VICI
Valco Instruments Co. Inc.

Fast Temperature Programmer Instruction Manual

Manufactured by:

Valco Instruments Co. Inc.
8300 Waterbury
Houston, TX 77055

11/19

Table of Contents

FTP Part Number Guide

$$F\,T\,P\,-2\,\_\,\_\,-1\,\_\,\_\,\_$$

Power cord

0 - US
1 - EU
2 - No cord

Options

0 - Enclosure, power supply
1 - Enclosure, no power supply
2 - No enclosure, no power supply
3 - No enclosure, power supply

Modules 2 to 4

0 - No module
1 - Thermocouple
2 - RTD 100
3 - RTD 1000

Introduction

Please read the manual completely before using the VICI Fast Temperature Programmer Model 200 (FTP-200).

> ⚠️ **The columns or heated zones controlled by the FTP-200 will be heated very rapidly to a very high temperature (450°C). *Do not touch* the columns at any time the FTP-200 is on. *Do not handle* the column unless the FTP-200 has been turned off for at least 15 minutes, and then use caution.**

General Description

The FTP-200 (Fast Temperature Programmer) is a highly-configurable temperature controller with as many as four channels that can be programmed to ramp independently or simultaneously. The zones use a temperature-predictive algorithm and thermocouple or RTD input for precise control of multiple columns or related transfer lines, injector, etc. The controller operates at a high frequency, allowing precise control of ramping rates as high as 1500°C per minute

The primary channel, specifically designed for precision temperature programming of low mass nickel-clad or nickel-wire columns, can utilize the nickel as both the heating element and the temperature sensor. This reduces the mass of the column, reduces the lag time between target temperature and actual temperature, and enables the use of a safe, low voltage to heat the column. A small K-type thermocouple will also allow rapid temperature ramping, since it has very little mass.

For each channel, eight programmable states can be set for temperature, ramp rate, and duration. A small fan can be used to cool the column to the starting temperature. *(Fans must be ordered separately.)*

A graphical user interface, or GUI, *(page 6)* provides user-friendly programming and data reporting. For users who prefer basic operation with raw data, control via a set of serial commands is accomplished via a terminal emulation or communication software running on a PC-compatible computer *(page 7)*.

Parts Included

The FTP system has many variables, starting with the number of modules and their functions. Beyond that, is it with or without an enclosure, and with or without a power supply? Does it come with a US power cord, a European power cord, or no power cord at all? All of these specifications will have been determined at the time of ordering, and are reflected in the FTP part number. *(See chart at left.)*

Columns and fans are sold separately, and are not reflected in the FTP part numbering system.

> ⚠️ **Please consult VICI technical support for assistance before making any changes to the FTP configuration. This includes installing new columns or fans.**
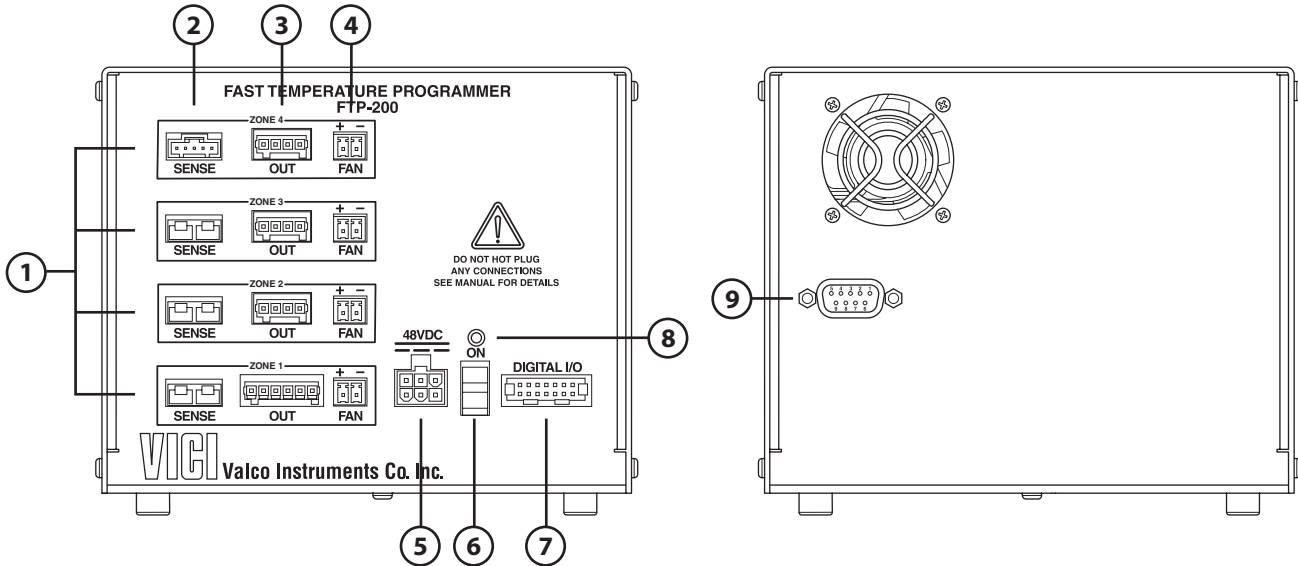
Figure 1: Front *(left)* and rear panels of the FTP-200 controller

Description of Controls, Indicators, and Connectors

1. **ZONE** connectors
   Each of the zones has clearly grouped connectors for Sense, Digital I/O, and Fan. Depending on the unit specified, your FTP is constructed with 1, 2, 3, or 4 zones.

2. **SENSE** (and power) connectors for Zones 1 to 4
   For Zone 1, the two functions are incorporated into one connector. For Zones 2-4, there are separate connections for power and for a thermocouple.

3. **OUT** connectors
   These connectors supply power to the heated devices.

4. **Fan** connectors
   Each zone has provision for it's own fan or cooling mechanism; however, only the Zone 1 fan is implemented.

5. **48VDC** power connector
   The 4' cable from the 48 VDC power supply is plugged into this connector.

6. **ON/**off switch
   This is the main power switch for the FTP system. When the switch is in the off position, there is no power to the column, fans, or heaters.

7. **Digital I/O** connector
   This connector provides two digital inputs and four digital output signals.
   Refer to "Appendix A: Digital I/O Control" on page 16.

8. **ON** indicator
   This green LED will be illuminated when power is connected to the unit and the power switch is on.

9. **RS 232** connector
   The FTP-200 connects to a PC via a standard DE9 extension cable (M-F). This DE-9F connector conforms to EIA-232C standard pin-outs for a DCE device.
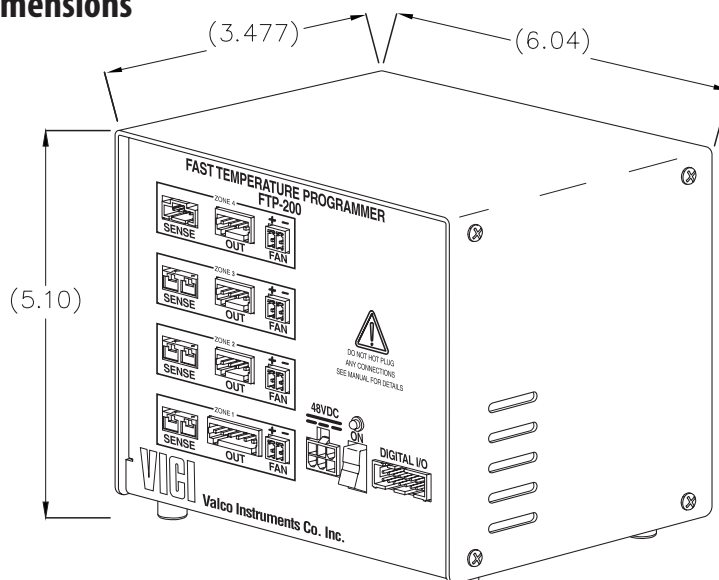
Controller Dimensions

Figure 2: FTP-200 controller dimensions

Hardware Specifications

Parameter	Minimum	Nominal	Maximum	Units	Notes
Controller input voltage	44	48	55	V	
Controller input current	0.1		10	A(DC)	Max current with power supply is 6.45A
Operating temperature	0		40	°C	
Storage temperature	-25		70	°C	
Humidity	0		95	%	Non-condensing
Output voltage	0		46	V	
Peak output current	0		6.25	A	
Continuous current/channel	0		5	A	
Programmable ramp rate	1		1500	°C/min	
Heating power			500	W	All zones power supply max 310W
Digital outputs impedance	60		150	Ω	Contact closure
Digital output max voltage	5		24	V	
Digital output current	10		200	mA	
Digital input					4.9K Ω pull-up
RTD temperature	0		450	°C	
Thermocouple temperature	0		400	°C	
Wire sensing resistance	2		20	Ω	
Input					
Input voltage	90		264	VAC	
Input frequency	47		63	Hz	
Input current			5	A	At 115 VAC
			2.5	A	At 230 VAC

Table 1: Hardware specifications

Getting Started

Cable Connections

This example uses a relatively basic two channel controller with a column and fan on Zone 1 and a transfer line on Zone 2. Refer to **Figure 1** as necessary.

1. Plug the column connectors (power/sensing and fan) into the Zone 1 connectors on the controller.

2. Plug the transfer line connectors(power and thermocouple) into the Zone 2 connectors.

3. Connect the RS-232 cable to the COM port on the PC and the connector on the rear of the controller.

4. Plug the 4' cable from the 48 VDC power supply into the connector labeled 48VDC on the front of the controller, then plug the power supply into the 110 or 230 VAC source.

Installing the Graphical User Interface (GUI) Software

If you prefer to program and operate the FTP-200 via console port commands instead of the GUI, r*efer to "Appendix B: Basic FTP Operation using Serial Commands" on page 17.*

A PC/Laptop running Microsoft Windows 7/8/10 is required to user the FTP-200 Graphical User Interface (GUI) program. The computer will also need a serial communication (COM) port to communicate with the controller.

Locate the FTP-200 software installer program on the USB key provided with the FTP-200 and run the setup.exe file. The self-extracting installer will automatically install two programs in addition to the GUI—Labview Runtime Engine and Labview VISA Runtime Engine. These applications are from National Instruments and are required in order to run the GUI.

Establishing Communication

1. Turn on the FTP-200 with the on/off switch on the front panel.

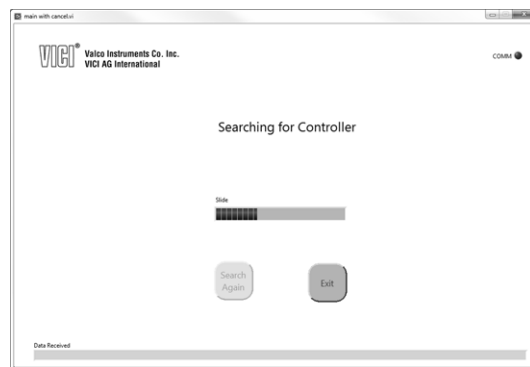2. Find FTP Control GUI on the Windows Start menu and click to open

Figure 3: The GUI is attempting to establish comnmunication with the FTP controller
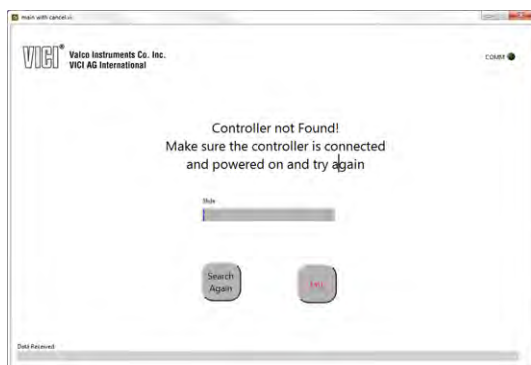
Figure 4: If you see this screen, check the power and connections and click "Search Again"

Figure 5: Communication has been successfully established

it. After the splash screen, the screen in **Figure 3** will appear.

3. If the window shown in **Figure 4** appears, check the cable connections and make sure that the FTP is turned on.

4. When the FTP is found, the data from the controller is downloaded into the PC and the GUI is initialized. (**Figure 5**)

5. If communication is lost between the PC and the FTP, a new search routine will be automatically initiated. (**Figure 6**) If the controller is still powered on, this method should restore communication. If it does not, contact the factory.

Figure 6: A new search routine is initiated if communication is interrupted

Features of the Graphical User Interface

Main Screen

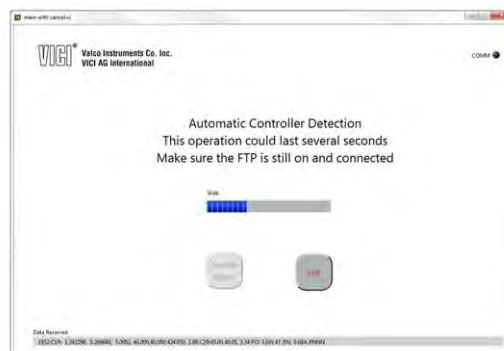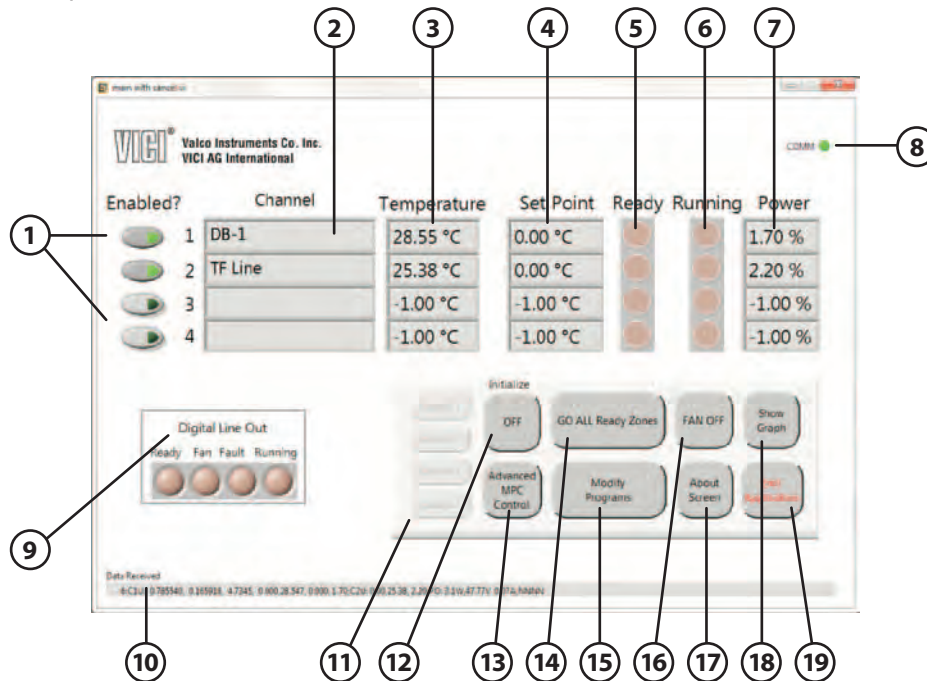After the GUI is initialized, the Main screen (**Figure 7**) will appear when the software is opened.

Figure 7: Main screen of the FTP GUI

1. **Enabled?** buttons
   Select which channels will have active connected devices controlled by the FTP.

2. **Channel** display fields
   These fields display the name of the device connected to each of the FTP's active chan-nels. The names are assigned at the factory, depending on the devices specified when the FTP is ordered. An empty field indicates that nothing is connected.

3. **Temperature** display fields
   The fields display actual measured temperatures. In this example, the Channels 1 and 2 boxes indicate the actual measured temperature of the connected devices. A value of -1.00 °C indicates either that there is no device connected, or a device is present but not enabled. (*See item 1.*)

4. **Set Point** display fields.
   The temperature set points are entered on the Modify Programs screen *(page 11)*.

5. **Ready** LEDs
   When a channel is ready to execute a temperature program, its Ready LED lights up.

6. **Running** LEDs
   When a channel is executing a temperature program, its Running LED lights up.

7. **Power** display field
   This shows the percentage of total output capacity that the controller is providing to each individual channel.

8. **COMM** LED
   This LED is green when on the device is "talking to" the PC.

9. **Digital Line Out** LEDs
   A green LED indicates which contact closure output is currently active.

10. **Data Received** display field
    This line displays the continuous data string received from the controller.

11. **Cancel** buttons
    When a temperature program is running on a channel, the corresponding button will be active. Clicking it aborts the temperature program.

12. **Initialize** button
    Clicking this initializes all enabled channels to their starting temperature set points.

13. **Advanced MPC Control** button
    Clicking this opens access to advanced controller setup features. These commands are only intended for advanced users, in consultation with factory support.

⚠️ **CAUTION:**
Changing values in the Advanced Controller Setup windows can damage attached devices and/or the controller.

14. **GO ALL Ready Zones** button
    Clicking this starts the temperature program on all enabled and ready channels. It is not active while a program is excuting.

15. **Modify Programs** button
    Click this to open the Temperature Program screen, which allows modification to each individual temperature program. *(Refer to page 8.)*

16. **FAN OFF/ON** button
    When the enabled channels are not initialized, this button can be used to turn the Channel 1 fan on and off.

17. **About Screen** button
    Click to opens the About screen. *(Refer to page 9.)*

18. **Show Graph** button
    Click to show a real time Graph screen. *(Refer to page 10.)*

19. **Exit Application** button
    Click to exits the application.

Program Screen

The Program screen (**Figure 8**) is accessed by clicking the Modify Programs button on the Main screen (**Figure 7**).
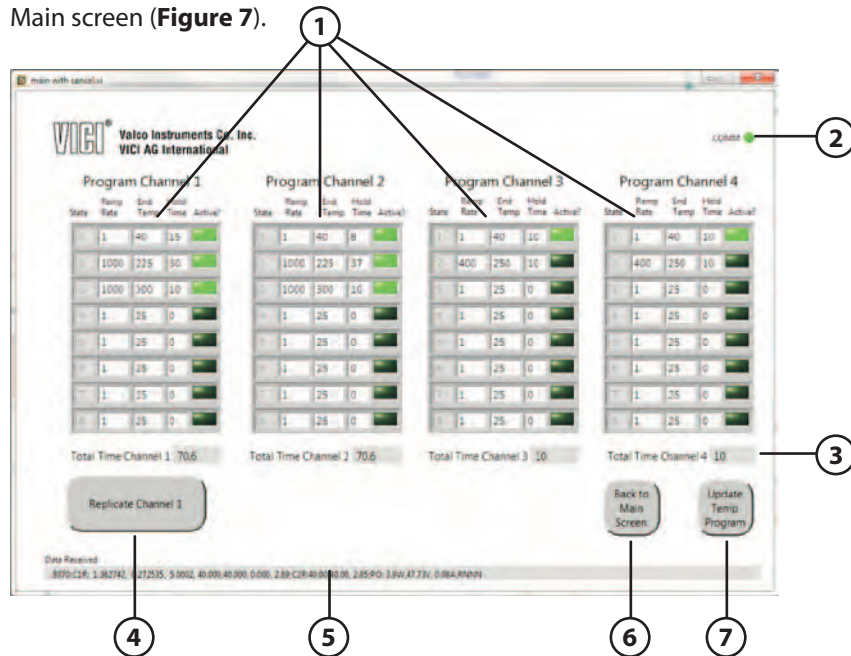

Figure 8: Program screen of the FTP GUI

1. **Program Channel** input fields (**Figure 9**)
   Each channel can be programmed to eight different temperature states. The first state is always enabled. Programming State 1 and leaving the rest inactive maintains the temperature constant, even when the other channels are ramping.

   a. **State 1 Ramp Rate** input field
      This field should be ignored, since the ramping rate from an unitialized state to the initialized state is determined by factory settings stored in the device's memory.

   b. **State 1 End Temp** input field
      The ending temperature of State 1 is also the initial temperature of the controller program.

   c. **State 1 Hold Time** input field
      The time (in seconds) that the controller will maintain the ending temperature before moving to the next active state. If no other state is active, it will remain at this temperature.

Figure 9: Section of the Program screen

   d. **State 1 Active?** LED
      The first state is always active. This LED will not toggle to an inactive state.

   e. **States 2 to 8 Active?** LEDs
      Clicking on the LED will toggle the state from Active (LED on, as in States 1 and 2) to inactive (LED off, as in State 3).

   f. **States 2 to 8 Hold Time** input fields
      This is the user-settable time (in seconds) that the end temperature will be held before the next active state begins.

   g. **States 2 to 8 End Temp** input fields
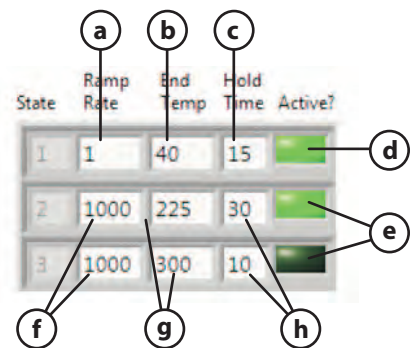   Enter the ending temperature for each active state in these fields.

     h. States 2 to 8 Ramp Rate input fields
       The ramp rate is how fast the controller will reach the state's End Temp. This can range from 1°C/minute to 1500°C/minute depending on the device's capacity.

2. **COMM** LED
This LED is green when on the device is "talking to" the PC.

3. **Total Time** display fields
These fields—one for each channel—indicate the total run time for the channel's temperature program.

4. **Replicate Channel 1** button
Clicking this button will cause the temperature programs for channels 2, 3, and 4 to be replaced with the temperature program of channel 1.

5. **Data Received** display field
This line displays the continuous data string received from the controller.

6. **Back to Main Screen** button
Click this button to return to the main screen without any changes being saved.

7. **Update Temp Program** button
When this button is clicked, updates to the temperature programs are saved into the non-volatile memory. The programs will still be active even after the controller is powered off and back on.

About Screen

The About screen (**Figure 10**) is accessed by clicking the About Screen button on the Main screen (**Figure 7**).
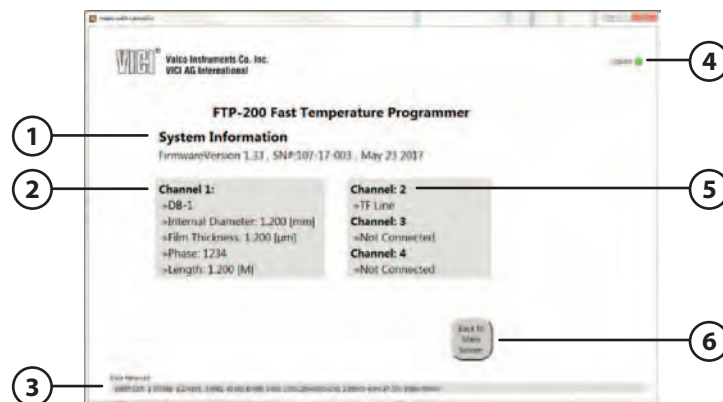
Figure 10: About screen of the FTP GUI

1. **System Information** display field
This field display the controller firmware version, serial number, and date of installation.

2. **Channel 1** display field
Information about the installed column is provided here.

3. **Data Received** display field
This line displays the continuous data string received from the controller.

4. **COMM** LED
This LED is green when on the device is "talking to" the PC.

5. **Channels 2 to 4** display field
Information about installed devices is provided here.

6. **Back to Main Screen** button
Click this button to return to the main screen.

Graph Screen

Click the Show Graph button on the Main screen to open the Graph screen (**Figure 11**).

Figure 11: Graph screen of the FTP GUI

1. **Primary scale**
   This scale indicates the temperature of enabled plots.

2. **Secondary scale**
   The secondary scale is in units of current, voltage, or resistance, depending on which plot is selected. These values are always autoscaled; that is, the scale is adjusted so that all the data fits on the screen.
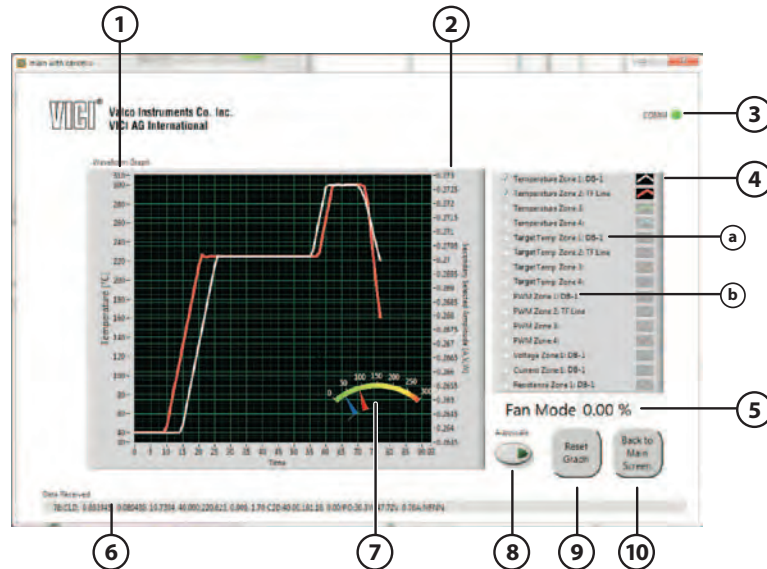
3. **COMM** LED
   This LED is green when on the device is "talking to" the PC.

4. **Graph** list and check boxes
   Check a box to select the graphs to be displayed. A couple of these require explanation.

   a. **PWM**
      PWM (Pulse Width Modulator) has a direct correlation with the output power of each zone, and is mostly used as a troubleshooting tool.

   b. **Target Temp**
      The Target Temp is the precisely-calculated temperature that the device should register at any given moment in order to reach the final temperature at the specified ramp rate. The target temperature is calculated approximately 200 times per second.

5. **Fan Mode** input field
   Ener the maximum voltage percent applied to the channel 1 fan during wait mode.

6. **Data Received** display field
   This line displays the continuous data string received from the controller.

7. **Power gauge**
   The gauge shows current power usage (blue) and the maximum power required during a run (red).

8. **Autoscale** button (primary scale)
   When autoscale is enabled, the left scale changes as required to fit all the available data on the screen. (The secondary scale is always autoscaled.)

9. **Reset Graph** button
   Click this button to clear the graph area.

10. **Back to Main Screen** button
    Click this button to return to the Main screen.

Creating and Running Temperature Programs

Initialization

In the example Main screen in **Figure 12**, two channels are enabled—one for the column and one for a transfer line.

1. Click the "OFF" button under "Initialize" to begin the initialization process.

2. When initialization is complete, the "OFF" button will turn green and say "Initialized".

CLICK HERE TO INITIALIZE THE CONTROLLER

THEN CLICK HERE TO GO TO THE PROGRAM SCREEN
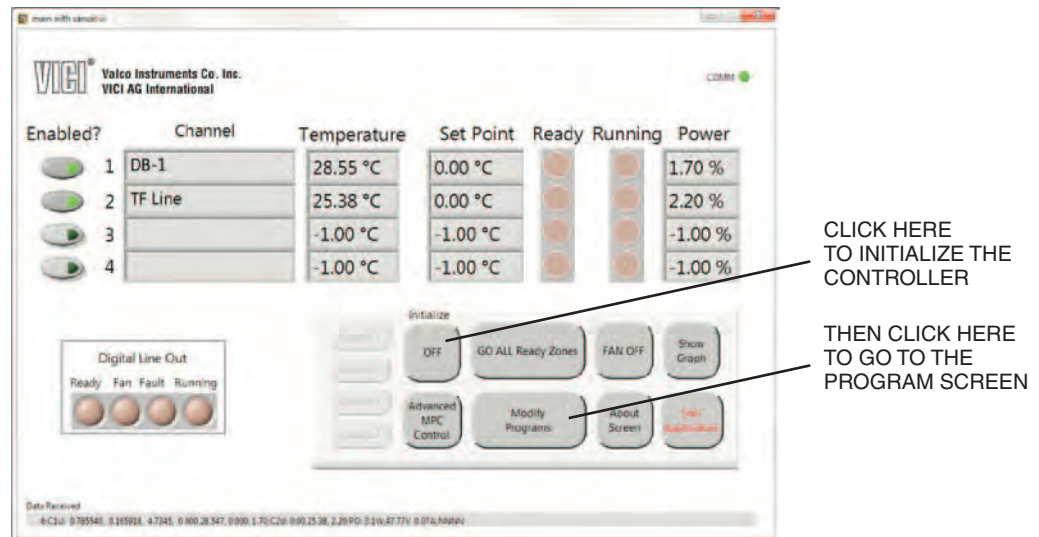
Figure 12: Beginning the programming process from the Main screen

Program Modification

1. Click the "Modify Programs" button on the Main screen to open the Program screen shown in **Figure 13**.

2. For this example, enter a value of 750°C in the Channel 1, State 2 ramp rate field.

3. Click the "Update Temp Program" to save changes and return to the main screen (**Figure 14**).

TYPE HERE TO ENTER A NEW RAMP RATE

THEN CLICK HERE TO UPDATE THE PROGRAM AND RETURN TO THE MAIN SCREEN
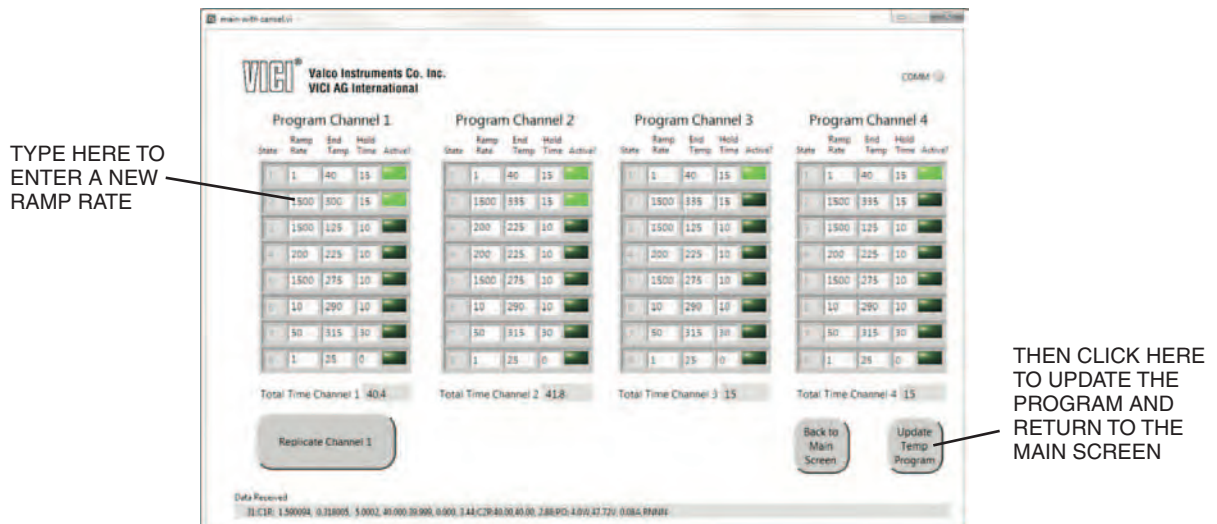
Figure 13: Entering a ramp rate and saving the change
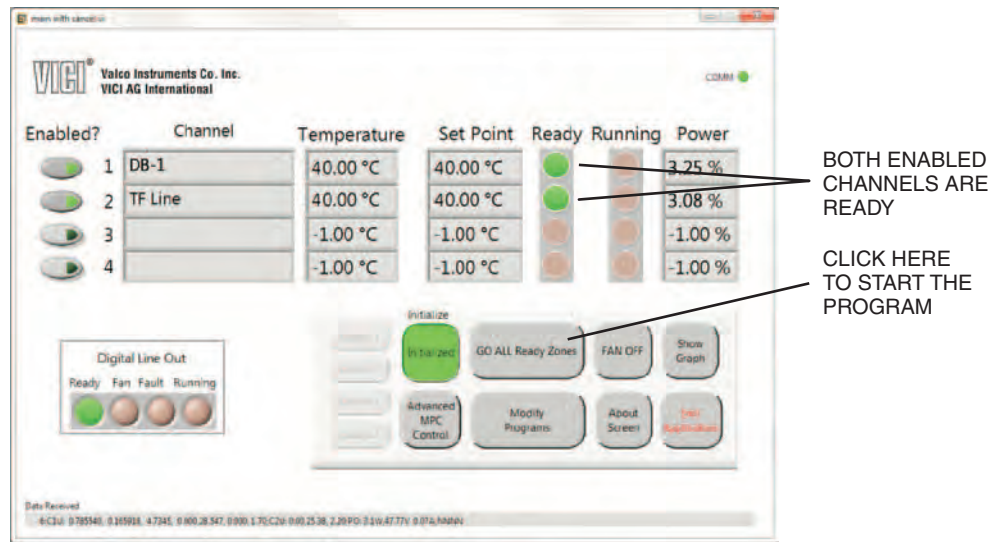
Figure 14: Ready LEDs on enabled channels indicate
that the program can be started

Starting and Running the Program

1. When both enabled channels are ready to start (indicated by the Ready LEDs turning green), start the program by clicking the "GO ALL Ready Zones" button

2. The green LEDs in **Figure 15** indicate that the controller is running the programs for Channels 1 and 2. Click the "Show Graph" button to open the Graph screen (**Figure 16**).

3. When you wish to return from the Graph screen to the Main screen, click the "Back to Main Screen" button.
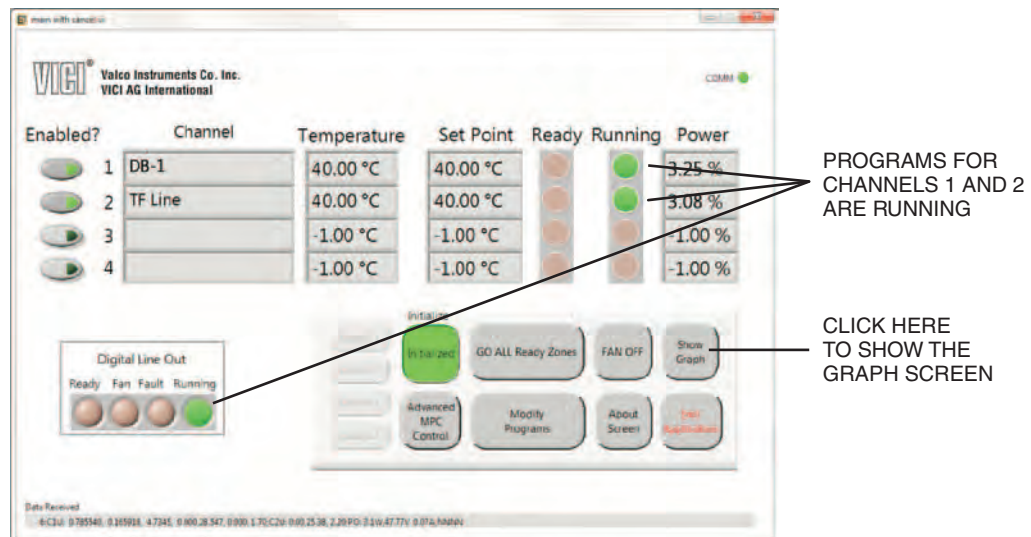
Figure 15: The controller is running the programs on Channels 1 and 2.

CLICK HERE TO RETURN TO THE MAIN SCREEN
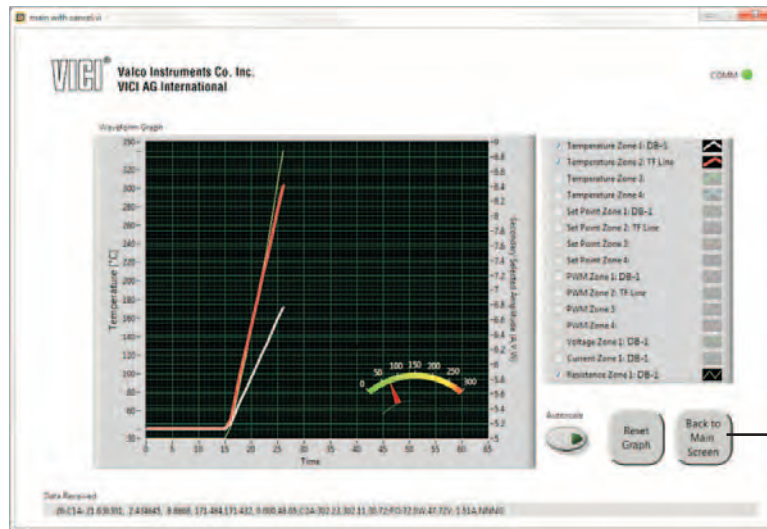
Figure 16: The Graph screen showing current temperatures for the column and transfer line and the resistance of the column heater

The Main screen in **Figure 17** indicates that the fan is running. This means that the State 2 temperature was reached and then maintained for the programmed hold time. At that point, the fan comes on to cool the devices to their State 1 temperatures so that another run can start.

THIS LED MEANS THAT THE FAN IS ON, COOLING THE DEVICES
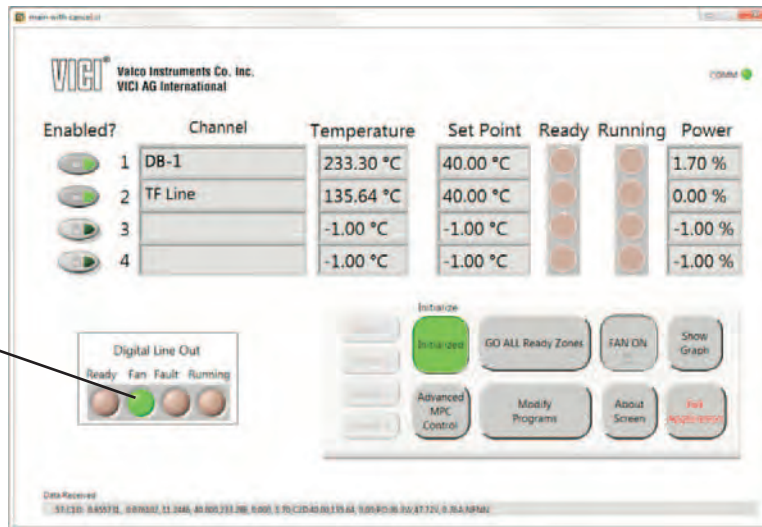
Figure 17: The Main screen at the end of one run, approaching a ready state for the next one

Enabling/Disabling Channels

1. Click the green "Initialize" button to shift the FTP into an unmanaged mode, which allows channel status to be changed.
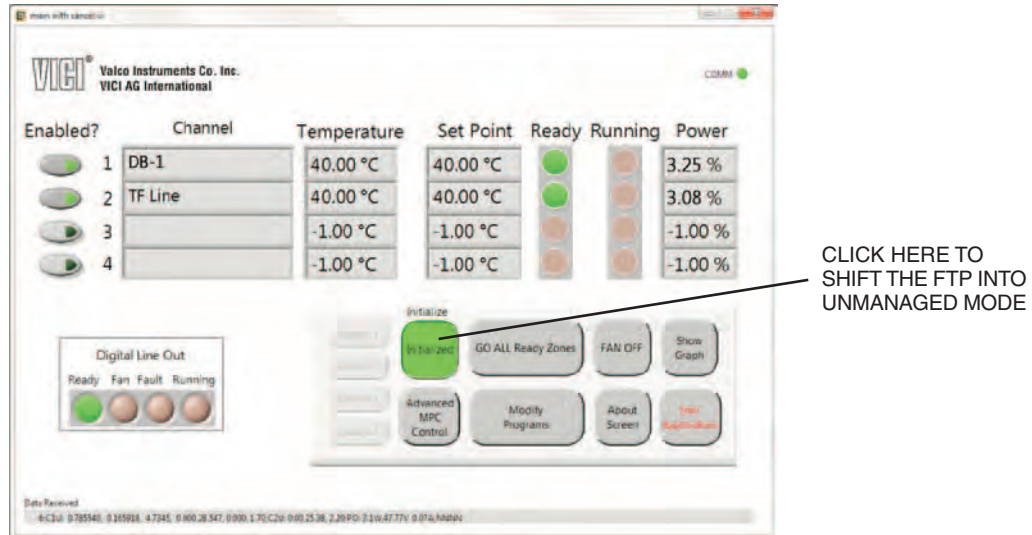
Figure 18: Clicking the green Initialize button places the FTP into an unmanaged state

2. Click the Channel 2 "Enabled?" button to disable the channel.

3. Click the "Initialize" button (which now says "Off") to re-initialize Channel 1.
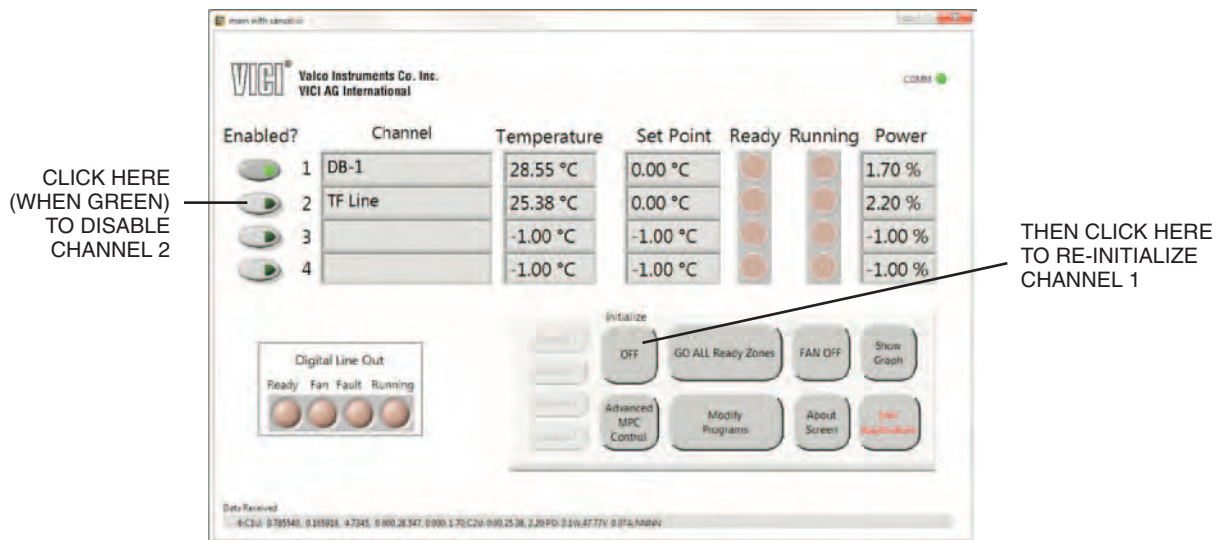
Figure 19: Disabling Channel 2 and re-initializing Channel 1

4. When Channel 1 is ready (**Figure 20**), start the program for Channel 1 by clicking the "GO ALL Ready Zones" button.

5. Click the "Show Graph" button to view the graph for the program running on Channel 1 (**Figure 21**).
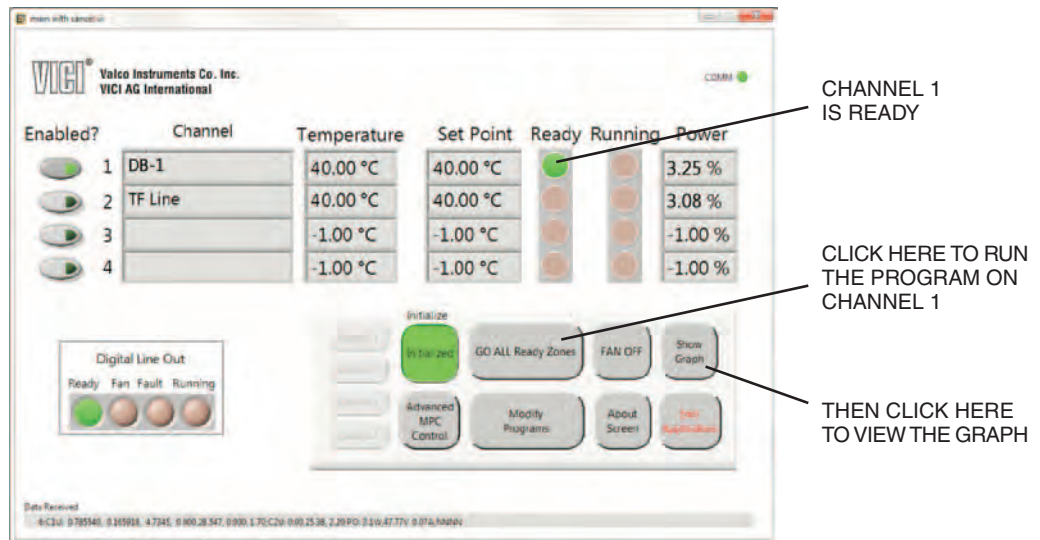
Figure 20: Ready to run Channel 1 program
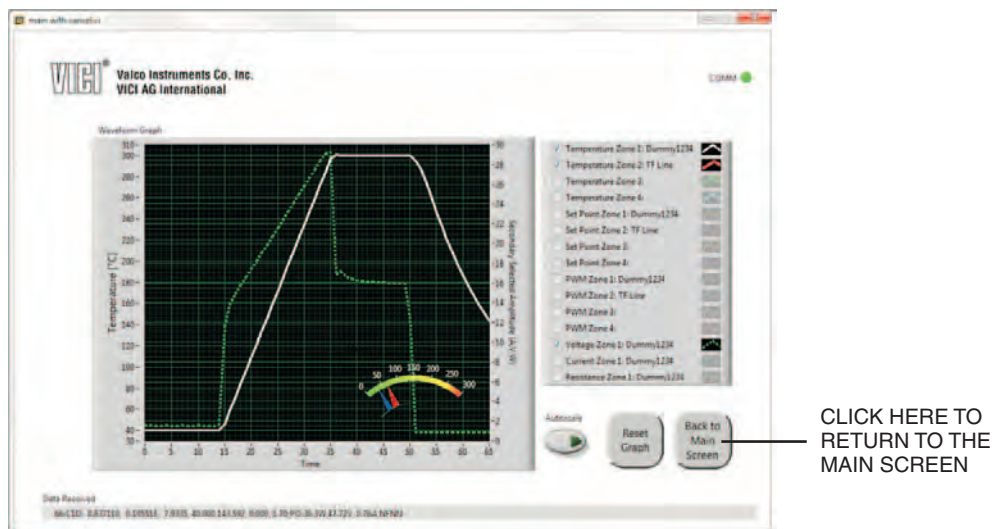
Figure 21: Graph screen showing temperature and
current for Channel 1

Exiting the GUI Application

The GUI software can be closed at any time by clicking the "Exit Application" button on the Main screen. When the GUI is closed, the controller retains the state it was in while the GUI was running; that is, if it was ramping, it will continue to ramp.

Appendix A: Digital I/O Control

The FTP controller provides digital signals for monitoring and control of the system. Note that entering system parameters such as temperature programming data require a serial link to set. After system parameters are set, the FTP can act in a stand-alone mode

Digital I/O Port

The Digital I/O port is on the front panel of the FTP controller. This 14-position male header (2x7) with .1" row spacing contains two digital input signals and four digital output signals.
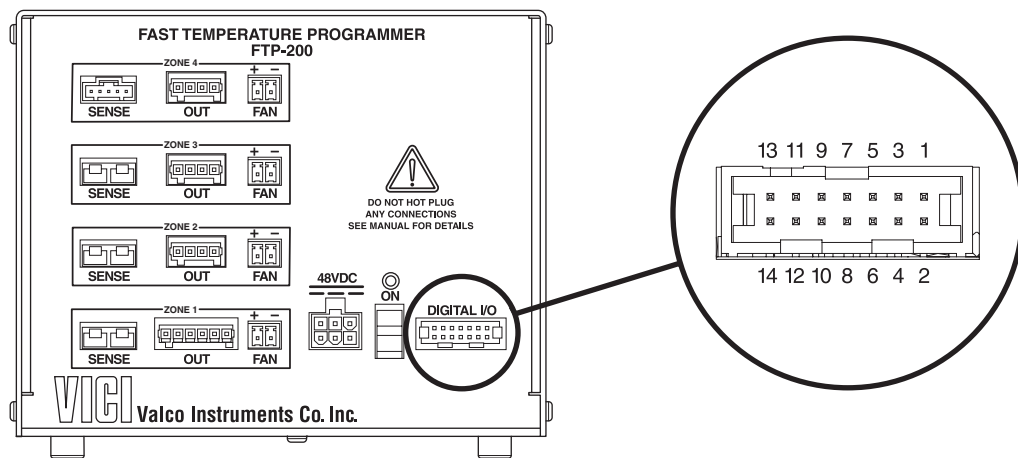
Figure 22: Digital I/O port location and pin numbering

|	Pins	Function	Notes
Input 1	1 and 2	Start zone, start program	If the controller is in idle mode, activating this input will start the zone for all active channels. A second trigger will start the program only if the controller is ready to start.
Input 2	3 and 4	Abort program while running	Triggering this input aborts the currently-running program and returns the zones to their holding temperatures.
Output 1	5 and 6	Program is running	The contact is closed when the program is running.
Output 2	7 and 8	Error	The contact is closed when the controller senses an error. The error is cleared when power is cycled off and back on, or when the controller is reset.
Output 3	9 and 10	Fan is running	The contact is closed when the fan is running after a program.
Output 4	11 and 12	Ready to run program	The contact is closed when all the active zones are ready.
	13 and 14	Unassigned	

Table 2: Digital I/O port pin assignments and functions

Appendix B: Basic FTP Operation via Serial Commands

NOTE: For more thorough documentation of the serial control possibilities designed into the FTP controller, contact VICI technical support.

Establishing Serial Communication

Serial communication must be established with the FTP controller to set system parameters. The interface is available by means of a RS-232C link. Once established, the serial communications link can be used either through a direct command console terminal, or by the provided Graphical User Interface (GUI).

Serial communication requires a terminal emulation or communication software (such as Tera Term, PuTTY, Qodem, Procomm Plus, etc.) Though the programs vary, in general you will be asked to select "Serial" from among various types of connections, select the COM port which will be used for the FTP, name the connection, and set some parameters; set the serial port at 115200 BAUD, using 8 data bits, no parity bits, 1 stop bit, and hardware flow control.

Confirming Communication

With the software running, and all the cables connected as described on page 4, turn the On/Off switch on the controller to the ON position. If the link is functioning, the following infromation will appear on your monitor. This message lists the unit designation, the firmware and hardware revisions, and the unit serial number.

```
FTP-200 Valco Instruments Co. Inc.

Zone 1:
   Column Id: Dummy1234
   Max Volt:         48.00 [V]
 Max Current:        4.60 [A]
      30.000[C]      4.853[r]
     165.000[C]      8.754[r]
     300.000[C]     14.161[r]
       0.000[C]      0.000[r]


R(T) = 4.13200E-05 * T^2 + 2.08400E-02 * T + 4.19100E+00

Zone2:                  TF007, 45.6 [V]
Zone3: Not Present or Memory Error
Zone4: Not Present or Memory Error

Memory Initialized: OK
    VCal = + 9.9945E+01 * V - 7.7802E-04
    ICal =  + 1.2450E+01 * I + 1.7525E-04

Temperature Programs: Loaded

Controller Input - Output Mapping:
    Zone 1: mapped to Wire-Sensing Input
    Zone 2: mapped to Thermal Sense 2
    Zone 3: mapped to Thermal Sense 3
    Zone 4: mapped to Thermal Sense 4
```

```
Zone1 Enabled
Zone2 Enabled
Zone3 Disabled
Zone4 Disabled

Sense Module 1: Thermocouple
Sense Module 2: Thermocouple
Sense Module 3: Thermocouple
Sense Module 4: Thermocouple
```

Serial Communication Protocols

General Console Port Usage

- Commands issued to the FTP must be terminated with a carriage return character (<CR>). (When using a terminal program for communications, pressing the <enter> key generates the carriage return character.)

- Space characters are used to separate commands and operands in command sequences. Other whitespace characters are ignored by the parser, including tab (<TAB>) and linefeed (<LF>) characters.

- Only printable ASCII characters are accepted by the FTP parser. (In other words, terminal control characters and extended ASCII characters are ignored).

- Response lines from the FTP will be terminated with a carriage return/linefeed (<CR><LF>) sequence.

- Commands to the FTP unit are not case sensitive.

- The FTP uses VT100 escape sequences for cursor and terminal control.

- Any characters on the input line after the final valid parameter could generate an error.

- A maximum of 124 characters are permitted in a single command line.

Interface Command Editing:

- Use the Escape key (<ESC>) to delete the current command line.

- The Backspace key (<BS>) deletes the previous character on the command line.

- The left and right arrow keys may be used to navigate the cursor within the current command line text.

- Hitting the <enter> key repeats the previous command..

Partial List of Serial Commands

The FTP uses a simple two character pneumonic command structure. Each command must be followed by the <enter> key. Several of the commands are read/set commands; that is, entering the two character command alone asks the FTP to read and respond with the current setting. Entering the two character command followed by a value sets the parameter at that value.

Examples:
To enable channel 2, type **OE21** and press <enter>.
To disable channel 2, type **OE20** and press <enter>.
To make channel 1 active for programming, type **CD1** and press <enter>.

The most typically used commands are detailed below. Most of the commands not included on this list are for advanced applications only, and can interfere with proper operation of the controller if used inappropriately.

CD[n]	Sets channel (n=1-4) as the active channel
SS[n]	Set state parameters for active channel (n=1-4)
L+	Start Logging
L-	Stop Logging
Z+	Initialize enabled channels
Z-	Return enabled channel to uncontrolled state
WP	Save parameters
GO[n]	Start channel (n=1-4 or A for all channels)
ES[n]	Set state parameters [State, HoldTime, HoldTemp, RampRate, Enable]
F+	Turn on the fan
F-	Turn off the fan
FM[n]	Set the maximum voltage percent (n=0-100) applied to the channel 1 fan during wait mode. Used to help maintain column starting temp when there is heat transfer from external sources (like transfer lines).
ID	Display channels stats
OE[n*n*]	Enable (*n*=1) or disable (*n*=0) channel (n=1-4)
OM	Verify input/output channel mapping
RS[n]	Cancel the program running on channel (n=1-4)
VR	Display version number
??	Show entire list of commands

Creating a Basic Temperature Program

In this simple example, channels 1 and 2 will be enabled while channels 3 and 4 are disabled. After some temperature and ramp rate details are entered, the information will be verified and saved before logging is turned on and the program is started.

Enable Channels 1 and 2, Disable Channels 3 and 4

1. Type **OE11**<enter> to enable zone 1.

2. Type **OE21**<enter> to enable zone 2.

3. Type **OE30**<enter> to disable zone 3.

4. Type **OE40**<enter> to disable zone 4

5. Verify that the correct zones are enable by typing **OE**<enter>. The following screen will appear:

```
Zone1 Enabled
Zone2 Enabled
Zone3 Disabled
Zone4 Disabled
```

Program Ramping Temperatures

Channel 1

1. Type **CD1**<enter> to make channel 1 active. You will see:

```
Active Zone set to 1
```

2. To set the temperature of state 1 for channel 1, type **SS1**<enter>. You will be prompted to enter the desired values. (Current values are shown in the brackets.)

```
Enter Zone 1, State 1 Parameters:
Enter Temperature [40]: 40<enter>
Hold Time [10]: 20<enter>
```

3. To set the temperature of state 2 for channel 1, type **SS2**<enter>, and type the desired values on the appropriate line..

```
Enter Zone 1, State 2 Parameters:
Enter Temperature [350]: 350<enter>
Hold Time [50]: 50<enter>
Ramp Rate [1]: 750<enter>
Enabled [1]: 1<enter>
```

Channel 2

1. Type **CD2**<enter> to make channel 2 active. You will see:

```
Active Zone set to 2
```

2. To set the temperature of state 1 for channel 2, type **SS1**<enter>. You will be prompted to enter the desired values.

```
Enter Zone 2, State 1 Parameters:
Enter Temperature [40]: <enter> (accept the current value)
Hold Time [10]: 20<enter>
```

3. To set the temperature of state 2 for channel 2, type **SS2**<enter>, and type the desired values on the appropriate line..

```
Enter Zone 2, State 2 Parameters:
Enter Temperature [250]: <enter>
Hold Time [30]: 40<enter>
Ramp Rate [400]: 750<enter>
Enabled [1]: <enter>
```

Verify Temperature Program

Channel 1

To verify the programming for channel 1, type **ES1**<enter>. You will see a screen like this, which should be an accurate reflection of the data entered:

```
Zone 1 Temperature Program:
State   Time   Temp   Rate   Enable
1       20     40     0      1
2       50     350    750    1
3       0      0      0      0
4       0      0      0      0
5       0      0      0      0
6       0      0      0      0
7       0      0      0      0
8       0      0      1      0
```

Channel 2

To verify the programming for channel 2, type **ES2**<enter>. Once again, you will see the screen verifying the data you have entered:

```
Zone 2 Temperature Program:
State   Time   Temp   Rate   Enable
1       20     40     0      1
2       50     250    450    1
3       0      0      0      0
4       0      0      0      0
5       0      0      0      0
6       0      0      0      0
7       0      0      0      0
8       0      0      1      0
```

Saving the Program

Once the parameters are verified, type **WP**<enter> to save the program.

Verify Output Mapping

Type **OM**<enter> to verify the channel outputs, which will be similar to what is shown below. If this needs to be altered for any reason, consult VICI technical support.

```
Controller Input - Output Mapping:
        Zone 1: mapped to Wire-Sensing Input
        Zone 2: mapped to Thermal Sense 2
        Zone 3: mapped to Thermal Sense 3
        Zone 4: mapped to Thermal Sense 4
```

Start Logging

Type **L+**<enter> to start data logging. You will see information similar to what is shown below. The logging data is explained on page 23.

```
0:C1U:  0.000, 31.668, 2.20;C2U: 0.00,25.70, 2.20;
1:C1U:  0.000, 31.669, 2.20;C2U: 0.00,25.69, 2.20;
2:C1U:  0.000, 31.668, 2.20;C2U: 0.00,25.70, 2.20;
3:C1U:  0.000, 31.668, 2.20;C2U: 0.00,25.70, 2.20;
4:C1U:  0.000, 31.668, 2.20;C2U: 0.00,25.71, 2.20;
5:C1U:  0.000, 31.668, 2.20;C2U: 0.00,25.71, 2.20;
```

Turn On (Initialize) the Active Zones

To turn on the active zones and bring them to their starting temperature (State 1) type
Z+<enter>. You will see something similar to the data below, indicating the temperatures
reaching the "ready" condition.

```
 1:C1N:  31.073, 31.072,  2.01;  C2N:  8.15,  25.43,  2.97;
 2:C1N:  31.324, 31.245, 11.64;  C2N: 25.46, 25.46,  3.71;
 3:C1N:  35.676, 35.289, 18.05;  C2N: 25.62, 25.57, 10.34;
 4:C1N:  39.819, 40.017,  6.91;  C2N: 26.44, 26.20, 21.67;
 5:C1N:  40.000, 40.017,  4.86;  C2N: 29.61, 28.97, 33.66;
 6:C1N:  40.000, 40.005,  4.23;  C2N: 35.27, 35.60, 15.83;
 7:C1N:  40.000, 40.003,  3.81;  C2N: 38.80, 39.43, 12.37;
 8:C1N:  40.000, 40.001,  3.62;  C2N: 39.78, 39.69, 11.68;
 9:C1N:  40.000, 40.001,  3.53;  C2N: 40.00, 40.27,  1.70;
10:C1N:  40.000, 40.000,  3.46;  C2N: 40.00, 39.92, 11.43;
11:C1N:  40.000, 40.000,  3.39;  C2N: 40.00, 40.07,  1.70;
12:C1N:  40.000, 40.000,  3.36;  C2N: 40.00, 39.96,  9.71;
13:C1N:  40.000, 40.000,  3.36;  C2N: 40.00, 40.04,  3.76;
14:C1R:  40.000, 40.000,  3.35;  C2N: 40.00, 39.98,  8.70;
15:C1R:  40.000, 40.000,  3.38;  C2N: 40.00, 40.02,  5.07;
16:C1R:  40.000, 40.001,  3.27;  C2N: 40.00, 39.99,  8.16;
17:C1R:  40.000, 40.000,  3.29;  C2N: 40.00, 40.01,  5.82;
18:C1R:  40.000, 40.000,  3.33;  C2N: 40.00, 40.00,  7.74;
19:C1R:  40.000, 40.000,  3.26;  C2R: 40.00, 40.00,  6.33;
20:C1R:  40.000, 40.000,  3.29;  C2R: 40.00, 40.00,  7.58;
```

Start the Program

To start the program on all active zones, type **GOA**<enter>. (To start the program only
on zone *x*, type **GOx**<enter>.) The logging screen will begin to reflect the temperature
changes.

```
21:C1R: 40.000, 39.999,  3.40;  C2R: 40.00, 40.00,  7.11;
22:C1R: 40.000, 40.000,  3.42;  C2R: 40.00, 40.00,  7.19;
23:C1R: 40.000, 40.000,  3.37;  C2R: 40.00, 39.99,  7.69;
GOA<enter>
 1:C1H:  40.000, 40.000,  3.40;  C2H: 40.00, 40.01,  7.03;
 2:C1H:  40.000, 40.000,  3.39;  C2H: 40.00, 40.00,  7.35;
 3:C1H:  40.000, 40.000,  3.34;  C2H: 40.00, 40.00,  6.95;
 4:C1H:  40.000, 40.000,  3.31;  C2H: 40.00, 40.00,  7.36;
 5:C1H:  40.000, 40.000,  3.38;  C2H: 40.00, 40.01,  6.46;
 6:C1H:  40.000, 40.000,  3.35;  C2H: 40.00, 40.00,  7.04;
 7:C1H:  40.000, 40.000,  3.35;  C2H: 40.00, 40.00,  6.95;
 8:C1H:  40.000, 40.000,  3.33;  C2H: 40.00, 40.00,  7.20;
 9:C1H:  40.000, 40.000,  3.33;  C2H: 40.00, 39.99,  7.51;
10:C1A:  40.000, 40.000,  3.63;  C2A: 40.00, 40.01,  7.35;
11:C1A:  46.282, 45.600, 31.27;  C2A: 43.13, 41.55, 42.56;
12:C1A:  58.794, 58.623, 30.90;  C2A: 49.80, 51.03, 14.42;
13:C1A:  71.306, 71.157, 32.86;  C2A: 56.48, 55.50, 40.42;
14:C1A:  83.817, 83.713, 35.16;  C2A: 63.15, 63.73, 29.22;
15:C1A:  96.329, 96.251, 36.96;  C2A: 69.82, 69.32, 40.04;
16:C1A: 108.840,108.798, 38.49;  C2A: 76.50, 76.95, 29.55;
17:C1A: 121.352,121.326, 41.33;  C2A: 83.17, 82.92, 39.60;
18:C1A: 133.863,133.834, 43.14;  C2A: 89.85, 90.02, 32.87;
19:C1A: 146.375,146.347, 44.74;  C2A: 96.52, 96.46, 38.86;
20:C1A: 158.887,158.858, 46.29;  C2A:103.19,103.25, 35.13;
21:C1A: 171.398,171.370, 47.98;  C2A:109.87,109.89, 38.60;
22:C1A: 183.910,183.884, 49.60;  C2A:116.54,116.52, 37.09;
```

Interpreting the Data Log

CURRENT
TEMP

CHANNEL   TARGET   PWM COUNT
FLAG*   TEMP*   (%)

CHANNEL

Repeat for all additional enabled channels

```
TIME          1:C1N:  31.073, 31.072, 2.01;  C2N:  8.15,  25.43, 2.97;
(SECONDS)     2:C1N:  31.324, 31.245, 11.64; C2N: 25.46,  25.46, 3.71;
              3:C1N:  35.676, 35.289, 18.05; C2N: 25.62,  25.57, 10.34;
              4:C1N:  39.819, 40.017, 6.91;  C2N: 26.44,  26.20, 21.67;
ZONE 1 SET POINT 5:C1N: 40.000, 40.017, 4.86; C2N: 29.61,  28.97, 33.66;
IS REACHED    6:C1N:  40.000, 40.005, 4.23;  C2N: 35.27,  35.60, 15.83;
              7:C1N:  40.000, 40.003, 3.81;  C2N: 38.80,  39.43, 12.37;
              8:C1N:  40.000, 40.001, 3.62;  C2N: 39.78,  39.69, 11.68;
              9:C1N:  40.000, 40.001, 3.53;  C2N: 40.00,  40.27, 1.70;
              10:C1N: 40.000, 40.000, 3.46;  C2N: 40.00,  39.92, 11.43;
              11:C1N: 40.000, 40.000, 3.39;  C2N: 40.00,  40.07, 1.70;
              12:C1N: 40.000, 40.000, 3.36;  C2N: 40.00,  39.96, 9.71;
ZONE 1 IS READY 13:C1R: 40.000, 40.000, 3.36; C2N: 40.00,  40.04, 3.76;
              14:C1R: 40.000, 40.000, 3.35;  C2N: 40.00,  39.98, 8.70;
ZONE 2 IS READY 15:C1R: 40.000, 40.000, 3.38; C2R: 40.00,  40.02, 5.07;
              16:C1R: 40.000, 40.001, 3.27;  C2R: 40.00,  39.99, 8.16;
PROGRAM IS STARTED GOA<enter>
FOR ALL ENABLED ZONES
              1:C1H:  40.000, 40.000, 3.40;  C2H: 40.00,  40.01, 7.03;
              2:C1H:  40.000, 40.000, 3.39;  C2H: 40.00,  40.00, 7.35;
              3:C1H:  40.000, 40.000, 3.34;  C2H: 40.00,  40.00, 6.95;
              4:C1H:  40.000, 40.000, 3.31;  C2H: 40.00,  40.00, 7.36;
              5:C1H:  40.000, 40.000, 3.38;  C2H: 40.00,  40.01, 6.46;
HOLD TIME     6:C1H:  40.000, 40.000, 3.35;  C2H: 40.00,  40.00, 7.04;
              7:C1H:  40.000, 40.000, 3.35;  C2H: 40.00,  40.00, 6.95;
              8:C1H:  40.000, 40.000, 3.33;  C2H: 40.00,  40.00, 7.20;
              9:C1H:  40.000, 40.000, 3.33;  C2H: 40.00,  39.99, 7.51;
              10:C1A: 40.000, 40.000, 3.63;  C2A: 40.00,  40.01, 7.35;
              11:C1A: 46.282, 45.600, 31.27; C2A: 43.13,  41.55, 42.56;
              12:C1A: 58.794, 58.623, 30.90; C2A: 49.80,  51.03, 14.42;
              13:C1A: 71.306, 71.157, 32.86; C2A: 56.48,  55.50, 40.42;
              14:C1A: 83.817, 83.713, 35.16; C2A: 63.15,  63.73, 29.22;
              15:C1A: 96.329, 96.251, 36.96; C2A: 69.82,  69.32, 40.04;
              16:C1A: 108.840,108.798,38.49; C2A: 76.50,  76.95, 29.55;
TEMPERATURE RAMPS TO 17:C1A: 121.352,121.326,41.33; C2A: 83.17, 82.92, 39.60;
BEGINNING TEMPERATURE 18:C1A: 133.863,133.834,43.14; C2A: 89.85, 90.02, 32.87;
OF STAGE 2    19:C1A: 146.375,146.347,44.74; C2A: 96.52,  96.46, 38.86;
              20:C1A: 158.887,158.858,46.29; C2A:103.19, 103.25, 35.13;
              21:C1A: 171.398,171.370,47.98; C2A:109.87, 109.89, 38.60;
              22:C1A: 183.910,183.884,49.60; C2A:116.54, 116.52, 37.09;
```

*Channel Flags

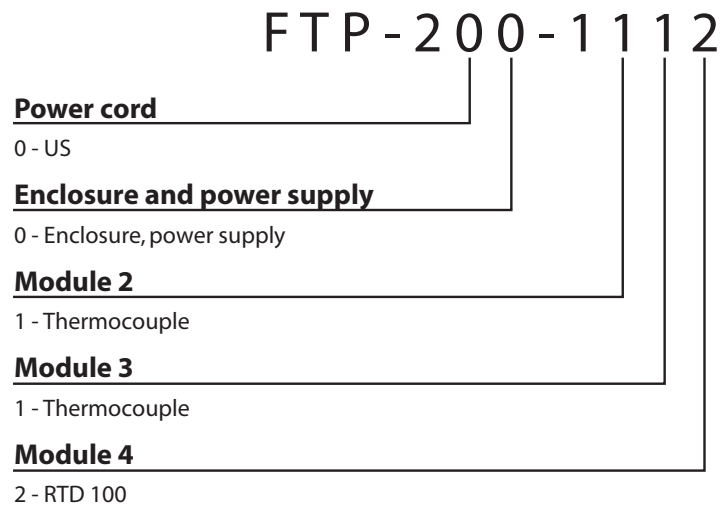| N	Not regulating
R	Ready
A	Ramping
H	Holding
D	Done

* Calculated Target Temps

In typical temperature controllers, there is no control over how the temperature gets to the set point. By contrast, the FTP *guides* the temperature to the set point, calculating a target temperature approximately 200 times per second.
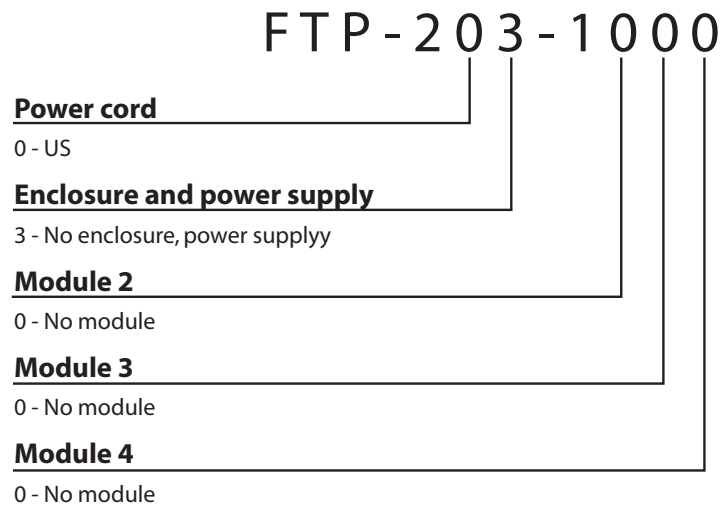
Appendix C: Part Number Examples

The FTP-200 allows for multiple configurations. The maximum number of channels is four, and at least one channel, the main channel, needs to be present. The following figure explains how the part numbers are formed.

$$F T P - 2 \_ \_ - 1 \_ \_ \_$$

Power cord

0 - US
1 - EU
2 - No cord

Options

0 - Enclosure, power supply
1 - Enclosure, no power supply
2 - No enclosure, no power supply
3 - No enclosure, power supply

Modules 2 to 4

0 - No module
1 - Thermocouple
2 - RTD 100
3 - RTD 1000
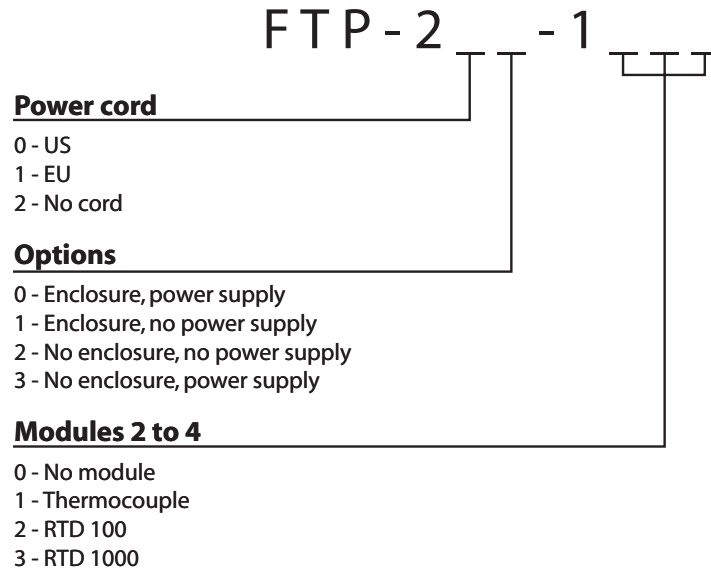
For example, the standard FTP has the following part number:

$$F T P - 2 0 0 - 1 1 1 2$$

Power cord

0 - US

Enclosure and power supply

0 - Enclosure, power supply

Module 2

1 - Thermocouple

Module 3

1 - Thermocouple

Module 4

2 - RTD 100

This part number describes an OEM unit for use in the US, with a power supply and single module:

FTP-203-1000

Power cord

0 - US

Enclosure and power supply

3 - No enclosure, power supplyy

Module 2

0 - No module

Module 3

0 - No module

Module 4

0 - No module

A slightly more complex domestic OEM unit adds two more modules.

FTP-203-1110

Power cord

0 - US

Enclosure and power supply

3 - No enclosure, power supplyy

Module 2

1 - Thermocouple

Module 3

1 - Thermocouple

Module 4

0 - No module
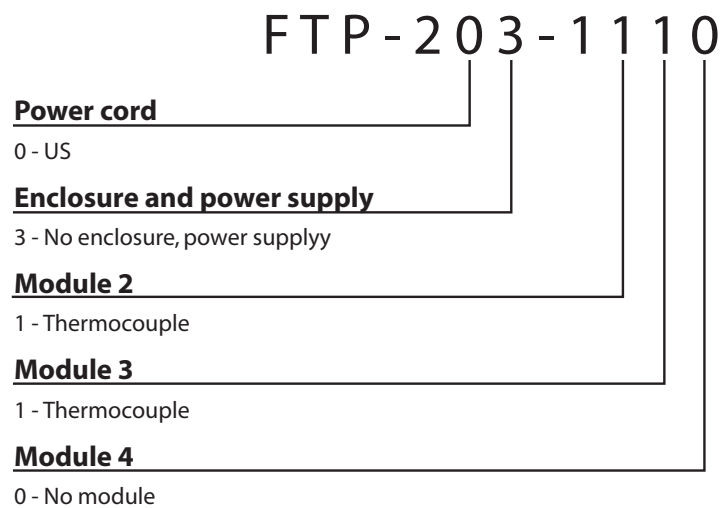
Finally, an end user in Europe might order a fully-configured unit.

FTP‑210‑1112

Power cord

0 - EU

Enclosure and power supply

0 - Enclosure, power supplyy

Module 2

1 - Thermocouple

Module 3

1 - Thermocouple

Module 4

2 - RTD 100
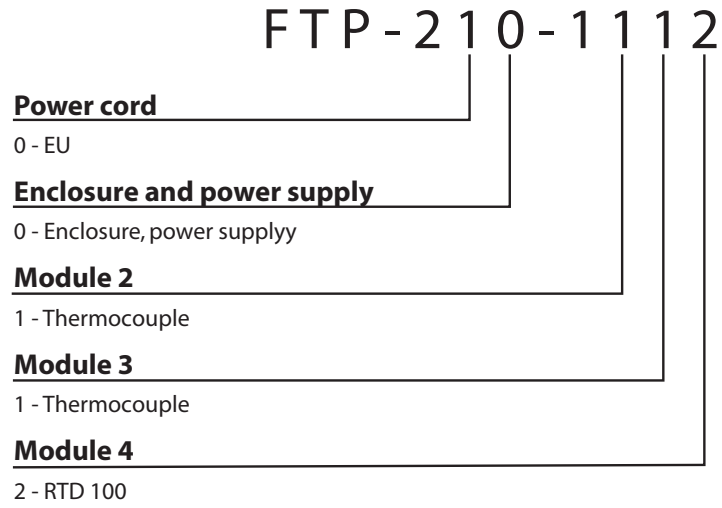
Warranty

This Limited Warranty gives the Buyer specific legal rights, and a Buyer may also have other rights that vary from state to state. For a period of 365 calendar days from the date of shipment, Valco Instruments Company, Inc. (hereinafter Seller) warrants the goods to be free from defect in material and workmanship to the original purchaser. During the warranty period, Seller agrees to repair or replace defective and/or noncon-forming goods or parts without charge for material or labor, or, at the Seller's option, demand return of the goods and tender repayment of the price. Buyer's exclusive remedy is repair or replacement of defective and nonconforming goods, or, at Seller's option, the repayment of the price.

Seller excludes and disclaims any liability for lost profits, personal injury, interruption of service, or for consequential incidental or special damages arising out of, resuiting from, or relating in any manner to these goods

This Limited Warranty does not cover defects, damage, or nonconformity resulting from abuse, misuse, neglect, lack of reasonable care, modification, or the attachment of im-proper devices to the goods. This Limited Warranty does not cover expendable items. This warranty is VOID when repairs are performed by a nonauthorized service center or representative. For information about authorized service centers or representatives, write Customer Repairs, Valco Instruments Company, Inc, P.O. Box 55603, Houston, Texas 77255, or phone (713) 688-9345. At Seller's option, repairs or replacements will be made on site or at the factory. If repairs or replacements are to be made at the factory, Buyer shall re-turn the goods prepaid and bear all the risks of loss until delivered to the factory. If Seller returns the goods, they will be delivered prepaid and Seller will bear all risks of loss until delivery to Buyer. Buyer and Seller agree that this Limited Warranty shall be governed by and construed in accordance with the laws of the State of Texas.

The warranties contained in this agreement are in lieu of all other warranties expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

This Limited Warranty supercedes all prior proposals or representations oral or written and constitutes the entire understanding regarding the warranties made by Seller to Buyer. This Limited Warranty may not be expanded or modified except in writing signed by the parties hereto.