Schedule button. The Copy Daily Schedule dialog box appears (Figure 37).

Figure 37. Copy Daily Schedule dialog box



3. In the Copy From list, click the day you want to copy the schedule from.
4. In the Copy To list, click the day you want to copy the schedule to.
5. Click the Copy button. A message appears stating that the schedule has been copied.
6. Click OK. The new schedule appears in the table.
7. Copy additional schedules or click Close to close the Copy Daily Schedule dialog box.
8. Complete one of the following options.
   - Make more changes.
   - Click another tab in the Schedule application.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Schedule dialog box.

Setting up the exception schedule

An exception is a period of time that does not follow the regular schedule—for example, a holiday or an unusual work day or event. You can add, edit, or clear exceptions to the schedule.

Note:
An exception is cleared automatically once the current date is past the exception stop date.

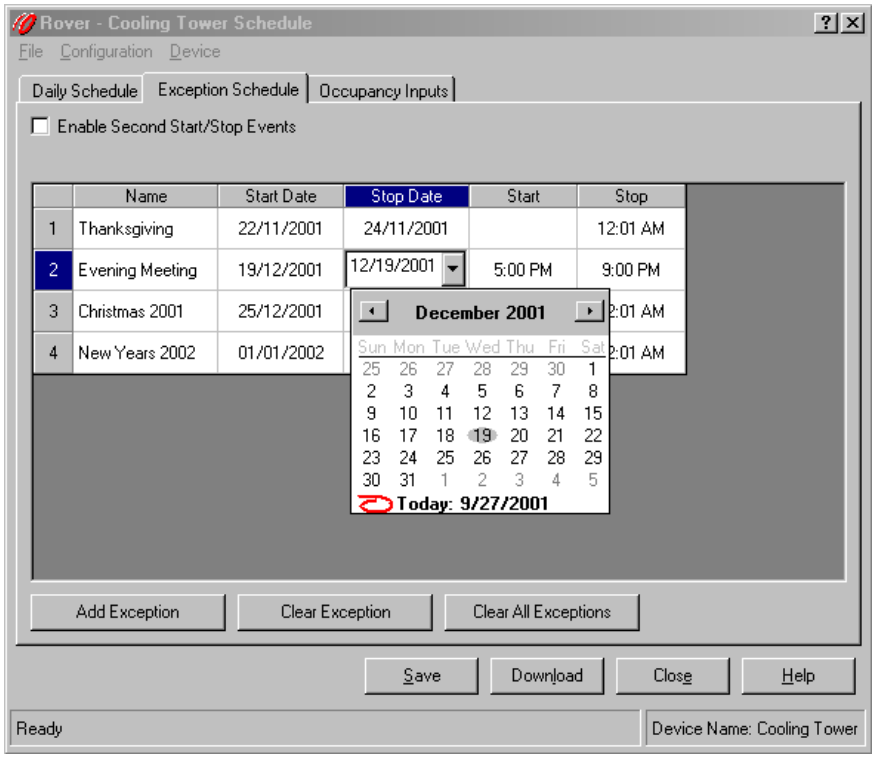
Adding an exception

You can set up a maximum of 20 exceptions.

To add an exception:

1. In the Active Device View, click the Schedule button. The Schedule dialog box appears.
2. Click the Exception Schedule tab (Figure 38 on page 54).

Figure 38. Exception Schedule



3. Click the Add Exception button. A blank exception row appears in the table.

4. Type a new name, such as New Years 2002.

Note:
Click and drag the column splitters to adjust the width of the columns in the table.

5. Click the start date.
6. Highlight the text and type a new date or click the down arrow to select from the calendar.
7. Enter the stop date, start time, and stop time.

   If you want an exception event to have no occupied time, delete the start time and enter only a stop time, such as 12:00 A.M. The request remains unoccupied until the next start time in the schedule.
8. If you want a second start and stop time, click to select the Enable Second Start/Stop Event check box.

   The controller does not check event order. It always implements the last commanded mode. This implies that you could have two starts or two stops in a row in a single day. Figure 36 on page 51 illustrates some examples of event orders.
9. Complete one of the following options.
   - Make more changes.
   - Click another tab in the Schedule application.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Schedule dialog box.

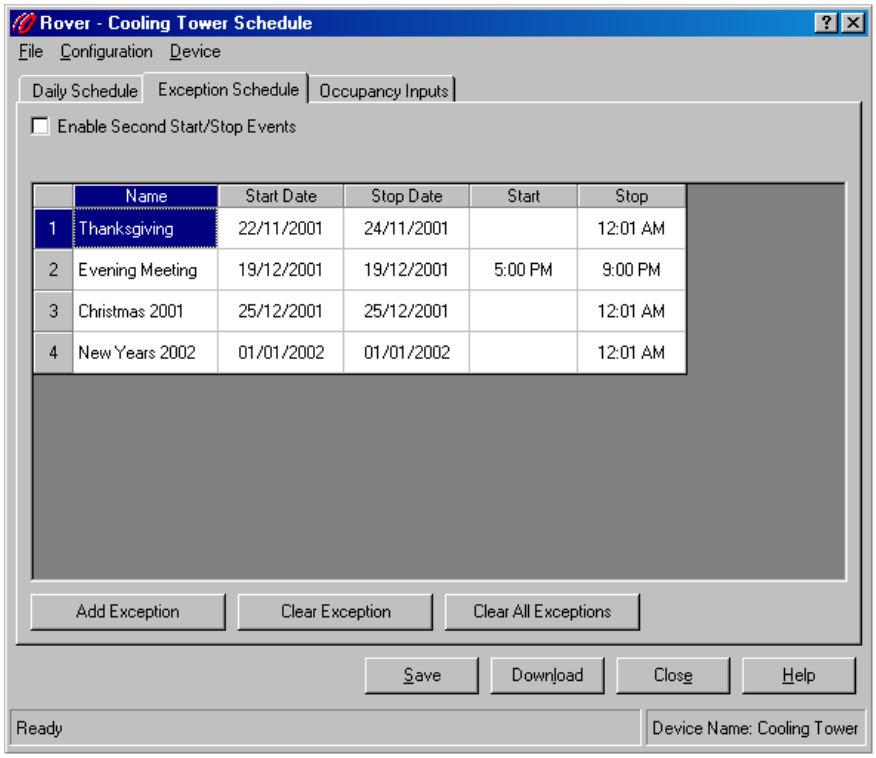
Clearing an exception

Clear an exception if you want to follow the normal schedule rather than a previously entered exception.

To clear an exception:

1. In the Active Device View, click the Schedule button. The Schedule dialog box appears.
2. Click the Exception Schedule tab.
3. Click in the row of the exception that you want to clear (Figure 39).

Figure 39. Exception row selected



4. Click the Clear Exception button. The exception is removed from the table.
5. Complete one of the following options.
   - Make more changes.
   - Click another tab in the Schedule application.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Schedule dialog box.

Editing an exception

To change existing exceptions to the schedule:

1. In the Active Device View, click the Schedule button. The Schedule dialog box appears.
2. Click the Exception Schedule tab.
3. Click the item in the row of the exception you want to change.
4. Highlight the text and type a value.
5. If you want a second start and stop time, click to select the Enable Second Start/Stop Event check box.

6. Complete one of the following options.
   - Make more changes.
   - Click another tab in the Schedule application.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Schedule dialog box.

Setting up occupancy inputs

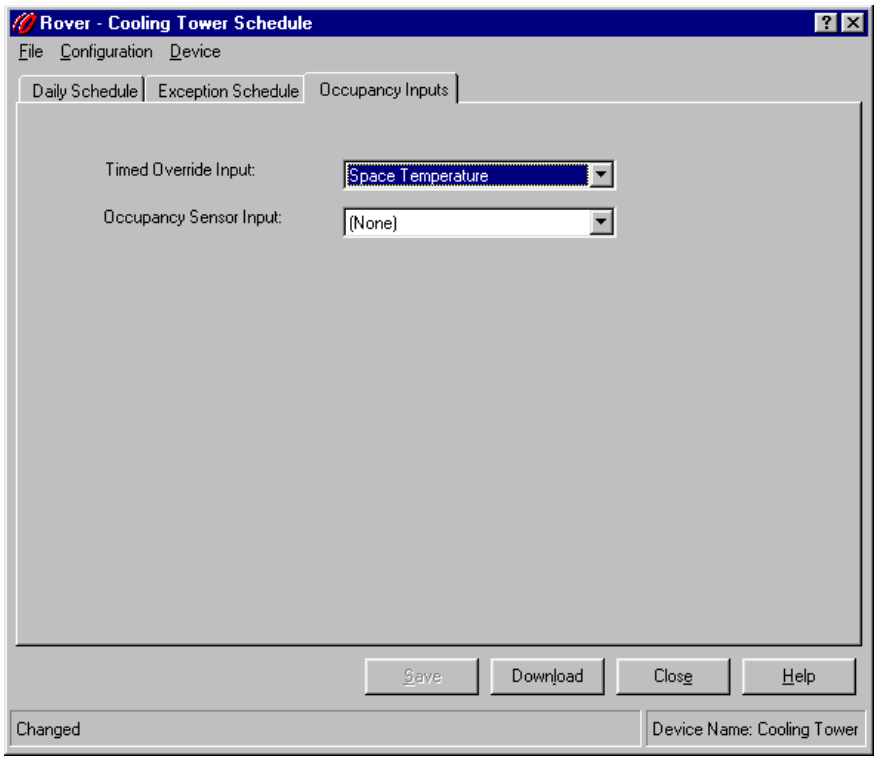
The effective occupancy of the Tracer MP580/581 controller can be changed also by other inputs. A timed override is initiated by pressing the ON button on a Trane zone sensor. A timed override request changes the occupancy mode from unoccupied to occupied bypass. The controller remains in occupied-bypass mode until the bypass timer times out or the CANCEL button on the sensor is pressed.

Note:
Although the occupancy input override request affects the occupancy mode of the Tracer MP580/581 controller, programming is required for the equipment controlled by the Tracer MP580/581 to react to this request. See Chapter 8, “Using the Occupancy and PID blocks” for more information.

To set up occupancy inputs:

1. In the Active Device View, click the Schedule button. The Schedule dialog box appears.
2. Click the Occupancy Inputs tab (Figure 40 on page 58).

Figure 40. Occupancy Inputs tab in Schedule application



3. In the Timed Override Input list, click the universal input you want to act as the timed override input for the controller.

   To appear in the list, the input must be configured as a thermistor. This input causes the controller to go to the occupied bypass mode. It stays in occupied bypass mode for the time set up as the occupied bypass timer.

4. In the Occupancy Sensor Input list, click the universal input you want to act as the hard-wired occupancy sensor to the controller.

   To appear in the list, the universal input must be configured as a binary input. This input controls the controller occupancy to occupied or unoccupied depending on the control source for the schedule. See Table 2 on page 62 for more information.

5. Complete one of the following options.

   - Make more changes.
   - Click another tab in the Schedule application.
   - Click the Download button to send your changes to the Tracer MP580/581 and click Close to close the Schedule dialog box.

Synchronizing time with Tracer Summit

Time synchronization of the Tracer MP580/581 controller with the Tracer Summit building automation system occurs automatically once a day or when the controller is powered up. The controller must be successfully communicating for the synchronization to occur.

Controlling the occupancy mode of the Tracer MP580/581

The occupancy mode of the Tracer MP580/581 controller can be controlled by the Schedule application, the operator display, a Rover service tool override, and the Tracer Summit system. Because there are several sources of control, there is an implied priority table. Table 2 on page 62 is a diagram of the priority list.

The highest priority is given to a request from the operator display or the Rover service tool. Both sources have the same priority level. The next highest priority is the building automation system (BAS), often the Tracer Summit system. The BAS request is initiated as long as all overrides from the operator display or Rover service tool have been released. Third on the list of priorities is the Tracer MP580/581 Schedule application local schedule.

The local schedule is used only if valid times are entered in the schedule table, and one of the following criteria is met.

- The controller is connected to an operator display (non-portable).
- Fifteen minutes have passed since the BAS lost communications.
- No overrides are present from the operator display or the Rover service tool.

If there are no times entered in the schedule table and no schedule request is available, the fourth and fifth items in the priority list are the communicated occupancy sensor and the local occupancy sensor, respectively. The default to occupied is the lowest on the list of priorities. If nothing is controlling the device, the controller remains in occupied mode.

Manual command

If an occupancy override is requested, the occupancy information is communicated to the Tracer MP580/581 from the variable nviOccManCmd or as an override from the operator display or Rover service tool. This manual command takes priority over any other occupancy request. If the operator display is unplugged with an active override, the occupancy request remains in the override state. There is no time out, just as with nviOccManCmd.

If power is lost, the operator display override value is stored in EEPROM and is restored when power returns. This is not the same as nviOccManCmd. The value of nviOccManCmd is lost when power is lost and is Null when power returns.

For more information about the manual command request priority, see Table 2 on page 62. For more information about network variable inputs, see Chapter 10, “Network variable bindings.”

Time schedule

Building automation systems normally communicate an occupancy request using the occupancy schedule input. The controller receives the communicated occupancy schedule from the network variable input nviOccSchedule. An occupancy schedule may also be communicated locally through the Schedule application. The local schedule could be from the week-day schedule or the exception schedule. The occupancy request from nviOccSchedule, sent from a BAS, takes priority over the local schedule.

For more information about the time schedule request priority, see Table 2 on page 62. For more information about network variable inputs, see Chapter 10, “Network variable bindings.”

Occupancy sensor

Some occupancy sensors may be equipped with the ability to communicate an occupancy mode to the controller. In such sensors, network variable input nviOccSensor is used to communicate occupancy to the controller. The controller must be using the SCC profile to use this variable.

For more information about an occupancy sensor request priority, see Table 2 on page 62. For more information about network variable inputs, see Chapter 10, “Network variable bindings.”

Occupancy binary input

A binary input on the controller can be used as an occupancy input if it is set up on the Occupancy Inputs tab in the Schedule application. For stand-alone controllers (any unit not receiving a communicated occupancy request, typically from a building automation system), the occupancy binary input determines the occupancy of the unit based on the hard-wired signal. Normally, the signal is hard-wired to a binary switch or time clock.

For controllers that receive a communicated occupancy request from a building automation system, the hard-wired occupancy binary input is used with a communicated occupancy request to place the controller in either occupied mode or occupied standby mode.

If both a hard-wired input and a communicated input exist, the communicated input is used. For more information about occupancy binary input request priority, see Table 2 on page 62.

Bypass timer

The bypass timer is set to the value in the Occupied Bypass Timer field every time the controller receives one of the following messages:

- nviOccManCmd = bypass
- Operator display override = bypass
- Timed override ON request from the local zone sensor (The zone sensor ON button is pushed and released within 5 seconds.)

After the bypass timer is set to the value in the Occupied Bypass Timer field, it counts down to zero. The bypass timer is cleared every time the controller receives one of the following messages:

- nviOccManCmd = occupied, unoccupied, standby, or null
- Operator display override = occupied, standby, or null
- Timed override CANCEL request from the local zone sensor (The zone sensor CANCEL button is pushed and released within 25 seconds.)

To disable the bypass timer, type 0 (zero) in the Occupied Bypass Timer field. This effectively disables the zone-sensor timed-override ON function, the operator-display schedule override-bypass enumeration, and the nviOccManCmd-bypass enumeration.

Note:
Although the bypass request affects the occupancy mode of the Tracer MP580/581 controller, programming is required for the equipment controlled by the Tracer MP580/581 to react to this request. See Chapter 8, “Using the Occupancy and PID blocks” for more information.

Table 2 shows the occupancy result of the hard-wired input, network inputs, or local schedule. The columns marked with a dash (—) represent inputs that are not considered in the occupancy arbitration.

Table 2. Effective occupancy arbitration for Tracer MP580/581 with operator display

Manual override[1] (nviOccManCmd)	Communicated schedule (nviOccSchedule)	Local schedule	Occupancy sensor (nviOccSensor[2])	Local occupancy binary input	Bypass timer[3]	Result (nvoEffectOccup)
Occupied	—	—	—	—	—	Occupied
Unoccupied	—	—	—	—	zero	Unoccupied
					not zero	Bypass
Bypass	Occupied	—	—	—	—	Occupied
	Unoccupied	—	—	—	zero	Unoccupied
					not zero	Bypass
	Standby	—	—	—	zero	Standby
					not zero	Bypass
	Null	Occupied	—	—	—	Occupied
		Unoccupied	—	—	zero	Unoccupied
					not zero	Bypass
		Null	Occupied	—	—	Occupied
			Unoccupied	—	zero	Unoccupied
					not zero	Bypass
			Null	Occupied	—	Occupied
				Unoccupied	zero	Unoccupied
					not zero	Bypass
				Not present	—	Occupied
Standby	—	—	—	—	zero	Standby
					not zero	Bypass

1 This value is the last enumeration received. It can come from either the nviOccManCmd network variable or the operator display schedule override.

2 The variable nviOccSensor is used with the SCC profile only. Refer to the Null rows in this column for the DAC profile.

3 This value represents whether or not the bypass timer is at zero or not. When a bypass request is made, the timer is set to the value specified in the Occupied Bypass Timer field, and it begins to count down. While it is counting down, the value is not zero. When the count down is complete, the value is zero.

Table 2. Effective occupancy arbitration for Tracer MP580/581 with operator display (Continued)

Manual override[1] (nviOccManCmd)	Communicated schedule (nviOccSchedule)	Local schedule	Occupancy sensor (nviOccSensor[2])	Local occupancy binary input	Bypass timer[3]	Result (nvoEffectOccup)
Null	Occupied	—	Occupied	—	—	Occupied
			Unoccupied	—	zero	Standby
					not zero	Bypass
			Null	Occupied	—	Occupied
				Unoccupied	zero	Standby
					not zero	Bypass
				Not present	—	Occupied
	Unoccupied	—	—	—	zero	Unoccupied
					not zero	Bypass
	Standby	—	—	—	zero	Standby
					not zero	Bypass
	Null	Occupied	Occupied	—	—	Occupied
			Unoccupied	—	zero	Standby
					not zero	Bypass
			Null	Occupied	—	Occupied
				Unoccupied	zero	Standby
					not zero	Bypass
				Not present	—	Occupied
		Unoccupied	—	—	zero	Unoccupied
					not zero	Bypass
		Null	Occupied	—	—	Occupied
			Unoccupied	—	zero	Unoccupied
					not zero	Bypass
			Null	Occupied	—	Occupied
				Unoccupied	zero	Unoccupied
					not zero	Bypass
				Not present	—	Occupied

1 This value is the last enumeration received. It can come from either the nviOccManCmd network variable or the operator display schedule override.

2 The variable nviOccSensor is used with the SCC profile only. Refer to the Null rows in this column for the DAC profile.

3 This value represents whether or not the bypass timer is at zero or not. When a bypass request is made, the timer is set to the value specified in the Occupied Bypass Timer field, and it begins to count down. While it is counting down, the value is not zero. When the count down is complete, the value is zero.

Chapter 5

Using the Calculations application

If there is a Tracer Summit system on the active link, use its totalization application to totalize pulse accumulations. If there is no Tracer Summit system on the active link, the Tracer MP580/581 plug-in includes the Calculations application that you can use to totalize pulse accumulations.

This application is easy to set up and apply to electrical monitoring, fluid flow, and other metering and monitoring functions. It can also be used to calculate runtime and starts for equipment. You do not have to do custom programming to calculate runtime. You can run up to six calculations. Use this application only for non-billing purposes.

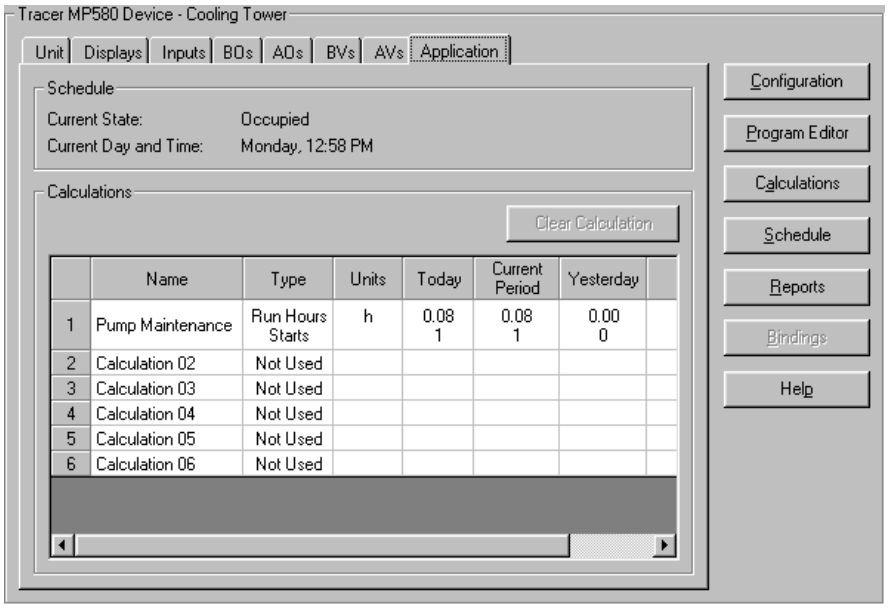
Viewing the status of a calculation

In the Rover service tool, view the status of a calculation, including its name, type, current value, and units. You can also view the accumulated values for the calculation.

To view the status of a calculation:

- In the Active Device View, click the Application tab. The status of the Tracer MP580/581 applications appears (Figure 41 on page 66).

Figure 41. Calculations application status



Setting up a calculation

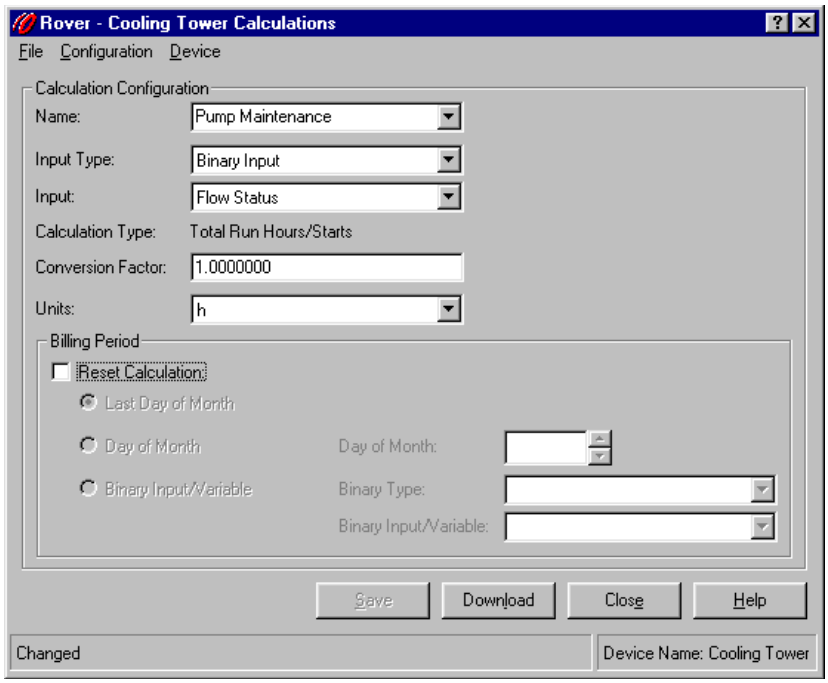
Set up the calculation name, input type, input, conversion factor, and units. Use the conversion factor and the units to make the value displayed in the Rover service tool more meaningful.

When you choose the input type, you also choose the calculation type. If an analog or pulse input is chosen, a totalization is performed. The calculation output is the sum of the pulse input values multiplied by the conversion factor. If a binary input type is chosen, the Tracer MP580/581 calculates run hours and starts. The output is incremented every minute a binary value is true. Starts are incremented every time a binary value changes from off to on.

To set up a calculation:

1. In the Active Device View, click the Calculations button. The Calculations dialog box appears (Figure 42 on page 67).

Figure 42. Calculations dialog box



2. In the Name list, click the calculation you want to set up. The configuration information for that calculation appears.
3. If you want to change the calculation name, highlight the text and type a new name.
4. In the Input Type list, click the type of input you want the calculation to use.

   This selection also controls what type of calculation occurs. If you select either an analog input or pulse input, the calculation type is a totalization. If you choose a binary input, Tracer Summit binary variable, local binary variable, or network variable input, the calculation type is total run hours and starts. See Table 3 for a list of the input types and their corresponding calculation types and available points.

Table 3. Input type selections

Input type	Calculation type	Available points
Analog input	Totalization	Universal inputs configured as Linear (0–20 mA) Universal inputs configured as Linear (0–10 VDC)
Binary input	Total run hours/ Starts	Universal inputs configured as Binary
Pulse input	Totalization	Universal inputs configured as Pulse

Table 3. Input type selections (Continued)

Input type	Calculation type	Available points
Tracer Summit binary variable	Total run hours/ Starts	All Tracer Summit binary variables (1–30)
Local binary variable	Total run hours/ Starts	All local binary variables (1–120)
Network variable (nviSwitch)	Total run hours/ Starts	All generic network variables nivSwitch01 to nviSwitch40

5. In the Input list, click the input you want to use in the calculation.
6. If the input is not a binary input, type a number in the Conversion Factor field.

   This value is used to convert the raw calculation into a more meaningful value. The default value is 1 and is good for many configurations. The conversion factor used here does not affect the value sent to the Tracer Summit system. Click the Help button to see a table of common conversion factors.
7. In the Units list, click the display units for the calculation output.
8. If you want to reset the current calculation values to zero at a specific time or when an event occurs, click to select the Reset Calculation check box and go to step 9. If you do not want to reset the calculation, go to step 13.

   Resetting the calculation moves the current-period value to the last-period value and sets the today, yesterday, and current-period value to zero.
9. Click the option for the time you want the calculation reset.
   - If you want the calculation reset at 12:00 A.M. on the day after the last day of the month, click the Last Day of Month option and go to step 13. The value just before the reset is saved as the last-period value.
   - If you want the calculation reset at 12:00 A.M. the day after a defined day of the month, click the Day of Month option and go to step 10.
   - If you want the calculation reset when a binary point changes from off to on, click the Binary Input/Variable option and go to step 11.
10. In the Day of Month list, click the day of the month you want the calculation reset and go to step 13. The calculation is reset to zero at 12:00 A.M. on the day after this day, and the value just before the reset is saved as the last-period value.

11. In the Binary Type list, click the type of binary point you want to control the calculation reset. See Table 4 for a list of the binary points available for each input type.

    The calculation restarts when the binary point changes back to off. The value just before the reset is saved as the last-period value.

Table 4. Binary input types

Input type	Available points
Binary input	Universal inputs configured as binary
Tracer Summit binary variable	All Tracer Summit binary variables (1–30)
Local binary variables	All local binary variables (1–120)
Network variable	All generic network variables nviSwitch01 to nviSwitch40

12. In the Binary Input/Variable list, click the binary input or variable you want to control the calculation reset. The calculation is reset to zero when this binary point changes from off to on, and the value just before the reset is saved as the last-period value.
13. Complete one of the following options:
    - Click another calculation name in the Name list to edit another calculation.
    - Click the Download button to download your changes to the Tracer MP580/581 and click Close to close the Calculations dialog box.

Clearing a calculation

Use the Clear Calculation button to manually set all calculation values (today, current period, yesterday, and last period) to zero.

To clear a calculation:

1. In the Active Device view, click the Application tab. The status of the applications appears.
2. In the Calculations table, click the name of the calculation you want to reset.
3. Click the Clear Calculation button. A message appears asking if you want to set the data to zero.
4. Click Yes. All the calculation values are set to zero.
5. Complete one of the following options:
    - Click another calculation name in the Name list to edit another calculation.
    - Click the Download button to download your changes to the Tracer MP580/581 and click Close to close the Calculations dialog box.

Chapter 6

Graphical programming overview

Use the Tracer graphical programming (TGP) editor to create and modify programs for the Tracer MP580/581 controller. The programs are stored in the controller with their graphical representations and can be uploaded and modified or re-used.

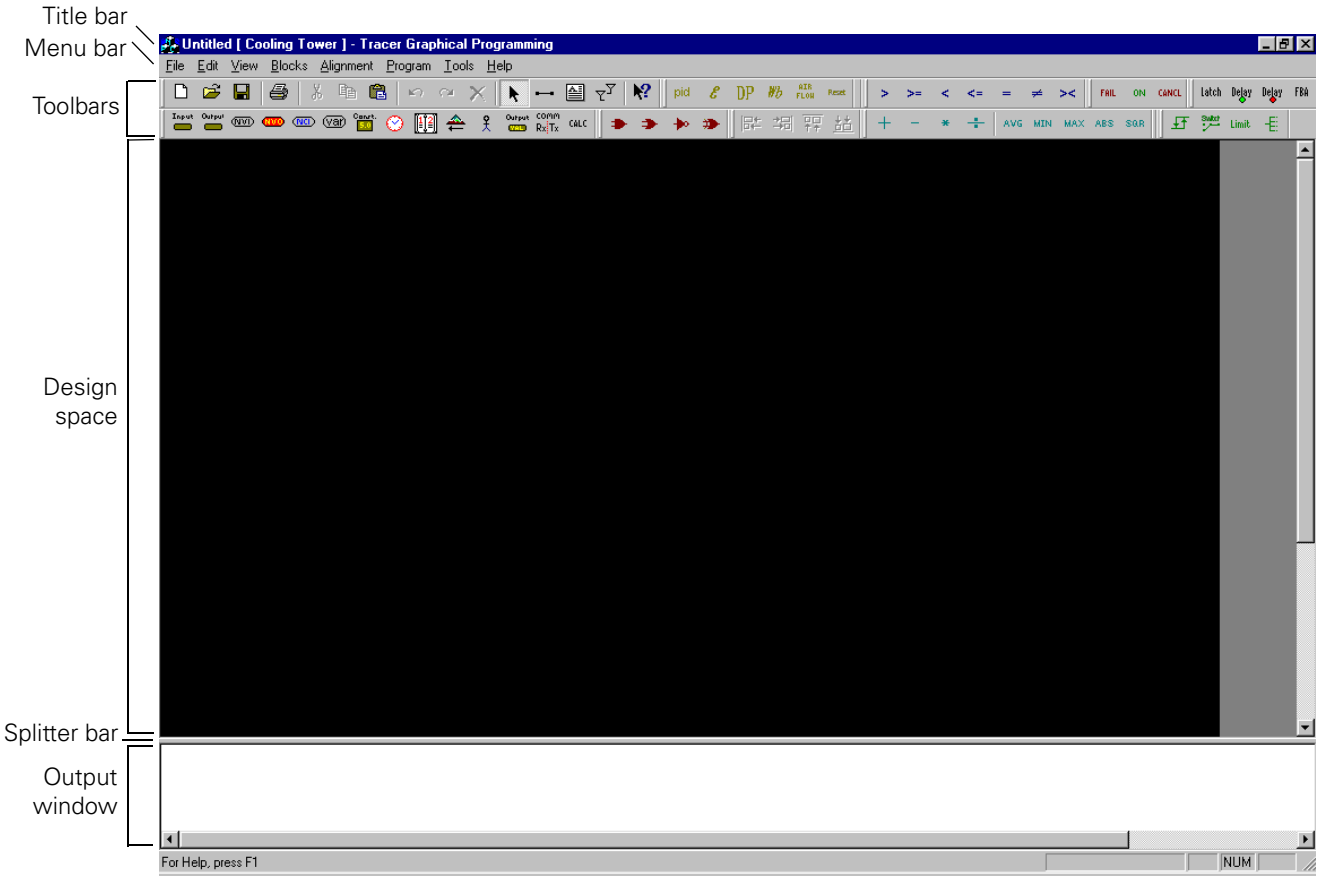
This guide includes basic instructions to introduce you to the editor. The TGP editor includes sample programs for common applications, such as cooling towers and air handlers. For a step-by-step tutorial on how to use the TGP editor, see the *Tracer Graphical Programming* applications guide (CNT-APG001-EN).

Opening the TGP editor

To open the TGP editor:

- In the Active Device View, click the Program Editor button. The TGP editor appears with a blank program in the design space (Figure 43 on page 72).

Figure 43. TGP editor running in Rover service tool



TGP editor

The TGP editor screen includes the design space, output display, blocks, menu bar, toolbars, and shortcut menus.

Design space

The design space is the area in which you can draw graphical programs.

Output display

The output display is the area in which results from building a graphical program appear.

To show or hide the output display:

- From the View menu, choose Output Display. If Output Display is checked, the output display is shown.

Note:
If you still cannot see the output display, the splitter bar may be too low. To move it up, make sure the status bar is visible and click under the design space. Move the splitter bar up.

Blocks

Graphical programming blocks are the fundamental objects used to write a program in the TGP editor. Each block serves a specific purpose. Connecting these blocks in a given arrangement determines how the program behaves. A program consists of a combination of graphical programming blocks connected to perform a logical task.

Figure 44 illustrates the basic structure of a graphical programming block. The connection points on the left side of the block are called input ports. Input ports pass data into the block. Connections on the right side of the block are called output ports. Output ports pass data out of the block.

Figure 44. Block structure

Note:
For further information on specific graphical programming blocks, see the blocks reference in the online Help.

Menu bar

The menu bar at the top of the TGP editor contains drop-down menus for working with TGP programs. Use the File menu to open new and existing program files as well as to save programs and set program properties. Use the Edit menu to undo and redo the last action made in the editor. This menu also includes options for cutting, copying, pasting, and deleting program elements.

Use the View menu to set up the editor window. The Blocks menu includes options for placing blocks in the design space. Use the Alignment menu to align blocks in the design space. The Tools menu includes options for working with your program. Use the Help menu to access the extensive TGP online Help and to find more information about the TGP editor.

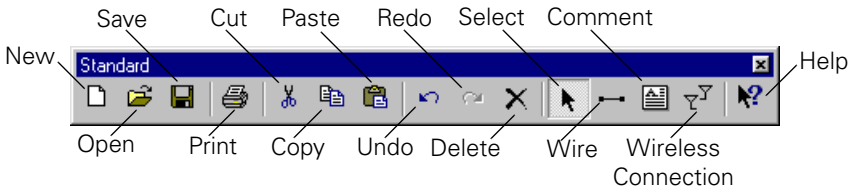
Toolbars

The TGP editor includes toolbars that provide buttons you can press to complete common tasks.

Standard toolbar

Use the Standard toolbar buttons (Figure 45) to open a new or existing program file or to save a file. Click one of the edit buttons to cut, copy, paste, or delete a block or group of blocks. You can undo or redo the last action completed in the editor, add a wired or wireless connection, or print the program. Click the Help button and then click on a block in the design space to get information about that block.

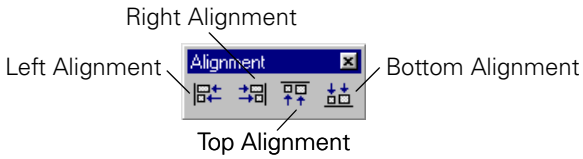
Figure 45. Standard toolbar



Alignment toolbar

Select the blocks in the design space you want to align and click an alignment button (Figure 46) to align the blocks in the design space. The last block selected controls the alignment.

Figure 46. Alignment toolbar

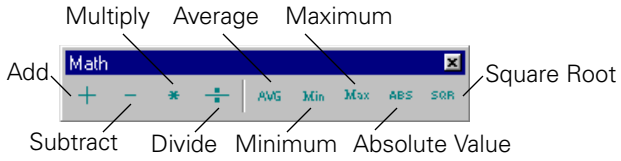


Block toolbars

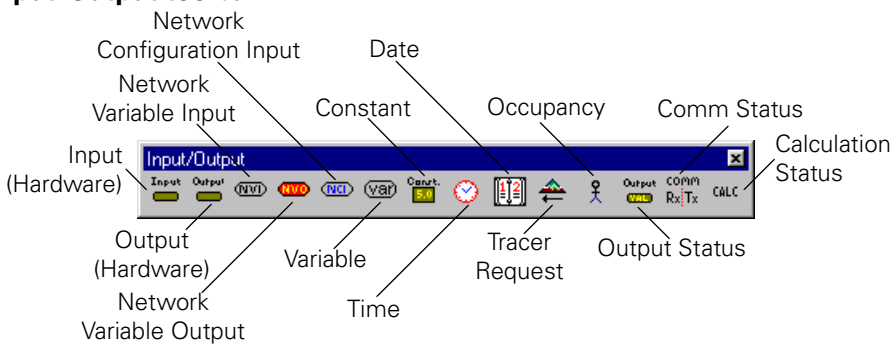
Use each of the following toolbars to add various blocks to your TGP program (Figure 47). For more information about each block, see the blocks reference in the online Help. The blocks are subdivided into eight categories. These categories are displayed in separate toolbars.

Figure 47. Block toolbars

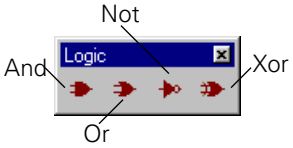
Math toolbar



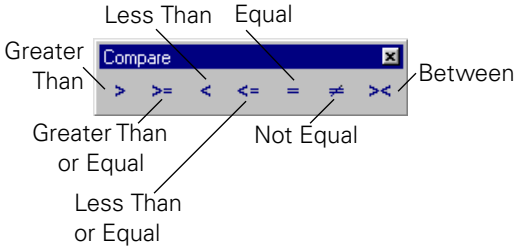
Input/Output toolbar



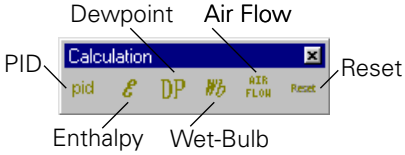
Logic toolbar



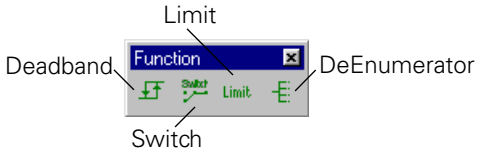
Compare toolbar



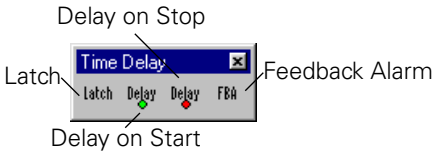
Calculation toolbar



Function toolbar



Time Delay toolbar

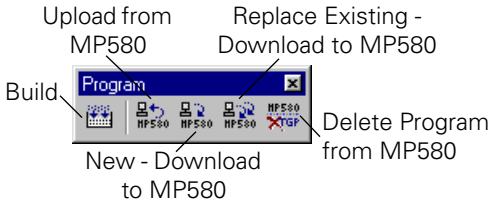


Test toolbar

Program toolbar

Use the Program toolbar to build programs and to control the programs on the Tracer MP580/581 controller (Figure 48).

Figure 48. Program toolbar



Showing or hiding toolbars

You can show or hide each toolbar in the TGP editor window. You can also move each toolbar in the window by clicking on the title bar of the toolbar and dragging it to a new position.

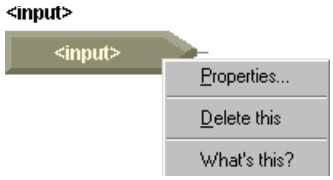
To show or hide a toolbar:

- From the View menu, choose Toolbars. From the Toolbars menu, choose the toolbar you want to view or hide. If a check mark is next to the toolbar name, that toolbar is shown in the window.

Short cut menus

To view a shortcut menu, use your right mouse button to click any block or port in the design space (Figure 49). Shortcut menus contain common commands you can use on the item you clicked. For example, right-click an input (hardware) block in the design space and choose Properties from the shortcut menu to edit the properties of the block.

Figure 49. Shortcut menu



Keyboard short cuts

Use keyboard short cuts (Table 5) in the TGP editor to work with program files and blocks.

Table 5. Keyboard short cuts

Category	Function	Key stroke
File	New	Ctrl+N
	Open	Ctrl+O
	Save	Ctrl+S
	Print	Ctrl+P
Edit	Undo	Ctrl+Z
	Redo	Ctrl+Y
	Cut	Ctrl+X
	Copy	Ctrl+C
	Paste	Ctrl+V
	Delete	Delete
Blocks	Block (pop-up menu)	Ctrl+B
	Comment	Ctrl+T
	Wire	Ctrl+W
	Wireless	Ctrl+L
Program	Build	F7
Tools	Start Debug/Start Simulation	F11
	Run	F5
	Exit Debug/Exit Simulation	Shift+F11

Chapter 7

Creating a graphical program

This chapter introduces the basics of Tracer graphical programming (TGP). Graphical programming consists of drawing a picture that represents data and logic.

Before you start to write a program, configure the inputs and outputs. For more information on configuring the inputs and outputs, see Chapter 3, "Configuring the Tracer MP580/581." For more information on setting up the wiring, see the *Tracer MP581 Programmable Controller Hardware Installation* guide (CNT-SVN01B-EN).

Creating a new program

When the editor opens, a new, blank program appears. If a program is already open, or you want to open a new program, save the current program and then choose New from the File menu. A blank program appears in the design space (Figure 43 on page 72).

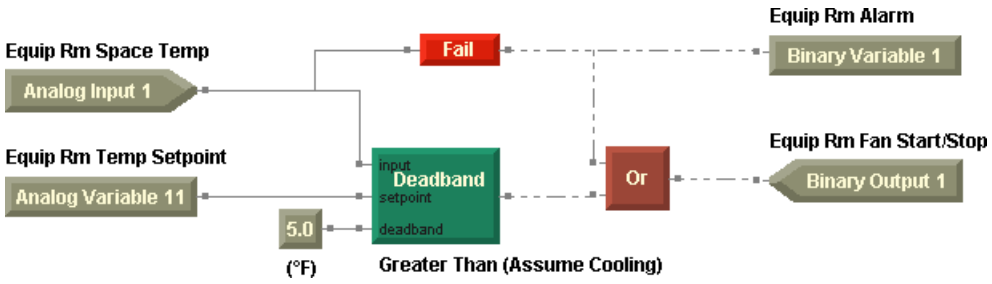
Note:
Only one program can be open in the TGP editor at a time.

Opening an existing program

To open an existing program:

1. From the File menu, choose Open. The Open dialog box appears.
2. Select the program you want to open.
3. Click Open. The program opens in the design space (Figure 50).

Figure 50. Equipment room exhaust fan program



Editing program properties

The next step in writing a graphical program is to give the program a name and define some basic properties of the program. The properties of a program define how the program behaves. For example, Run Frequency is a property that defines how often the program executes. It is good practice to set the program properties before you begin to write a new program, but you can edit the properties at any time by opening the Program Properties dialog box.

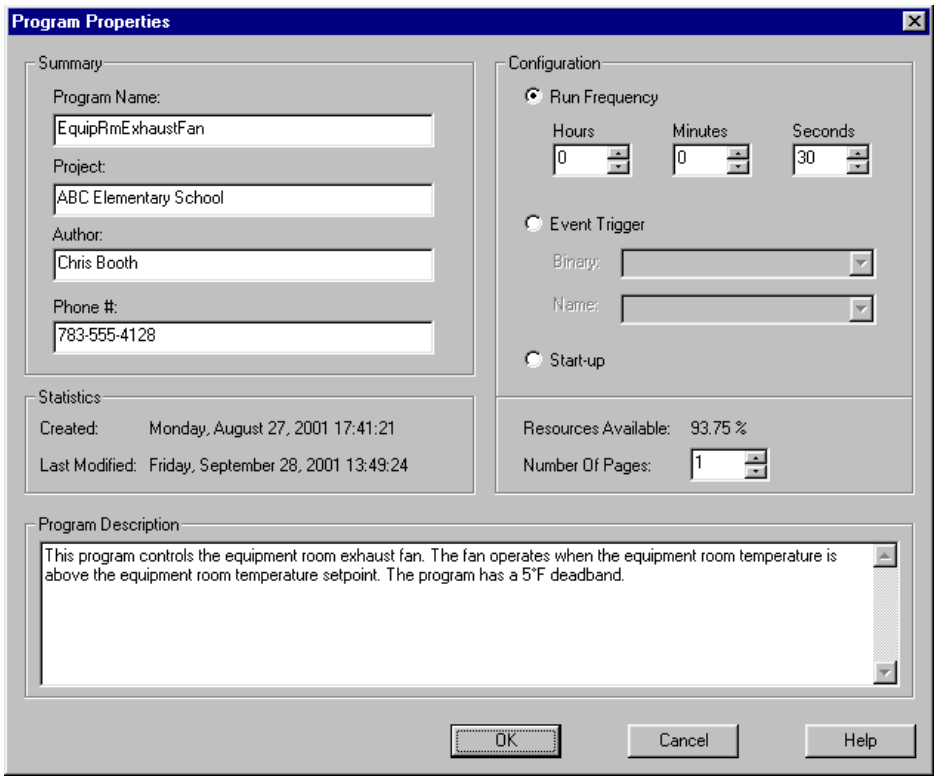
To select the appropriate method of program execution, ask yourself the following questions:

- Is the program required to run at regular time intervals? If so, click the Run Frequency option. Then specify the time interval in hours, minutes, and seconds.
- Is the program required to run on demand? If so, use the Event Trigger option to provide the program with a reference to a universal input configured as a binary input or to a binary variable. When the binary input or variable changes state, the program runs.
- Is the program required to run only when the Tracer MP580/581 powers on? In this case, click the Start-up option.

To edit program properties:

1. From the File menu, choose Program Properties. The Program Properties dialog box appears (Figure 51 on page 81).

Figure 51. Program Properties dialog box



2. In the Program Name field, type a name for your program.

   The name may be up to 32 characters in length. Do not use spaces or special characters except for an underscore in program names.

3. Type your name, project name, and phone number in the appropriate fields.

   This information appears on the printout of the program.

4. Under Configuration, click one of the Run Frequency options.

Note:
When choosing Run Frequency, keep in mind that universal input status from expansion modules is updated every 2 seconds.

5. In the Number of Pages field, type the number of pages you need to draw your program.

   The allowable range is one to five pages. You can always change the number if you find that you have too few or too many pages.

6. In the Program Description field, type a description of your program.

7. Click OK.

Setting page width and size

The page size and layout you choose impacts the design space. For example, if you want to have a wider and shorter space, choose the landscape option. If you want to print your programs on 11 × 17 in. paper, choose that option.

To set page width and size:

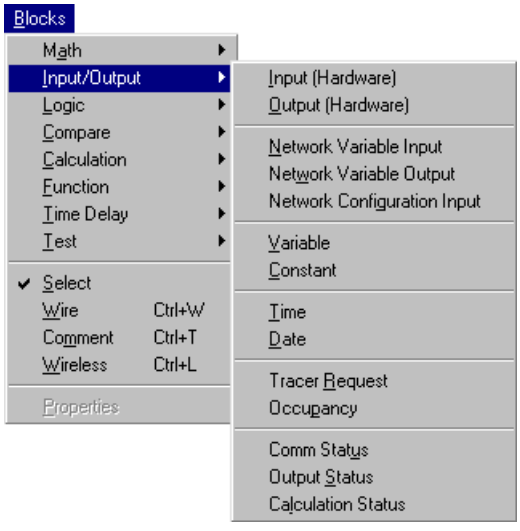
1. From the File menu, choose Page Setup. The Page Setup dialog box appears.
2. Set the paper size, orientation, and margins. These settings apply to the TGP editor design space.
3. Click the Print Setup button. The Print Setup dialog box appears.
4. Set the paper size and orientation to implement these settings on paper when the program is printed.
5. Click OK. The Print Setup dialog box closes.
6. Click OK. The Page Setup dialog box closes, and the design space changes to the new setting.

Adding a block

To add a block:

1. From the Blocks menu, choose the type of block you want to add. See Figure 52 for an example. The cursor changes to a cross-hair (;) when over the design space.

Figure 52. Choosing Input (Hardware) from the Input/Output Blocks menu



2. Click in the design space to place the block. The block appears at the cursor location in the design space (Figure 53).

Figure 53. Input (Hardware) block

Editing block properties

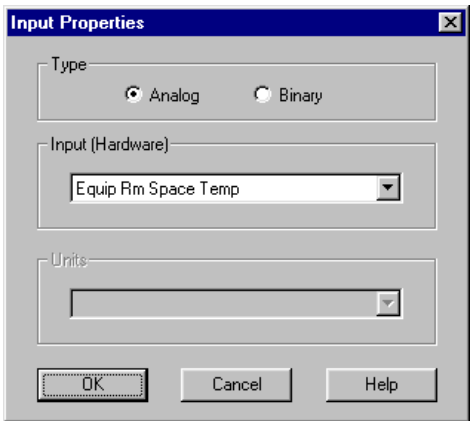
A block is an object. In the TGP editor, you can edit the properties for objects, such as programs and blocks, by using their properties dialog boxes. Set the properties of each block as you place it in the program. This is especially important for blocks that can be set as analog or binary, because the connections between blocks are dependent on the data type, analog or binary.

To edit block properties:

1. Click on the block to select it. The block is outlined in yellow.
2. From the Edit menu, choose Properties. The properties dialog box for the block appears (Figure 54).

Note:
The properties dialog boxes for each block vary considerably depending on the options available for that block. Some blocks have no editable properties.

Figure 54. Input Properties dialog box



3. Set the properties for the block.
4. Click OK.

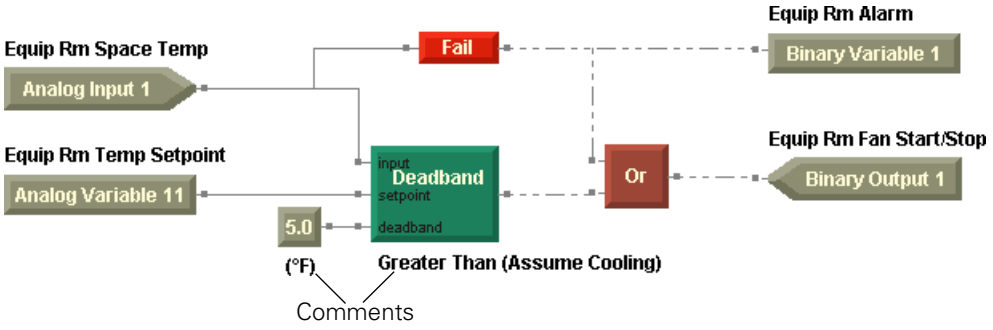
Adding a comment

Use comments to make notes in your program, to annotate blocks, or to describe logic.

To add a comment:

1. From the Blocks menu, choose Comment and click in the design space to place the Comment block. The Comment dialog box appears.
2. Type the text you want to appear as a comment.
3. Click OK. The comment appears in the design space (Figure 55).

Figure 55. Comments added to describe the Constant block and the Deadband block



Arranging blocks

The graphical element of graphical programming is critical. Move blocks and use the alignment options to arrange your blocks and design your programs.

Moving blocks

To move blocks:

1. Press and hold the left mouse button on a block and then move the cursor (click and drag) to move the block to a new position in the design space. The block appears in the new location.
2. To select two or more blocks, press the Ctrl key while clicking to select blocks. The selected blocks are outlined in yellow.

Note:
You can also use a rubber-band selection to select more than one block. Click in the design space and drag the cursor so that the white line surrounds the blocks you want to select.

3. Click and drag the selected blocks to a new position in the design space. The blocks appear in the new location.

Aligning blocks

To align blocks:

1. Select two or more blocks. The *last* block selected is the controlling block, so all of the selected blocks align according to the position of the *last* block selected. The selected blocks are outlined in yellow.
2. From the Alignment menu, choose the alignment you want. The blocks align according to the selection.

Deleting a block

To delete a block:

1. Click on the block. The block is outlined in yellow.
2. From the Edit menu, choose Delete. The block and any wires connected to the block are removed from the design space.

Note:
To delete a block, you can also select the block and then press the Delete key.

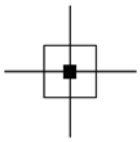
Connecting blocks using wired connections

To use wired connections to pass data from block to block:

1. From the Blocks menu, choose Wire. The cursor changes to a cross-hair (;) in the design space.
2. Hold the cursor over the output port of a block. The cursor changes from a simple cross-hair to a cross-hair with a square (Figure 56). This change in the cursor indicates that a connection may be made.

Note:
You may start wires on any block-input or -output port or on an existing wire. You cannot end a connection on a wire.

Figure 56. Cursor in wire mode over a valid connection



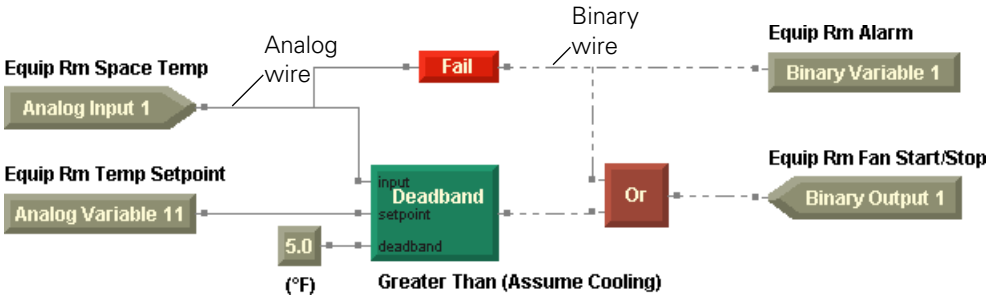
3. Click on the output port of a block. A solid or dotted line appears between the connection point and the cursor.

Note:
A solid wire between blocks represents analog data being passed. A dotted wire between blocks represents binary data being passed. An analog-output port cannot be connected to a binary-input port, and a binary-output port cannot be connected to an analog-input port. Figure 57 shows the cursor that is displayed over an invalid connection.

Figure 57. Cursor in wire mode on an invalid connection

4. Click in an empty area of the design space to add a turn to the wire.
5. Move the cursor and click on an input port of a block. The wired connection is complete (Figure 58).

Figure 58. Analog wired connection



Connecting blocks using wireless connections

Use wireless connections to pass data from block to block when wired connections are impractical. In general, it is good programming practice to use an input in a program only once. By doing so, you will have an easier time debugging your program. By using the wireless connection, you can also prevent long and overlapping wired connections that are difficult to follow.

Figure 59 on page 87 is a sample program without wireless connections. Figure 60 on page 88 is the same program with two wireless connections added.

Figure 59. Program without wireless connections

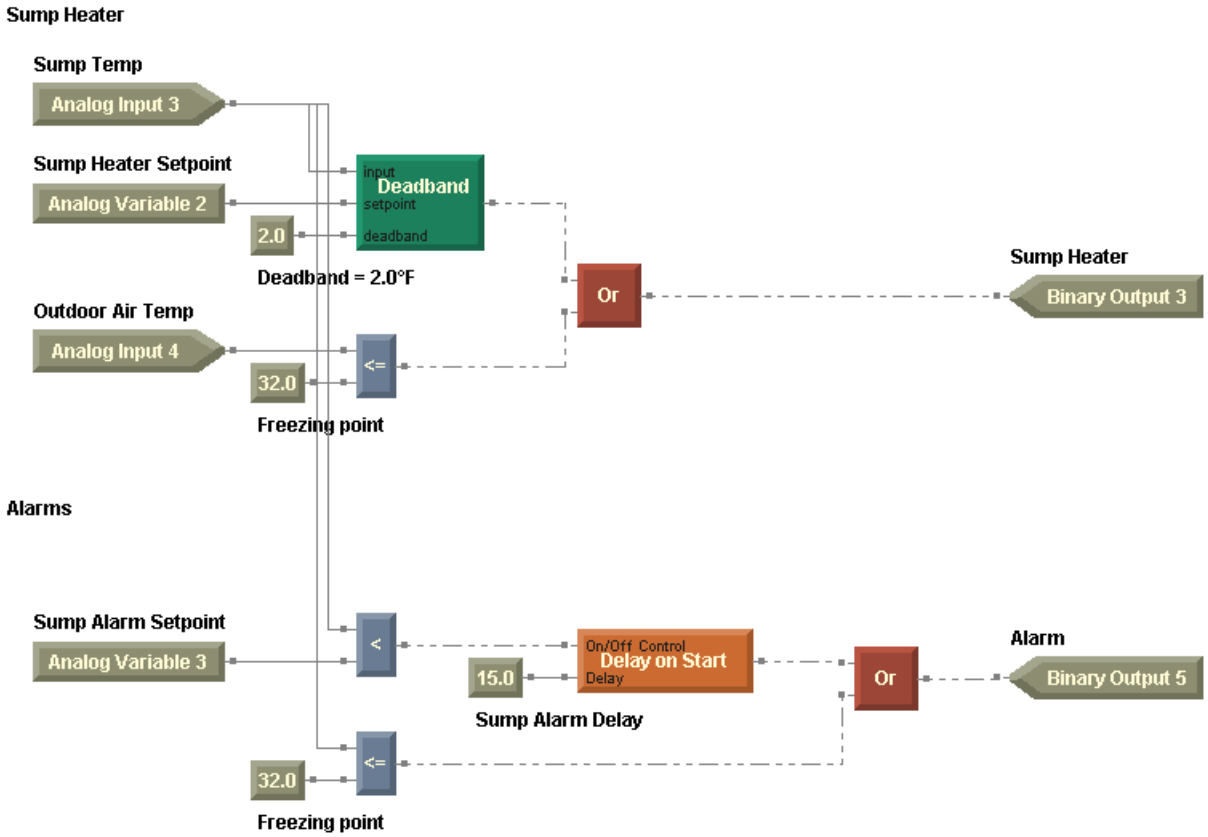
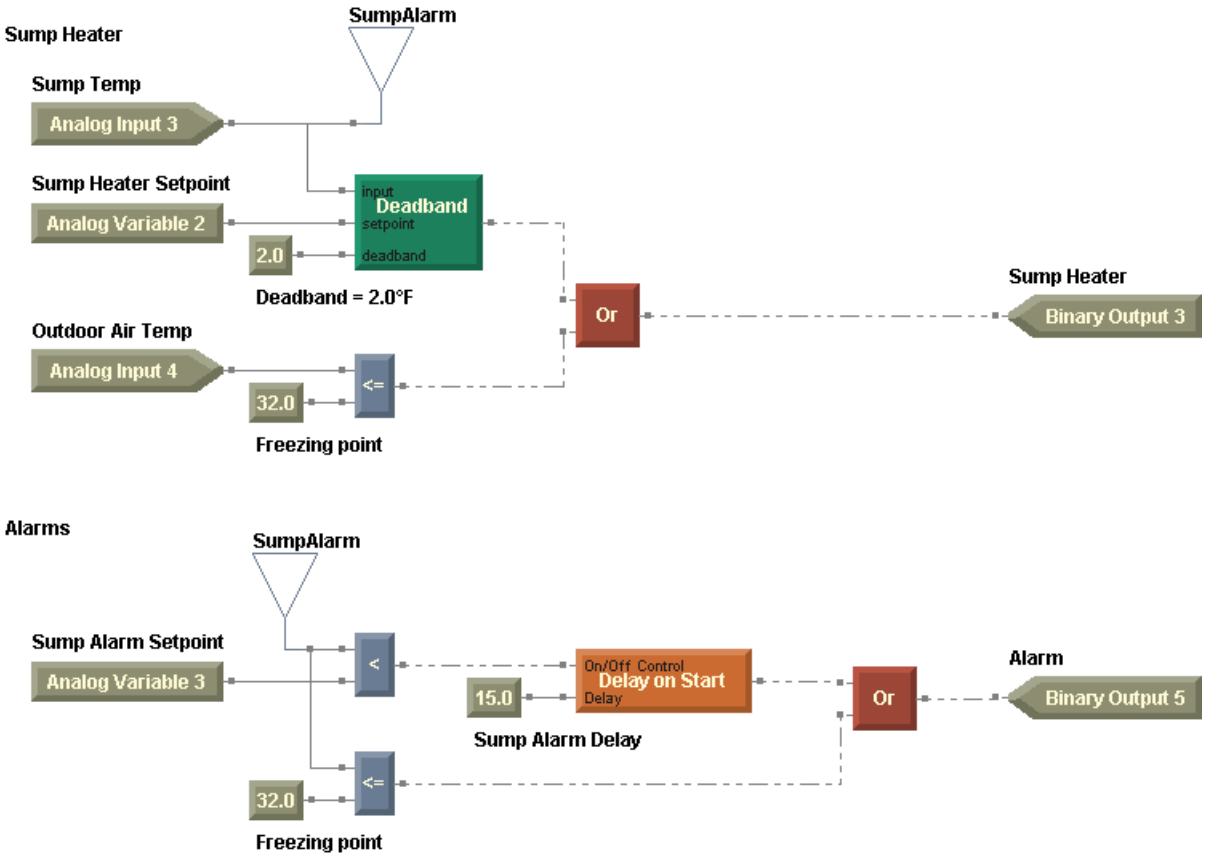


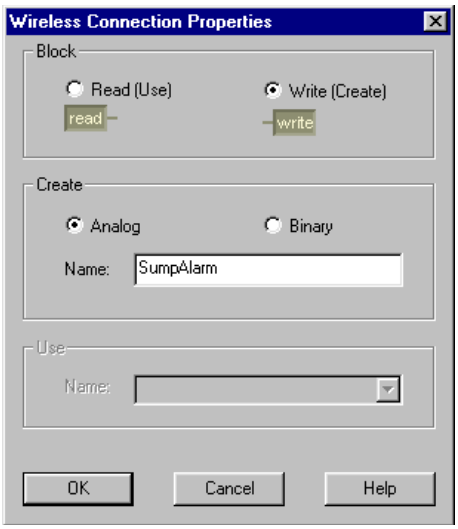
Figure 60. Program with wireless connections



To connect blocks using a wireless connection:

1. From the Blocks menu, choose Wireless. The cursor changes to a cross-hair (;) in the design space.
2. Click in the design space to place a wireless block. The Wireless Connection Properties dialog box appears (Figure 61 on page 89).

Figure 61. Creating wireless connection block



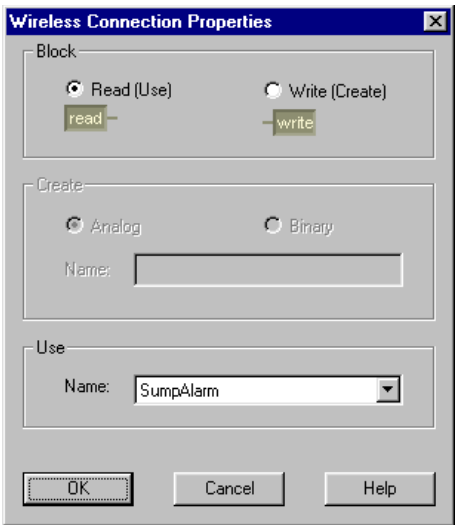
3. Under Block, click the Write (Create) option to create a new wireless connection block.
4. Under Create, click the option for the type of connection you want to make: analog or binary.
5. In the Name field, type a name for the block.

   The name may be up to 16 characters in length. Spaces are not allowed.
6. Click OK. The Wireless write block appears in the design space.
7. Connect the Wireless write block with a wired connection to the block with the value you want to write to the wireless block (Figure 62).

Figure 62. Wireless write connection

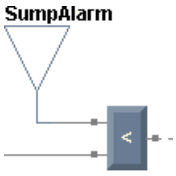
8. From the Blocks menu, choose Wireless. and click in the design space to place a wireless block. The Wireless Connection Properties dialog box appears (Figure 63 on page 90).

Figure 63. Using wireless connection block



9. Under Block, click the Read (Use) option to use a new wireless connection block.
10. Under Use, in the Name list, click the wireless connection you want to use.
11. Click OK. The Wireless read block appears in the design space.
12. Connect the Wireless read block with a wired connection to the block to which you want to pass the wireless value. The wireless connection is complete (Figure 64).

Figure 64. Wireless read connection



Refreshing the TGP editor

After making changes to the controller configuration, use the refresh function to update the TGP editor. For example, if you are writing a program and you realize that you need to set up an analog variable, go to the Rover application to set up the variable. Then return to the TGP editor and refresh the analog variables to implement the variable you just configured.

To refresh the TGP editor:

1. From the View menu, choose Refresh.
2. From the Refresh menu, choose the set of data you want to refresh or choose All. The configuration data uploads to the editor.

Saving a program

To save a program:

1. From the File menu, choose Save. The Save As dialog box appears.
2. In the File name field, type a name for your program.
3. Click Save. The graphical program file is saved.

   All files are saved with a file extension of *.tgp, which denotes the file as a Tracer graphical program.

Printing a program

To print a hard copy of a program:

Note:
To see what your program will look like printed on paper, choose Print Preview from the File menu.

1. From the File menu, choose Print. The Print dialog box appears.
2. Select the printer and set the print range and the number of copies.
3. Click the Properties button to select the paper size and orientation.
4. Click OK. The graphical program is printed.

Closing a program

To close a program, you must open a new or existing program or exit the TGP editor. To exit the TGP editor:

- From the File menu, choose Exit. The program and the TGP editor close.

Chapter 8

Using the Occupancy and PID blocks

This chapter discusses the Occupancy block and the PID (proportional, integral, derivative) block. For more information about specific TGP blocks, see the block reference in the online Help.

Using the Occupancy block

The Occupancy block outputs the occupancy request as received by the Tracer MP580/581 controller. (For more information about the occupancy request arbitration, see Table 2 on page 62.) Use the Occupancy block in graphical programming to determine the values and states of the analog and binary outputs on the Tracer MP580/581 controller. This section discusses common uses of the Occupancy block in different program examples.

To be useful, the Occupancy block must be used in a TGP program. Four examples are shown in this section to aid in program design for two typical applications of the Occupancy block: fan request and setpoint adjustment.

The Occupancy block has an enumerated output. The enumerated value and mode are shown in Table 6. These values follow the SCC and DAC standard.

Table 6. Occupancy block enumerated values

Output value	Mode name	Notes
0	Occupied	
1	Unoccupied	
2	Occupied bypass	This mode is the equivalent of a timed override request. It is considered an occupied mode.
3	Occupied standby	This mode is meant to be used for a space that is currently unoccupied but will be occupied soon. Meeting rooms are a good example. Typically, this mode has different setpoints than the occupied or unoccupied modes.

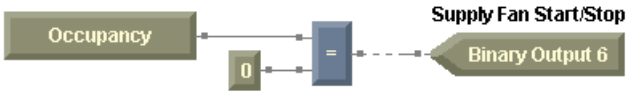
The following sections contain examples of how the Occupancy block can be used in a TGP program. The examples begin as simple as possible and

become more complex. The program is shown and discussed in each example.

Using the Occupancy block to turn on a supply fan

In the example shown in Figure 65, the program takes advantage of the fact that the Occupancy block output is an analog value. It uses an Equal block to compare the Occupancy block output to a Constant block. If the Occupancy block output is equal to zero, the output of the Equal block is true, and the Supply Fan Start/Stop binary output is true (on). If the Occupancy block output is not equal to zero, the Supply Fan Start/Stop binary output is false (off).

Figure 65. Supply fan on or off with an Equal block and a Constant block



The use of the Equal block and a Constant block is acceptable for the program in Figure 65. But it can become awkward as you use more of the Occupancy block output values. Each value would have to have an associated Equal and Constant block. Alleviate the awkwardness by using the DeEnumerator block shown in Figure 66.

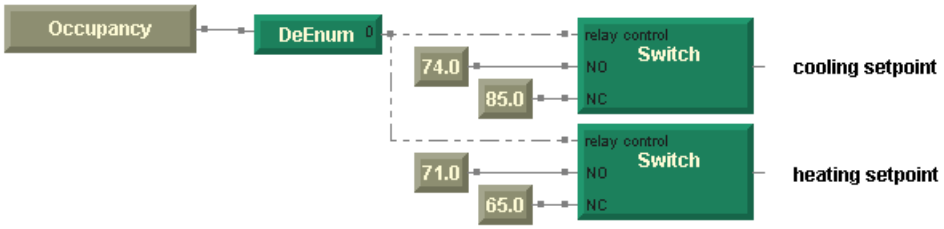
Figure 66. Supply fan on or off with a DeEnumerator block

The program in Figure 66 completes the same function as the program in Figure 65. The DeEnumerator block takes the place of the Equal and Constant blocks. For more information about the DeEnumerator block see the block reference in online Help in the TGP editor.

Using the Occupancy block to adjust setpoints

The program in Figure 67 on page 95 provides two values, the cooling and heating setpoints, to other parts of a TGP program. The DeEnumerator block controls which value is passed by using a pair of Switch blocks. For more information on how the Switch block works see the block reference online Help in the TGP editor.

Figure 67. Occupied and unoccupied mode setpoint adjustment



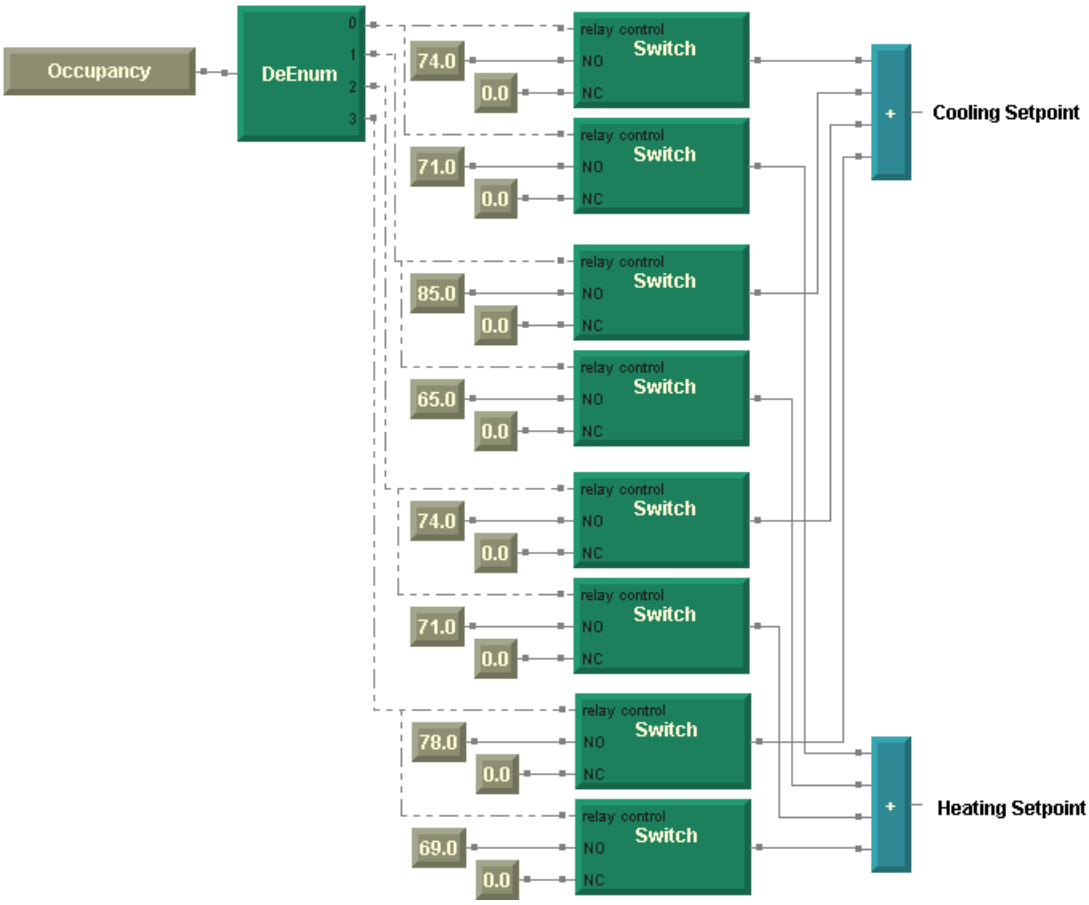
Note:
You could use another Switch block to pick which setpoint is used. That Switch block would be controlled by the heating or cooling mode.

The program in Figure 68 on page 96 is a direct extension of the one shown in Figure 67. Because it is sending setpoint values based on four possible modes, it is more complex than the examples seen previously. Each mode controls the cooling and heating setpoints to the values in Table 7.

Table 7. Occupancy mode heating and cooling setpoint values

Mode name	Cooling setpoint	Heating setpoint
Occupied	74.0°F	71.0°F
Unoccupied	85.0°F	65.0°F
Occupied bypass	74.0°F	71.0°F
Occupied standby	78.0°F	69.0°F

Figure 68. All occupancy modes setpoint adjustment



The DeEnumerator block turns on the appropriate pair of Switch blocks, depending on the Occupancy block output. If a Switch block pair is off, it contributes zero to the final cooling and heating setpoint calculation. If a Switch block pair is on, it contributes the non-zero values to the final cooling and heating setpoint calculation.

Note:
The occupied and occupied bypass setpoints are the same. Occupied bypass should be considered an occupied mode.

Using the PID block

A proportional, integral, derivative (PID) loop control is an automatic control system that calculates how far a measured variable is from its setpoint and controls an output to move the measured variable toward the setpoint. The loop performs PID calculations to determine how aggressively to change the output.

In the HVAC industry, PID loops are used to control modulating devices such as valves and dampers. Some common applications include:

- Temperature control
- Humidity control
- Duct static pressure control
- Staging applications

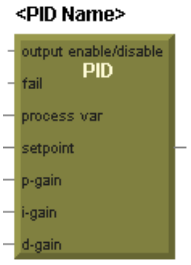
For a more in-depth discussion of PID control, see the *PID Control in Tracer Controllers* applications guide (CNT-APG002-EN).

Setting up the PID block properties

To set up the PID block properties:

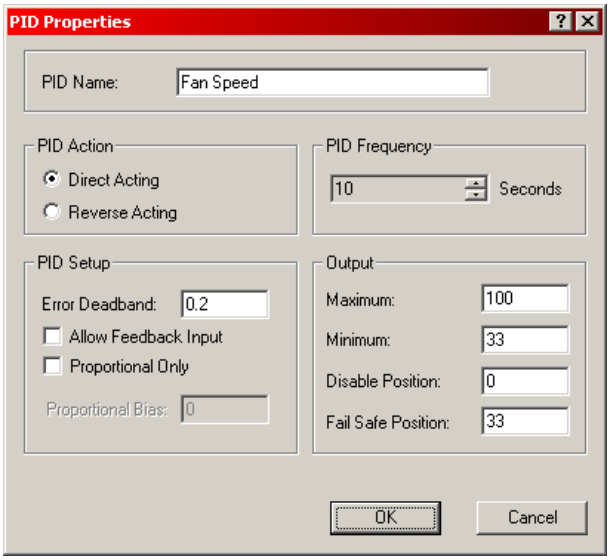
1. From the Blocks menu, choose Calculation. From the Calculation menu, choose PID.
2. Click in the design space to place the PID block (Figure 69).

Figure 69. PID block



3. Double-click the PID block. The PID Properties dialog box appears (Figure 70 on page 98).

Figure 70. PID Properties dialog box



4. In the PID Name field, type the name of your PID block.

   The name is used to select a PID loop for troubleshooting and plotting purposes.

5. Under PID Action, click the action option you want.

   The action of a PID loop determines how it reacts to a change in the measured variable. A controller using direct action increases the output when the measured variable increases. A controller using reverse action decreases the output when the measured variable increases.

6. Under PID Setup, in the Error Deadband field, type the error deadband value.

   The error deadband prevents the PID output from changing when the absolute value of the error is less than the error deadband. The error itself is defined as the difference between the setpoint and the measured variable.

7. If you want a change in the new PID output to be added to the Feedback Input for each PID cycle when the program runs, click to select the Allow Feedback Input check box. A Feedback Input port is added to the PID block.

   NewOutput = Δoutput + FeedbackInput

   If this check box is not selected, the previous PID block output is added to the change in the new PID output for each PID cycle.

   NewOutput = Δoutput + OldOutput

Note:
This feature applies to only Tracer MP580/581 Firmware Revision 2 or higher. Follow the procedure for "Viewing Comm5 parameters" on page 13 to view your current revision number.

8. Click to select the Proportional Only check box if you do not want to use the integral and derivative contributions of the PID loop.

   This is typically used with pneumatic controls or in staging applications.

9. Type the Proportional Bias if the PID loop is proportional only.
10. Under PID Frequency, enter the time interval at which you want the PID loop to run.

    The PID Frequency defaults to the same frequency as the program. You may run a PID loop at the same rate as its parent program or at a slower rate. The time interval must be an integer multiple of the program run frequency.

11. Under Output, type the maximum and minimum output percent values for the loop.
12. In the Disable Position field, type the disable position value.

    When the Output Enable/Disable port of the PID block receives a value of false, the PID loop outputs the disable-position value. Otherwise, the PID loop outputs its calculated value.

13. In the Fail Safe Position field, type the fail safe value.

    When the Fail port of the PID block receives a value of true, the PID loop outputs the fail-safe-position value. Otherwise, the PID loop outputs its calculated value.

14. Click OK.

Incorporating the PID block

Add the necessary intermediate blocks and then make the PID block connections.

To incorporate the PID block:

1. Place a Fail block in the design space and connect it so that it checks the measured variable for failure.
2. Place three blocks to serve as the proportional, integral, and derivative gains for the PID block and connect them to the block.

   These three blocks could be inputs, constants, or variables.
3. Connect a block to the Output Enable/Disable port of the PID block.

   When the PID block receives a true value here, it outputs its calculated result. When the PID block receives a false value here, it outputs its disable-position value.
4. Connect the Fail block to the Fail port of the PID block.

   When the PID block receives a false value here, it outputs its calculated result. When the PID block receives a true value here, it outputs its fail-safe-position value.
5. Connect an input block to the Measured Variable port of the PID block.
6. Connect a block, typically a constant or variable, to the Setpoint port of the PID block.
7. Connect a block, such as an analog output status block or a local analog variable block, to the Feedback Input port of the PID block if you cleared the Decouple PID Block Output check box in the PID Properties dialog box.
8. Connect the PID block to the block you want it to control, typically an analog output. See Figure 71 for an example of a PID block in a program; see Figure 72 on page 102 for an example of a PID block with the Feedback Input port present in the program.

Figure 71. PID block in program

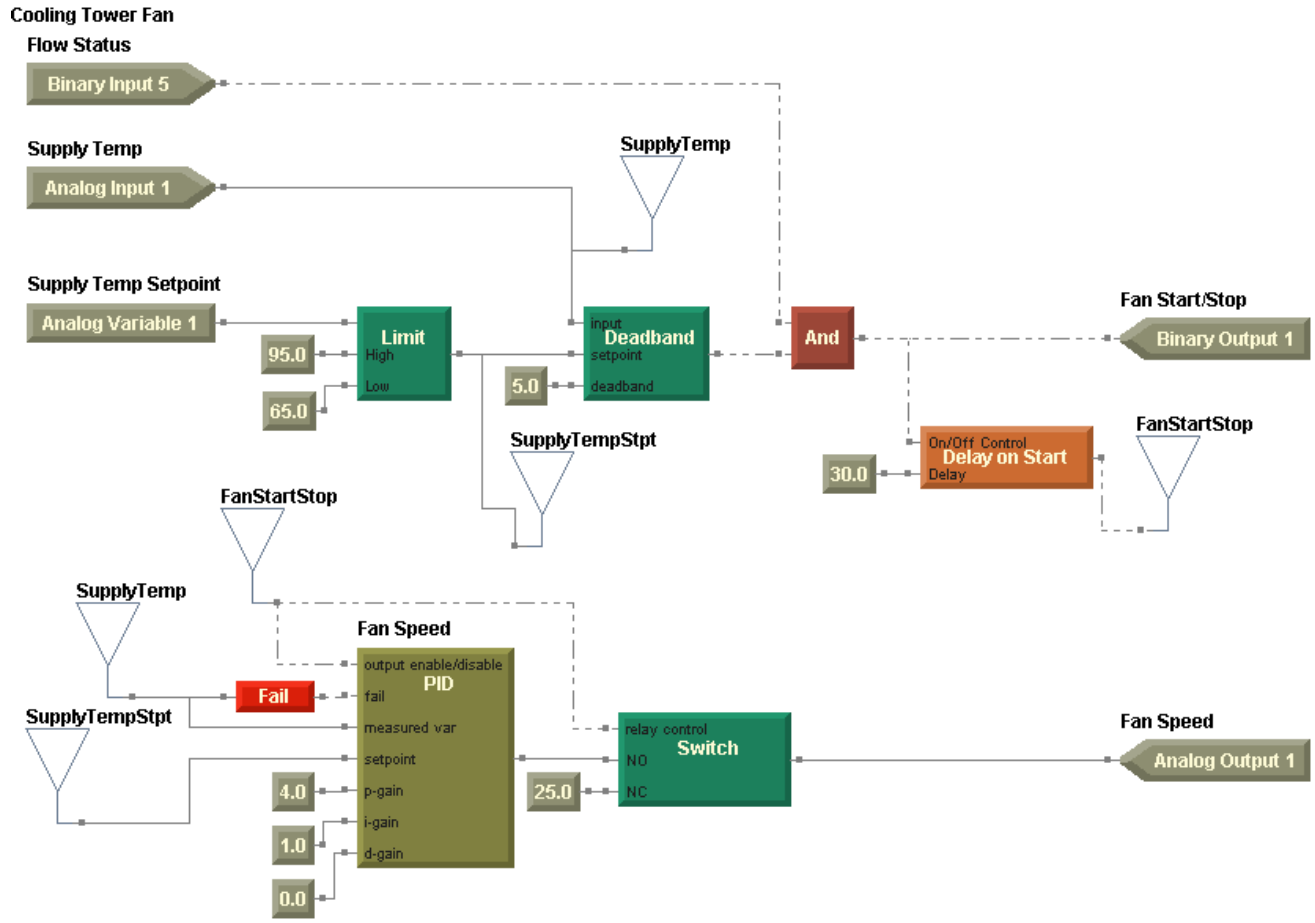
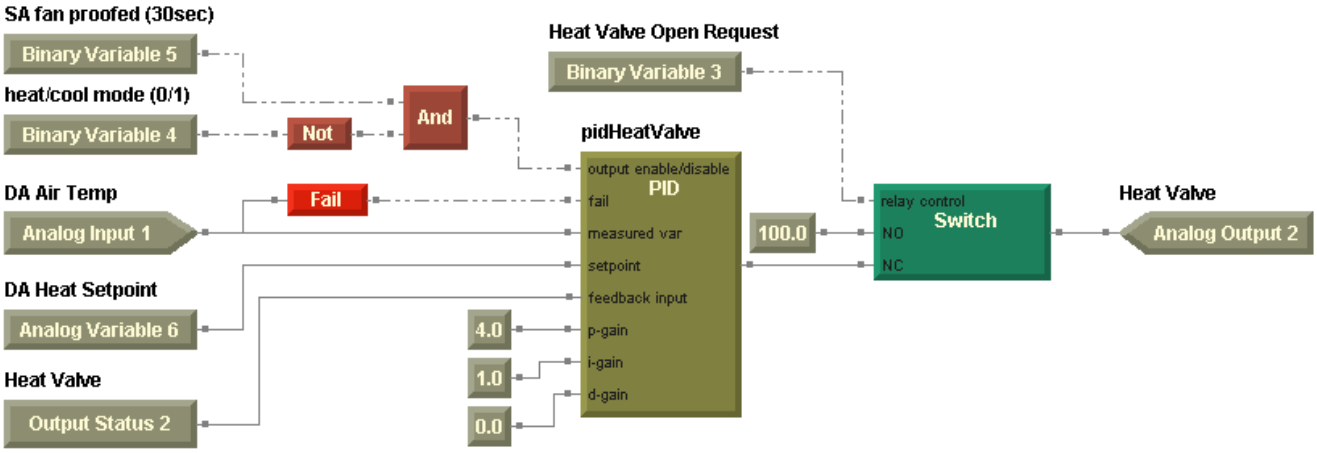


Figure 72. PID block with Feedback Input port in program



Chapter 9

Implementing a graphical program

Before downloading a program to the Tracer MP580/581, you must compile the program. When you compile, the TGP editor checks the program for errors and prepares it for download. You can upload and download compiled programs, and you can view the status of downloaded programs in the controller.

Compiling a program

To compile a program:

- From the Program menu, choose Build/Compile. The system builds and compiles the program. The output window displays the results, including any applicable errors.

Downloading a program

To download a program to the Tracer MP580/581 controller:

1. Compile the program you want to download if you have not done so already.
2. From the Program menu, choose Download to MP580. The Security Logon dialog box appears.
3. Type in your user name and password and click OK.
4. From the Download to MP580 menu, choose one of the following options:
   - New, if the program is new. The program download begins. Upon completion of the download, a message appears stating that the program downloaded successfully. Go to step 7.
   - Replace Existing, if the program already exists in the controller. The Select a Program dialog box appears. Go to step 5.
5. Click the program name you want to replace.
6. Click OK. The program downloads. Upon completion of the download, a message appears stating that the program was overwritten successfully.
7. Click OK.

Uploading a program

To upload a program from the Tracer MP580/581 controller:

1. From the Program menu, choose Upload from MP580. The Select a Program dialog box appears.
2. Click the program name you want to upload.
3. Click OK. The program uploads and appears in the workspace. A message may appear asking you to save changes to the current program, if you already had one open.

Deleting a program from the Tracer MP580/581

To remove an active program from the Tracer MP580/581 controller:

1. From the Program menu, choose Delete Program from MP580. The Select A Program dialog box appears.
2. Click the program name you want to delete.
3. Click OK. A message appears asking if you are sure you want to delete the program from the controller.
4. Click Yes. A message appears stating that the program has been deleted.
5. Click OK. The program has been removed from the controller.

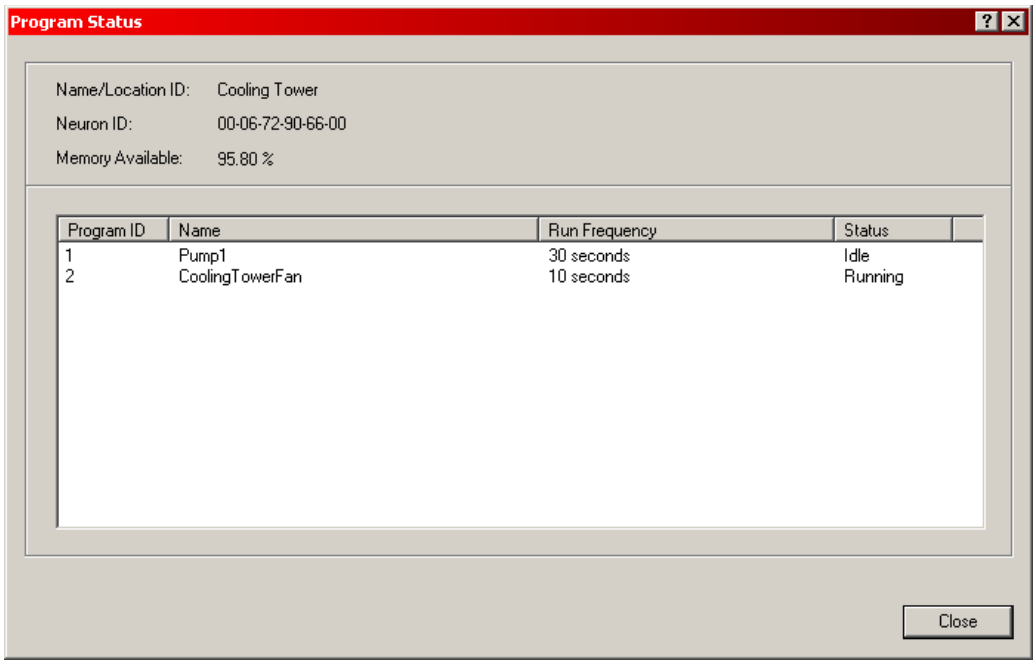
Viewing program status

You can view the status of each program downloaded to the Tracer MP580/581 controller. The program status includes the program name, run frequency, and state. It also displays the remaining memory available for programs.

To view program status:

- From the Tools menu, choose Program Status. The Program Summary dialog box appears (Figure 73 on page 105).

Figure 73. Program Summary dialog box



Debugging a program

Debug a program to troubleshoot problems in the program. Debugging is performed online.

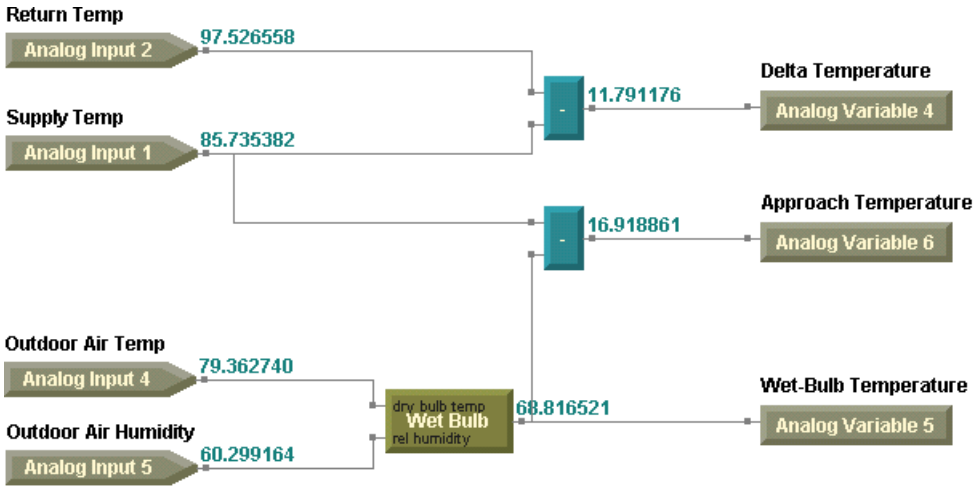
To debug a program:

1. Compile and download the program you want to debug if you have not done so already.
2. From the Tools menu, choose Start Debug. The Select a Program dialog box appears.
3. Click the program name you want to debug.
4. Click OK. The screen changes color to indicate that debug mode is active.
5. From the Tools menu, choose Options. The Debug/Simulation Options dialog box appears.

   If this menu item is not available, click in the design space.
6. Click to select the Inhibit Output check box if you want to prevent the program from controlling outputs or changing variables while in debug mode. Or click to clear the Inhibit Output check box if you want to enable the program to control outputs or change variables.
7. Click OK.

8. From the Tools menu, choose Run. The program runs. Upon completion, the output value of each block is displayed (Figure 74). Use these values to determine if your program logic is correct.

Figure 74. TGP program in debug run or simulation mode



9. Repeat steps 3–7 until the debugging session is complete. A program can be debugged multiple times within a session. To adjust program logic or block properties, exit the debugging session.
10. From the Tools menu, choose Exit Debug. A message appears stating that the program was exited normally.
11. Click OK.

Simulating a program

Simulate a program to test the program logic while you are offline. In simulation mode, you can enter a number of different values to simulate various system scenarios and to verify that the program will execute with the desired results.

To simulate a program:

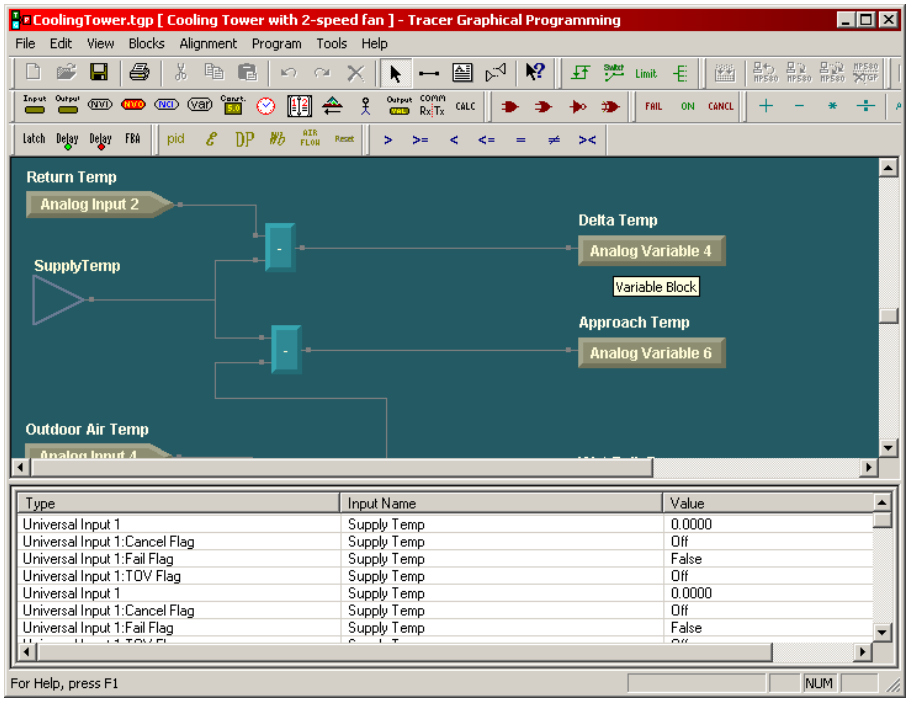
1. In the Rover Configuration Builder (the offline editor for Tracer MP580/581), compile and download the program you want to simulate if you have not done so already.
2. From the Tools menu, choose Start Simulation. The Select a Program dialog box appears.
3. Click the program name you want to simulate.
4. Click OK. The screen changes color to indicate that simulation mode is active, and the Change Value Table appears (Figure 75 on page 107).

5. From the Tools menu, choose Options. The Debug/Simulation Options dialog box appears.
6. Type the number of cycles you want the program to execute before displaying the results. Click OK.
7. In the Change Value Table, double-click the values and enter new input values to match the test scenarios you require.

   These values are read at the start of each simulation. For certain items, such as program-controlled analog or binary variables, the values are likely to change. The change persists but is not reflected in the Change Value Table.
8. From the Tools menu, choose Run. The program executes the number of times you entered in the Options dialog box. Upon completion, the output value of each block is displayed (Figure 74 on page 106). Use these values to determine if your program logic is correct.

   If this menu item is not available, click in the design space.
9. Repeat steps 3–8 until the testing session is complete. A program can be simulated multiple times within a simulation session. To adjust program logic or block properties, exit the simulation session.
10. From the Tools menu, choose Exit Simulation.
11. Click OK.

Figure 75. TGP Change Value Table



Change Value Table

Chapter 10

Network variable bindings

This chapter describes how to use network variable bindings in Tracer MP580/581 controller applications.

Overview

The Comm5 communications protocol allows data to be shared between devices (stand-alone or with a BAS) on a Comm5 network. This is called peer-to-peer communication. As an example of peer-to-peer communication, two or more devices serving the same space share data, such as a temperature reading, without having to pass the data through a BAS.

Network variables are used to share data between devices. The method used to direct data from one device to another is called network variable binding, or just binding. A network variable output from one device is bound to a network variable input on another device. An output variable from one device can be bound to input variables on many other devices.

Network variables

Each network variable is a standard type. This standard type is referred to as a standard network variable type (SNVT, pronounced “snivet”). To bind two variables together they must be the same network variable type. For example, an output of type SNVT_temp_p can only be bound to an input of type SNVT_temp_p. For more information about SNVTs, see the LonMark™ Web site (www.lonmark.org). From that Web site you can download the official list of SNVTs.

Binding network variables

IMPORTANT
Only Comm5 devices can use network variable binding. Devices on other communications links do not have this capability.

BAS communications typically do not require the use of network variable binding because a Tracer Summit BCU will automatically bind to the proper data in a device. However, communications speed may be increased between two devices by binding their data rather than having the BAS read the information from one device and then broadcast it to another.

Use the Rover service tool to create bindings. (See the *Rover Operation and Programming* guide, EMTX-SVX01C-EN.)

Tracer MP580/581 bindings

The Tracer MP580/581 controller has user-defined application software developed in the Tracer graphical programming (TGP) editor. The bindings for this controller fall into the following two categories:

- Generic custom bindings
- Bindings associated with the Space Comfort Controller (SCC) or Discharge Air Controller (DAC) profile

Generic custom bindings are made with generic network variable inputs and outputs. These inputs and outputs are always available on the Tracer MP580/581. Use network variable inputs and outputs associated with the SCC and DAC profiles only when their respective profile is active. See "Configuring an SCC or DAC profile" on page 44 for more information.

The examples in this chapter illustrate some common applications in which bindings are used with the Tracer MP580/581 controller.

Receiving data

A network variable input (nvi) *receives* data from other devices on the Comm5 network. Network variable inputs (including their SNVTs) that are commonly used in Tracer MP580/581 bindings are shown in the following tables. Generic network variable inputs are shown in Table 8. Table 9 on page 112 contains the DAC profile network variable inputs, and the SCC profile network variable inputs are shown in Table 10 on page 114.

Table 8. Tracer MP580/581 generic network variable inputs

Variable name	SNVT	Data type	Description
nviSwitch01 ... nviSwitch40	SNVT_switch	Binary	Bind to these 40 network variable inputs to communicate binary values to the device.
nviPPM01 ... nviPPM05	SNVT_ppm	Analog	Bind to these five network variable inputs to communicate concentrations in parts-per-million to the device. The valid range is from 0 ppm to 65535 ppm with a resolution of 1 ppm.
nviCount01 ... nviCount02	SNVT_count	Analog	Bind to these two network variable inputs to communicate unassigned numbers to the device. The valid range of each variable is from 0 to 65,535 with a resolution of 1.
nivCurrentAmp01 ... nviCurrentAmp05	SNVT_amp	Analog	Bind to these five network variable inputs to communicate currents in amperes to the device. The valid range is from –3,276.8 A to 3,276.8 A with a resolution of 0.1 A.
nviCurrent_mA01 ... nviCurrent_mA08	SNVT_amp_mil	Analog	Bind to these eight network variable inputs to communicate currents in milliamperes to the device. The valid range is from –3,276.8 mA to 3,276.8 mA with a resolution of 0.1 mA.

Table 8. Tracer MP580/581 generic network variable inputs (Continued)

Variable name	SNVT	Data type	Description
nviEnergyKwh	SNVT_elec_kwh	Analog	Bind to this network variable input to communicate electrical energy usage in kilo Watt-hours to the device.The valid range is from 0 kWh to 65,535 kWh with a resolution of 1 kWh.
nviEnergyWhr	SNVT_elec_whr_f	Analog	Bind to this network variable input to communicate electrical energy usage in Watt-hours to the device. The valid range of this floating point value is from 0 Wh to 1E38 Wh.
nviFlow01 ... nviFlow05	SNVT_flow	Analog	Bind to these five network variable inputs to communicate flow rate in liters per second to the device. The valid range is from 0 L/s to 65,534 L/s with a resolution of 1 L/s.
nvilllum01 ... nvilllum02	SNVT_lux	Analog	Bind to these two network variable inputs to communicate illuminations in lux to the device. The valid range is from 0 lux to 65,535 lux with a resolution of 1 lux.
nviHeatCool01 ... nviHeatCool20	SNVT_hvac_mode	Enumerated	Bind to these 20 network variable inputs to communicate the application (heat/cool) modes of other devices to the device.
nviOccManCmd	SNVT_occupancy	Enumerated	Bind to this network variable input to communicate occupancy overrides to the device.
nviOccSchedule	SNVT_tod_event	Enumerated	Bind to this network variable input to communicate scheduled occupancy to the device.
nviDeviceOccup01 ... nviDeviceOccup20	SNVT_occupancy	Enumerated	Bind to these 20 network variable inputs to communicate the occupancy modes of other devices to the device.
nviPercent01 ... nviPercent20	SNVT_lev_percent	Analog	Bind to these 20 network variable inputs to communicate levels in percent to the device. The valid range is from –163.84% to 163.83% with a resolution of 0.005%.
nviPower	SNVT_power	Analog	Bind to this network variable input to communicate a power in Watts to the device. The valid range is from 0 W to 6,553.5 W with a resolution of 0.1 W.
nviPower_f	SNVT_power_f	Analog	Bind to this network variable input to communicate a power in Watts to the device. The valid range of this floating point value is from –1E38 W to 1E38 W.
nviPower_kilo	SNVT_power_kilo	Analog	Bind to this network variable input to communicate a power in kilo Watts to the device. The valid range is from 0 kW to 6,553.5 kW with a resolution of 0.1 kW.
nviPressure01 ... nviPressure05	SNVT_press_p	Analog	Bind to these five network variable inputs to communicate pressures in Pascals to the device. The valid range is from –32,768 Pa to 32,766 Pa with a resolution of 1 Pa.

Table 8. Tracer MP580/581 generic network variable inputs (Continued)

Variable name	SNVT	Data type	Description
nviTemp01 ... nviTemp40	SNVT_temp_p	Analog	Bind to these 40 network variable inputs to communicate temperatures in degrees Celsius to the device. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nviUnitStatus01 ... nviUnitStatus20	SNVT_hvac_status	Enumerated Analog Binary	Bind to this network variable to communicate status of other control units. The enumerated range is from 0 to 11, which indicates the mode of the controller (see description of SNVT_hvac_mode in this table). Analog values have a range of –163.83% to 183.83%.
nviVolts01 ... nviVolts08	SNVT_volt	Analog	Bind to these eight network variable inputs to communicate voltages in volts to the device. The valid range is from –3,276.8 V to 3,276.8 V with a resolution of 0.1 V.
nviVolt_f	SNVT_volt_f	Analog	Bind to this network variable input to communicate a voltage in volts to the device. The valid range of this floating point value is from –1E38 V to 1E38 V.

Table 9. Tracer MP580/581 DAC profile network variable inputs

Variable name	SNVT	Data type	Description
nviOccSchedule	SNVT_tod_event	Enumerated	Bind to this network variable input to communicate scheduled occupancy to the device.
nviOccManCmd	SNVT_occupancy	Enumerated	Bind to this network variable input to communicate occupancy overrides to the device.
nviApplicMode	SNVT_hvac_mode	Enumerated	Bind to this network variable input to communicate the application mode to the device.
nviValveOverride*	SNVT_hvac_overid	(Structure)	Bind to this network variable input to communicate water valve overrides to the device.
nviEmergOverride	SNVT_hvac_emerg	Enumerated	Bind to this network variable input to communicate emergency overrides to the device.
nviDuctStatPress	SNVT_press_p	Analog	Bind to this network variable input to communicate the duct static pressure in Pascals to the device. The valid range is from –32,768 Pa to 32,766 Pa with a resolution of 1 Pa.
nviDuctStaticSP	SNVT_press_p	Analog	Bind to this network variable input to communicate the duct static pressure setpoint in Pascals to the device. The valid range is from –32,768 Pa to 32,766 Pa with a resolution of 1 Pa.
nviDAClSP	SNVT_temp_p	Analog	Bind to this network variable input to communicate the discharge air cooling setpoint in degrees Celsius to the device. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.

* The variable nviValveOverride contains structures. This variable cannot be viewed on the operator display.

Note: For more information on network variable inputs associated with the DAC profile, see the LonMark™ Functional Profile: Discharge Air Controller. For more information about standard network variable types (SNVTs), see the SNVTs and SCPTs in the Device Resource Files on the LonMark™ Web site at www.lonmark.org.

Table 9. Tracer MP580/581 DAC profile network variable inputs (Continued)

Variable name	SNVT	Data type	Description
nviDAHtSP	SNVT_temp_p	Analog	Bind to this network variable input to communicate the discharge air heating setpoint in degrees Celsius to the device. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nviBldgStatPress	SNVT_press_p	Analog	Bind to this network variable input to communicate the building static pressure in Pascals to the device. The valid range is from –32,768 Pa to 32,766 Pa with a resolution of 1 Pa.
nviBldgStaticSP	SNVT_press_p	Analog	Bind to this network variable input to communicate the building static pressure setpoint in Pascals to the device. The valid range is from –32,768 Pa to 32,766 Pa with a resolution of 1 Pa.
nviOAMinPos	SNVT_lev_percent	Analog	Bind to this network variable input to communicate the outdoor air damper minimum position to the device. The valid range is from –163.84% to 163.83% with a resolution of 0.005%.
nviOutdoorTemp	SNVT_temp_p	Analog	Bind to this network variable input to communicate the outdoor air temperature in degrees Celsius to the device. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nviSpaceTemp	SNVT_temp_p	Analog	Bind to this network variable input to communicate the space temperature in degrees Celsius to the device. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nviSpaceRH	SNVT_lev_percent	Analog	Bind to this network variable input to communicate the space relative humidity in percent to the device. The valid range is from –163.84% to 163.83% with a resolution of 0.005%.

* The variable nviValveOverride contains structures. This variable cannot be viewed on the operator display.

Note: For more information on network variable inputs associated with the DAC profile, see the LonMark™ Functional Profile: Discharge Air Controller. For more information about standard network variable types (SNVTs), see the SNVTs and SCPTs in the Device Resource Files on the LonMark™ Web site at www.lonmark.org.

Table 10. Tracer MP580/581 SCC profile network variable inputs

Variable name	SNVT	Data type	Description
nviSpaceTemp	SNVT_temp_p	Analog	Bind to this network variable input to communicate the space temperature in degrees Celsius to the device. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nviSetpoint	SNVT_temp_p	Analog	Bind to this network variable input to communicate the space temperature setpoint in degrees Celsius to the device. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nviOccSchedule	SNVT_tod_event	Enumerated	Bind to this network variable input to communicate scheduled occupancy to the device.
nviOccManCmd	SNVT_occupancy	Enumerated	Bind to this network variable input to communicate occupancy overrides to the device.
nviOccSensor	SNVT_occupancy	Enumerated	Bind to this network variable input to communicate the value of an occupancy sensor to the device.
nviApplicMode	SNVT_hvac_mode	Enumerated	Bind to this network variable input to communicate the application mode to the device.
nviValveOverride*	SNVT_hvac_overid	(Structure)	Bind to this network variable input to communicate water valve overrides to the device.
nviFlowOverride*	SNVT_hvac_overid	(Structure)	Bind to this network variable input to communicate air flow overrides to the device.
nviEmergOverride	SNVT_hvac_emerg	Enumerated	Bind to this network variable input to communicate emergency overrides to the device.
nviOutdoorTemp	SNVT_temp_p	Analog	Bind to this network variable input to communicate the outdoor air temperature in degrees Celsius to the device. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nviSpaceRH	SNVT_lev_percent	Analog	Bind to this network variable input to communicate the space relative humidity in percent to the device. The valid range is from –163.84% to 163.83% with a resolution of 0.005%.
nviSpaceCO2	SNVT_ppm	Analog	Bind to this network variable input to communicate the space concentration of carbon dioxide (CO_2) in parts-per-million to the device. The valid range is from 0 ppm to 65,535 ppm with a resolution of 1 ppm.

* The variables nviValveOverride and nviFlowOverride contain structures. These variables cannot be viewed on the operator display.

Note: For more information on network variable inputs associated with the SCC profile, see the LonMark™ Functional Profile: Space Comfort Controller. For more information about standard network variable types (SNVTs), see the SNVTs and SCPTs in the Device Resource Files on the LonMark™ Web site at www.lonmark.org.

Sending data

A network variable output (nvo) *send*s data to other devices on the Comm5 network. The network variable outputs (including their SNVTs) that are commonly used in Tracer MP580/581 bindings are shown in the following tables. Generic network variable inputs are shown in Table 11. Table 12 on page 116 contains the DAC profile network variable outputs, and the SCC profile network variable inputs are shown in Table 13 on page 117.

Table 11. Tracer MP580/581 generic network variable outputs

Variable name	SNVT	Data type	Description
nvoSwitch01 ... nvoSwitch40	SNVT_switch	Binary	These 40 network variable outputs communicate binary values to other devices.
nvoPPM01 ... nvoPPM05	SNVT_ppm	Analog	These five network variables outputs communicate concentrations in parts-per-million to other devices. The valid range is from 0 ppm to 65,535 ppm with a resolution of 1 ppm.
nvoCount01 ... nvoCount02	SNVT_count	Analog	These two network variable outputs communicate unsigned numbers to other devices. The valid range of each variable is from 0 to 65,535 with a resolution of 1.
nvoCurrent_mA01 ... nvoCurrent_mA05	SNVT_amp_mil	Analog	These five network variable outputs communicate currents in milliamperes to other devices. The valid range is from –3,276.8 mA to 3,276.8 mA with a resolution of 0.01 mA.
nvoFlow01 ... nvoFlow05	SNVT_flow	Analog	These five network variable outputs communicate the flow rates in liters per second to other devices. The valid range is from 0 L/s to 65,534 L/s with a resolution of 1 L/s.
nvoOccManCmd	SNVT_occupancy	Enumerated	This network variable output communicates occupancy overrides to other devices. Avoid controlling this from a program.
nvoOccSchedule	SNVT_tod_event	Enumerated	This network variable output communicates scheduled occupancy to other devices. Avoid controlling this from a program.
nvoBypassTime	SNVT_time_min	Analog	This network variable output communicates the remaining occupied bypass time to other devices.
nvoOccupancy	SNVT_occupancy	Enumerated	This network variable output communicates occupancy mode as defined by custom programming to other devices.
nvoOccTOD	SNVT_tod_event	Enumerated	This network variable output communicates occupancy mode as defined by custom programming to other devices.
nvoEffectOccup	SNVT_occupancy	Enumerated	This network variable output communicates effective occupancy mode to other devices. Avoid controlling this from a program (see Table 2 on page 62 for details).

Table 11. Tracer MP580/581 generic network variable outputs (Continued)

Variable name	SNVT	Data type	Description
nvoPercent01 ... nvoPercent20	SNVT_lev_percent	Analog	These 20 network variable outputs communicate levels in percent to other devices. The valid range is from –163.84% to 163.83% with a resolution of 0.005%.
nvoPressure01 ... nvoPressure05	SNVT_press_p	Analog	These five network variable outputs communicate pressures in Pascals to other devices. The valid range is from –32,768 Pa to 32,766 Pa with a resolution of 1 Pa.
nvoLinRes01 ... nvoLinRes05	SNVT_res_f	Analog	These five network variable outputs communicate a resistance in ohms to other devices. The valid range of this floating point value is from –1E38 Ω to 1E38 Ω.
nvoTemp01 ... nvoTemp40	SNVT_temp_p	Analog	These 40 network variable outputs communicate temperatures in degrees Celsius to other devices. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nvoVolts01 ... nvoVolts05	SNVT_volt	Analog	These five network variable outputs communicate voltages in volts to other devices. The valid range is from –3,276.8 V to 3,276.8 V with a resolution of 0.1 V.

Table 12. Tracer MP580/581 DAC profile network variable outputs

Variable name	SNVT	Data type	Description
nvoDischAirTemp	SNVT_temp_p	Analog	This network variable output communicates the discharge air temperature in degrees Celsius to other devices. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nvoUnitStatus*	SNVT_hvac_status	(Structure)	This network variable output communicates unit status information to other devices.
nvoEffDATempSP	SNVT_temp_p	Analog	This network variable output communicates the effective discharge air temperature setpoint in degrees Celsius to other devices. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nvoDuctStatPress	SNVT_press_p	Analog	This network variable output communicates duct static pressure in Pascals to other devices. The valid range is from –32,768 Pa to 32,766 Pa with a resolution of 1 Pa.
nvoEffDuctStatSP	SNVT_press_p	Analog	This network variable output communicates the effective duct static pressure setpoint in Pascals to other devices. The valid range is from –32768 Pa to 32766 Pa with a resolution of 1 Pa.
nvoApplicMode	SNVT_hvac_mode	Enumerated	This network variable output communicates the application mode of the device.
nvoEffectOccup	SNVT_occupancy	Enumerated	This network variable output communicates the effective occupancy mode of the device. Avoid controlling this from a program.

* The variable nvoUnitStatus contains structures. It cannot be viewed on the operator display.

Note: For more information on network variable outputs associated with the DAC profile, see the LonMark™ Functional Profile: Discharge Air Controller. For more information on any standard network variable types (SNVTs), see SNVTs and SCPTs in the Device Resource Files on the LonMark™ Web site at www.lonmark.org.

Table 12. Tracer MP580/581 DAC profile network variable outputs (Continued)

Variable name	SNVT	Data type	Description
nvoExhFanStatus	SNVT_switch	Binary	This network variable outputs communicates the exhaust fan status of the device.
nvoRetFanStatus	SNVT_switch	Binary	This network variable outputs communicates the return fan status of the device.
nvoBldgStatPress	SNVT_press_p	Analog	This network variable output communicates the building static pressure in Pascals to other devices. The valid range is from –32,768 Pa to 32,766 Pa with a resolution of 1 Pa.
nvoOAFlow	SNVT_flow	Analog	This network variable output communicates the outdoor air flow rate in liters per second to other devices. The valid range is from 0 L/s to 65,534 L/s with a resolution of 1 L/s.
nvoMATemp	SNVT_temp_p	Analog	This network variable output communicates the mixed air temperature in degrees Celsius to other devices. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nvoSpaceTemp	SNVT_temp_p	Analog	This network variable output communicates the space temperature in degrees Celsius to other devices. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nvoSpaceRH	SNVT_lev_percent	Analog	This network variable output communicates the space relative humidity in percent to other device. The valid range is from –163.84% to 163.83% with a resolution of 0.005%.

* The variable nvoUnitStatus contains structures. It cannot be viewed on the operator display.

Note: For more information on network variable outputs associated with the DAC profile, see the LonMark™ Functional Profile: Discharge Air Controller. For more information on any standard network variable types (SNVTs), see SNVTs and SCPTs in the Device Resource Files on the LonMark™ Web site at www.lonmark.org.

Table 13. Tracer MP580/581 SCC profile network variable outputs

Variable name	SNVT	Data type	Description
nvoSpace Temp	SNVT_temp_p	Analog	This network variable output communicates the space temperature in degrees Celsius to other devices. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nvoUnitStatus*	SNVT_hvac_status	(Structure)	This network variable output communicates unit status information to other devices.
nvoEffectSetpt	SNVT_temp_p	Analog	This network variable output communicates the effective setpoint in degrees Celsius to other devices. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nvoEffectOccup	SNVT_occupancy	Enumerated	This network variable output communicates the effective occupancy mode of the device. Avoid controlling this from a program.

* The variable nvoUnitStatus contains structures. It cannot be viewed on the operator display.

Note: For more information on network variable outputs associated with the SCC profile, see the LonMark™ Functional Profile: Space Comfort Controller. For more information on any standard network variable types (SNVTs), see SNVTs and SCPTs in the Device Resource Files on the LonMark™ Web site at www.lonmark.org.

Table 13. Tracer MP580/581 SCC profile network variable outputs (Continued)

Variable name	SNVT	Data type	Description
nvoDischAirTemp	SNVT_temp_p	Analog	This network variable output communicates the discharge air temperature in degrees Celsius to other devices. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.
nvoSpaceRH	SNVT_lev_percent	Analog	This network variable output communicates the space relative humidity in percent to the devices. The valid range is from –163.84% to 163.83% with a resolution of 0.005%.
nvoSpaceCO2	SNVT_ppm	Analog	This network variable output communicates the space concentration of carbon dioxide (CO_2) in parts-per-million to other devices. The valid range is from 0 ppm to 65,535 ppm with a resolution of 1 ppm.
nvoMATemp	SNVT_temp_p	Analog	This network variable output communicates the mixed air temperature in degrees Celsius to other devices. The valid range is from –273.17°C to 327.66°C with a resolution of 0.01°C.

* The variable nvoUnitStatus contains structures. It cannot be viewed on the operator display.

Note: For more information on network variable outputs associated with the SCC profile, see the LonMark™ Functional Profile: Space Comfort Controller. For more information on any standard network variable types (SNVTs), see SNVTs and SCPTs in the Device Resource Files on the LonMark™ Web site at www.lonmark.org.

Examples of network variable bindings

The following examples show four common uses of bindings in Tracer MP580/581 applications.

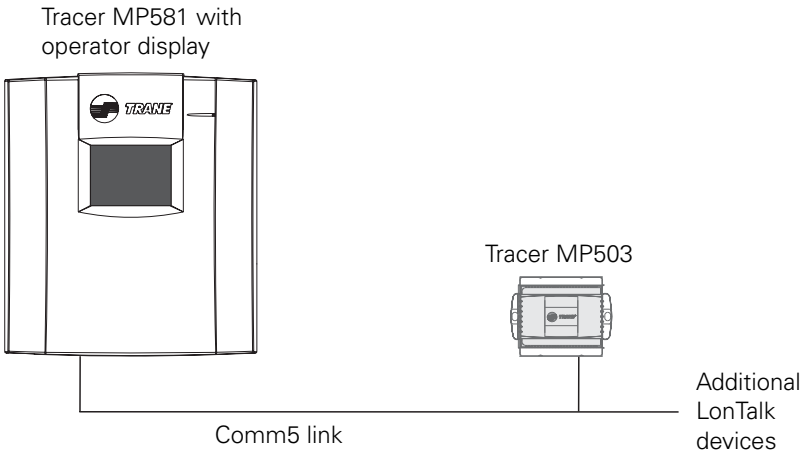
Example 1: Display sensor readings from a Tracer MP503 on a Tracer MP581 operator display

In this example, four different sensors are connected to a Tracer MP503 input/output (I/O) module. A thermistor reading the outside air temperature is connected to universal input 1 on the Tracer MP503. A 4–20 mA sensor reading the outside air humidity is connected to universal input 2. Two binary inputs from a fire panel (Alarm Status and Fire Panel Trouble) are connected to universal input 3 and universal input 4, respectively. A Tracer MP581 controller is on the same Comm5 link as the Tracer MP503. The Tracer MP581 is controlling an air-handling unit (AHU). The outside air enthalpy is required to control the economizer on the AHU.

The building operator also wants to know the outside air temperature and humidity, so those values should be displayed on the operator display of the Tracer MP581. The location of the outside air sensors made it convenient to wire those points to the Tracer MP503 also.

Use bindings to allow the economizer control in the Tracer MP581 to calculate outside air enthalpy and to display the four inputs from the Tracer MP503 on the operator display of the Tracer MP581. Figure 76 on page 119 shows the Comm5 network for this example.

Figure 76. Comm5 network for example 1



Use the Rover service tool to create bindings. (See the *Rover Operation and Programming* guide, EMTX-SVX01C-EN.) Using the Rover service tool, select the network variable from the Tracer MP503 and then select the Tracer MP581. The Rover service tool shows you only the variables in the Tracer MP581 of the SNVT that matches the variable you selected in the Tracer MP503.

Table 14 shows the bindings needed.

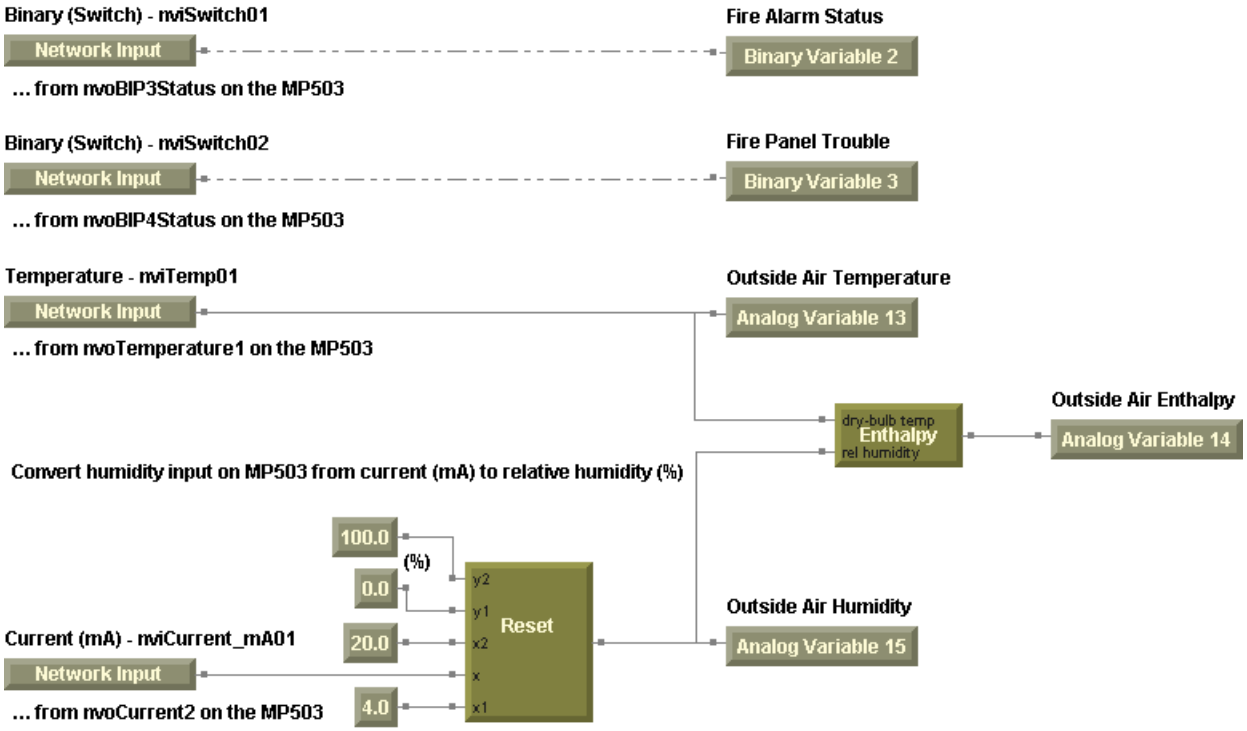
Table 14. Bindings for example 1

Network variable output on the Tracer MP503		Network variable input on the Tracer MP581
nvoTemperature1	binds to	nviTemp01[1]
nvoCurrent2	binds to	nviCurrent_mA01[2]
nvoBIP3Status	binds to	nviSwitch01[3]
nvoBIP4Status	binds to	nviSwitch01[3]

[1] The Tracer MP581 has 40 generic temperature (SNVT_temp_p) network variable inputs available for binding (nviTemp01 through nviTemp40).
[2] The Tracer MP581 has 8 generic current (SNVT_amp_mil) network variable inputs available for binding (nviCurrent_mA01 through nviCurrent_mA08).
[3] The Tracer MP581 has 40 generic binary (SNVT_switch) network variable inputs available for binding (nviSwitch01 through nviSwitch40).

Once you have completed the bindings, program the Tracer MP581 to display this data on the operator display. Remember that the outside air humidity is being transmitted over the network in units of mA. Some custom programming is required in the Tracer MP581 to convert the humidity from units of mA to units of percent (%). Custom programming in the Tracer MP581 will also use the outside air temperature and humidity to calculate the outside air enthalpy and use it to control the economizer of the AHU. See Figure 77 on page 120 for a sample program written in the TGP editor.

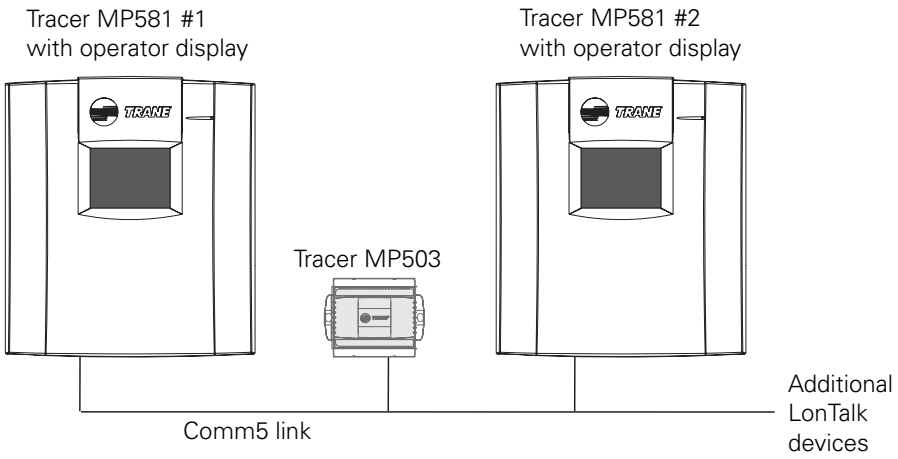
Figure 77. Program for example 1



Example 2: Display sensor readings from a Tracer MP503 on two different Tracer MP581 operator displays

This example builds on example 1 and shows that bindings can be “one to many.” In this example, a second Tracer MP581 controller is added to the system described in example 1. The second Tracer MP581 also controls an AHU. This AHU also requires the outside air enthalpy in order to control its economizer. As in example 1, use bindings to allow the economizer control in the second Tracer MP581 to calculate outside air enthalpy.
Figure 78 on page 121 shows the Comm5 network for this example.

Figure 78. Comm5 network for example 2



Use the Rover service tool to create bindings. (See the *Rover Operation and Programming* guide, EMTX-SVX01E-EN.) Using the Rover service tool, select the network variable from the Tracer MP503 and then select the second Tracer MP581. The Rover service tool shows you only the variables in Tracer MP581 #2 of the SNVT that matches the variable you selected in the Tracer MP503.

Table 15 shows the bindings needed between the Tracer MP503 I/O module and Tracer MP581 #2.

Table 15. Bindings for example 2

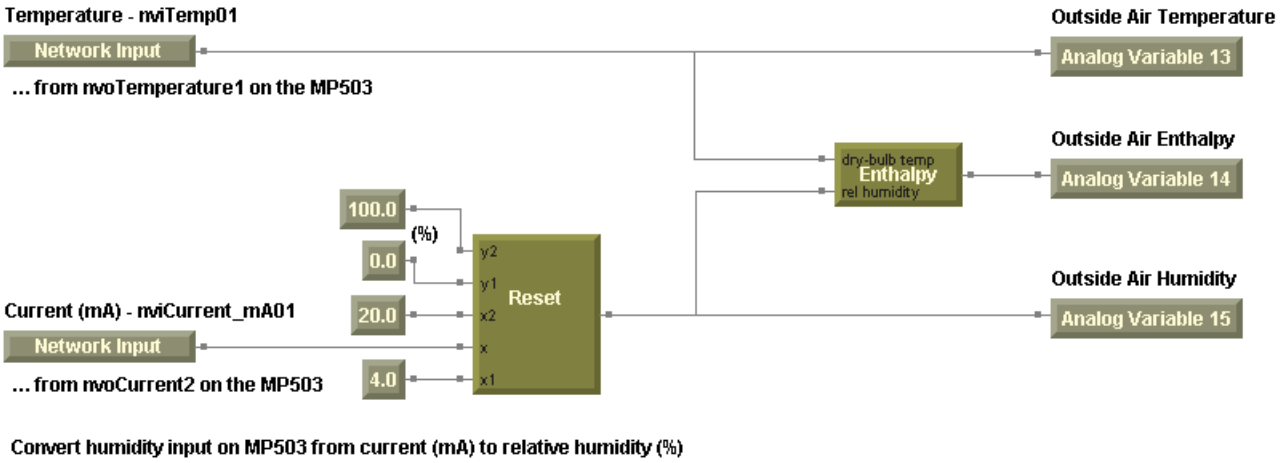
Network variable output on the Tracer MP503		Network variable input on Tracer MP581 #2
nvoTemperature1	binds to	nviTemp01[1]
nvoCurrent2	binds to	nviCurrent_mA01[2]

[1] The Tracer MP581 has 40 generic temperature (SNVT_temp_p) network variable inputs available for binding (nviTemp01 through nviTemp40).

[2] The Tracer MP581 has 8 generic current (SNVT_amp_mil) network variable inputs available for binding (nviCurrent_mA01 through nviCurrent_mA08).

Again, after you have completed the bindings, program Tracer MP581 #2 to calculate enthalpy from the outside air temperature and humidity. Custom programming is also required to display this data on the operator display of Tracer MP581 #2. Remember that the outside air humidity is being transmitted over the network in units of mA. Some custom programming is required in Tracer MP581 #2 to convert the humidity from units of mA to units of percent (%) before performing the enthalpy calculation. See Figure 79 on page 122 for a sample program written in the TGP editor.

Figure 79. Program for example 2

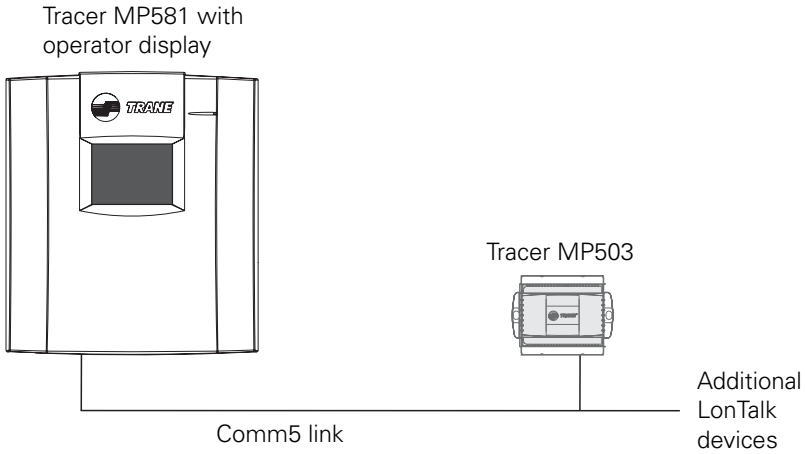


Example 3: Control a binary output on the Tracer MP503 from a Tracer MP581

This example shows an nvi on the Tracer MP503 I/O module being bound, which allows a binary output on the Tracer MP503 to be controlled by another device on the Comm5 network. In this example, binary output 1 on the Tracer MP503 is starting and stopping an exhaust fan. The Tracer MP503 is communicating through the Comm5 network to a Tracer MP581 controller that is controlling an AHU. The AHU and the exhaust fan follow the same schedule; for example, whenever the AHU runs, the exhaust fan runs.

Bind an nvo on the Tracer MP581 to an nvi on the Tracer MP503 so the AHU and exhaust fan run together. Figure 80 shows the Comm5 network for this example.

Figure 80. Comm5 network for example 3



Use the Rover service tool to create bindings. (See the *Rover Operation and Programming* guide, EMTX-SVX01C-EN.) Using the Rover service tool, select the network variable from the Tracer MP581 and then select the Tracer MP503. The Rover service tool shows you only the variables in the Tracer MP503 of the SNVT that matches the variable you selected in the Tracer MP581.

Table 16 shows the bindings needed.

Table 16. Bindings for example 3

Network variable output on the Tracer MP581		Network variable input on the Tracer MP503
nvoSwitch01[1]	binds to	nviBOP1Request
[1] The Tracer MP581 has 40 generic binary (SNVT_switch) network variable outputs available for binding (nvoSwitch01 through nvoSwitch40).		

Custom programming in the Tracer MP581 controls nvoSwitch01. Write a custom program to control nvoSwitch01 on when the AHU is on, and has been on for 30 seconds, and off when the AHU is off. The network binding passes the command to the binary output on the Tracer MP503. See Figure 81 for a sample program written in the TGP editor.

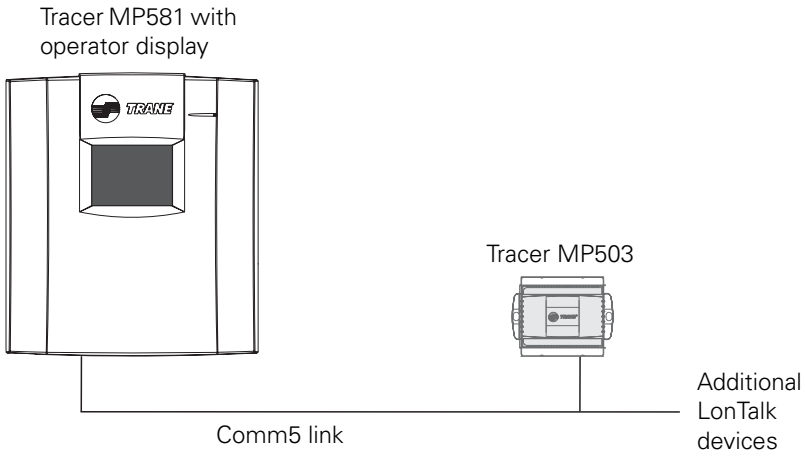
Figure 81. Program for example 3

Example 4: Use a sensor reading on a Tracer MP503 to control a pump VFD on a Tracer MP581

In this example, a Tracer MP581 controller is controlling the variable frequency drive (VFD) of a chilled water pump. We want to use a differential pressure sensor (4–20 mA output) to control the speed of this pump. Unfortunately, the differential pressure sensor is located more than 1,000 ft away from the pump, so it cannot be wired directly to the universal input on the Tracer MP581. Install a Tracer MP503 I/O module to read the differential pressure and then use network bindings to send the pressure value to the Tracer MP581 controlling the chilled water pump VFD.

Figure 82 on page 124 shows the Comm5 network for this example.

Figure 82. Comm5 network for example 4



Use the Rover service tool to create bindings. (See the *Rover Operation and Programming* guide, EMTX-SVX01C-EN.) Using the Rover service tool, select the network variable from the Tracer MP503 and then select the Tracer MP581. The Rover service tool shows you only the variables in the Tracer MP581 of the SNVT that matches the variable you selected in the Tracer MP503.

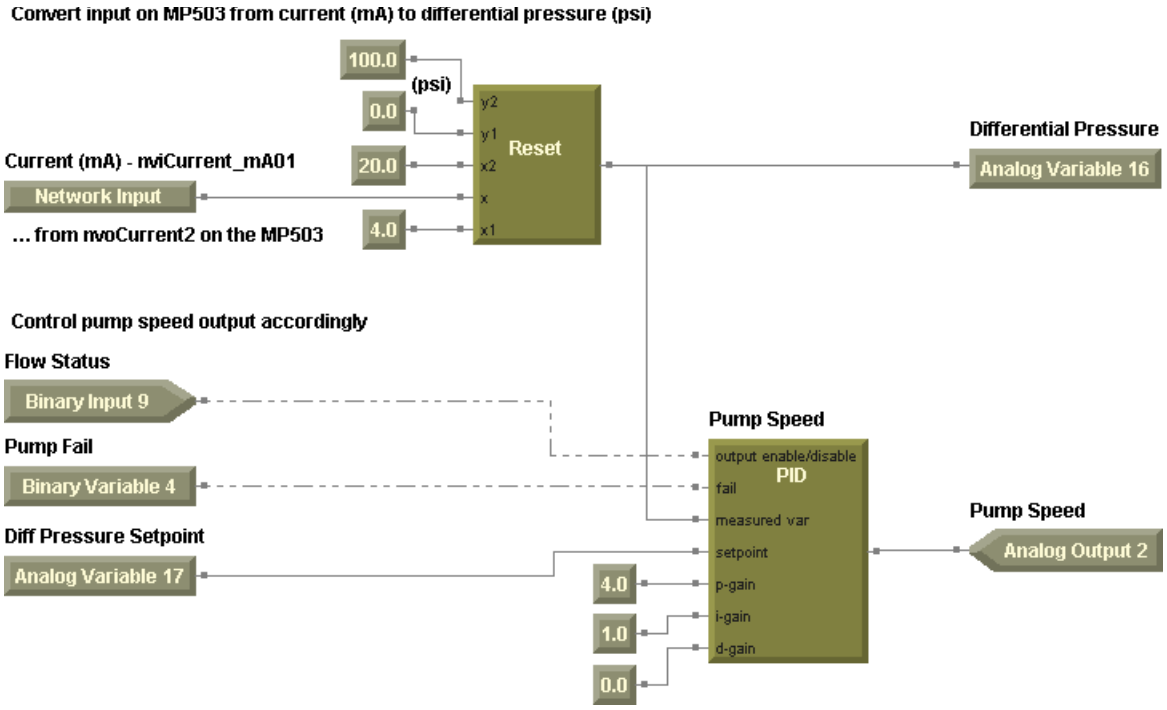
Table 17 shows the bindings needed.

Table 17. Bindings for example 4

Network variable output on the Tracer MP503		Network variable input on the Tracer MP581
nvoCurrent1	binds to	nviCurrent_mA01[1]
[1] The Tracer MP581 has 8 generic current (SNVT_amp_mil) network variable inputs available for binding (nviCurrent_mA01 through nviCurrent_mA08).		

Once you have completed the bindings, you need to program the Tracer MP581 to use this data to control the pump speed. Remember that the differential pressure is being transmitted over the network in units of mA. Some custom programming is required in the Tracer MP581 to convert the differential pressure from units of mA to the proper units of pressure. Custom programming in the Tracer MP581 will then use the pressure to control the speed of the chilled water pump. See Figure 83 on page 125 for a sample program written in the TGP editor.

Figure 83. Program for example 4



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