OPERATIONS MANUAL

Model 7300 / 7400
Continuous Gas Analyzer

Please read, understand, and follow these instructions before operating this equipment. Super Systems, Inc. is not responsible for damages incurred due to a failure to comply with these instructions. If at any time there are questions regarding the proper use of this analyzer, please contact us at (800) 666-4330 for assistance.

7205 Edington Drive
Cincinnati, OH 45249
513-772-0060 / 800-666-4330
Fax: 513-772-9466
www.supersystems.com

Table of Contents

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 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 setpoint 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. Some applications will require only one bench, while others may contain as many as four. In addition, some applications require the monitoring of ammonia (NH_3) in addition to the standard carbon monoxide, carbon dioxide, and methane. As a result, some of the pictures and screens shown in this manual may not exactly match your instrument.

The example used for the menu screens in this manual is a single-bench instrument without ammonia. For a multiple bench application, most of the screens shown here will be identical, however the user will be able to select that bench the information pertains to. If an ammonia sensor is included in the unit, the values from this sensor will be shown to the left of the other three gases (above the humidity sensor value).

System Description

The Model 7X00 is a Continuous Gas Analyzer (CGA) designed specifically for measuring and controlling the endothermic atmosphere in heat treating furnaces. It uses infrared detection methods to measure Carbon Monoxide (CO), Carbon Dioxide (CO2), and Methane (CH4). The 3-Gas information, combined with inputs from the Carbon Probe, is used to monitor and control the atmosphere within user-specified limits.

The calculated % Carbon using the 3-Gas algorithm is a result of many years of experience working with the harsh environments that are present in heat-treating operations.
To avoid the numerous problems associated with using sequencing valves to flow multiple samples through one set of sensors, the Model 7X00 uses one distinct set of sensors for each sampling point. Up to four sets of sensors (called "benches") can be used with each operator interface. The benches are designed with quick disconnects to allow them to be easily returned for factory calibration or service if required.

Control Features

"Probe plus IR" technology - The system uses probe temperature and millivolt data to determine the Probe % Carbon. It also uses the gas values from the infrared sensors and the furnace temperature to determine the IR % Carbon. If there is a difference between the Probe % Carbon and the IR % Carbon, the Model 7X00 is capable of adjusting the COF factor in the probe control instrumentation to match the IR calculated % Carbon.

Variable COF Adjustment Interval - The CGA also has adjustment limits. The COF can only be adjusted at an interval you determine and it will only adjust the COF by the amount you specify each time. For example, every 10 minutes you can adjust 10 points of COF.

Variable ON/Off Delays - The CGA has on- and off-delays that are preset during system configuration. Adjustments to the sampling delays can be made if necessary based on the specific parameters of the application.

Integrated Pressure Regulators - The CGA utilizes pressure regulators on each calibration cylinder input. This reduces the possibility of damaging the sensors or creating internal leaks.

Internal Calendar / Clock - The CGA has an automatic clock and keeps track of hours in use between calibrations. If the unit is in need of calibration, an automatic alarm is energized. The operator must initiate calibration of the unit. Once initiated, this procedure is automatic.

Flow Obstruction Detection - The CGA has an internal digital flow meter to detect when a sample line is plugged or has low flow. If this occurs, sampling stops and an alarm is energized to notify the operator.

Combustible Gas Leak Detection - The CGA has an internal leak detector to reduce the potential for ignition in the event that flammable gases leak into the interior of the control cabinet.

Specifications

CO range:	0.00 to 30.00 %
CO2 range:	0.000 to 2.000 %
CH4 range:	0.00 to 15.00 %
NH3 range (if applicable):	0.00 to 100%
Sampling method:	Extraction by externally mounted pump
Operator Interface:	5.7" color touch screen
Accuracy and repeatability:	± 1% of full scale
Power requirements:	115/230 VAC; 50/60 Hz; 60 Watts
Operating temperature:	32° to 122° F (0° to 50° C)

Additional Features

The Operator Interface (touch screen) contains a removable compact flash card that can be used to transfer data from the Model 7X00 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 display (see Flash Card Installation on Page #7).

Also included is a Utility Software CD that includes SSi's SD Charting. SD Charting is a utility program that is loaded on any Windows® based computer (operating Windows 98® or higher). This software will allow the computer to read the data from the Model 7X00, 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 two distinct uses. The first is should the Operator Interface fail; it allows a laptop to be connected to the Series 9200 DIN rail mounted unit. This connection can act as a FULL 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 **192.168.1.205.** If you are experiencing problems please call 800-666-4330 and talk with our computer communications personnel. The second use would be for communications to a SCADA software package. Call us at **800-666-4330** if you are interested in this option.

Mechanical Installation

The Model 7X00 is usually located in close proximity to the furnace(s) that it will be controlling. Installation begins by securing the unit to the floor using the mounting holes on the inside of the feet. The instrument should be secured prior to making any electrical or plumbing connections.

The sample gas should be obtained from the furnace using a dedicated, clean sampling tube. At the end of this sample tube (fastened directly to the side port on the "Tee" fitting), should be a red high-temperature filter housing. This filter will capture most of the particulate matter from the furnace and should be monitored periodically to prevent clogging. An additional filter will be attached to the side of the instrument to capture any particles that remain in the gas stream between the pump and the analyzer. Although both of these filter housings are different, they use the same internal filter element.

Connections for the vent lines are at the top of the instrument. Care should be taken to prevent moisture from traveling into the vent lines and entering the instrument. If the instrument is vented outside, then suitable caps should be installed outside and a drip leg should be used at the instrument to prevent rainwater from entering and damaging the sensors. External drain traps have been supplied with the instrument for installation at the vents. These drain traps have the same exterior as the low temperature bowl filters, but the filtration element has been removed and replaced with a drip leg.

Electrical Installation

The Model 7X00 requires 110VAC, 60 Hz, single-phase power. Power should be applied to the panel in accordance with the electrical drawings that have been supplied with the instrument. Since each installation is customized for each site, the customer is responsible for punching a hole in the appropriate location for the electrical conduit.

Instrument Start-up

On power-up, the Operator Interface will display a logo screen for thirty seconds and then switch to the default "Status" screen. The logo display can be terminated early by touching the screen.

Flash Card & Flash Card Reader

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

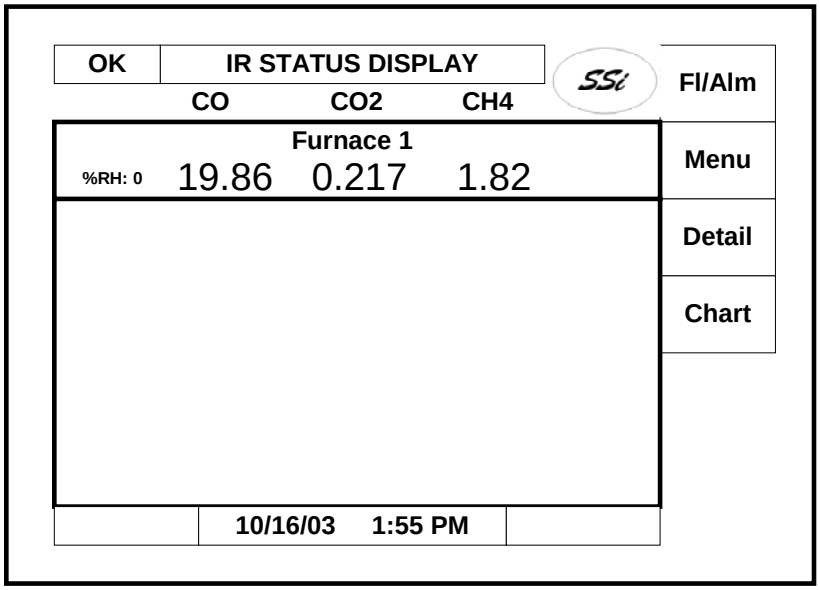
To properly shut down the operator interface, press the "Menu" button, and select "Shutdown". At the prompt, press "Yes" to shut down the operator interface. This will bring you to a conventional Microsoft Windows screen. The power to the operator interface can now be turned off by sliding the black switch (located directly over the green power connector) to the "OFF" position.

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 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 it's proper position. To restore power to the unit, move the black switch to the right or "ON" position.

IR Status Display

The "IR Status Display" screen displays the CO, CO2 and CH4 process variables for each "bench" in the sample flow cabinet. The relative humidity percent is also shown to the left. If an ammonia sensor is included in the system, it will be shown on the left above the relative humidity value. This screen also displays the date and time, and the status of the display. The date and time are shown on the bottom of the screen and the status of the operator interface is shown in the upper left-hand corner of the display.

This screen also displays an Alarm Condition, by the "ALM" Block in red, in the upper left corner. It will also display Alarm Text above the "Date and Time".

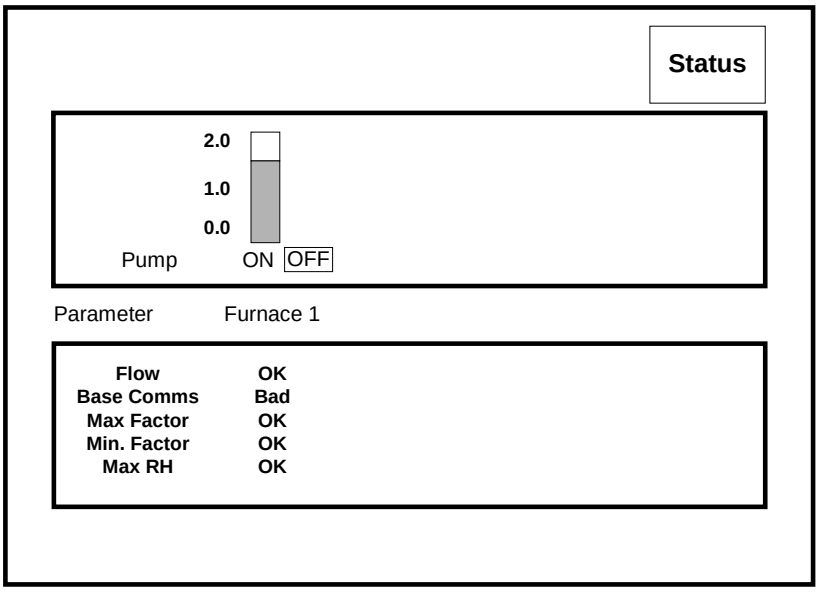


The right-hand side of the display has functional keys that take you to other screens that pertain to this particular configuration mode.

- "**Fl/Alm**" is the flow alarm. Pressing this button shows you the status of the sample flow for all of the available benches. Additional information on the flow alarm screen is on Page #9.
- "**Menu**" is a set of menus available to the operator and to the engineering staff to use in configuring the operator interface and the functionality of the CGA (Model 9200) Controller. Additional information on the Menu screen is on Page #10.
- "**Detail**" shows the "detail" data from each bench that is communicating with the Operator Interface. Additional information on the Detail screen is on Page #11.
- "**Chart**" will display a real-time video chart of the items that are configured to be recorded for each of the benches in the sample panel. Additional information on the Chart screen is on Page #12.

Flow / Alarm Display

Pressing the "Fl/Alm" button displays the following screen:



This will show the amount of flow that is being detected by each bench, the status of the pump operation, and the status of various communications parameters. There may be some slight discrepancies between the flow meter shown on the screen and the flow meter on the outside of the enclosure. The highest degree of accuracy will come from the flow meter that is physically mounted on the front of the instrument.

If the instrument sounds an alarm, this screen will alert the operator to the nature of the issue. In the above example, there is a problem with the base communications that requires attention. Max Factor and Min Factor are alarms that the maximum or minimum CO Factor or Process Factor have been exceeded. The set points for these parameters are user-adjustable and can be accessed at the "Set Sampling Parameters" screen.

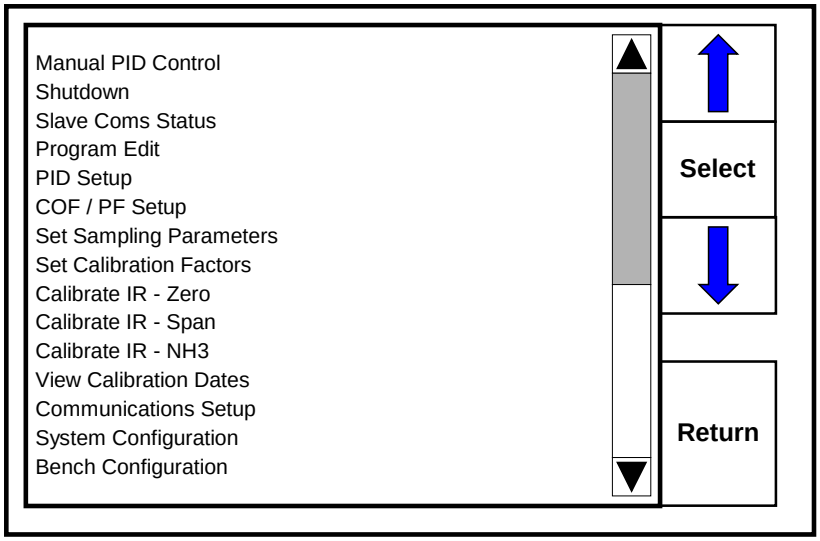
Next to the pump status indication is a button that can be used to manually shut down each pump. Under normal conditions, the pump will be shut off when the sampling conditions fail to meet the operating requirements established in the "Set Sampling Parameters" menu. If all of the appropriate conditions are met and the pump is running, it can be manually turned off by pressing this button. Pressing the button will not only turn off the pump, but it will disable communications with the bench. Pressing the button again can restore normal pump operation.

Pressing the "Status" button returns you to the "IR Status Display" screen.

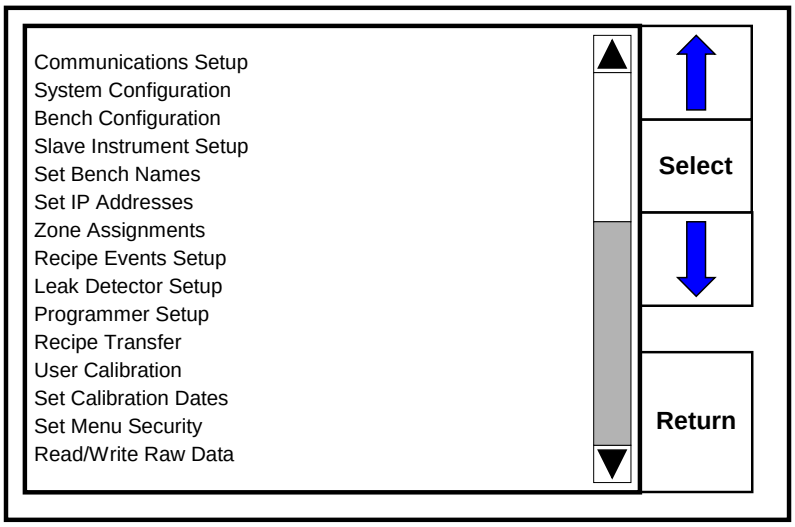
"Ack 1", "Ack 2", "Ack 3" and "Ack 4" Buttons are used to acknowledge Alarms for each individual Bench.

Menu Display

This screen shows a list of menu options that are available. These can be selected by highlighting the desired function using the up and down arrows and then pressing the "Select" button. The list of menu options is longer than can be displayed on one screen, so the arrows on the side must be used to access items towards the bottom of this list. The first list of menu options is as follows...



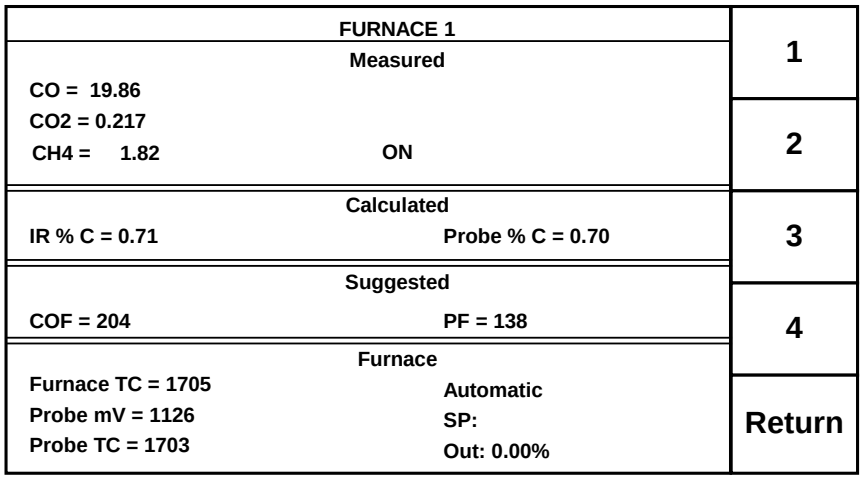
...while the remaining items can be found by scrolling down using the arrows on the right hand side of the screen...



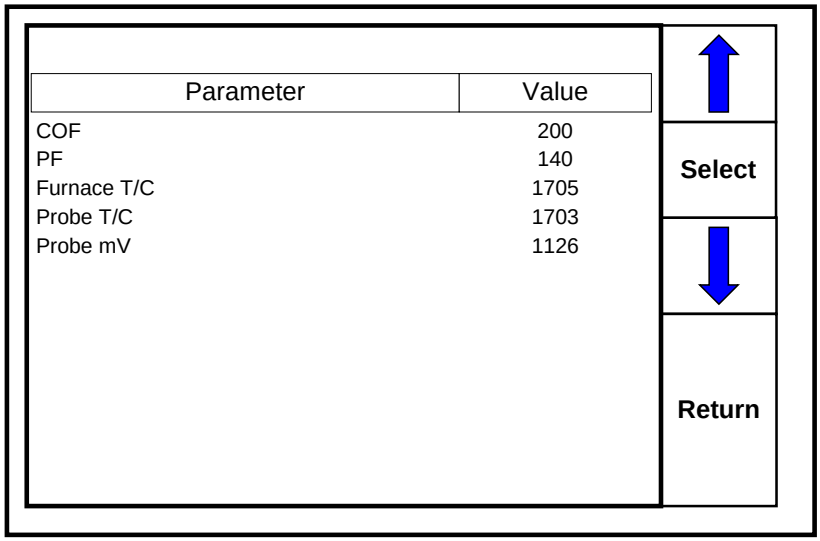
Detailed information on each of these menu items can be found elsewhere in this manual. The "Return" key takes you back to the "IR Status Display" screen.

Detail Screen

This screen allows the operator to look at detailed information from each bench connected to the Operator Interface.



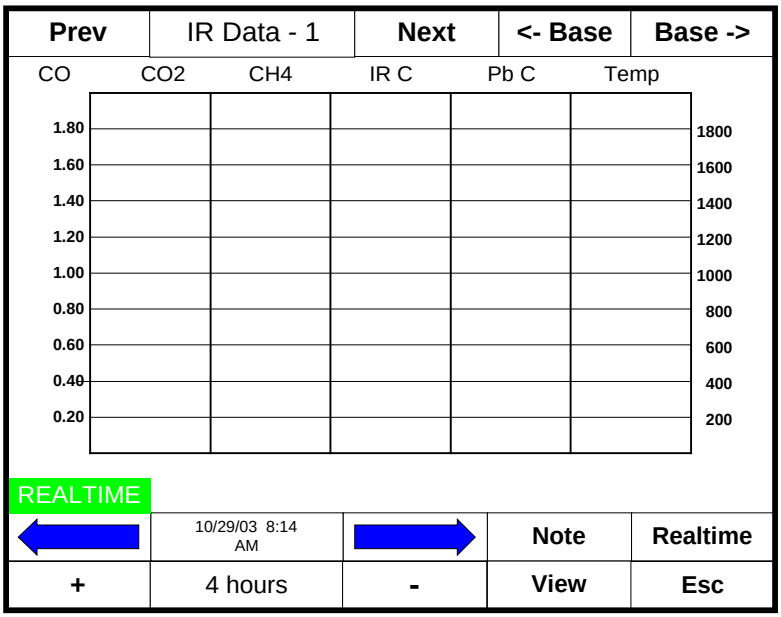
Pressing the furnace number on the right-hand side of the screen changes to display to match the furnace number. In this example, the numbers 1 through 4 are shown on the buttons, however the user at the "Set Bench Names" screen can change this text. By pressing the "furnace" area at the bottom of the screen, the furnace and probe input parameters can be entered.



Pressing the "return" key once takes you back to the "Detail Screen", and pressing it one more time returns you to the "IR Status Display".

Chart Screen

The "**Chart**" display shows between 4 and 96 hours of process variable data on the screen, and can be scrolled back to view all of the data stored on the hard drive (96 hours at a time). The vertical bars change with the change of time viewed on the screen. Two charts are available. One is for only the process variables, and the other shows the process variables and their corresponding setpoints.



The "Prev" and "Next" arrows change the display from one chart to another (i.e. from just process variables to process variables and setpoints.)

The "<-Base" and "Base->" arrows change the display from one bench to another (if more than one bench is configured).

The blue "RIGHT" and "LEFT" arrows move the displayed chart along the horizontal axis, going back 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 only shows up when the chart is printed out using the utility software included with the Series 9000 instrumentation and only when the Operator Interface is the 5.7 inch screens or larger.

Pressing the "Note" key displays an alpha/numeric keypad asking for operator ID or Initials. Pressing the appropriate keys and then pressing the keypad "<- Enter" key displays another alpha/numeric keypad and asks the operator to enter the note. After pressing the keys on the keypad and pressing the "<- Enter" key, the next screen displayed will ask you where you would like the note written. The choice is the current time and date, or you can change those parameters and place the note at whatever time and date that is required. Pressing the "OK" key takes you back to the real time chart page.
Pressing the "View" key shows you a list of the NOTES that have been annotated on the chart. The blue "UP" and "DOWN" arrow keys on this display allow the operator to move through the NOTES that have been entered. Highlighting the NOTE and pressing the "View" key on that

display allows you to see the actual NOTE entered. Pressing the "Return" key returns you to the "IR Status Display" screen.

Menu Screen Option Descriptions

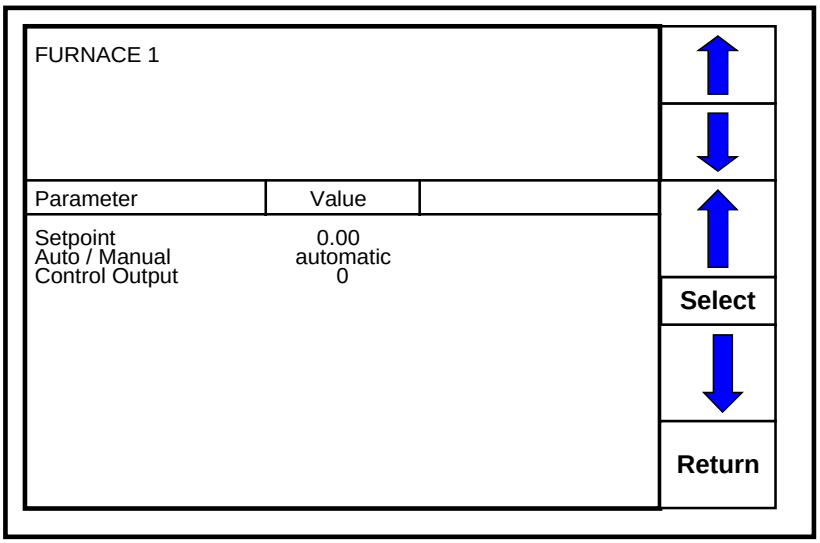
Selecting any of the menu screen options will display a numeric keypad that will allow the user to enter a passcode. This is to prevent unauthorized or unintended access to different system parameters. The passcode level required for each menu screen will be determined by the settings of the variables located in the "Set Menu Security" screen. There are two levels of menus on the Operator Interface.

- 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 configuration level. This requires the level 2 passcode ONLY.

As shipped, the level 1 and level 2 codes are set as 1 and 2 respectively. The pass codes can be changed under the "System Configuration" menu.

Manual PID Control

Selecting "Manual PID Control" will result in the screen shown below:



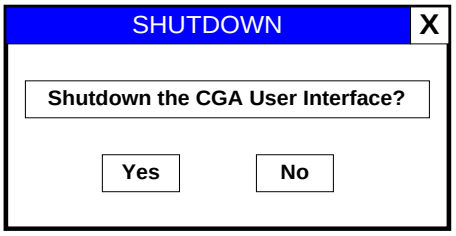
This screen allows the user to select either the desired % carbon setpoint of the process, or maintain a constant control output. When the instrument is in Manual mode, the control output will be consistently maintained at the displayed percentage. The operator can adjust this value. When the unit is in Automatic mode, the instrument will automatically adjust the control output to maintain the displayed setpoint, which can be adjusted by the operator. Changing between Automatic and Manual operation, as well adjusting the setpoint and control output, can be accomplished by using the bottom set of arrows followed by the select button. **NOTE:** The information on this screen is only relevant if the "IR Mode" in the "Bench Configuration" menu is

in “Control” mode. If the instrument is not in control mode, the values on the “Manual PID Control” screen are irrelevant.

The upper set of arrows will allow the user to toggle between the various benches. For example, this above example is for Furnace 1, however the same information can be viewed for Furnace 2 by pressing the down arrow on the upper set of arrows.

Shutdown

Highlighting the “Shutdown” selection pops up another screen asking whether or not you wish to shutdown the interface with the Series 9200. This procedure must be done to remove the flashcard.



NOTE: Shutting down the Operator Interface does NOT “turn-off” the control of the Series 9200. The SERIES 9200 CGA controller is still functioning, however datalogging will not continue.

By selecting “Yes”, the operator will see 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 “IR Status Display” screen.

NOTE: Before removing the flashcard, please review the warnings on Page #7.

Data Logging using Flash Card

The Operator Interface uses a Compact Flash Card that allows the operator to data log the parameters that have been pre-configured by SSi personnel. If the data is not extracted in a timely manner, the data will be over-written with the oldest data being over-written first. Here is how it works:

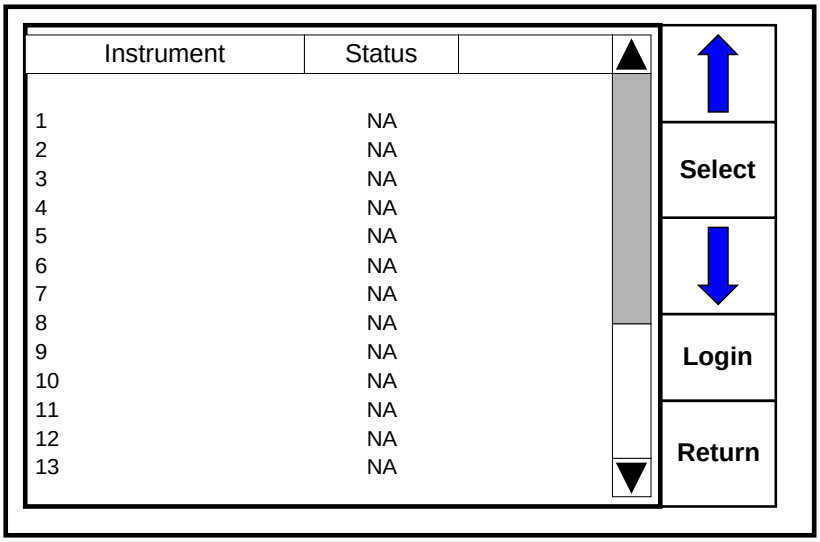
1. When the Operator Interface detects that there is less than 5% disk space left on the Compact Flash Card, an alarm will be displayed on the main interface screen stating "x% disk space remaining (overwrite at 3%)". In the upper left corner, an ALM is indicated, but because it is not a communications alarm or a 9200 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 logged 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 the files are offloaded.

3. The data log data alarm is the lowest priority. The alarm priorities are touch screen communications, then 9200 controller/programmer, then disk space.

Slave Coms Status

Highlighting the "Slaves Coms Status" key and pressing "Select" button displays the following screen:



This is a view-only screen showing the status of any instrumentation connected to the CGA 9200. Instrument numbers 17-20 have been assigned to the four IR benches. There are four possible messages that can occur to describe the 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

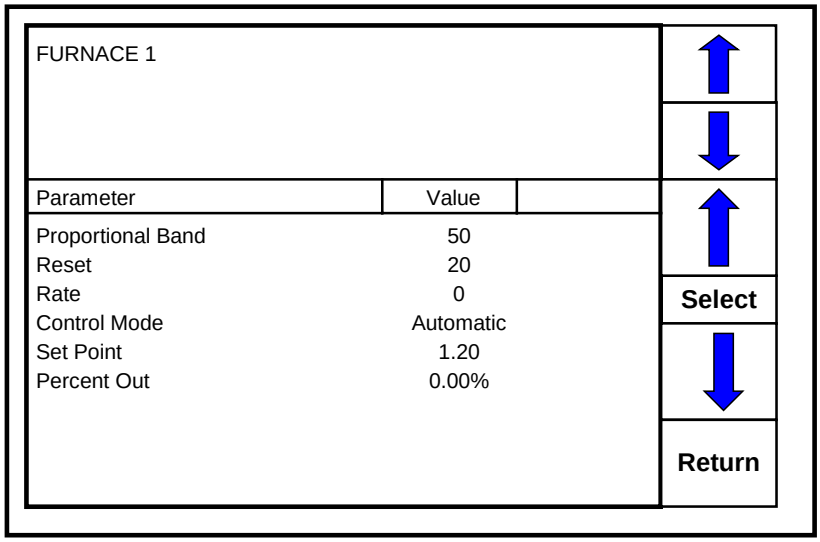
Pressing the "Return" key takes you back to the configuration menu.

Program Edit

The "Program Edit" feature has not yet been enabled on the Model 7X00, so this menu cannot be accessed.

PID Setup

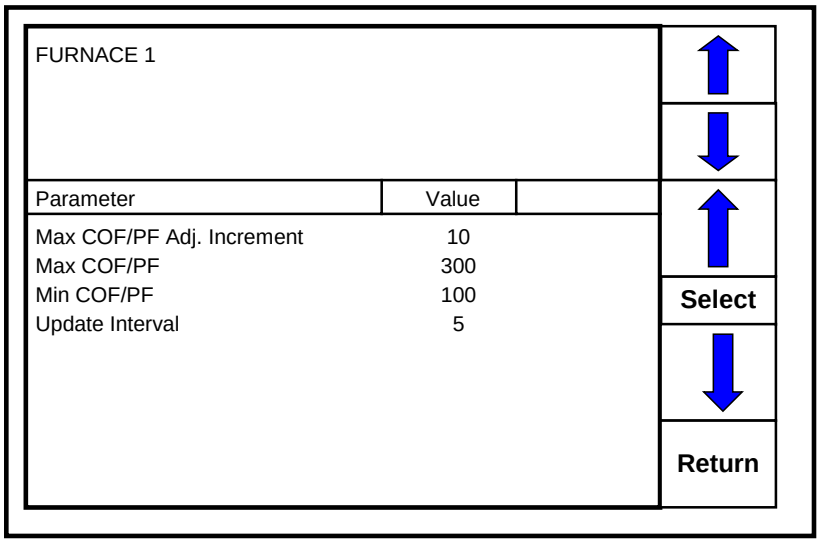
Highlighting the “PID Setup” and pressing the “Select” button displays the following screen:



This screen allows for the tuning of the control loop, so therefore it is only used when the instrument is in “Control” mode. Using the uppermost “blue arrow” buttons, the operator is able to select which bench is being configured. Using the lower “blue arrow” buttons, the operator is able to select which parameter is to be modified. By highlighting the parameter and pressing “Select” a Numeric Pop-up window will display, allowing authorized personnel to make changes.

COF/PF Setup

Selecting the "COF/PF Setup" menu page allows the user to modify the setup parameters controlling the COF/PF of the control instrument.



Max COF/PF Adj. Increment – This is the largest increment of change that will be applied to automatic COF/PF adjustments.

Max COF/PF & Min COF/PF – These values establish the upper and lower allowable limits for the COF/PF.

Update Interval – This determines the amount of time between automatic updates of the COF/PF on the control instrument. This is adjustable in one-minute increments.

Minimum mV – This determines if the minimum millivolt will inhibit and or stop the pump. Possible entries are "INH" and "INH + ST pump". Setup should always be "Inh+stoppump".

Digital Input – This determines whether Digital Input 1 (Terminals 17 and 21 (Com)) would inhibit, adjust and/or stop the pump. Possible entries are "inh cntrl/adj", "block sample" and "stop pump". Setup should be "inh control adj".

Default COF/PF on Limit – This determines whether the Default COF/PF will be applied when the limit is reached. Possible entries are "yes" and "no". Default should be "YES".

Default COF/PF Sample off – This determines whether the Default COF/PF will be applied when the sample is turned off. Possible entries are "yes" and "no". Default should be "NO".

Default COF/PF Pump off – This determines whether the Default COF/PF will be applied when the pump is off. Possible entries are "yes" and "no". Default should be "NO".

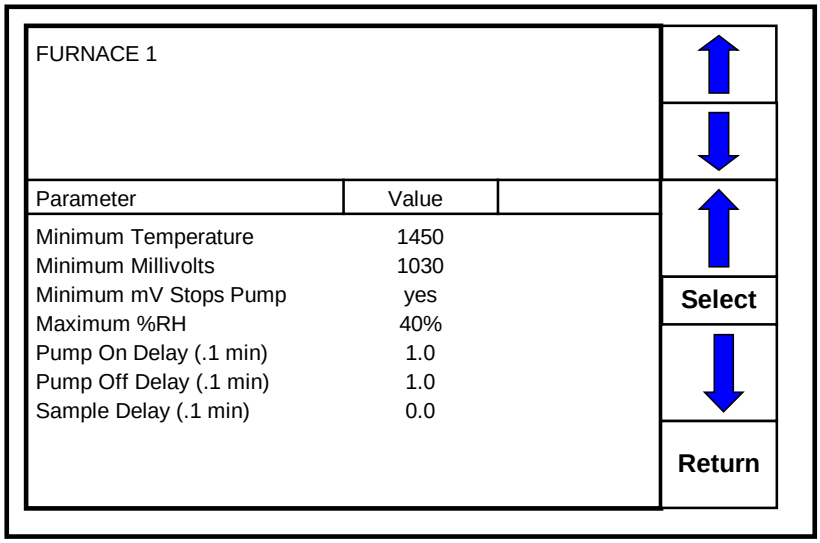
COF/PF Adj Startup Dly – This determines how much delay (in minutes) will be applied during startup. Default should be " 5 Min"*COF/PF Adj Limit Dly* – This determines how much delay (in minutes) will be applied when the limit is reached. Default should be " 5 Min".

Default COF/PF – This is the default COF/PF to be applied. Default should be "190".

Clear IR Mode – This determines how much delay (in minutes) will be applied during startup.

Set Sampling Parameters

This menu screen allows for the modification of the parameters that control when the instrument pulls a sample into the analyzer. Correctly setting these values will reduce the possibility that the instrument will be damaged by a contaminated sample, and extend the life of the system by only operating it under specified conditions.



Minimum Temperature – This is the lowest temperature that the instrument will sample from. When the temperature drops below this value, the sample flow is diverted out of the vent without passing though the sensors. Minimum temperature should always be 1450 or higher.

Minimum Millivolts – When the millivolts drop below this value, the sample flow is diverted out the vent without passing though the sensors. Minimum millivolts should always be 1030 or higher.

Minimum Millivolts Stops Pump – When this is set to "no", flow will be diverted through the vent then the millivolts drop below the specified value. If it is set to "yes", the pump will also turn off. Should always be setup to "STOP PUMP".

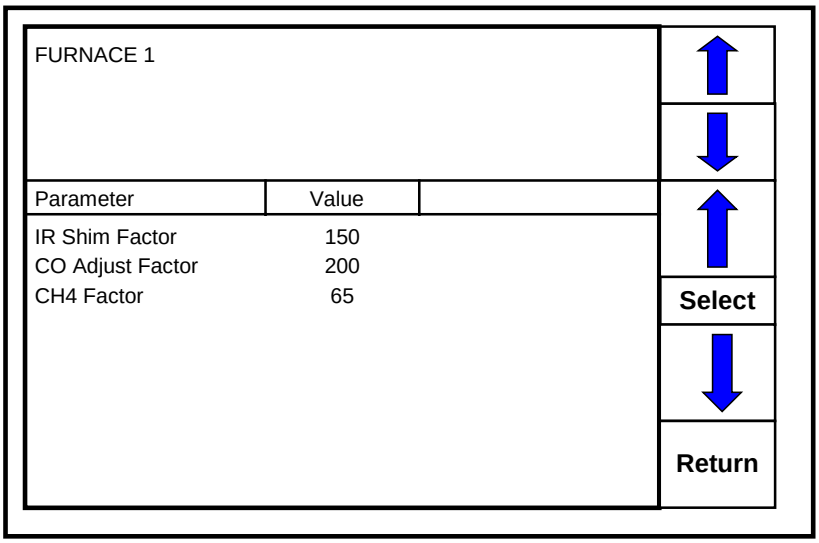
Pump On Delay (.1 min) – This determines the amount of time it takes for the pump to turn on after all of the operating parameters have been met. This is adjustable in six-second (0.1-minute) increments.

Pump Off Delay (.1 min) – This determines the amount of time it takes for the pump to turn off after any one of the operating parameters is not met. This is also adjustable in six-second (0.1-minute) increments.

Sample Delay (.1 min) – After the pumps turn on, there is a delay before the sample gas enters the bench. This is the Sample Delay time, and it is adjustable in six-second (0.1-minute) increments.

Set Calibration Factors

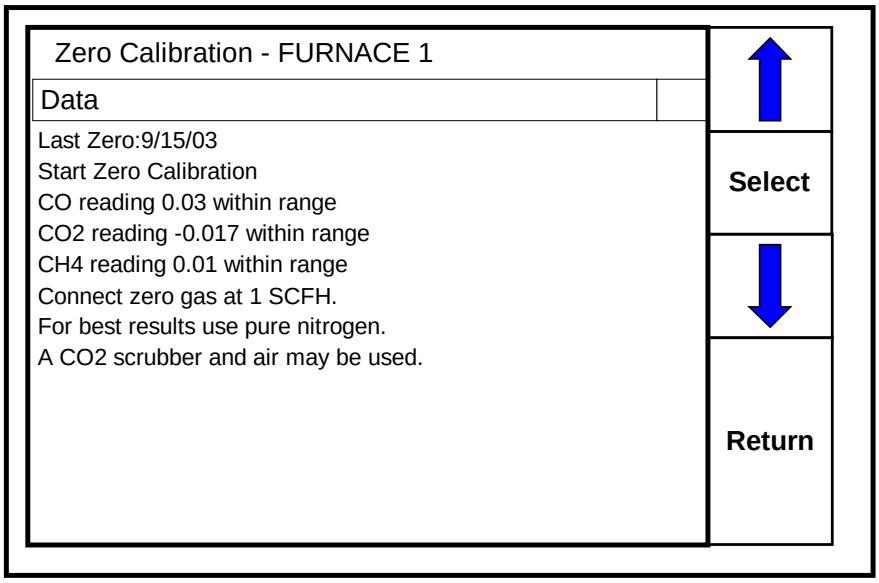
This screen allows the user to apply adjustment factors, which will impact the calculations made by the Model 7X00. The values shown below are the default values.



IR Shim Factor adjusts the IR calculation to match actual shim stock values, while the CO Adjust Factor adjusts the CO Factor in the slave instrument. The slave instrument will only be adjusted when the Model 7X00 is in the "COF/PF on IR %C" or "COF/PF on CO" modes.

Calibrate IR - Zero

After accessing this menu page, the operator will be asked to select which bench will be calibrated. Only one bench can be calibrated at a time. The screen will then display a representation of the appropriate valve orientations required to complete the procedure. The operator should make the valves for that specific bench, match the orientation of the valves shown in the picture. Please note that the short end of the valve handle has the pointer. When this has been done, the "OK" button is pressed. The following page shows zero calibration data for that specific bench:



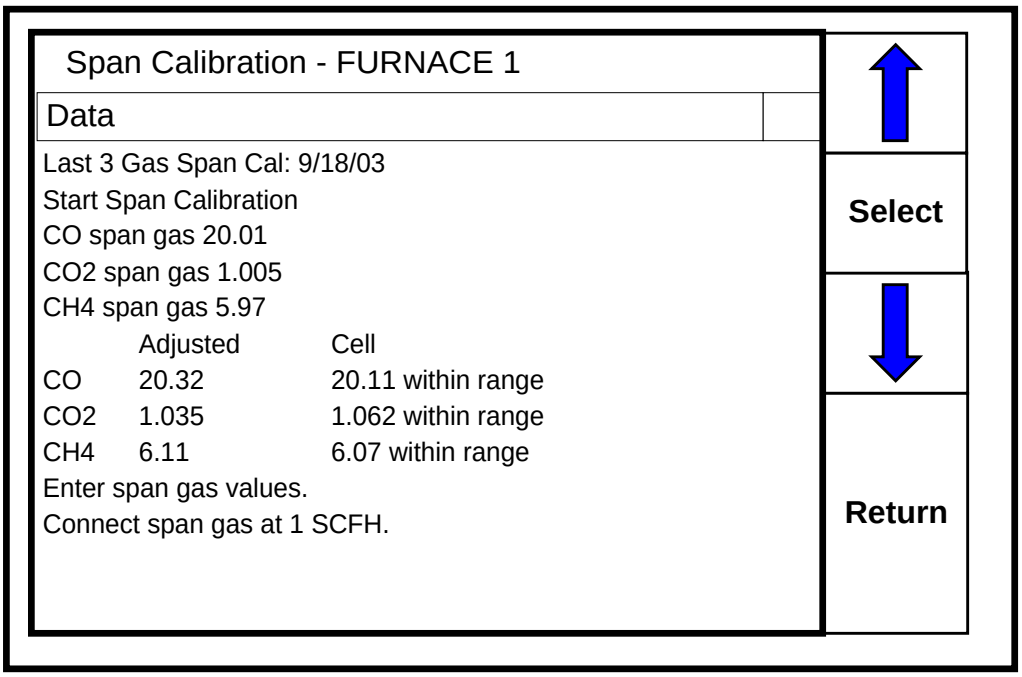
At this point in the calibration procedure, the valve on the Zero Calibration gas (Nitrogen) should be opened, and the regulator on the cylinder adjusted to allow for between 1.0 and 1.5 SCFH of flow. This flow must be maintained throughout the calibration procedure. When the flow of gas has begun, the values on this screen will begin to drop and approach zero. If the values are within 10% of the span value, there will be a "within range" message. If they are between 10 and 20% of span, there will be a message saying "out of range", however calibration will still be allowed to proceed. If the values are in excess of 20% out of range, the "out of range" message will appear and calibration will be prohibited. If this occurs, call Super Systems at (800) 666-4330 for assistance.

To begin the calibration procedure, press the down arrow and select "Start Zero Calibration". Timers will automatically count down while the unit is calibrating, and a "Done" button will appear. Pressing this button will show the correct position of the valves to restore normal operation of the instrument.

* Note: Since the calibration procedure may involve temporarily disrupting the flow to the sensors, the alarm will be disabled for whichever bench is being calibrated. This prevents the alarm from sounding when valves are open or closed and the flow of calibration gas has not yet started. The alarm is not disabled for any other benches that are not being calibrated. In addition to disabling the alarm, the CGA will suspend all COF/PF adjustments during calibration if the instrument is in control mode. This prevents the instrument from making adjustments based on the calibration gases instead of the sample gas.

Calibrate IR - Span

After accessing the "Calibrate IR - Span" menu page, the operator will be asked to select which bench will be calibrated. Only one bench can be calibrated at a time. The screen will then display a representation of the appropriate valve orientations to complete the procedure. The operator should make the valves for that specific bench match the orientation of the valves shown in the picture. When this has been done, the "OK" button is pressed. The following menu page shows span calibration data for that specific bench:



Before beginning a span calibration, the gas values of your specific calibration gas need to be entered. This gas should be a certified primary standard of the following nominal composition (the actual composition will vary slightly):

- CO: 20%
- CO2: 1%
- CH4: 6%
- H2: 40%
- N2: Balance

Use the cursor to scroll down to the percentages at each gas, and press "Select". The user will then be prompted to enter the gas value of their cylinder. Enter the correct values for CO, CO2, and CH4. When these values have been entered, open the cylinder and adjust the regulator to allow between 1.0 and 1.5 SCFH of gas to flow through the sensors. NOTE: Until the sensors come to equilibrium, the values read by the sensors will probably not be close to the span calibration values. This will result in the message "Factory Calibration Required". This condition should disappear as the sensors are exposed to the calibration gas.

After the readings stabilize (approximately 2 minutes), scroll the cursor up to the "Start span calibration" line and press "select". The timer will count down from 120 seconds, and the user calibration will be complete.

This screen shows “Adjusted” and “Cell” values. The user calibration procedure (described above) will only make changes to the “adjusted” values. This calibration information is contained within the memory of the Model 7X00. The “Cell” values can only be modified during a factory calibration. This calibration information is contained on the sensors themselves. Each bench should be returned to the factory annually for a calibration of the sensors.

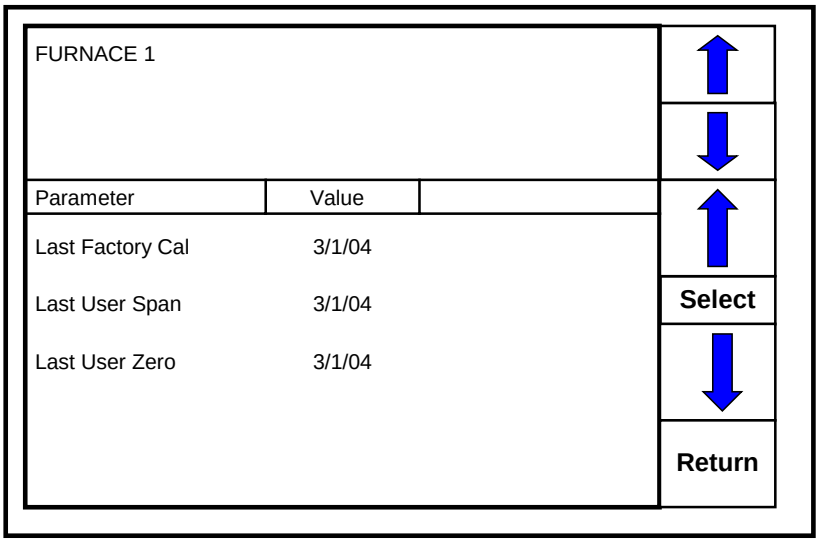
- Note: Since the calibration procedure may involve temporarily disrupting the flow to the sensors, the alarm will be disabled for whichever bench is being calibrated. This prevents the alarm from sounding when valves are open or closed and the flow of calibration gas has not yet started. The alarm is not disabled for any other benches that are not being calibrated. In addition to disabling the alarm, the CGA will suspend all COF/PF adjustments during calibration if the instrument is in control mode. This prevents the instrument from making adjustments based on the calibration gases instead of the sample gas.

Calibrate IR – NH3

This feature is not applicable to instruments that do not contain ammonia sensors. If the instrument has this sensor, a calibration can be performed using the same procedure that is used for the “Calibrate IR – Span” function. The calibration procedure is the same, but the plumbing system is separate to eliminate exposure to NH3 by components that could be damaged.

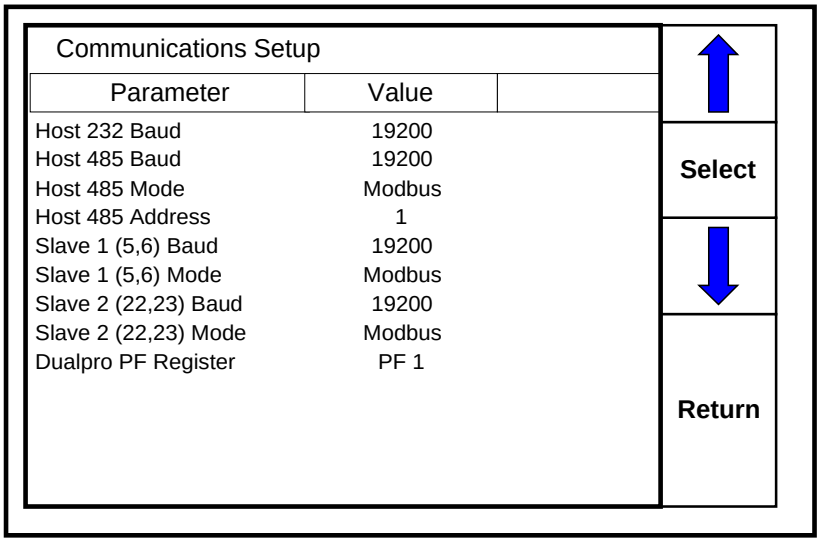
View Calibration Dates

The Model 7X00 will store calibration date information to remind the operator when recalibrations are necessary. The actual calibration interval will need to be determined by the customer based on their specific application, however some guidelines are shown in the section of this manual called “Preventive Maintenance Requirements”.



Communications Setup

This menu will set up the communications parameters for the Model 7X00.

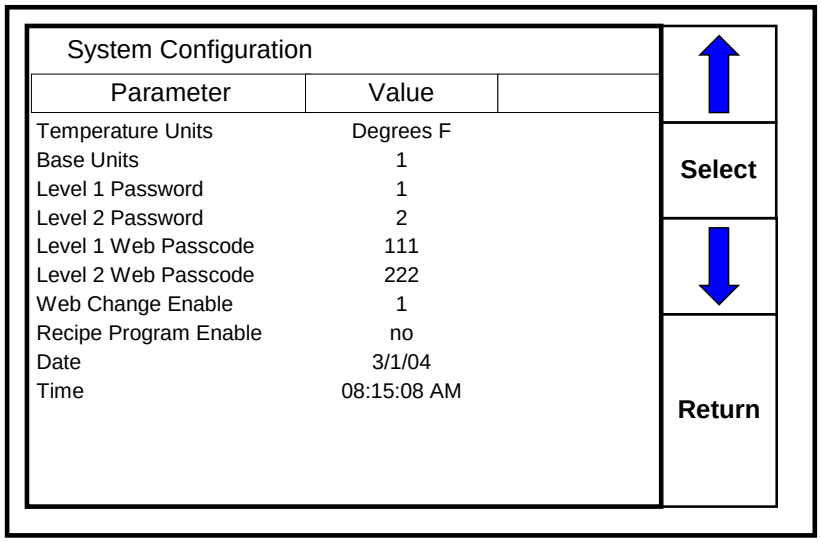


The Host 232 information relates to the internal communications on the Model 7X00. The Host 485 information relates to the host computer (if applicable). Slave 1 is any slave instrument that is communicating with the Model 7X00, while Slave 2 is the communication with the IR bench. The numbers in parenthesis pertain to the respective terminals on the 9200 Din box inside the Model 7X00. The "Dualpro PF Register" is only required if the Slave 1 instrument is a Dualpro or a Multipro.

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

System Configuration

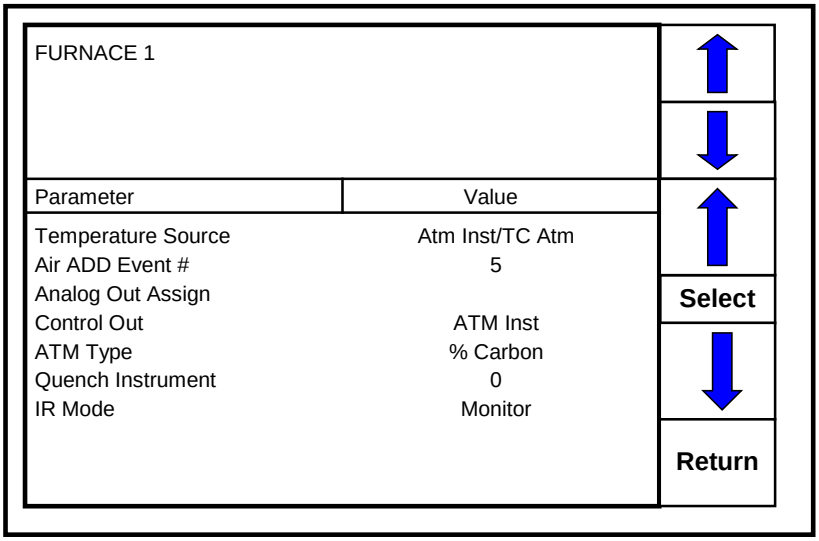
This screen allows for the adjustment of some main system parameters.



This screen determines the unit of measure for temperature values, and assigns the appropriate number of IR benches that will be communicating with the instrument. Level 1 and Level 2 passwords have default values of 1 and 2 respectfully, however they can be modified on this screen if desired. At this time, "Web Change Enable" and "Recipe Program Enable" are not available options.
Modifying the date and time on this screen adjusts the information on the 9200 controller. Changes made here will not always be reflected on the display, since the display receives its time and date information from its own operating system.

Bench Configuration

The following parameters are used to set up each bench.



To toggle between the benches, use the upper-most set of arrows. Modifications to each of the items can be made by highlighting the item, using the lower Blue Arrows and pressing the "select" button. The options for each item will be displayed for selection.

Temperature Source: This determines the source of the temperature input.

Air ADD Event #: This is the event number on the 9200 controller. This is only used when the IR is in "Control" mode.

Analog Out Assign: This is the analog out assignment on the 9200 controller. This is only used when the IR is in "Control" mode.

Control Out: This selection determines what type of instrument will be used when the instrument is in control mode.

ATM Type: This determines the type of atmosphere that will be controlled (only when the IR is in "control" mode). This will be either % carbon or dew point.

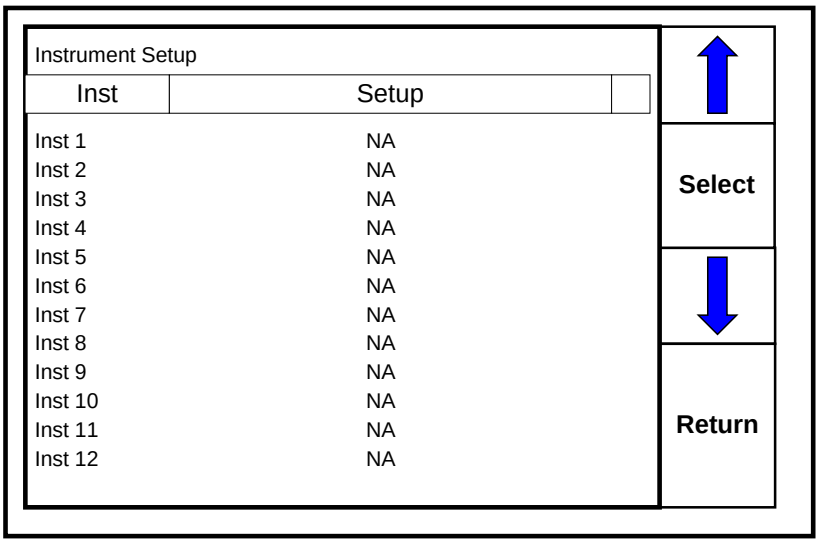
Quench Instrument: This determines the type of quench instrument (if any) will be used when the IR is in "control" mode.

IR Mode: There are four possible selections for the IR Mode:

- Monitor – Information is displayed for the user but it is not used to control or adjust anything.
- COF/PF on IR %C – The Model 7X00 determines the appropriate COF/PF and then makes adjustments to this value in the control instrument.
- COF/PF on CO – The Model 7X00 uses the actual CO value to make adjustments to the COF/PF value in the control instrument.
- Control – The Model 7X00 is used as it's own control instrument.

Slave Instrument Setup

These parameters are used to set up the Model 7X00. Using the uppermost "Up" and "Down" blue arrow keys, select the appropriate slave instrument number.



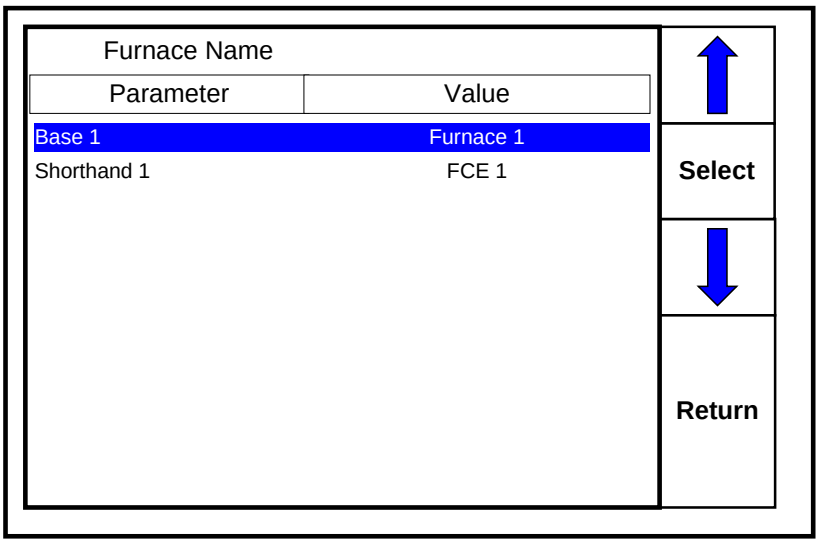
WARNING: This screen should not be changed without consulting SSi at 800-666-4330.

When an instrument has been selected, the user will be prompted to enter the Instrument Type (atmosphere controller, temperature controller, or event controller), the Port Number for that instrument, and the Address for that instrument.

Set Bench Name

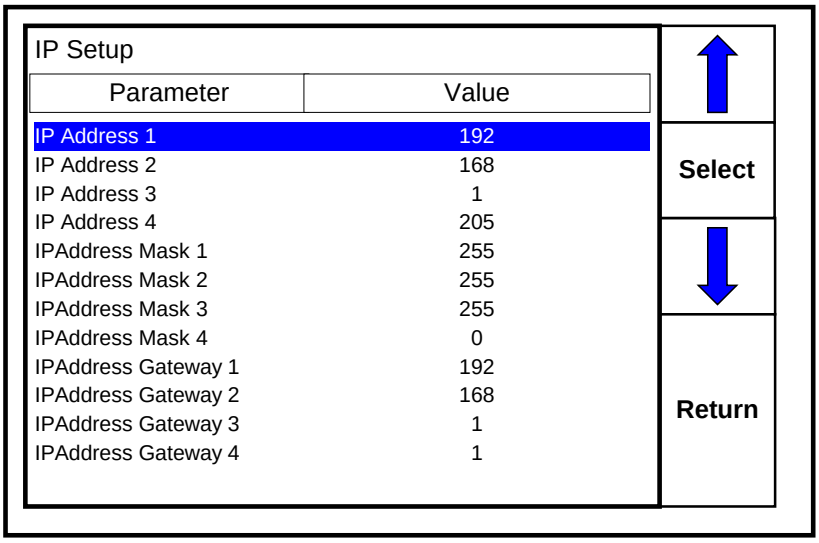
Pressing the "Set Bench Name" button displays the following screen, which allows the system to be set up with customized names that may be familiar to the operators. For each bench, a full name and a shorthand name can be entered. The full name will appear on any menu screen that references that bench. The shorthand name will be used on the screens where only a limited number of characters are available due to space constraints.

Highlighting the base and pressing the "Select" button displays an alphanumeric keyboard that allows the operator to change the furnace name. Pressing "Enter" on the keyboard changes the value. Pressing the "Return" button returns you to the configuration menu.



Set IP Addresses

This screen shows the Ethernet setups for the web page and Modbus TCP. Pressing the "Select" button displays the following screen. Using the blue "Up" and "Down" arrow keys, and highlighting the parameter, then pressing the "Select" button displays a numeric keypad that allows the operator to change the "value".



Zone Assignments

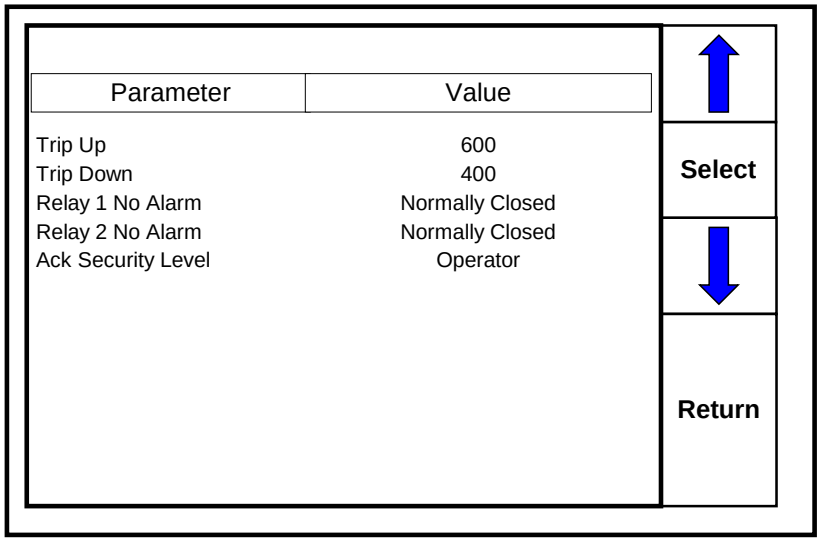
This screen is used with the Recipe Programmer, which is not enabled.

Recipe Events Setup

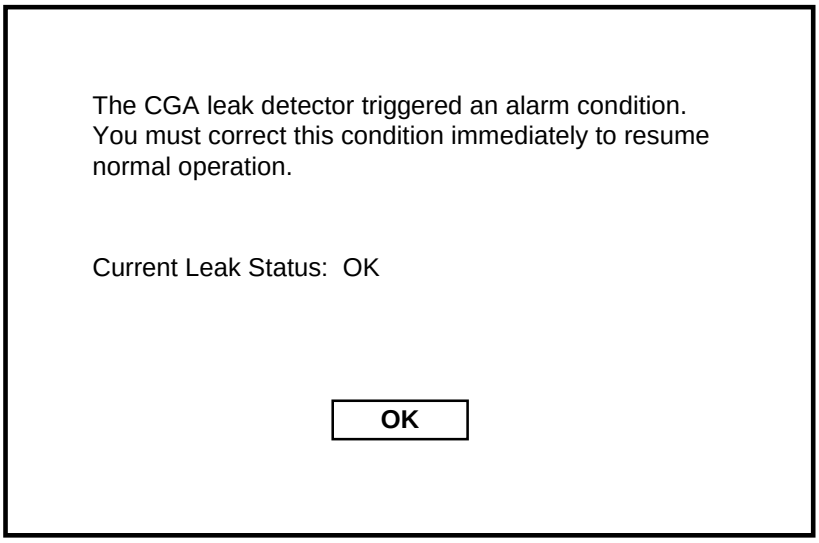
This screen is used with the Recipe Programmer, which is not enabled.

Leak Detector Setup

The CGA has a leak detector inside the main panel to detect the presence of combustible gases. The following screen shows the default settings for the combustible leak detector:



The values shown on this screen can be roughly correlated to the Lower Explosive Level (LEL) of endothermic gas. A value of 1000 will represent approximately 100% of the LEL, while 600 would only represent approximately 60% of the LEL. If the "Trip Up" value is reached, the



sample pumps will be shut off, the sample solenoid will close, and the internal fan will continue to operate to purge the enclosure of combustible gas until the alarm has been cleared. The following screen will appear:

The “Current Leak Status” will either be “OK” or “BAD”. If the level is above the “Trip Down” value, the unit will display “BAD”. If it falls below, it will display “OK”. When the “OK” button is pressed to clear an alarm condition, the user will be prompted to enter a passcode. In the above example, “Ack Security Level” is set to Supervisor, so the supervisor passcode must be entered to clear the alarm condition. After the “Current Leak Status” displays “OK”, the door to the enclosure can be opened to determine the cause of the alarm. The unit should not resume operation until the cause of the alarm has been determined.

Programmer Setup

This screen is used with the Recipe Programmer, which is not enabled.

Recipe Transfer

This screen is used with the Recipe Programmer, which is not enabled.

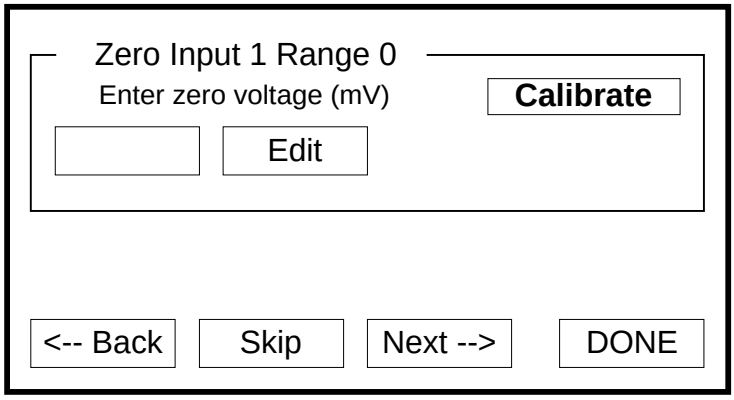
User Calibration

Highlighting "User Calibration" and pressing the "Enter" key takes you to the following screen, which allows the user to calibrate the Cold Junction Compensation on the Series 9200 Controller.

Pressing the "Edit" button displays a numeric keypad allowing you to change the current value.

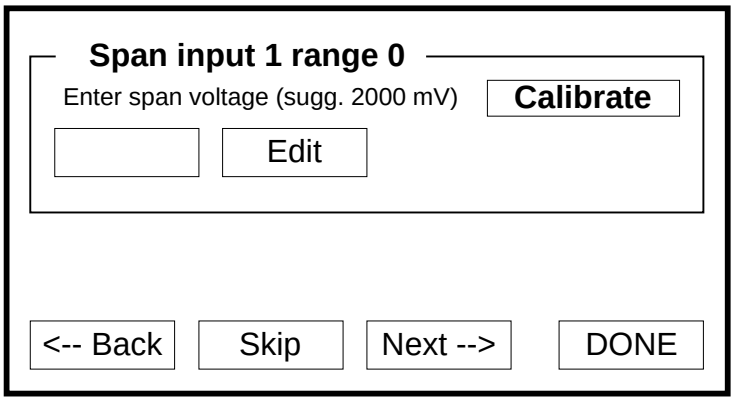
The current value is displayed directly above the bottom row of buttons as Current CJ value: XX.X ° F.

Pressing the "Next ->" key displays the following screen. Normally terminals 31 and 32 are shorted for this step.



Pressing the "Edit" key displays a numeric keyboard and allows the operator/calibration technician to enter an appropriate number. Pressing the "Calibrate" key stores that value. The current value is displayed right above the bottom row of buttons as:
Current Input 1 value: XXXXX

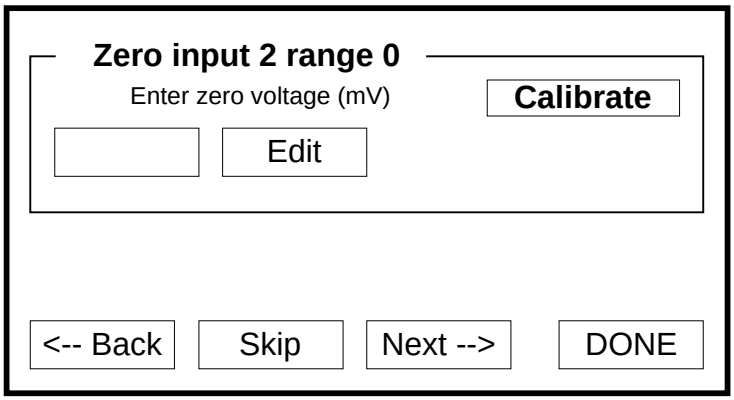
Pressing the "Next ->" key displays the following calibration screen:



Normally terminals 31(-) and 32(+) have 2000 mV applied for this step. Pressing the "Edit" key displays a numeric keypad that allows a value to be entered. Pressing the "Calibrate" key stores the appropriate value.

The current input 1 value is displayed directly above the bottom row of buttons as:
"Current Input 1 value: XXXXXXXXX

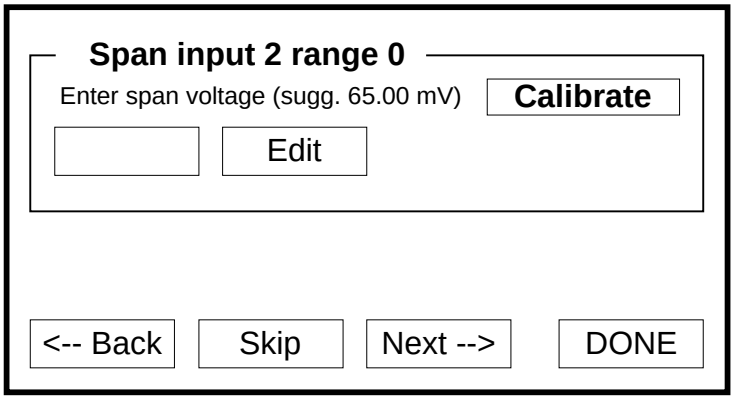
Pressing the "Next ->" key displays the following calibration screen:



Normally terminals 29 and 30 are shorted for this step. Pressing the "Edit" key displays a numeric keypad that allows a value to be entered. Pressing the "Calibrate" key stores the appropriate value.

The current input 1 value is displayed directly above the bottom row of buttons as:
"Current Input 2 value: XXXXXXXXX"

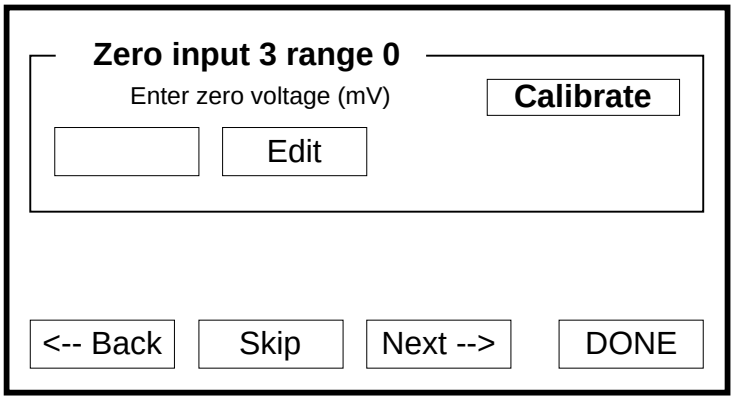
Pressing the “Next ->” key displays the following calibration screen:



Normally terminals 29(-) and 30(+) have 2000 mV applied for this step. Pressing the “Edit” key displays a numeric keypad that allows a value to be entered. Pressing the “Calibrate” key stores the appropriate value.

The current input 2 value is displayed directly above the bottom row of buttons as:
“Current Input 2 value: XXXXXXXXX

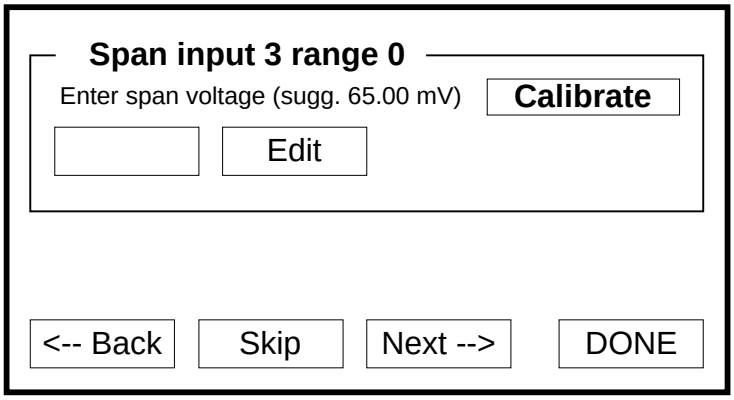
Pressing the “Next ->” key displays the following calibration screen:



Normally terminals 27 and 28 are shorted for this step. Pressing the “Edit” key displays a numeric keypad that allows a value to be entered. Pressing the “Calibrate” key stores the appropriate value.

The current input 3 value is displayed directly above the bottom row of buttons as:
“Current Input 3 value: XXXXXXXXX

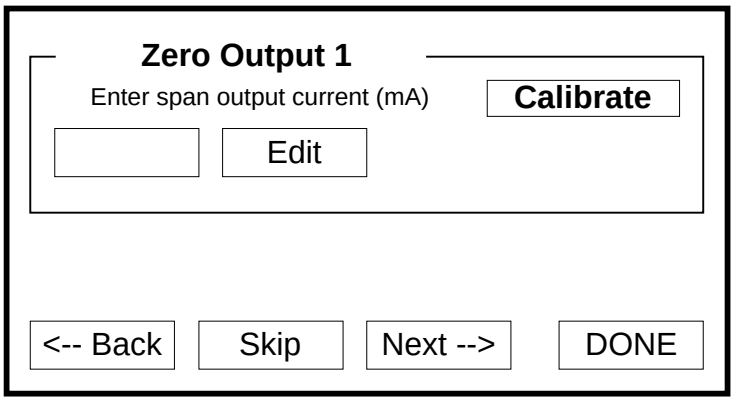
Pressing the “Next ->” key displays the following calibration screen:



Normally terminals 27(-) and 28(+) have 2000 mV applied for this step. Pressing the “Edit” key displays a numeric keypad that allows a value to be entered. Pressing the “Calibrate” key stores the appropriate value.

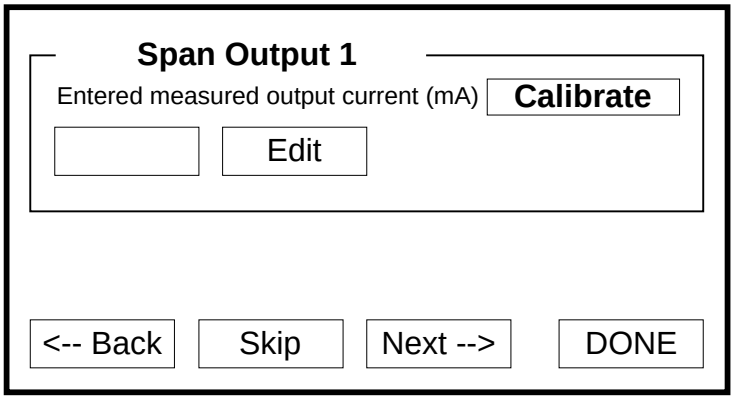
The current input t3 value is displayed directly above the bottom row of buttons as:
“Current Input 3 value: XXXXXXXXX

Pressing the “Next ->” key displays the following calibration screen:



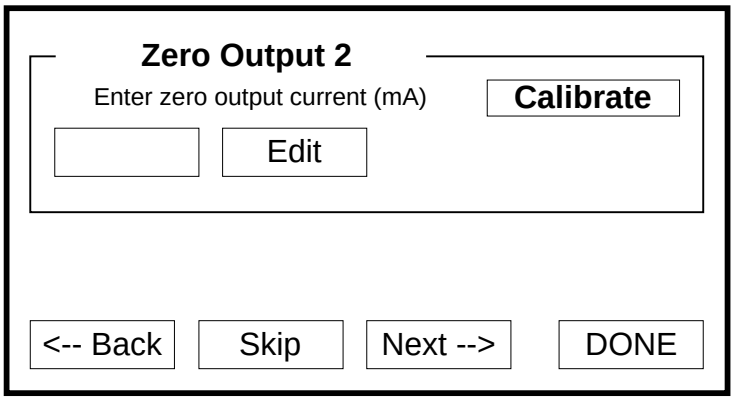
Pressing the “Edit” key displays a numeric keypad that allows a value to be entered. Measured at terminals 24(-) and 25(+) for this step. Pressing the “Calibrate” key stores the appropriate value.

Pressing the “Next ->” key displays the following calibration screen:



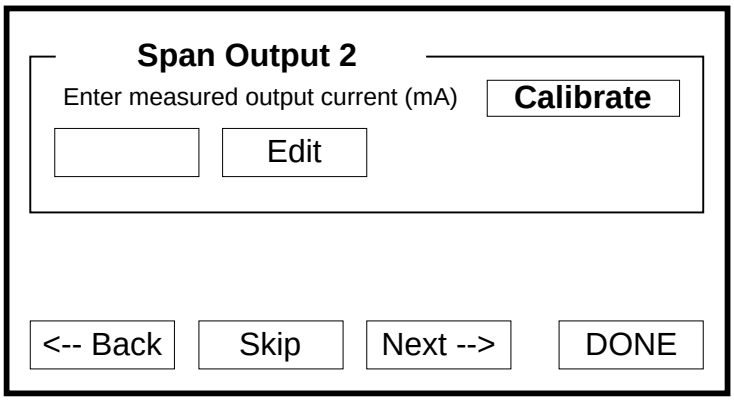
Pressing the “Edit” key displays a numeric keypad that allows a value to be entered. Measured at terminals 24(-) and 25(+) for this step. Pressing the “Calibrate” key stores the appropriate value.

Pressing the “Next ->” key displays the following calibration screen:



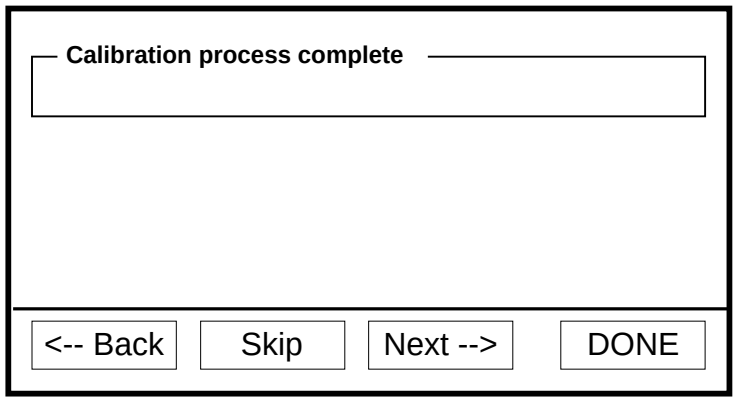
Pressing the “Edit” key displays a numeric keypad that allows a value to be entered. Measured at terminals 26(-) and 25(+) for this step. Pressing the “Calibrate” key stores the appropriate value.

Pressing the “Next ->” key displays the following calibration screen:



Pressing the “Edit” key displays a numeric keypad that allows a value to be entered. Measured at terminals 26(-) and 25(+) for this step. Pressing the “Calibrate” key stores the appropriate value.

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.



Set Calibration Dates

This screen is used to reset the factory calibration dates, and it will only be used by SSi factory personnel. Calibration dates for user calibration are automatically recorded.

Set Menu Security

The security level for each menu screen can be modified to be either Level 1 (Operator) or Level 2 (Supervisor). There is a third level (Administrator) that is only used to set up the instrument during installation. SSi will set the Menu Security levels during the installation of the instrument, and if adjustments or modifications are required please contact SSi at (800) 666-4330 for information on how this can be accomplished.

Read / Write Raw Data

SSi uses this section during installation to set up communications. No adjustments should be required, however if they are please contact SSi at (800) 666-4330 for information on how this can be accomplished.

Preventive Maintenance Requirements

Proper maintenance of the CGA will ensure accuracy and reliability over a long period of time. The frequencies of each function shown below are estimated. Actual frequencies will be determined by the features of the specific application.

Minimum Frequency	Preventive Maintenance
Every Day	Check sample flow rate to ensure 1.0 to 1.5 SCFH of sample gas to benches
1 Week	Check filters located on sample tubes at the furnace and on the side of the enclosure
4-6 Weeks	Check “Span” calibration on NDIR benches (calibrate if required)
4-6 Weeks	Check “Zero” calibration on NDIR benches (calibrate if required)
3 Months	Remove Compact Flash card and copy logged files to network.
6 Months	Perform leak test on sample tubing from furnace to instrument
6 Months	Remove and clean sample tube in furnace
Annually	Return NDIR benches to SSi for factory calibration and hydrophobic filter replacement
Annually	Verify calibration of 9200 controller (calibrate if required)

Recommended Spare Parts List

Contact SSi at (800) 666-4330 for pricing and delivery information for any of the items shown below:

Part Number	Description
T.B.D.	3-Gas NDIR bench assembly (CO, CO2, CH4)
T.B.D.	4-Gas NDIR bench assembly (CO, CO2, CH4, NH3)
37051	Filter elements for bowl filters
37050	Replacement regular-duty, high capacity filter housing
T.B.D.	Replacement high temperature, high capacity filter housing
13084	“Span” calibration gas kit
30054	“Zero” calibration gas kit
13316	5.7” color touch-screen display
T.B.D.	5A, 250V fuse (5x20mm) for touch-screen display
13335	64MB Compact Flash card
13333	Series 9000 and 9200 Flash Card Reader
37132	Heavy duty sample pump
37185	Regulator for calibration gas
Varies	Series 9200 Programmable Control System
31069	AC20 carbon controller
31081	7EK temperature controller
31302	7SL Hi-Limit controller
15008/15009	SSi Gold Probe
60000	Supervision of customer installation and start-up
20263	Sampling wand assembly (including high-temperature filter assembly)
M4554	Product operations manual

Revision History

Revision Level	Date	Description
A	11/03/03	Initial Release
B	4/13/04	Added descriptions of new features and reorganization of menu items
C	7/28/04	Modified “Flow / Alarm Display” screen, clarification of other functions
D	4/14/05	SSi Address Update, General Update