Simple Temperature Control Connected Components Building Block

Quick Start

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://literature.rockwellautomation.com) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING ⚠	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION ⚠	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
SHOCK HAZARD ⚡	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD ♨	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

Connected Components Building Block Outline

Follow the path below to complete your connected components building block.

Connected Components
Building Blocks, publication
CC-QS001

Chapter 1 900-TC Temperature Controller Integration
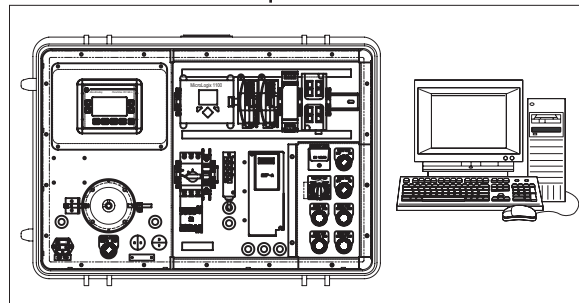
Chapter 2 System Validation and Application Tips

Table of Contents

About This Publication

This quick start is designed to provide a way to implement a connected component for temperature control.
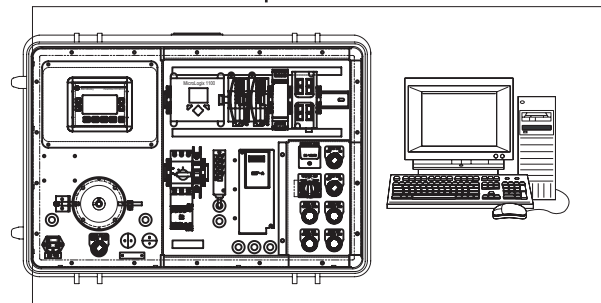

IMPORTANT   Use the Temperature Control Connected Components Building Block Quick Start in conjunction with the Connected Components Building Blocks Quick Start, publication CC-QS001.

Refer to Additional Resources on page 8 for a listing of quick starts.

To assist in the design and installation of your system, application files and other information are provided on the Connected Components Building Blocks Overview CD, publication CC-QR001. The CD provides bills of materials (BOM), CAD drawings for panel layout and wiring, control programs, Human Machine Interface (HMI) screens, and more. With these tools and the built-in best-practices design, the system designer is free to focus on the design of their machine control and not on design overhead tasks.

The beginning of each chapter contains the following information. Read these sections carefully before beginning work in each chapter:

- **Before You Begin** - This section lists the steps that must be completed and decisions that must be made before starting that chapter. The chapters in this quick start do not have to be completed in the order in which they appear, but this section defines the minimum amount of preparation required before completing the current chapter.
- **What You Need** - This section lists the tools that are required to complete the steps in the current chapter. This includes, but is not limited to, hardware and software.
- **Follow These Steps** - This illustrates the steps in the current chapter and identifies which steps are required to complete the examples.

Conventions

Convention	Meaning	Example
Check or uncheck	To activate or deactivate a checkbox.	Check Disable Keying.
Click	Click the left mouse button once while the cursor is positioned on object or selection.	Click Browse.
Double-click	Click the left mouse button twice in quick succession while the cursor is positioned on object or selection.	Double-click the application icon.
Expand	Click the + to the left of a given item /folder to show its contents.	Expand 1768 Bus under I/O Configuration.
Right-click	Click the right mouse button once while the cursor is positioned on object or selection.	Right-click the 1768 Bus icon.
Select	Using the mouse to highlight a specific option.	Select the New Module folder.
Enter	What you type.	Enter your choice.
Press	Pressing a specific key on the keyboard.	Press Enter.
>	Use this symbol to indicate the sub-menu name.	Choose File>Menu>Options.

Additional Resources

Resource	Description
Connected Components Building Blocks Quick Start, publication CC-QS001	Provides information on how to select products and gain access to panel and wiring information.
Connected Components Building Blocks Overview CD, publication CC-QR001	Provides files for the Connected Components Building Blocks.
MicroLogix 1100 Programmable Controllers User Manual, publication 1763-UM001	Provides information on using the MicroLogix 1100 Programmable Controller.
MicroLogix 1400 Controller User Manual, publication 1766-UM001	Provides information on using the MicroLogix 1400 Programmable Controller.
PanelView Component Operator Terminals User Manual, publication 2711C-UM001	Provides information on using the PanelView Component HMI Terminals.
Temperature Controllers User Manual, publication 900-UM007	Provides information on configuration, operation, and troubleshooting 900-TC16 and 900-TC8 temperature controllers.
Temperature Controller Communications Functions, publication 900-UM004	Provides information on using the communication capabilities of the 900-TC series of temperature controllers.
Temperature/Process Controller Installation Instructions, publication 41063-227-01	Provides information on installing and using the 900-TC16 controller.
Temperature Controller Option Units, Installation Instructions, publication 41063-223-01	Provides information on connecting optional equipment available for use with the 900-TC16 controller.
http://www.ab.com	Provides access to the Allen-Bradley website.
http://rockwellautomation.com/knowledgebase	Provides access to self-service support.
http://rockwellautomation.com/components/connected/blocks.html	Provides access to the Connected Components website.

900-TC Temperature Controller Integration

Introduction

In this chapter, you configure the parameters in the temperature controller to allow the MicroLogix controller to communicate with the temperature controller via Modbus protocol.

This chapter provides step-by-step instructions for configuring the 900-TC16 controller. The procedure is very similar for the 900-TC8 controller. These steps do not apply to the 900-TC32 as that module does not support Modbus RTU communication.

In addition, this chapter specifies the minimum number of parameters that need to be changed from the factory default settings to establish communication with MicroLogix controllers. For your machine application, there may be additional temperature controller parameters that need to be adjusted. Consult the temperature controller documentation listed in the Additional Resources on page 8 for information on all the other temperature parameters. This building block helps you develop an application to control a light, heater, relay, contactor (single or three-phase output) or fan using an analog output from the 900-TC controller.

Before You Begin

- Review the Connected Components Building Blocks Quick Start, publication CC-QS001, verifying that you have completed the hardware design and installation as well as software installation.
- Apply power to your 900-TC controller.

What You Need

- personal computer with 900BuilderLite 1.2 software loaded
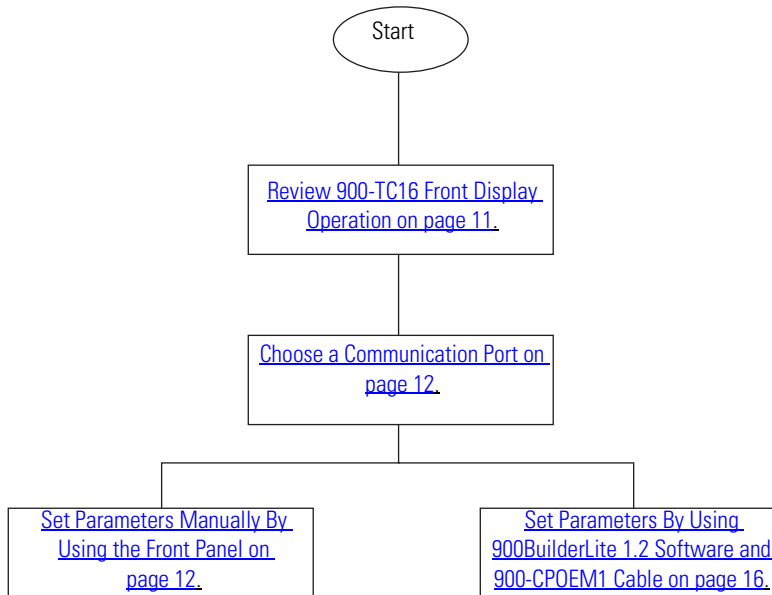- 900-CPOEM1 USB-Serial Conversion Cable (recommended)

  To use this cable, you must download the free USB driver. The driver is available on the Temperature Controller home page, http://www.ab.com/industrialcontrols/products/relays_timers_and_temp_controllers/single_loop_temp-heater_controllers/900tc.html. On the right side of the home page, under Get Software', click 900-CPOEM1 Driver and follow the download instructions.
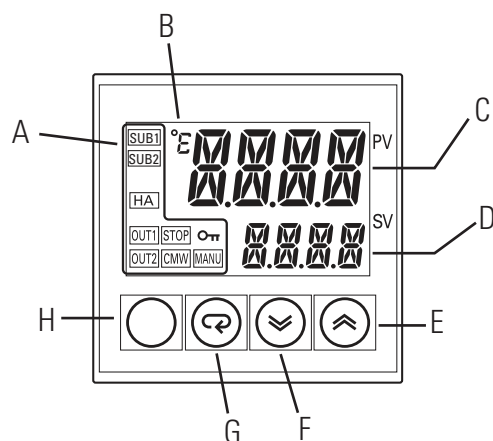
- Connected Components Building Blocks Overview CD, publication CC-QR001
- 900-TC16ACGTU25 controller
- MicroLogix 1100 or 1400 controller

Follow These Steps

Follow these steps to configure your temperature controller.

```
                        ┌─────────┐
                        │  Start  │
                        └─────────┘
                             │
              ┌──────────────────────────────┐
              │ Review 900-TC16 Front Display │
              │    Operation on page 11.      │
              └──────────────────────────────┘
                             │
              ┌──────────────────────────────┐
              │ Choose a Communication Port on│
              │          page 12.             │
              └──────────────────────────────┘
                             │
         ┌───────────────────┴───────────────────┐
  ┌──────────────────┐              ┌───────────────────────┐
  │ Set Parameters   │              │ Set Parameters By Using│
  │ Manually By Using│              │ 900BuilderLite 1.2     │
  │ the Front Panel  │              │ Software and           │
  │ on page 12.      │              │ 900-CPOEM1 Cable on    │
  │                  │              │ page 16.               │
  └──────────────────┘              └───────────────────────┘
```

Review 900-TC16 Front Display Operation

Item	Operation Indicators	
A	SUB1	Lights when the auxiliary 1 output is ON.
	SUB2	Lights when the auxiliary 2 output is ON.
	HA	Heater burnout alarm display indicator lights (red) when a heater failure, due to open or short-circuit, is detected. The heater burnout alarm remains ON because the heater burnout latch is set. To reset, cycle the power supply or set the heater burnout alarm value to 0.0 A.
	OUT1	Control output 1 indicator lights (amber) when control output 1 is ON.
	OUT2	Control output 2 indicator lights (amber) when control output 2 is ON.
	STOP	Stop indicator lights (amber) when control of the 900-TC16 controller has stopped. During control, this indicator lights when an event or the run/stop function has stopped. Otherwise, it is OFF.
	CMW	Communication writing control indicator lights (amber) when communication writing is enabled and is OFF when communication writing is disabled.
	MANU	Manual mode indicator lights when the controller mode is manual.
	O┰	Key indicator lights when the settings change protection is ON (⌄ and ⌃ keys are disabled).
B	Temperature Unit	Temperature units are displayed when the display unit parameter is configured for temperature. Indication is determined by the currently selected temperature unit parameter set value. When this parameter is set to °C, 'c' is displayed. When this parameter is set to °F, 'f' is displayed.
C	No. 1 Display	Displays the process value or parameter type. (Programmable as red, green, or amber.)
D	No. 2 Display	Displays the set point, manipulated variable, or configured value (setup) of the parameter.
E	Up Key	Each press of this key increases values displayed in the No. 2 display. Holding down this key continuously increases values.
F	Down Key	Each press of this key decreases values displayed on the No. 2 display. Holding down this key continuously decreases values.
G	Mode Key	Press this key to select parameters within each functional group.
H	Function Group Selection Key	Press this key to select the setup function group. The setup function group is selected in this order: operation function group, adjustment function group, initial setting function group, communications setting function group.
Function Group + Mode Key		This key combination sets the 900-TC16 controller to the protect function group.

Choose a Communication Port

The 900-TC series B controller has two communication ports which operate independently.

- Unit No. 1, a fixed 4-pin port
- Unit No. 00…99, an RS-485 port on 900-TC16 and an RS-232C port on 900-TC8 controllers

TIP	The use of RS-485 communication requires that you have an RS-485 communication card installed.

The 900-TC16 controller's communication parameters must be set before any communication via Modbus protocol can be established. You can set the parameters using the front panel or by using the 900-CPOEM1 Cable and 900BuilderLite software, version 1.2.

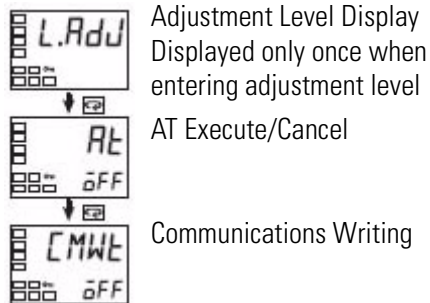| **TIP**	The easiest way to set parameters in an application that includes multiple 900-TC controllers is to use 900BuilderLite 1.2 software and the 900-CPOEM1 cable.

Set Parameters Manually By Using the Front Panel

To change the parameters using the front panel, you need to turn Communication Writing ON to let the host write to the 900-TC16 controller via communications. You also need to configure the temperature controller for Modbus communication. Then, you can edit the other parameters used in this application.

Set Communications Writing

Follow these steps to set the communication writing parameter to ON.

1. Press the ▢ key for less than one second to move from the operation level to the adjustment level.

2. Select the parameters as shown by pressing the ⏎ key.

3. Use the ⌄ or ⌃ keys to set the communications writing parameter to ON.

L.AdJ — Adjustment Level Display
Displayed only once when entering adjustment level

At oFF — AT Execute/Cancel

CMWt oFF — Communications Writing

Change Communication Parameters for Modbus Protocol

The 900-TC controller's communication parameters are set at the communication setting level.

Communication Parameters and Ranges

Parameter	Characters Displayed	Range[1]
Communication protocol	*PSEL*	*CWF*/*Mod*
Communications unit number	*U-No*	0, **1**…99
Baud rate	*bPS*	1.2/2.4/4.8/**9.6**/19.2/38.4/57.6 kbps
Communication data length	*LEN*	**7**/8 bit
Communications stop bit	*Sbit*	1/**2**
Communications parity	*PRtY*	*NoNE*/***EuEn***/*odd* (None/even/odd)
Send data wait time	*SdWt*	0…99 ms, default time: **20** ms

(1) Bold text indicates default settings.

To set these parameters manually by using the front panel, follow these steps.

1. Hold down the ⬭ Function Group key for at least three seconds to move from the Operation function group to the Initial Setting function group.

2. Press the ⬭ Function Group key for less than one second to move from the Initial Setting group to the Communication Setting group.

3. Select the appropriate parameters by pressing the ⮂ Mode key.

4. Use the ⌄ and ⌃ keys to change the parameter set values.
    For Modbus protocol as used in this application, make the following settings:

    - Communication protocol: *Mod*
    - Communications unit no.: *17*
      This parameter sets a unique unit number for each temperature controller, letting the host identify the temperature controller during communication. When two or more temperature controllers are used, do not use the same unit number. This building block uses unit numbers (nodes) 17…24.
    - Communication baud rate: *9.6* kbps
   - Communications parity: *NoNE*
    - Send data wait time: *20*

5. After you change the communication parameters, enable them by resetting the controller.

Set Parameters Used in this Building Block Application

Follow these steps to manually change the following parameters as shown for this building block application.

Parameter		Setting
	Set Point	*80*
īn-t	Input Type	*7* = J type thermocouple
d-U	Temperature Unit	*°F* = Fahrenheit
īNtL	PID/OnOff	*Pīd* = PID
ōREV	Direct/reverse Operation	*ōR-d* = direct
ALt 1	Alarm 1 Type	*8* = absolute value, upper limit
ALt2	Alarm 2 Type	*8* = absolute value, upper limit
AL - 1	Alarm Value 1	*75*
AL -2	Alarm Value 2	*85*

These parameters are described in more detail in Appendix A and can be adjusted for your application. Appendix A also contains a flowchart of function groups and parameters to help you set additional parameters specific to your application.

1. Hold down the ▣ function key for at least three seconds to move from the Operation group to the Initial Setting group.

2. Change the *īN-t* by using the ⊻ and ⊼ keys to set the input type to 7 or match your input type.

3. Press the ⊡ mode key to move to the *d-U* setting.

4. Press ⊼ to change from *°C* to *°F*.

5. Press the ⊡ mode key to move to *īntL*.

6. Press ⊼ to change from *ōNōF* to *Pīd*.

7. Press the ⊡ mode key to change to direct operation *ōREV*.

8. Press ⊻ to change from direct to reverse, if needed.
   Usually, direct is used for fans and reverse for heaters.

9. Press the ⊡ mode key to move to *ALt 1*.

10. Press ⊼ to change the setting to *8*, or the value you require for your application.

11. Press the ⊡ mode key to move to *ALt2*.

12. Press ⊼ to change the setting to *8*, or the value you require for your application.

13. Press the ⊡ function group key for three seconds to move to the Operation group.

14. Press the ⊡ mode key to move to *AL - 1*.

15. Press ⊻ or ⊼ to change the level to *75*, or the value you require for your application.

16. Press the ⊡ mode key to move to *AL -2*.

17. Press ⊻ or ⊼ to change the level to *85*, or the value you require for your application.

Setting the 900-TC Controller for Manual Control

Follow these steps to configure the controller to use manual control.

1. Press the ⊡ key for at least 3 seconds to move from the Operation function group to the Initial Setting function group.

 PV/SP

 Input type

2. Select the PID On/Off parameter by pressing the ⊡ key and choosing PID mode.
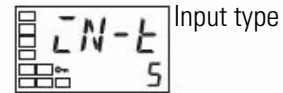
3. Select the Move to Advanced Setting function group parameter by pressing the ⊡ key.
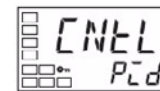
4. Press the ⊻ key to enter the password (-169) and move from the Initial Setting function group to the Advanced Setting function group.

 Parameter Initialization

5. Select the Auto/Manual Select Addition parameter by pressing the ⊡ key.

6. Use the ⊼ key to set the parameter to ON.

7. Press the ▢ key for at least 1 second to move from the
Advanced Setting function group to the Initial Setting
function group.

 Input type
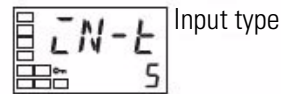
8. Press the ▢ key for at least 1 second to move from the Initial Setting function group to the
Operation function group.

Set Parameters By Using 900BuilderLite 1.2 Software and 900-CPOEM1 Cable

Before you proceed, make sure the free 900BuilderLite, version 1.2 software and the free USB
driver have been downloaded.

Connect the cable to your
personal computer's USB port
and the 900-TC16 controller's
communication port for support
software.
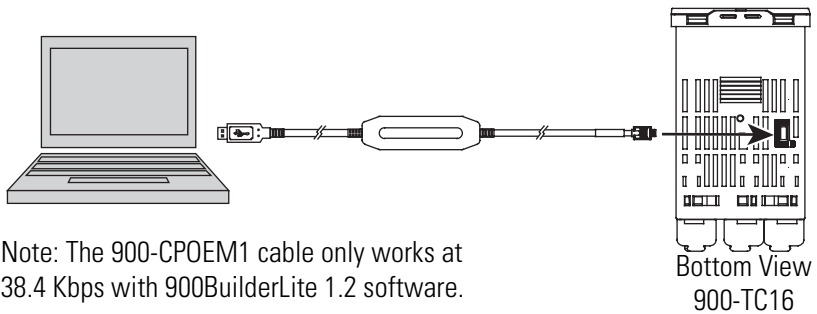
Note: The 900-CPOEM1 cable only works at
38.4 Kbps with 900BuilderLite 1.2 software.

Bottom View
900-TC16

Change Communication Parameters for Modbus Protocol

Follow these steps to set communication parameters for the 900-TC16 controller when using the 900-CPOEM1 cable.

1. Launch 900BuilderLite, version 1.2.
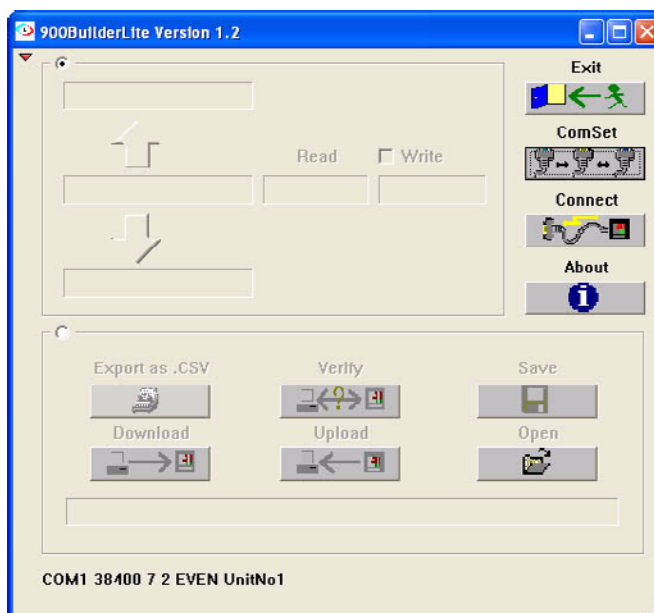
2. Click ComSet to open the communication settings dialog box.

3. From the Serial Port pull-down menu, choose your personal computer's serial port.
It may be different than the one shown here.

4. From the appropriate pull-down menu, choose the Baud Rate, Data Length, StopBit Length, Parity and UnitNo as shown here.
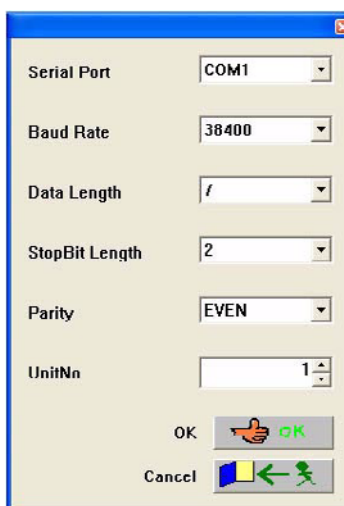
5. Click OK.

6. Click Connect.

ComSet fades out and Connect is covered by a red X.
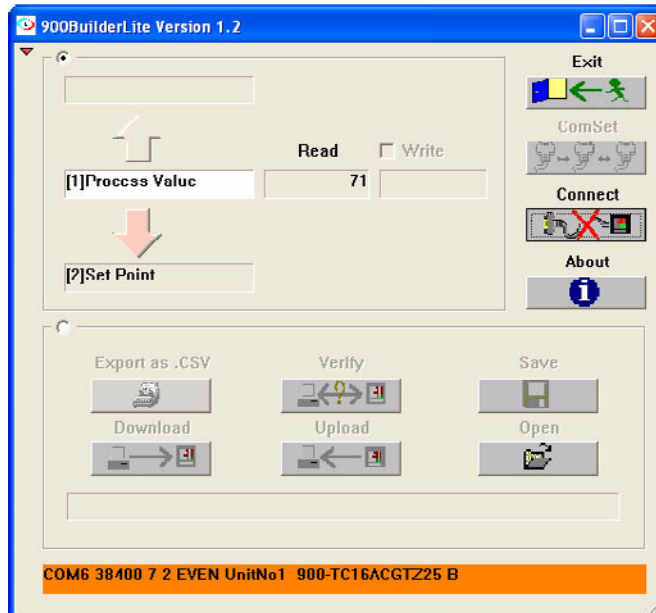
7. Click the red triangle in the upper left corner to open the parameter list.

The model number of your temperature controller appears at the bottom of the screen.

8. Scroll down to parameter [131] Protocol Setting.

9. Double-click the parameter to edit it.

10. Check the box next to Write, if it is not already checked.

11. Type 1 for Modbus.
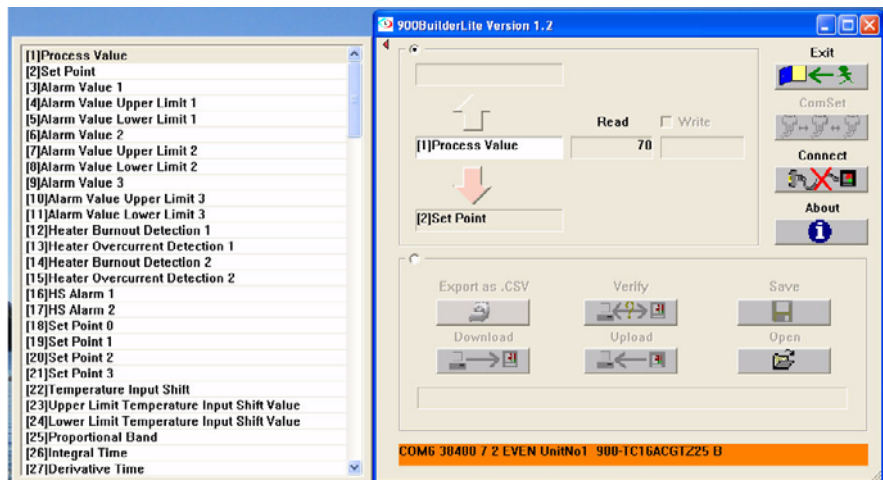
12. Press Enter on your personal computer keyboard.

The value appears in the Read field.

13. Set these parameters to the values shown in bold type in the table.

The software doesn't list individual values, but uses digits as shown in the table.

Parameter	Setting	
[131] Protocol Setting	0	CWF
	1	**MoD**
[132] Communications Unit No.	**17**	change to additional nodes as desired
[133] Communications Baud Rate	0	1.2 kbps
	1	2.4 kbps
	2	4.8 kbps
	3	**9.6 kbps**
	4	19.2 kbps
	5	38.4 kbps
	6	57.6 kbps
[134] Communications Data Length[1]	7	7 bits
	8	8 bits
[135] Communications Stop Bits[1]	1	1
	2	2
[136] Communications Parity	**0**	**None**
	1	Even
	2	Odd
[137] Send Data Wait Time	0…99	**20** ms (default)

(1)   These parameters are not used for Modbus protocol. Leave these settings at their defaults.

Set Parameters Used in this Building Block Application

Change the following parameters as shown for this building block application.

Parameter	Setting
[2] Set Point	80
[43] Input Type	7 = J type thermocouple
[47] Temperature Unit	1 = Fahrenheit
[50] PID/OnOff	1 = PID
[56] Direct/reverse Operation	1 = Direct
[57] Alarm 1 Type	8 = absolute value, upper limit
[59] Alarm 2 Type	8 = absolute value, upper limit
[61] Alarm 3 Type	0[1]
[3] Alarm Value 1	75
[6] Alarm Value 2	85
[9] Alarm Value 3	0[1]
[105] Auto/Manual Select Addition	1 = Manual[2]

(1)   Set this value to zero because the value is not used on the 900-TC16 temperature controller.

(2)   Do not set this parameter to manual for On/Off control.

These parameters are described in more detail in <u>Appendix A</u> and can be adjusted for your specific application.

Upload and Save Your Settings

To upload and save the settings you just made, follow these steps. Once the program has been uploaded and saved, you can download it to other 900-TC temperature controllers.

1. Select the radio button in the middle left of the 900BuilderLite dialog box.

2. Click Upload.
   The cancel button

   appears during upload and disappears when the upload is complete.

3. Once the upload is complete, click Save.
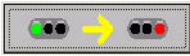
4. Type a name for your project file.
   Filenames have a .tmf extension.

5. Click Save.
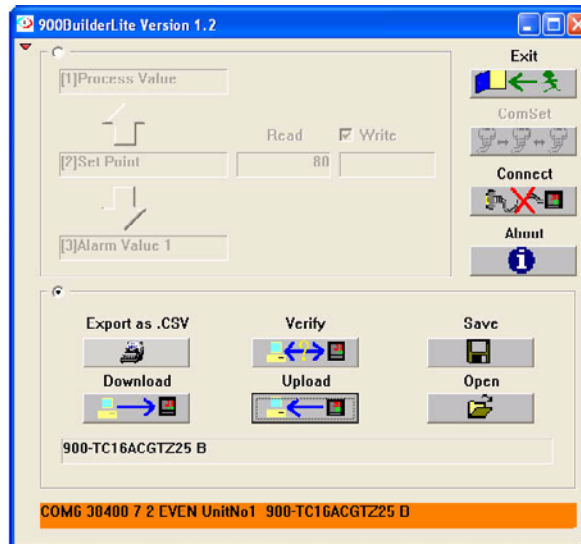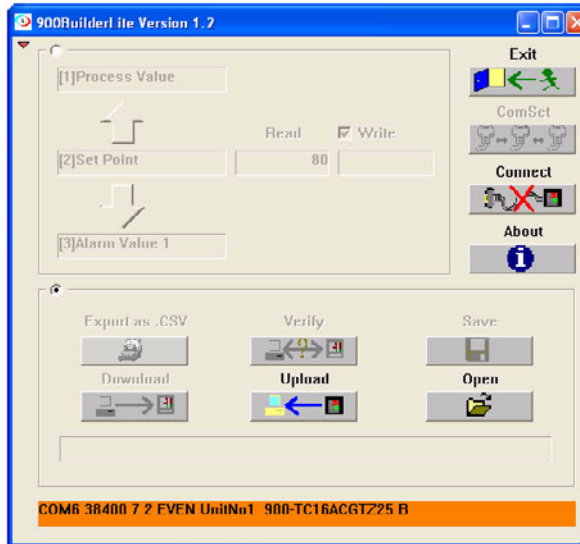
Download Your Program to Another 900-TC Temperature Controller

1. Make sure 900BuilderLite, version 1.2 is configured and your PC is connected to the 900-TC controller.

2. Click Open.

3. Select your project file and click Open.

4. Click Download.

5. Verify that the UnitNo is 1 and click OK.

The cancel button appears during the download and disappears when the download is complete.
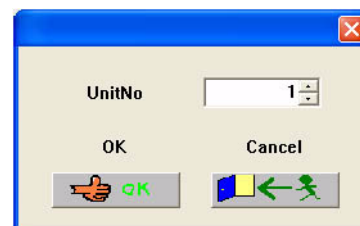
Additional Resources

Refer to for a listing of product and information resources.

System Validation and Application Tips

Introduction

In this chapter, you validate that communication is occurring as intended between the MicroLogix controller and the 900-TC temperature controller as well as between the MicroLogix controller and the PanelView terminal.

Before You Begin

- Verify that all the devices are connected per the Temperature Control CAD wiring diagram.
- Verify that the MicroLogix controller, 900-TC controller, and the PanelView terminal have power applied to them.
- Review the Connected Components Building Blocks Quick Start, publication CC-QS001, verifying that you have completed all of the steps in Chapter 3 of that publication.
- Verify that you have completed all of the steps in Chapter 1 of this document.

What You Need

- Personal computer.
- PanelView Component terminal.
- MicroLogix 1100 or 1400 controller.
- 900-TC temperature controller.
- Previously loaded software.
- Standalone Ethernet switch so that you can connect your personal computer to both the MicroLogix controller and PanelView terminal over an isolated Ethernet network.
- The Connected Components Building Blocks Overview CD, publication CC-QR001.

Follow These Steps

Follow these steps to ….

```
                          ( Start )
                             │
                             │
        ┌────────────────────────────────────────┐
        │ Configure and Validate MicroLogix       │
        │ Controller-to-900-TC Controller         │
        │ Communication on page 25                │
        └────────────────────────────────────────┘
                             │
        ┌────────────────────────────────────────┐
        │ Configure and Validate PanelView        │
        │ Component                               │
        │ Terminal-to-MicroLogix Controller       │
        │ Communication on page 26                │
        └────────────────────────────────────────┘
                             │
        ┌────────────────────────────────────────┐
        │ Testing the Temperature                 │
        │ Control Functionality on page           │
        └────────────────────────────────────────┘
                             │
        ┌────────────────────────────────────────┐
        │ Integrating 900-TC Control into         │
        │ the Machine Control Ladder              │
        │ Logic on page 34                        │
        └────────────────────────────────────────┘
                             │
        ┌────────────────────────────────────────┐
        │ MicroLogix Sample Code for              │
        │ 900-TC Backup & Restore on              │
        │ page 34                                 │
        └────────────────────────────────────────┘
                             │
        ┌────────────────────────────────────────┐
        │ Merge the PB&R Routine into             │
        │ a New or Existing Program on            │
        │ page 36                                 │
        └────────────────────────────────────────┘
                             │
        ┌────────────────────────────────────────┐
        │ Initiate PB&R Functionality on          │
        │ page 39                                 │
        └────────────────────────────────────────┘
```

Configure and Validate MicroLogix Controller-to-900-TC Controller Communication

By default, the MicroLogix temperature control routine is configured for communication with one temperature controller, set to node address 17. We recommend that communication be verified with one temperature controller at a time. The procedures listed are for the first temperature controller. Perform these steps for each temperature controller in your application.

Data table bits B240/17…B240/24 are the temperature-communication enable bits for node addresses 17…24. If a bit is turned ON, the MicroLogix controller attempts to communicate with the temperature controller at the node address represented by that bit during each communication scan.

By default, only bit B240/17 (temperature controller #1 enabled) is set. Bits B240/18…24 are cleared. You can change and verify these setting by using either the programming software or the built-in Bit Monitoring function of the MicroLogix LCD display.

Follow these steps to verify or change the settings.

1. On the MicroLogix front panel, press Esc until the display shows the top-level menu selections:

   - I/O Status
   - Monitoring
   - Mode Switch

2. Press the down arrow corner of the diamond key so that the screen selector is pointing to Monitoring and press OK.

   The display shows these menu selections:

   - Bit
   - Integer

3. Press OK to choose Bit.

   'B240:0/0= OFF' appears, with '0/0' flashing.

4. Press the up arrow corner of the diamond key to display B240:0/17, with '0/17' flashing, and to verify that the value is 'ON'.

5. If the value is OFF, change it to ON.

   a. Press OK so that 'OFF' begins flashing.
   b. Press the up arrow of the diamond key to change OFF to ON.
   c. Press OK to accept the change.

6. Verify that B240:0/18…B240:0/24 are all OFF by pressing the up arrow to display that status of each bit.

7. Make sure the MicroLogix controller is in Run mode by verifying that the Run status indicator next to the display screen is ON (solid green).

If the MicroLogix controller is not in Run mode, change the mode by using the programming software or the Mode switch function of the MicroLogix display.

8. Verify that the COMM0 indicator in the top left corner of the MicroLogix display is flashing rapidly to indicate that the Temperature Control routine is constantly communicating with the 900-TC temperature controller via communication channel 0.

If	Then
the COMM0 status indicator is flashing rapidly	test any additional 900-TC temperature controllers by repeating the previous steps.
the COMM0 status indicator is flashing only once every couple of seconds	the 900-TC temperature controller is not responding to the MicroLogix controller's communication attempts. Verify the wiring connections and the 900-TC controller's communication parameter settings.
the COMM0 status indicator is always OFF	the MicroLogix controller is not in Run mode or the Temperature Control routine was not properly downloaded to the controller.

Configure and Validate PanelView Component Terminal-to-MicroLogix Controller Communication

The six-inch color touchscreen PanelView Component (PVc) terminal communicates with the MicroLogix controller over the Ethernet network. The PVc application reads from and writes to the data table of the MicroLogix controller. When the PVc application writes to the MicroLogix controller, the controller program detects the value change and writes that new value to the appropriate temperature controller via the Modbus network. Since the controller program is continually updating status data from all of the enabled temperature controllers into its data table via Modbus reads, the PVc application is monitoring the latest 900-TC temperature controller status data.

Modify the IP Address

The sample CCBB Temperature Control programs for the controller and PVc terminal assumes the static IP address for the MicroLogix controller is 192.168.1.2. If you are using this address, go to .

If you are using a different address for the controller, you must modify the MicroLogix controller's IP address in the PVc application by following these steps.

1. Connect to the PVc terminal with your web browser by entering the terminal IP address in the web browser address bar.

2. Select the application name in the PVc dashboard dialog box and click Edit.

3. From the Edit dialog box, click the Communication tab.

4. Type the correct IP address and click Save.
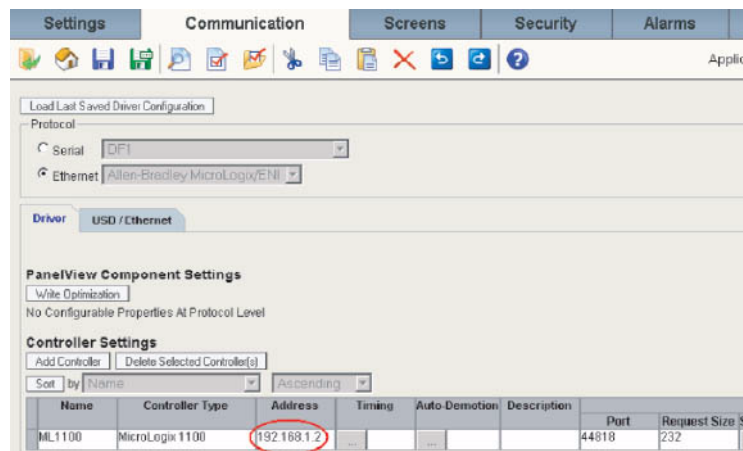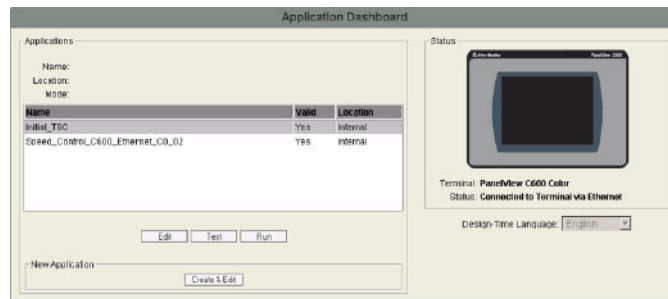
Run the PVc Application

1. If you are not already connected, connect to the PVc terminal with your web browser by entering the terminal IP address in the web browser address bar.

2. Select the application name in the PVc dashboard dialog box and click Run.

View the Network Overview Screen

Since you have already verified that communication between the MicroLogix controller and the temperature controller is working, once the PVc application is running, any temperature controllers that are enabled should display as being 'Ready' on the Network Overview Screen.

Ready indicates that the temperature controller is responding when the MicroLogix controller attempts to communicate with it and that the 900-TC controller is ready to be started.
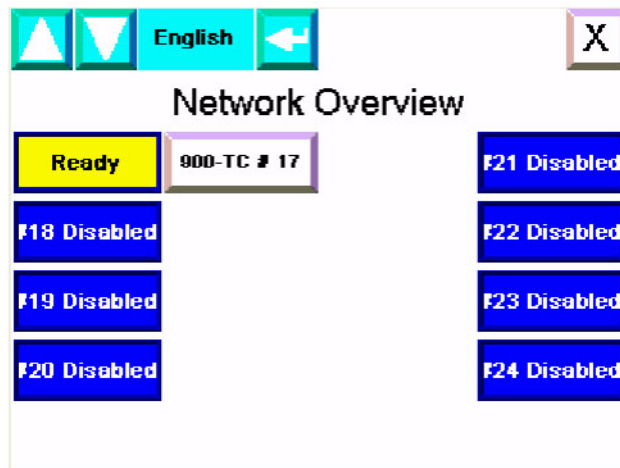
When the application is running, if a 900-TC node address is disabled, its '900-TC #*xx*' button is not visible. The Network Overview screen has been preconfigured to support up to eight 900-TC node addresses (17…24).

If you get a yellow banner message like the one shown below, the PVc application is still not able to communicate with the MicroLogix controller over the Ethernet network at the configured IP address.
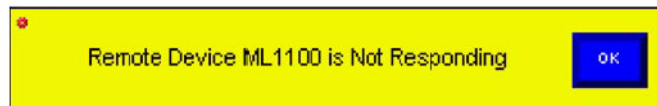
Use RSLogix 500 programming software and your web browser to verify that the MicroLogix controller's channel 1 IP address matches the one in the PVc application.

TIP   If your personal computer can communicate with both devices over the Ethernet network, then the PVc terminal should be able to communicate with the MicroLogix controller over the Ethernet network.

Once the PVc terminal is successfully communicating with the MicroLogix controller, you may observe a temperature controller status other than Disabled or Ready, such as Running or Faulted.
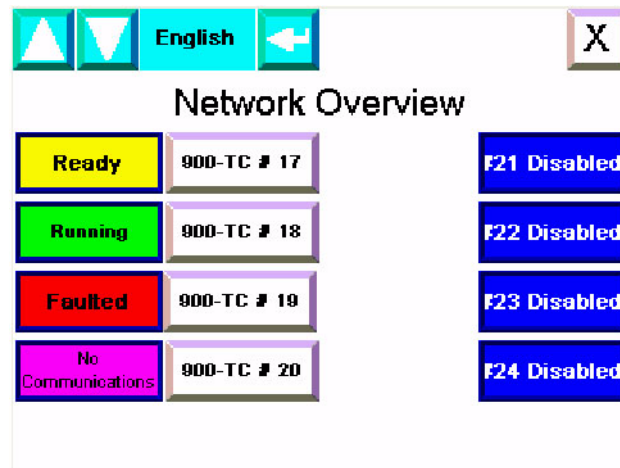
- Running indicates that the 900-TC controller has been started and is running.
- No Comms indicates that the 900-TC controller is not responding to communication attempts from the MicroLogix controller.
- Faulted indicates that the 900-TC controller has an alarm.

You can enable or disable a temperature controller node address from the Network Overview screen. Press the Disabled button to enable that node address. The button will display status information for the temperature controller at that node address. Press the button again to disable the temperature controller at that node address. The button displays Disabled again.

Click the X in the upper-right corner to exit this screen and go to the PVc Terminal Configuration dialog box.

Edit the Network Overview Screen

IMPORTANT   Before proceeding, make sure that all of the configured temperature controllers are enabled and communicating successfully and that all of the non-existing temperature controllers are disabled in the Network Overview screen.

You can edit the Network Overview screen and delete the buttons and status displays associated with non-existing temperature controllers. You can also change the temperature controller descriptions, like 900-TC#17, to something more meaningful for your application.

> **IMPORTANT**
>
> Screen numbering is very important. The controller-status screen numbers match the temperature controller's node address. With every screen change, the PVc terminal writes the screen number to the MicroLogix controller by entering in a destination tag for the current screen number under Tags>Global Connections. CMD_CURRNT_SCRN_NMBR is a write-only tag defined for the MicroLogix controller.

Since all of the 900-TC status screens use the same tag definitions, the MicroLogix controller copies the data for the appropriate controller based on the current screen number.

Testing the Temperature Control Functionality

Now that the PVc terminal is successfully communicating with the MicroLogix controller, you are ready to test the Temperature Control functionality.

View the Temperature Control Screen

On the Network Overview screen, press the 900-TC *#xx* button for a temperature controller that is enabled. The Temperature Control screen for that controller appears.

On this screen, 900-TC #*xx* is a text object that you can change to reflect the name and description of

the specific temperature controller. The [X] in the top-right corner takes you back to the Network Overview screen. This button only appears in Program mode.

The numeric displays in the middle show the temperature in °F, the Output % of the analog output, and the set point as provided by the MicroLogix controller program. Although the 900-TC temperature controller provides these values to the MicroLogix controller as integer values, the PLC program performs the appropriate calculations and stores the values as floating-point/real values, so that the PVc terminal can read and display them just as they are displayed on the built-in temperature controller displays.

Notice that the button in the lower-right corner displays Program mode. This indicates that the screen is for monitoring only. The MicroLogix program is still in control of the temperature controller. If you want to take control away from the MicroLogix controller, change to Operator mode.

To change from the Program mode to Operator mode, press Program. The Set Point indicator button illuminates to show that you can now adjust the Set Point from this menu. Pressing the button enables the numeric entry key pad.
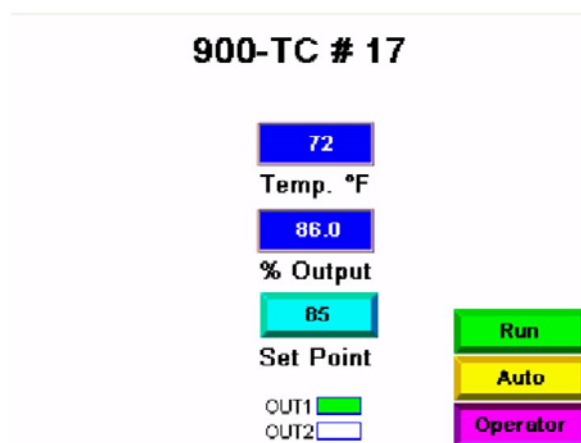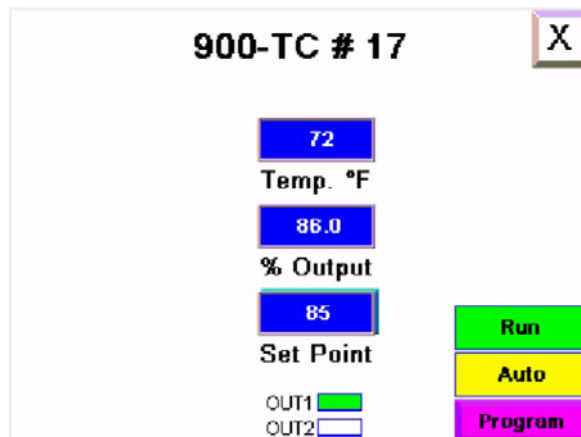
To manually control the Manipulated Variable, that is the % Output, switch from Auto to Manual mode by pressing Auto. The % Output indicator button illuminates. This is the % of the manipulated variable. Pushing the button will enact the numeric entry key pad.

TIP	Manual control only works in PID mode, not in On/Off mode.

TIP	If going back to Program mode, without changing back to Automatic mode, the % Output remains at the value se in Manual mode.

This screen also shows errors or alarms, if they exist. This example shows all of the possible errors that could be displayed.
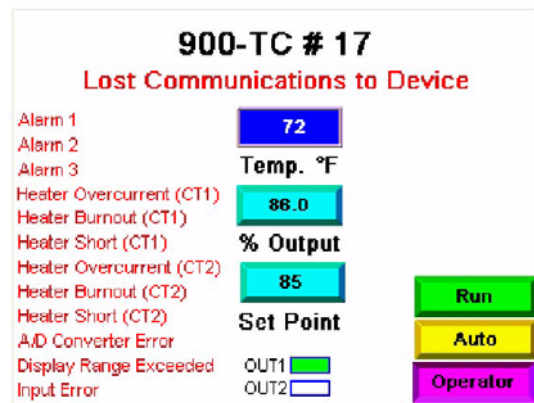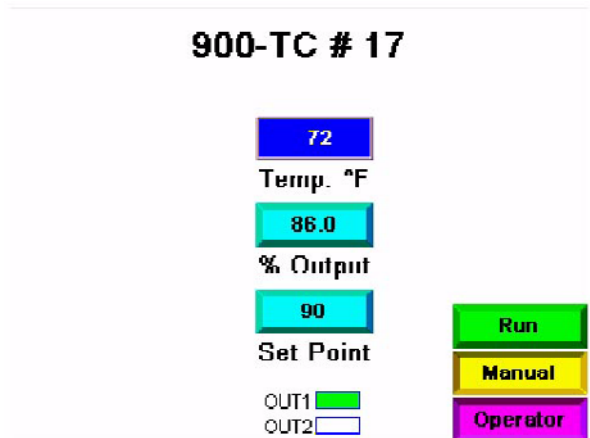
IMPORTANT	The current firmware in the 900-TC16 modules enables Alarm 3 type to default at type 2, alarm value of 0. The Alarm 3 is not used on the 900-TC16, but on the 900-TC8. This parameter cannot be changed on the front display of the 900-TC16. It can be turned off by using the 900BuilderLite 1.2 software. Go to parameter 61, Alarm 3 Type, enter 0 for the alarm type. The Alarm 3 will no longer be displayed on the PVc terminal.

Test the Temperature Controller

Follow these steps to test your controller.

1. Press Program to change to Operator mode.

This test can be done in Auto or Manual mode. The examples show Auto mode.

2. Press Stop while the 900-TC temperature controller is stopped, verifying that the temperature controller is in Run mode because the stop button is not illuminated on the 900-TC controller.

IMPORTANT   The Stop and Run indicator buttons are used to show which mode the temperature controller is in. That is why you press Stop to start and Run to stop.

---

3. Adjust the Set Point by pressing the Set Point button.

4. Type a new value on the numeric keypad and press enter on the keypad.

The Set Point display should show the new value.

5. Unplug the 1763-NC01 cable connection to the MicroLogix controller and verify that the Lost Communication to Device message is flashing.

6. Plug the 1763-NC01 cable back in and verify that the message disappears.
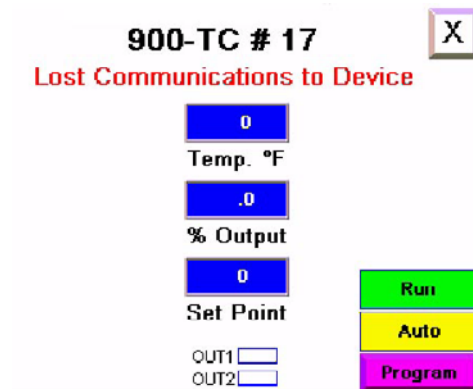
Integrating 900-TC Control into the Machine Control Ladder Logic

The previous section demonstrated how the PanelView Component (PVc) terminal used the Temperature Control routine to start, stop, and adjust the set point when the PVc terminal was in Operator mode. When the PVc terminal is in Program mode, it is your machine control ladder logic that uses the Temperature Control routine to control one or more of the temperature controllers by adjusting specific bits and words in the data table.

An example of how to use the temperature control routines to start and stop all of the temperature controllers is included in ladder file 100 of the Temperature Control routine.

MicroLogix Sample Code for 900-TC Backup & Restore

The 900-TC Parameter Backup & Restore (PB&R) provides the capability of backing up all of the configured 900-TC parameters for up to eight 900-TC controllers connected together on a Modbus serial RS-485 network. The parameter sets are stored as recipes within the MicroLogix controller, which is the Modbus master on the network. Recipe memory is used to store the parameter settings for each temperature controller, without consuming any MicroLogix user program or data table memory (except for that memory used by the subroutines themselves). As recipes, the parameter settings are saved as part of the MicroLogix RSLogix 500 program, as well as part of the optional memory module backup image.

Once the 900-TC parameters have been backed up to the MicroLogix controller, if that temperature controller fails and is replaced, those parameters can be quickly restored to the new controller without requiring any programming device or software.

The new 900-TC controller to be added to the line up must have the communication settings shown on page 13. The Communications Unit No. must be set to 99.

This MicroLogix sample code consists of an SLC library routine that can be imported into a new or existing MicroLogix 1100, MicroLogix 1400 or MicroLogix 1500 LRP controller's RSLogix 500 project. If the user-display is not controlled by any existing routines in the MicroLogix controller, the PB&R functionality can be initiated through the MicroLogix keypad and user display. Alternately, PB&R can be initiated via the MicroLogix web server by using your Internet Explorer web browser or directly from RSLogix 500 software while online with the MicroLogix controller.

Before importing the PB&R routine, be sure to confirm all of the following:

- All temperature controllers are 900-TC16 or 900-TC8 models.
- All temperature controllers are networked together with the MicroLogix controller on an RS-485 serial Modbus network.
- Channel 0 of the MicroLogix controller is configured for Modbus RTU Master protocol. The MicroLogix controller must be the only master on the Modbus network.
- The Modbus communication parameters for all devices are set to 9.6 Kbps, 8 data bits, no parity bit, and 1 stop bit.
- All temperature controller node addresses fall within the range of 17…24.
- Recipe files 0…7 and recipe numbers 0…24 are available for use.
- Program files 237, 238, and 252…255 and data table files 237 and 253…255 are available for use.
- Enough unused data table and program memory is available.

Although 900-TC parameters are stored in recipe memory, the various subroutines that make up the PB&R routine require program and data table memory, as well as specific program file numbers and data table file numbers. The number of temperature controllers being supported does not matter. The amount of program and data table memory used to support PB&R is the same for 1 temperature controller or 8 temperature controllers. Also, if you are not going to use the MicroLogix controller user display to initiate the back-up and restore functions, you can also delete the files specific to this functionality.

The MicroLogix 1100 controller memory supports a maximum of 4096 data table words and a maximum of 6656 instruction words.

The 4096 data table words use up 1024 instruction words, so the maximum number of instruction words available for ladder logic is 5632.
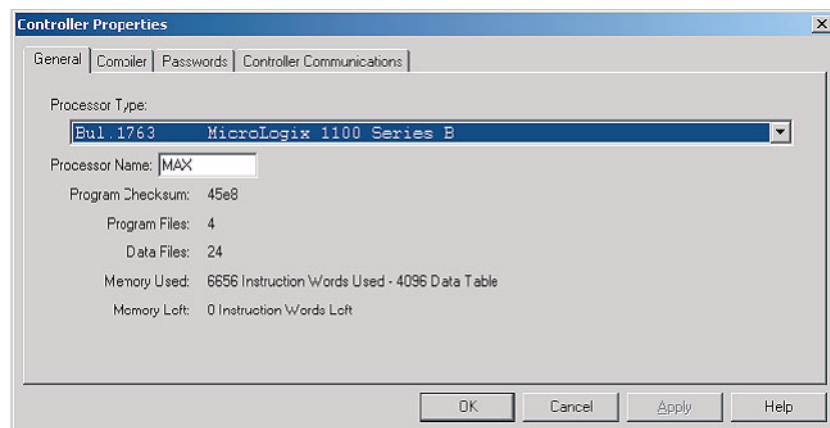
This table lists the ladder files and number of instruction words used.

The maximum amount of memory used by the PB&R routine, supporting all 900-TC controllers and including the MicroLogix controller user-display capability, is 3087 data table words and 1927 instruction words. The minimum amount of memory used by the PB&R routine, supporting only one 900-TC controller with no MicroLogix user-display capability, is 581 data table words and 296 instruction words.

Ladder File

File Name	File Number	Required By	Number of Instruction Words
900TC RSTR	237	All	452
900TC BKUP	238	All	393
PB&R LCD	252	Optional	306
PB&R RESTR	253	All	72
PB&R BCKUP	254	All	51
PB&R MAIN	255	All	32

Data Table File

File Name	File Number	Required By	Number of Instruction Words
900TC MSG	237	All	1150
PB&R LCD	253	Optional	756
PB&R MSG	254	All	50
PB&R PARAM	255	All	256

Merge the PB&R Routine into a New or Existing Program

The PB&R routine library file names all start with:

PB&R_ML1100_900TC_EN_PBR900TC_C0_02

Use RSLogix 500 software, version 7.20 or later, offline to open the MicroLogix 1100 series B file (new or existing) into which you intend to copy the PB&R subroutines. If you are merging into an existing file, make sure you have a backup copy before proceeding.

Import the PB&R File

Follow these steps to merge the routine into a project file.

1. Verify that Channel 0 in the existing file is configured for Modbus RTU Master protocol.

2. Copy the PB&R routine files onto your personal computer, within RSLogix 500 software.

3. From the File menu, choose Open.

4. Browse to and select this file:
   PB&R_ML1100_900TC_EN_PBR900TC_C0_02.SLC

5. Make sure the settings on the Import
SLC Format screen match those shown
here and click OK.
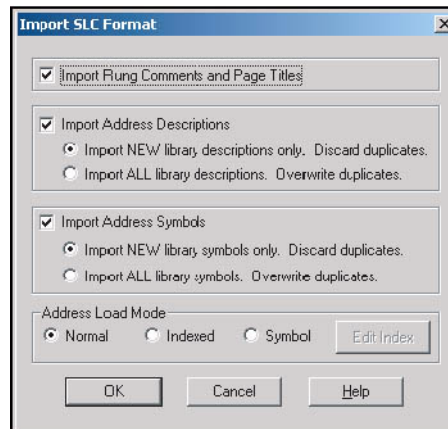
6. When the RSLogix500
System Warning dialog box
appears, click OK.
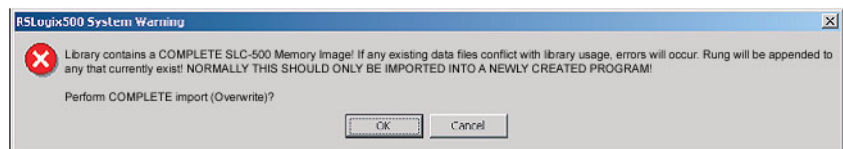
7. Click Yes on the series of
screens that follow, similar to the one
shown here.
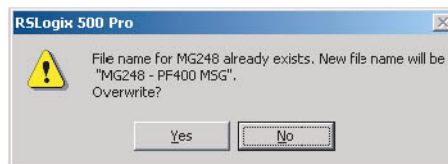
Create Recipe Configuration Files

If the Recipe (RCP) Configuration files don't already exist in the ladder project, you must create them. If these files already exist, go to .

Follow these steps to create RCP files.

1. In the project folder of the MicroLogix program, right-click RCP Configuration Files and choose New.

2. In the Number of Recipes box, type 25.

3. In the Name field, type PB&R 1 of 8 for RCP File 0.

4. Click OK.
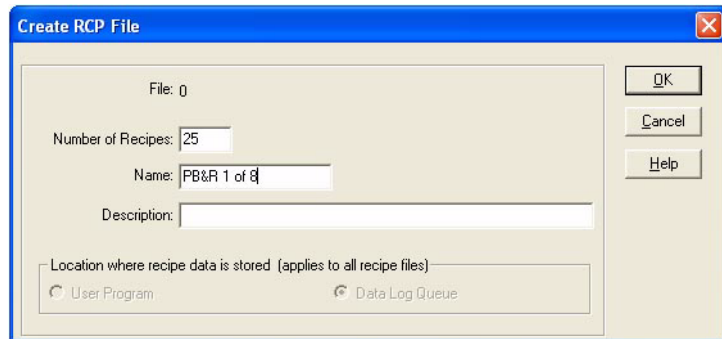
5. Type N255:0 in the Address field.

6. Type 32 in the length field.

   The description displays automatically.
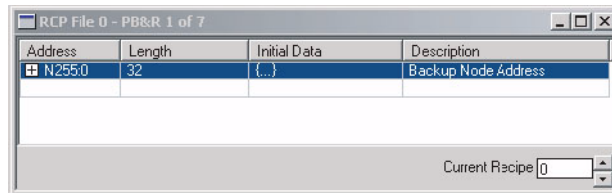
7. Close this dialog box.

8. Using the data in this table, follow steps 1…7 to create RCP files 1…7.

RCP File Number	Number of Recipes	Name	Address	Length
0	25	PB&R 1 of 8	N255:0	32
1	25	PB&R 2 of 8	N255:32	32
2	25	PB&R 3 of 8	N255:64	32
3	25	PB&R 4 of 8	N255:96	32
4	25	PB&R 5 of 8	N255:128	32
5	25	PB&R 6 of 8	N255:160	32
6	25	PB&R 7 of 8	N255:192	32
7	25	PB&R 8of 8	N255:224	32

9. Click Verify Project.

If you get verification errors, either attempt to fix them individually or try merging from you original file again. If the project verified without errors, then the merge was successful and you are ready to test the project or delete files you do not need.

Initiate PB&R Functionality

Every 900-TC controller on the Modbus network has a node address between 17…24. The Parameter Backup function is initiated by writing the node number to be backed up into data table word N255:0. Therefore, the backup can be initiated from any device that can write to N255:0, including the MicroLogix user display, the MicroLogix 1100 web server, and RSLogix 500 software. Similarly, the Parameter Restore function is initiated by writing the node number of the replacement temperature controller into data table word N255:255. The temperature controller to be restored must be set to Modbus protocol, with 9.6 Kbps, 8 data bits, no parity, and 1 stop bit.

> **TIP** The Communications Unit No. on the new replacement 900-TC controller must be set to 99 and the controller must use the restore in addition to the other communication settings. In addition, the node address for the 900-TC controller being replaced on the PanelView Component Network Overview screen must be disabled or the node on the restored 900-TC controller will not update to the correct node address. It will remain at node 99.

From the MicroLogix 1100 User Display

1. Make sure the MicroLogix controller is in Run or Remote Run mode.

2. Use the arrow to move the cursor down from the display's top menu to the 'User Disp' selection and press OK.

3. Use the arrow to increase the displayed value from +00000 to +00001 for Backup or to +00002 for Restore and press OK.

4. On the next screen, use the arrow to increase the displayed value up to the node number of the 900-TC controller (17…24) to be backed up or restored and press OK.

   Within a few seconds, the status screen indicates whether the operation was successful.

5. Press ESC to return to the main PB&R screen.

6. To exit from the PB&R screen, press and hold ESC for several seconds.

From the MicroLogix 1100 Web Server

1. Go online with the MicroLogix 1100 controller by using a standard web server.

2. Select Data Views and type your User Name and Password.

   You must have write privileges.

3. Click File Name N255.

4. To initiate the Backup function, follow these steps. For Restore, go to step 5.
   a. Double-click N255:0.
   b. Type the node number of the temperature controller to be backed up.
   c. Click OK to confirm the value.
   d. Close the Data Change Success dialog box and click Update.
      When the backup is complete, the value of N255:0 returns to 0.

5. To initiate the Restore function, follow these steps.
   a. Double-click N255:255.
   b. Type the node number of the temperature controller to be backed up.
   c. Click OK to confirm the value.
   d. Close the Data Change Success dialog box and click Update.
      When the restore is complete, the value of N255:255 returns to 0.

From RSLogix 500 Software

1. Go online with the MicroLogix controller and verify that the controller is in Run or Remote Run mode.

2. Double-click Data file N255.

3. To initiate the Backup function, follow these steps. For Restore, go to step 4.
   a. Double-click N255:0.
   b. Type the node number of the temperature controller to be backed up.
      When the backup is complete, the value of N255:0 returns to 0.

4. To initiate the Restore function, follow these steps.

   a. Double-click N255:255.

   b. Type the node number of the temperature controller to be backed up.

   When the backup is complete, the value of N255:255 returns to 0.
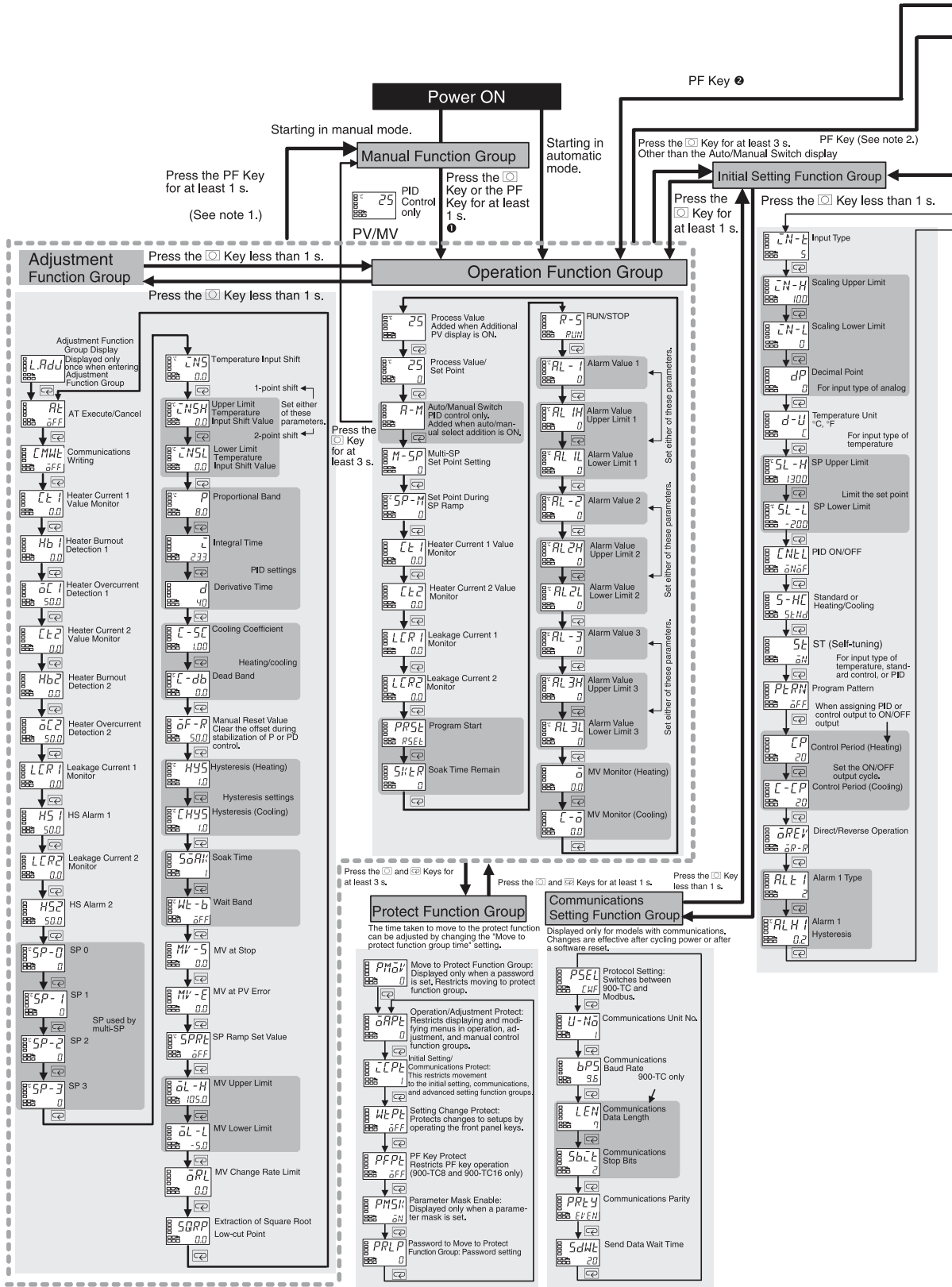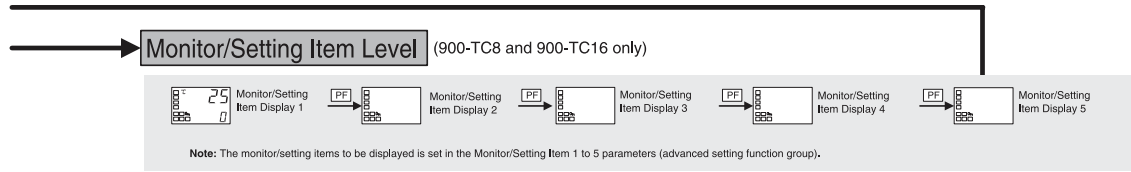
Setting 900-TC Parameters

Introduction

This appendix describes the parameters used in the building block and also provides parameter flow diagrams on pages and to help you set other parameters specific to your application.

Parameters Used in this Building Block

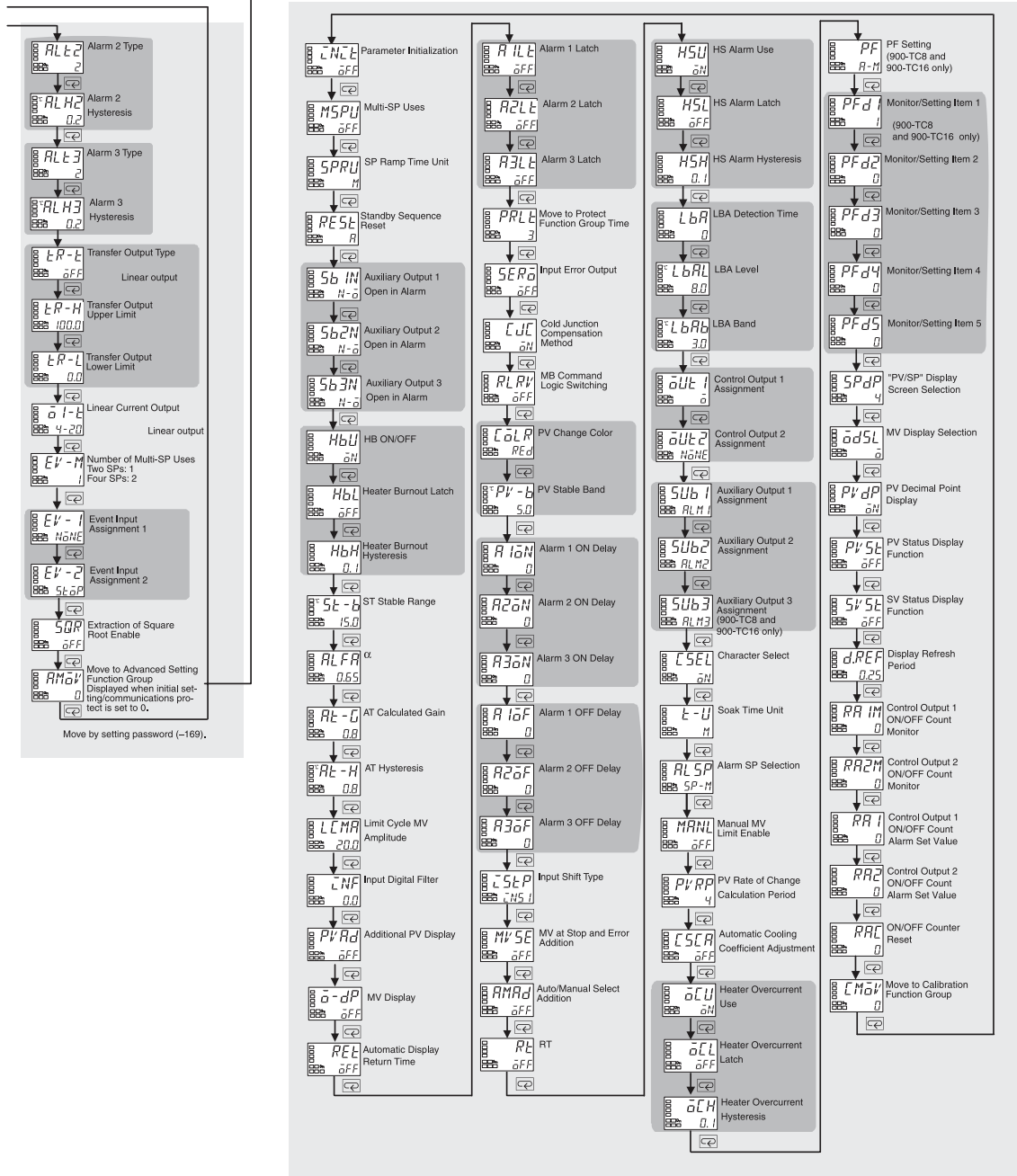| Using the Front Display Panel		Using 900BuilderLite 1.2 Software		Parameter Names and Descriptions	
Parameter Display	Set Value	Parameter Number	Set Value		
	80	[2]	80	**Set Point** – The value configured on the process or temperature controller to control the system. You can change this value for your specific application.	
⌐ n-t	7	[43]	7	**Input Type** – The type of device used in the application to signal a temperature change to the 900-TC temperature controller. In this case, 7 equals a J-type thermocouple, which was used to develop this building block. Refer to the Temperature Controllers User Manual, publication 900-UM007 for a list of input devices and parameter values.	
d-U	°F	[47]	1	**Temperature Unit** – You can used Fahrenheit or Celsius. The PanelView Component (PVc) screen uses a text message to display 'Temp F'. To change this text for Celsius, go into the edit mode on the PVc terminal.	
⌐NtL	Pⁱd	[50]	1	**PID/OnOff** – Configure the temperature controller for 2-PID or ON/OFF control.	
ōREV	ōR-d	[56]	1	**Direct/reverse Operation** – Configure the temperature controller for direct or reverse operation of the manipulated variable (MV). Direct operation refers to the control method where the MV is increased according to the increase in the process value. Reverse operation refers to the control method where the MV is increased according to the decrease in the process variable.	
ALt 1	8	[57]	8	**Alarm 1 Type**	Configure the type of alarm operation for the alarm output (1 or 2). In this case, 8 equals absolute value, upper limit, which was used in this building block. Refer to the Temperature Controllers User Manual, publication 900-UM007 for other possible selections.
ALt2	8	[59]	8	**Alarm 2 Type**	
–	–	[61]	0	**Alarm 3 Type**	Set this value to zero because this value is not used on the 900-TC16 temperature controller. It cannot be accessed using the display panel.
AL-1	75	[3]	75	**Alarm Value 1**	Set the value for the alarm contact to change state by setting the alarm values to the temperature at which you want the alarms to turn ON. These parameters work in conjunction with the Alarm Type parameters. You can change this value for your specific application.
AL-2	85	[6]	85	**Alarm Value 2**	
–	–	[9]	0	**Alarm Value 3**	Set this value to zero because it is not used on the 900-TC16 temperature controller. It cannot be accessed using the display panel.
AMAd	ōN	[150]	1	**Auto/Manual Select Addition**	To use the manual mode of the PanelView Component terminal in PID control on the analog output, set this parameter to ON.

Parameter Flow Diagrams

Monitor/Setting Item Level (900-TC8 and 900-TC16 only)

25 / 0 Monitor/Setting Item Display 1	PF → Monitor/Setting Item Display 2	PF → Monitor/Setting Item Display 3	PF → Monitor/Setting Item Display 4	PF → Monitor/Setting Item Display 5

Note: The monitor/setting items to be displayed is set in the Monitor/Setting Item 1 to 5 parameters (advanced setting function group).

Press the ◯ Key for at least 1 s.

Advanced Setting Function Group

ALt2 Alarm 2 Type — 2

ALH2 Alarm 2 Hysteresis — 0.2

ALt3 Alarm 3 Type — 2

ALH3 Alarm 3 Hysteresis — 0.2

tR-t Transfer Output Type — oFF Linear output

tR-H Transfer Output Upper Limit — 100.0

tR-L Transfer Output Lower Limit — 0.0

o1-t Linear Current Output — 4-20 Linear output

EV-M Number of Multi-SP Uses Two SPs: 1 Four SPs: 2 — 1

EV-1 Event Input Assignment 1 — NoNE

EV-2 Event Input Assignment 2 — StoP

SQR Extraction of Square Root Enable — oFF

AMoV Move to Advanced Setting Function Group Displayed when initial setting/communications protect is set to 0. — 0

Move by setting password (−169).

CNCt Parameter Initialization — oFF

MSPU Multi-SP Uses — oFF

SPRU SP Ramp Time Unit — M

RESt Standby Sequence Reset — A

Sb IN Auxiliary Output 1 Open in Alarm — N-o

Sb2N Auxiliary Output 2 Open in Alarm — N-o

Sb3N Auxiliary Output 3 Open in Alarm — N-o

HbU HB ON/OFF — oN

HbL Heater Burnout Latch — oFF

HbH Heater Burnout Hysteresis — 0.1

St-b ST Stable Range — 15.0

ALFA α — 0.65

At-G AT Calculated Gain — 0.8

At-H AT Hysteresis — 0.8

LCMA Limit Cycle MV Amplitude — 20.0

CNF Input Digital Filter — 0.0

PVAd Additional PV Display — oFF

o-dP MV Display — oFF

REt Automatic Display Return Time — oFF

A1Lt Alarm 1 Latch — oFF

A2Lt Alarm 2 Latch — oFF

A3Lt Alarm 3 Latch — oFF

PRLt Move to Protect Function Group Time — 3

SERo Input Error Output — oFF

CJC Cold Junction Compensation Method — oN

RLRV MB Command Logic Switching — oFF

CoLR PV Change Color — REd

PV-b PV Stable Band — 5.0

A1oN Alarm 1 ON Delay — 0

A2oN Alarm 2 ON Delay — 0

A3oN Alarm 3 ON Delay — 0

A1oF Alarm 1 OFF Delay — 0

A2oF Alarm 2 OFF Delay — 0

A3oF Alarm 3 OFF Delay — 0

CStP Input Shift Type — CNS1

MVSE MV at Stop and Error Addition — oFF

AMAd Auto/Manual Select Addition — oFF

Rt RT — oFF

HSU HS Alarm Use — oN

HSL HS Alarm Latch — oFF

HSH HS Alarm Hysteresis — 0.1

LbA LBA Detection Time — 0

LbAL LBA Level — 8.0

LbAb LBA Band — 3.0

out1 Control Output 1 Assignment — o

out2 Control Output 2 Assignment — NoNE

SUb1 Auxiliary Output 1 Assignment — ALM1

SUb2 Auxiliary Output 2 Assignment — ALM2

SUb3 Auxiliary Output 3 Assignment (900-TC8 and 900-TC16 only) — ALM3

CSEL Character Select — oN

t-U Soak Time Unit — M

ALSP Alarm SP Selection — SP-M

MANL Manual MV Limit Enable — oFF

PVRP PV Rate of Change Calculation Period — 4

CSCA Automatic Cooling Coefficient Adjustment — oFF

oCU Heater Overcurrent Use — oN

oCL Heater Overcurrent Latch — oFF

oCH Heater Overcurrent Hysteresis — 0.1

PF PF Setting (900-TC8 and 900-TC16 only) — A-M

PFd1 Monitor/Setting Item 1 (900-TC8 and 900-TC16 only) — 1

PFd2 Monitor/Setting Item 2 — 0

PFd3 Monitor/Setting Item 3 — 0

PFd4 Monitor/Setting Item 4 — 0

PFd5 Monitor/Setting Item 5 — 0

SPdP "PV/SP" Display Screen Selection — 4

odSL MV Display Selection — o

PVdP PV Decimal Point Display — oN

PVSt PV Status Display Function — oFF

SVSt SV Status Display Function — oFF

d.REF Display Refresh Period — 0.25

RA1M Control Output 1 ON/OFF Count Monitor — 0

RA2M Control Output 2 ON/OFF Count Monitor — 0

RA1 Control Output 1 ON/OFF Count Alarm Set Value — 0

RA2 Control Output 2 ON/OFF Count Alarm Set Value — 0

RAC ON/OFF Counter Reset — 0

CMoV Move to Calibration Function Group — 0

# Using a 900-TC Controller with a Relay Output

Introduction

This appendix provides additional information for using a 900-TC16RGTU25 with a 900-TC16NACCOM.

When using the relay output with this building block, change the control method to On/Off control. PID control is more beneficial for analog output and using manual control of the manipulated output.

The PanelView Component screens remain the same except that you will not have a manual option to control the manipulated variable when in operator mode. The run and stop button operates the same. The % Output is either 0 or 100 %. The Set Point can be adjusted in the Operator mode.

| TIP | The Auto button will not change to manual when using a 900-TC controller with a relay output. |

900-TC # 18

74
Temp. °F

100.0
% Output

74
Set Point

OUT1
OUT2

Run

Auto
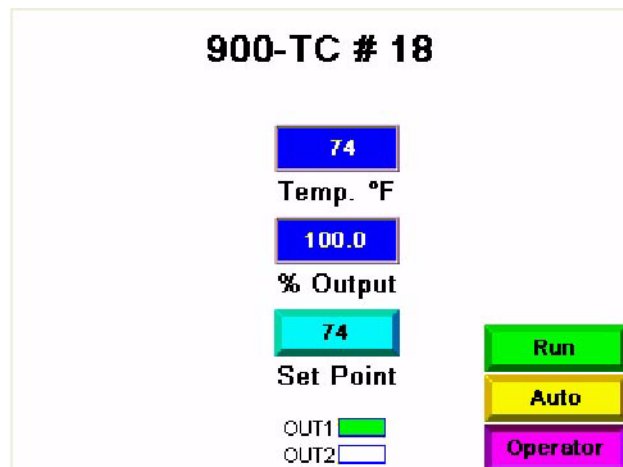
Operator

Considerations When Using On/Off Control

In the reverse operation On/Off control method, the control output (MV) turns OFF when the controlled temperature (PV) reaches the user-defined set point. When the control output (MV) turns OFF, the controlled temperature begins to fall and the control output turns ON again. This operation is repeated at a certain point. At this time, how much the temperature must fall before the control output turns ON again is determined by the Hysteresis (HEAT) parameter. Also, how much the manipulated variable must be adjusted in response to the increase or decrease in the process value is determined by the Direct/Reverse Operation parameter.

Hysteresis

In the On/Off control method, hysteresis is used to provide a margin/differential for switching the control output ON when the controlled temperature moves away from the required set point. The Hysteresis parameter is used to give stability to the output around the set point.

The hysteresis value for HEAT control output and COOL control output functions are configured in the Hysteresis (HEAT) and Hysteresis (COOL) parameter functions respectively. In standard heating or cooling control, the HEAT Hysteresis setting is used as the hysteresis setting (Adjustment function group) regardless of the control mode, heating control or cooling control.

On/Off Control Setup

The following steps illustrate how to set the On/Off control method, as well as the Set Point and Hysteresis parameters by using the front display of the 900-TC controller. You can also set the parameters by using 900BuilderLite software.

Configure the communication parameters of the 900-TC controller as previously described in chapter 1 of this quick start manual.

Configure the PID/OnOff Parameter

Follow these steps to set up On/Off control.

1. Press the ▢ key for at least 3 seconds to move from the Operation function group to the Initial Setting function group.

2. Display the Input Type parameter in the Initial Setting function group.

3. Select the PID/OnOff parameter by pressing the ⏎ key.

4. Check that the configured control method parameter is ōNōF (the default).

5. To return to the Operation function group, press the ▢ key for at least 1 second.
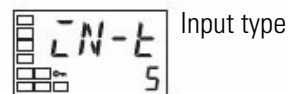
Configure the Set Point

The set value (SP) is shown on the controller's bottom display. To change the set point, follow these steps. In this example, the set point is changed to 200. You can set it to a value appropriate to your application.

1. Select the Process Value/Set Point parameter in the Operation function group.
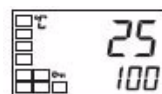
2. Use the ⌃ and ⌄ keys to change the SP.

   You can load the new value into the controller's memory by pressing the M key, or it will go into effect after 2 seconds have elapsed.
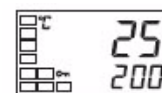
Set the Hysteresis

Follow the steps below to change the hysteresis value. In this example, we change the value to 2.0 °C.

1. Press the ▢ key to move from the Operation function group to the Adjustment function group.

2. The Adjustment function group Display parameter is displayed in the adjustment function group.
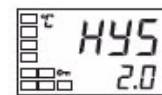
3. Select the Hysteresis (Heating) parameter by pressing the ⏎ key.
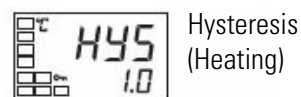
4. Press the ⌃ and ⌄ keys to set the hysteresis.

5. Press the ⏎ key or wait for at least 2 seconds after setting the hysteresis value to load the new value into controller memory.

6. Press the ▢ key for at least 1 second to return to the Operation function group.

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running.

United States	1.440.646.3434 Monday – Friday, 8 a.m. – 5 p.m. EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

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Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning, it may need to be returned.

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Outside United States	Please contact your local Rockwell Automation representative for return procedure.