Allen-Bradley

Using a PLC-5 Processor in a Heat Application

Application Note

product icon

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

- identify a hazard
- avoid the hazard
- recognize the consequences

Important: Identifies information that is critical for successful application and understanding of the product.

Table of Contents

Preface P–1

Who Should Use This Manual P–1
Purpose of This Manual P–1
Related Documentation P–2
Common Techniques Used in This Manual P–3
Allen-Bradley Support P–4
Local Product Support P–4
Technical Product Assistance P–4
Your Questions or Comments about This Manual P–4

Overview 1–1

About the Application 1–1
What You Need to Do 1–1
System Components 1–2

Set Up the Hardware 2–1

Configure the I/O Chassis 2–2
Install the Hardware 2–2
Ground the I/O Chassis 2–2
Install the PLC-5 Processor 2–3
Install the I/O Modules 2–3
Install the Power Supply 2–4
Install the Programming Terminal Interface Card 2–5
Connect the Programming Terminal and the PLC-5 Processor to the DH+ Link 2–6
Connect the PanelView 550 to the Remote I/O 2–7
Connect the 1771-IXHR to Monitor the System Temperature . . . 2–8
Connect the System to the I/O Modules 2–8
Connect the 1771-OAD to the Power Heat Source 2–8

Set Up the Software 3–1

Install the Software 3–1
Start the 6200 Programming Software 3–2
Configure the Communication Parameters for Online Programming 3–2

Configure the PLC-5 Processor System 4–1

Configure the PLC-5 Processor 4–2
Configure the PLC-5 Processor Communication Channels 4–3
Configure Channel 1A 4–3
Configure Channel 1B 4–4

Create the Ladder Logic Program 5–1

Create a Data Table File 5–2
Enter the Ladder Logic 5–3
PID Configuration Screen 5–7
Configure the PID Screens 5–7
PID Monitor Screen 5–7
Add 1771-IXHR Thermocouple Module to the Database 5–8
Use the I/O Configuration Utility 5–8
Configure the 1771-IXHR Thermocouple I/O Module 5–9
Run the Ladder Program 5–9
Monitor Data 5–10
Verify the Configuration Data 5–11

Create the PanelView Application and Develop the Application Screen 6–1

Determine the Application Screen Objects 6–2
Start the PanelBuilder Software 6–2
Create a New Application File 6–3
Create the Quick Start Application 6–3
Create a New Screen 6–3
Define the Remote I/O Communication Settings 6–4
Enter the Tags 6–5
Develop the Application Screen (PID Loop) 6–6
Create the Bar Graphs 6–6
Set the Bar Graph Attributes 6–7
Create the Scales 6–8
Set the Scale Attributes 6–8
Create the Data Displays 6–8
Set the Data Display Attributes 6–8
Develop the Numeric Entry Objects 6–9
Create the Numeric Entry Objects 6–9
Set the Numeric Entry Object Attributes 6–9
Develop the Push Button 6–10
Create the Push Button 6–10
Set the Push Button Attributes 6–10
Create the Labels 6–11
Validate the Application 6–11
Validate and Save the Application 6–11
Save the Application 6–11
Download Using Pass-Through and Run the Application 6–12
Select the INTERCHANGE Configurator 6–12
Download the Application 6–13
Run the Application 6–14

Troubleshoot the Processor and I/O Modules 7–1

Troubleshoot General Problems 7–1
Use the PLC-5 Processor Status Indicators 7–1
Troubleshoot the Processor Communication Channels 7–2
Use the 1771-IXHR Module Status Indicators 7–3
Use the 1771-OAD Module Status Indicators 7–3

Preface

Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics:

- who should use this manual
- the purpose of this manual
- how to use this manual
- conventions used in this manual
- Allen-Bradley support

Who Should Use This Manual

Use this manual if you are knowledgeable about control system products, but may not have used one or more products for a period of time.

You should understand programmable controllers and be able to interpret the ladder logic instructions required to control your application. If you do not, see the documents listed on the following page or contact your local Allen-Bradley representative for information on available training courses before using this manual.

Purpose of This Manual

This manual is for experienced users for the PLC-5® processor. It:

- presents you with the basic information you need to get the small example application up and running
- provides “memory jogger” information, such as specific bit settings for a sample application
- includes high-level procedures with cross-references to other manuals for more detail

Related Documentation

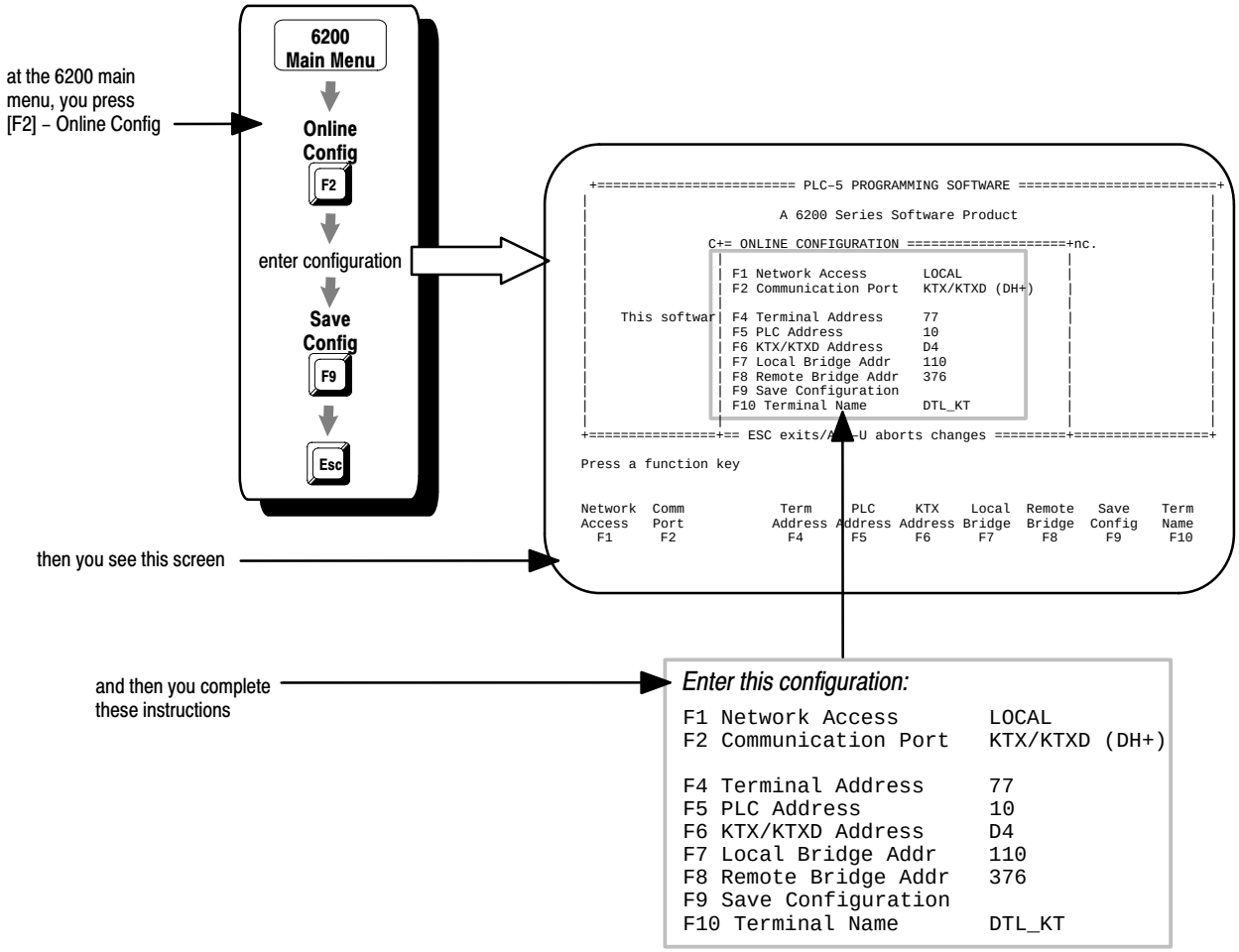
The following documents contain additional information concerning the products discussed in this manual. To obtain a copy, contact your local Allen-Bradley Sales office or distributor.

For more information about:	See this document:	Document number:
PLC-5 programmable controllers	Enhanced PLC-5 Programmable Controllers Installation Instructions	1785-5.7
	Enhanced and Ethernet PLC-5 Programmable Controllers User Manual	1785-6.5.12
	1785 PLC-5 Programmable Controllers Quick Reference	1785-7.1
	PLC-5 Programming Software Instruction Set Reference Manual	6200-6.4.11
Universal 1771 I/O chassis	Universal I/O Chassis Installation Instructions	1771-2.210
power supply	Power Supply Modules (1771-P4S, -P6S, -P4S1, -P6S1) Installation Instructions	1771-2.135
DH+® network	Enhanced and Ethernet PLC-5 Programmable Controllers User Manual	1785-6.5.12
	Data Highway/Data Highway Plus/Data Highway II/Data Highway-485 Cable Installation Instructions	1770-6.2.2
communication cards	1784-KT*x* Communication Interface Card User Manual	1784-6.5.22
	Allen-Bradley Publication Index (for your specific communication card)	SD499
cables	Enhanced and Ethernet Programmable Controllers User Manual	1785-6.5.12
6200 PLC-5 programming software	PLC-5 Programming Software Configuration and Maintenance Manual	6200-6.4.6
	PLC-5 Programming Software Programming Manual	6200-6.4.7
	PLC-5 Programming Software Instruction Set Reference Manual	6200-6.4.11
	PLC-5 Programming Software I/O Configuration Manual	6200-6.4.12
input module (1771-IXHR)	High Resolution Thermocouple/Millivolt Input Module User Manual	1771-6.5.80
output module (1771-OAD)	AC (12-120V) Output module Cat. No. 1771-OAD Series B Installation Instructions	1771-2.74
PanelBuilder® 900 software	PanelBuilder 900 Configuration Software User Manual	2711-815
PanelView® 550 operator terminal	PanelView 550 Operator Terminals User Manual	2711-802
grounding and wiring Allen-Bradley programmable controllers	Allen-Bradley Programmable Controller Wiring and Grounding Guidelines	1770-4.1
current Allen-Bradley documentation, including ordering instructions	Allen-Bradley Publication Index	SD499
terms and definitions	Allen-Bradley Industrial Automation Glossary	AG-7.1

Common Techniques Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- Text in `this font` indicates words or phrases you should type.
- Text in *this font* enclosed in a box like this [ ] represents actions you should complete (see picture below).
- Pictures of keys and/or screens represent the actual keys you press or the screens you see (see picture below).



Tip We also use this symbol to call attention to helpful information.

More We use this symbol to indicate addition references to look at for more information.

Allen-Bradley Support

Allen-Bradley offers support services worldwide, with over 75 sales/support offices, 512 authorized distributors, and 260 authorized systems integrators located throughout the United States alone, plus Allen-Bradley representatives in every major country in the world.

Local Product Support

Contact your local Allen-Bradley representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

Technical Product Assistance

If you need to contact Allen-Bradley for technical assistance, call your local Allen-Bradley representative.

Your Questions or Comments about This Manual

If you find a problem with this manual, please notify us of it on the enclosed Publication Problem Report (at the back of this manual).

If you have any suggestions for how this manual could be made more useful to you, please contact us at the address below:

Allen-Bradley Company, Inc.
Automation Group
Technical Communication
1 Allen-Bradley Drive
Mayfield Heights, OH 44124-6118

Overview

This manual is designed to provide you with enough information to get your system up and running. Use this manual if you are knowledgeable about the products, but may have not used one or more of the products for a period of time. The information provided is geared towards "jogging your memory."

About the Application

This manual presents an example application that uses a PLC-5 processor to control the temperature in a system. Using a PanelView 550, you can set the desired temperature and view the actual system temperature. A J-Type thermocouple connected to a thermocouple input module senses the temperature of the system. The PLC-5 processor controls a digital output module, using timed proportional output (TPO), which pulses an ac signal to the heating device.

What You Need to Do

Set up the hardware (Chapter 2)

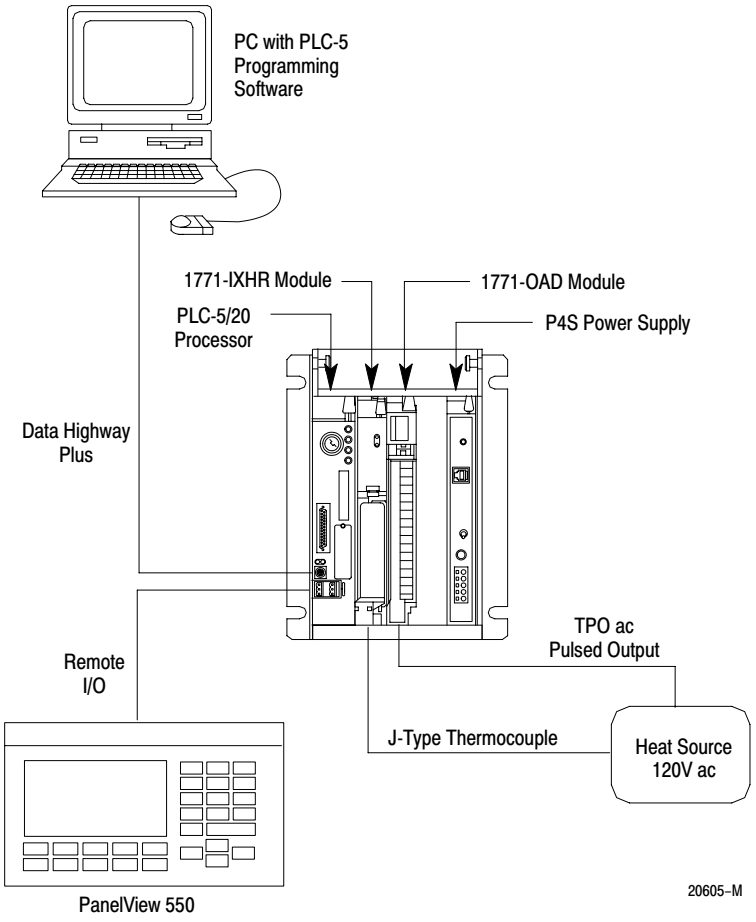
Set up the software (Chapter 3)

Configure the PLC-5 processor system (Chapter 4)

Create the ladder logic program (Chapter 5)

Create the application and application screens (Chapter 6)

Troubleshoot the processor and I/O modules (Chapter 7)



System Components

We use these devices for the purposes of this manual. For your own system, substitute your own devices to fit your application.

The recommended switch settings in this manual help you set up a test system and get it working. Actual switch settings depend on your application.

Product name:	Catalog number:
Hardware	
PLC-5 processor (In this manual we use a PLC-5/20 processor; you could also use a PLC-5/11, -5/30, -5/40, -5/60, or -5/80 processor.)	1785-L20B
I/O chassis	1771-A1B
High Resolution Thermocouple/MilliVolt Input Module	1771-IXHR
120V ac Output Module	1771-OAD
Slot Power Supply	1771-P4S
PanelView 550 Remote I/O Keypad and Touch Screen Operator Terminal	2711-B5A1
PanelView RS232 5 meter cable	2711-NC13
Belden 9463 (RIO) cable	1770-CD (10 feet)
DH+ cable and adapter	1784-CP12 and 1784-CP7
Processor Communication Interface Module	1784-KT*x*
PC that supports PLC-5 Programming Software	
ac line cords	
J-Type thermocouple wire	
150Ω terminating resistors	
heating device	
Software	
PLC-5 Programming Software (In this manual we use 6200 PLC-5 Programming Software. If you are using another software package, substitute the screens in this quick start with the screens in your software package.)	9323-PLC5
Panelbuilder 900 software (includes INTERCHANGE)	2711-ND3

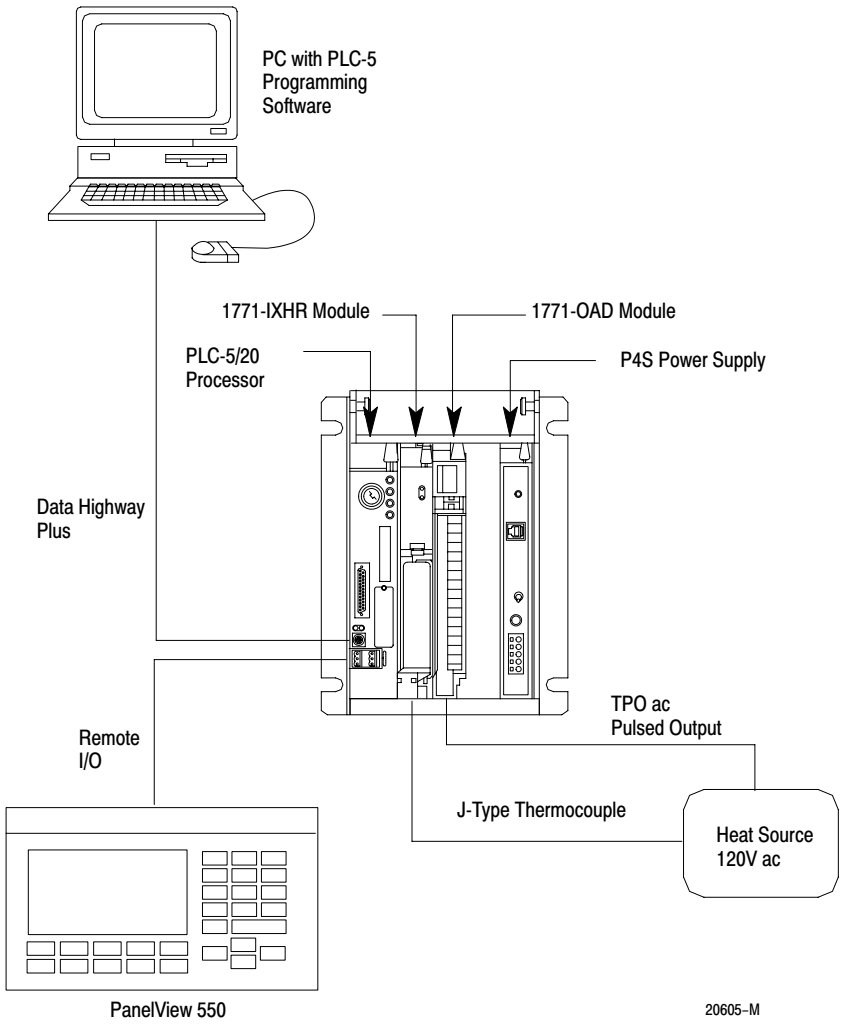
Set Up the Hardware

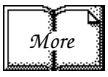
1 *Install the hardware (page 2–2)*

2 *Connect the programming terminal and the PLC-5 processor to the DH+ link (page 2–6)*

3 *Connect the PanelView 550 to the Remote I/O (page 2–7)*

4 *Connect the system to the I/O modules (page 2–8)*



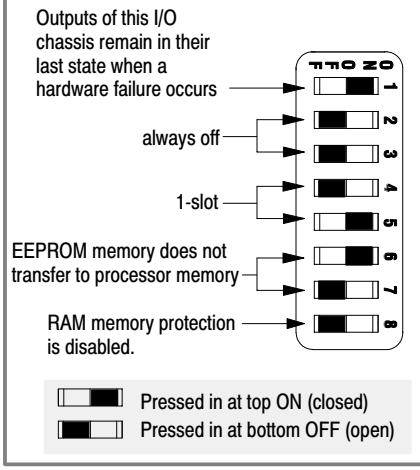


For more information, see the Enhanced PLC-5 Programmable Controllers Installation Instructions, publication number 1785-5.7.

Install the Hardware

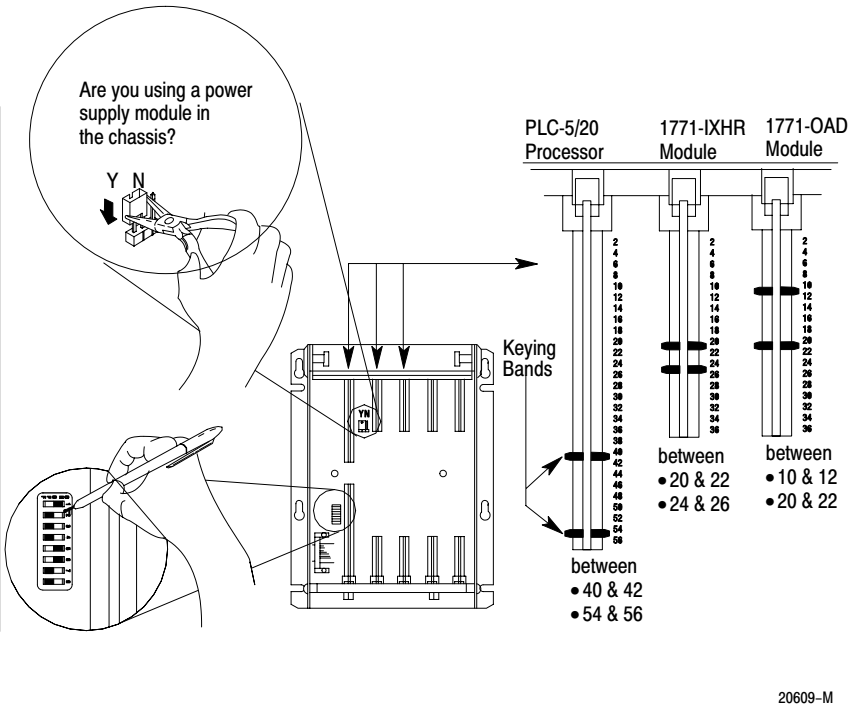
1 *Set the power supply configuration jumper.*

2 *Set the backplane switches.*



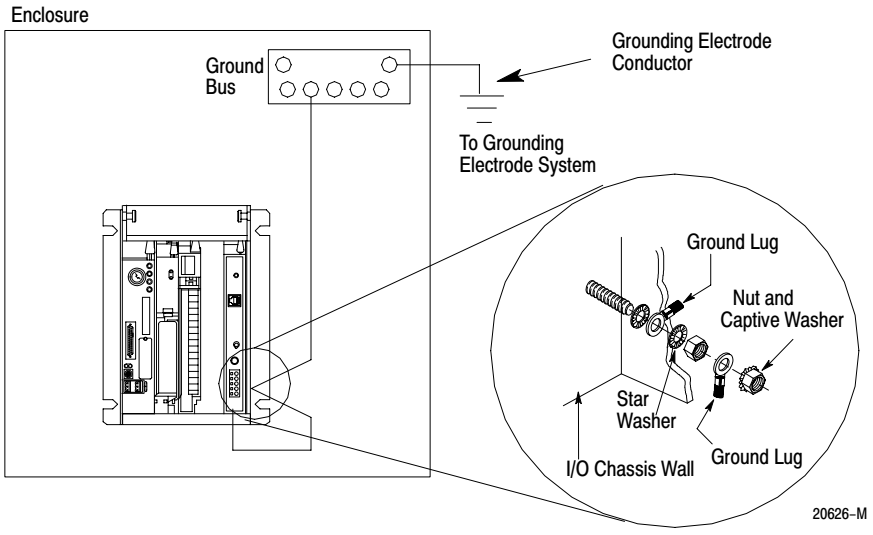
3 *Install the keying bands.*

Configure the I/O Chassis



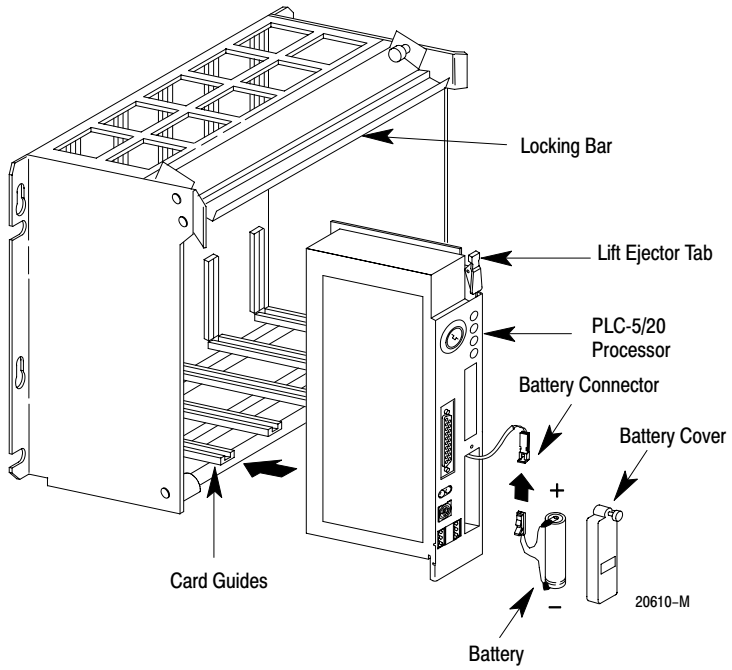
For more information, see the Universal I/O Chassis installation instructions, publication number 1771-2.10.

Ground the I/O Chassis

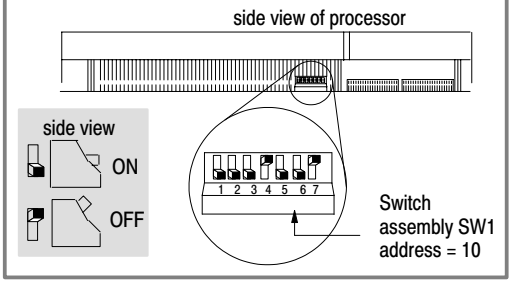


For more information, see the Allen-Bradley Programmable Controller Wiring and Grounding Guidelines, publication number 1770-4.1.

Install the PLC-5 Processor



1 *Define the DH+ Station Address of Channel 1A by setting switch assembly SW-1 on the back of the processor. (See the side of the processor if you want to use another address.)*



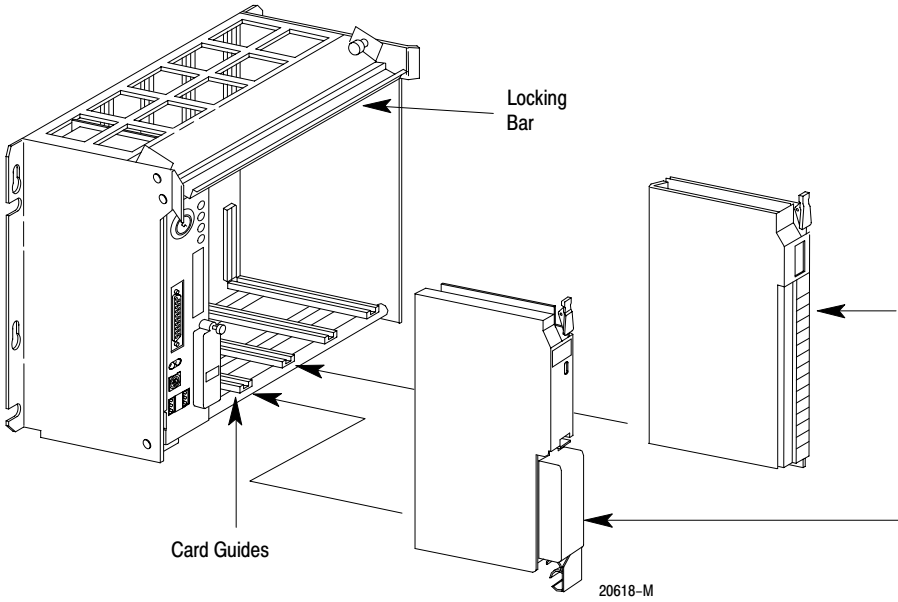
2 *To install the battery, slide the battery-side connector into the processor-side connector until you hear them snap together, and attach the battery cover.*

3 *Install the processor.*

More

For more information, see the Enhanced PLC-5 Programmable Controllers Installation Instructions, publication number 1785-5.7.

Install the I/O Modules



1 *Install the 1771-OAD module and connect the wiring arm.*

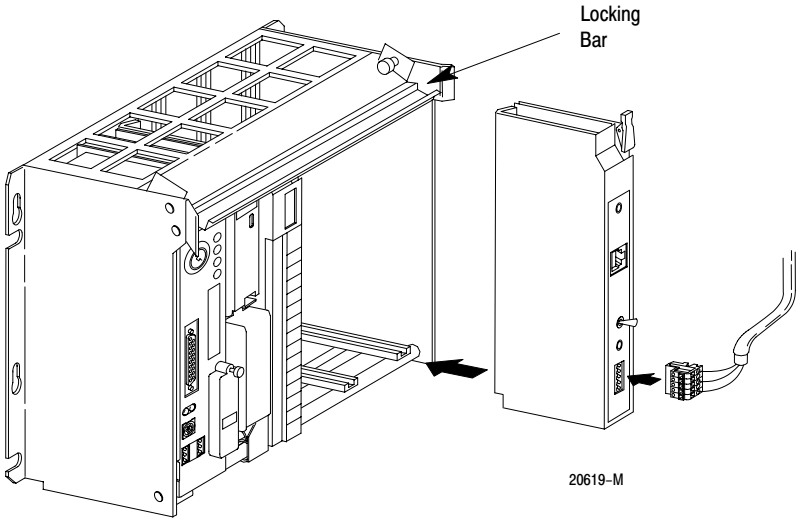
2 *Install the 1771-IXHR thermocouple module and connect the wiring arm.*

More

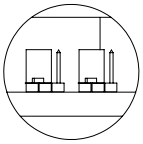
For more information, see:

- High Resolution Thermocouple/Millivolt Input Module User Manual, publication number 1771-6.5.80
- AC (12-120V) Output Module Cat. No. 1771-OAD Series B Installation Instructions, publication number 1771-2.74

Install the Power Supply

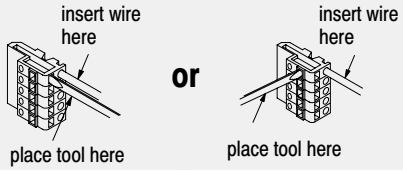


1 *Set the jumpers on the back side of the power supply like this:*

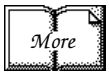


2 *Connect the power cord to the 120V ac connector of the power supply module.*

This side plugs into connector on the module.

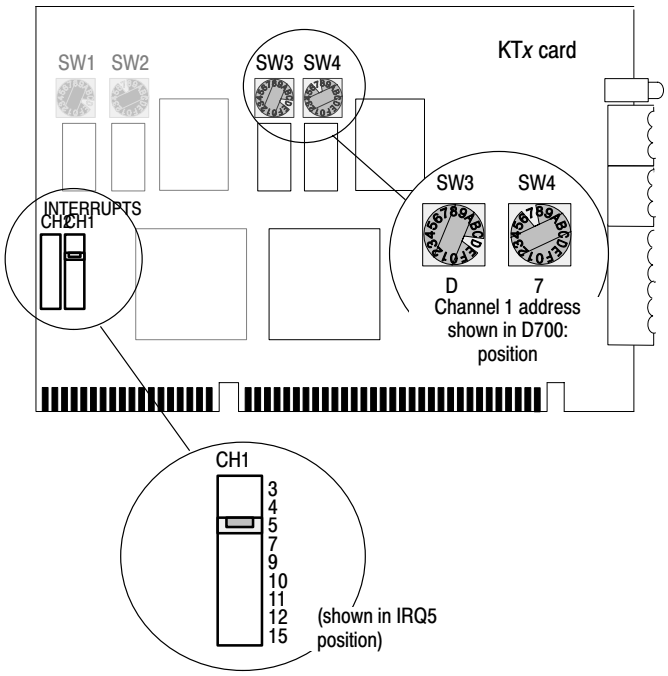


3 *Install the power supply in the chassis and snap the module-locking bar over the modules.*



For more information, see the Power Supply Modules (1771-P4S, -P6S, -P4S1, -P6S1) Installation Instructions, publication number 1771-2.135.

Install the Programming Terminal Interface Card



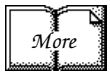
1 *Set the interrupt jumpers on the communication card to IRQ5.*

2 *Set the switches on the card.*

Remember to record the 1784-KTx addresses:

Channel 1 Address: _____

3 *Insert the programming terminal interface card into a vacant 16-bit ISA or EISA expansion slot, and tighten the screw to secure the card.*



For more information, see:

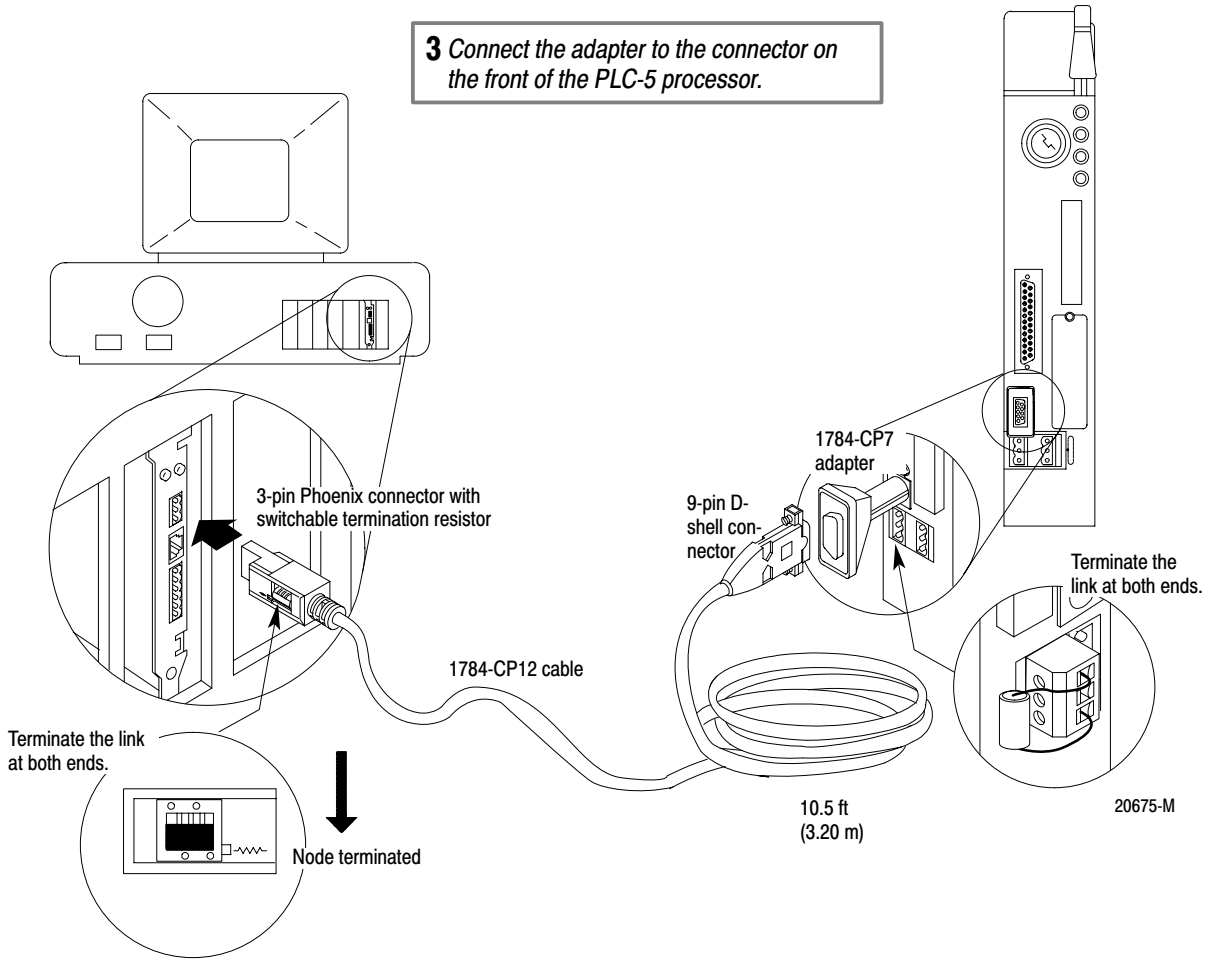
- 1784-KT*x* Communication Interface Card User Manual, publication number 1784-6.5.22
- Allen-Bradley Publication Index (for your specific communication card), publication number SD499

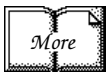
Connect the Programming Terminal and the PLC-5 Processor to the DH+ Link

1 *Connect the 3-pin Phoenix end of the CP12 cable to the KTx card.*

2 *Connect the 9-pin D-shell connector to the CP7 adapter.*

3 *Connect the adapter to the connector on the front of the PLC-5 processor.*





For more information, see:

- Enhanced PLC-5 Programmable Controllers Installation Instructions, publication number 1785-5.7
- 1784-KT*x* Communication Interface Card User Manual, publication number 1784-6.5.22
- Data Highway/Data Highway Plus/Data Highway II/Data Highway 485 Cable Installation Manual, publication 1770-6.2.2

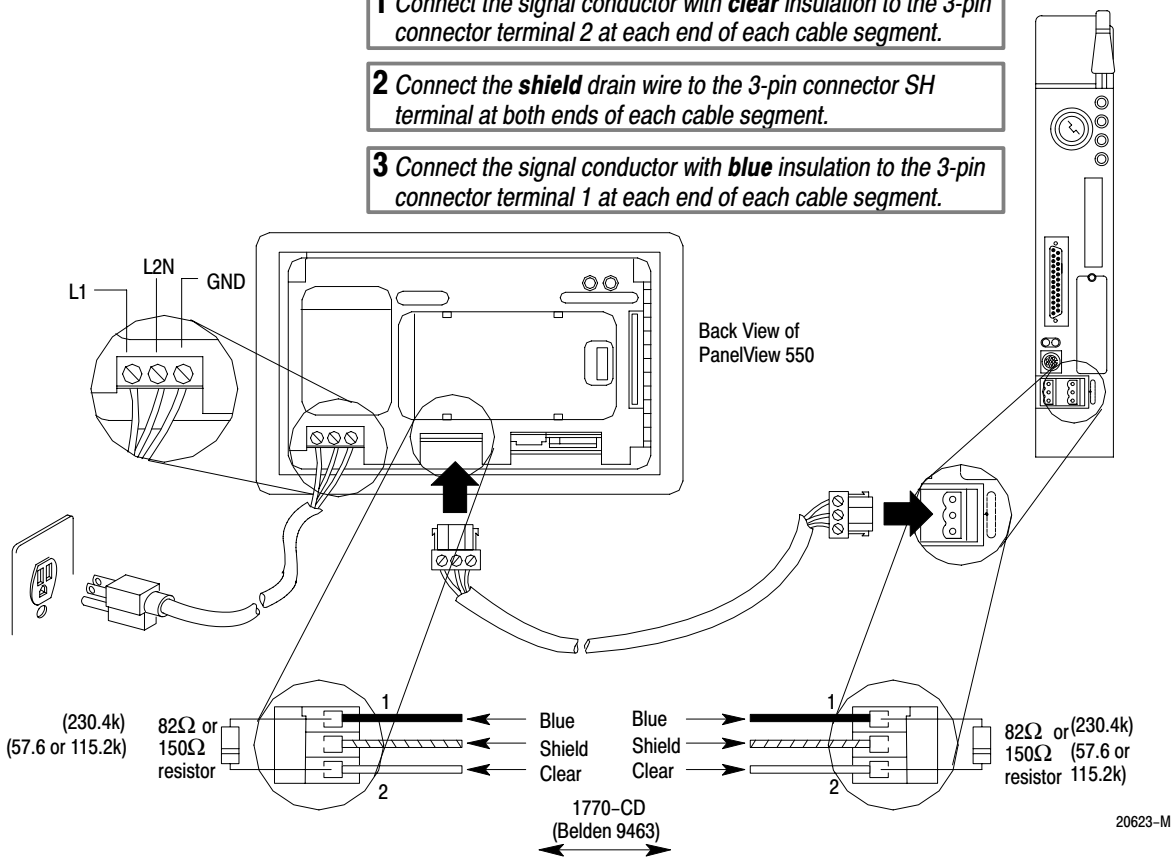
Connect the PanelView 550 to the Remote I/O

Important: We assume you are wiring a new out-of-the-box PanelView 550 operator terminal. If the PanelView 550 terminal you are wiring is not right out of the box, see the tip in step 5.

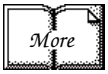
1 *Connect the signal conductor with **clear** insulation to the 3-pin connector terminal 2 at each end of each cable segment.*

2 *Connect the **shield** drain wire to the 3-pin connector SH terminal at both ends of each cable segment.*

3 *Connect the signal conductor with **blue** insulation to the 3-pin connector terminal 1 at each end of each cable segment.*



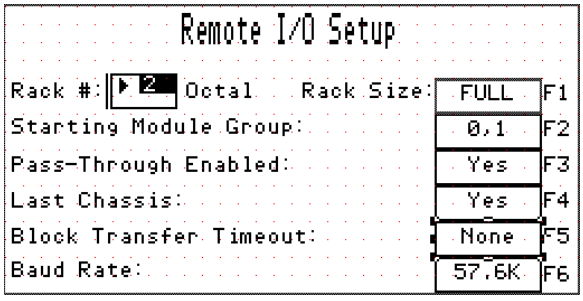
4 *Terminate both ends of a remote I/O link.*



For more information, see:

- Data Highway/Data Highway Plus/Data Highway II/Data Highway 485 Cable Installation Manual, publication number 1770-6.2.2
- PanelView 550 Operator Terminals User Manual, publication number 2711-802

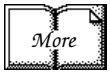
5 *Set the Remote I/O Setup screen the same as below. If you do not have an out-of-the-box PanelView terminal; see the tip below.*



If your PanelView 550 terminal is not right out of the box:

1. Go to the Configuration Mode, Serial Communication, and RIO Configuration screens on the PanelView 550 Terminal and record the settings for :
   Pass Through Enabled _____
   Rack # _____
   Starting Module Group _____
2. Change the Baud Rate to 57.6 k Baud.

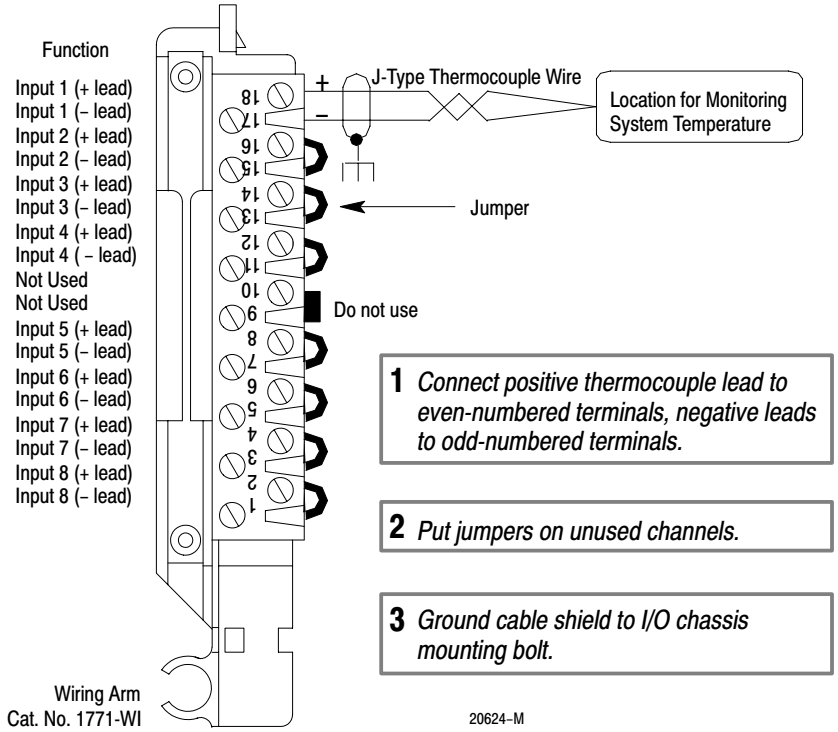
Connect the System to the I/O Modules



For more information, see the High Resolution Thermocouple/Millivolt Input Module User Manual, publication number, 1771-6.15.80.

Connect the 1771-IXHR to Monitor the System Temperature

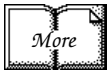
Terminal	Function
18	Input 1 (+ lead)
17	Input 1 (– lead)
16	Input 2 (+ lead)
15	Input 2 (– lead)
14	Input 3 (+ lead)
13	Input 3 (– lead)
12	Input 4 (+ lead)
11	Input 4 (– lead)
10	Not Used
9	Not Used
8	Input 5 (+ lead)
7	Input 5 (– lead)
6	Input 6 (+ lead)
5	Input 6 (– lead)
4	Input 7 (+ lead)
3	Input 7 (– lead)
2	Input 8 (+ lead)
1	Input 8 (– lead)



1 *Connect positive thermocouple lead to even-numbered terminals, negative leads to odd-numbered terminals.*

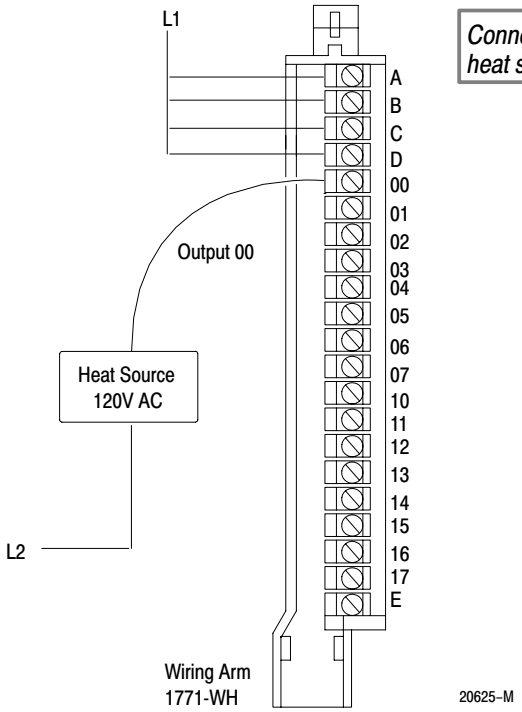
2 *Put jumpers on unused channels.*

3 *Ground cable shield to I/O chassis mounting bolt.*



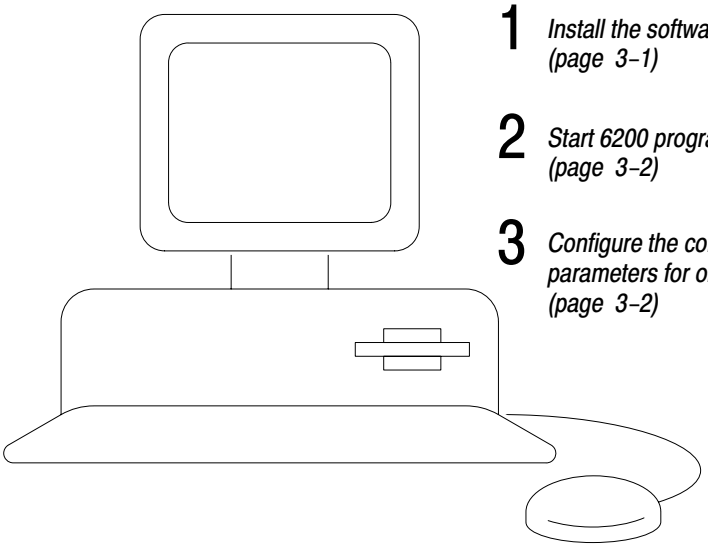
For more information, see the ac (12-120V) Output Module Cat. No. 1771-OAD Series B Installation Instructions, publication number 1771-2.74.

Connect the 1771-OAD to the Power Heat Source



Connect the 1771-OAD output module to the heat source.

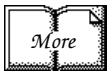
Set Up the Software



1 *Install the software (page 3–1)*

2 *Start 6200 programming software (page 3–2)*

3 *Configure the communication parameters for online programming (page 3–2)*



For more information, see:

- PLC-5 Programming Software Configuration and Maintenance Manual, publication number 6200-6.4.6
- PanelBuilder 900 Configuration Software User Manual, publication number 2711-815

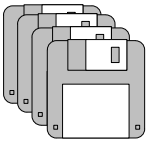
Install the Software

For 6200 software, you need:

- 11 Mbytes hard disk space for 6200 software
- 547 Kbytes (560,000 bytes) free RAM
- recommended additional 384 Kbytes extended or expanded memory to program off line
- high-density, 1.44 Mbyte disk drive (3 1/2")

For PanelBuilder software, you need:

- MS-DOS® operating system version 3.31 or later (5.0 or later recommended)
- Microsoft® Windows® version 3.1 or higher
- Personal computer using 80386 or higher processor
- 4 Mbytes RAM (8 MBytes recommended) with minimum 10 Mbytes permanent swap under virtual memory
- 12 Mbytes hard disk space
- high-density, 1.44 Mbyte disk drive (3 1/2")
- monitor supported by Windows (VGA or better recommended)
- mouse that is compatible with Windows



Install 6200 Programming Software:

A: Enter

↓

INSTALL C: Enter

Install PanelBuilder 900 software and INTERCHANGE software:

In the Program Manager, choose `File` ➡ `Run`

↓

Type `a: setup`

↓

Enter

Start the 6200 Programming Software

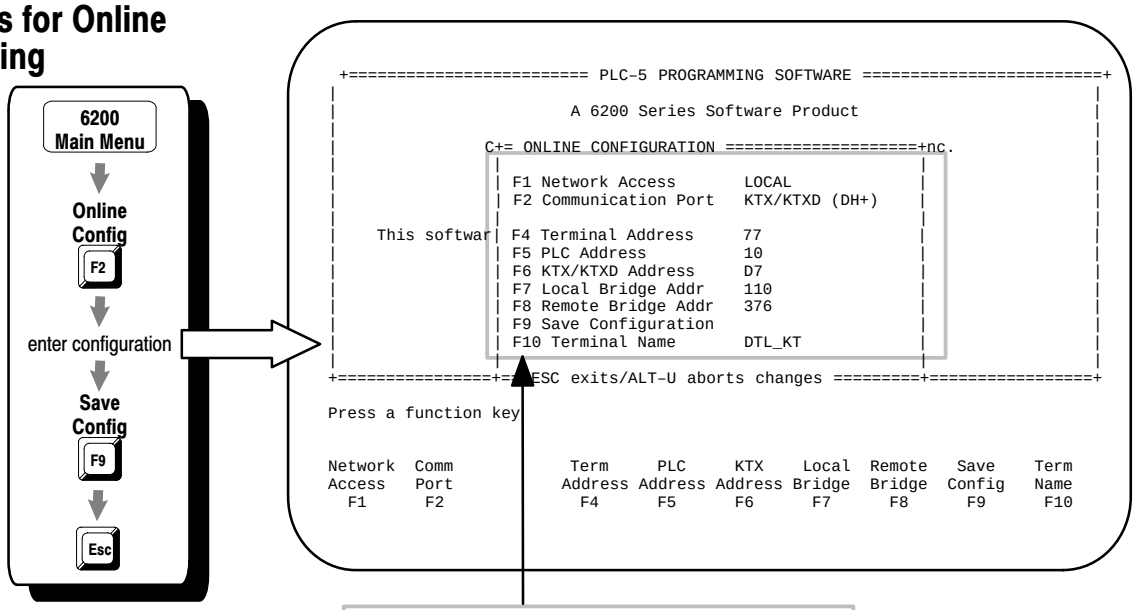
Tip Make sure you turn on the power supply.

Start the software from the DOS command line:

```
CD C:\IPDS\ATTACH\PLC5   Return
        ↓
IT       Return
```

More For more information, see the PLC-5 Programming Software Configuration and Maintenance Manual, publication number 6200-6.4.6.

Configure the Communication Parameters for Online Programming



Function keys [F1] and [F2] are toggle keys. Keep pressing the function key until the correct option appears.

Enter this configuration:

```
F1 Network Access        LOCAL
F2 Communication Port    KTX/KTXD (DH+)

F4 Terminal Address      77
F5 PLC Address           10
F6 KTX/KTXD Address      D7
F7 Local Bridge Addr     110
F8 Remote Bridge Addr    376
F9 Save Configuration
F10 Terminal Name
```

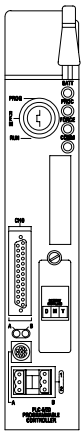
Tip Remember these are the two most significant digits of the 1784-KTx card's memory address you recorded on page 2–5.

More For more information, see the PLC-5 Programming Software Configuration and Maintenance Manual, publication number 6200-6.4.6.

Configure the PLC-5 Processor System

1 *Configure the PLC-5 processor*
(page 4–2)

2 *Configure the PLC-5 processor communication channels*
(page 4–3)

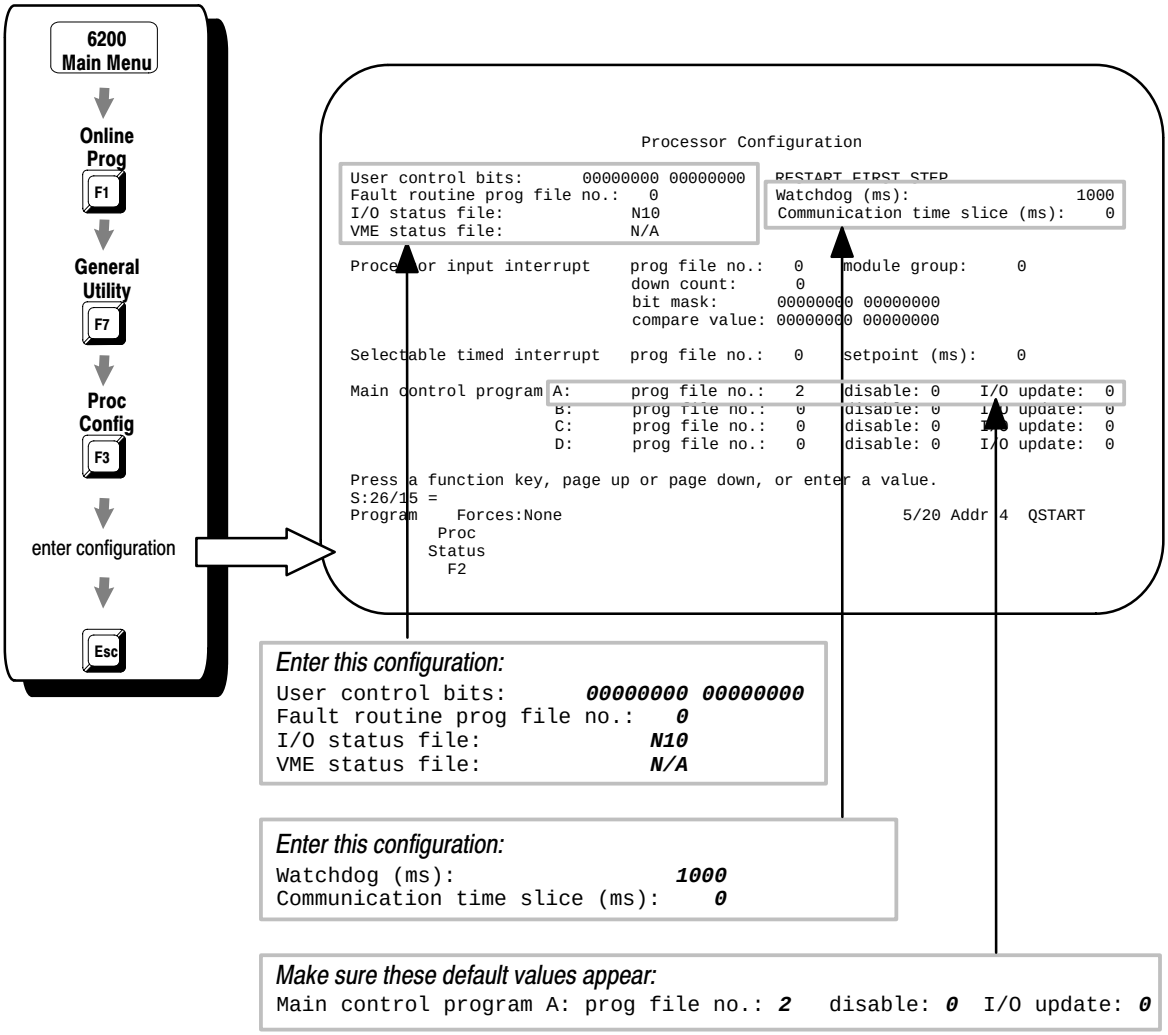


More

For more information, see the PLC-5 Programming Software Configuration and Maintenance Manual, publication number 6200-6.4.6.

Tip Make sure the processor is in Remote Program or Program mode.

Configure the PLC-5 Processor



Enter this configuration:

```
User control bits:      00000000 00000000
Fault routine prog file no.:   0
I/O status file:             N10
VME status file:             N/A
```

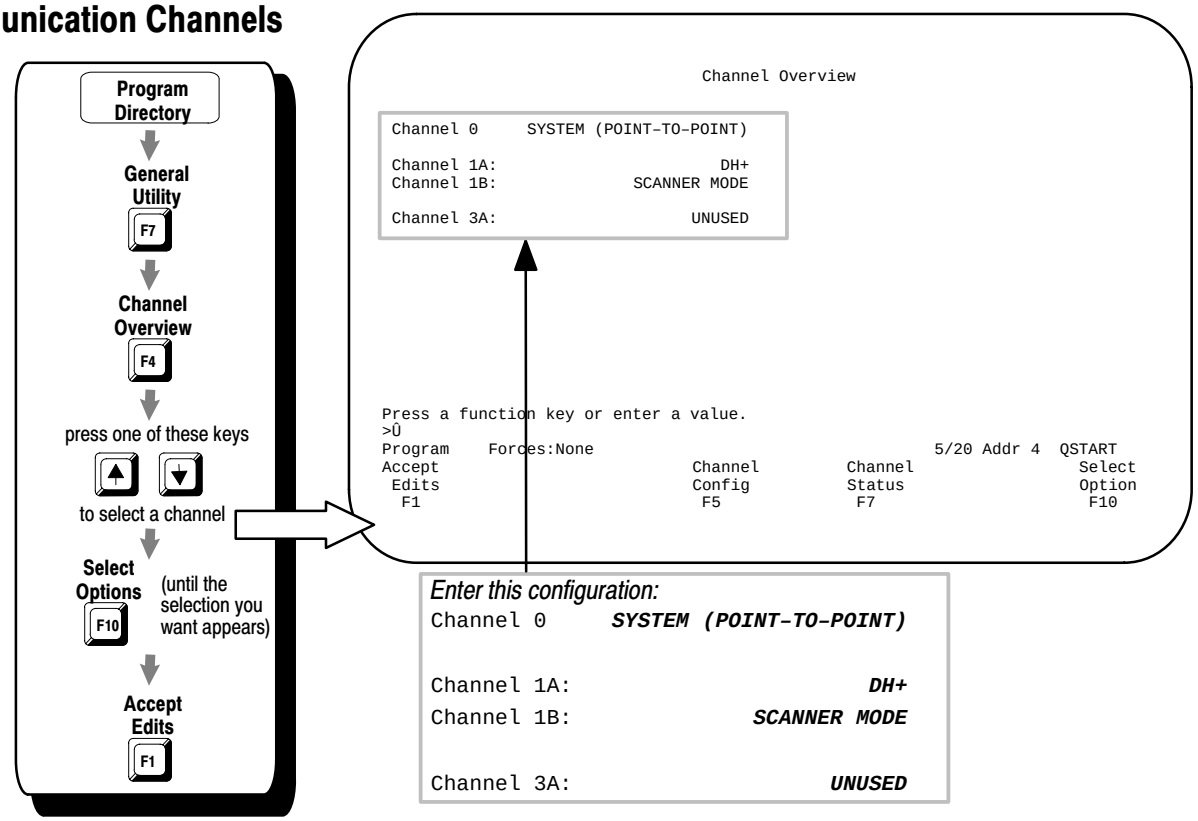
Enter this configuration:

```
Watchdog (ms):                1000
Communication time slice (ms):    0
```

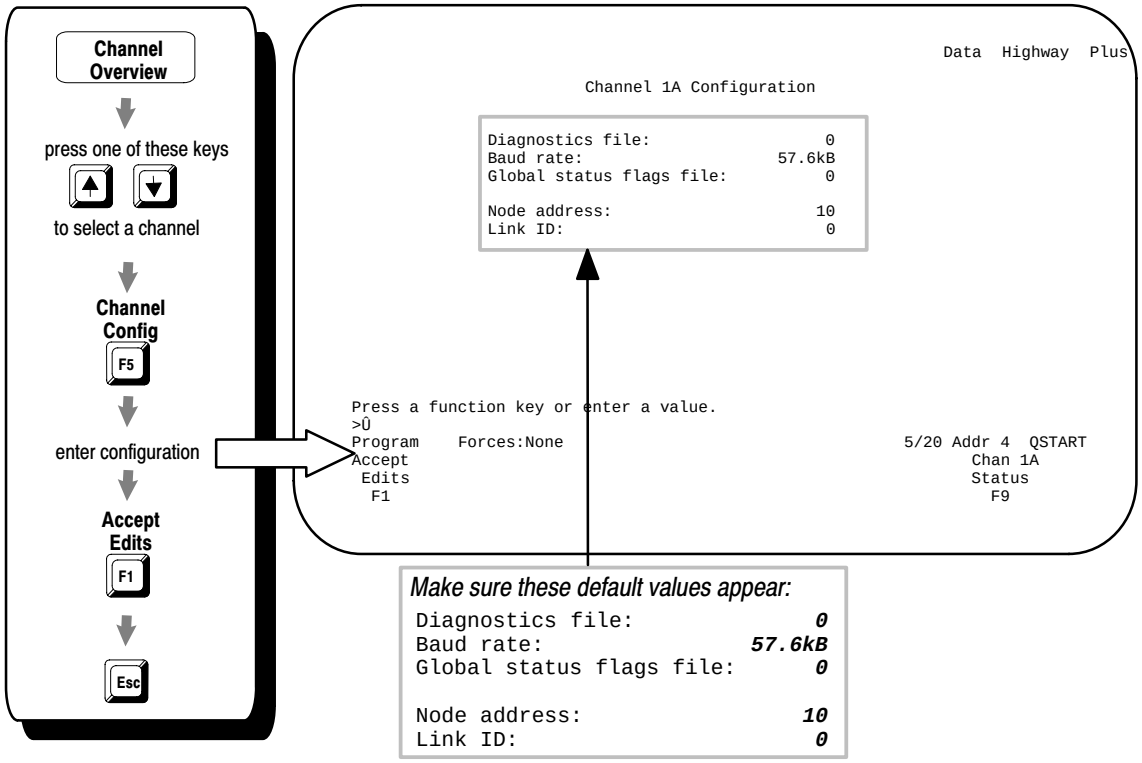
Make sure these default values appear:

```
Main control program A: prog file no.: 2   disable: 0  I/O update: 0
```

Configure the PLC-5 Processor Communication Channels

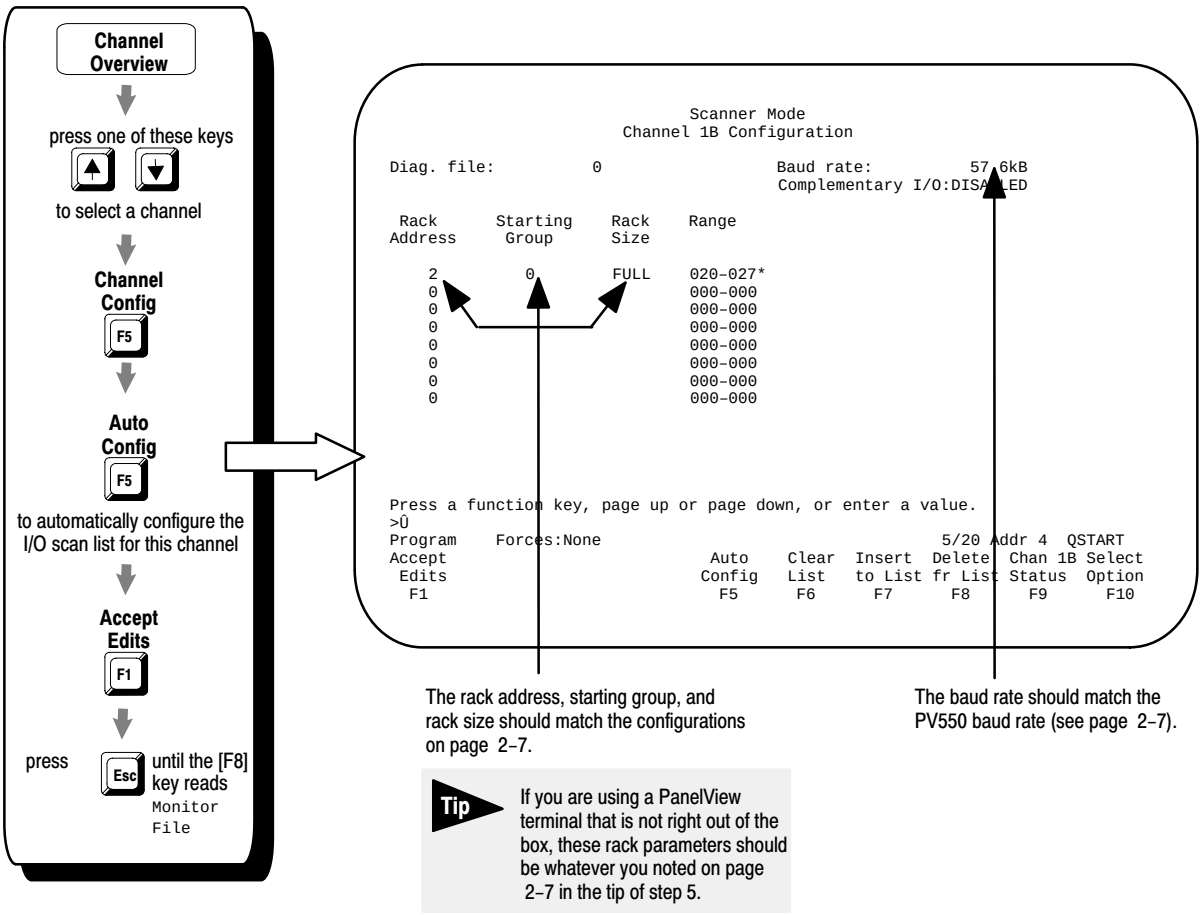


Configure Channel 1A



Configure Channel 1B

Important: We assume you are using a new, out-of-the-box PanelView 550 operator terminal. If not, configure channel 1B **again** (by performing the steps shown on the left) to automatically configure the I/O scan list after you finish page 6-13 in chapter 6.



Tip If you are using a PanelView terminal that is not right out of the box, these rack parameters should be whatever you noted on page 2–7 in the tip of step 5.

Create the Ladder Logic Program

1 *Create a data table file (page 5–2)*

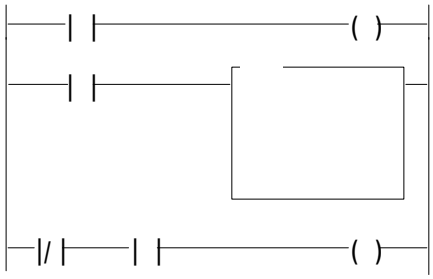
2 *Enter the ladder logic (page 5–3)*

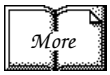
3 *Configure the PID screens (page 5–7)*

4 *Use the I/O Configuration Utility (page 5–8)*

5 *Run the ladder program (page 5–9)*

6 *Monitor data (page 5–10)*



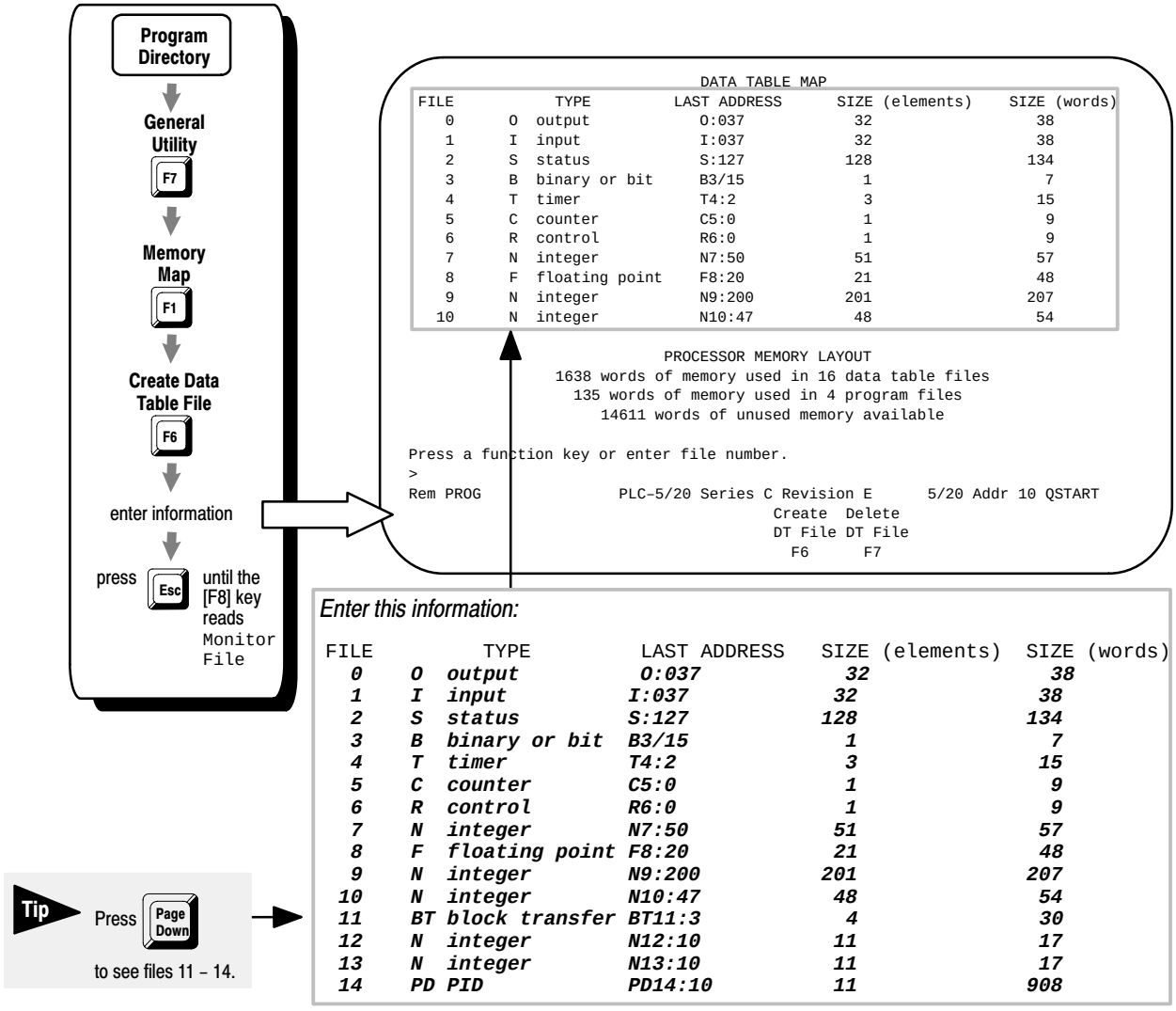


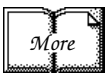
For more information, see:

- PLC-5 Programming Software Configuration and Maintenance Manual, publication number 6200-6.4.6
- PLC-5 Programming Software Programming Manual, publication number 6200-6.4.7
- PLC-5 Programming Software Instruction Set Reference Manual, publication number 6200-6.4.11
- PLC-5 Programming Software I/O Configuration Manual, publication number 6200-6.4.12

Tip Make sure the processor is in Remote Program or Program mode.

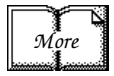
Create a Data Table File



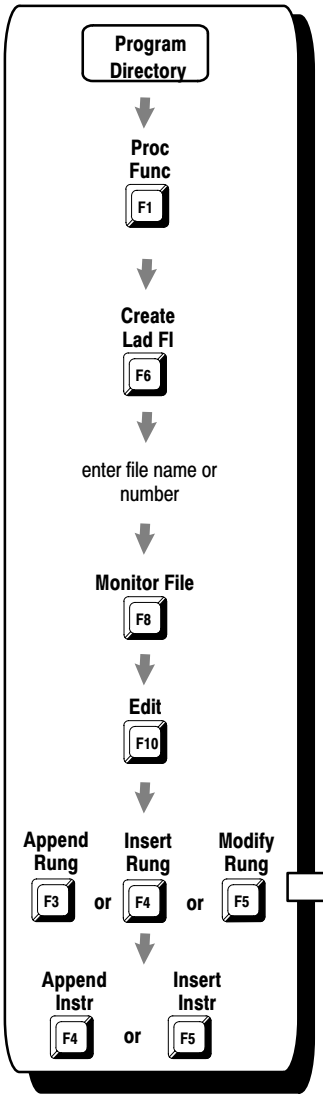


For more information, see the PLC-5 Programming Software Configuration and Maintenance Manual, publication number 6200-6.4.6.

Enter the Ladder Logic

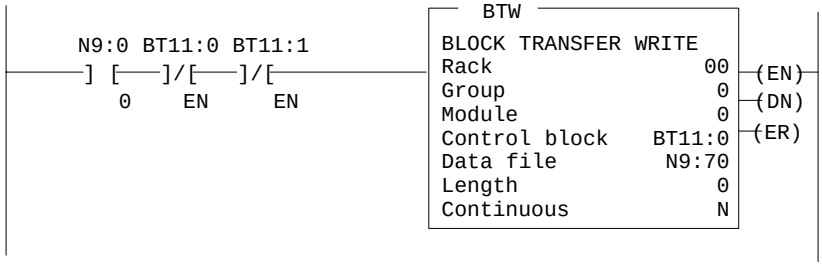


For more information, see the PLC-5 Programming Software Instruction Set Reference Manual, publication number 6200-6.4.11.

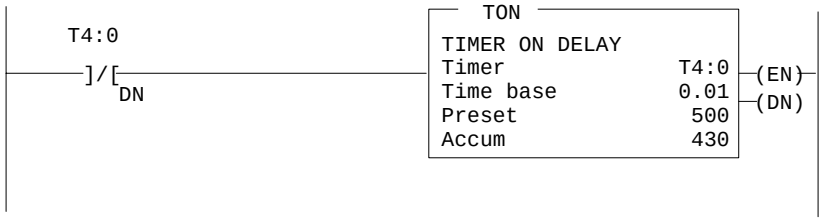


Tip To use the I/O Configuration Utility, see page 5–8.

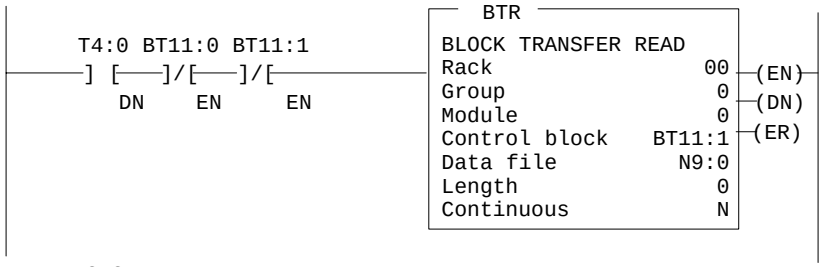
Rung 2:0
Configuration of the Analog Input module. Executed only once. N9:0 is the power-up bit of the IXHR module.



Rung 2:1
Main coordination timer. Free-running timer used to coordinate Analog data input, PID execution, and set overall TPO interval.



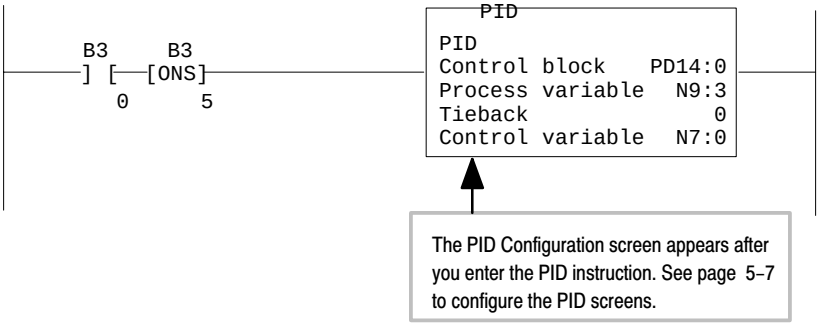
Rung 2:2
Analog input Block Transfer. Triggered by the main timer.



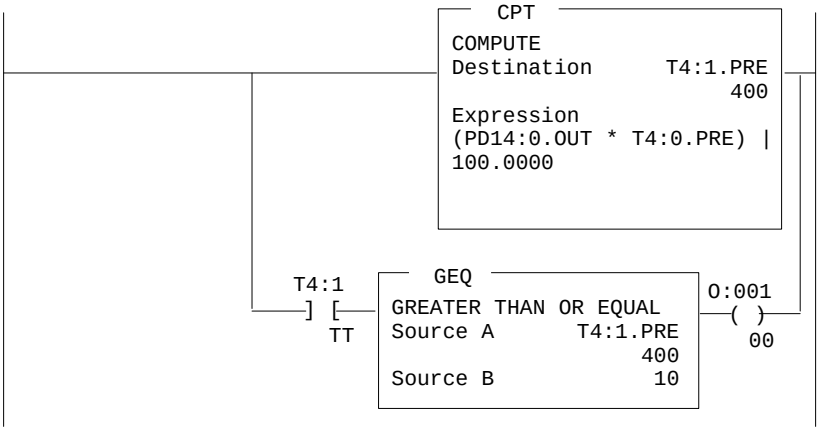
Rung 2:3
Rung to detect communications error with the analog module. If an error occurs, bit B3/1 will be latched since the BT error bit will be reset when the Block Transfer is retried.

Rung 2:4
When the Analog Input Block Transfer is complete, set an intermediate bit (B3/0) to synchronize the remainder of the program.

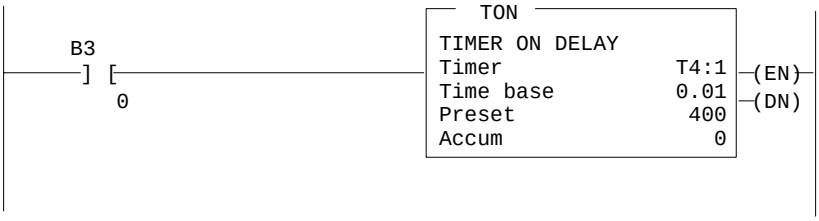
Rung 2:5
Heat only PID instruction. THE CONTROL VARIABLE N7:0 IS NOT USED IN THIS APPLICATION (PID REQUIRES A VALUE HERE BUT IT IS NOT NEEDED FOR THE TPO OUTPUT).



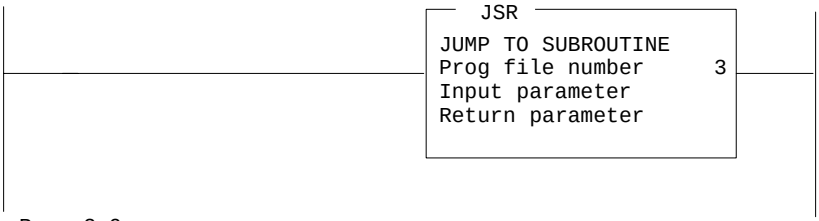
Rung 2:6
TON.preset=(pid.out/100)*TPO_Overall_Interval
If ((TON.TT=1)&(TON.preset>Minimum_Heat_Time)) Then set_heat_bit_on



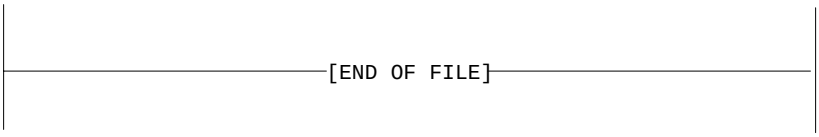
Rung 2:7
TPO ON-TIME timer synchronized to PID execution.



Rung 2:8
Call subroutine to manage PV550



Rung 2:9



Tip

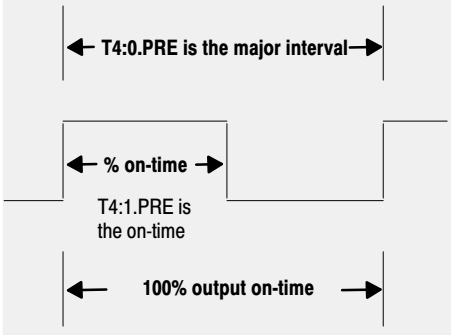
Time-proportioned outputs (TPOs) are used in situations where analog regulation of a process is complicated or impractical. High heat regulatory loops are in this category.

The idea is to vary the duty cycle of applied power to some final element, in this case a heater.

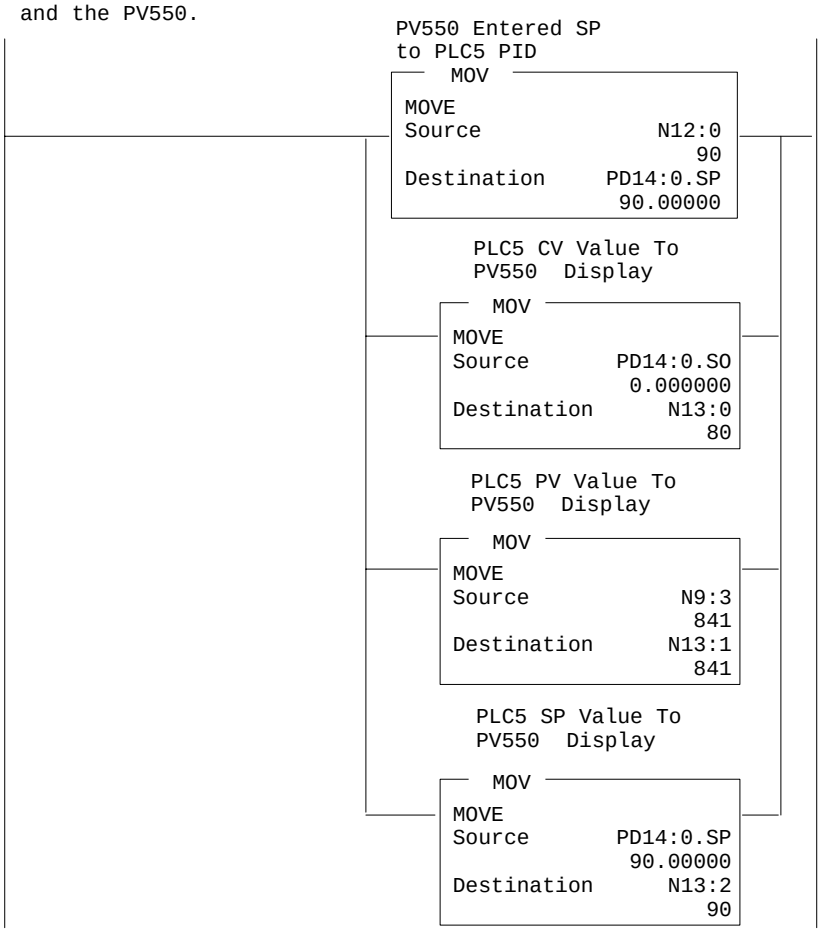
You need to do two things to accomplish TPO:

3. Set the overall or major interval. In our example this is controlled by T4:0, which also synchronizes the PID execution.
4. Calculate the "on-time" based upon the PID output by scaling as a fraction of the overall or major interval.

$$\text{on time} = \frac{\text{PID output\%} * \text{T4:0.PRE}}{100}$$



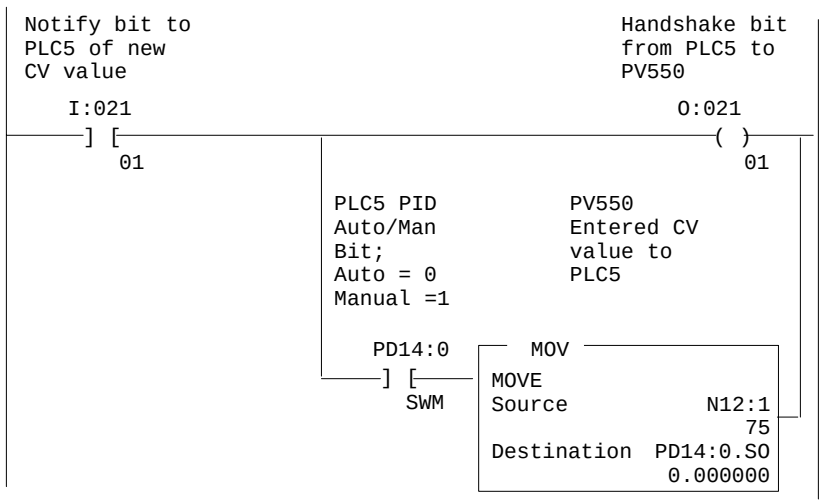
Rung 3:0
This subroutine controls movement of data between the PLC5 and the PV550.



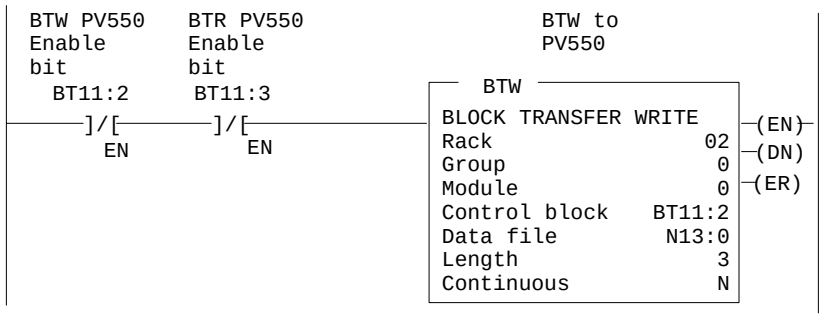
Rung 3:1

Rung 3:2

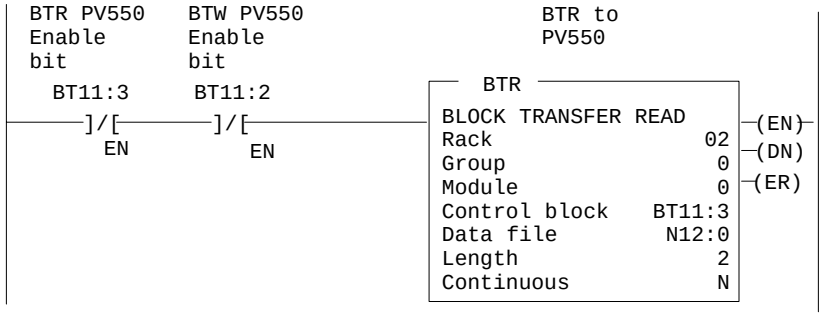
Rung 3:3



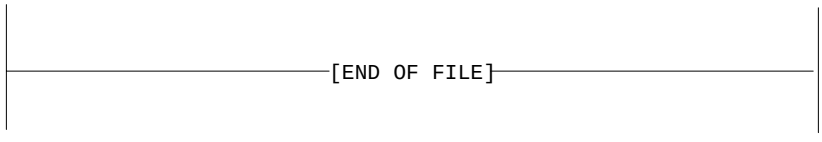
Rung 3:4



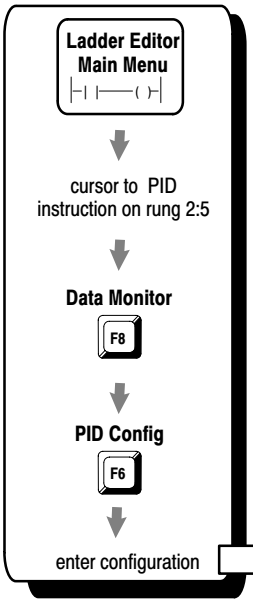
Rung 3:5



Rung 3:6



Configure the PID Screens



PID Configuration Screen

```
PID Equation:            DEPENDENT      Engineering Unit Maximum:       600.0000
Derivative of:           PV             Engineering Unit Minimum:       0.000000
Control Action:          SP-PV
PV Tracking:             YES            Input Range Maximum:            6000.000
                                        Input Range Minimum:            0.000000

Update Time (secs):      5.000000       Output Limit High %:            100.0000
                                        Output Limit Low %:             0.000000

Cascaded Loop:           NO             PV Alarm High:                  0.000000
Cascaded Type:           -              PV Alarm Low:                   0.000000
Master to This Slave:    -              PV Alarm Deadband:              0.000000

                                        (+) Deviation Alarm:            0.000000
                                        (-) Deviation Alarm:            0.000000
                                        Deviation Alarm Deadband:       0.000000


Press a function key or enter a value.
PD14:0.PE = 0
Rem PROG   Forces:None      Data:Decimal   Addr:Decimal  5/20 Addr 10 QSTART
             Toggle           Specify   PID    Next    Prev    Next    Prev
                            Address Monitor  File    File   Elemnts Elemnts
               F3              F5      F6     F7      F8      F9      F10
```

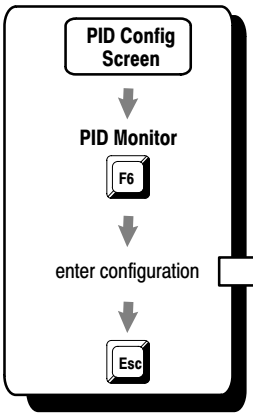
Enter this configuration:

PID Equation:	***DEPENDENT***
Derivative of:	PV
Control Action:	SP-PV
PV Tracking:	***YES***
Update Time (secs):	***5.000000***

Enter this configuration:

Engineering Unit Maximum:	***600.0000***
Engineering Unit Minimum:	0.000000
Input Range Maximum:	***6000.000***
Input Range Minimum:	0.000000
Output Limit High %:	***100.0000***

PID Monitor Screen




```
Setpoint:                0.000000    Proportional Gain (Kc):          25.00000
Process Var.:            73.40000    Reset Time (Ti) [mins/repeat]: 0.6000000
Error:                   -73.40000   Derivative Rate (Td) [mins]:   0.0420000
Output %:                0.000000

Mode:                    AUTO        Deadband:                        0.000000
PV Alarm:                HIGH        Output Bias %:                   0.000000
Deviation Alarm:         NEG
Output Limiting:         LOW         Tieback %:                       0.000000
SP Out of Range:         NO          Set Output %:                    0.000000
Error within Deadband:   NO
PID Initialized:         YES

A/M Station Mode:        AUTO
Software A/M Mode:       AUTO
Status Enable (EN):      0


Press a function key or enter a value.
PD14:0.SP = 0
Rem PROG   Forces:None      Data:Decimal   Addr:Decimal  5/20 Addr 10 QSTART
             Toggle           Specify   PID    Next    Prev    Next    Prev
                            Address Config   File    File   Elemnts Elemnts
               F3              F5      F6     F7      F8      F9      F10
```

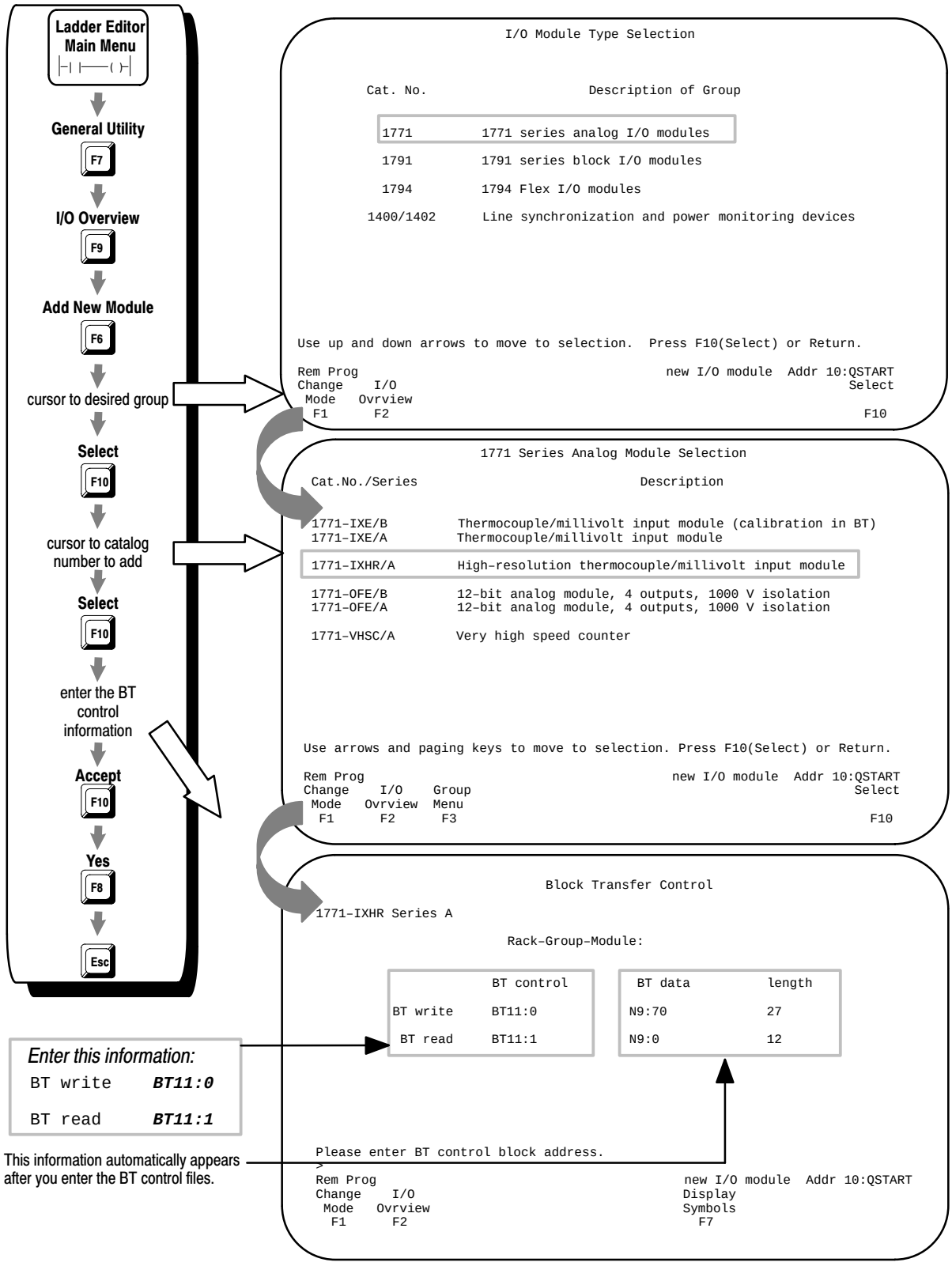
Enter this configuration:

Proportional Gain (Kc):	***25.00000***
Reset Time (Ti) [mins/repeat]:	***0.6000000***
Derivative Rate (Td) [mins]:	***0.0420000***

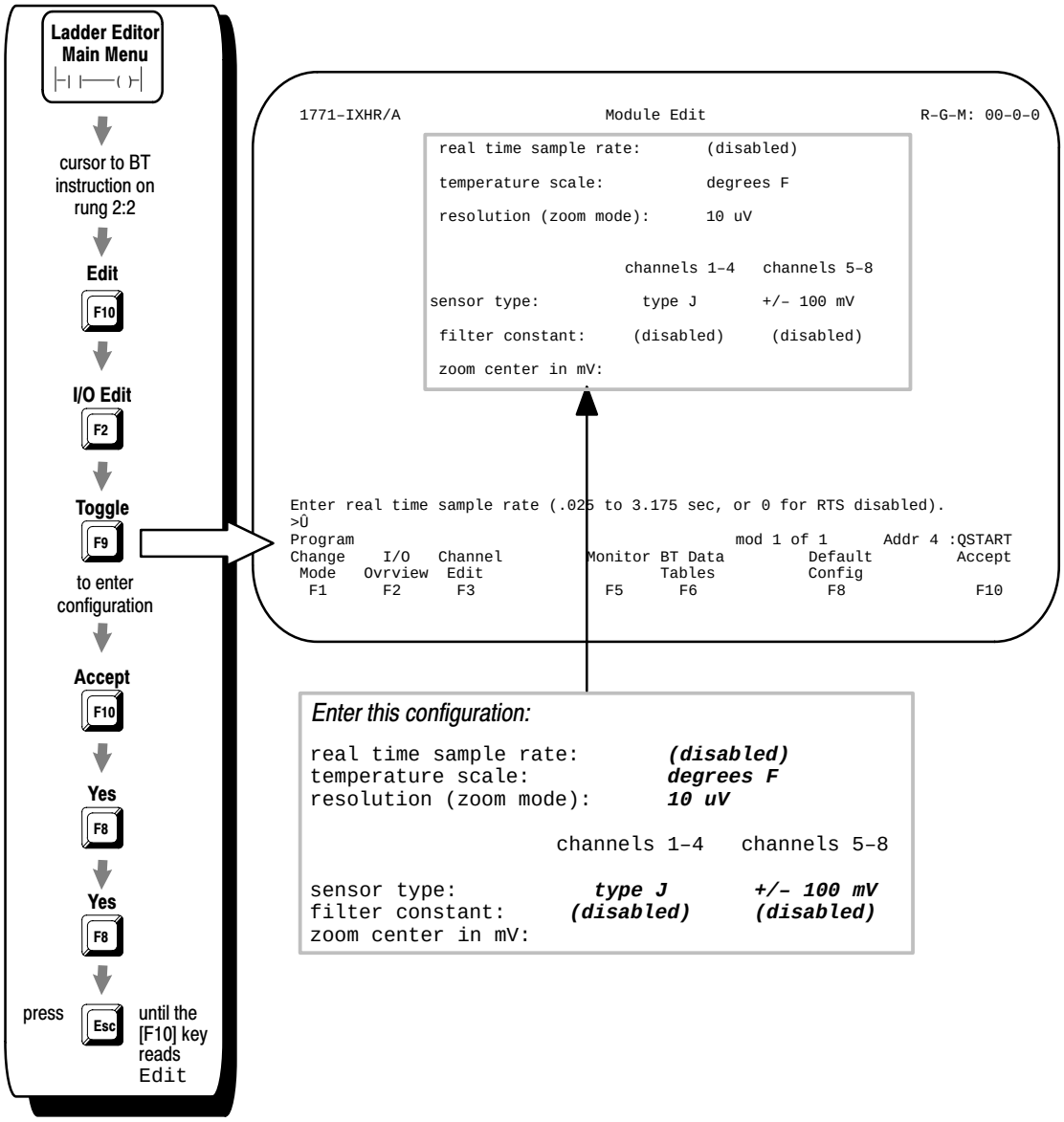
Use the I/O Configuration Utility

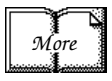
Add 1771-IXHR Thermocouple Module to the Database

Tip Use the I/O configuration utility to specify the intelligent I/O modules you use in block transfer instructions. You must enter the block transfer instructions in a ladder program before you can use the I/O configuration utility.



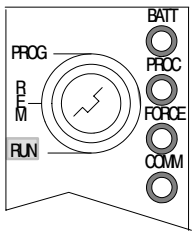
Configure the 1771-IXHR Thermocouple I/O Module





For more information, see the PLC-5 Programming Software I/O Configuration Manual, publication number 6200-6.4.12.

Run the Ladder Program

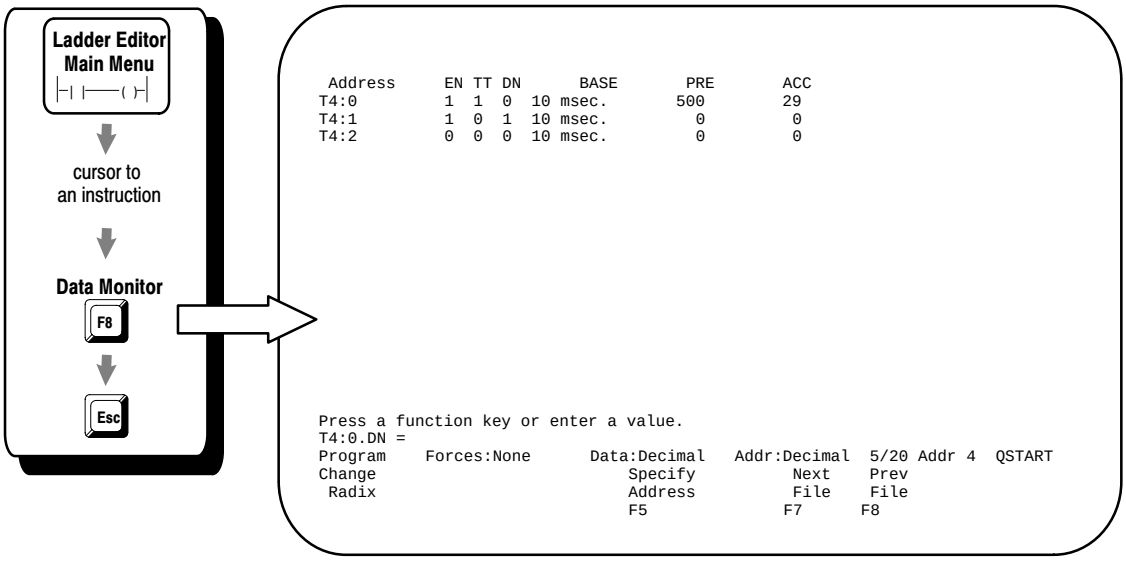


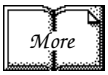
Put the PLC-5 processor in Run mode.

Monitor Data

Use the Data Monitor Screen

Monitor data while the program is running. For example, if you choose to monitor a timer instruction, you might see something like this:

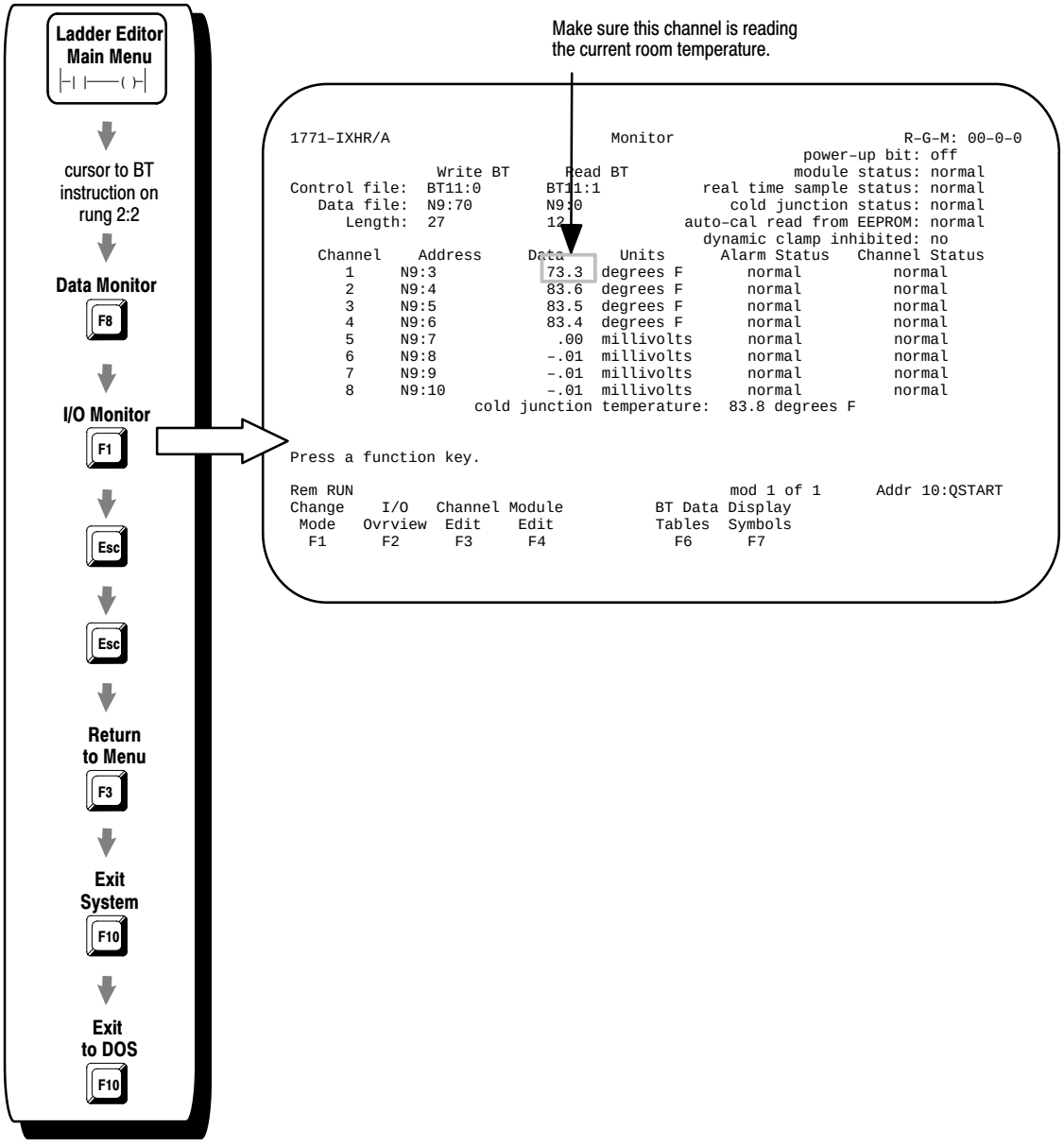


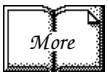


For more information, see the PLC-5 Programming Software Configuration and Maintenance Manual, publication number 6200-6.4.6.

Verify the Configuration Data

Verify that the configuration data looks like this screen while the program is running.





For more information, see the PLC-5 Programming Software I/O Configuration Manual, publication number 6200-6.4.12.

Create the PanelView Application and Develop the Application Screen

1 *Determine the application screen objects (page 6–2)*

2 *Start the PanelBuilder software (page 6–2)*

3 *Create the quick start application (page 6–3)*

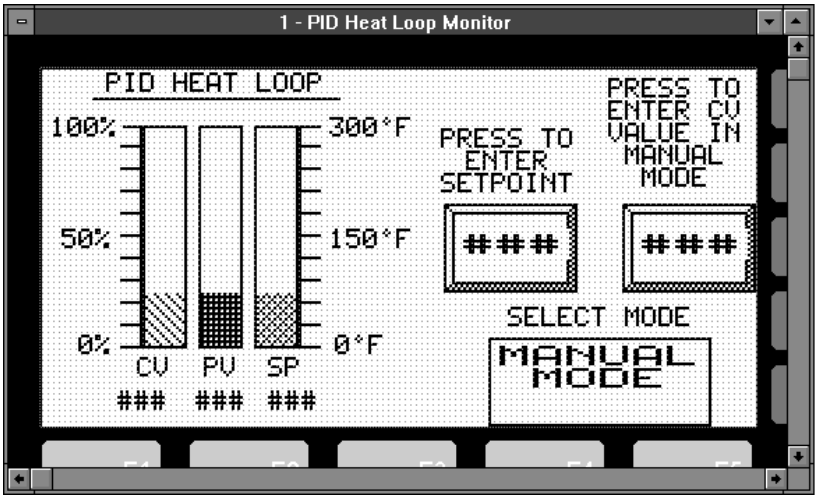
4 *Define the remote I/O communication settings (page 6–4)*

5 *Enter the tags (page 6–5)*

6 *Develop the application screen (PID loop) (page 6–6)*

7 *Validate and save the application (page 6–11)*

8 *Download and run the application (page 6–12)*



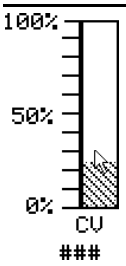
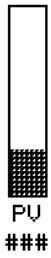
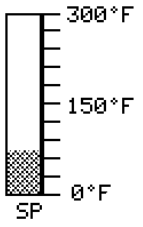
More

For more information, see:

- PanelView 550 Operator Terminals User Manual, publication number 2711-802
- PanelBuilder 900 Configuration Software, publication number 2711-815

Tip The PanelView 550 allows you to view and change the temperature of a system. The PanelView 550 acts as a "window into your process" by allowing you to view and change the temperature of the system. It reads the temperature from the processor's memory and writes new set points into the processor's memory.

Determine the Application Screen Objects

Object:	Object Type:	Tag:	Function:
	bar graph and scale with background text and numeric data display	CV	control variable for the heat loop in percent
	bar graph with background text and numeric data display	PV	processor variable for the heat loop
	bar graph and scale with background text and numeric data display	SP	set point value for the heat loop
	numeric entry with background text	NEW_CV	new CV value entered from the PV550 operator terminal while in manual mode
	numeric entry with background text	spvalue	desired set point value entered from the PV550 operator terminal
	push button with background text	SEL_MODE	button that toggles between two modes of operation: manual mode and automatic mode

Start the PanelBuilder Software

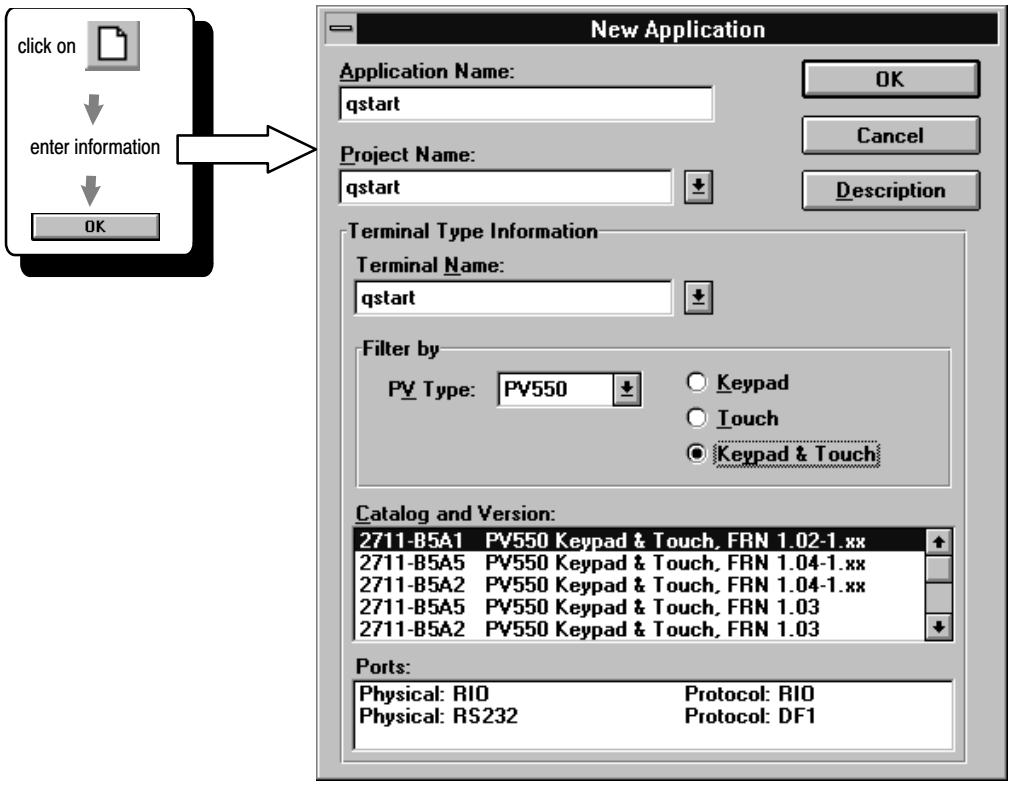
Tip Make sure Windows is running.

Start PanelBuilder software.

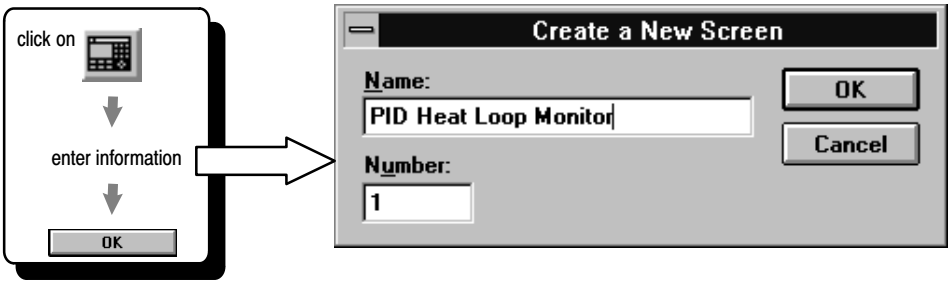
double click on:

Create the Quick Start Application

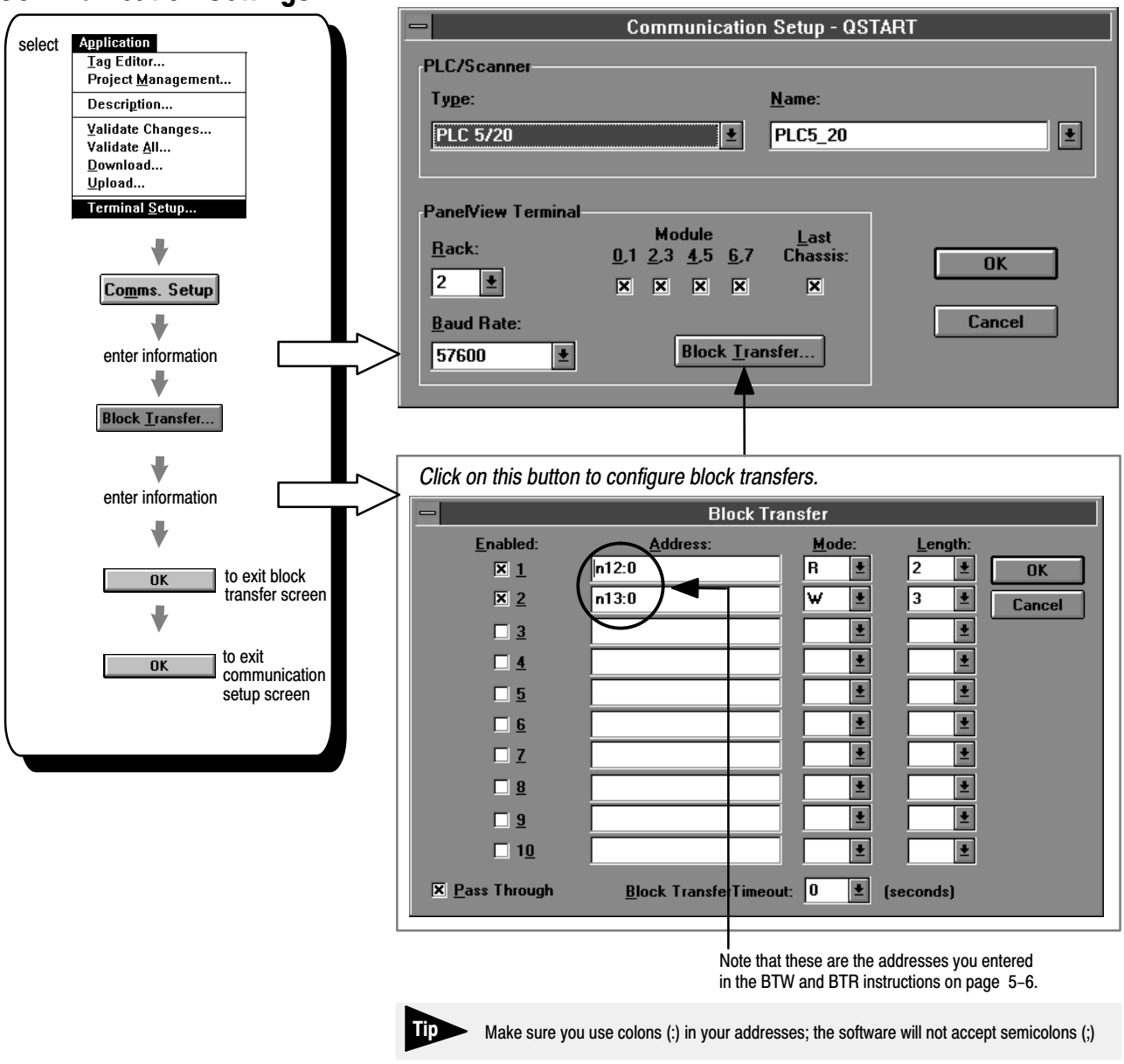
Create a New Application File



Create a New Screen



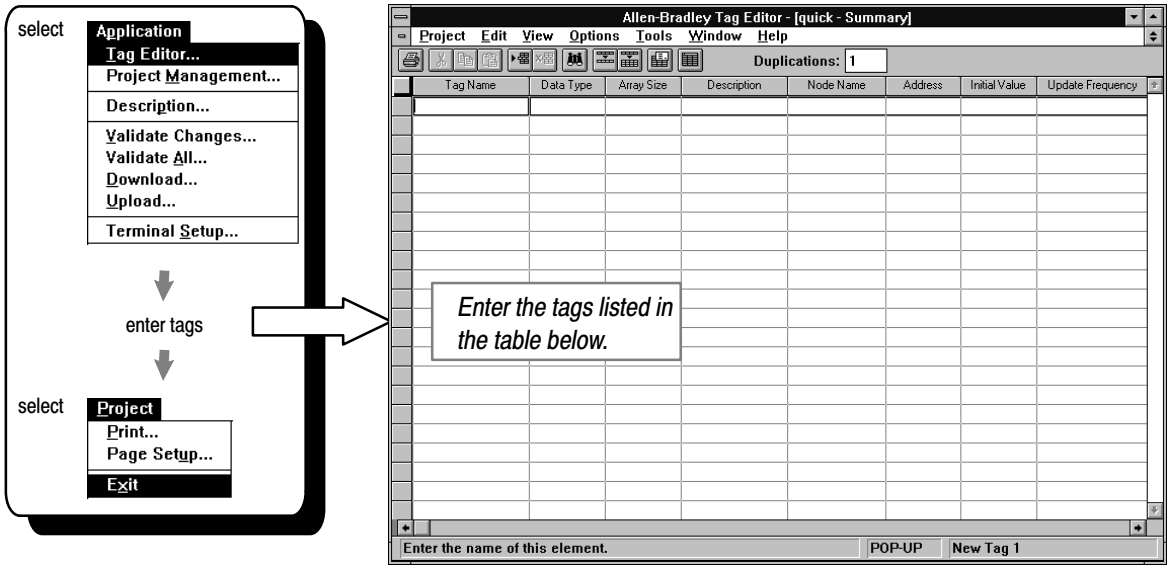
Define the Remote I/O Communication Settings



Tip Make sure you use colons (:) in your addresses; the software will not accept semicolons (;)

Enter the Tags

Enter the tags listed in the table below.



Tip Make sure you use colons (:) in your addresses; the software will not accept semicolons (;)

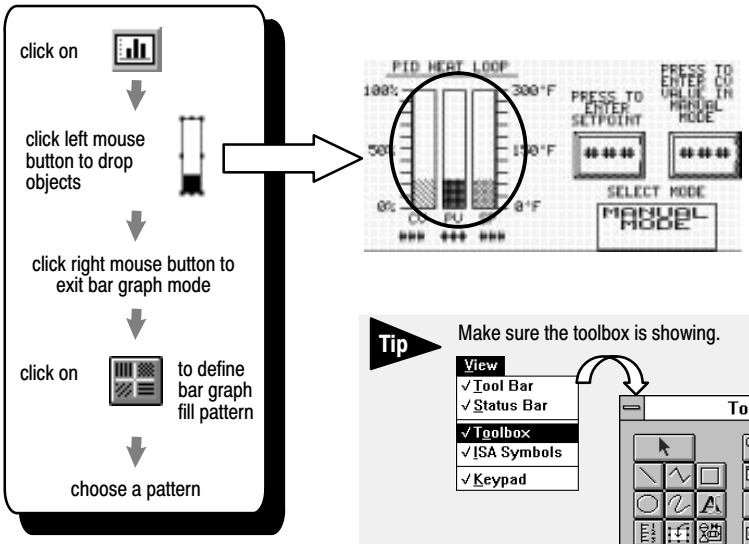
Tag:	Data Type:	Description:	Node Name:	Address:	Initial Value:	Update Frequency:
cv	Unsigned Integer	Control variable for the heat loop in %	PLC5_2Ø	N13:Ø	Ø	1
cvnotify	Bit	This tag tells the PLC5 when the enter key is pressed after entering a new CV value in manual mode	PLC5_2Ø	I:Ø21/1	Ø	1
new_cv	Unsigned Integer	Enters new CV value in manual mode	PLC5_2Ø	N12:1	Ø	1
new_mode	Bit	Displays mode of operation	PLC5_2Ø	O:Ø21/Ø	Ø	1
plc5ack	Bit	This bit tells the PV550 that the PLC5 has received the notify bit indicating a new CV value has been entered	PLC5_2Ø	O:Ø21/1	Ø	1
pv	Unsigned Integer	Process variable for the heat loop	PLC5_2Ø	N13:1	Ø	1
sel_mode	Bit	Selects mode of operation	PLC5_2Ø	I:Ø21/Ø	Ø	1
sp	Unsigned Integer	Set point value for the heat loop	PLC5_2Ø	N13:2	Ø	1
spvalue	Unsigned Integer	This is the desired set point value entered from the PV550	PLC5_2Ø	N12:Ø	Ø	1

Develop the Application Screen (PID Loop)

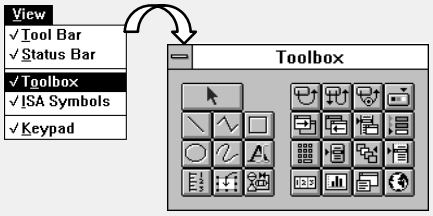
Develop the Bar Graphs with Scales and Data Displays

Create bar graphs and data displays for each bar graph: CV, PV, and SP. Create scales for the CV and SP bar graphs.

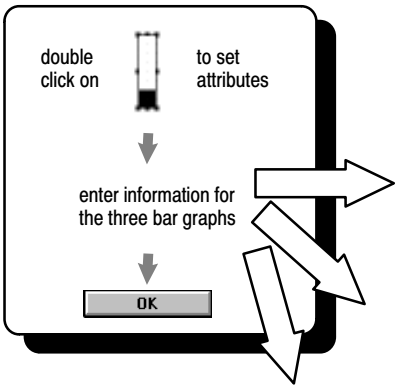
Create the Bar Graphs

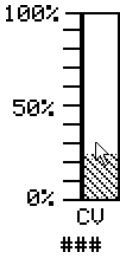


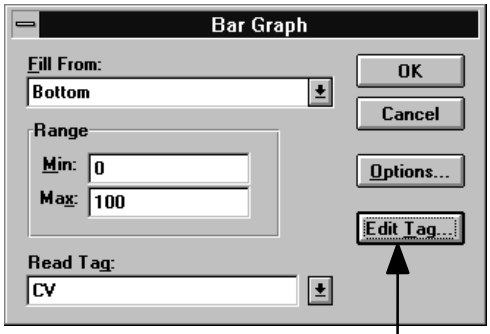
Tip Make sure the toolbox is showing.



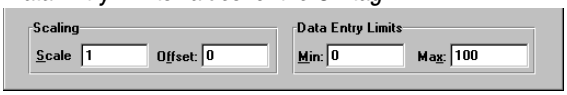
Set the Bar Graph Attributes

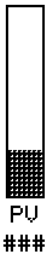


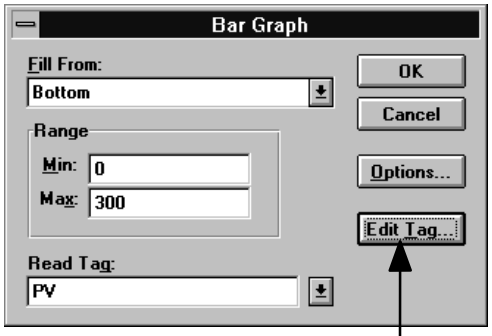




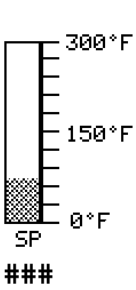
Click on this button to enter these Scaling and Data Entry Limits values for the CV tag:

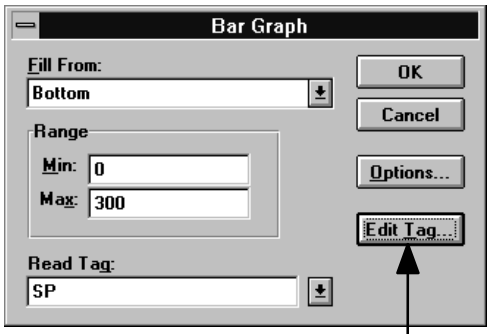






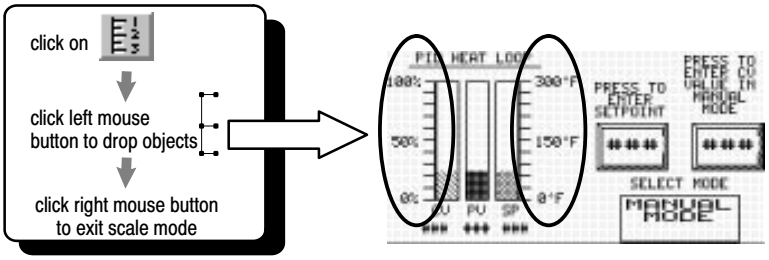
Click on this button to enter these Scaling and Data Entry Limits values for the PV tag:



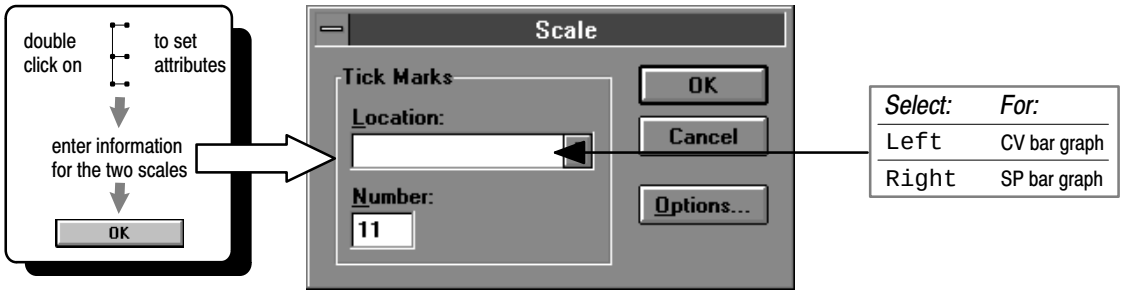


Click on this button to enter these Scaling and Data Entry Limits values for the SP tag:

Create the Scales

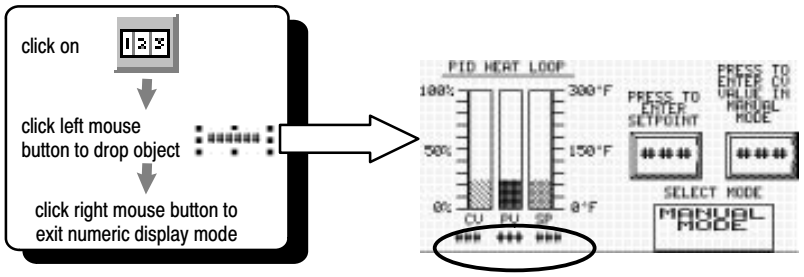


Set the Scale Attributes

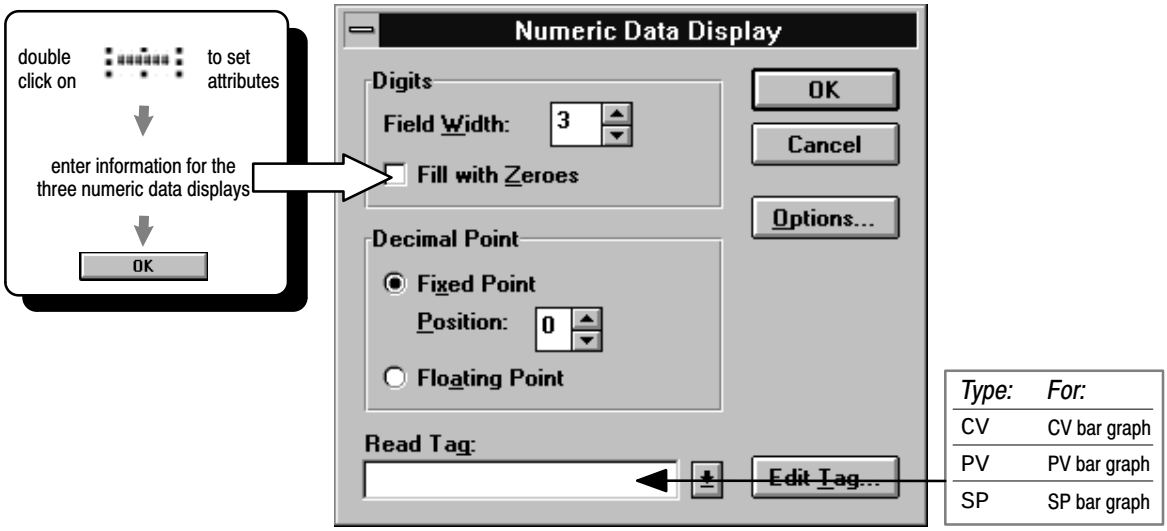


Select:	For:
Left	CV bar graph
Right	SP bar graph

Create the Data Displays



Set the Data Display Attributes

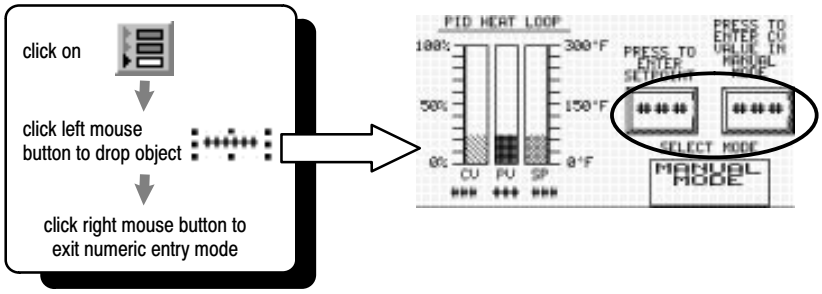


Type:	For:
CV	CV bar graph
PV	PV bar graph
SP	SP bar graph

Develop the Numeric Entry Objects

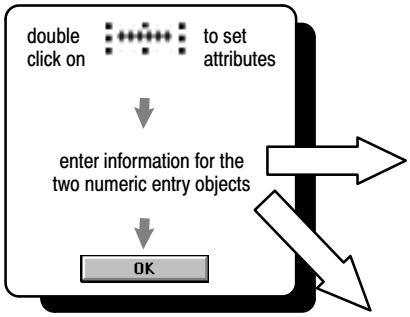
Create the setpoint and CV numeric entry objects.

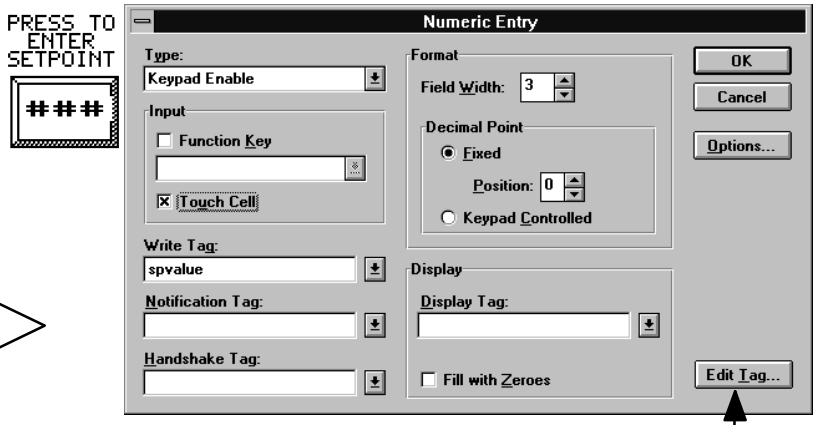
Create the Numeric Entry Objects



Tip In order to display a button object like this one: , you must import a bitmap graphic created with other programs. To import bitmap graphics, click on:

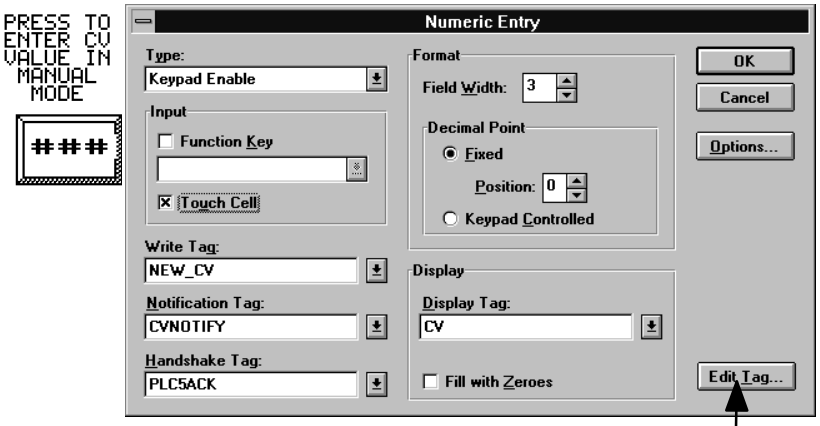
Set the Numeric Entry Object Attributes





Enter Scaling and Data Entry Limits values for the spvalue tag.

Scaling: Scale 1, Offset: 0 — Data Entry Limits: Min: 0, Max: 275



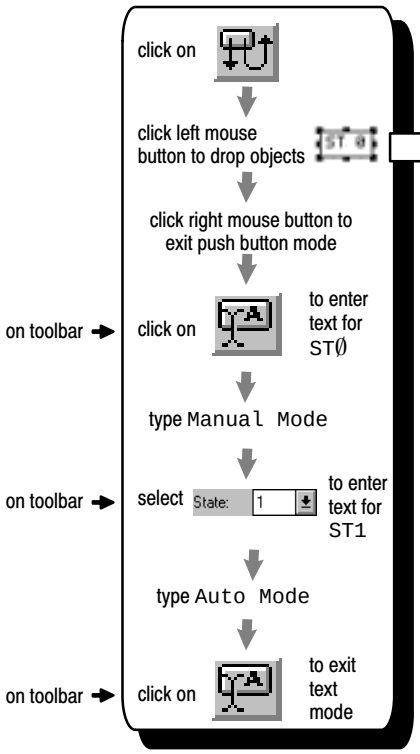
Enter Scaling and Data Entry Limits values for the NEW_CV tag.

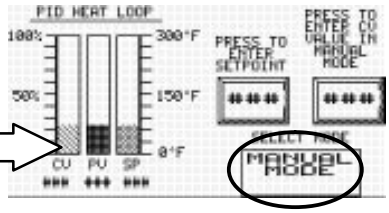
Scaling: Scale 1, Offset: 0 — Data Entry Limits: Min: 0, Max: 100

Develop the Push Button

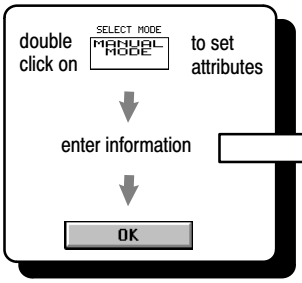
Create the Select Mode push button.

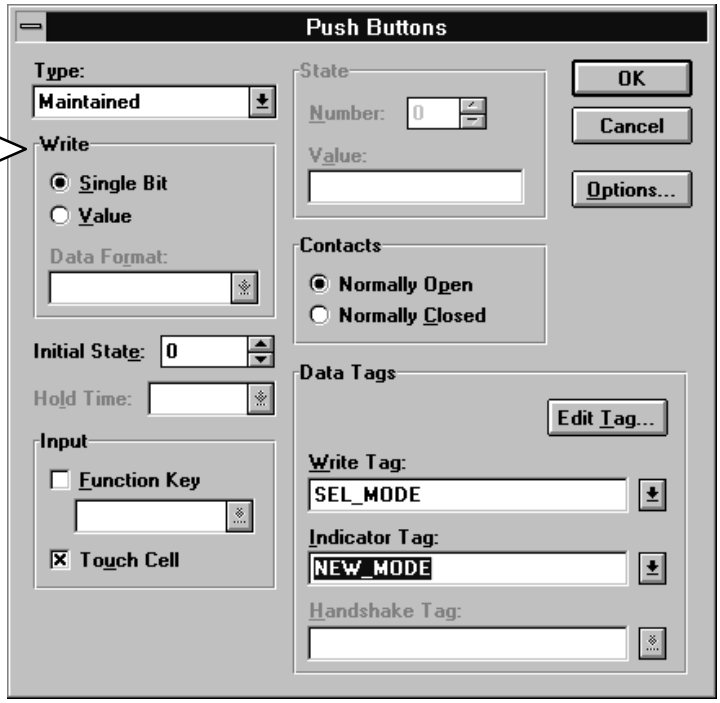
Create the Push Button





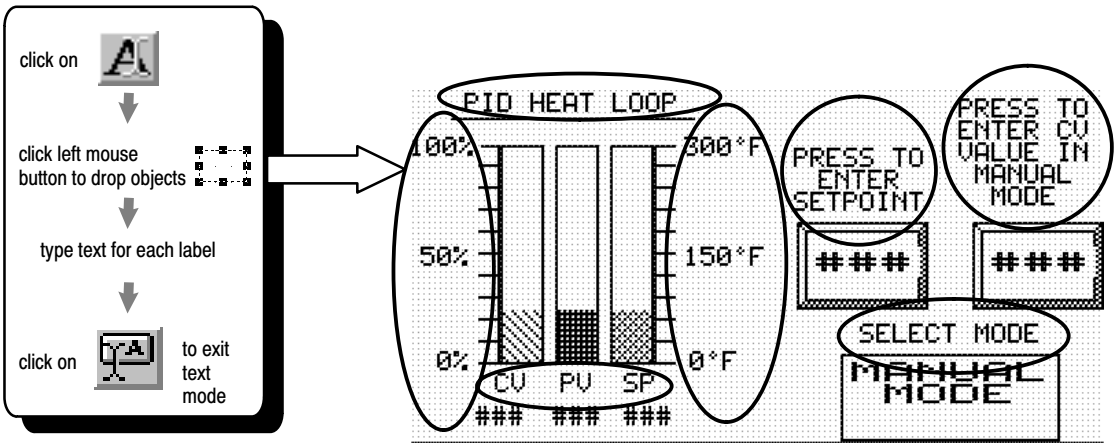
Set the Push Button Attributes





Create the Labels

Create all the labels for this application screen.



Validate and Save the Application

Tip If you have any warnings or errors, you will see a screen like this one.

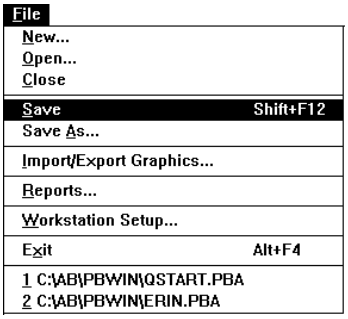
In order to successfully download your application, you must correct any errors; however, you do not have to correct warnings.

Validate the Application

select **Application**

Save the Application

select **File**



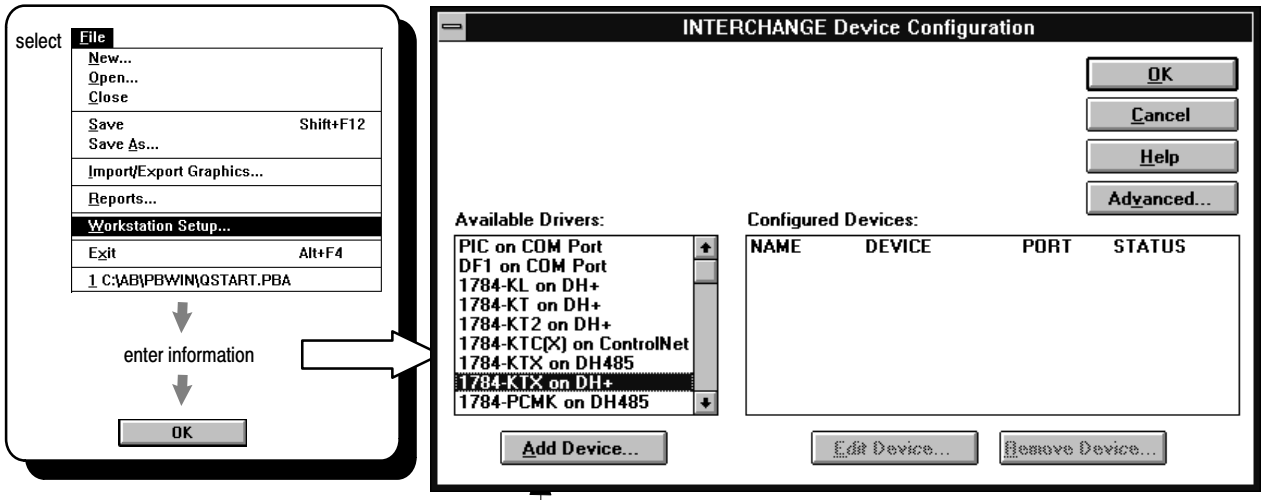
Download Using Pass-Through and Run the Application

Important: If your PanelView 550 terminal is not right out of the box, and if Pass-Through Enabled was set to NO on the Remote I/O Setup screen (see the Tip of step 5 on page 2-7), then you must:

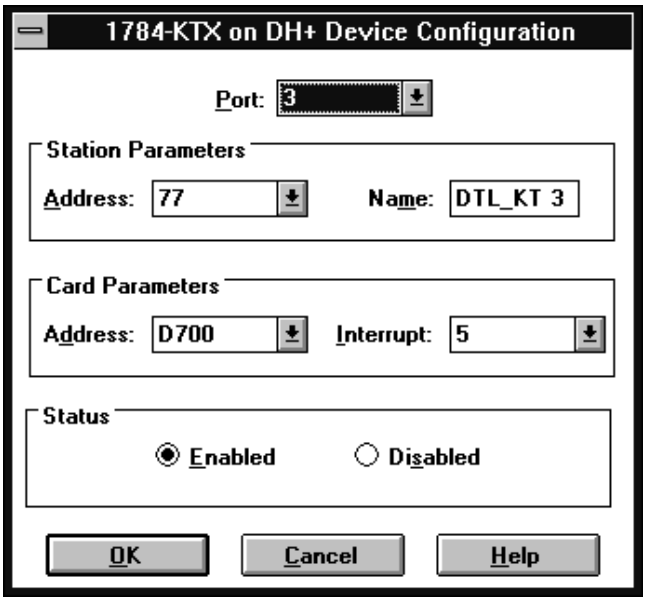
1. Skip this section, and perform a direct download through the serial port of the PV550 terminal. See the PanelView 900 Configuration Software User Manual, publication number 2711-815 for instructions about how to do so.
2. Go to page 4–4 to automatically configure the I/O scan list.
3. Go to to page 6–14 to run the application.

Select the INTERCHANGE Configurator

INTERCHANGE software allows you to download PanelBuilder applications to the PanelView Operator Terminal. It also allows you to select drivers.



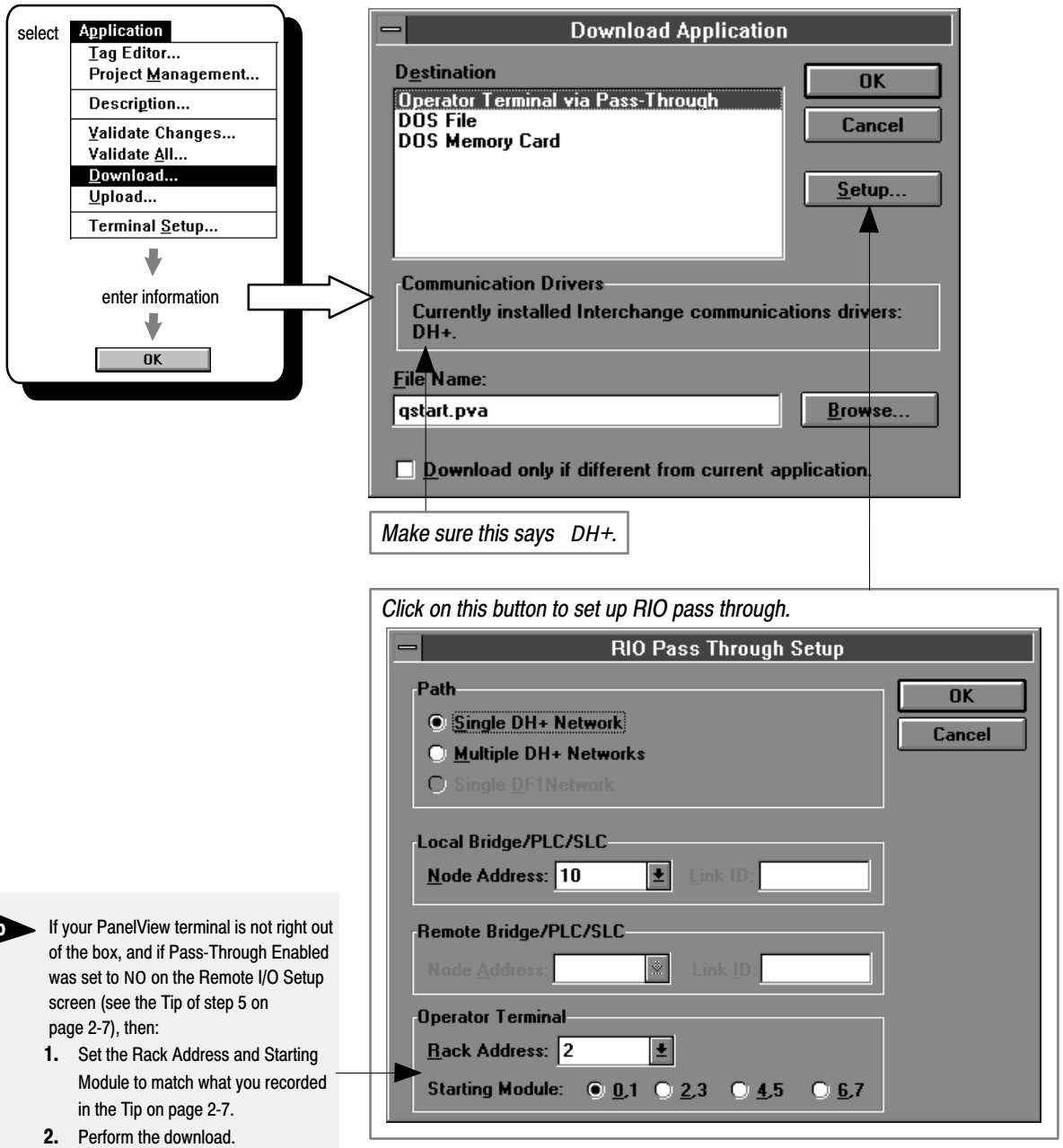
Click on Add Device.



Tip When you add a device, you have to:

1. Save your PanelBuilder application.
2. Exit PanelBuilder and Windows.
3. Reboot your programming terminal by pressing the `Ctrl+Alt+Del` keys simultaneously.
4. Restart Windows and PanelBuilder.
5. Open your application.

Download the Application

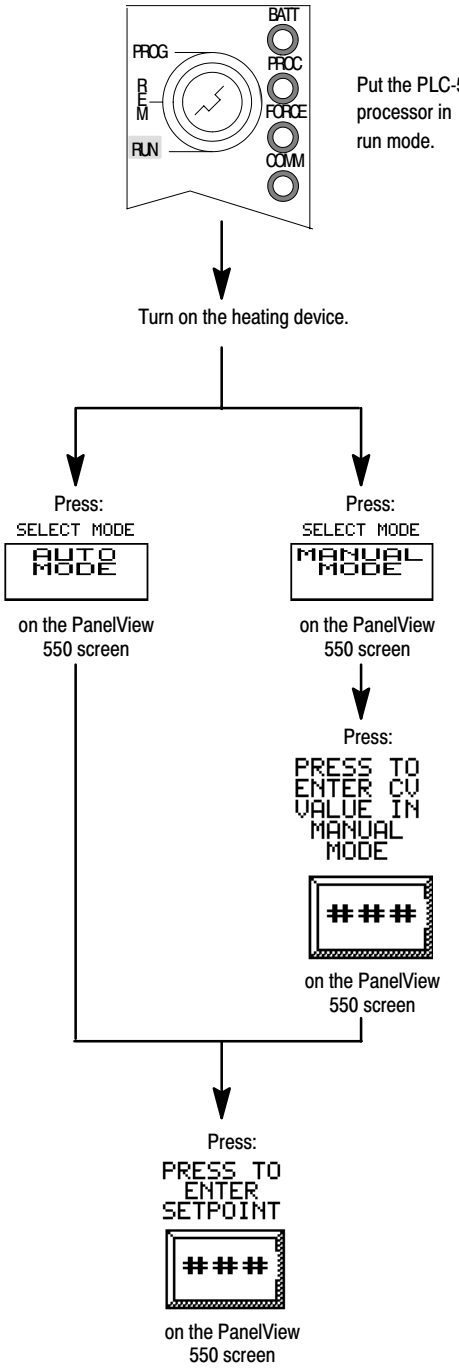


Tip If your PanelView terminal is not right out of the box, and if Pass-Through Enabled was set to NO on the Remote I/O Setup screen (see the Tip of step 5 on page 2-7), then:

1. Set the Rack Address and Starting Module to match what you recorded in the Tip on page 2-7.
2. Perform the download.
3. Go to page 4–4 to automatically configure the I/O scan list.

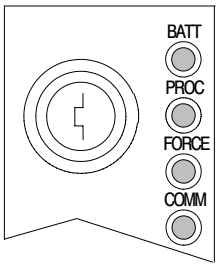
Important: If you encounter any download errors, see PanelBuilder 900 Configuration Software User Manual, publication number 2711-815.

Run the Application



You have completed the quick start. For additional information about what you can do with the products discussed in this quick start or if you have questions, see the list of publications on page P–2 in the preface of this manual or call your local Allen-Bradley representative.

Troubleshoot the Processor and I/O Modules

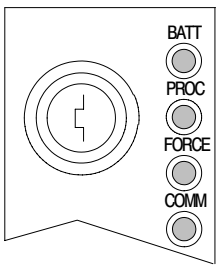


1 *Use the PLC-5 Processor Status Indicators (page 7–1)*

2 *Use the 1771-IXHR Module Status Indicators (page 7–3)*

3 *Use the 1771-OAD Module Status Indicators (page 7–3)*

Use the PLC-5 Processor Status Indicators

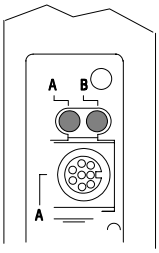


Troubleshoot General Problems

Indicator	Color	Description	Probable Cause	Recommended Action
BATT	Red	Battery low	Battery low	Replace battery within 10 days
	Off	Battery is good	Normal operation	No action required
PROC	Green (steady)	Processor is in run mode and fully operational	Normal operation	No action required
	Green (blinking)	Processor memory is being transferred to EEPROM		
	Red (blinking)	Major fault	Run-time error	• Check major fault bit in status file (S:11) for error definition • Clear fault bit, correct problem, and return to run mode
	Red (steady)	Major fault	• Processor memory has checksum error • Memory module error • Internal diagnostics have failed	• Clear memory and reload program • Check backplane switch settings and/or insert correct memory module • Power down, reseat processor and power up; then, clear memory and reload your program. Replace EEPROM with new program; then, if necessary, replace the processor
	Off	Processor is in program load or test mode or is not receiving power		Check power supply and connections

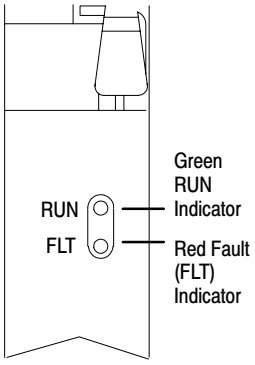
Indicator	Color	Description	Probable Cause	Recommended Action
FORCE	Amber (steady)	SFC and/or I/O forces enabled	Normal operation	No action required
	Amber (blinking)	SFC and/or I/O forces present but not enabled		
	Off	SFC and/or I/O forces not present		
COMM	Off	No transmission on channel 0	Normal operation if channel is not being used	
	Green (blinking)	Transmission on channel 0	Normal operation if channel is being used	

Troubleshoot the Processor Communication Channels



Indicator	Color	Channel Mode	Description	Probable Cause	Recommended Action
A or B	Green (steady)	Remote I/O Scanner	Active Remote I/O link, all adapter modules are present and not faulted	Normal operation	No action required
		Remote I/O Adapter	Communicating with scanner		
		DH+	Processor is transmitting or receiving on DH+ link		
	Green (blinking rapidly or slowly)	Remote I/O Scanner	At least one adapter is faulted or has failed	• Power off at remote rack • Cable broken	• Restore power to the rack • Repair cable
		DH+	No other nodes on network		
	Red (steady)	Remote I/O Scanner Remote I/O Adapter DH+	Hardware fault	Hardware error	• Turn power off, then on. • Check that the software configurations match the hardware set-up. • Replace the processor.
	Red (blinking rapidly or slowly)	Remote I/O Scanner	Faulted adapters detected	• Cable not connected or is broken • Power off at remote racks	• Repair cable • Restore power to racks
		DH+	Bad communication on DH+	Duplicate node detected	Correct station address
	Off	Remote I/O Scanner Remote I/O Adapter DH+	Channel offline	Channel is not being used	Place channel online if needed

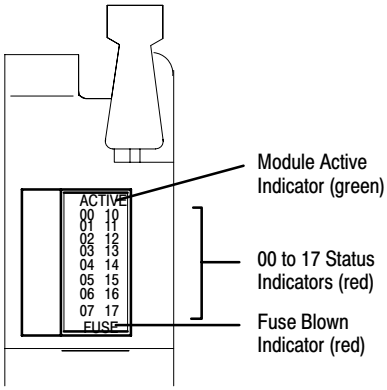
Use the 1771-IXHR Module Status Indicators



Use this table to help you interpret the 1771-IXHR status indicators and to troubleshoot module and system faults.

Indicator Status	Probable Cause	Recommended Action
Both LEDs are OFF	No power to module Possible short on the module LED driver failure	Check power to I/O chassis. Cycle as necessary. Replace module
Red FLT LED ON and Green RUN LED is ON	Microprocessor, oscillator or EPROM failure	Replace module
Red FLT LED ON	If immediately after power-up, indicates RAM or EPROM failure. [1]	Replace module
	If during operation, indicates possible microprocessor or backplane interface failure. [1]	Replace module
Green RUN LED is flashing	Power-up diagnostics successfully completed.	Normal operation
	If LED continues to flash, and write block transfers (BTW) cannot be accomplished, you have a possible interface failure.	Replace module
When red LED is on, the watchdog timer has timed out and backplane communications are terminated. Your user program should monitor communication.		

Use the 1771-OAD Module Status Indicators



Use this table to help you interpret the 1771-OAD status indicators and to troubleshoot module and system faults.

Indicator Status	Description of Fault or System Status	Recommended Action
Module active ON (green)	Normal Indication.	None.
Module active ON (green) and Output status ON (red)	Check voltage at output point on swing arm.	If voltage is present, take no action. If no voltage is present, check the fuse. If the fuse is OK, replace the module.
Module active ON (green) and Output status OFF	No voltage.	None.
	Voltage on terminal.	Replace the module.
Module active OFF and Output status ON (red) or OFF	1. Processor is in program mode. 2. Module not functioning properly.	1. If module is in normal mode, take no action. If module is in CSI mode replace module. 2. Check the chassis power supply and processor. If they are OK, replace the module.
Fuse blown (red)	Outputs will not turn on.	Replace the fuse. If fuse replacement does not correct the problem, replace the module.

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Publication Problem Report

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Pub. Name Using a PLC-5 Processor in a Heat Application Application Note

Cat. No. _____ Pub. No. 1785-2.41 Pub. Date April 1996 Part No. 955124-64

Check Problem(s) Type:	Describe Problem(s):	Internal Use Only
☐ Technical Accuracy	☐ text ☐ illustration	
☐ Completeness What information is missing?	☐ procedure/step ☐ illustration ☐ definition ☐ example ☐ guideline ☐ feature ☐ explanation ☐ other	☐ info in manual (accessibility) ☐ info not in manual
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