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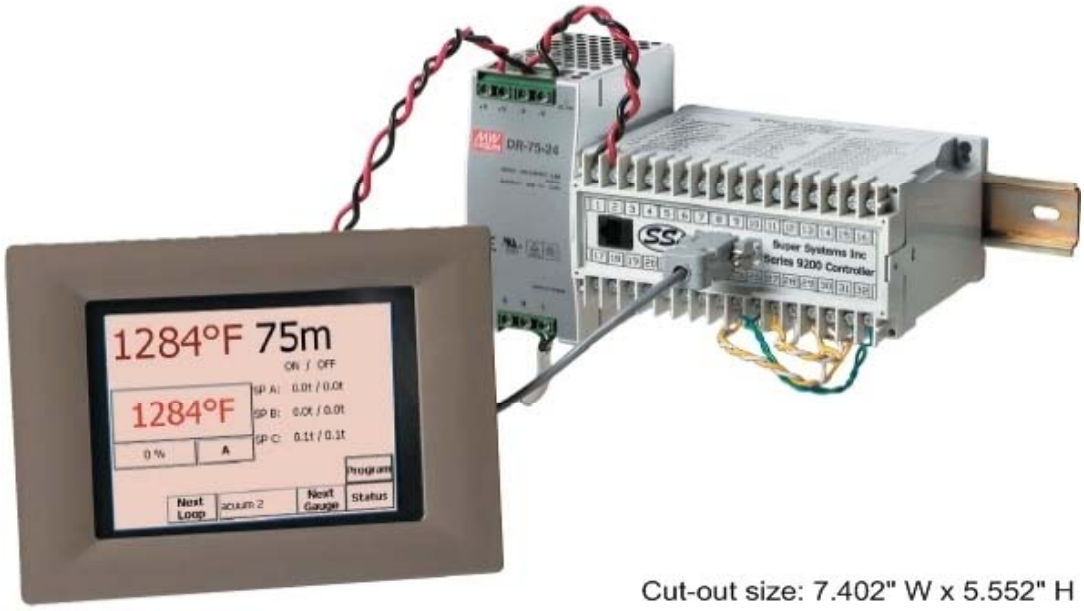

Cut-out size: 7.402" W x 5.552" H

Model 9220 Controller

USER'S MANUAL

Super Systems Inc. help desk:
1-800-666-4330

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Safety

- *Safety Symbols* - Various symbols are used on the instrument, they have the following meaning:

Caution (refer to the accompanying documents)

Functional earth (ground) terminal

The functional earth connection is required for safety purposes and to ground RFI filters.

- *Personnel* - Installation must only be carried out by technically qualified personnel.

- *Enclosure of live parts* - To prevent hands or metal tools from touching parts that may be electrically live (powered), the controller must be installed in an enclosure.

- *Caution: Live sensors* - Do not connect live (powered) sensors to any signal input on the controller. Live sensors are sensors that must be connected to the main's supply. The controller has transient protection circuits connected between the inputs and the earth connection, which might be damaged by live (powered) sensors.

- *Wiring* - It is important to connect the controller in accordance with the wiring data given in this handbook. Take particular care not to connect AC supplies to the low voltage sensor input or other low-level inputs and outputs. Only use copper conductors for connections (except thermocouple inputs) and ensure that the wiring of installations comply with all local wiring regulations. For example, in the United Kingdom use the latest version of the IEE wiring regulations, (BS7671). In the USA use NEC Class 1 wiring methods.

- *Power Isolation* - The installation must include a power-isolating switch or circuit breaker. This device should be in close proximity to the controller, within easy reach of the operator and marked as the disconnecting device for the instrument.

- *Earth leakage current* - Due to RFI Filtering there is an earth leakage current of less than 0.5mA. This may affect the design of an installation of multiple controllers protected by Residual Current Device, (RCD) or Ground Fault Detector, (GFD) type circuit breakers.

- *Over current protection* - To protect the internal PCB tracking within the controller against excess currents, the AC power supply to the controller and power outputs must be wired through a fuse or circuit breaker specified in the technical specification.

- *Voltage rating* - The maximum continuous voltage applied between any of the following terminals must not exceed 264VAC:

    - line or neutral to any other connection
    - relay or triac output to logic, DC or sensor connections
    - any connection to ground.

The power supply/controller should not be wired to a three-phase supply with an unearthed star connection. Under fault conditions such a supply could rise above 264Vac with respect to ground and the product would not be safe.

Voltage transients across the power supply connections, and between the power supply and ground, must not exceed 2.5kV. Where occasional voltage transients over 2.5kV are expected or measured, the power installation to both the instrument supply and load circuits should include a transient limiting device. These units will typically include gas discharge tubes and metal oxide varistors that limit and control voltage transients on the supply line due to lightning strikes or inductive load switching. Devices are available in a range of energy ratings and should be selected to suit conditions at the installation.

- *Conductive pollution* - Electrically conductive pollution must be excluded from the cabinet in which the controller is mounted. For example, carbon dust is a form of electrically conductive pollution. To secure a suitable atmosphere in conditions of conductive pollution, fit an air filter to the air intake of the cabinet. Where condensation is likely, for example at low temperatures, include a thermostatically controlled heater in the cabinet.

- *Over-temperature protection* - When designing any control system it is essential to consider what will happen if any part of the system should fail. In temperature control applications the primary danger is that the heating will remain constantly on. Apart from spoiling the product, this could damage any process machinery being controlled or even cause a fire. Reasons why the heating might remain constantly on include:

    - the temperature sensor becoming detached from the process
    - thermocouple wiring becoming a short circuit
    - the controller failing with its heating output constantly on
    - an external valve or contactor sticking in the heating condition
    - the controller set point set too high

Where damage or injury is possible, we recommend fitting a separate over-temperature protection unit, with an independent temperature sensor, which will isolate the heating circuit. Please note that the alarm relays within the controller will not give protection under all failure conditions.

- *Grounding of the temperature sensor shield* - In some installations it is common practice to replace the temperature sensor while the controller is still powered up. Under these conditions, as additional protection against electric shock, we recommend that the shield of the temperature sensor be grounded. Do not rely on grounding through the framework of the machine.

- *Installation requirements for EMC* - To ensure compliance with the European EMC directive certain installation precautions are necessary. When using relay or triac outputs it may be necessary to fit a filter suitable for suppressing the emissions. The filter requirements will depend on the type of load. For typical applications we recommend Schaffner FN321 or FN612.

- *Routing of wires* - To minimize the pick-up of electrical noise, the wiring for low voltage DC and particularly the sensor input should be routed away from high-current power cables. Where it is impractical to do this, use shielded cables with the shield grounded at one end.

About This Manual

This instrument is designed to be custom-configured for each specific application and customer need. The applications (addendum's to the general manual) include atmosphere control, vacuum furnace control and nitriding control (% dissociation). Each addendum is application specific showing the specific screens and terminal connections.

Controller Description

The Model 9220 is a Proportional Integral Derivative (PID) controller that can be custom configured to control a variety of different applications. General features of this product include:

The Model 9220 is powered by 24 VDC, not LINE Voltage. Please be careful when connecting power to this controller. Connecting anything other than 24 VDC will cause serious damage.

Approximate Box Dimensions	2.75" x 4" x 4.5"
Power Requirements	24VDC, 4 Watts
Digital Output Rating	300VAC / 1 AMP
Analog Output Load Rating	1000 Ohms (Total)
Controller Enclosure Rating	IP10 – hand protected
Number of RS232 Ports	One (1)
Number of Ethernet Ports	One (1)
Number of RS485 Host Ports	One (1)
Number of RS485 Slave Ports	Two (2)
Number of Internal Relays	Eight (8)
Number of Analog Inputs	Three (3)
Number of Analog Outputs	Two (2)
Number of Digital Inputs	Four (4)
Number of Control Loops	Three (3)

The variety of input and output combinations allows SSi to configure the Model 9220 to control **vacuum** furnaces (temperature and vacuum gauges). There are special occasions where the three analog inputs have been used to control 3-zones of temperature.

Model 9220 Terminals Connections

SUPER SYSTEMS INC.
(800) 666-4330
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1 - 24VDC (COM)	12 - RELAY OUT 5	22 - SLAVE 2 RS485 (+)
2 - 24VDC (+)	13 - RELAY OUT 6	23 - SLAVE 2 RS485 (-)
3 - RS485 RT (-)	14 - RELAY OUT 7	24 - 4-20mA OUT 1 (-)
4 - RS485 RT (+)	15 - RELAY OUT 8 NC	25 - 4-20mA OUT COM (+)
5 - SLAVE 1 RS485 (-)	16 - RELAY OUT 8 NO	26 - 4-20mA OUT 2 (-)
6 - SLAVE 1 RS485 (+)	17 - DIGITAL IN 1	27 - ANALOG IN 3 (-)
7 - RELAY COMMON	18 - DIGITAL IN 2	28 - ANALOG IN 3 (+)
8 - RELAY OUT 1	19 - DIGITAL IN 3	29 - ANALOG IN 2 (-)
9 - RELAY OUT 2	20 - DIGITAL IN 4	30 - ANALOG IN 2 (+)
10 - RELAY OUT 3	21 - DIGITAL IN COM	31 - ANALOG IN 1 (-)
11 - RELAY OUT 4		32 - ANALOG IN 1 (+)

Additional Features

The Operator Interface (touch screen) contains a removable compact Flash Card that can be used to transfer data from the Model 9220 to a computer. This flash card acts like a removable hard drive, however it is very small and contains no moving parts to make it very portable. It is located on the back of the touch screen (see *Flash Card & Flash Card Reader*).

Also included is a Utility Software CD that includes SSi's Super Data (SD) Charting. SD Charting is a utility program that can be loaded onto any Windows® based computer (operating Windows 98® or higher). This software will allow the computer to read the data from the Model 9220, and allow it to be charted in a manner that is similar to a strip chart recorder.

The Operator Interface is normally accessed via the touch-screen, however connections also exist that will allow the operator to use a traditional mouse and keyboard to enter information.

Ethernet Connections

The Ethernet connection has three distinct uses. The first is should the Operator Interface fail, the Ethernet connection allows a laptop to be connected to the Series 9220 DIN rail mounted unit. This connection can act as a LIMITED FUNCTION "operator interface" until the Operator Interface can be repaired or replaced. The laptop needs to be operating a WINDOWS 98® or higher with Internet Explorer. The default IP address is **192.168.0.200.** If you are experiencing problems please call 800-666-4330 and talk with our computer communications personnel. The second use for the Ethernet port would be for communications to

a SCADA software package. Call us at **800-666-4330** if you are interested in this option. The third use for the Ethernet Port is the primary communications connection for the Configurator Software.

Mechanical Installation

The Model 9220 Operator Interface is generally flush-mounted, either in an existing enclosure, on a "plate" that will be retrofitted to an existing enclosure, or on a new enclosure specifically designed for it's particular application. Installation begins by securing the new enclosure to the floor or wall, securing the retrofit plate to the door of the existing enclosure, or flush-mounting the Operator Interface in a cut-out of the existing enclosure. When tightening the retaining clips on the Operator Interface, it is important to make them snug but not to over-tighten them. Over-tightening can warp the bezel and cause irreparable damage to the Operator Interface. The DIN rail mount portion of the controller (the Model 9220 and the 24 VDC power supply) needs to be located in close proximity to the existing wires that were connected to the older control unit being replaced. These units should be secured prior to making any electrical connections.

Electrical Installation

The Model 9220 requires 24VDC, 4 Watt, 60 Hz, single-phase power. A 24 VDC power supply is required and is generally included as part of the Model 9220 system. This power supply has a universal input that can accept between 60 and 265VAC. Power should be applied in accordance with the electrical drawings that have been supplied. Since each installation is unique for each site, the customer is responsible for providing adequate power and making it available to the Model 9220 power supply.

SSi requirement:

MOV's must be wired across the isolation relay coil terminals on all isolation relays that are connected to solenoids. **Further…** MOV's must be connected across the HOT and NEUTRAL wires when the solenoid is wired to them. **IT IS AN ABSOLUTE MUST to have the MOV's at BOTH LOCATIONS.**

Instrument Start-up

On power-up, the Operator Interface will display a Microsoft Windows desktop screen for a few seconds and then switch to the default Status screen.

Flash Card & Flash Card Reader

Never remove the flash card when the Operator Interface is "ON".

To properly shut down the Operator Interface, press the **Menu** button, and select *Shutdown*. At the prompt, press **Yes** to shut down the Operator Interface. This will bring you to a conventional Microsoft Windows screen. Sliding the black switch to the OFF position (located directly over the green power connector, on the back of the Operator Interface) will turn off the power to the Operator Interface.

Once the Operator Interface is turned off, remove the compact flash card cover at the top of the display unit, exposing the card. Press the black release button and the card will pop out of the slot. To replace the flash card, simply return the card to the slot making sure that the release button is in it's UP position, and replace the flash card cover to its proper position. To restore power to the unit, move the black switch to the right or ON position.

Operator Interface Screen Saver

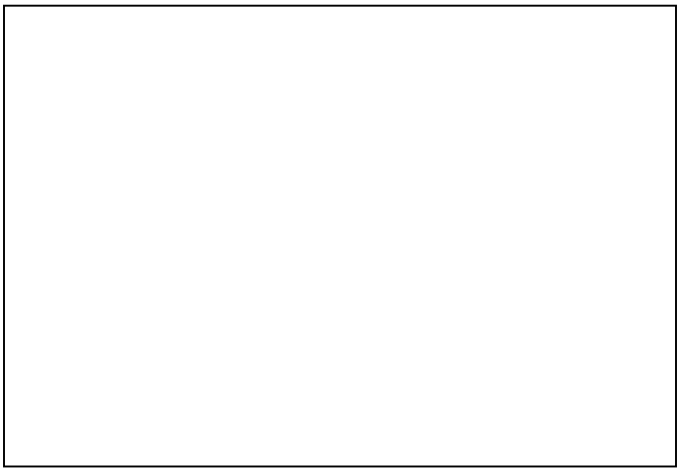
The Operator Interface has a default screen saver. It automatically "blanks" the screen after ten (10) minutes of non-activity. To disengage the screen saver, simply touch the screen and it will re-appear.

Chapter 1 - INSTALLATION

Mounting

The Series 9220 Operator Interface mounts into a panel or on a plate by using the enclosed 8 mounting brackets. With the exception of the Operator Interface, these items can be mounted on a standard DIN rail for mounting inside an electrical enclosure. SSi supplies a 10-foot communications cord with the two connectors and the piece of DIN rail required for the components that have been ordered.

Operator Interface Cutout: 7.402"W X 5.552"H



Default Status Screen

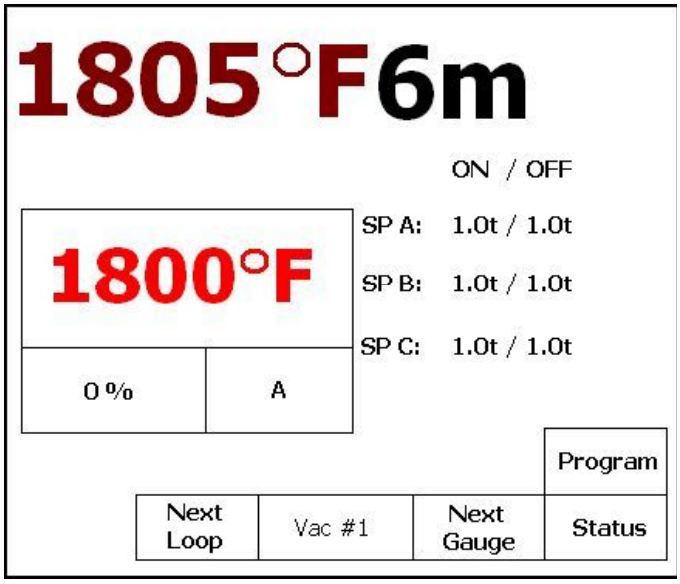
Display

The Status Display shows the vacuum and temperature controller information as well as an overview of the programmer. There are six active buttons on the Status Display: **Loops, Menu, Program, Load/TC, Chart** and **Alarm Ack.** One hidden button is located behind the SSi Logo. By activating this button selected Software and Firmware information will be displayed.

- The **Loops** button will switch the display to the two control loops, % Carbon on the left and Temperature on the right.
- The **Menu** button will switch to the menu. The blue UP and DOWN arrow keys move you from one selection to another. The **Enter** button will enter the selected Menu Screen, if access is authorized.
- The **Program button** will switch to the Program Display. This is a companion display to the status screen and is described below.
- The **Load/TC** button will display the *Zone/Load TC Setup* menu screen. This button can be used as a shortcut to the menu option. This menu item requires a *configuration level* passcode for access. See *Chapter 2 – Configuration* for an explanation of the menu item.
- The **Chart** button will switch the display to the video recorder display. Use of the Chart Display is explained below.
- The **Alarm Ack** button is used to a**c**knowledge an alarm. The alarm is displayed in the lower left-hand corner of the Status Screen. A red **ALM** block in the top right corner of the screen

displays an alarm condition. The alarm will either be a flashing number, which indicates a program operator alarm, or a flashing message, which indicates a program system alarm.

Loops Display

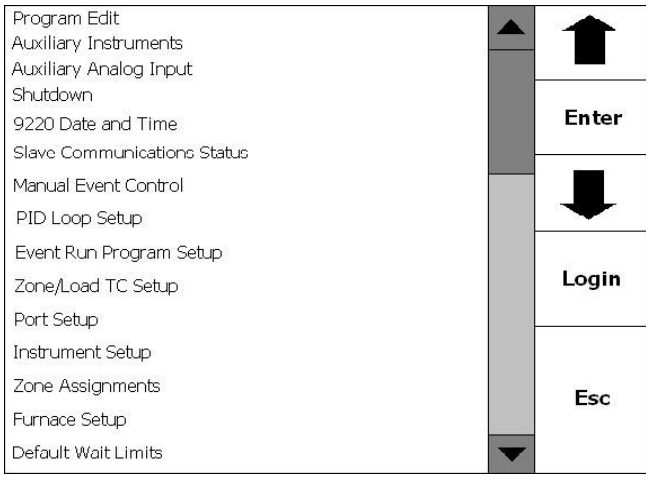


The current process variable is displayed at the top, with each loop set point displayed beneath the process variable. The operator can change the process set point by touching the screen area below the large process variable numbers. When pressing the Temperature set point, a numeric keypad is displayed, showing the current value and allowing the operator to enter a new set point by simply pressing on the appropriate numeric keys. Once the correct set point has been entered, press the **Enter** key to make the change. When the **Enter** key is pressed the display returns to the *Loops* Screen. Another active key within the *Loops* Screen is the **A/M** (Auto/Manual) button. Pressing that button moves you to a display page asking for a supervisor or administrative pass code. Pressing the proper numeric keys and pressing the **Enter** button changes the controller's mode from Auto to Manual, or from Manual to Auto depending on which mode it was in when the **A/M** key was pressed. If you are in the manual mode, you may press the percent output button on the *Loops* Screen and a numeric keypad appears, allowing you to enter a % output to control the "loop" in a manual mode.

Also displayed is the vacuum gauge reading.

The Loops Screen also allows you to move back to the default Status Screen by pressing the **Status** button or to the Program Screen to view the program currently running on the Series 9220 controller by pressing the **Program** button. See the *Program Display* section below for more information on this menu item. The **Next Gauge** button will display the next gauge and the **Next Loop** button will display the next loop. The furnace name will be displayed between the **Next Loop** and **Next Gauge** buttons.

Menu Display



The remaining items on the Menu Display are:

- Furnace Name
- Alarm Setup
- Relay Assignments
- Relay Setpoints
- Analog Input Setup
- Analog Output Setup
- Passcode and Alarm
- IP Address
- Event Control
- Vacuum Gauge Setup
- User Calibration
- Full Calibration
- Set Menu Security
- Read/Write Raw Data
- Curve Entry
- Alternate PID Setup
- Analog Input Board Setup
- ADAM Correction
- Aux SP Configuration

Menus

There are four levels of menus in the Series 9220.

- The first level is the *operator level*. These are functions or operations that are typically handled by the furnace operator. This menu is accessed without the need for a pass code.
- The second level is the *supervisor level*. This level requires the entry of a level 1 or a level 2-pass code.
- The third level is the *configuration level*. This requires the level 2-pass code ONLY.
- The fourth level is the *SSi level*. This level is used by SSi personnel for configuration purposes.

As shipped, the level 1 and level 2 codes are set as **1** and **2** respectively. The pass codes can be changed at the Passcode and Alarm Screen. *Note: Any level can access a lower level screen. For instance, the Configuration level passcode can access all of the Supervisor and Operator level screens*.

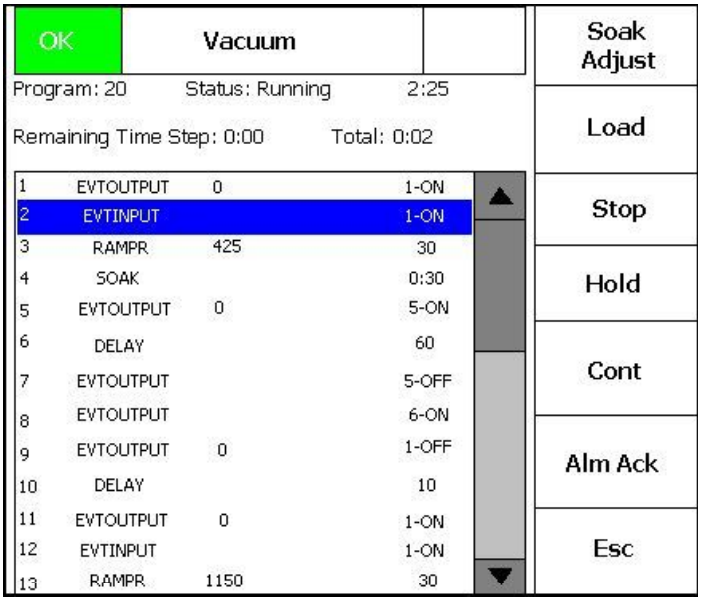
The menu has five operating buttons located on the right side of the screen. The UP arrow moves the cursor from bottom to top. The **Enter** button activates the selection that the operator has chosen, the DOWN arrow key moves the cursor from top to bottom, the **Login** key activates another screen that allows access to the Supervisor Menu and the Configuration Menu, and the **Esc** key takes you back to the previous screen without any action being taken.

Pressing the **Login** key takes you to the numeric keypad Enter Password Screen. Entering the correct password (the default password is **2**) displays the Supervisor Menu, which includes the entire list of menus necessary to configure the Series 9220. These are explained in detail in *Chapter 2 – Configuration*.

Program Display

Pressing the **Program** key displays the default Program Status page.

The Program Status Display shows the last program loaded into the program run buffer and its status. If the program is running, the active step number is highlighted, and the status is running. A red **ALM** block in the top left corner of the screen displays an alarm condition.



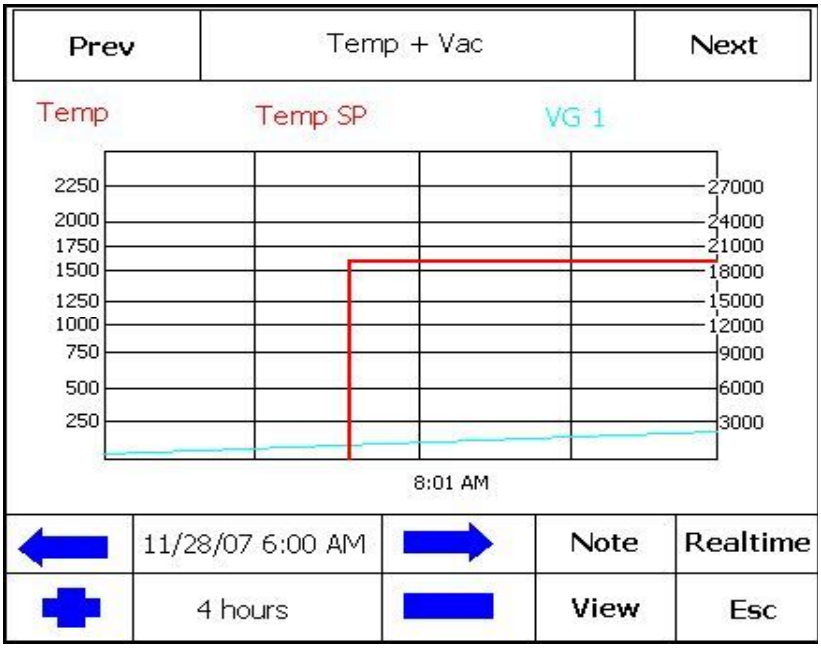
The Program Display has seven active buttons located on the right side of the display. Touching the inside of the blocks activates these. The active buttons are **Soak Adjust, Load, Stop, Hold, Cont, Alm Ack (Alarm Acknowledge)** and **Esc.**

- The **Soak Adjust** button allows you to enter a new value for the time remaining in the current soak or ramp cycle. A soak or ramp cycle must be running for a change in soak/ramp time to be adjusted.
- The **Load** button allows the operator to enter the recipe number to be run and to view the recipe before pushing the **Run** button. Pushing the **Run** button starts the recipe. If a recipe program is running and the operator enters a new recipe program it can be viewed and modified. The recipe does not become active until the **Run** button is pushed. Pressing **Run** places the program currently being viewed in the active memory and will begin to run the new recipe. You can start the program in any step, simply by moving the highlight down to the step that that the program needs to be started in, and then pressing the **Run** key.

  While reviewing the program that is about to be run, certain parameters within those steps can be modified. You can change the set points, the time and the options. You CAN NOT delete a step, or modify it's Opcode.
- The **Stop** button stops the recipe program that is currently displayed. Stop means exactly that! It stops the program. It is NOT a hold button. See hold below. To re-start the program if it has been stopped you must use the **Load** button, enter the recipe number, and then highlight the segment number of the recipe that you want to start with and initiate *Run*.
- The **Hold** button places the displayed recipe program in hold. Once a decision is made that affects the recipe, it may be continued by pressing the **Cont** button.
- The **Cont** button re-starts the displayed (active) recipe, where it was placed in hold at.
- The **Alm Ack** will acknowledge the alarm. In most cases, it will be acknowledging *end of soak*. The alarm must be acknowledged to allow the program to go to the next step.
- The **Esc** button returns you to the default Display Screen.

<u>Chart</u>

The Chart Display shows between 15 minutes and 7 days of process variable data on the screen, and can be scrolled back to view all of the data stored on the hard drive (72 hours at a time). The vertical timelines change as the time changes on the screen. A chart is available for the temperature only and a chart is available for the temperature and vacuum gauge and the set points. You can toggle between the two charts by pressing the **PREV** and the **NEXT** keys.



The blue **RIGHT** and **LEFT** arrows move the displayed chart along the horizontal axis, going back and forward in time and then returning to real time.

The **+** and **–** keys change the time window displayed on the screen.

The **Note** key allows the operator to enter a note on the chart, similar to writing on a paper chart. The note shows up when the chart is printed out using the utility software included with the Series 9220 instrumentation. The interface must be the ADVANTECH 5.7-inch with the Flash Card.

Pressing the **Note** key displays a screen where the operator can enter the operator ID or initials and a note. Pressing either **Edit** key will allow the operator to enter the information. The default choice for when the note is to be written is the current time and date. You can change the parameters and place the note at whatever time and date is required. Pressing the **Save** key saves the note and takes the operator back to the real time chart page. Pressing the **Cancel** key will not save the note.

Pressing the **Realtime** key brings the chart display back to the current time, and the chart will update every minute.

The **View** key allows you to look at the NOTES that have been stored with the chart.

Pressing the **Esc** key will display the default status screen.

Alarm Ack

The **Alarm Ack** button displays the Active Alarm Screen. From which you can acknowledge any alarms that have been configured, or that have been made part of the recipes that run on the Series 9220. If a recipe has an alarm as a step, the alarm must be acknowledged before the recipe will continue to the next step.

Data Logging using Flash Card

NOTE: See Warnings with respect to removing the Flash Card.

The Advantech TPC-642S/642-SE touch screen Operator Interface utilizing a Compact Flash Card allows the unit to data log the parameters setup by a qualified SSi technician. Should a customer not take the data offline in a timely manner, the data will be over-written, the oldest data being over-written first. Here is how it works:

1. When the ADVANTECH Operator Interface detects that there is less than 5% disk space left on the compact flash card, an alarm will be displayed on the main interface screen stating "x% disk space remaining (overwrite at 3%)". In the upper right corner, an ALM is indicated, but because it is not a

communications alarm or a 9220 device alarm, the background remains green. This alarm will remain active until more than 5% of disk space is available for writing data log files.

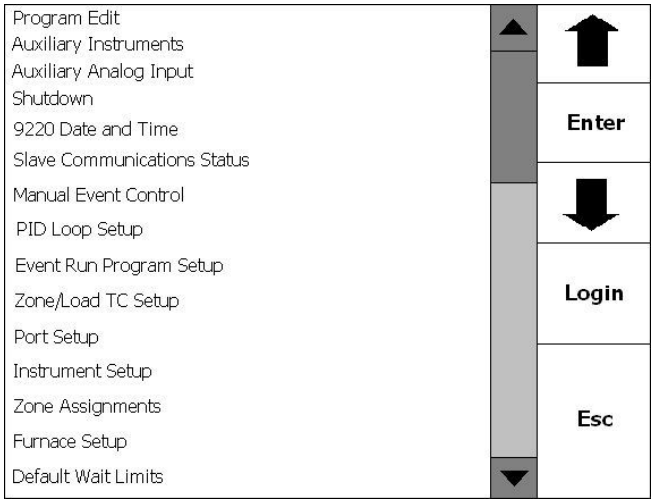
2. If the user does not copy the log data from the disk, it will eventually fall to 2% disk space. At this point, the touch screen will select the oldest compressed file and delete it. It then checks to see if 3% remains. It repeats this procedure until 3% disk space remains. At this point the alarm message changes to "Overwriting data log data!" Because this allows the system to seesaw between 2% and 3%, it will continue to display "Overwriting data log data!" until somebody offloads the files.

Technical concerns and details:
1. If there are not enough compressed files to bring the free space up to 3%, the system will hunt down and kill hourly files. This should only happen if compression would not be running for some reason.
2. If all compressed files and hourly files have been removed and there is still not enough disk space (perhaps a problem with the compact flash card), the data logger will not write to the disk until the condition is remedied. (Alarms continue to display).
3. The data log data alarm is the lowest priority. The alarm priorities are touch screen communications, then 9220 controller/programmer, then disk space.

Chapter 2 - CONFIGURATION

Configuration Menu

The Configuration Menu is entered through the **Menu** key that is part of the six buttons running down the right side of the Default Display Screen. Pressing the **Login** key that is below the blue up and down arrow keys displays a numeric keypad. Enter the correct passcode for the configuration level and press the **Enter** key. This displays the configuration menu. The rest of the configuration menu is:



- Furnace Name
- Alarm Setup
- Relay Assignments
- Relay Setpoints
- Analog Input Setup
- Analog Output Setup
- Passcode and Alarm
- IP Address
- Event Control
- Vacuum Gauge Setup
- User Calibration
- Full Calibration
- Set Menu Security
- Read/Write Raw Data
- Curve Entry
- Alternate PID Setup
- Analog Input Board Setup
- ADAM Correction
- Aux SP Configuration

Program Edit

Selecting this **Program Edit** button pops up another screen which asks the operator to enter a program number to be edited. Enter **0** to edit a blank program. To ERASE/DELETE an existing recipe/program you need to SAVE it as program Zero (0). Program 0 is a NO-OPT program.

When you enter a number for a stored program and push the **Enter** key the program steps are displayed. Using the up and down arrow keys you select the step in the existing program that you wish to edit. Move the cursor to that step and press the **Enter** key. The next screen to pop up will show the step's parameter and it's value.

NOTE: A list of OPCODES appears in the Appendix of this manual.

Example:

Parameter equals OPCODE, Value equals SOAK.

Parameter equals TIME, Value equals 3:45.

Highlighting the opcode and soak and pressing the **Enter** key brings up a screen that shows all of the possible opcodes. Selecting the opcode that you want to use for the program step that you are editing and pressing the **Enter** key.

If you desire to change the time highlight the time and press the **Enter** key. The next screen is the Time Edit Screen. To change the hour, press the **Hour** key in the upper right-hand corner. If you want to change the minutes press the **Min** key. The next screen that pops up in both cases is a numeric keypad. Enter the time that you wish to permanently change the recipe to and press the **Enter** key. If you DO NOT wish to make any changes press the **Esc** key. *Note: if you wish to only change the minutes, you must enter the desired hour(s), if other than 0*.

If you have made a change, pressing the **Enter** key takes you back to the Time Edit Screen. If you wish to make the change, press the **Set** key on the right-hand side of the screen. The next screen to pop up verifies the time has been changed to the number of minutes that you have selected. Pressing the **Cancel** key takes you back to the full Program Screen. If you are sure that you want the change to be permanent press the **Set** key. This takes you back to the screen that shows you the entire program. Notice that the time has been changed on the program segment that you were editing. If you wish to save this change press the **Save** key. You will notice that a numeric keypad pops up and asks you to enter the number of the program that you wish to save. You must enter the desired program number you wish to save these changes to.

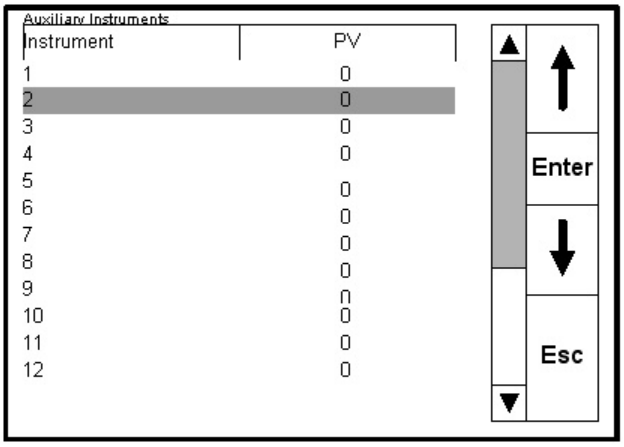
NOTE: See the APPENDIX section of this manual for a sample program.

The **Insert** button will insert a step into the recipe.

The **Delete** button will delete a step from the recipe.

The **Esc** button takes you back to the Default Menu.

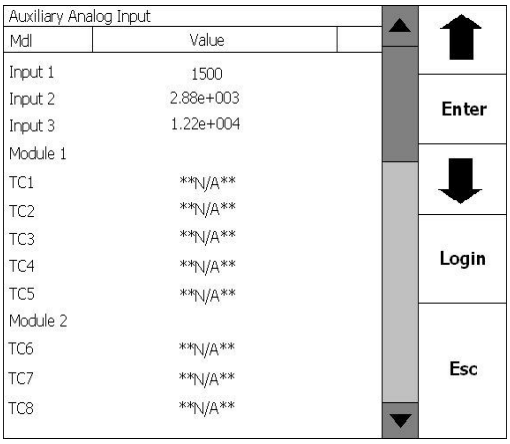
Auxiliary Instruments (Read-only)



The Auxiliary Instruments Display shows the following information:
The instruments slaved to the Series 9220 and their process variables.

Auxiliary Analog Input (Read-only)

The Auxiliary Analog Input Display shows the information from any attached analog input modules such as: load T/C's, flows from Waukee-Tronic flow meters, etc.



Shutdown

The Shutdown selection pops up another screen asking whether or not you wish to shutdown the interface with the Series 9220. Two responses are possible Yes or No.

When you shutdown the ADVANTECH interface, the SERIES 9220 controller is still functioning. You can monitor it by connecting the ETHERNET connection to a laptop computer, using Internet Explorer, and assigning a legitimate IP address.
"Yes" shows you a typical computer screen with the **Start** button in the bottom left-hand corner. You can now turn the power off to the operator interface without upsetting any of the settings. The "No" response returns you to the initial Status Screen. *Shutting down the Operator Interface does not shutdown the Series 9220 Controller*.

9220 Date and Time

Pressing **Enter** moves you to screen Clock setup.

Highlighting the date and pressing **Enter** moves you to a screen Date Edit.

The current date in the Series 9220 is displayed as well as the date on a scroll type display. Touching the individual parts of the date [day (Monday, Tuesday, etc.), month, and year] will highlight that portion of the date, and using the little up and down arrow keys will allow you to adjust the highlighted value.

Pressing the **Set** button makes the change permanent.

If you desire to change the time highlight the time and press the **Enter** key. The next screen is the Time Edit Screen. To enter the hour, press the **Hour** key in the upper right-hand corner. If you want to change the minutes press the **Min** key. The next screen that pops up in both cases is a numeric keypad. Enter the time that you wish to change the time to and press the **Set** key. If you DO NOT wish to make any changes press the **Cancel** key. Note, if you wish to only change the minutes, you must also enter the hour in 24-hour (Military) format.

Pressing the **Cancel** key takes you back to the Clock Setup Screen.

Slave Communications Status

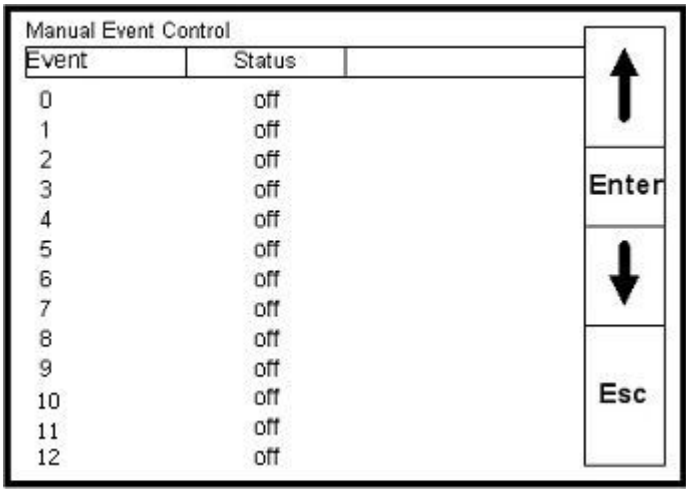
Pressing the **Enter** key displays the auxiliary instruments and their status, if any.
There are five possible messages that can occur to describe the instrument communications status.

- N/A – No instrument is connected
- Bad – No communications exist
- ??? – Communications exist, but there are frequent errors
- ?OK – Communications exist, but there are occasional errors
- OK – Communication is established and working properly

This is a display-only screen.

Manual Event Control

Pressing **Enter** displays the Manual Event Control Screen.



Highlighting a specific event and pressing the **Enter** key changes the displayed status of the highlighted event. This will activate or de-activate whatever digital contact is connected to that particular event.

Pressing the **Esc** key returns you to the original Menu Screen.

PID Loop Setup (Includes cycle time and more….)

Pressing the **Enter** key moves you to the PID Screen, showing you **Loop 1**, **Loop 2**, and **Loop 3**.

The TOP two blue arrows move you from one loop to the other. Below each of the loops are shown the PID parameters as they exist in the Series 9220 at that particular moment.

Highlighting the loop and pressing the **Enter** key activates the lower two up and down blue arrow keys, separated by the **Enter** key. Using the lower up and down arrow keys allows the operator/supervisor to highlight the parameters shown in the lower portion of the screen. These editable parameters include Proportional Band, Reset and Rate, Set point, Pct Out (when in Manual Mode), Mode, Integral Preset, Cycle Time, SP Change Limit, Control Mode, Low Limit, High Limit, 0 SP stops ctrl. Some of the parameters are view only, such as Probe Millivolts, Process Variable, Pct Out (while in Auto Mode), SP Lower Limit, and SP Upper Limit. Pressing the **Enter** key when the parameter is highlighted can change all of the other parameters. This will move you to a numeric keypad that will allow you to change the specific parameter. In some cases the keypad is non-active. You are given a menu of choices. Highlight your choice and press the **Enter** key to make the appropriate selection.

Change set point overshoot protection:

When the Change Set point is set to any value other than OFF, the PID control operates normally until there is a set point change. When a set point change occurs, the PID algorithm uses PB only (i.e. it ignores the (I) Reset and (D) Rate) until the % output from the specified loop falls below the value specified. At this time it begins calculating Reset and Rate and returns to normal operation.

Example: Change set point is set at 80%.
Current set point is 1500.
New set point is 1700 - % output rapidly goes to 100%, PID ignores Reset and Rate.
Temperature gets within PB, % output starts to drop.
When % output drops below 80%, PID operation returns to normal with Reset and Rate applied.

Normally overshoot is caused by a buildup of the Reset error term, by ignoring this term until the temperature is with PB; the Reset term is minimized thus reducing the overshoot error. You should be cautious not to set the change set point value too low. (E.g. if the furnace controls 1700 in a steady state at 50% output and you set the change set point value to 40% and the PB value is low, you could find yourself in a situation where you never see 40% output and remain in a **PB only** control mode.)

Default PID Parameters for Loop 1(% Carbon) and Loop 2 (Temperature)

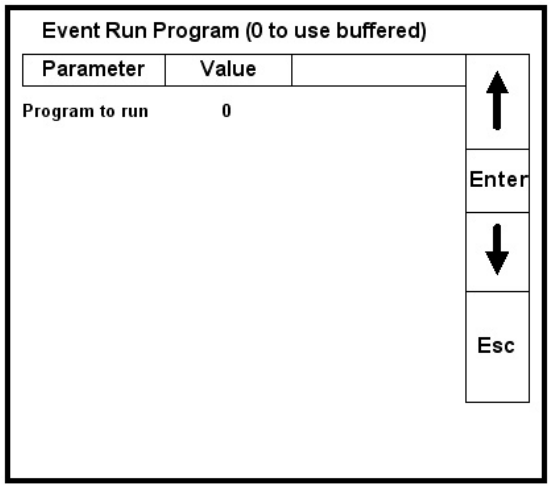
Loop 1 Default PID Parameters	Loop 2 Default PID Parameters
Proportional Band: 20	Proportional Band: 4.0
Reset: .10	Reset: 0.10
Rate: 0	Rate: 0
Cycle time: 16	Cycle time: 60

The **Cancel** key on some of the screens returns you to the previous screen without any changes being effected. The **Esc** key takes you back to the Menu Screen.

Event Run Program Setup

Pressing the **Enter** key takes you to a screen labeled *Event Run Program (0 to use buffered).*

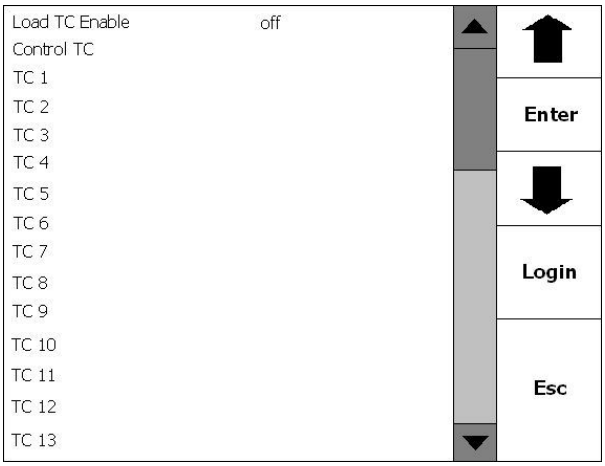
This is used to start a program stored in the 9220, by contact closure between terminals 21 (Digital In Com) and 17 (Digital In 1). The value entered at program to run will start with contact closure.



Pressing **Enter** pops up the Current Value Screen, showing the current value in the Series 9220. To make an adjustment, enter the program number, using the numeric keypad and press the **Enter** key. This returns you to the original Event Run Program Screen that now shows the new program number that you have entered. If you do not wish to make the change simply press the **Esc** key which takes you back to the Event Run Program Screen with NO change being made to the Event Run Program.

Zone / Load TC Setup

Pressing the **Enter** key displays the Zone/Load TC screen.
This screen is used to set up Load, Monitor Thermocouples. It is normally used in conjunction with an ADAM Module to provide information from the Load Thermocouples. There are three modes of operation for Load TC Enable. They are Off, On, and On + Alarm. To set the mode on Load TC Enable, highlight it and press **Enter**, this will open a new window, use the blue up and down arrows to highlight the desired mode then press **Enter**. This will enter the selected mode and return you to the Load TC Screen. By activating a thermocouple, no conditional soak will start unless the temperature is with the default wait limits of the selected thermocouple(s).



To activate one or more of the thermocouples, use the blue up and down arrows to highlight the desired thermocouple then press **Enter**. This will activate, or deactivate the selected thermocouple.

Port Setup

Warning: Changes to this screen should not be made without consulting SSi at 800-666-4330.

Highlighting this menu selection and pressing the **Enter** key moves you to the Port Setup Screen.

Parameter	**Value**
Host 232 Baud	TPC-642S/SE
Host 232 Mode	Modbus Master
Host 485 (3,4) Baud	19200
Host 485 (3,4) Mode	Modbus
Host 485 (3,4) Address	1

Slave 1 (5,6) Baud	19200
Slave 1 (5,6) Mode	Modbus Master
Slave 2 (22,23) Baud	19200
Slave 2 (22,23) Mode	Analog Input Board
232 PLC Port Baud	19200

These values can be changed by using the up and down arrow keys to highlight your selection, press the **Enter** key. A selection of communication protocols is displayed. Make your selection and press the **Enter** key. The **Cancel** key takes you back to the previous screen without changes being made.
The options for the Host 232 Baud are:
TPC-642S/SE
TPC-642S/SE High Speed
Prism
The options for the Host 232 Mode are:
Modbus host/no PLC
Modbus master/PLC
The options for the Host 485 (3, 4) Baud/Slave 1 (5, 6) Baud/Slave 2 (22, 23) Baud are:
1200
2400
4800
9600
14400
19200
28800
38400
57600
76800
115200
The options for the Host 485 (3, 4) Mode are:
MMI
Modbus
The options for the Host 485 (3, 4) Address are:
0 – **249**
The options for the Slave 1 (5, 6) Mode are:
MMI
Modbus
ADAM
Modbus Master
The options for the Slave 2 (22, 23) Mode are:
MMI
Modbus
ADAM
Analog Input Board

Instrument Setup

WARNING: This screen should not be changed without consulting SSi at 800-666-4330.

Highlighting this entry and pressing the **Enter** key takes you to a two-level screen. The first level allows you to select the instrument to setup (**Instrument 1** – **Instrument 25**). To highlight the desired instrument use the first set of blue up and down arrow keys and then press **Enter** key.
The list of controllers includes the following **Atmosphere Controllers**:

- SSi AC20

- Yokogawa 750
- Honeywell UDC3300
- Dualpro 1 Modbus
- Dualpro 2 Modbus
- Dualpro 1 MMI
- Dualpro 2 MMI
- Eurotherm 2404
- Eurotherm 2500
- Carbpro v3.5
- Carbpro v3.0
- CarbPC
- 9200 Loop 1
- IR Base

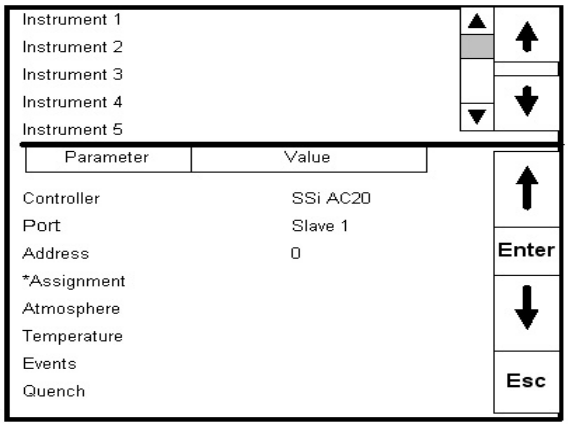
This list of controllers includes the following **Temperature Controllers**:

- SSi 7EK
- Yokogawa 750
- Honeywell UDC3300
- Dualpro 1 Modbus
- Dualpro 2 Modbus
- Dualpro 1 MMI
- Dualpro 2 MMI
- Eurotherm 2404
- Eurotherm 2500
- Unipro v3.5
- Unipro v3.0
- Carbpro v3.5 Slave
- Carbpro v3.0 Slave
- 10Pro
- DualPro IN C
- 9200 LP1
- 9200 LP2
- 9200 LP3
- 9100 LP2
- Eurotherm 2704 lp1
- Eurotherm 2704 lp2
- Eurotherm 2704 lp3
- VC BASE 1
- VC BASE 2
- VC BASE 3
- VC BASE 4
- AIPC
- SSi 7SL Limit Controller
- SSi Flow Board
- UMC800 Lp1

This list of controllers includes the following **Event Controllers**:

- SSi AC E
- Yokogawa 750E
- Mod Mux
- Dualpro E Modbus
- Dualpro E MMI
- Carbpro E v3.5

- Carbpro E v3.0
- Eurotherm 2500
- SSi 8-8
- 9200E
- Micrologox PLC



Selecting, for example, the SSi AC20, the following screen is shown.

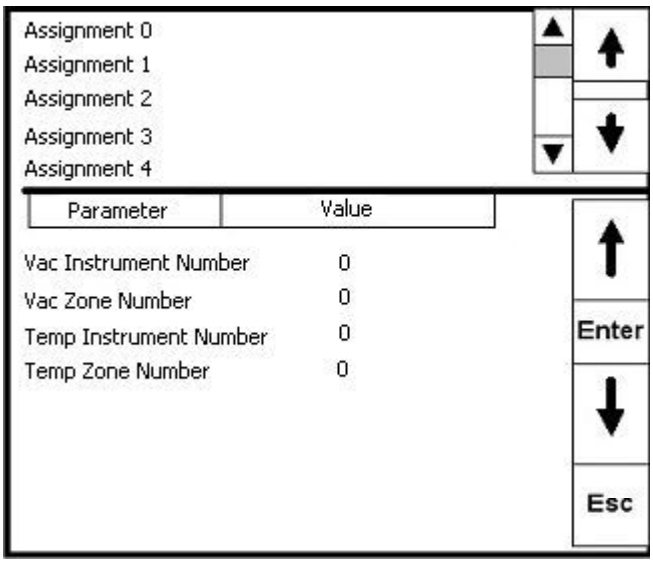
Using the blue up and down arrow keys highlight the desired selection and press the **Enter** key. This returns you to the previous screen and shows you the instrument that you have chosen and then will allow you to make some changes per the parameters shown.
The port can be:
Slave 1
Slave 2
RS-232
The address can be **0** – **249**. An address of 0 is a non-defined instrument.
The Atmosphere/Temperature can be:
Loop 1
Loop 2
Loop 3
Instrument 1
Instrument 2
Instrument 3
Instrument 4
Instrument 5
Instrument 6
Instrument 7
Instrument 8
Instrument 9
Instrument 10
Instrument 11
Instrument 12
The Events can be:
Internal
Instrument 1
Instrument 2
Instrument 3
Instrument 4
Instrument 5
Instrument 6
Instrument 7
Instrument 8
Instrument 9
Instrument 10
Instrument 11
Instrument 12
The Quench can be:
Instrument 1
Instrument 2
Instrument 3

Instrument 4
Instrument 5
Instrument 6
Instrument 7
Instrument 8
Instrument 9
Instrument 10
Instrument 11
Instrument 12

Pressing the **Esc** key will return you to the Menu Screen.

Zone Assignments

WARNING: This screen should not be changed without consulting SSi at 800-666-4330.



The zone assignment feature allows the SERIES 9220 program to change set points on all instruments of a multi-zone furnace. The SERIES 9220 has up to five (5) temperature and atmosphere zone assignments available (Assignment 0 – Assignment 4). The SERIES 9220 programmer looks for appropriate zone assignments whenever a set point is to be sent to the atmosphere or temperature controller. The temperature set point is sent to every instrument number in the temperature zone assignment.

If the *ZONE_OFF* (Zone Offset) opcode had been used in the program, the set point sent to the specified zone instrument would have the offset added. For example, a 3-zone pit furnace where the bottom zone usually has a higher set point. The middle zone and the top zone usually have a lower set point. The bottom zone temperature controller is assigned to zone 1, the middle temperature controllers to zone 2, and the top zone controller to zone 3.

If the first three steps of a program are as shown below, then the bottom zone set point is 1725, the middle zones are 1750, and the top zone is 1800.

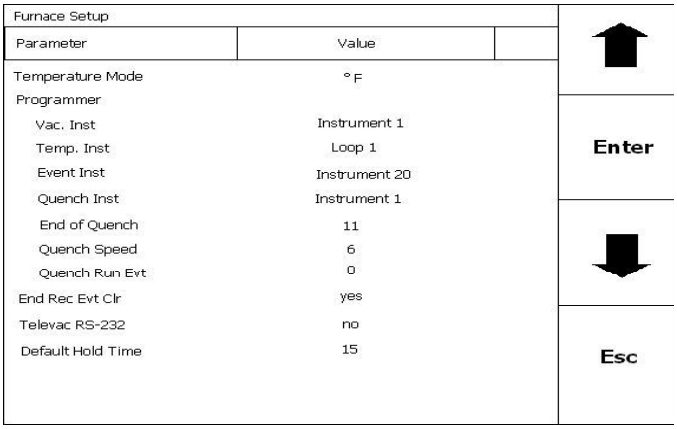
Step	**opcode**	**Temperature**	**Atmosphere**	**Option**
1	*ZONE_OFF*	50		1
2	*ZONE_OFF*	25		3
3	*SETPT*	1750		

The first step sets the offset for zone 1 to –25 degrees; therefore, the bottom zone controller would be sent a set point of 1725 when step 3 is executed. Likewise step 2 sets the offset for zone 4 to 50 degrees. The top zone then receives a set point of 1800. The middle zone controller would receive the 1750. The temperature controller displayed on the Status Display is instrument #2. If instrument #2 were the top zone controller then the Status Display would show the 1800-degree set point.

When using the multi-zone offset feature, the atmosphere and temperature controller assigned as instruments 1 and 2 should be in zones that will not be offset.

Furnace Setup

When highlighted, press the **Enter** key. This takes you to the Furnace Setup Screen. Highlighting *Temperature Mode* and pressing **Enter** will change the temperature mode between Fahrenheit and Celsius. The *Vac. Inst* and the *Temp. Inst* has the following options:



- Loop 1
- Loop 2
- Loop 3
- Instrument 1
- Instrument 2
- Instrument 3
- Instrument 4
- Instrument 5
- Instrument 6
- Instrument 7
- Instrument 8
- Instrument 9
- Instrument 10
- Instrument 11
- Instrument 12

The *Event Inst* has the following options:

- Internal
- Instrument 1
- Instrument 2
- Instrument 3
- Instrument 4
- Instrument 5
- Instrument 6
- Instrument 7
- Instrument 8
- Instrument 9
- Instrument 10
- Instrument 11
- Instrument 12
- Instrument 13
- Instrument 14
- Instrument 15
- Instrument 16
- Instrument 17
- Instrument 18
- Instrument 19
- Instrument 20
- Instrument 21
- Instrument 22
- Instrument 23
- Instrument 24
- Instrument 25

The Quench Inst has the following options:

- Instrument 1
- Instrument 2

- Instrument 3
- Instrument 4
- Instrument 5
- Instrument 6
- Instrument 7
- Instrument 8
- Instrument 9
- Instrument 10
- Instrument 11
- Instrument 12

The *End of Quench*, *Quench Speed*, and *Quench Run Evt* have a range of: **0** to **15**. Pressing **Enter** will cycle through these options while the menu item is highlighted.
The *End Rec Evt Clr*(clear events at the end of a recipe) and *Televac RS-232*(is there a Televac on the RS-232 port?) options will cycle through **yes** and **no** when **Enter** is pressed while the option is highlighted.
The *Default Hold Time* has a range of: **1** to **1000**.
Highlighting your choice and pressing the **Enter** key returns you to the Furnace Setup Screen with your new choice appearing in whatever parameter that you had selected.
Pressing the **Esc** key returns you to the Menu Screen.

Default Wait Limits

Pressing the **Enter** key takes you to the Wait Limit Setup Screen.

Parameter	Value
Temperature Wait Limit	15
Vacuum Wait Limit	10

The wait limits are used in the recipe programming. A wait limit allows the program to move to the next step once the process variable (or the actual furnace) has reached the default wait limits that are indicated on this screen.
Highlighting your choice to be changed and pressing the **Enter** key moves you to a numeric keypad that allows you to enter a new value by touching the appropriate keys. Once you have made the change pressing the **Enter** key takes you back to the previous screen. Once again, pressing the **Esc** key takes you back to the previous screen without making the changes.
The range for either option is: **0** to **50**.
Pressing the **Esc** key returns you to the Menu Screen.

Furnace Name

Highlighting this selection and pressing the **Enter** key displays the following Furnace Name Screen.

Parameter	Value
Furnace Name	??????????????
PV1 Name	Temperature
PV2 Name	Temperature
PV3 Name	Temperature

Highlighting *Furnace Name*, *PV1 Name*, *PV2 Name*, or *PV3 Name* and pressing the **Enter** key displays an alphanumeric keyboard. Type the name that you wish to be displayed. Pressing the **Enter** key returns you to the previous screen. Pressing **Esc** will return to the previous screen without setting the name.
Pressing the **Esc** key returns you to the Menu Screen.

Alarm Setup

Highlighting this entry and pressing the **Enter** key takes you to a two-level screen. The first level allows you to select the alarm (**Alarm 1** – **Alarm 3**). The second level scrolls through the alarm parameters.

Parameter	Value
Setpoint	
Alarm Type	
Hysteresis	

A numeric keypad is used to enter the Alarm set point, pressing **Enter** after selecting the value. The range for the setpoint is: **-9999** to **9999**.
Using the blue up and down arrow keys, select *Alarm Type* press the **Enter** key. Using the blue up and down arrow keys select the alarm type from the top and bottom choices.

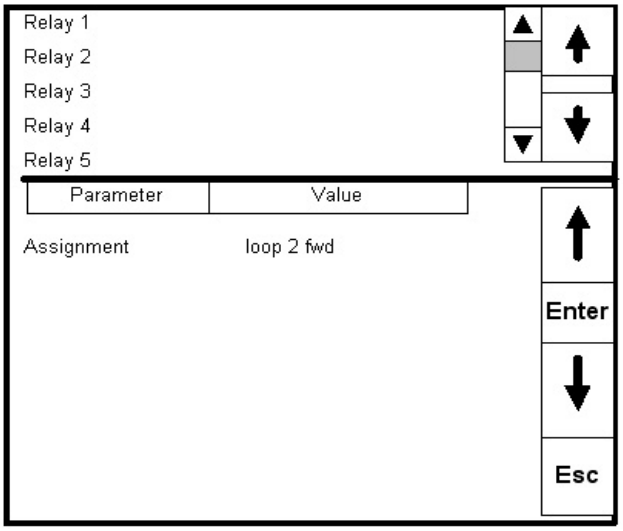
The top choices are:	The bottom choices are:
Process High	PV 1 Value
Process Low	PV 2 Value
Band, Normally Open	PV 3 Value
Band, Normally Closed	Input 1 Value
Deviation, Normally Open	Input 2 Value
Deviation, Normally Closed	Input 3 Value
	PO1 Value
	PO2 Value
	PO3 Value

After highlighting your choice press the **Enter** key. This returns you to the previous screen. You should observe the choice that you made for *Alarm Type* displayed.
Using the blue up and down arrow keys highlight *Hysteresis* and press the **Enter** key. A numeric pad is displayed to allow you to enter a value. Press the applicable numeric keys and press **Enter**. The range for the Hysteresis is: **0** to **9999**. If you are configuring more than one alarm, follow the above instructions for each alarm that you are configuring.
Pressing the **Esc** key returns you to the Menu Screen.

Relay Assignments

Highlight the relay (**Relay 1** – **Relay 8**) that you wish to assign and press the **Enter** key to display a screen that has the following choices:

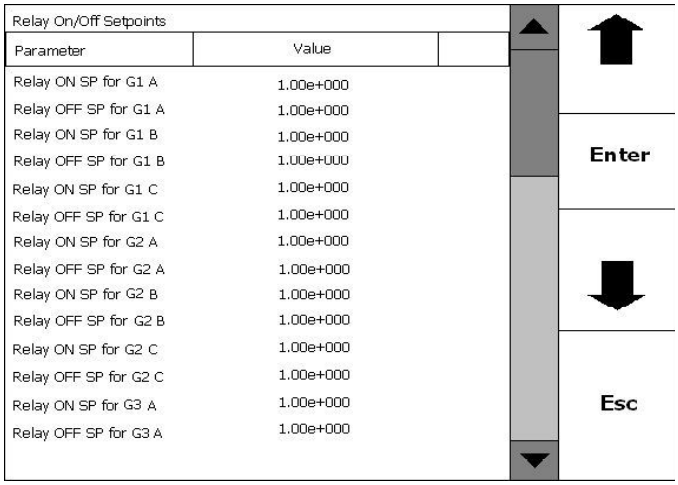
- Loop 1 fwd
- Loop 1 rev
- Loop 2 fwd
- Loop 2 rev
- Loop 3 fwd
- Loop 3 rev
- Programmer alarm
- Alarm 1
- Alarm 2
- Alarm 3
- Event 0 through Event 15
- Out gas hold
- Gauge 1 Relay SP A
- Gauge 1 Relay SP B



- Gauge 1 Relay SP C
- Gauge 2 Relay SP A
- Gauge 2 Relay SP B
- Gauge 2 Relay SP C
- Gauge 3 Relay SP A
- Gauge 3 Relay SP B
- Gauge 3 Relay SP C
- Gauge 4 Relay SP A
- Gauge 4 Relay SP B
- Gauge 4 Relay SP C
- Event 16 – Event 47

Pressing the **Cancel** key will return you to the Relay Assignment screen.
Pressing the **Esc** key returns you to the Menu Screen.

Relay Setpoints



Highlighting one of the choices allows the operator to change the value of the highlighted selection using the numeric keypad that pops up.
These values are only valid if the assigned relay has been assigned IN? Relay SP? (where ? = actual value) on the *Relay Assignment* Screen.
Pressing the **Esc** key returns you to the Menu Screen.

Analog Input Setup

Pressing the **Enter** key takes you to a two-zone screen with the top zone showing the three analog inputs. Pressing the blue up and down keys highlights one of the inputs. Pressing the **Enter** key takes you to a menu of parameters that can be assigned to any of the three inputs. Included are thermocouple types, voltages, and current inputs.

The lower zone of the Input Setup Screen contains a table.

Parameter	Value
TC Type	S
Filter Time	0
Initial Scale	0
Full Scale	3000
Decimal Point Location	0
Open TC	Up scale
Input offset	0
Use curve	0

Selecting the input type of Inputs 1 through 3 automatically places that parameter in the first table cell (TC Type). Using the blue up and down arrow keys to highlight the table cell below the parameter TC Type, and pressing the **Enter** key brings up a numeric keypad that allows you to type in the parameter that is appropriate. If no parameter is necessary simply move the highlight down to the next parameter and enter that if required. Continue until all values associated/required by the input type have been entered. Pressing the **Esc** key takes you back to the Configuration Menu.

NOTE: See the following list of Input Selections

Input type selections for the Series 9220 -

Input Type Options	T/C's B, C, E, J, K, N, NNM, R, S, T
	781.25, 195.3125, 25, 12.5, 2.5 and 1.25 Volts
	78.125, 19.53125 Millivolts
	4 – 20 mA (124 Ohm precision shunt required)
	25 Volts (Requires internal jumper)
	12.5 Volts (Requires internal jumper)
	781.25 Millivolts (Requires internal jumper)
	195.3125 Millivolts (Requires internal jumper)

Analog Output Setup

Parameter	Value
Assignment	
Offset	
Range	
Current Selection	

Pressing the **Enter** key takes you to a page similar to the *Analog Input Setup* screen with the exception that there are two outputs, not three inputs.

Pressing the **Enter** key when Output 1 is highlighted displays a screen with many parameters listed that could be assigned to Output 1. Remember that this is **NOT** control output, but an auxiliary output. For example you can re-transmit PV1 (Process Variable) to a chart recorder or an analog input board in a PLC. Pressing the **Enter** button assigns whichever parameter you have highlighted as the value for the assignment parameter.
The list of *Assignment*s are:

- PV 1 retrans
- Loop 1 inc
- Loop 1 dec
- Loop 1 combo
- PV 2 retrans
- Loop 2 inc
- Loop 2 dec
- Loop 2 combo
- PV 3 retrans
- Loop 3 inc
- Loop 3 dec
- Loop 3 combo
- Input 1 retrans
- Input 2 retrans
- Input 3 retrans
- G1 log of torr
- G1 linear torr

- G1 microns
- G2 log of torr
- G2 linear torr
- G2 microns
- G3 log of torr
- G3 linear torr
- G3 microns
- G4 log of torr
- G4 linear torr
- G4 microns

The *Offset* and *Range* have a range of: **-32767** to **32767**.
By pressing **Enter** when the *Current Selection* is highlighted will cycle through its options: **0-20 mA** and **4-20 mA**.
The blue up and down arrow keys highlight either Output 1 or Output 2. Pressing the **Enter** key takes you to a list of outputs. Selecting an output returns a screen similar to the one below.
Pressing the **Esc** key returns you to the Configuration Menu.

Passcode and Alarm

Highlighting *Passcode and Alarm* and pressing the **Enter** key takes you to the following screen:

Parameter	Value
Level 1 Code	1
Level 2 Code	2
Web Level 1 Code	111
Web Level 2 Code	222
Web Change Enable	1
No Alarm	Contact is Open (NO)
Alarm Text Setup	
Alarm 0	User Alarm 0
……	……..
Alarm 99	User Alarm 99

The values shown in the above table are the default values. The level 1 code is the supervisor code and the level 2 code is the administrator code. The web level 1 code is for the 9220's web page's supervisor code, and the web level 2 code is for the 9220's web page's administrator code.
The parameter *NO ALARM* means that if there is no controller alarm, the controller alarm relay is NO. Scroll down until *NO ALARM* is highlighted. Press **Enter**. On the numeric keypad use a **1** and press the **Enter** key to change the state of the relay to *Contact is Closed*, and use a **0** and press the **Enter** key to change the state of the relay to *Contact is Open*. This allows the operator to assign the controller alarm as a NC contact such as a 1400° F alarm.
When highlighting a parameter and pressing the **Enter** key a numeric keypad is displayed allowing you to enter your value. Enter that value using the touch-screen keypad and press the **Enter** key. The change will be made. Press the **Esc** key to return to the Configuration Menu.
Alarm 0 through 99
Highlighting *Alarm ??* and pressing the **Enter** key displays an alphanumeric keyboard. Type the alarm text that you wish to be displayed. Pressing the **Enter** key returns you to the previous screen. These text messages will be displayed on the Loops Screen when generated by the program and active.

IP Address

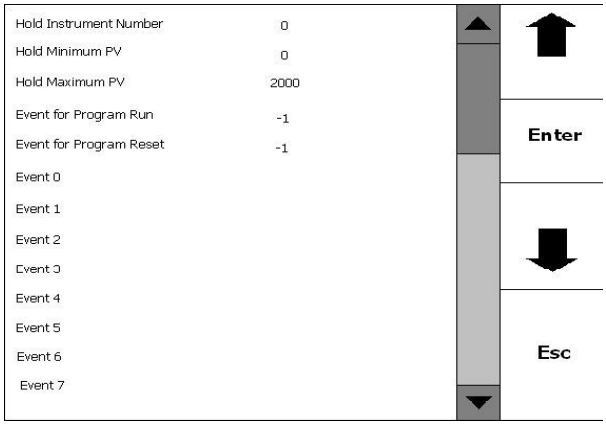
Highlighting *IP Address* and pressing the **Enter** key displays the following screen.

Parameter	Value
IP Address 1	192
IP Address 2	168
IP Address 3	0
IP Address 4	200
IP Address Mask 1	255
IP Address Mask 2	255
IP Address Mask 3	255
IP Address Mask 4	0
IP Address Gateway 1	192
IP Address Gateway 2	168
IP Address Gateway 3	1
IP Address Gateway 4	1

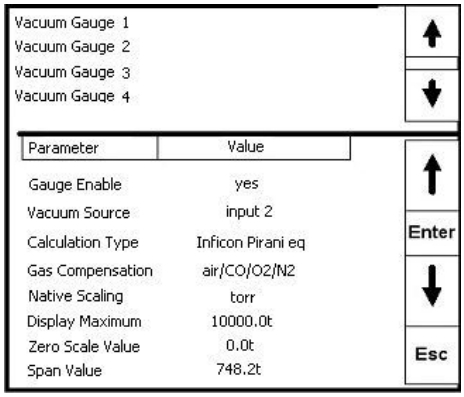
Highlighting whichever parameter needs to be entered and pressing the **Enter** key displays a numeric keypad that can be used to enter the required value. Pressing the **Esc** key returns you to the Configuration Menu.

The default IP Address is: 192.168.0.200
The default IP Address Mask is: 255.255.255.0
The default IP Address Gateway is: 192.168.1.1

Event Control



Hold Instrument Number defines the Slave Instrument to be placed in hold (normally used with Soak) if the Process Variable goes below the value entered in *Hold Minimum PV*, or above *Hold Maximum PV*. Highlighting your choice to be changed and pressing the **Enter** key moves you to a numeric keypad that allows you to enter a new value by touching the appropriate keys. Once you have made the change pressing the **Enter** key takes you back to the previous screen. Once again pressing the **Esc** key takes you back to the Event Control Screen without making the changes.
Event for Program Run defines which event contact will start the program identified on the Event Run Program Setup Screen.
Event for Program Reset defines which event contact will reset the program currently running.
NOTE: this will only reset the program, all set points, events, etc will remain in their last state.
Event 0 – Event 15 have three options to select from: **event inactive**, **event active, open triggers hold**, and **event active, closed triggers hold**.



Vacuum Gauge Setup
This menu option will allow the user to set up the vacuum gauges (**Vacuum Gauge 1** – **Vacuum Gauge 4**) for the 9220. Pressing **Enter** while the *Gauge Enable* menu option is highlighted will cycle through its options: **yes** and **no**.
The options for *Vacuum Source* are:

- Input 1
- Input 2

- Input 3
- Televac gauge 1
- Televac gauge 2
- Televac gauge 3
- Televac gauge 4

The options for *Calculation Type* are:

- None
- Linear log
- Inficon Pirani eq

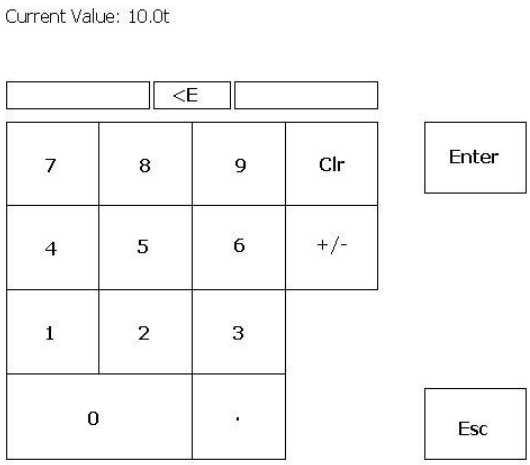
The options for *Gas Compensation* are:

- Air/CO/O2/N2
- Helium
- Neon
- Argon
- Krypton
- Xeon
- H2
- CO2
- Water Vapor
- Freon 12

The options for *Native Scaling* are:

- Torr
- Microns
- Millibars
- Bars
- Pascals
- Kilopascals
- Log of torr

The *Display Maximum*, *Zero Scale Value*, and *Span Value* are entered in exponent format, i.e. 1.0 E3, which can be written as 1.0 x 10^3, which can be written as 1.0 x 1000, which equals 1000. The box on the left is the number and the box on the right is the exponent. When the button in the middle shows **<E**, then the user can enter the number. When the button shows **E>**, then the user can enter the exponent. Pressing the button will cycle through **<E** and **E>**. The left box has a range of **–9.999999999** to **9.9999999999**, and the right box has a range of **–31** to **31**.

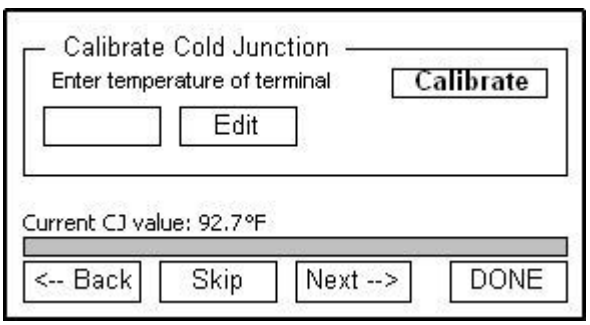


The options for *Display Scaling* are:

- Log torr
- Torr
- Microns
- Millibars
- Pascals

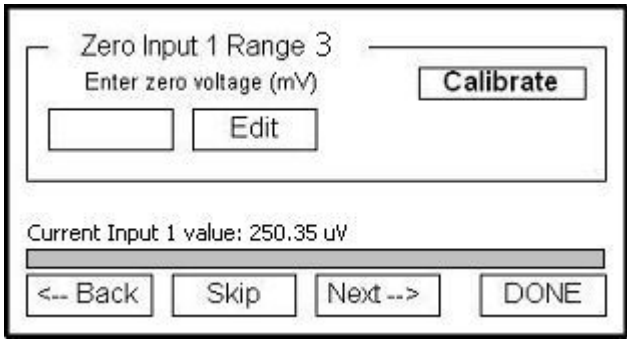
Pressing **Esc** will return you to the Main Menu.

User Calibration



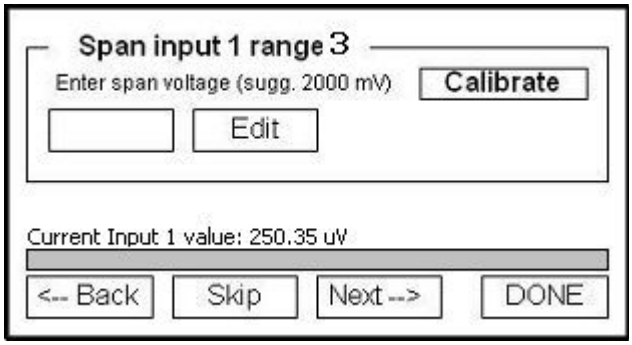
Pressing the **Edit** button displays a numeric keypad allowing you to change the Cold Junction value. After entering the new Cold Junction value, you must press **Calibrate**. Pressing the **Calibrate** key stores the

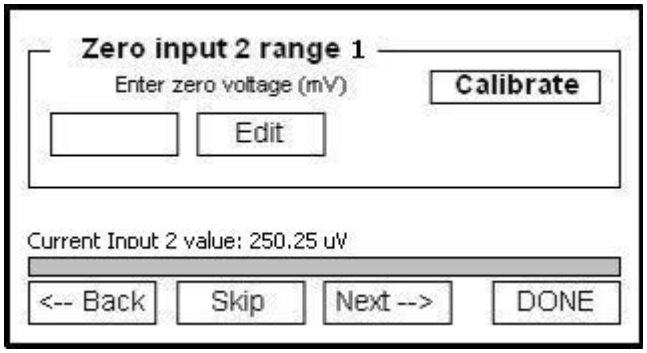
appropriate value. Pressing the **Done** will return you to the User Calibration Screen.
The current value is displayed directly above the bottom row of buttons as Current CJ value: XX.X ° F.
Pressing the **Next ->** key displays the next screen.



Pressing the **Edit** button displays a numeric keypad allowing you to change the Zero Input 1 range value. Normally terminals 31 and 32 are shorted for this step.
After entering the new Zero Input value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value. Pressing the **Done** will return you to the User Calibration Screen.
The current value is displayed directly above the bottom row of buttons as Current Input 1 value: XX.X uV.

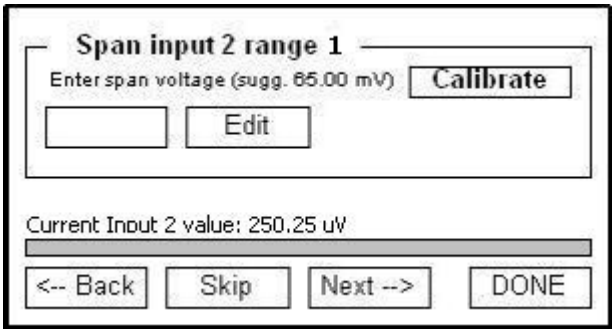
Pressing the **Next ->** key displays the next calibration screen.
Pressing the **Edit** button displays a numeric keypad allowing you to change the Span Input 1 range value. Normally terminals 31(-) and 32(+) have 2000 mV applied for this step.
After entering the new Span Input value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value. Pressing the **Done** will return you to the User Calibration Screen.



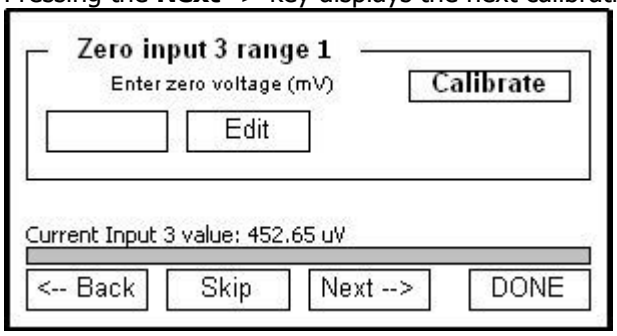


The current value is displayed directly above the bottom row of buttons as Current Input 1 value: XX.X uV.
Pressing the **Next ->** key displays the next calibration screen.
Pressing the **Edit** button displays a numeric keypad allowing you to change the Zero Input 2-range value. Normally terminals 29 and 30 are shorted for this step.
After entering the new Zero Input value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value. Pressing the **Done** will return you to the User Calibration Screen.
The current value is displayed directly above the bottom row of buttons as Current Input 2 value: XX.X uV.

Pressing the **Next ->** key displays the next calibration screen.
Pressing the **Edit** button displays a numeric keypad allowing you to change the Span Input 2-range value. Normally terminals 29(-) and 30(+) have 17.500 mV applied for this step.
After entering the new Span Input value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value. Pressing the **Done** will return you to the User Calibration Screen.
The current value is displayed directly above the bottom row of buttons as Current Input 2 value: XX.X uV



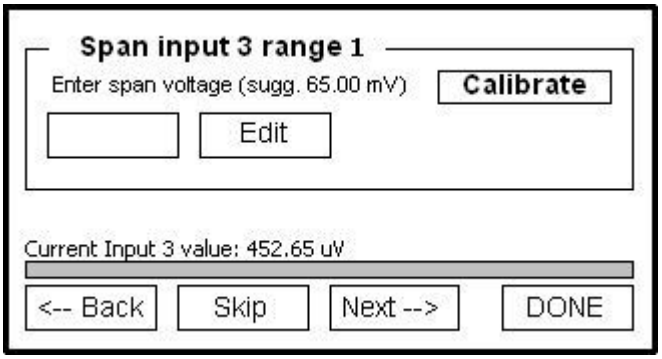
Pressing the **Next ->** key displays the next calibration screen.

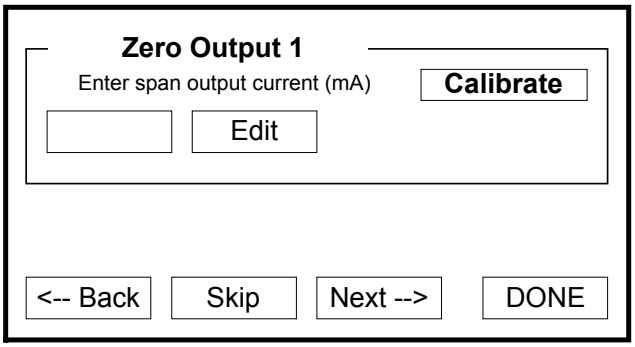


Pressing the **Edit** button displays a numeric keypad allowing you to change the Zero Input 3 range value. Normally terminals 27 and 28 are shorted for this step.
After entering the new Zero Input value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value. Pressing the **Done** will return you to the User Calibration Screen.
The current value is displayed directly above the bottom row of buttons as Current Input 2 value: XX.X uV.

Pressing the **Next ->** key displays the next calibration screen.

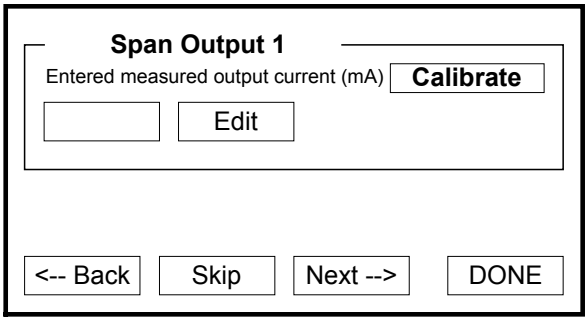
Pressing the **Edit** button displays a numeric keypad allowing you to change the Span Input 3 range value. Normally terminals 27(-) and 28(+) have 65.000 mV applied for this step.
After entering the new Span Input value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value. Pressing the **Done** will return you to the User Calibration Screen.
The current value is displayed directly above the bottom row of buttons as Current Input 3 value: XX.X uV

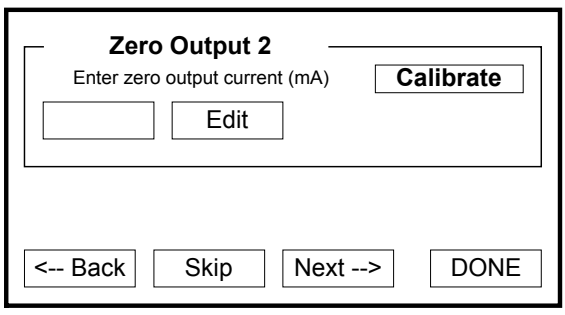




Pressing the **Next ->** key displays the next calibration screen.
Pressing the **Edit** button displays a numeric keypad allowing you to change the Zero Output 1 value - measured at terminals 24(-) and 25(+) for this step. After entering the new Zero Output value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value. Pressing the **Done** will return you to the User Calibration Screen.
Pressing the **Next ->** key displays the next calibration screen.

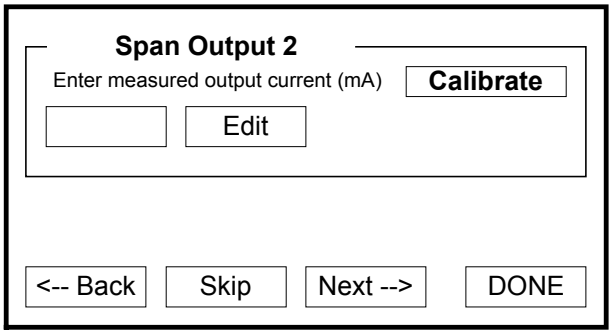
Pressing the **Edit** button displays a numeric keypad allowing you to change the Span Output 1 value - measured at terminals 24(-) and 25(+) for this step. After entering the new Span Output value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value. Pressing the **Done** will return you to the User Calibration Screen.





Pressing the **Edit** button displays a numeric keypad allowing you to change the Zero Output 2 value - measured at terminals 26(-) and 25(+) for this step. After entering the new Zero Output value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value. Pressing the **Done** will return you to

the User Calibration Screen.
Pressing the **Edit** button displays a numeric keypad allowing you to change the Span Output 2 value - measured at terminals 26(-) and 25(+) for this step. After entering the new Span Output value you must press **Calibrate**. Pressing the **Calibrate** key stores the appropriate value.
Pressing the **Done** button will return you to the User Calibration Screen.
Pressing the **Next ->** displays a screen that indicates that the calibration process is complete.



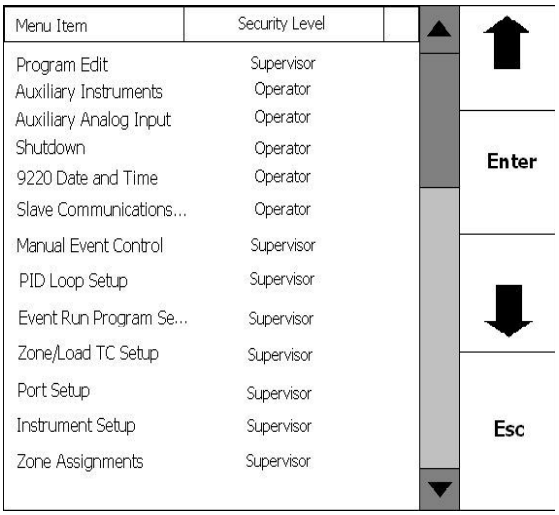
Pressing the **Done** key at the bottom right of the screen takes you back to the Configuration Menu.

Full Calibration

Used by SSi personnel**.**

Set Menu Security

Highlighting a specific screen (using the blue up and down arrows) and pressing the **Enter** key changes the displayed Security Level of the highlighted screen.



The additional items on the screen are as follows:

Furnace Setup	Supervisor
Default Wait Limits	Administrator
Furnace Name	Administrator
Alarm Setup	Administrator
Relay Assignments	Administrator
Relay Setpoints	Administrator
Analog Input Setup	Administrator
Analog Output Setup	Administrator
Passcode and Alarm	Administrator
IP Address	Administrator
Event Control	Administrator
Vacuum Gauge Setup	Administrator
User Calibration	Administrator
Full Calibration	Administrator
Set Menu Security	Administrator
Read/Write Raw Data	SSi
Curve Entry	Administrator
Alternate PID Setup	Administrator
Analog Input Board Setup	Administrator
ADAM Correction	Administrator
Aux SP Configuration	Operator

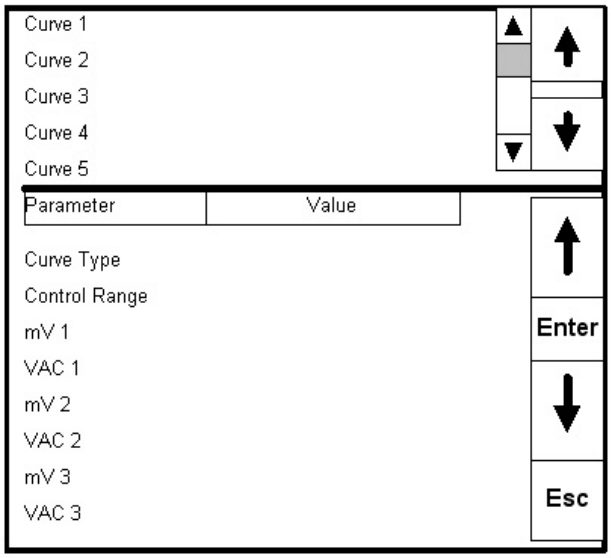
The four Security Levels available are:

Operator	Level 1	Full access to the indicated screen
Supervisor	Level 2	Access to screen is limited by Passcode (Passcode and Alarm Screen)
Administrator	Level 3	Access to screen is limited by Passcode (Passcode and Alarm Screen)
SSi	Level 4	Used by SSi personnel for configuration purposes

Each level has access to the levels below, i.e., a user logged in as Administrator can access Administrator, Supervisor, and Operator level screens.

Read/Write Raw Data

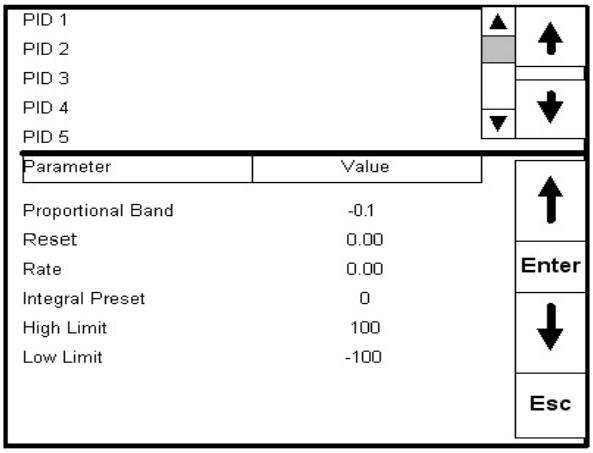
Used by SSi personnel**.** Do not make changes to this screen until after contacting SSi personnel at 800-666-4330.



Curve Entry

This screen is used to install custom curve information for *Curve 1* through *Curve 5*. It is normally used in Vacuum or Nitriding Furnace applications, and only should be used after contacting SSi personnel at 800-666-4330.
Pressing **Enter** while *Curve Type* is selected will cycle through the types of curves available: **linear** or **invalid curve**.
The *Control Range* has a range of **0** to **32000**.
The *mV 1 – mV 32* have a range of **0** to **32000**.
The *Vac 1 – Vac 32* have a range of **0** to **32000**.
Pressing **Esc** will return you to the Main Menu.

Alternate PID Setup



This screen is used to enable up to 16 sets of alternate PID's for control purposes. It is implemented with the PID Select Opcode in the program.

By using the upper blue up and down arrow, you can highlight the PID set (*PID 1* through *PID 16*, *Loop 1*, *Set 1* through *Set 3*, *Loop 2*, *Set 1* through *Set 3*, or *Loop 3*, *Set 1* through *Set 3*) to be modified, then press **Enter** to display the parameters associated with that PID set. By using the lower blue up and down arrows (above and below the **Enter**) you can highlight the desired parameter. Once highlighted, pressing **Enter** will display a numeric keypad, with the current value displayed. By selecting the new value and **Enter**, you have entered the new desired value.

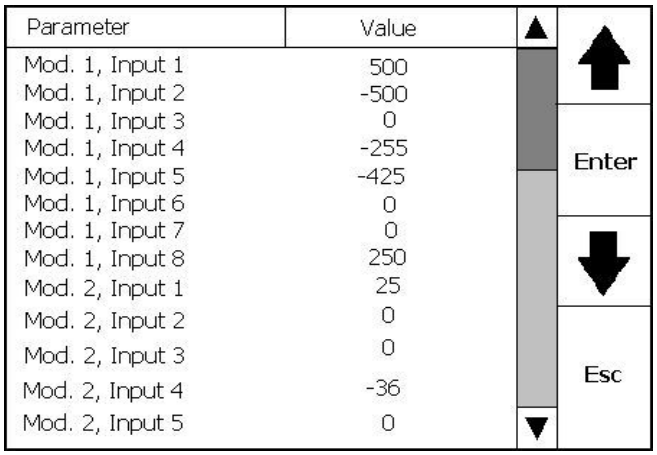
The *Proportional Band* has a range of **0** to **999**.
The *Reset* and the *Rate* have a range of **0.00** to **10.00**.
The *Integral Preset*, *High Limit*, and *Low Limit* have a range of **–100** to **100**.
Pressing **Esc** will return you to the Alternate PID Setup Screen.
Pressing **Esc** will return you to the Main Menu.

Analog Input Board Setup

Used by SSi personnel**.** Do not make changes to this screen until after contacting SSi personnel at 800-666-4330.

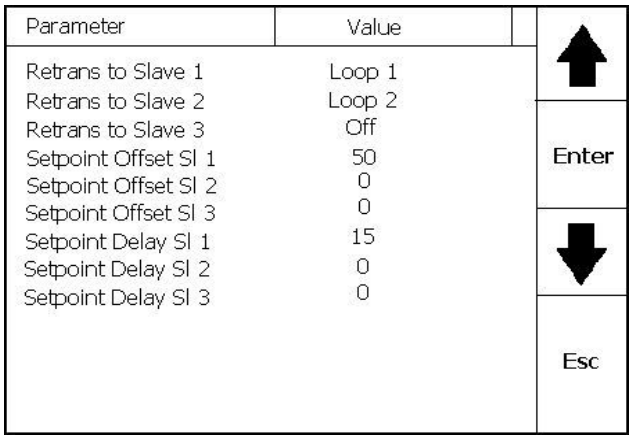
ADAM Correction

The ADAM module offset correction menu option gives the user the ability to offset any input on any ADAM module for up to five ADAM modules. There are eight inputs per module. The offset can be in degrees + or -, and it is typically used to compensate for incorrect T/C wires. The offsets are entered and displayed



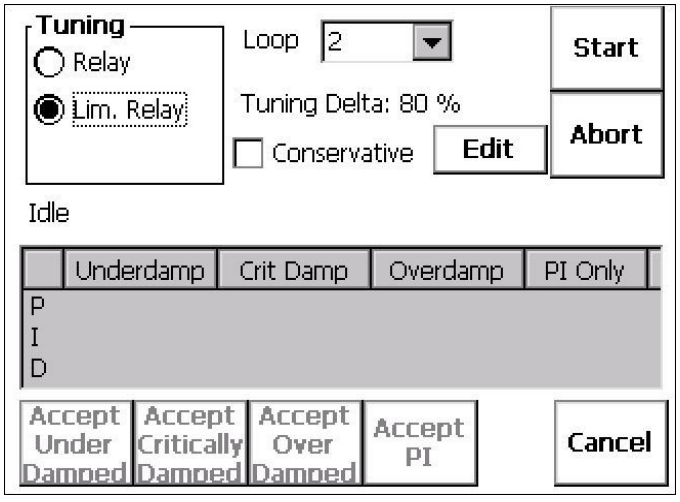
on the screen without decimal points. For example, an offset of **255** would actually be an offset of **25.5** degrees **+**, and an offset of **–85** would be an offset of **8.5** degrees **-**. The range of the offsets is **–50.0** to **50.0**.

Aux SP Configuration



This menu option allows for up to three slave instruments to have the setpoint retransmitted from one of the three control loops. This menu option is typically used to retransmit an alarm setpoint value to an overtemp controller.
The "Retrans to Slave 1", "Retrans to Slave 2", and "Retrans to Slave 3" menu options each have four options to select: **Off**, **Loop 1**, **Loop 2**, or **Loop 3**. These options will allow the user to select which, if any, values to retransmit to the selected slave instrument.
The "Setpoint Offset Sl 1", "Setpoint Offset Sl 2", and "Setpoint Offset Sl 3" menu options can be a number between **–32767** and **32767**. These options will allow the user to set the destination offset for the selected slave instrument.
The "Setpoint Delay Sl 1", "Setpoint Delay Sl 2", and "Setpoint Delay Sl 3" menu options can be a number between **–32767** and **32767**. These options will allow the user to set the delay, in seconds, before the setpoint is retransmitted to the selected slave instrument.

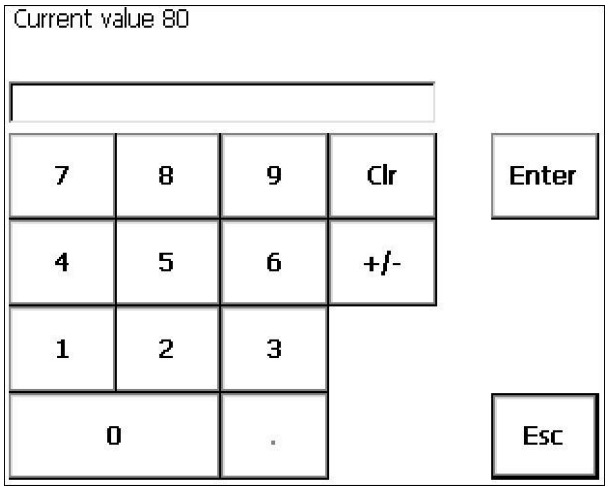
Tuning Assistant



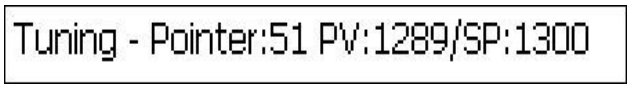
The Tuning Assistant menu option will allow the user to automatically generate the PID loop settings for the control loops in the 9220 controller.

Note: The four buttons at the bottom of the screen: ***Accept Under Damped****,* ***Accept Critically Damped****,* ***Accept Over Damped****, and* ***Accept PI*** *will be inaccessible until some PID settings are loaded into the PID settings list above the buttons*. The **Cancel** button in the bottom right of the screen will close down the screen. The user can select the loop to use from the drop down list next to "Loop" at the top of the screen. The loop choices are: **1**, **2**, or **3**. This will select the specific loop to perform the

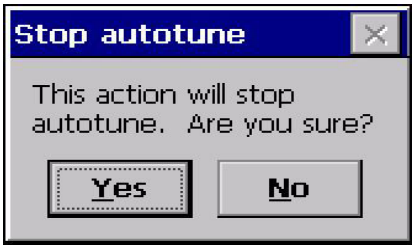
auto tune on. The user can select the tuning option from the "Tuning" section on the top left of the screen. The choices are: **Relay** and **Lim. Relay** (Limited Relay). This option will allow the user to limit the output value while the controller is controlling the furnace. Normal operation will typically use 100 % output. When the limited relay option is selected, the "Tuning Delta:" label and the **Edit** button will be displayed. When the **Relay** option is selected, the "Tuning Delta:" label and the **Edit** button will be hidden. The "Tuning Delta:" value will be the amount to limit the controller by. Pressing the **Edit** button will display the numeric keypad, which will allow the user to enter the limiting value.



The current value will be displayed at the top of the screen. Enter the new value and press the **Enter** button to set the value. Pressing the **Esc** button will cancel the change.



The "Conservative" option will allow the user to minimize, if not remove, the possibility for an overshoot of the setpoint. If a small overshoot is acceptable, leave the "Conservative" checkbox unchecked. If, however, no overshoot is desired, then checking the "Conservative" checkbox will accomplish this.



Pressing the **Start** button will begin the auto tune process. *Note: The process may take a few seconds to start*. The "Idle" line will change to display the calibration process for the auto tune. The line will display a pointer value, along with the process variable value and the setpoint.

*Note: The **Start** button will be disabled while the calibration is running*. Pressing the **Abort** button will abort the process. If the **Cancel** button is pressed while a calibration is running, a message box will be displayed confirming the action.

Pressing the **Yes** button will stop the auto tune calibration and exit the screen. The **No** button will cancel the abort process.

When the calibration is finished, the PID settings list will be populated with suggested values and the four buttons underneath will be enabled. The line above the PID settings list will read "Idle" again as well.

	Underdamp	Crit Damp	Overdamp	PI Only
P	1.2	1.8	2.4	1.3
I	3.69	1.84	1.23	1.10
D	0.10	0.13	0.13	

The user has the option to select only one of these sets of values: either the Under Damped set, the Critically Damped set, the Over Damped set, or the PI set. To select the set of values, press the corresponding button. For example, to select the Critically Damped set of values, press the **Accept Critically Damped** button. The under damped values will reach the setpoint faster, but there will be more overshoot involved. The over damped values will work to minimize the overshoot, but it will be slower than the under damped values. The critically damped values are considered the "optimum" values because they are a balance between the under damped and over damped values with regards to time and overshoot. The PI values are just the

proportional band and the reset value (the *P* and the *I* from *PID*). This could be applicable in an atmosphere loop, where the rate won't have much effect.
Once a set of values has been accepted, the user can press the **Cancel** button to exit the screen. The accepted values can be viewed on the *PID Loop Setup* menu option*. Note: Once the screen is closed out, the PID settings values will be lost*. To populate these values again, another calibration routine will need to be run.

Chapter 3 - PROGRAMS

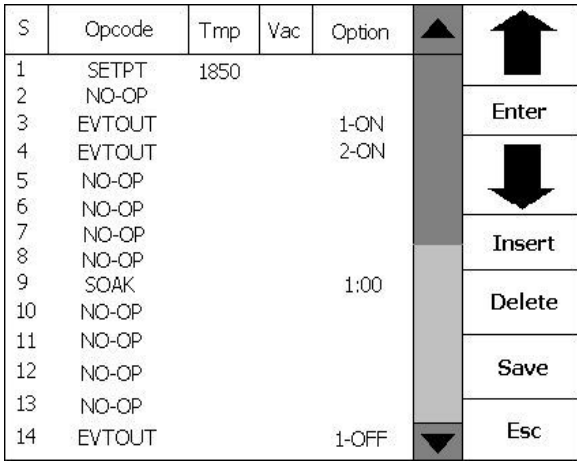
Overview

The program format used in the SERIES 9220 provides a simple but powerful recipe language for controlling the heat-treat process. The SERIES 9220 can store up to 300 programs of twenty-four steps each. Each step consists of an opcode that defines what is done at this step. The step can also contain vacuum, temperature, and option data.

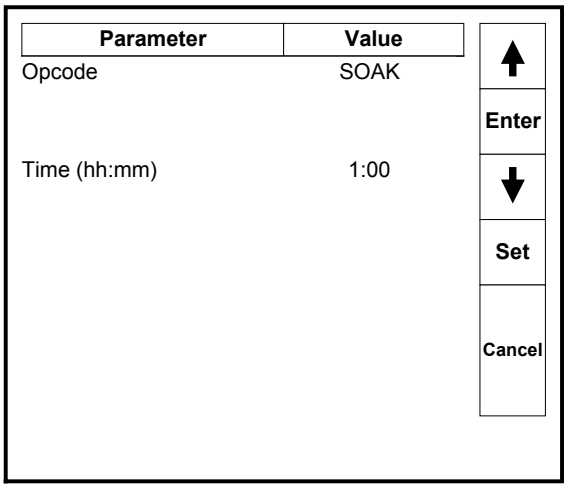
The programmer also has alarm capability that can be turned on during a program to monitor deviations and high and low limits while the program is running.

Program Editing

The Program Edit Display is accessed through the Menu key on the Default Display Screen. Pressing the **Menu** key displays a screen that contains the configuration items that all personnel are allowed to perform. On that screen, running down the right side are five buttons. Below the blue down arrow key is the **Login** key. Pressing this key displays a numeric keypad that allows you to enter the passcode to get to the configuration level (default as shipped from SSi is the number **2**). Entering the password and then pressing the **Enter** button displays the many configuration options; the first option is *Program Editing*. Highlighting this parameter and pressing the **Enter** key displays a numeric screen pad that asks you to enter the number of the program that you wish to edit. Pressing that recipe number and then pressing **Enter** displays that particular recipe. You may have to CLEAR the recipe number that is shown in the display box if the number of the recipe to be edited was not the last recipe run on the system. Press the **Clr** button on the numeric keypad and then enter the number for the recipe that you wish to edit. To edit a step in the recipe, using the up and down arrow keys, highlight the step that you wish to edit and press the **Enter** key.



Highlighting the parameter that you wish to edit and pressing the **Enter** key takes you to the appropriate menu, either that of the opcode choices, or a numeric keypad to allow you to change the time.
After making the change, press the **Set** button twice to have the change take place. This returns you to the Program Edit Screen. At this time you can choose to save the program as the same number, or if you have edited the program to save the program as a new recipe number, make the choice at this time and press the **Save** button. This is a quick way to make new recipes using an already existing recipe and changing only those steps that need to be changed.
Pressing the **Cancel** button on either display takes you back to the Edit Screen without making any changes.



Chapter 4 - SERIES 9220 Opcodes

Programmer Description

The SERIES 9220 Recipe Programmer provides a convenient operator interface and recipe programmer.

The programmer uses enhanced opcodes that reduce the number of steps required for a program. Each step consists of an opcode, a temperature value, a vacuum value, and an option value. The opcode determines how and if each of the three values is used.

Opcodes

NO-OP This no operation code does nothing and is used as a place hold on programs that are less than 24 steps.

ALARM This alarm function is used to notify the operator that an operation is complete or that a manual action is required. By use of the *Passcode and Alarm* menu screen, up to 99 User Alarms can be assigned, with a short text on each that is displayed during an active alarm condition. The program waits until the alarm is acknowledged to proceed.

BRANCH The *Branch* opcode can change program flow based upon an inquiry opcode. The temperature data is interpreted as a program step if the inquiry is true and the vacuum data as a program step if the inquiry is false.

DELAY This opcode is used when a short delay is needed. The option value is the delay time in seconds, up to 500 seconds.

DEVAL This deviation alarm opcode is used to turn the temperature or vacuum deviation alarms ON or OFF.

The option values are:

- OFF, turns off both the temperature and vacuum alarms;
- TEMPERATURE, turns on the temperature alarm and turns off the vacuum alarm;
- VACUUM, turns on the vacuum alarm and turns off the temperature alarm; and
- BOTH, turns on both the temperature and the vacuum alarms.

The band limit can be changed by the *SET_WAIT* opcode.

DOWINQ This opcode checks the real time clock for the day of the week. This is useful for performing operations on a weekly basis on a specific day. The option data is the day of the week, i.e. SUN, MON, TUE, WED, THU, FRI, and SAT.

EVTINPUT This opcode waits for an input event to be turned ON or OFF depending on the option value. The option value is the event number followed by either ON or OFF.

If temperature data and/or vacuum data are specified, they are considered set points and will be sent to the appropriate controller.

EVTOUTPUT The event output opcode turns ON or OFF an output event based upon the option value. The option value is the event number followed by either ON or OFF.

If temperature data and or vacuum data are specified, they are considered set points and will be sent to the appropriate controller.

GHSOAK This is a guaranteed soak high opcode. The temperature process value must be above the deviation band to allow the soak timer to run. The vacuum data is the hold alarm delay, in minutes, and the option value is the soak time in hours and minutes. The band limit can be changed by the *SET_WAIT* opcode.

GLSOAK This is a guaranteed soak low opcode. The temperature process value must be below the deviation band to allow the soak timer to run. The vacuum data is the load alarm delay, in minutes, and the option value is the soak time in hours and minutes. The band limit can be changed by the *SET_WAIT* opcode.

GOSUB The go to subroutine opcode is used to call a program to run and then return to the calling program. This is used to execute standard routines that can be used by many programs. *GOSUBs* can be stacked up to eight levels. The option data is the program number to call.

GRAMP This is a guaranteed ramp opcode. The process value must be within the deviation band to allow the ramp timer to run. The temperature data is the temperature set point, and the option data is the ramp time in hours and minutes. The band limit can be changed by the *SET_WAIT* opcode.

GSOAK This is a guaranteed soak opcode. The temperature process value must be within the deviation band to allow the soak timer to run. The vacuum data is the hold alarm delay, in minutes, and the option value is the soak time in hours and minutes. The band limit can be changed by the *SET_WAIT* opcode.

GTCINQDEL This is a guaranteed TC inquiry short delay opcode. It is used to verify that all active thermocouples are within the set wait limits around the setpoint for the user defined time period. The temperature data is the delay time in seconds. The vacuum data is the control TC or the load tc's. The option data is: wait, wait up, or wait down.

GZRAMP This is a guaranteed ramp opcode for a zone. The process value must be within the deviation band to allow the ramp timer to run. The temperature data is the temperature set point, and the option data is the ramp time in hours and minutes. The band limit can be changed by the *SET_WAIT* opcode.

GZ_SOAK This is a guaranteed soak opcode for a zone. The temperature process value must be within the deviation band to allow the soak timer to run. The vacuum data is the hold alarm delay, in minutes, and the option value is the soak time in hours and minutes. The band limit can be changed by the *SET_WAIT* opcode.

GZHSOAK This is a guaranteed soak high opcode for a zone. The temperature process value must be above the deviation band to allow the soak timer to run. The vacuum data is the hold alarm delay, in minutes, and the option value is the soak time in hours and minutes. The band limit can be changed by the *SET_WAIT* opcode.

GZLSOAK This is a guaranteed soak low opcode for a zone. The temperature process value must be below the deviation band to allow the soak timer to run. The vacuum data is the load alarm delay, in minutes, and the option value is the soak time in hours and minutes. The band limit can be changed by the *SET_WAIT* opcode.

HIALM This opcode is used to enable a high limit alarm on the temperature process and/or the vacuum process. The temperature data is the high limit point for the temperature process. The vacuum data is the high limit point for the vacuum process. This alarm remains active until the program ends.

HIPO This opcode is used to enable a high limit alarm on the temperature percent. The temperature data is the high limit point for the temperature percent output. This alarm remains active until the program ends.

IDSET This opcode is used to set the ID number to the value specified in the temperature data. The vacuum and option data are not used. The ID number is provided as a feature to track loads or jobs and is not used by any controller.

IDINC This opcode increments the ID number by one. No data is required.

IDINQ This opcode is used to compare the ID value to the value in the temperature data. The *LIMIT* opcode immediately following this opcode sets a time limit on the wait. A *BRANCH* opcode immediately following this opcode can be used to change the program flow based on the inquiry results.

JUMP The *JUMP* opcode is used to go to another program when no return is needed. The option data is the program number to execute next. The difference between a *JUMP* and a *GOSUB* is that *GOSUB* will return to the original program when the called program completes. A *JUMP* will not return to the original program.

LIMIT This option is used to place a time limit on a wait or inquiry step. The option data is the time limit to wait in hours and minutes. Should the time run out before the wait or inquiry is satisfied an alarm occurs.

LOWALM This opcode is used to enable a low limit alarm on the temperature process and/or the vacuum process. The temperature data is the low limit point for the temperature process. The vacuum data is the low limit point for the vacuum process. This alarm remains active until the program ends.

LOWPO This opcode is used to enable a low limit alarm on the temperature percent output. The temperature data is the low limit point for the temperature percent output. This alarm remains active until the program ends.

MEVT_OUT_0 This opcode will set multiple output events **0** through **15**. The temperature data is an optional temperature setpoint, the vacuum data is the event mask, which is the events affected, and the option data is the event ON/off bitmap, which will set the final condition of the events if the event mask. The opcode will ignore the bits not in the mask and either set or reset the bits depending upon their states in the bitmap.

MEVT_OUT_1 This opcode will set multiple output events **16** through **31** (if available). The temperature data is an optional temperature setpoint, the vacuum data is the event mask, which is the events affected, and the option data is the event ON/off bitmap, which will set the final condition of the events if the event mask. The opcode will ignore the bits not in the mask and either set or reset the bits depending upon their states in the bitmap.

MEVT_OUT_2 This opcode will set multiple output events **32** through **47** (if available). The temperature data is an optional temperature setpoint, the vacuum data is the event mask, which is the events affected, and the option data is the event ON/off bitmap, which will set the final condition of the events if the event mask. The opcode will ignore the bits not in the mask and either set or reset the bits depending upon their states in the bitmap.

MEVT_IN_0 This opcode waits for multiple input events **0** through **15**. The temperature data is an optional temperature setpoint, the vacuum data is the enabled events, which is the events affected, and the option data is the check event ON, which is the bitmap of events to wait on. The opcode ignores the bits not in the enabled events and waits on the bits specified in the bitmap.

MEVT_IN_1 This opcode waits for multiple input events **16** through **31** (if available). The temperature data is an optional temperature setpoint, the vacuum data is the enabled events, which is the events affected, and the option data is the check event ON, which is the bitmap of events to wait on. The opcode ignores the bits not in the enabled events and waits on the bits specified in the bitmap.

OG_HOLDM This opcode is used to set a vacuum level maximum in microns. The program will automatically place itself in hold if the value goes above the user defined level. The options are: disable, Gauge 1, Gauge 2, Gauge 3, or Gauge 4.

OG_HOLT This opcode is used to set a vacuum level maximum in torr. The program will automatically place itself in hold if the value goes above the user defined level. The options are: disable, Gauge 1, Gauge 2, Gauge 3, or Gauge 4.

PIDLOAD This opcode will load an alternate PID set from the controller memory. The temperature data is the Loop 2 PID, the vacuum data is the Loop 1 PID, and the option data is the Loop 3 PID. A value of **–1** will disable each Loop PID. **1** – **16** will load the corresponding alternate PID set up on the *Alternate PID Setup* menu screen.

POINQ The percent output inquiry is used to test the actual percent output of the temperature controller.

The options are:

- wait, reach within band;
- wait up, reach or exceed the specified value;
- or wait down, reach or be less than the specified value.

The *LIMIT* opcode immediately following this opcode sets a time limit on the wait.
A *BRANCH* opcode immediately following this opcode can be used to change the program flow based on the inquiry results.

QTCset This is the quench setpoint opcode. This will allow the user to set the setpoint for a quench cycle. The temperature data is the temperature setpoint.

QUENCH This opcode is used to start a quench cycle. The quench cycle is independent of any program that is running. The temperature data is the quench temperature controller set point. The vacuum data is the quench time in minutes. The option data can be used to control the agitator speed, high or low, by Event # 6. Event # 6 OFF equals low speed, and Event # 6 ON equals high speed. The quench temperature controller must be *Aux Instrument # 4*. The quench cycle starts when the opcode is executed. The set point is sent to the quench temperature controller, the timer is started, and the high-speed event is turned on if it is selected. When the quench timer times out, the end of quench cycle (event # 7) is turned on for one second and the high speed event is turned off.

RAMP This opcode changes the temperature set point linearly over time. The temperature data specifies the final set point for the temperature set point. The option data is the total ramp time in minutes.

RAMPR This opcode changes the temperature set point at a rate of degrees per minute. The temperature data is the final setpoint for the temperature controller. The option data is the rate of degrees per minute.

RESET This opcode is used to clear all stacks and timers and start a program. The temperature data is interpreted as a program number and the vacuum data as a program step to start. The option data is not used. The RESET is useful in a weekend shut down program to restart the normal operating program.

RLYINQ This is a relay state inquiry. The temperature data is the step to go to if the relay is On. The vacuum data is the step to go to if the relay if Off. The options are: relay 0, relay 1, relay 2, relay 3, relay 4, relay 5, or relay 6.

RLYSPM This opcode enables an On/Off setpoint in microns based on the readings from a selected vacuum gauge. This is used to set partial pressure values. The temperature data is the Off setpoint. The vacuum data is the On setpoint. The option data can be:

- 1A
- 1B
- 1C
- 2A
- 2B
- 2C
- 3A

RLYSPT This opcode enables an On/Off setpoint in torr based on the readings from a selected vacuum gauge. This is used to set partial pressure values. The temperature data is the Off setpoint. The vacuum data is the On setpoint. The option data can be:

- 1A
- 1B
- 1C
- 2A
- 2B
- 2C
- 3A

RUN_SLAVE Starts a recipe on the specified slave SSI recipe programmer instrument. The temperature data is the recipe number, the vacuum data is the step number, and the option data is the slave instrument (SSi recipe programmers only).

SETWAIT This opcode sets the band limits for the wait option or inquiry opcodes. The temperature data specifies the temperature band (i.e. +/- the value) and the vacuum data specifies the vacuum level.

SETPT This opcode is used to set the temperature and/or vacuum set points. Either or both of the set points can be specified. The options are Wait, Wait Up, or Wait Down. If both set points are specified the Wait applies to both.

SOAK This opcode is an unconditional soak for the time (in hours and minutes) specified in the option data.

TC_Z_INQ The zone temperature inquiry is used to wait for the actual control zone temperature to reach the value specified in the Temperature data.
The options are:

- wait, reach within band
- wait up, reach or exceed the set point
- wait down, reach or be less than the set point

The default band can be set under the Configuration Menu and is typically 15 degrees. The band limit can be changed by the S*ET_WAIT* opcode.
The *LIMIT* opcode immediately following this opcode sets a time limit on the wait. A *BRANCH* opcode immediately following this opcode can be used to change the program flow based on the inquiry results.
This opcode is identical to the *TINQ* opcode, except that it will deal with zones.

TINQ The temperature inquiry is used to wait for the actual control temperature to reach the value specified in the "temp" field.

The options are:
- wait, reach within band;
- wait up, reach or exceed the set point;
- or wait down, reach or be less than the set point.

The default band can be set under the Configuration Menu and is typically 15 degrees. The band limit can be changed by the S*ET_WAIT* opcode.
The *LIMIT* opcode immediately following this opcode sets a time limit on the wait. A *BRANCH* opcode immediately following this opcode can be used to change the program flow based on the inquiry results.

TOD_INQ This opcode is a time of day inquiry that would be used to start a process or subroutine at a specific hour and minute. The option data is the time in 24-hour format (i.e. 2:30 pm is 14:30).

VACINQM1 This opcode is used to check for a user selected vacuum level on Gauge 1 in microns. The vacuum data is the vacuum level in microns. The options are: wait, wait up, or wait down.

VACINQM2 This opcode is used to check for a user selected vacuum level on Gauge 2 in microns. The vacuum data is the vacuum level in microns. The options are: wait, wait up, or wait down.

VACINQM3 This opcode is used to check for a user selected vacuum level on Gauge 3 in microns. The vacuum data is the vacuum level in microns. The options are: wait, wait up, or wait down.

VACINQM4 This opcode is used to check for a user selected vacuum level on Gauge 4 in microns. The vacuum data is the vacuum level in microns. The options are: wait, wait up, or wait down.

VACINQT1 This opcode is used to check for a user selected vacuum level on Gauge 1 in torr. The vacuum data is the vacuum level in torr. The options are: wait, wait up, or wait down.

VACINQT2 This opcode is used to check for a user selected vacuum level on Gauge 2 in torr. The vacuum data is the vacuum level in torr. The options are: wait, wait up, or wait down.

VACINQT3 This opcode is used to check for a user selected vacuum level on Gauge 3 in torr. The vacuum data is the vacuum level in torr. The options are: wait, wait up, or wait down.

VACINQT4 This opcode is used to check for a user selected vacuum level on Gauge 4 in torr. The vacuum data is the vacuum level in torr. The options are: wait, wait up, or wait down.

Z_SETPT This opcode is used to set the temperature and/or vacuum set points for a zone. Either or both of the set points can be specified. The options are Wait, Wait Up, or Wait Down. If both set points are specified, the Wait applies to both.

ZONEOFFSET The Zone Offset opcode is used to set an offset to be added to the set point sent to a specific zone. Either temperature, vacuum, or both can be offset. The same loop (furnace) can have different offsets for each zone. The zones must be defined in the zone configuration.

For example, a pit furnace has three zones: top, middle, and bottom.

The zones could be defined as:

- top = zone 1,
- middle = zone 2 ,
- bottom = zone 3.

If the *ZONE_OFF* opcode is used in a program with temperature data = 50 and zone = 1, then a temperature set point value in the following steps of 1700 would be sent to the middle and bottom as 1700 and the top as 1750.

Chapter 5 - APPLICATIONS INFORMATION

Default Values

Series 9220 Factory defaults
November 29, 2007.

Values independent of PV type

Parameter	Default	Factory Setting	Customer Setting
RS-232 Host A baud	19200		
RS-232 Host A Mode	Modbus slave		
RS-232 Host B baud	19200		
RS-232 Host B Mode	Modbus master		
RS-485 Host baud	19200		
RS-485 Host Mode	Modbus slave		
RS-485 Slave 1 baud	19200		
RS-485 Slave 1 Mode	Modbus slave		
RS-485 Slave 2 baud	19200		
RS-485 Slave 2 Mode	Analog input brd		
Pass code 1	1		
Pass code 2	2		
Web code 1	111		
Web code 2	222		
Web change enable	yes		
PV 1 Name	Temperature 1		
PV 2 Name	Vacuum		
PV 3 Name	Vacuum		
AD 1 filter time	0		
AD 2 filter time	0		
AD 3 filter time	0		
IN 1 initial scale	0		
IN 1 Full scale	1000		
IN 2 initial scale	0		
IN 2 Full scale	12500		
IN 3 initial scale	0		
IN 3 Full scale	12500		
	10000		
IN 1 Decimal place	0		
IN 2 Decimal place	3		
IN 3 Decimal place	3		

Values independent of PV type

Parameter	Default	Factory Setting	Customer Setting
Setpoint lower limit, all	-9999		
Setpoint upper limit, all	29999		
Event hold	none		
Event hold polarity	all N.O.		
Hold instrument	none		
Hold PV min	0		
Hold PV max	2000		
Event run	None (-1)		
Event reset	None (-1)		
Slave Instrument setups	None		
Zone Assignments	None		
SPP VAC instrument	Gage 1		
SPP Temperature Inst	Internal loop 1		
SPP Event instrument	20 (PLC)		
Quench instrument	Loop 3		
Quench events	6 speed, 7 end		
Temperature default wait limit	15		
Atmosphere default wait limit	10		
IP address	192.168.0.200		
IP net mask	255.255.255.0		
IP gateway	192.168.1.1		
Temperature mode	Fahrenheit		
Loop 1 setpoint	0		
Loop 1 prop band	4.0		
Loop 1 reset	0.4		
Loop 1 rate	.2		
Loop 1 cycle time	16		
Loop 1 auto/manual	auto		
Loop 1 integral preset	0		
Loop 2 setpoint	0		
Loop 2 prop band	4.0		
Loop 2 reset	0.4		
Loop 2 rate	.2		
Loop 2 cycle time	60		
Loop 2 auto/manual	manual		
Loop 2 integral preset	0		

Values independent of PV type

Parameter	Default	Factory Setting	Customer Setting
Loop 3 setpoint	0		
Loop 3 prop band	4.0		
Loop 3 reset	0.4		
Loop 3 rate	.2		
Loop 3 cycle time	60		

Loop 3 auto/manual	manual		
Loop 3 integral preset	0		
Vacuum Gauge 1 Gauge Enable	Yes		
Vacuum Gauge 1 Vacuum Source	Input 2		
Vacuum Gauge 1 Calculation Type	Inficon Pirani eq		
Vacuum Gauge 1 Gas Compensation	Air/CO/O2/N2		
Vacuum Gauge 1 Native Scaling	Log of torr		
Vacuum Gauge 1 Display Maximum	4000		
Vacuum Gauge 1 Display minimum	-4000		
Vacuum Gauge 1 Zero Scale Value	-4902		
Vacuum Gauge 1 Span Value	2874		
Vacuum Gauge 1 Display Scaling	Log torr		
Vacuum Gauge 2 Gauge Enable	No		
Vacuum Gauge 2 Vacuum Source	Input 2		
Vacuum Gauge 2 Calculation Type	Inficon Pirani eq		
Vacuum Gauge 2 Gas Compensation	Air/CO/O2/N2		
Vacuum Gauge 2 Native Scaling	Log of torr		
Vacuum Gauge 2 Display Maximum	4000		
Vacuum Gauge 2 Display minimum	-4000		
Vacuum Gauge 2 Zero Scale Value	-4902		
Vacuum Gauge 2 Span Value	2874		
Vacuum Gauge 2 Display Scaling	Log torr		
Vacuum Gauge 3 Gauge Enable	No		
Vacuum Gauge 3 Vacuum Source	Input 2		
Vacuum Gauge 3 Calculation Type	Inficon Pirani eq		
Vacuum Gauge 3 Gas Compensation	Air/CO/O2/N2		

Vacuum Gauge 3 Native Scaling	Log of torr		
Vacuum Gauge 3 Display Maximum	4000		
Vacuum Gauge 3 Display minimum	-4000		
Vacuum Gauge 3 Zero Scale Value	-4902		
Vacuum Gauge 3 Span Value	2874		
Vacuum Gauge 3 Display Scaling	Log torr		
Vacuum Gauge 4 Gauge Enable	No		
Vacuum Gauge 4 Vacuum Source	Input 2		
Vacuum Gauge 4 Calculation Type	Inficon Pirani eq		
Vacuum Gauge 4 Gas Compensation	Air/CO/O2/N2		
Vacuum Gauge 4 Native Scaling	Log of torr		
Vacuum Gauge 4 Display Maximum	4000		
Vacuum Gauge 4 Display minimum	-4000		
Vacuum Gauge 4 Zero Scale Value	-4902		
Vacuum Gauge 4 Span Value	2874		
Vacuum Gauge 4 Display Scaling	Log torr		
Analog Output 1 Assignment	Loop 1 inc		
Analog Output 1 offset	0		
Analog Output 1 Range	200		
Analog Output 2 Assignment	PV1 retrans		
Analog Output 2 offset	0		
Analog Output 2 Range	3000		
Relay 1 Assignment	Event 0		
Relay 2 Assignment	Event 1		
Relay 3 Assignment	Event 2		
Relay 4 Assignment	Event 3		
Relay 5 Assignment	Event 4		
Relay 6 Assignment	Alarm 1		
Relay 7 Assignment	Alarm 2		
Relay 8 Assignment	Loop 1 fwd		
PID Loop 1 Mode	Auto		

PID Loop 1 Low Limit	0		
PID Loop 1 High Limit	100		
PID Loop 1 Source	Input 1		
PID Loop 1 0 SP Stops Control	Yes		
PID Loop 1 Reset Limiter	Yes		
PID Loop 2 Mode	N/A		
PID Loop 2 Low Limit	0		
PID Loop 2 High Limit	100		
PID Loop 2 Source	Off		
PID Loop 2 0 SP Stops Control	No		
PID Loop 2 Reset Limiter	No		
PID Loop 3 Mode	N/A		
PID Loop 3 Low Limit	0		
PID Loop 3 High Limit	100		
PID Loop 3 Source	Off		
PID Loop 3 0 SP Stops Control	No		
PID Loop 3 Reset Limiter	No		
Alarm 1 Setpoint	2000		
Alarm 1 Alarm Type	PV2 Process Low		
Alarm 1 Hysteresis	1		
Alarm 2 Setpoint	301		
Alarm 2 Alarm Type	PV2 Process Low		
Alarm 2 Hysteresis	1		
Alarm 3 Setpoint	1400		
Alarm 3 Alarm Type	PV2 Process High		
Alarm 3 Hysteresis	1		
Clear events at end of recipe	Yes		

Sample Event Assignments

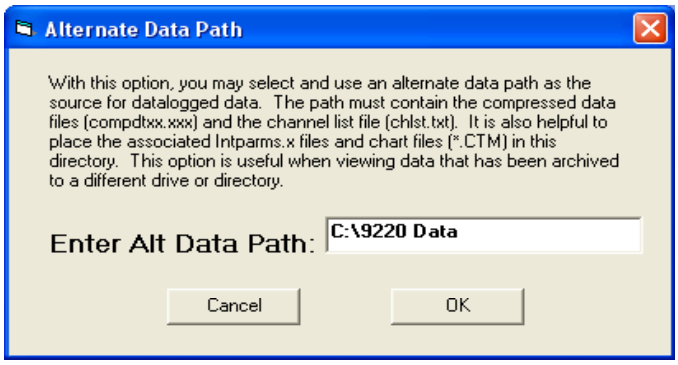
The following list is an example of vacuum event assignments.

Event 0	Spare
Event 1	Cycle Running/Start Pump Down
Event 2	Spare
Event 3	Vacuum Cool
Event 4	Partial Pressure
Event 5	Gas Fan Cool
Event 6	End of Cycle
Event 7	Spare
Event 8	Spare
Event 9	Spare
Event 10	Static Cool

Flash Card Management

This section will show the user how to pull logged data from an Advantech screen and view it on the PC using a flash card reader and SD Recorder. This option requires SDRecorder to be installed on the local computer. If SDRecorder is not installed, see the section *SDRecorder Installation* for instructions on how to install the SDRecorder software. If SDRecorder is installed, continue on with these instructions.

1. Shut down the screen software. To shut down the screen software, press the **Menu** button from the Default Display Screen. This will display the *Configuration* menu list. Select the *Shutdown* menu option and confirm the shutdown process. See the section *Shutdown* in the *Chapter 2 – Configuration* section of this manual for more information on shutting down the screen software.
2. When the Windows desktop is visible, turn off the screen using the power switch located on the back of the screen just above the power connector.
3. Remove the compact flash card from the top rear of the screen. *Note – Be sure to remember the orientation of the compact flash card with respect to the screen. The compact flash card will only fit into the screen one way*.
4. Read the flash card with a compact flash card reader onto a PC. Copy the contents of the "\SSi\COMP\ folder and the \SSi\LOG\ folder into a folder on the PC. *Note – The location of this folder can be anywhere on the PC, however, it is recommended that the user keep the location of this folder simple – i.e. directly on the main drive (C:\)*. For example, the location "C:\9220 Data\" is better than "C:\SSi\Devices\9220\Data\".
5. It is also helpful to include the INTPARMS.x files, chlist.txt file, and any associated chart files (.CTM) into the selected folder. These files should be located on the installation CD.
6. Open SD Recorder.
7. From the *Options* menu on SD Recorder, select *Alternate Data*. The user will have to enter the location of the alternate data, which is the location of the selected folder, i.e. "C:\9220 Data".



Click the **OK** button to use the alternate data that was pulled off of the compact flash card.

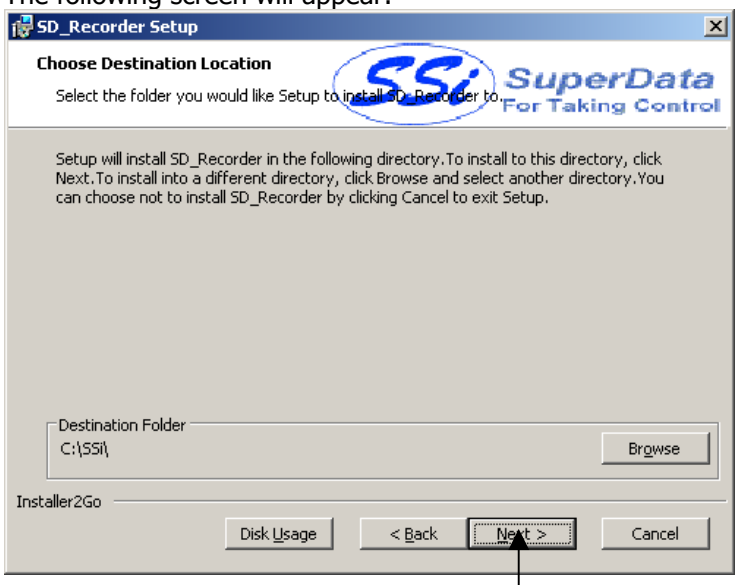
SDRecorder Installation

The SDRecorder Installation installs the SDRecorder program and associated files onto the PC. SDRecorder is used to allow the user to view and print data logged data in a chart or tabular format. To install the program follow the steps listed below:

1. From the Installation CD double-click on the SD_SDRecetup.exe file. The following screen will appear:

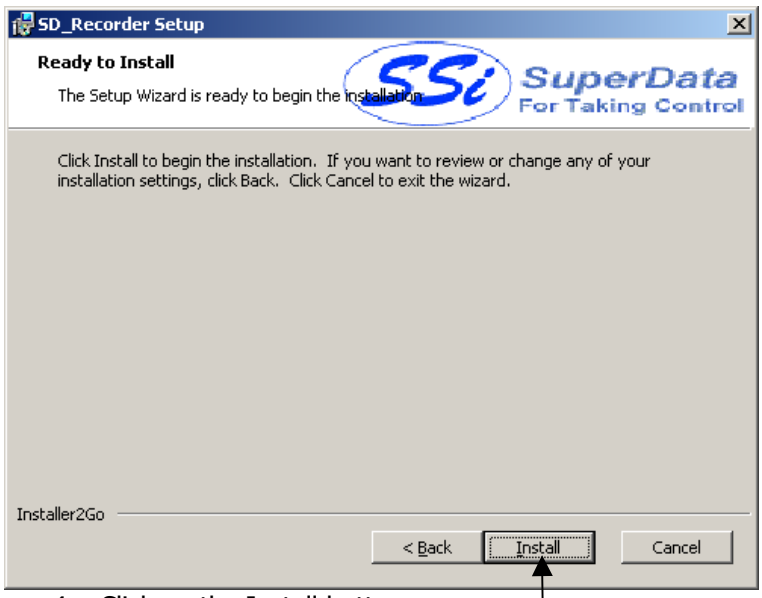
2. Click on the Next button.

The following screen will appear:



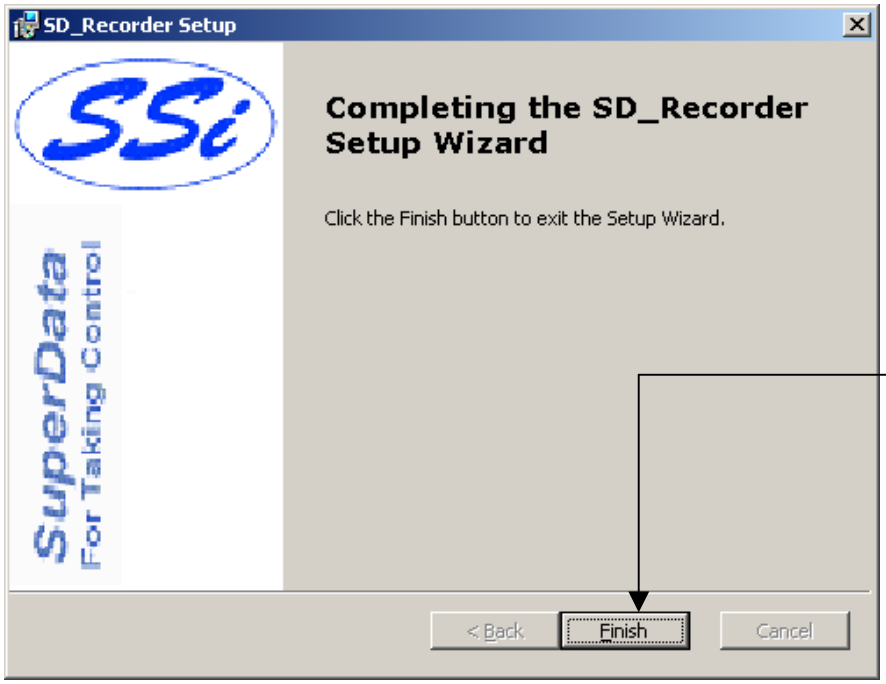
3. Click on the Next button.

The following screen will appear:



4. Click on the Install button.

5. Once the Program has finished being installed the following screen will appear. Click on the Finish button.



Slave Instrument Mapping

The following tables can be used as a reference for retrieving information such as the PV, setpoint, etc from a slave instrument. The slave instrument information will have a base offset based on the instrument number that is assigned. The base offset can be determined using the following formula:

Base Offset = (Instrument Number * 100) + 900

For example, the base offset for instrument 1 would be 1000 → (1 * 100) + 900 – and the base offset for instrument 7 would be 1600 → (7 * 100) +900. The slave instruments will be split into three sections: Atmosphere Instruments, Temperature Instruments, and Events Instruments. The layout for each instrument will be the same:

- Controller – The type of controller the slave instrument is – i.e. AC20, Series 9200, etc.
- Source Location – The register *in the controller* where the specified value is located. *Note: These will be added on to the base offset of the instrument (see above section)*. For example, the source location for %C actual for an AC20 is 11. For instrument 1, the register to find the %C actual would be 1011 → the base offset for instrument 1 is 1000, plus the source location of 11.
- Write Register – The register *within the slave instrument* where the value will be written.
- Read Scale – Any value read in from an instrument will be divided by this number for display purposes only.
- Write Scale – Any value written to an instrument will be multiplied by this number for display purposes only.
- Description – This will be a brief description of what the value is, i.e. %C actual, Setpoint, etc.

Atmosphere Instruments

Controller	**Source Location**	**Write Register**	**Read Scale**	**Write Scale**	**Description**
AC20	11	123	1	1	%C Actual
(Modbus Mode)	29	138	1	1	%C Setpoint
	13	125	1	1	Probe Temperature
	10	122	1	1	Probe Millivolts
	20	130	10	10	%C Percent Output
	34	142	1	1	CO Factor or Equivalent
	35	143	1	1	H Factor or Equivalent
	12	124	1	1	Dew Point
	36	144	10	10	O2

Controller	**Source Location**	**Write Register**	**Read Scale**	**Write Scale**	**Description**
Yoko 750	2	2	1	1	%C Actual
(Modbus Mode)	3	100	1	1	%C Setpoint
	20	19	1	1	Probe Temperature
	10	122	1	1	Probe Millivolts
	4	4	10	10	%C Percent Output
	0	0	1	1	CO Factor or Equivalent
	0	0	1	1	H Factor or Equivalent

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
UDC 3300's	1	0	1	1	%C Actual
(Modbus Mode)	3	2	1	1	%C Setpoint
	6	5	10	10	Probe Temperature
	5	4	10	10	Probe Millivolts
	4	3	10	10	%C Percent Output
	43	39	10	10	CO Factor or Equivalent
	43	39	10	10	H Factor or Equivalent

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Loop 1	21	20	1	1	%C Actual
(Modbus Mode)	7	6	1	1	%C Setpoint
	18	17	8	8	Probe Temperature
	19	18	8	8	Probe Millivolts
	41	40	41	41	%C Percent Output
	4	3	1	1	CO Factor or Equivalent
	5	4	1	1	H Factor or Equivalent

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Loop 2	21	20	1	1	%C Actual
(Modbus Mode)	8	7	1	1	%C Setpoint
	18	17	8	8	Probe Temperature
	19	18	8	8	Probe Millivolts
	42	41	41	41	%C Percent Output
	4	3	1	1	CO Factor or Equivalent
	5	4	1	1	H Factor or Equivalent

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Loop 1	20	20	1	1	%C Actual
(MMI Mode)	6	6	1	1	%C Setpoint
	17	17	8	8	Probe Temperature
	18	18	8	8	Probe Millivolts
	40	40	41	41	%C Percent Output
	3	3	1	1	CO Factor or Equivalent
	4	4	1	1	H Factor or Equivalent

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Loop 2	20	20	1	1	%C Actual
(MMI Mode)	7	7	1	1	%C Setpoint
	17	17	8	8	Probe Temperature
	18	18	8	8	Probe Millivolts
	41	41	41	41	%C Percent Output
	3	3	1	1	CO Factor or Equivalent
	4	4	1	1	H Factor or Equivalent

Controller	**Source Location**	**Write Register**	**Read Scale**	**Write Scale**	**Description**
Eurotherm 2404	1	1	1	1	%C Actual
(Modbus Mode)	5	5	1	1	%C Setpoint
	72	11073	1	1	Probe Temperature
	61	11062	1	1	Probe Millivolts
	4	4	1	1	%C Percent Output
	0	0	1	1	CO Factor or Equivalent
	0	0	1	1	H Factor or Equivalent

Controller	**Source Location**	**Write Register**	**Read Scale**	**Write Scale**	**Description**
Eurotherm 2500	1	1	1	1	%C Actual
(Modbus Mode)	5	5	1	1	%C Setpoint
	72	11073	1	1	Probe Temperature
Assumes Loop 1 =	61	11062	1	1	Probe Millivolts
Atmosphere	4	4	1	1	%C Percent Output
	68	11069	1	1	CO Factor or Equivalent
	68	11069	1	1	H Factor or Equivalent

Controller	**Source Location**	**Write Register**	**Read Scale**	**Write Scale**	**Description**
Carbpro 3.5	6	28	1	1	%C Actual
(MMI Mode)	1	1	1	1	%C Setpoint
	5	25	8	8	Probe Temperature
	4	24	8	8	Probe Millivolts
	11	117	1	1	%C Percent Output
	13	7	1	1	CO Factor or Equivalent
	14	8	1	1	H Factor or Equivalent

Controller	**Source Location**	**Write Register**	**Read Scale**	**Write Scale**	**Description**
Carbpro 3.0	6	28	4	4	%C Actual
(MMI Mode)	1	1	1	1	%C Setpoint
	5	25	8	8	Probe Temperature
	4	24	2	2	Probe Millivolts
	11	117	1	1	%C Percent Output
	13	7	1	1	CO Factor or Equivalent
	14	8	1	1	H Factor or Equivalent

Controller	**Source Location**	**Write Register**	**Read Scale**	**Write Scale**	**Description**
Carbpc	20	20	1	1	%C Actual
(MMI Mode)	6	6	1	1	%C Setpoint
	17	17	8	8	Probe Temperature
	18	18	8	8	Probe Millivolts
	64	64	41	41	%C Percent Output
	3	3	1	1	CO Factor or Equivalent
	4	4	1	1	H Factor or Equivalent

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Series 9200 Loop 1	3	126	1	1	%C Actual
	5	128	1	1	%C Setpoint
	22	145	1	1	Probe Temperature
	21	144	10	10	Probe Millivolts
	7	130	10	10	%C Percent Output
	19	142	1	1	CO Factor or Equivalent
	20	143	1	1	H Factor or Equivalent

Temperature Instruments

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Series 20	11	123	1	1	Temperature Controller Actual
(Modbus Mode)	30	138	1	1	Temperature Controller Setpoint
	18	130	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Yoko 750	2	2	1	1	Temperature Controller Actual
(Modbus Mode)	3	100	1	1	Temperature Controller Setpoint
	4	4	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
UDC 3300's	1	0	10	10	Temperature Controller Actual
(Modbus Mode)	3	2	10	10	Temperature Controller Setpoint
	4	3	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Loop 1	18	17	8	8	Temperature Controller Actual
(Modbus Mode)	7	6	1	1	Temperature Controller Setpoint
	41	40	41	41	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Loop 2	18	17	8	8	Temperature Controller Actual
(Modbus Mode)	8	7	1	1	Temperature Controller Setpoint
	42	41	41	41	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Loop 1	17	17	8	8	Temperature Controller Actual
(MMI Mode)	6	6	1	1	Temperature Controller Setpoint
	40	40	41	41	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Loop 2	17	17	8	8	Temperature Controller Actual
(MMI Mode)	7	7	1	1	Temperature Controller Setpoint
	41	41	41	41	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Eurotherm 2404	1	1	1	1	Temperature Controller Actual
(Modbus Mode)	2	2	1	1	Temperature Controller Setpoint
	3	3	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Eurotherm 2500	26	1025	1	1	Temperature Controller Actual
(Modbus Mode)	27	1026	1	1	Temperature Controller Setpoint
Assumes Loop 2 is Temperature	29	1028	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Unipro 3.5	3	25	8	8	Temperature Controller Actual
(MMI Mode)	1	1	1	1	Temperature Controller Setpoint
	5	118	1	1	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Unipro 3.0	3	25	8	8	Temperature Controller Actual
(MMI Mode)	1	1	1	1	Temperature Controller Setpoint
	5	118	1	1	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Carbpro 3.5 Slave	9	46	1	1	Temperature Controller Actual
(MMI Mode)	3	18	1	1	Temperature Controller Setpoint
	12	53	41	41	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Carbpro 3.0 Slave	9	46	1	1	Temperature Controller Actual
(MMI Mode)	3	18	1	1	Temperature Controller Setpoint
	12	53	41	41	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
10Pro Slave or E Slave	2	2	1	1	Temperature Controller Actual
(MMI Mode)	3	3	1	1	Temperature Controller Setpoint
	4	4	1	1	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Input C	19	19	8	8	PV
	5	5	1	1	Setpoint Loop 1
	40	40	41	41	Percent Output Loop 1

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Series 9200 Loop 1	3	126	1	1	Temperature Controller Actual
	5	128	1	1	Temperature Controller Setpoint
	7	130	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Series 9200 Loop 2	8	131	1	1	Temperature Controller Actual
	10	133	1	1	Temperature Controller Setpoint
	12	135	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Series 9200 Loop 3	13	136	1	1	Temperature Controller Actual
	15	138	1	1	Temperature Controller Setpoint
	17	140	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Series 9100 Loop 2	1	104	1	1	Temperature Controller Actual
	36	139	1	1	Temperature Controller Setpoint
	28	131	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Eurotherm Loop 1	1	1	1	1	Temperature Controller Actual
(Modbus Mode)	2	2	1	1	Temperature Controller Setpoint
	3	3	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Eurotherm Loop 2	26	1025	1	1	Temperature Controller Actual
(Modbus Mode)	27	1026	1	1	Temperature Controller Setpoint
	29	1028	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Eurotherm Loop 3	51	1049	1	1	Temperature Controller Actual
(Modbus Mode)	52	1050	1	1	Temperature Controller Setpoint
	53	1052	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
9500 Valve Controller Valve 1	30	130	1	1	Flow Actual
	56	156	1	1	Flow Setpoint
	54	154	1	1	Flow Percent of Full Scale

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
9500 Valve Controller Valve 2	31	131	1	1	Flow Actual
	66	166	1	1	Flow Setpoint
	64	164	1	1	Flow Percent of Full Scale

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
9500 Valve Controller Valve 3	32	132	1	1	Flow Actual
	76	176	1	1	Flow Setpoint
	74	174	1	1	Flow Percent of Full Scale

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
9500 Valve Controller Valve 4	33	133	1	1	Flow Actual
	86	186	1	1	Flow Setpoint
	84	184	1	1	Flow Percent of Full Scale

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
SSi 7SL Limit Controller	4	123	1	1	Limit Controller Actual
	8	177	1	1	Limit Controller Alarm Threshold (SP)
	11	310	1	1	Limit Controller Main Setpoint

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Flow Meter	1	16	1	1	Flow
	3	18	1	1	Setpoint
	0	0	1	1	*No Value Available*

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
UMC 800 Loop 1	0	64	1	1	PV Actual
All Values are	4	68	1	1	Working Setpoint
Floating Point	6	70	1	1	Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
SSi Quad DAC Ch. 0	10	10	1	1	DAC Out
	10	10	1	1	DAC Out
	16	16	1	1	*No Value Available*

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
SSi Quad DAC Ch. 1	11	11	1	1	DAC Out
	11	11	1	1	DAC Out
	16	16	1	1	*No Value Available*

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
SSi Quad DAC Ch. 2	12	12	1	1	DAC Out
	12	12	1	1	DAC Out
	16	16	1	1	*No Value Available*

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
SSi Quad DAC Ch. 3	13	13	1	1	DAC Out
	13	13	1	1	DAC Out
	16	16	1	1	*No Value Available*

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Yoko UT350/320	2	2	1	1	Temperature Controller Actual
(Modbus Mode)	3	300	1	1	Temperature Controller Setpoint
	4	4	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Yoko UP750/550 Loop 2	18	18	1	1	Temperature Controller Actual
(Modbus Mode)	19	101	1	1	Temperature Controller Setpoint
	20	20	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Yoko UP350	2	2	1	1	Temperature Controller Actual
(Modbus Mode)	3	138	1	1	Temperature Controller Setpoint
	4	4	10	10	Temperature Controller Percent Output

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Honeywell DCP551	4	259	10	10	Temperature Controller Actual
	5	702	10	10	Temperature Controller Setpoint
	0	0	10	10	Temperature Controller Percent Output

Events Instruments

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
AC20	50	310	1	1	Events Actual
(Modbus Mode)	50	310	1	1	Events Setpoint
	49	300	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Yoko 750	49	310	1	1	Events Actual
(Modbus Mode)	49	310	1	1	Events Setpoint
	49	310	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
ModMux	97	97	1	1	Events Actual
(Modbus Mode)	97	97	1	1	Events Setpoint
	98	98	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Events	59	178	1	1	Events Actual
(Modbus Mode)	49	168	1	1	Events Setpoint
	59	178	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Dualpro Events	82	178	1	1	Events Actual
(MMI Mode)	72	168	1	1	Events Setpoint
	82	178	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Carbpro 3.5 Events	8	43	1	1	Events Actual
(MMI Mode)	2	17	1	1	Events Setpoint
	8	43	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Carbpro 3.0 Events	8	43	1	1	Events Actual
(MMI Mode)	2	17	1	1	Events Setpoint
	8	43	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Eurotherm 2500	19	19	8	8	PV
(Modbus Mode)	5	5	1	1	Setpoint Loop 1
	40	40	1	1	Percent Output Loop 1

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
SSi_8_8	5	100	1	1	Events Actual
	3	98	1	1	Events Setpoint
	6	101	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Series 9200	5	176	1	1	Events Actual
	2	109	1	1	Events Setpoint
	4	175	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
Micrologix Modbus	10	110	1	1	Events Actual
RS-232	0	100	1	1	Events Setpoint
	15	115	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
MCMModule Modbus	10	110	1	1	Events Actual
RS-232	0	100	1	1	Events Setpoint
	15	115	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
PLC5DF1	10	110	1	1	Events Actual
RS-232	0	100	1	1	Events Setpoint
	15	115	1	1	Events Input

Controller	Source Location	Write Register	Read Scale	Write Scale	Description
SLKDF1	10	110	1	1	Events Actual
RS-232	0	100	1	1	Events Setpoint
	15	115	1	1	Events Input

Sample 9220 Configuration with vacuum gauge

Revision	
Revision	1.81
PID Loop 1 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Mode	Single Reverse
Integral Preset	0
Cycle Time	16
Setpoint Change Limit	OFF
Low Limit	0
High Limit	100
0 set point stops control	yes
IN1 high input shuts down ctrl	no
IN2 high input shuts down ctrl	no
IN3 high input shuts down ctrl	no
PID auto switch	no
Switch Point PID 1->2	9999
Switch Point PID 2->3	9999
Overshoot limit gain	0
Setpoint Lower Limit	-9999
Setpoint Upper Limit	29999
PID Loop 2 Setup	
PID Loop 3 Setup	
Event Run Program Setup	
Program number to run	0
Load TC Setup	
Load TC Enable	off
Control TC	
TC 1	
TC 2	
TC 3	
TC 4	
TC 5	
TC 6	
TC 7	
TC 8	
TC 9	
TC 10	
TC 11	
TC 12	
TC 13	
TC 14	

TC 15	
TC 16	
TC 17	
TC 18	
TC 19	
TC 20	
TC 21	
TC 22	
TC 23	
TC 24	
Load TC Alarm ON Delay (sec)	0
Port Setup	
Host 232 Baud	19200
Host 232 Mode	Modbus master/PLC
Host 485 (3,4) Baud	19200
Host 485 (3,4) Mode	Modbus
Host 485 Address	1
Slave 1 (5,6) Baud	19200
Slave 1 (5,6) Mode	Modbus Host
Slave 2 (22,23) Baud	19200
Slave 2 (22,23) Mode	SSi Analog Input Board
232-2 Port Baud	9600
Slave Instrument Setup	
Instrument 1	
Instrument 2	
Instrument 3	
Instrument 4	
Instrument 5	
Instrument 6	
Instrument 7	
Instrument 8	
Instrument 9	
Instrument 10	
Instrument 11	
Instrument 12	
Instrument 13	
Instrument 14	
Instrument 15	
Instrument 16	
Instrument 17	
Instrument 18	
Instrument 19	
Instrument 20	Micrologix PLC @ 1 on RS-232
Instrument 21	

Instrument 22	
Instrument 23	
Instrument 24	
Instrument 25	
Zone 1 Assignment	
Temp Instrument	Loop 1
Temp Zone Number	0
Default Zone Offset, temp	0
Zone 2 Assignment	
Temp Instrument	Loop 1
Temp Zone Number	0
Default Zone Offset, temp	0
Zone 3 Assignment	
Temp Instrument	Loop 1
Temp Zone Number	0
Default Zone Offset, temp	0
Zone 4 Assignment	
Temp Instrument	Loop 1
Temp Zone Number	0
Default Zone Offset, temp	0
Zone 5 Assignment	
Temp Instrument	Loop 1
Temp Zone Number	0
Default Zone Offset, temp	0
Furnace Setup	
PVT Type	Vacuum
Temperature Mode	°F
Atmosphere Instrument	Instrument 1
Temperature Instrument	Loop 1
Event Instrument	Instrument 20
Quench Instrument	Loop 1
End of quench event	12
Quench speed event	7
Quench run event	0
Televac on RS-232	no
Date and Time	invalid
PLC Type	Micrologix Modbus
Default Hold Time	15
Clear events/end of recipe	yes
Wait Limits	
Temp Wait Limit	15
Atm Wait Limit	10
Furnace Name	
Furnace Name	VAC 001

PV1 Name	
PV2 Name	
PV3 Name	
Alarm 1 Setup	
Setpoint	2000
Alarm Type	PV2 proc low
Hysteresis	1
Smart Alarm	disabled
ON Delay Time	0
0 SP blocks alarm	no
Alarm 2 Setup	
Setpoint	301
Alarm Type	PV2 proc low
Hysteresis	1
Smart Alarm	disabled
ON Delay Time	0
0 SP blocks alarm	no
Alarm 3 Setup	
Setpoint	1400
Alarm Type	PV2 proc high
Hysteresis	1
Smart Alarm	disabled
ON Delay Time	0
0 SP blocks alarm	no
Thermocouple Check	
Source 1	not used
Source 2	not used
Source 3	not used
Tolerance Band	0
Source 2 Offset	0
Source 3 Offset	0
Relay Assignments	
Relay 1	event 0
Relay 2	event 1
Relay 3	event 2
Relay 4	event 3
Relay 5	event 4
Relay 6	alarm 1
Relay 7	alarm 2
Relay 8	loop 1 fwd
Relay Setpoints	
Relay ON SP for Gauge 1 A	1.000000e+000
Relay OFF SP for Gauge 1 A	1.000000e+000
Relay ON SP for Gauge 1 B	1.000000e+000

Relay OFF SP for Gauge 1 B	1.000000e+000
Relay ON SP for Gauge 1 C	1.000000e+000
Relay OFF SP for Gauge 1 C	1.000000e+000
Relay ON SP for Gauge 2 A	1.000000e+000
Relay OFF SP for Gauge 2 A	1.000000e+000
Relay ON SP for Gauge 2 B	1.000000e+000
Relay OFF SP for Gauge 2 B	1.000000e+000
Relay ON SP for Gauge 2 C	1.000000e+000
Relay OFF SP for Gauge 2 C	1.000000e+000
Relay ON SP for Gauge 3 A	1.000000e+000
Relay OFF SP for Gauge 3 A	1.000000e+000
Relay ON SP for Gauge 3 B	1.000000e+000
Relay OFF SP for Gauge 3 B	1.000000e+000
Relay ON SP for Gauge 3 C	1.000000e+000
Relay OFF SP for Gauge 3 C	1.000000e+000
Relay ON SP for Gauge 4 A	1.000000e+000
Relay OFF SP for Gauge 4 A	1.000000e+000
Relay ON SP for Gauge 4 B	1.000000e+000
Relay OFF SP for Gauge 4 B	1.000000e+000
Relay ON SP for Gauge 4 C	1.000000e+000
Relay OFF SP for Gauge 4 C	1.000000e+000
Input 1 Setup	
Input Type	S
Filter Time	0
Initial Scale	0
Full Scale	1000
Decimal Point Location	0
Open TC	up scale
Input Offset	0
Scaling	linear microns
Trip Point 1 Setpoint	0
Trip Point 1 Force Value	0
Trip Point 1 Direction	input above setpoint
Trip Point 2 Setpoint	0
Trip Point 2 Force Value	0
Trip Point 2 Direction	input above setpoint
High Input Limit Setpoint	9999
High Input Limit Hysteresis	1
Input 2 Setup	
Input Type	12.5 volts
Filter Time	0
Initial Scale	0.000
Full Scale	12.500
Decimal Point Location	3

Open TC	up scale
Input Offset	0.000
Scaling	linear microns
Trip Point 1 Setpoint	0.000
Trip Point 1 Force Value	0.000
Trip Point 1 Direction	input above setpoint
Trip Point 2 Setpoint	0.000
Trip Point 2 Force Value	0.000
Trip Point 2 Direction	input above setpoint
High Input Limit Setpoint	9.999
High Input Limit Hysteresis	0.001
Input 3 Setup	
Input Type	12.5 volts
Filter Time	0
Initial Scale	0.000
Full Scale	12.500
Decimal Point Location	3
Open TC	up scale
Input Offset	0.000
Scaling	linear microns
Trip Point 1 Setpoint	0.000
Trip Point 1 Force Value	0.000
Trip Point 1 Direction	input above setpoint
Trip Point 2 Setpoint	0.000
Trip Point 2 Force Value	0.000
Trip Point 2 Direction	input above setpoint
High Input Limit Setpoint	9.999
High Input Limit Hysteresis	0.001
Output 1 Setup	
Assignment	loop 1 inc
Offset	0
Range	200
Current Selection	4 - 20 mA
Output 2 Setup	
Assignment	PV1 retrans
Offset	0
Range	3000
Current Selection	4 - 20 mA
Passcodes	
Level 1 Code	1
Level 2 Code	2
Web Level 1 Code	111
Web Level 2 Code	222
Web Change Enable	1

Programmer Alarm	normally open
Alarm 1	normally open
Alarm 2	normally open
Alarm 3	normally open
IP Address	
IP Address 1	192
IP Address 2	168
IP Address 3	1
IP Address 4	202
IP Address Mask 1	255
IP Address Mask 2	255
IP Address Mask 3	255
IP Address Mask 4	0
IP Address Gateway 1	192
IP Address Gateway 2	168
IP Address Gateway 3	1
IP Address Gateway 4	1
Event Control	
Hold instrument number	0
Hold Minimum PV	0
Hold Maximum PV	2000
Event for Program Run	-1
Event for Program Reset	-1
Event 0	
Event 1	
Event 2	
Event 3	
Event 4	
Event 5	
Event 6	
Event 7	
Event 8	
Event 9	
Event 10	
Event 11	
Event 12	
Event 13	
Event 14	
Event 15	
Vacuum Gauge 1 Setup	
Gauge Enable	yes
Vacuum Source	Input 2
Calculation Type	Inficon Pirani eq
Gas Compensation	air/CO/O2/N2

Native Scaling	torr
Display Maximum	10000.0 t
Zero Scale Value	0.0 t
Span Value	748.2 t
Display Scaling	log torr
Vacuum Gauge 2 Setup	
Gauge Enable	yes
Vacuum Source	Input 1
Calculation Type	linear log
Gas Compensation	Argon
Native Scaling	log of torr
Display Maximum	1500 logt
Zero Scale Value	0 logt
Span Value	748 logt
Display Scaling	log torr
Vacuum Gauge 3 Setup	
Gauge Enable	no
Vacuum Source	Input 2
Calculation Type	Inficon Pirani eq
Gas Compensation	air/CO/O2/N2
Native Scaling	log of torr
Display Maximum	10000 logt
Zero Scale Value	0 logt
Span Value	748 logt
Display Scaling	log torr
Vacuum Gauge 4 Setup	
Gauge Enable	no
Vacuum Source	Input 2
Calculation Type	Inficon Pirani eq
Gas Compensation	air/CO/O2/N2
Native Scaling	log of torr
Display Maximum	10000 logt
Zero Scale Value	0 logt
Span Value	748 logt
Display Scaling	log torr
Menu Security	
Program Edit	supervisor
Auxiliary Instruments	operator
Auxiliary Analog Input	operator
Shutdown	operator
Adjust Date and Time	operator
Slave Communications Status	operator
Backup Compressed Data	supervisor
Manual Event Control	supervisor

PID Loop Setup	supervisor
Event Run Program Setup	supervisor
Zone/Load TC Setup	supervisor
Port Setup	supervisor
Slave Instrument Setup	supervisor
Zone Assignments	supervisor
Furnace Setup	administrator
Default Wait Limits	administrator
Furnace Name	administrator
Alarm Setup	administrator
Relay Assignments	administrator
Relay Setpoints	administrator
Analog Input Setup	administrator
Output Setup	administrator
Passcodes and Alarm	administrator
IP Address	administrator
Event Control	administrator
Vacuum Gauge Setup	administrator
Programmer Setup	administrator
Recipe Transfer	administrator
User Calibration	administrator
Full Calibration	administrator
Set Menu Security	administrator
Read/Write Raw Data	administrator
Tuning Assistant	administrator
Curve Entry	operator
ADAM Correction	operator
Aux SP Configuration	operator
Curve 1 Entry	
Curve Type	linear
Control Range	2500
mV 1	1000
Vac 1	1500
mV 2	10314
Vac 2	14952
mV 3	-27683
Vac 3	16638
mV 4	6785
Vac 4	12356
mV 5	13472
Vac 5	-23117
mV 6	-30672
Vac 6	-31097
mV 7	-26861

Vac 7	-13902
mV 8	4572
Vac 8	-4929
mV 9	20242
Vac 9	-3743
mV 10	23084
Vac 10	13036
mV 11	-21694
Vac 11	-22662
mV 12	-5464
Vac 12	-23907
mV 13	30634
Vac 13	-21878
mV 14	3634
Vac 14	-133
mV 15	-4951
Vac 15	1323
mV 16	-3768
Vac 16	-3868
mV 17	10895
Vac 17	-15106
mV 18	-31794
Vac 18	18372
mV 19	-13897
Vac 19	30403
mV 20	-20781
Vac 20	19936
mV 21	-16757
Vac 21	-8720
mV 22	4343
Vac 22	-11234
mV 23	-6747
Vac 23	-14734
mV 24	-32053
Vac 24	1009
mV 25	-921
Vac 25	6592
mV 26	-28566
Vac 26	-11153
mV 27	-29565
Vac 27	23825
mV 28	9164
Vac 28	-31774
mV 29	-1395

Vac 29	31528
mV 30	-20747
Vac 30	26478
mV 31	10503
Vac 31	24482
mV 32	-7237
Vac 32	6503
Curve 2 Entry	
Curve Type	linear
Control Range	-548
mV 1	32624
Vac 1	24513
mV 2	20424
Vac 2	24211
mV 3	10183
Vac 3	-1267
mV 4	-16838
Vac 4	16490
mV 5	-211
Vac 5	24079
mV 6	-31801
Vac 6	30970
mV 7	-17554
Vac 7	-1470
mV 8	12944
Vac 8	-7266
mV 9	-4487
Vac 9	10511
mV 10	6518
Vac 10	-17462
mV 11	5155
Vac 11	-850
mV 12	11862
Vac 12	-30500
mV 13	-9175
Vac 13	6000
mV 14	23726
Vac 14	27799
mV 15	-2208
Vac 15	-29077
mV 16	0
Vac 16	0
mV 17	0
Vac 17	0

mV 18	0
Vac 18	0
mV 19	0
Vac 19	0
mV 20	0
Vac 20	0
mV 21	0
Vac 21	0
mV 22	0
Vac 22	0
mV 23	0
Vac 23	0
mV 24	0
Vac 24	0
mV 25	0
Vac 25	0
mV 26	0
Vac 26	0
mV 27	0
Vac 27	0
mV 28	0
Vac 28	0
mV 29	0
Vac 29	0
mV 30	0
Vac 30	0
mV 31	0
Vac 31	0
mV 32	0
Vac 32	0
Curve 3 Entry	
Curve Type	none
Control Range	0
mV 1	0
Vac 1	0
mV 2	0
Vac 2	0
mV 3	0
Vac 3	0
mV 4	0
Vac 4	0
mV 5	0
Vac 5	0
mV 6	0

Vac 6	0
mV 7	0
Vac 7	0
mV 8	0
Vac 8	0
mV 9	0
Vac 9	0
mV 10	0
Vac 10	0
mV 11	0
Vac 11	0
mV 12	0
Vac 12	0
mV 13	0
Vac 13	0
mV 14	0
Vac 14	0
mV 15	0
Vac 15	0
mV 16	0
Vac 16	0
mV 17	0
Vac 17	0
mV 18	0
Vac 18	0
mV 19	0
Vac 19	0
mV 20	0
Vac 20	0
mV 21	0
Vac 21	0
mV 22	0
Vac 22	0
mV 23	0
Vac 23	0
mV 24	0
Vac 24	0
mV 25	0
Vac 25	0
mV 26	0
Vac 26	0
mV 27	0
Vac 27	0
mV 28	0

Vac 28	0
mV 29	0
Vac 29	0
mV 30	0
Vac 30	0
mV 31	0
Vac 31	0
mV 32	0
Vac 32	0

Curve 4 Entry	
Curve Type	none
Control Range	0
mV 1	0
Vac 1	0
mV 2	0
Vac 2	0
mV 3	0
Vac 3	0
mV 4	0
Vac 4	0
mV 5	0
Vac 5	0
mV 6	0
Vac 6	0
mV 7	0
Vac 7	0
mV 8	0
Vac 8	0
mV 9	0
Vac 9	0
mV 10	0
Vac 10	0
mV 11	0
Vac 11	0
mV 12	0
Vac 12	0
mV 13	0
Vac 13	0
mV 14	0
Vac 14	0
mV 15	0
Vac 15	0
mV 16	0
Vac 16	0

mV 17	0
Vac 17	0
mV 18	0
Vac 18	0
mV 19	0
Vac 19	0
mV 20	0
Vac 20	0
mV 21	0
Vac 21	0
mV 22	0
Vac 22	0
mV 23	0
Vac 23	0
mV 24	0
Vac 24	0
mV 25	0
Vac 25	0
mV 26	0
Vac 26	0
mV 27	0
Vac 27	0
mV 28	0
Vac 28	0
mV 29	0
Vac 29	0
mV 30	0
Vac 30	0
mV 31	0
Vac 31	0
mV 32	0
Vac 32	0
Curve 5 Entry	
Curve Type	none
Control Range	0
mV 1	0
Vac 1	0
mV 2	0
Vac 2	0
mV 3	0
Vac 3	0
mV 4	0
Vac 4	0
mV 5	0

Vac 5	0
mV 6	0
Vac 6	0
mV 7	0
Vac 7	0
mV 8	0
Vac 8	0
mV 9	0
Vac 9	0
mV 10	0
Vac 10	0
mV 11	0
Vac 11	0
mV 12	0
Vac 12	0
mV 13	0
Vac 13	0
mV 14	0
Vac 14	0
mV 15	0
Vac 15	0
mV 16	0
Vac 16	0
mV 17	0
Vac 17	0
mV 18	0
Vac 18	0
mV 19	0
Vac 19	0
mV 20	0
Vac 20	0
mV 21	0
Vac 21	0
mV 22	0
Vac 22	0
mV 23	0
Vac 23	0
mV 24	0
Vac 24	0
mV 25	0
Vac 25	0
mV 26	0
Vac 26	0
mV 27	0

Vac 27	0
mV 28	0
Vac 28	0
mV 29	0
Vac 29	0
mV 30	0
Vac 30	0
mV 31	0
Vac 31	0
mV 32	0
Vac 32	0
Alternate PID 1 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 2 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 3 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 4 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 5 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0

High Limit	100
Low Limit	0
Alternate PID 6 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 7 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 8 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 9 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 10 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 11 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0

Alternate PID 12 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 13 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 14 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 15 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 16 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 17 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 18 Setup	
Prop Band (0 for On/Off)	4.0

Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 19 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 20 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 21 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 22 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 23 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 24 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20

Integral Preset	0
High Limit	100
Low Limit	0
Alternate PID 25 Setup	
Prop Band (0 for On/Off)	4.0
Reset	0.40
Rate	0.20
Integral Preset	0
High Limit	100
Low Limit	0
Analog Input 1 Setup	
Input type 0	B
Input type 1	B
Input type 2	B
Input type 3	B
Input type 4	B
Input 0 Correction	not used
Input 1 Correction	not used
Input 2 Correction	not used
Input 3 Correction	not used
Input 4 Correction	not used
Analog Input 2 Setup	
Input type 0	B
Input type 1	B
Input type 2	B
Input type 3	B
Input type 4	B
Input 0 Correction	not used
Input 1 Correction	not used
Input 2 Correction	not used
Input 3 Correction	not used
Input 4 Correction	not used
Analog Input 3 Setup	
Input type 0	B
Input type 1	B
Input type 2	B
Input type 3	B
Input type 4	B
Input 0 Correction	not used
Input 1 Correction	not used
Input 2 Correction	not used
Input 3 Correction	not used
Input 4 Correction	not used
Analog Input 4 Setup	

Input type 0	B
Input type 1	B
Input type 2	B
Input type 3	B
Input type 4	B
Input 0 Correction	not used
Input 1 Correction	not used
Input 2 Correction	not used
Input 3 Correction	not used
Input 4 Correction	not used
Analog Input 5 Setup	
Input type 0	B
Input type 1	B
Input type 2	B
Input type 3	B
Input type 4	B
Input 0 Correction	not used
Input 1 Correction	not used
Input 2 Correction	not used
Input 3 Correction	not used
Input 4 Correction	not used
Analog Input 6 Setup	
Input type 0	B
Input type 1	B
Input type 2	B
Input type 3	B
Input type 4	B
Input 0 Correction	not used
Input 1 Correction	not used
Input 2 Correction	not used
Input 3 Correction	not used
Input 4 Correction	not used
Analog Input 7 Setup	
Input type 0	B
Input type 1	B
Input type 2	B
Input type 3	B
Input type 4	B
Input 0 Correction	not used
Input 1 Correction	not used
Input 2 Correction	not used
Input 3 Correction	not used
Input 4 Correction	not used
Analog Input 8 Setup	

Input type 0	B
Input type 1	B
Input type 2	B
Input type 3	B
Input type 4	B
Input 0 Correction	not used
Input 1 Correction	not used
Input 2 Correction	not used
Input 3 Correction	not used
Input 4 Correction	not used
ADAM Offset	
Input 1	25.5
Input 2	0.0
Input 3	0.0
Input 4	0.0
Input 5	0.0
Input 6	0.0
Input 7	0.0
Input 8	0.0
Input 9	0.0
Input 10	0.0
Input 11	0.0
Input 12	0.0
Input 13	0.0
Input 14	0.0
Input 15	0.0
Input 16	0.0
Input 17	0.0
Input 18	0.0
Input 19	0.0
Input 20	0.0
Input 21	0.0
Input 22	0.0
Input 23	0.0
Input 24	0.0
Input 25	0.0
Input 26	0.0
Input 27	0.0
Input 28	0.0
Input 29	0.0
Input 30	0.0
Input 31	0.0
Input 32	0.0
Input 33	0.0

Input 34	0.0
Input 35	0.0
Input 36	0.0
Input 37	0.0
Input 38	0.0
Input 39	0.0
Input 40	0.0
Input 0 Correction	not used
Input 1 Correction	not used
Input 2 Correction	not used
Input 3 Correction	not used
Input 4 Correction	not used
Input 5 Correction	not used
Input 6 Correction	not used
Input 7 Correction	not used
Input 8 Correction	not used
Input 9 Correction	not used
Input 10 Correction	not used
Input 11 Correction	not used
Input 12 Correction	not used
Input 13 Correction	not used
Input 14 Correction	not used
Input 15 Correction	not used
Input 16 Correction	not used
Input 17 Correction	not used
Input 18 Correction	not used
Input 19 Correction	not used
Input 20 Correction	not used
Input 21 Correction	not used
Input 22 Correction	not used
Input 23 Correction	not used
Input 24 Correction	not used
Input 25 Correction	not used
Input 26 Correction	not used
Input 27 Correction	not used
Input 28 Correction	not used
Input 29 Correction	not used
Input 30 Correction	not used
Input 31 Correction	not used
Input 32 Correction	not used
Input 33 Correction	not used
Input 34 Correction	not used
Input 35 Correction	not used
Input 36 Correction	not used

Input 37 Correction	not used
Input 38 Correction	not used
Input 39 Correction	not used
Auxiliary Setpoint Configuration	
Retrans to Slave 1	Off
Retrans to Slave 2	Off
Retrans to Slave 3	Off
Setpoint Offset Sl 1	0
Setpoint Offset Sl 2	0
Setpoint Offset Sl 3	0
Setpoint Delay Sl 1	0
Setpoint Delay Sl 2	0
Setpoint Delay Sl 3	0
TC Extension Correction Curves	
Curve 1: Point 1 Temp	0
Curve 1: Point 1 Offset	0.000
Curve 1: Point 2 Temp	0
Curve 1: Point 2 Offset	0.000
Curve 1: Point 3 Temp	0
Curve 1: Point 3 Offset	0.000
Curve 1: Point 4 Temp	0
Curve 1: Point 4 Offset	0.000
Curve 1: Point 5 Temp	0
Curve 1: Point 5 Offset	0.000
Curve 1: Point 6 Temp	0
Curve 1: Point 6 Offset	0.000
Curve 1: Point 7 Temp	0
Curve 1: Point 7 Offset	0.000
Curve 1: Point 8 Temp	0
Curve 1: Point 8 Offset	0.000
Curve 1: Point 9 Temp	0
Curve 1: Point 9 Offset	0.000
Curve 1: Point 10 Temp	0
Curve 1: Point 10 Offset	0.000
Curve 2: Point 1 Temp	0
Curve 2: Point 1 Offset	0.000
Curve 2: Point 2 Temp	0
Curve 2: Point 2 Offset	0.000
Curve 2: Point 3 Temp	0
Curve 2: Point 3 Offset	0.000
Curve 2: Point 4 Temp	0
Curve 2: Point 4 Offset	0.000
Curve 2: Point 5 Temp	0
Curve 2: Point 5 Offset	0.000

Curve 2: Point 6 Temp	0
Curve 2: Point 6 Offset	0.000
Curve 2: Point 7 Temp	0
Curve 2: Point 7 Offset	0.000
Curve 2: Point 8 Temp	0
Curve 2: Point 8 Offset	0.000
Curve 2: Point 9 Temp	0
Curve 2: Point 9 Offset	0.000
Curve 2: Point 10 Temp	0
Curve 2: Point 10 Offset	0.000
Curve 3: Point 1 Temp	0
Curve 3: Point 1 Offset	0.000
Curve 3: Point 2 Temp	0
Curve 3: Point 2 Offset	0.000
Curve 3: Point 3 Temp	0
Curve 3: Point 3 Offset	0.000
Curve 3: Point 4 Temp	0
Curve 3: Point 4 Offset	0.000
Curve 3: Point 5 Temp	0
Curve 3: Point 5 Offset	0.000
Curve 3: Point 6 Temp	0
Curve 3: Point 6 Offset	0.000
Curve 3: Point 7 Temp	0
Curve 3: Point 7 Offset	0.000
Curve 3: Point 8 Temp	0
Curve 3: Point 8 Offset	0.000
Curve 3: Point 9 Temp	0
Curve 3: Point 9 Offset	0.000
Curve 3: Point 10 Temp	0
Curve 3: Point 10 Offset	0.000

Sample Recipe 1

Step	Opcode	Temp	Vac	Option
1	EVTOUTPUT - Event Output	0 °F		3-ON
2	DELAY – Short Delay			5 Sec
3	EVTOUTPUT – Event Output			3-OFF
4	VACINQM1 – Vacuum Inquiry Gauge 1 (Microns)		30 m	Wait Down
5	RAMPR – Ramp at Rate (Temperature)	1850 °F		100 °/Min
6	GSOAK – Guaranteed Soak (Temperature)			0:45
7	RAMPR – Ramp at Rate (Temperature)	1875 °F		100 °/Min
8	EVTOUTPUT – Event Output			0-ON
9	RAMPR – Ramp at Rate (Temperature)	2050 °F		100 °/Min
10	GSOAK – Guaranteed Soak (Temperature)			0:20
11	EVTOUTPUT – Event Output			0-OFF

12	EVTOUTPUT – Event Output	0 °F		1-ON
13	TINQ – Temperature Inquiry	150 °F		Wait Down
14	SOAK – Soak			0:15
15	EVTOUTPUT – Event Output			4-ON
16	ALARM – User Alarm			User Alarm 1
17	EVTOUTPUT – Event Output			5-ON
18	DELAY – Short Delay			5 Sec
19	NO-OP – No Opcode			
20	NO-OP – No Opcode			
21	NO-OP – No Opcode			
22	NO-OP – No Opcode			
23	NO-OP – No Opcode			
24	NO-OP – No Opcode			

Sample Recipe 2

Step	**Opcode**	**Temp**	**Vac**	**Option**
1	EVTOUTPUT - Event Output	0 °F		3-ON
2	DELAY – Short Delay			5 Sec
3	EVTOUTPUT – Event Output			3-OFF
4	VACINQM1 – Vacuum Inquiry Gauge 1 (Microns)		30 m	Wait Down
5	RAMPR – Ramp at Rate (Temperature)	1850 °F		100 °/Min
6	GSOAK – Guaranteed Soak (Temperature)			1:15
7	RAMPR – Ramp at Rate (Temperature)	1875 °F		100 °/Min
8	EVTOUTPUT – Event Output			0-ON
9	RAMPR – Ramp at Rate (Temperature)	2050 °F		100 °/Min
10	GSOAK – Guaranteed Soak (Temperature)			0:20
11	EVTOUTPUT – Event Output			0-OFF
12	EVTOUTPUT – Event Output	0 °F		1-ON
13	TINQ – Temperature Inquiry	150 °F		Wait Down
14	SOAK – Soak			0:15
15	EVTOUTPUT – Event Output			4-ON
16	ALARM – User Alarm			User Alarm 1
17	EVTOUTPUT – Event Output			5-ON
18	DELAY – Short Delay			5 Sec
19	NO-OP – No Opcode			
20	NO-OP – No Opcode			
21	NO-OP – No Opcode			
22	NO-OP – No Opcode			
23	NO-OP – No Opcode			
24	NO-OP – No Opcode			

Sample Recipe 3

Step	**Opcode**	**Temp**	**Vac**	**Option**
1	EVTOUTPUT - Event Output	0 °F		3-ON
2	DELAY – Short Delay			5 Sec
3	EVTOUTPUT – Event Output			3-OFF
4	VACINQM1 – Vacuum Inquiry Gauge 1 (Microns)		30 m	Wait Down
5	RAMPR – Ramp at Rate (Temperature)	1600 °F		100 °/Min
6	EVTOUTPUT - Event Output			0-ON

7	RAMPR – Ramp at Rate (Temperature)	1750 °F		100 °/Min
8	GSOAK – Guaranteed Soak (Temperature)			2:00
9	EVTOUTPUT – Event Output			0-OFF
10	EVTOUTPUT – Event Output	0 °F		1-ON
11	TINQ – Temperature Inquiry	150 °F		Wait Down
12	SOAK - Soak			0:45
13	EVTOUTPUT – Event Output			4-ON
14	ALARM – User Alarm			User Alarm 1
15	EVTOUTPUT – Event Output			5-ON
16	DELAY – Short Delay			5 Sec
17	NO-OP – No Opcode			
18	NO-OP – No Opcode			
19	NO-OP – No Opcode			
20	NO-OP – No Opcode			
21	NO-OP – No Opcode			
22	NO-OP – No Opcode			
23	NO-OP – No Opcode			
24	NO-OP – No Opcode			

Sample Recipe 4

Step	**Opcode**	**Temp**	**Vac**	**Option**
1	EVTOUTPUT - Event Output	0 °F		3-ON
2	DELAY – Short Delay			5 Sec
3	EVTOUTPUT – Event Output			3-OFF
4	VACINQM1 – Vacuum Inquiry Gauge 1 (Microns)		30 m	Wait Down
5	RAMPR – Ramp at Rate (Temperature)	1700 °F		100 °/Min
6	EVTOUTPUT - Event Output			0-ON
7	RAMPR – Ramp at Rate (Temperature)	1850 °F		100 °/Min
8	GSOAK – Guaranteed Soak (Temperature)			2:00
9	RAMPR – Ramp at Rate (Temperature)	2050 °F		50 °/Min
10	GSOAK – Guaranteed Soak (Temperature)			1:10
11	RAMPR – Ramp at Rate (Temperature)	1700 °F		50 °/Min
12	TINQ – Temperature Inquiry	1700 °F		Wait Down
13	SOAK - Soak			0:01
14	EVTOUTPUT - Event Output			0-OFF
15	EVTOUTPUT – Event Output	0 °F		1-ON
16	TINQ – Temperature Inquiry	150 °F		Wait Down
17	SOAK - Soak			0:15
18	EVTOUTPUT - Event Output			4-ON
19	ALARM – User Alarm			User Alarm 1
20	EVTOUTPUT - Event Output			5-ON
21	DELAY – Short Delay			5 Sec
22	NO-OP – No Opcode			
23	NO-OP – No Opcode			
24	NO-OP – No Opcode			

Sample Recipe 5

Step	**Opcode**	**Temp**	**Vac**	**Option**
1	EVTOUTPUT - Event Output	0 °F		3-ON

2	DELAY – Short Delay			5 Sec
3	EVTOUTPUT – Event Output			3-OFF
4	VACINQM1 – Vacuum Inquiry Gauge 1 (Microns)		30 m	Wait Down
5	RAMPR – Ramp at Rate (Temperature)	1500 °F		100 °/Min
6	GSOAK – Guaranteed Soak (Temperature)			3:00
7	RAMPR – Ramp at Rate (Temperature)	1000 °F		100 °/Min
8	TINQ – Temperature Inquiry	1000 °F		Wait Down
9	SOAK - Soak			0:05
10	EVTOUTPUT – Event Output	0 °F		1-ON
11	TINQ – Temperature Inquiry	150 °F		Wait Down
12	SOAK - Soak			0:15
13	EVTOUTPUT – Event Output			4-ON
14	ALARM – User Alarm			User Alarm 1
15	EVTOUTPUT – Event Output			5-ON
16	DELAY – Short Delay			5 Sec
17	NO-OP – No Opcode			
18	NO-OP – No Opcode			
19	NO-OP – No Opcode			
20	NO-OP – No Opcode			
21	NO-OP – No Opcode			
22	NO-OP – No Opcode			
23	NO-OP – No Opcode			
24	NO-OP – No Opcode			

Sample Recipe 6

Step	**Opcode**	**Temp**	**Vac**	**Option**
1	EVTOUTPUT - Event Output	0 °F		3-ON
2	DELAY – Short Delay			5 Sec
3	EVTOUTPUT – Event Output			3-OFF
4	VACINQM1 – Vacuum Inquiry Gauge 1 (Microns)		30 m	Wait Down
5	RAMPR – Ramp at Rate (Temperature)	1850 °F		65 °/Min
6	GSOAK – Guaranteed Soak (Temperature)			0:20
7	RAMPR – Ramp at Rate (Temperature)	1875 °F		100 °/Min
8	EVTOUTPUT – Event Output			0-ON
9	RAMPR – Ramp at Rate (Temperature)	2050 °F		50 °/Min
10	GSOAK – Guaranteed Soak (Temperature)			0:10
11	EVTOUTPUT – Event Output			0-OFF
12	EVTOUTPUT – Event Output	0 °F		1-ON
13	TINQ – Temperature Inquiry	150 °F		Wait Down
14	SOAK – Soak			0:15
15	EVTOUTPUT – Event Output			4-ON
16	ALARM – User Alarm			User Alarm 1
17	EVTOUTPUT – Event Output			5-ON
18	DELAY – Short Delay			5 Sec
19	NO-OP – No Opcode			
20	NO-OP – No Opcode			
21	NO-OP – No Opcode			
22	NO-OP – No Opcode			
23	NO-OP – No Opcode			
24	NO-OP – No Opcode			

Sample Recipe 7

Step	Opcode	Temp	Vac	Option
1	EVTOUTPUT - Event Output	0 °F		3-ON
2	DELAY – Short Delay			5 Sec
3	EVTOUTPUT – Event Output			3-OFF
4	VACINQM1 – Vacuum Inquiry Gauge 1 (Microns)		30 m	Wait Down
5	RAMPR – Ramp at Rate (Temperature)	1300 °F		100 °/Min
6	EVTOUTPUT – Event Output			0-ON
7	RAMPR – Ramp at Rate (Temperature)	1550 °F		100 °/Min
8	GSOAK – Guaranteed Soak (Temperature)			3:00
9	RAMPR – Ramp at Rate (Temperature)	1100 °F		2 °/Min
10	TINQ – Temperature Inquiry	1100 °F		Wait Down
11	SOAK – Soak			0:10
12	EVTOUTPUT – Event Output			0-OFF
13	EVTOUTPUT – Event Output	0 °F		1-ON
14	TINQ – Temperature Inquiry	150 °F		Wait Down
15	SOAK – Soak			0:15
16	EVTOUTPUT – Event Output			4-ON
17	ALARM – User Alarm			User Alarm 1
18	EVTOUTPUT – Event Output			5-ON
19	DELAY – Short Delay			5 Sec
20	NO-OP – No Opcode			
21	NO-OP – No Opcode			
22	NO-OP – No Opcode			
23	NO-OP – No Opcode			
24	NO-OP – No Opcode			

Sample Recipe 8

Step	Opcode	Temp	Vac	Option
1	EVTOUTPUT - Event Output	0 °F		3-ON
2	DELAY – Short Delay			5 Sec
3	EVTOUTPUT – Event Output			3-OFF
4	VACINQM1 – Vacuum Inquiry Gauge 1 (Microns)		30 m	Wait Down
5	RAMPR – Ramp at Rate (Temperature)	1500 °F		35 °/Min
6	EVTOUTPUT – Event Output			0-ON
7	RAMPR – Ramp at Rate (Temperature)	1650 °F		35 °/Min
8	GSOAK – Guaranteed Soak (Temperature)			0:45
9	EVTOUTPUT – Event Output			0-OFF
10	EVTOUTPUT – Event Output	0 °F		1-ON
11	TINQ – Temperature Inquiry	150 °F		Wait Down
12	SOAK – Soak			0:15
13	EVTOUTPUT – Event Output			4-ON
14	ALARM – User Alarm			User Alarm 1
15	EVTOUTPUT – Event Output			5-ON
16	DELAY – Short Delay			5 Sec
17	NO-OP – No Opcode			
18	NO-OP – No Opcode			
19	NO-OP – No Opcode			

20	NO-OP – No Opcode			
21	NO-OP – No Opcode			
22	NO-OP – No Opcode			
23	NO-OP – No Opcode			
24	NO-OP – No Opcode			

Sample Recipe 9

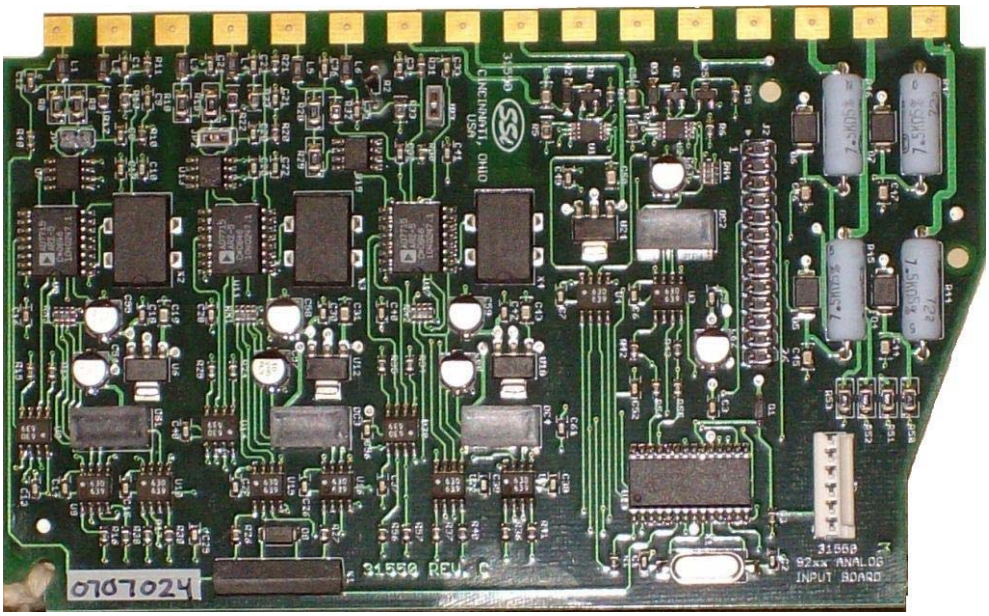
Step	**Opcode**	**Temp**	**Vac**	**Option**
1	EVTOUTPUT – Event Output	0 °F		1-ON
2	EVTINPUT – Event Input			1-ON
3	RAMPR - Ramp at Rate (Temperature)	425 °F		30 °/Min
4	SOAK - Soak			0:30
5	EVTOUTPUT – Event Output	0 °F		5-ON
6	DELAY – Short Delay			60 Sec
7	EVTOUTPUT – Event Output			5-OFF
8	EVTOUTPUT – Event Output			6-ON
9	EVTOUTPUT – Event Output	0 °F		1-OFF
10	DELAY – Short Delay			10 Sec
11	EVTOUTPUT – Event Output	0 °F		1-ON
12	EVTINPUT – Event Input			1-ON
13	RAMPR - Ramp at Rate (Temperature)	1150 °F		30 °/Min
14	SETWAIT – Set Wait Limits	26 °F		
15	GTCINQDEL – Guaranteed Temperature Inquiry Short Delay	10 Sec	T/C 1	Wait up
16	SOAK – Soak			1:57
17	EVTOUTPUT – Event Output	150 °F		5-ON
18	SETWAIT – Set Wait Limits	40 °F		
19	GTCINQDEL – Guaranteed Temperature Inquiry Short Delay	120 Sec	T/C 1	Wait down
20	EVTOUTPUT – Event Output			5-OFF
21	EVTOUTPUT – Event Output			6-ON
22	EVTOUTPUT – Event Output	0 °F		1-OFF
23	DELAY – Short Delay			10 Sec
24	NO-OP – No Opcode			

9220 Analog Input Board Jumper Settings

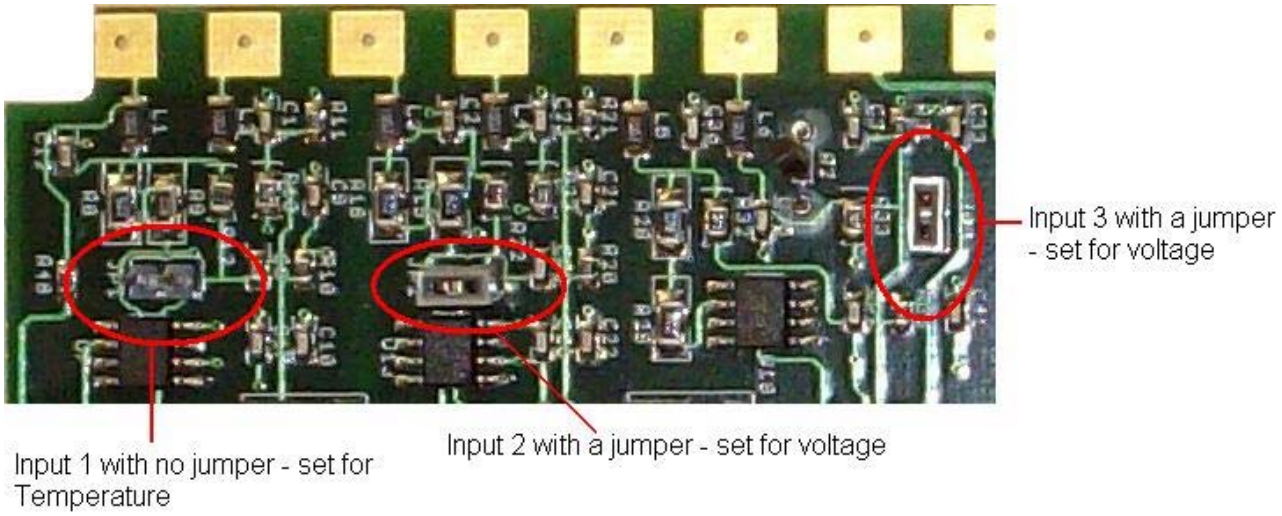
The 9220 analog input boards are initially set up with the following configuration:

Input 1 – Temperature/Thermocouple
Input 2 – Voltage
Input 3 – Voltage

In order to change these settings, the following steps must be taken:



1. If necessary, shut down the 9220 screen software by clicking on the *Shutdown* menu option from the *Configuration* menu
2. Shut down power to the screen and any connected instrument
3. Remove the cover of the 9220 instrument. This is done by removing the four (4) screws in the corner of the 9220 instrument box, and then pushing the two (2) tabs on the side of the box outward while pulling on the chassis.
4. Remove the analog input board
5. In order for an input to be set up as a voltage input, a jumper must be placed on the two pins of the input



6. To set an input for voltage, place the gray jumper over the two pins on the desired input. To set an input for temperature, remove the gray jumper from the two pins on the desired input.

***** WARNING: A jumper must be placed over the input before voltage inputs can be applied or the analog input board will be damaged *****

7. Re-insert the analog input board
8. Replace the cover on the 9220 instrument
9. Re-attach the power to the screen and any connected device
10. Power up the Advantech screen
11. From the Analog Input Setup menu screen, select the appropriate input and change the T/C Type to the correct type

Contact Super Systems Inc at 800-666-4330 if there are any questions or problems.

Revision History

Rev.	Description	Date	MCO #
-	Initial Release	12-27-2007	N/A
A	Added "Auto Tuning" section	01-04-2008	2058