

## S7999 ControlLinks™ Configuration Display

USER'S GUIDE



### APPLICATION

The S7999 ControlLinks™ Configuration Display Device reduces burner/boiler setup time by letting you create a burner/boiler modulation curve (profile) for the burner/boiler that allows for safe and efficient operation at all points along the modulation curve. The display uses a wizard-like process to assist you through the commissioning process. Once the burner/boiler is commissioned, real-time monitoring of the system can be done via the monitoring tool.

The display can be used on systems with one or two fuels and on systems with or without flue gas re-circulation (FGR).

### FEATURES

- Allows configuration of the R7999 ControlLinks™ Controller.
- Allows monitoring of the R7999 ControlLinks™ Controller.
- Color 3.5 in. x 4.625 in. (5.7 in. diagonal) user interface display.
- Touch screen.
- RS-485 communication port.
- LED indicators:
  - Power.
  - RS-485 Communication traffic.
- Audio feedback.
- Flush mounting
- Touch screen disable for screen cleaning.
- 4-20 mA firing rate hysteresis adjustment.
- Actuator control accuracy adjustment.
- 12 Vdc power supply.
- Screen saver.
- Contrast control.
- Volume control.



# TABLE OF CONTENTS

TABLE OF CONTENTS	2
SPECIFICATIONS	3
SAFETY FEATURES	4
INSTALLING THE HARDWARE	4
BEFORE YOU BEGIN	7
QUICK SETUP	7
STARTING THE DISPLAY	7
MONITORING	8
DISPLAY OPERATION	11
OPERATING PROCEDURES	16
COMMISSIONING PROCESS	17
TROUBLESHOOTING	24
R7999 OUTPUTS AND INPUTS	25
R7999 FAULT CODES AND ACTIONS	25
DISPLAY SETUP AND DIAGNOSTICS	28
SOFTWARE UPGRADE ADDENDUM	31

## SPECIFICATIONS

### Electrical Ratings:

S7999:

+12 Vdc input, maximum of 500 mA current drain.

Included Power Supply:

Inputs: 85 to 264 Vac, 47-63 Hz; 120 to 370 Vdc

Output: 12 Vdc; 0 to 2.1 A.

Power: 25W

**Storage Temperature:** -13°F to +155°F (-25°C to +60°C).

### Humidity:

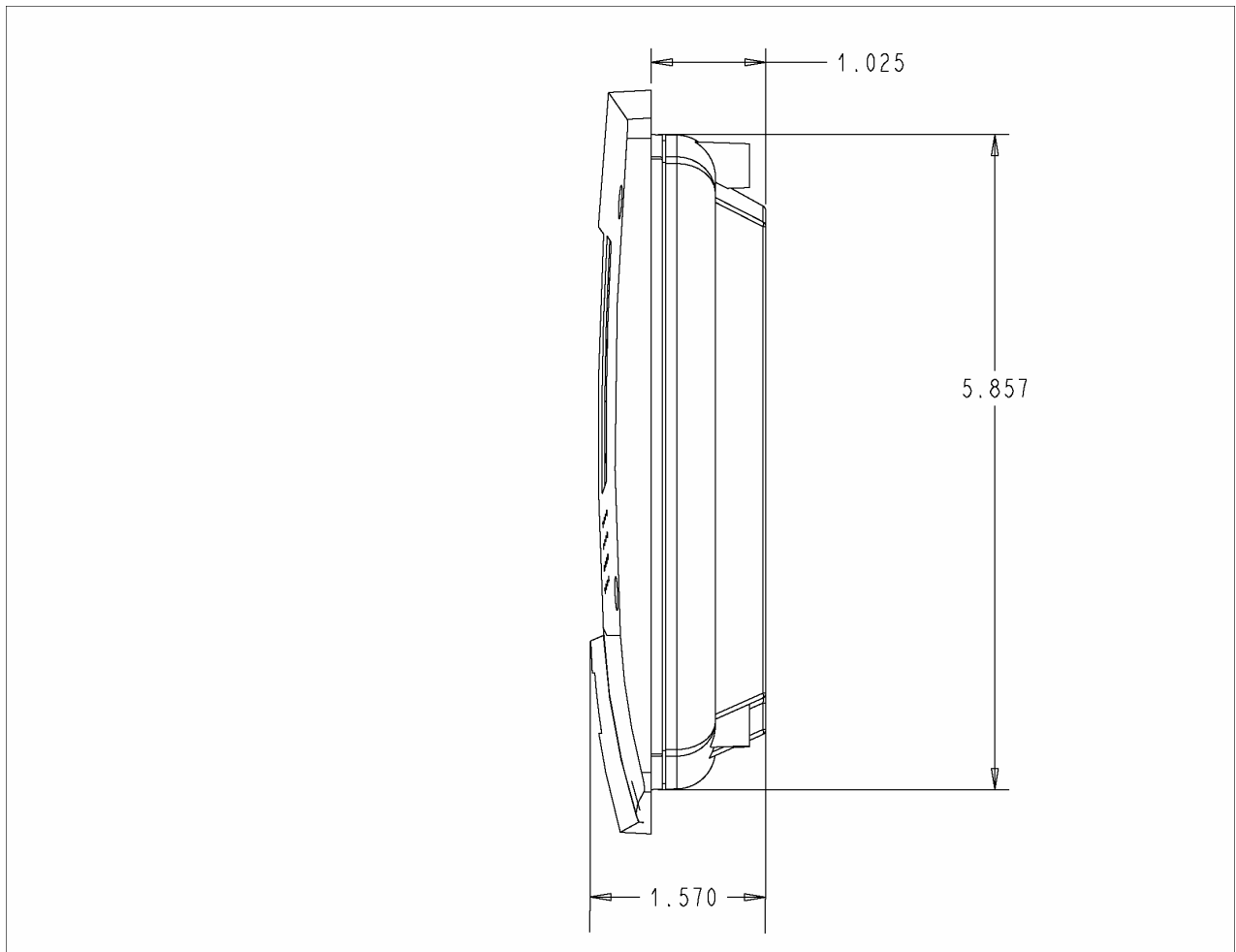
95% maximum relative humidity.

### Approvals:

Underwriters Laboratories, Inc.

**Operating Temperature:** 14°F to 122°F (-10°C to +50°C)

**Dimensions:** See Fig. 1 and 2.



**Fig. 1. S7999 dimensions in inches, side view.**

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This Class A digital apparatus complies with Canadian ICES-003.

Cet Appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

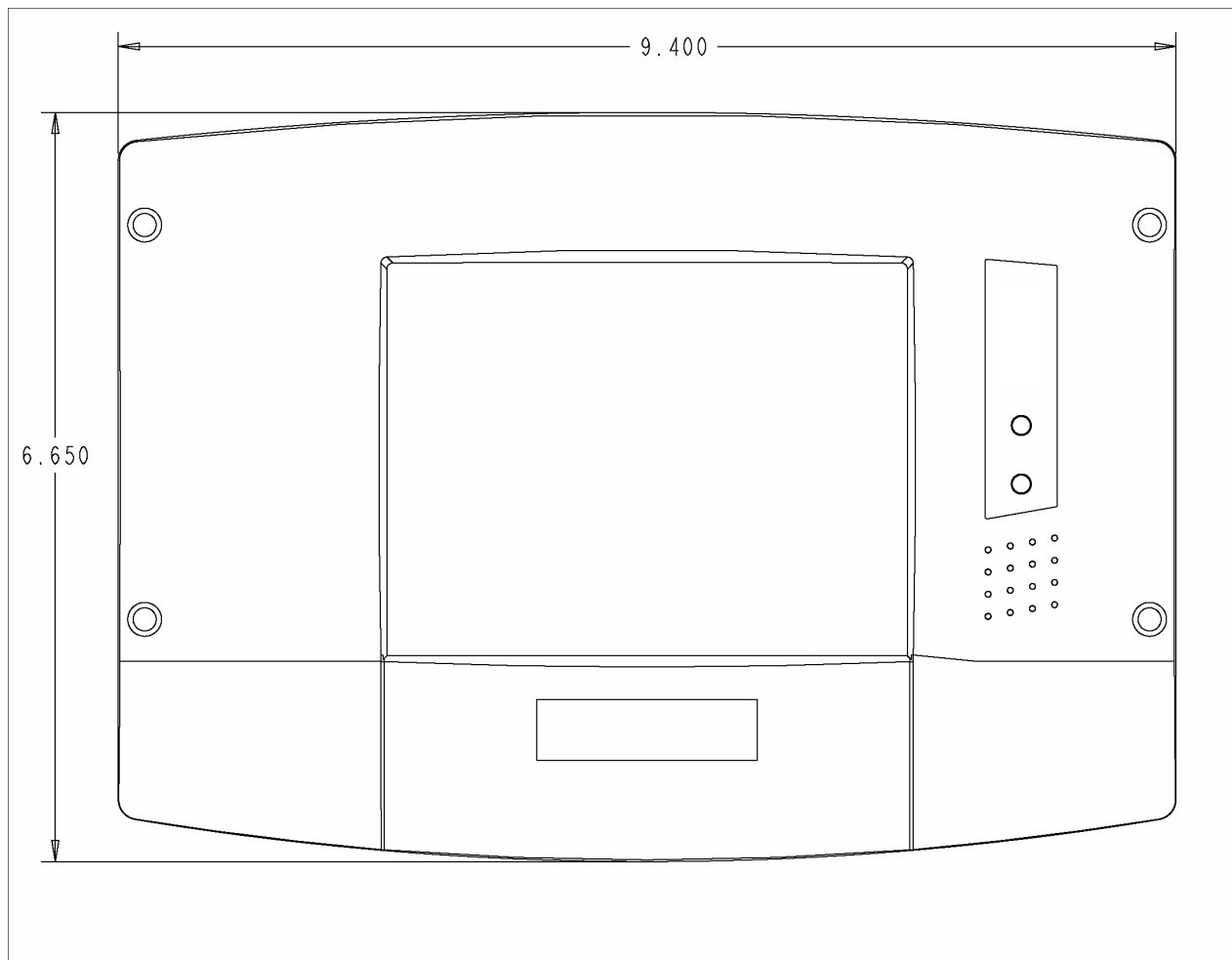


Fig. 2. S7999 dimensions in inches, front view.

## SAFETY FEATURES

The S7999 contains software that incorporates many features that are designed to guide you safely through the commissioning process. Safety, however, is your responsibility.

Read all documentation carefully and respond appropriately to all error messages.

Be aware that as you command the display to open and close actuators, the display is designed to prevent you from opening or closing them too rapidly. When any of the system actuators is below 20% of its open position, the R7999 effectively limits any actuator from traveling more than three degrees without moving the other actuators in the system. When all the actuators are over 20% of their open position, the limit increases to 10 degrees.

## WARNING

### Explosion Hazard.

**Improper configuration can cause fuel buildup and explosion.**

Operators of this display may move fuel and/or air actuators to positions that can create hazardous burner conditions. Improper user operation may result in PROPERTY LOSS, PHYSICAL INJURY or DEATH.

The S7999 ControlLinks™ Configuration Display Device is to be used only by experienced and/or licensed burner/boiler operators and mechanics.

## INSTALLING THE HARDWARE

### Mounting the S7999 and Power Supply

The S7999 can be mounted on the door panel of an electrical enclosure.

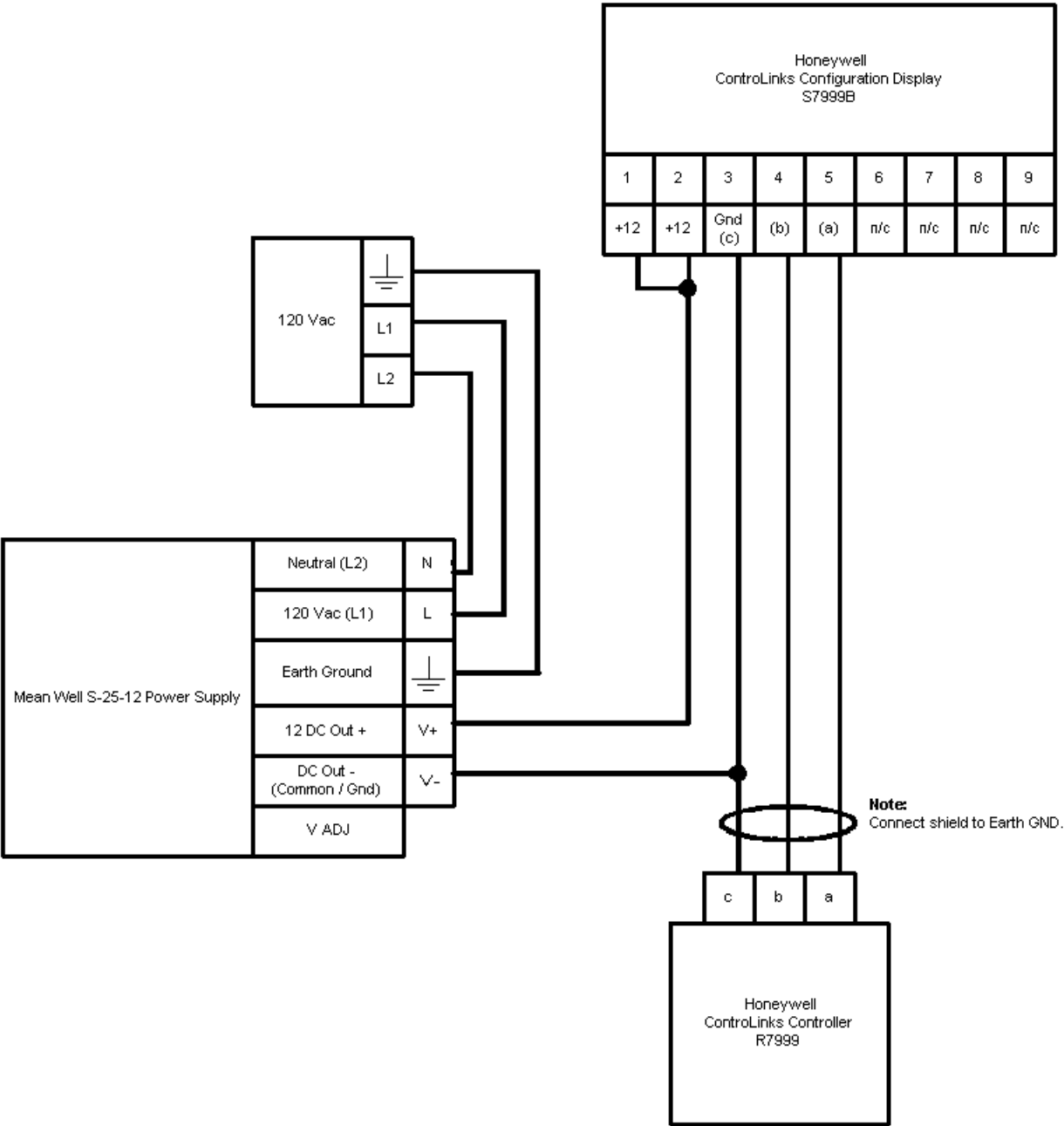
1. Select the location on the door panel to mount the unit; note that the device will extend into the enclosure at least one inch past the mounting surface.
2. Provide an opening in the panel door 8-1/8 in. wide by 5-7/8 in. high.
3. Place the S7999 in the opening and use it as a template to mark the location of the four mounting screw holes. Remove the device and drill pilot holes at the marked location.
4. Using the pilot holes as guides, drill 1/4 in. holes through the door panel.
5. Place the S7999 in the opening, aligning the mounting holes in the device with the drilled holes in the panel.
6. Secure the S7999 to the panel with four #6-32 screws and nuts provided.
7. Select a location inside the enclosure for mounting the power supply.
8. Using the power supply as a template, mark the locations of two mounting holes in the enclosure.
9. Remove the power supply and drill pilot holes.
10. Drill 1/4 in. holes through the panel at the marked locations and secure the power supply with the two #6-32 screws and nuts provided.
11. Remove the 9-pin connector plug from the back of the S7999.
12. Wire the connector to the power supply and the RS-485 cable using the wiring diagram in Fig. 3.
13. Insert the 9-pin connector plug back into the S7999 and secure firmly.

## Installing the ControlLinks™ System Hardware

Use the following ControlLinks™ Control instructions to install the system hardware: See Fig. 3 for wiring block diagram.

- 65-0238 R7999 ControlLinks™ Control Controller.
- 65-0239 ML7999 ControlLinks™ Control Actuator.
- 65-0240 Q7999 Wiring Subbase.

**Honeywell ControlLinks Configuration Display (S7999B) Wiring Diagram**



**Fig. 3. Honeywell ControlLinks™ Control simplified wiring diagram.**

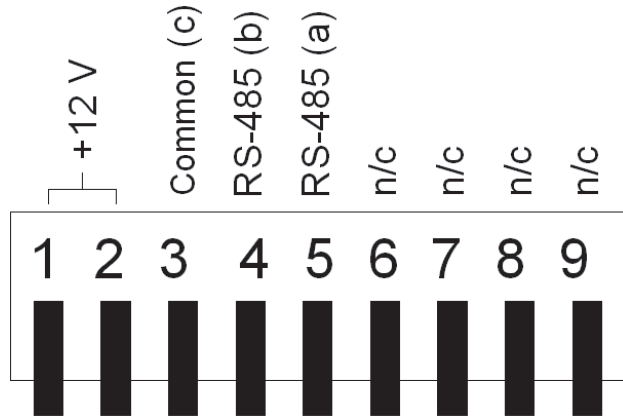


Fig. 4. S7999 connector terminals.

## BEFORE YOU BEGIN

Before you begin to commission a system:

1. Read this guide to understand how the display operates.
2. Review the “Commissioning Process” and “Creating an Air/Fuel Ratio Profile - Example” sections so that you have a clear understanding of the commissioning process.

## QUICK SETUP

1. Make sure the S7999 9-pin connector is properly aligned and pressed firmly in place.
2. Make sure the 3-pin connector is connected securely to the ControlLinks™ Control controller RS-485 communication port.



### WARNING

**Electrical Shock Hazard.**  
Can cause severe injury, death or equipment damage.  
Line voltage is present at the 120 Vac power supply.

3. Make sure the +12 Vdc power supply is connected securely to the 120 Vac power source.

## STARTING THE DISPLAY

### Home Page

Make sure this screen (Fig. 5) appears after the device is properly powered up.

The number of actuators displayed on this page will vary depending on the number of actuators previously wired to the ControlLinks™ Control and configured via the S7999 configuration tool.

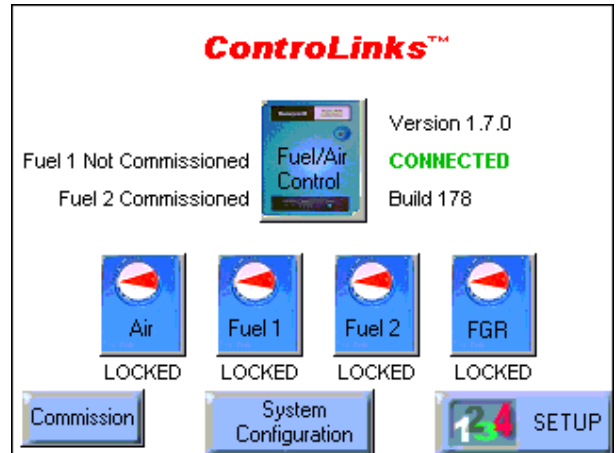


Fig. 5. Home Page screen.

If the following screen (Fig. 6) appears, then no R7999R7999 is seen by the display. Check for proper wiring connections and make necessary corrections.



Fig. 6. Home Page—disconnected.

### Power-up Validation

This Home Page will appear and the Ready LED will be blinking when the device is properly powered. Select the Setup button to adjust the contrast as desired.

If the screen is dim, check pin 1 wiring connections.

### Communication Validation

1. Make sure the I/O LED is blinking.
2. If the I/O LED is not blinking:
  - a. Make sure the proper connections have been made between ControlLinks™ Control and the S7999. See the section on Ensure Proper Wiring of the S7999 9-pin Header Connections.

MONITORING

ControlLinks Control (R7999)

Monitoring the ControlLinks™ Control system is performed by clicking on the Fuel/Air Control icon located on the Home Page screen to display the current configuration status, actuator positions and terminal states.

NOTE: Clicking on the Home or Back button will exit the Monitor screen and return to the Home Page.

The Show Faults button on the monitor screen can be selected to display the most recent faults reported by the R7999 (see Fig. 9).

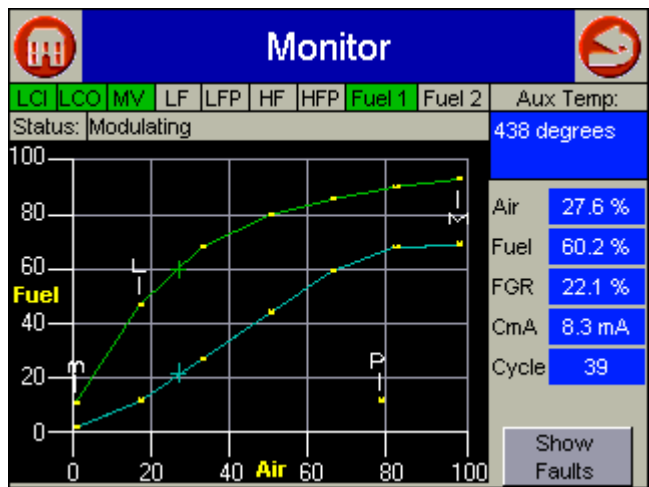


Fig. 7. Monitor Screen.

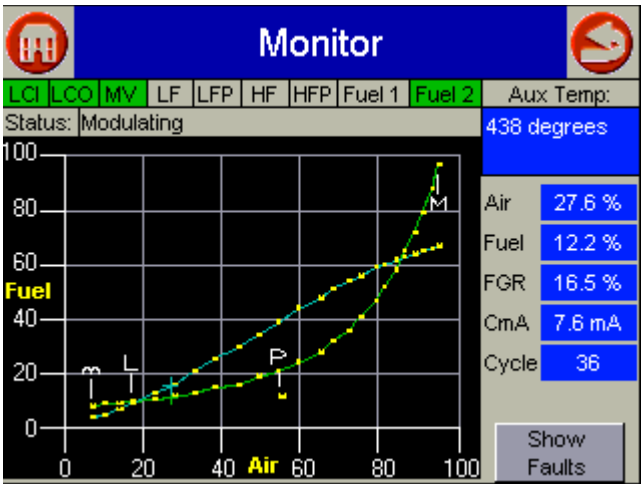


Fig. 8. Monitor Screen—24 point curve, modulating.

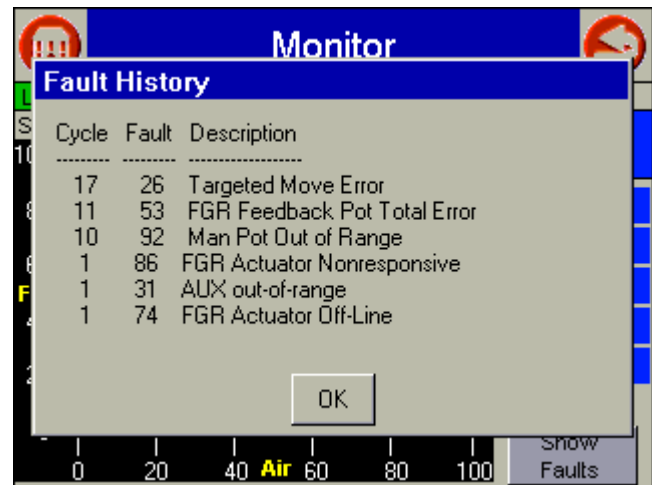


Fig. 9. Monitor Screen—Fault History.

Actuator

The status of each actuator can be viewed by clicking on the icon on the Home Page corresponding to that actuator. A screen similar to that in Fig. 10 is displayed.

The Show Faults button can be selected on the actuator screen to display the fault history for that actuator (see Fig. 11).



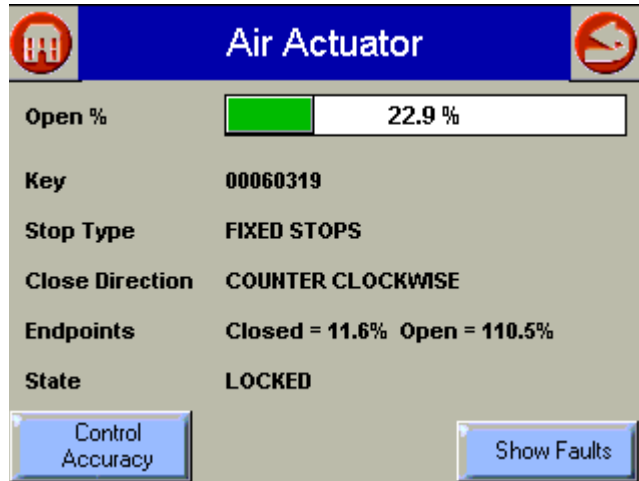


Fig. 10. Monitor Screen—Air Actuator status.

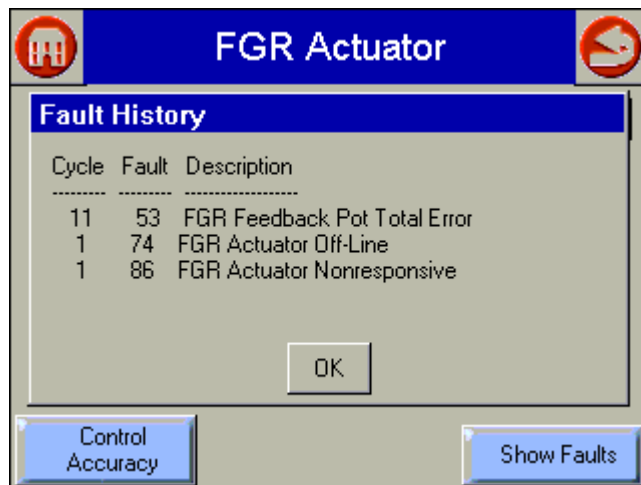


Fig. 11. Monitor Screen—FGR Actuator fault history,

## Set Control Accuracy

This feature is only available for Fuel/Air controller software builds higher than 178. The Fuel/Air control must be updated to use this feature. The Control Accuracy button on the Air/Fuel1/Fuel2/FGR Actuator screen will be grayed-out when the Fuel/Air control software build is 178 or below (see Home Page screen for build number).

The Control Accuracy setting controls how closely the actuators will follow the profile curve configured in a Fuel/Air control and defines the allowable tolerance for achieving each commanded position. The R7999 system will normally drive the actuators to within 0.1 degree (default value) of the programmed curve, but many applications may not require this type of accuracy. Increasing the Control Accuracy value may reduce the amount of actuator dither/hunting and premature wearout due to a noisy environment or a potentiometer.

Pressing the Set Accuracy button will cause the R7999 to reset and store the user-selected value in the Fuel/Air Control nonvolatile memory.

Setting the Control Accuracy to a value other than 0.1 degree will disable 0.1 degree positioning commands available by default when commissioning the curve.

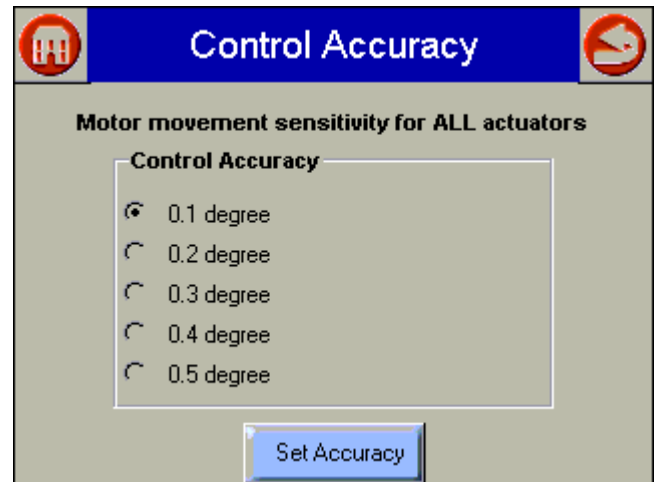


Fig. 12. Monitor Screen—Set Control Accuracy.

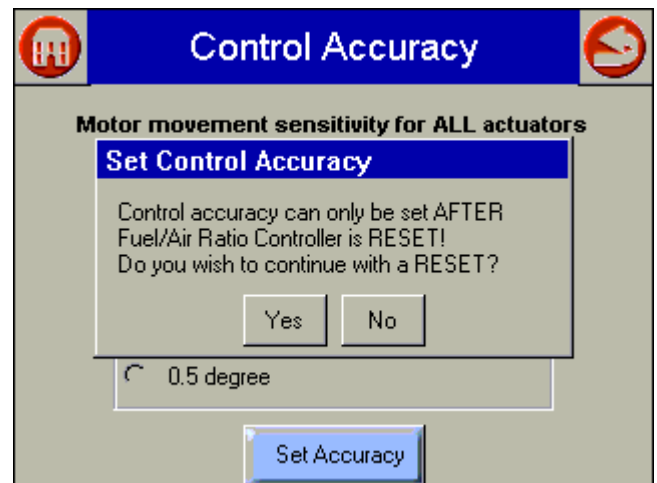


Fig. 13. Monitor Screen—Setup for Set Control Accuracy.

## System Configuration

The System Configuration button on the Home Page allows the user to monitor and view the system configuration parameters set during commissioning. The first screen displayed is the one shown in Fig. 14. The buttons on the bottom of the screen guide the user to the next screens displayed (Fig. 15 - 18).

The Show Faults button shows the most recent faults reported by the R7999.

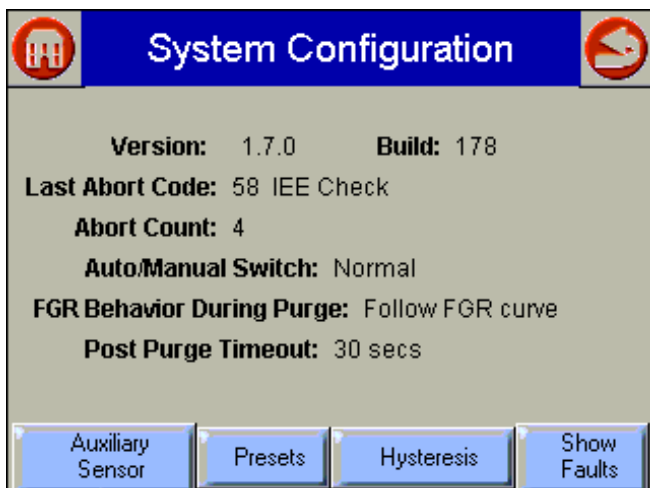


Fig. 14. System Configuration Screen.

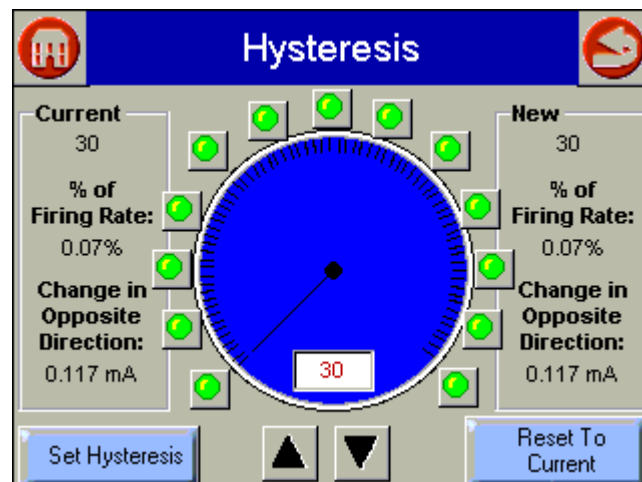


Fig. 17. Set Hysteresis screen.

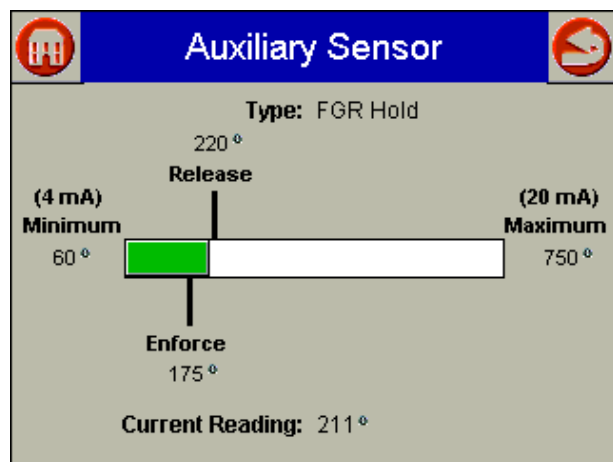


Fig. 15. Auxiliary Sensor temperature settings.

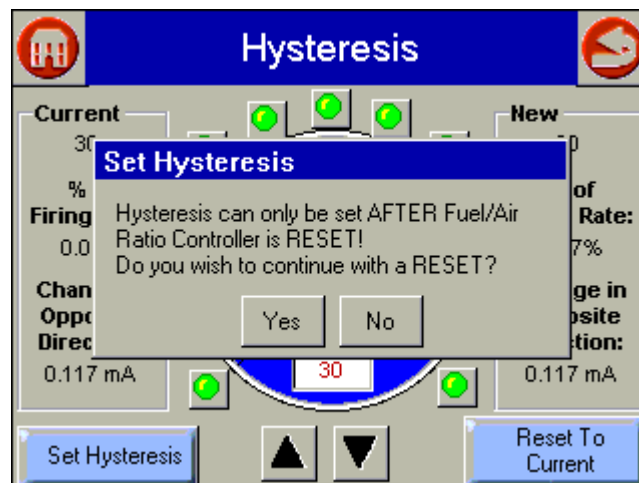


Fig. 18. Hysteresis pop-up screen.

<b>Fuel 1 Preset Positions</b>			
	Air	Fuel	FGR
Purge	78%	12%	12%
Lightoff	10%	8%	3%
Stop	10%	10%	10%
Non-selected		10%	

Fig. 16. Actuator Preset positions.

## Set Hysteresis

This feature is available for all ControlLinks™ controller software builds except 176 (see Home Page screen for build number). The Fuel/Air control must be updated to use this feature.

The Hysteresis value controls the amount of hysteresis for the 4 to 20 mA firing rate (CmA) input signal. Adjusting the Hysteresis value determines when the R7999 (ControlLinks™ Controller) will react to a firing rate change in the opposite direction. The ControlLinks™ Controller only reacts to a firing rate change in the opposite direction when it has increased/decreased more than the user-selected Hysteresis value. However, the ControlLinks Controller always follows the firing rate signal as it changes in the same direction.

For example: When a hysteresis value of 0.5 mA has been selected and the firing rate dropped from 12 mA to 10 mA, the ControlLinks™ Controller will not begin to follow an increased firing rate until it increases to a value of 10.5 mA or higher. All firing rate values between 10 mA and 10.5 mA are interpreted

as a value of 10 mA. The configured actuators will remain at their corresponding 10 mA firing rate position until a new firing rate is accepted.

Increasing the hysteresis value may reduce the amount of actuator dither/hunting and premature wear-out due to a noisy environment or an intelligent firing rate controller continuously attempting to satisfy a very precise setpoint.

Use the green LED buttons on the Hysteresis screen for large changes to the hysteresis value. Then use the up/down buttons to slowly fine-tune the desired Hysteresis selection. Pressing the Set Hysteresis button will cause the controller to reset and the new value will be written into nonvolatile memory. The Reset to Current button causes the current value to be copied to the proposed new value field, similar to an undo operation. See Fig. 17 and 18.

## DISPLAY OPERATION

Because the S7999 ControlLinks™ Control Configuration Display Device operates like a wizard, you cannot open screens randomly. You must step through them one at a time, and provide the information necessary for one before you can move on to another. The screen descriptions are provided below so that you can understand the purpose of each and view the selections, parameters, and information that is available or required on each.

**NOTE:** Most screens have a Home button which appears as an icon of a building structure in the upper left corner of the screen and a Back button which appears as an icon of an arrow returning to its origin in the upper right corner of the screen. The Home button returns the user immediately to the Home Page and terminates any operation in progress. Care should be taken with this button during commissioning. The Back button returns the user to the previous screen.

### Screen Descriptions

The S7999 ControlLinks™ Control Configuration Display Device screens include the following:

- a. ControlLinks™ Controller S7999, referred to as the Home Page.
- b. Commission Warning.
- c. Commission Configuration.
- d. XXXX Actuator Configuration, where XXXX is either Air, Fuel1, Fuel 2, or FGR (Serial Number).
- e. System Configuration.
- f. Curve Commissioning for Fuel X, where X is either 1 or 2.
- g. Monitor (This screen is not part of the commissioning process, but allows you to monitor a system after it has been commissioned.)

### Home Page (Fig. 5)

The Home Page is used to select one of the following actions:

- Commission the system:
  - Commission Button. Press to start commissioning a new system or modify/review the commission settings of an existing system.

- Monitor a commissioned system:
  - Press the icon corresponding to the part of the system you wish to monitor. Press the System Configuration button to view system parameter settings.
- Display Setup and Diagnostics.
- Press the setup button to configure display settings.
- Verify the version number of the S7999 software, adjust display settings, test the display and reset the display.

### Commission Warning Screen (Fig. 25)

The Commission Warning screen is used to:

- Protect the system from unauthorized users.
- Connect the R7999 to the S7999. Refer to the R7999A,B ControlLinks™ Control Controller specification sheet (Form No. 65-0238).

You can perform the following actions from this screen:

1. Enter your password to access the commissioning function of the S7999.
2. Change the password.
3. Monitor.

### Commission Configuration Screen (Fig. 27)

The Commission Configuration screen is used to:

- Identify the configuration of the system you want to commission, for example, dual fuel system with a FGR or a single fuel system, etc.
- Begin configuration of the actuators.
- Allow the user to set System Parameters.
- Load a curve from the display memory.
- Begin configuration of the ControlLinks™ curve.

You must perform the following actions from this screen:

1. Select base configuration for the system:
  - a. **Base Configuration**
    - (1) **Unconfigured**—This is the initial (default) option. You can select this option to erase the current configuration and reset to factory configuration.
    - (2) **Single Fuel**—Select if you want to configure only one fuel actuator and one air actuator.
    - (3) **Single Fuel with FGR**—Select if you want to configure a fuel actuator, an air actuator, and an FGR actuator.
    - (4) **Dual Fuel**—Select if you want to configure two fuel actuators and one air actuator.
    - (5) **Dual Fuel with FGR**—Select if you want to configure two fuel actuators, one air actuator, and an FGR actuator.
  - b. **Air**  
**Fuel1**  
**Fuel 2**  
**FGR**
    - (1) Press a button to configure the actuator. (If you selected 'Single Fuel' or 'Single Fuel with FGR' in the Base Configuration, the Fuel 2 button is not displayed. If you selected 'Single Fuel' or 'Dual Fuel' in the Base Configuration, the FGR button is not displayed.) When you press a button, the *Set Actuator Endpoints* screen is
2. Select and configure all actuators within the base configuration:

displayed. When the actuator has been configured, a checkmark is displayed next to the appropriate button. See Fig. 27.

3. Go to the System Parameters screens to set system parameters or view the default system parameters (if necessary).
4. Press the Next button to configure a ControlLinks™ curve.
5. Press Load Default Curve button to load and configure a pre-existing ControlLinks™ curve.

## Actuator Configuration Screens (Fig. 29 - 33)

The Actuator Configuration screens (there is a set for each actuator) are used to:

- Identify the configuration of each actuator in the system. This prevents actuator and/or controller replacement without recommissioning the system and verifying safe operation.
- Set the maximum open and closed positions for each actuator.
- Enter the actuator configuration information including: direction of travel, actuator type, and KEY (serial number).



## CAUTION

**Operating condition hazard.**

**Wrong actuator information can cause an unsafe operating condition.**

Use caution when selecting this setting. If you enter the wrong direction of travel, you may create an unsafe condition later in the commissioning process.

1. Actuator Configuration:
  - a. Direction of Closed Travel—Select the direction that the actuator travels to close, either *Clockwise* or *Counterclockwise*.
  - b. Actuator Type—Select the type of actuator, either *Fixed Stops* or *Continuous* rotation.
2. Next button on Actuator Configuration screen:
  - a. Press this button after you have selected the direction of closed travel and actuator type.
  - b. If you change an actuator in a commissioned system, you cannot run the system until you have entered the new KEY (serial number) of the actuator, set the maximum open and closed positions and re-verify the existing curve (or set and verify a new curve) for the system.
  - c. Serial Number—Enter the serial number of the actuator you are configuring. The serial number can be found on the ML7999 actuator body in two places under the label “KEY.” The “key” is made up of eight numbers, the first four numbers represent the date code of manufacture for the actuator. The R7999 writes the serial number to the actuator to verify your entry. If you enter the wrong number, you will receive an error message.
3. OK button on Serial Number screen:
  - a. Press this button after you have entered the KEY (serial number). The serial number is verified and the configuration information is stored. If the serial number you entered and the device serial number do not match, you will receive an error message

NOTE: You must resend the KEY (serial number) any time you revise the closed direction setting or change the type of end-stop selection.

4. Set Maximum Closed Position/Set Maximum Open Position:
  - Press one of these buttons to manually open or close the actuator the number of degrees indicated in the slide bar (from 1 to 10). Each time you press the *Open* or *Close* key, the R7999 receives a command to execute the move command, the interface is essentially locked out until the command has been completed.
5. Auto Seek Open/Closed:
  - Press one of these buttons to automatically locate the maximum open or maximum closed position of the actuator. The actuators are moving in a limited torque mode. Therefore the time required to move from one end of travel to the other is extended by approximately a factor of three. You can speed up this activity by opening the actuator cover and pressing the CW or CCW buttons.
6. It is not recommended that you let the actuators hit the damper or valve system endpoints when using the actuator CW or CCW buttons.
7. Lock/Unlock Position:
  - After you have set the maximum open or closed positions for the actuator, ‘lock’ the settings by pressing the *Lock Position* button. Once you press the *Lock Position* button, the degrees position will change from red to blue and the button redisplay as *Unlock Position*. To change the position settings once the *Lock Position* button has been pressed, you must press the *Unlock Position* button.
8. **Next** Press this button to move to the *Commission Configuration* screen. You cannot move to the next screen until you have completed the actions required on this screen. See Fig. 32 and 33.

## System Parameters Screens (Fig. 19 - 23)

### SYSTEM PARAMETERS

NOTE: All System Parameter screens are disabled until all actuators are configured.

1. Press the System Configuration button on the Commission Configuration screen to set system parameters. System parameters let you choose advanced features that use the auxiliary 4-20mA input such as: low fire hold and/or FGR holds, configure actuator positions during standby, configure the position of the non-selected fuel actuator, configure action of the FGR actuator during purge, adjust the postpurge timing parameter, and select a maximum firing rate limit via the manual potentiometer input.
2. Setting these parameters is optional. If you do not set system parameters, the default values will be used. See Default System Parameters for the default value/setting for each parameter.

NOTE: The selection of Xma (auxiliary mA) operation system parameters result in a common attribute between the operation of both fuel selections. For example, selecting low fire hold will apply to both fuels.

- Home**—Press to go to Home Page.
- Back**—Press to return to the previous screen.
- Next**—Press to move to the next screen for additional system parameters.
- Set**—Save the settings shown on the current page.
- Finish**—Press when finished setting system parameters. Returns to Commission Configuration screen.

If you make changes to the system parameters on the screen, they are not saved until you press the **Set** button.

System parameters you can set include:

- Stack or boiler water temperature sensor operating parameters.
- Controller timing (postpurge time).
- Auto/manual maximum firing rate option via the manual potentiometer input.
- Program standby positions and nonselected fuel position.
- FGR behavior during purge.
- XmA Operation (Auxiliary mA input).

Select an operation from the dropdown list:

- Disabled means the input is ignored.
- Low Fire Hold**—Selecting this option field enables an algorithm that protects the boiler from thermal shock. Upon successful progression to modulation, the R7999 holds the burner at the light off point until the auxiliary temperature input exceeds the programmed threshold.
- FGR Hold**—Selecting this option field enables an algorithm that holds the FGR damper closed until the stack temperature has reached a programmed threshold. After successful progression to modulation, the R7999 holds the FGR closed until the auxiliary temperature input exceeds the programmed threshold.
- FGR and Low Fire Hold**—Selecting this option enforces both of the above actions.
  - Max (20 mA)**—This field lets you set the maximum sensing range of the transducer. The maximum value must be between -60°F and 1400°F.
  - Min (4 mA)**—This field lets you set the minimum sensing range of the transducer. The minimum must be less than the maximum by at least 100°F.
  - Threshold**—This field lets you set the threshold temperature at which you want the low fire hold or FGR hold or Low Fire and FGR hold to be released. The threshold temperature must be less than the maximum and greater than the minimum.
  - Differential**—This field lets you set the differential temperature at which the system will revert to a hold condition. The threshold must be set lower than the threshold but greater than the minimum.

**Controller timing: Postpurge Timeout**—Use the dropdown list to select how long the system should wait at the postpurge position once the postpurge state has been detected. It is important that the postpurge timeout time be at least as long as the burner control time, especially when the air damper is configured to close while in standby.

#### Auto/Manual Switch

- Select either Normal or Maximum Firing Rate Limit.
- When the Maximum Firing Rate Limit is selected, the R7999 (when in auto mode) reads the value of the manual potentiometer input and does not allow modulation beyond its interpreted value. The

manual potentiometer input equates 0 to 500 ohms as a 4 mA firing rate input and 4500 ohm or greater as a 20 mA input; all other values are determined by linear interpolation. The behavior during manual switch setting is not affected, i.e., the firing rate input is derived directly from the potentiometer value and the controller mA input is ignored.

**Program Standby Position**—Lets you set the position of the actuators when the controller is in the standby position. For each actuator, select *Closed*, *Lightoff* or *Open*. If you select *Open*, you must enter a value in the appropriate field to indicate how wide the actuator should be opened (percentage of the actuator span value).

**Program Non Selected Fuel Position**—Lets you set the position of the fuel actuator of the fuel that is not currently being used. Select *Closed*, *Lightoff* or *Open*.

**FGR Behavior During Purge**—Lets you set the position of the FGR actuator during the purge cycle. The options are *Remain Closed* or *Follow FGR Curve to Purge Position*.

## Default System Parameters

The default values/settings for each system parameter are shown in Table 1. See also Fig. 19 - 23.

Table 1. Default Values/Settings for System Parameters

Parameter	Default
<b>XmA Operation</b>	
Operation	Disabled
Max (20 mA)	NA
Min (4 mA)	NA
Threshold	NA
Differential	NA
<b>Controller Timing</b>	
Postpurge time	30 seconds
<b>Automanual Switch</b>	
Automanual Switch	Normal Mode
<b>Program Standby Position</b>	
<i>Fuel Selection 1</i>	
Fuel	Closed
Air	Closed
FGR	Closed
<i>Fuel Selection 2</i>	
Fuel	Closed
Air	Closed
FGR	Closed
<b>Program Non-Selected Fuel Position</b>	
Fuel Selection 1	
Fuel Selection 2	Closed
Fuel Selection 2	
Fuel Selection 1	Closed
<b>FGR Behavior During Purge</b>	
FGR Behavior During Purge	Remains Closed.

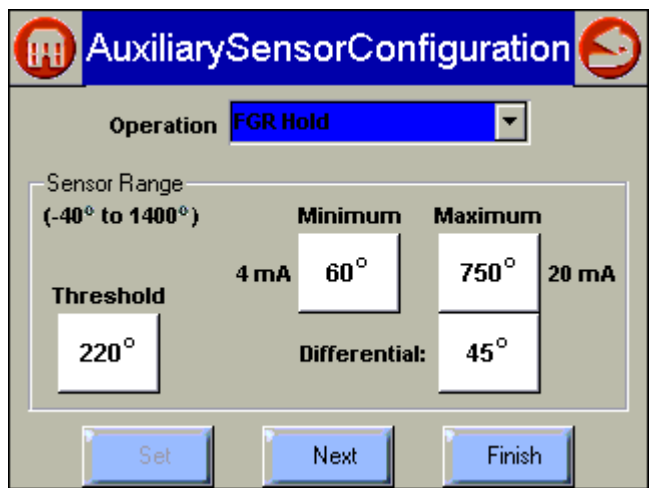


Fig. 19. Commissioning System Parameters—Setting Auxiliary Sensor Parameters.

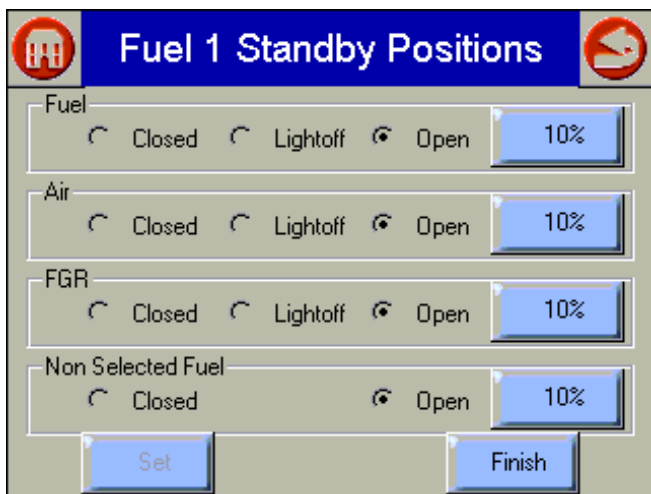


Fig. 22. Fuel 1 Standby Positions—Presets.

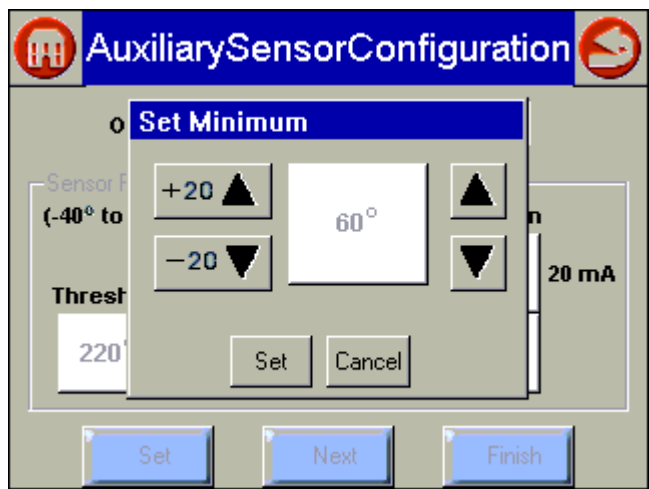


Fig. 20. Auxiliary Sensor Configuration—set minimum.

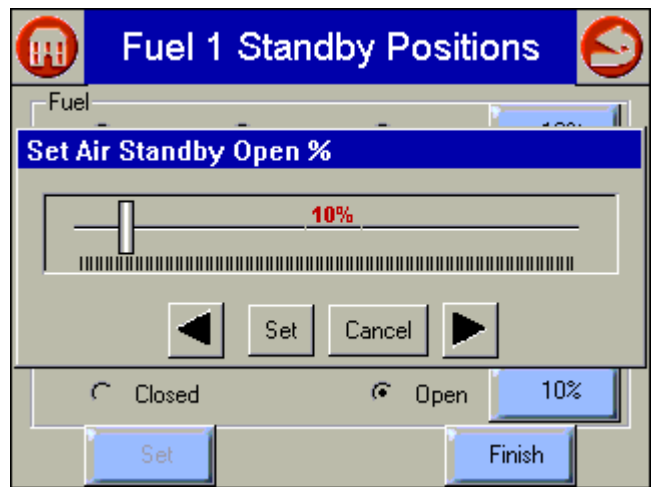


Fig. 23. Fuel 1 Standby Positions—Set Air Standby open.

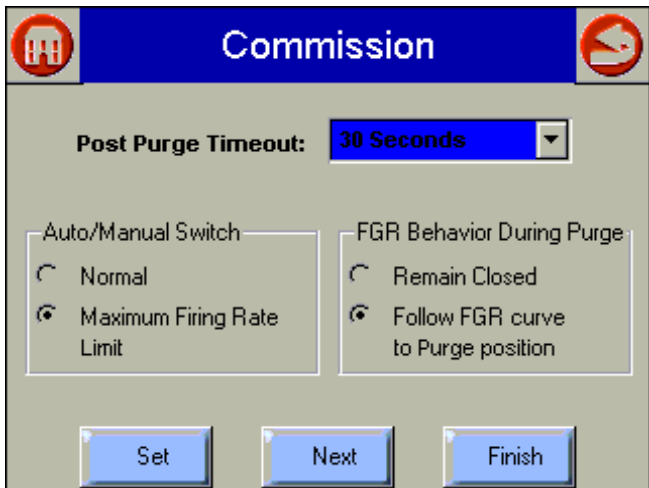


Fig. 21. Miscellaneous Commissioning Parameters.

## Commission Curve Screen

The Commission Curve screen for Fuel 1 or Fuel 2 is used to:

- Enter points on the graph to indicate the Air Purge position, Light Off position, Maximum and Minimum modulation positions, and intermediate positions for the actuators for the specified fuel (Fuel 1 or Fuel 2).
- Create a curve that provides safe and efficient operation of the burner from minimum to maximum modulation.
- Verify the profile that was created.
- Save the profile you created to a default curve if desired.

The following buttons are displayed on the screen:

1. Fuel/Air/FGR:
  - Open/Close—Press one of these buttons to manually open or close the actuator the number of degrees indicated in the drop-down box (from 0.1 to 10). When you are positioning actuators, while any actuators are below 20%, you can only move the actuator 3 degrees at a time. This is a safety constraint.
2. Point Type Buttons:
  - After positioning the actuator(s), press the appropriate button to save the point on the graph.
  - a. Point—Press to save positions on the curve that are between the max and min modulation points. A point is displayed on the graph each time you press this button. You need at least 5 intermediate points between the max and min modulation points on a curve for a valid profile.
  - b. Light Off—Press to save the light off position on the graph. An 'L' is displayed on the graph to indicate the lightoff point. Only one light off point is allowed per curve.
  - c. Max—Press to save the maximum modulation position on the graph. An 'M' is displayed on the graph to indicate the maximum modulation point. Only one maximum modulation point is allowed per curve.
  - d. Min—Press to save the minimum modulation position on the graph. An 'm' is displayed in the graph to indicate the minimum modulation point. Only one minimum modulation point is allowed per curve.
  - e. Purge—Press to save the air purge position on the graph. A 'P' is displayed on the graph to indicate the air purge point. Only one air purge point is allowed per curve.
3. Delete:
  - a. Delete Position—Press to delete a point on the curve. To delete the point, you must position the cursor on the point.
  - b. Delete All Positions—Press to delete ALL positions on the curve, including the light off, air purge, max and min modulation points. Use this button ONLY when you want to start creating the curve from the beginning.
4. Start Lightoff /Stop Modulation:
  - This button serves a dual purpose. Press this button after you have positioned the actuators (as shown by the cursor) to the light off position. Pressing this button activates the burner controller lightoff sequence. If the lightoff sequence is successful, this button then displays *Stop Modulation*. If the lightoff sequence fails, the *Status* window indicates the problem.

- If you want to stop the system at any time during the commissioning process, use the *Stop Modulation* button.

### 5. Previous Point/Next Point

- Press these buttons to move the cursor along the curve to a previously set position. Use these buttons to reposition the cursor or to 'walk the curve' and verify system operation. As the curve is verified, the color of the curve changes.
- Curve segments will be displayed in red when not validated. You must 'walk the curve' to verify system operation with the curve.

NOTE: The S7999 requires you to enter at least 3 points (inclusive of the min and max modulation points) to use the "Move Along the Curve" buttons.

### 6. Quit

- Press this button when done with the curve at this point. The following buttons display:
  - a. Back:
    - Press to return to the *Commission Configuration* screen.
  - b. Home:
    - Go to Home Page.
  - c. Finish:
    - Press to save the profile you have created. The *Finish* button is grayed out until you complete the profile. After you press this button, the *Monitor* screen is displayed. You can exit the program from there.
  - d. Save:
    - Save Curve as Default Curve in Display memory. Control returns to Curve Commission screen.
  - e. Cancel:
    - Cancel quite and continue curve configuration.

## Monitor Screen

The Monitor screen is used to:

- Monitor the burner controlled by an R7999.
- Review alarms that were generated during run cycles.
- View various parameters of the system including: current positions of the Air, Fuel and FGR actuators; status of the system, on/modulating/lockout/alarm etc.; historical list of alarms:
  1. Fuel Selection:
    - Identifies which fuel is currently in use, Fuel 1 or Fuel 2.
  2. Fuel:
    - Displays the current position of the fuel actuator.
  3. Air:
    - Displays the current position of the air actuator.
  4. FGR:
    - Displays the current position of the FGR actuator (if present).
  5. Firing Rate:
    - Displays the current firing rate position (in milliamps).
  6. Aux Temperature Input:
    - Displays the actual interpreted temperature reading from the auxiliary input. If the function is disabled, the value indicates "disabled".
  7. Status:

- Indicates system status, for example, manual modulation, air purge, lightoff sequence, etc.
- 8. Cycle:
  - Indicates the current cycle of the system, with one being the first call-for-heat cycle since the system was commissioned.
- 9. Active Alarm:
  - Indicates if the system is in an Alarm state.
- 10. Alarm History (use Show Faults buttons):
  - Displays all alarms that have been generated. The dropdown box displays the cycle the alarm occurred in and the alarm type.
- 11. Inputs/Outputs:
  - All Outputs and Inputs are displayed and their current state is noted. See Outputs and Inputs for a description.
- 12. Back/Home:
  - Go to HomePage.



Fig. 24. Commissioning login to set password.

## OPERATING PROCEDURES

This section describes procedures for the various operations you will have to perform when using the S7999 ControlLinks™ Control Configuration Display Device to commission a burner.

The S7999 works like a wizard. As you progress through the screens, use this section to answer specific questions as to how to perform required actions.

The process of commissioning a system is described in detail in "Creating an Air/Fuel Ratio Profile - Example."

### How to Change the System Password

To change the system password, proceed as follows:

1. Select the Set Password button on the Commissioning Warning screen.
2. Enter the current password in the *Commission Password* field. (The factory default password is "password".)
3. Press *OK*. The system must be successfully connected in order to change the password.
4. Enter a new password in the *New Password* field.
5. Press *OK*.

NOTE: Your new password requires a minimum of four (4) characters and a maximum of 10 characters.

NOTE: The password is not case sensitive. Make sure you write down your new password before you press *OK*. Once you have pressed this button you cannot enter the system without the password.

### How To Set the Actuator Maximum Open/Closed Positions

To set the maximum open and closed positions for the actuator, proceed as follows:

1. From the Commission Configuration screen, select the actuator button that needs changing.

NOTE: Buttons are disabled when system is fully commissioned and LCO is on.

2. Closed Travel Direction and Actuator Type screen is displayed. If no changes are needed, select the Next button.
3. Serial Number screen is displayed. If correct serial number is displayed, select the OK button. You will be asked if you want to reset the Open and Closed endpoints in a pop-up screen. Select Yes to reset both of them or No if you want to keep the current settings.
4. Set Maximum Open Position screen displays. If Open position has been previously set, you must select Unlock Position button to allow it to be changed. Press *Auto Seek* and the controller automatically opens (or closes) the actuator to its maximum open (or closed) value.

NOTE: This button is only enabled for actuator types that are fixed stop actuators.

5. When the actuator has been driven to its maximum position, visually verify its position and use the *Open* or *Close* buttons to manually adjust the maximum position if necessary. Press the *Lock Position* button for the endpoint once the appropriate position has been achieved and verified.
6. Repeat Steps 4 and 5 for the Closed position.
7. Press the *Next* button. This will return you to the *Commission Configuration* screen to configure another actuator. After all actuators are configured, press the *Next* button again to display the *Commission Curve* screen.



## COMMISSIONING PROCESS

Commissioning a burner using the S7999 ControlLinks™ Control Display requires the following general steps:

1. Connecting the R7999 to the S7999 and logging into the system with a password. This prevents unauthorized users from modifying the modulation curve.
2. Specifying the base configuration: one or two fuels, with or without FGR.
3. Selecting system parameters such as Low Fire Hold.
4. Specifying the characteristics of the actuators and setting the valve/damper endpoints for those actuators.

5. Creating a modulation curve (profile) for each fuel and verifying it from maximum to minimum modulation. (While you are commissioning the system, you must monitor the burner operation with appropriate safety instrumentation to verify the modulation curve.)

### Commissioning Overview

The following table provides a step-by-step overview of how a system is commissioned.

The Notes column in the table provide references to detailed information when completing the more complex operations.

**Table 2. Commissioning Overview.**

Step	Action	Notes
1	On the Home Page screen, select <b>Commission</b> .	
2	On the WARNING screen, select <b>Commission</b> :	
3.a.	Enter your password.	The S7999 requires you to enter your own password. The factory default password is "password".
3.b.	Set new password for new R7999 (factory state)	
4	On the Commission Configuration screen, perform the following steps:	
4.a.	Select the base configuration.	The choices are: <ul style="list-style-type: none"> <li>• Unconfigured: selecting this option takes the device back to a factory state.</li> <li>• Single Fuel</li> <li>• Single Fuel with FGR</li> <li>• Dual Fuel</li> <li>• Dual Fuel with FGR</li> </ul>
4.b.	Select an actuator to configure: Air, Fuel 1, Fuel 2, or FGR.	Actuator buttons corresponding to the base configuration are enabled. Any actuators that have completed configuration (are locked) have a check mark next to the button.
5.a.	Select the Direction of Closed Travel: Clockwise or Counterclockwise.	
5.b.	Select the Actuator's Valve or Damper Type: Fixed Stops or Continuous Rotation.	
5.c.	Select the next button.	
6.a.	Enter the KEY (serial number) of the Actuator.	Manually move the actuator to a midspan position to allow the ID unlocking algorithm to function properly. Please ensure all eight digits are entered correctly. You may confirm that an actuator has been successfully brought on-line by noting its flash rate has changed from a rapid flash to a slow flash, i.e. one blink a second.
6.b.	Select the <b>OK</b> button.	
7.a.	Press Auto Seek on Maximum Open Endpoint screen.	Only for fixed Stop valve or damper type.
7.b.	If necessary, press Open or Close to adjust the actuator position to open Endpoint.	
7.c.	Press <b>Lock</b> button.	
7.d.	Select the <b>Next</b> button.	
8.a.	Press <b>Auto Seek</b> on Maximum Closed Endpoint screen.	
8.b.	If necessary, press <b>Open</b> or <b>Close</b> to adjust the actuator position to Closed endpoint.	
8.c.	Press <b>Lock</b> button.	
8.d.	Select the <b>Next</b> button.	
9	Repeat steps 4.b through 8.d to set the configuration of the other actuators in your system.	

Step	Action	Notes
10	If any System Configuration parameters need to be set, select System Configuration button.  NOTE: Go to System Configuration section for more information.	
11.a.	Press Next on Commission Configuration screen.	
11.b.	If a default profile curve exists and is desired, select <b>Load Default Curve</b> button instead of the Next button.	Default curve is loaded and proceeds to curve commissioning screen.
12	On the Curve Commissioning screen, perform the following steps:	
12.a.	Switch the external burner demand switch (power LCI terminal 13) and then select the <b>Start lightoff</b> button.	Wait for actuators to move to preset Air Purge position.
12.b.	Press Open and/or Close for Air to move the cursor to the desired Air Purge point of the burner.	The R7999 will automatically move the Air actuator to a 62% open position.
12.c.	Press Purge button.	A "P" will be displayed on the profile. The R7999 will energize its HFP output (terminal 10) which, in turn, allows the burner control to start the purge time. Wait for purge to complete and cursor to move to preset Lightoff position.
12.d.	Press the Open and Close buttons for Fuel and Air and the FGR (if present) to move the cursor to the desired Light Off point of the burner.	The damper will automatically move to a 25% open position, while the fuel actuator will remain at the closed position plus 1 degree. When used with Honeywell burner controls, the user has 240 seconds to perform this action, otherwise the burner control will lock out.
12.e.	Press Light Off button.	An "L" will be displayed on the profile, and the R7999 will energize the LFP output (terminal 8), which will allow the burner control to light off the system. The burner should light. Wait for the lightoff to complete and the system to change to the Modulating state.
12.f.	Press Open and Close for Fuel and Air and the FGR (if present) to move the cursor to the Minimum Modulation point for the burner.	
12.g.	Press Min button.	An "m" will be displayed on the profile.  NOTE: The min modulation point may be higher or lower than the Light Off point.
12.h.	Press Open and Close for Fuel and Air and the FGR (if present) to move the cursor to the next desired fuel air mixture point.	The R7999 enforces slope limitations of 1 to 8 and 8 to 1 (in degrees) with the exception of Flat Line or Negative FGR capability. The cursor changes from a cursor to a box when you have moved out of the range of allowable slopes. You are not allowed to enter points when a box shape is present. With controller release 1.4 or greater, the FGR actuator may have negative slopes (maximally negative slope of 1 to 5) anywhere within the modulation band.

Step	Action	Notes
12.i.	<p>Press Point button. Or press Maximum Modulation. With Rev. 1.4 controllers or greater, the user may alternatively place a maximum modulation point in place of an intermediate as long as a span of at least 17 degrees exist between the minimum and maximum modulation points.</p>	<p>A dot will be displayed on the profile and a line will connect the minimum modulation point and the first intermediate point.</p> <p>Entering a new Maximum Modulation point causes an pre-existing Maximum Modulation point to change to an intermediate point. This technique of entering each new intermediate point as the new "temporary" Maximum Modulation point has an advantage, which is apparent under light boiler load conditions. The user will be able to use the "Move Along Curve" commands during the next light off sequence and hence will be able to more quickly reach the firing rate point where the system was at prior to going out because of low demand.</p> <p>For gas systems where the gas pressure has not been adjusted to match the burner-rated BTU capability, the use should use the maximum Modulation replacement technique to rough in a curve until maximal airflow is obtained. The gas flow may then be adjusted to set the maximum firing rate. The user may then delete all points and immediately re-enter another maximum modulation point.</p>
12.j.	Repeat steps 12.h. and 12.i. until you have created at least six points starting with Min.	
12.k.	Press Open and Close for Fuel and Air and the FGR (if present) to move the cursor to the Maximum Modulation point for the burner.	For gas systems of which the gas pressure has not been adjusted to match the burner-rated BTU capability, the use should use the maximum Modulation replacement technique to rough in a curve until maximal airflow is obtained. The gas flow may then be adjusted to set the maximum firing rate. The user may then delete all points and immediately re-enter another maximum modulation point. This may save the user some time by not having to successively delete invalid intermediate points due to the gas pressure change.
12.l.	Press Max button.	An "M" will be displayed on the profile and a line will connect it to the previous intermediate points. The R7999 requires re-verification of any verified curve segments after setting the maximum modulation point.

Step	Action	Notes
12.m.	Press Prev. Point/Next Point until the cursor reaches the next lower point on the profile. Alternatively the user may add intermediate points as the effective firing rate is lowered. Jump back to 12.h. if the temporary intermediate points were deleted in 12. k.	The line segment turns color, red to green, to indicate the curve has been walked (verified). FGR line segment turns color from brown to cyan.  NOTE: The S7999 requires you to enter at least three points (inclusive of the min and max modulation points) in order to use the “Prev Point” and “Next Point” buttons.
12.n.	Repeat step 12.m. until you have moved along the curve from top to bottom.	The profile is now complete and operational. Status should display “Profile Complete. Ready to Run.”  The R7999 requires reverification of any line segment after the maximum modulation point has been altered.
13.a.	If you wish to save the profile you have just created to be the default curve, press <b>Quit</b> button and then the <b>Save</b> button.	The user must insure that the purge point is within the minimum and maximum modulation points before finishing the profile. The purge point can be moved while the burner is firing by simply using the Prev Point, Next Point buttons and pressing the PURGE button at the desired level or at the purge point definition period during the next start up sequence.
13.b.	When you are through with the profile, press <b>Quit</b> and then the <b>Finish</b> button.	The Monitor screen appears. You have successfully commissioned the R7999.

Begin commissioning/configuring the ControlLinks™ Control device by clicking on the Commissioning button located on the Homepage. The Warning screen (Fig. 25) will appear.

## Initiate ControlLinks™ Control Commissioning.

After reading the warning and accepting the responsibility for configuring a safe and efficient fuel/air profile curve, click on the Commission button to exit the Warning screen and display the Commission Password screen.

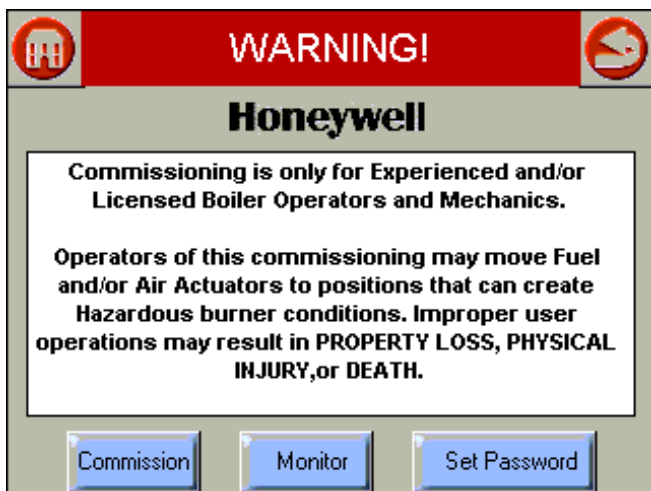


Fig. 25. Warning screen.

NOTE: Clicking the Home, Back or Monitor button will exit Commissioning mode and display the Home Page.

## Password



Fig. 26. Password screen.

The factory default password is “password”. You must enter your own password into the system. The password consists of a minimum of four characters/numbers and a maximum of ten characters/numbers.

NOTE: The first time you use the system, enter the password ‘password’ and then press OK. A message will display that you must change the default password. Change the password, as described in “How to Change the System Password.” Enter your new password and press OK.

NOTE: Select the OK button after the password is entered to log in.

## Commission Configuration

This screen (Fig. 27) selects the type (Base Configuration) of ControlLinks™ Control System to be configured. The Base Configuration defines the number of actuators connected to the ControlLinks™ Control Controller. After the Base Configuration is chosen, the corresponding actuators are enabled as Endpoint Configuration options.

Selecting the Unconfigured Base Configuration sets all the ControlLinks™ Control parameters back to the factory default settings. All user configurable data stored in the ControlLinks™ Control will be deleted by selecting this option. A warning message is displayed (Fig. 28) to confirm this selection.

Single Fuel configuration enables the Air and Fuel 1 actuator buttons in the Endpoint Configuration options. Single Fuel with FGR enables the Air, Fuel1 and FGR buttons. Dual Fuel enables the Air, Fuel1 and Fuel2 buttons. Dual Fuel with FGR enables all four actuator buttons. Begin configuring the actuators by selecting the enabled buttons.

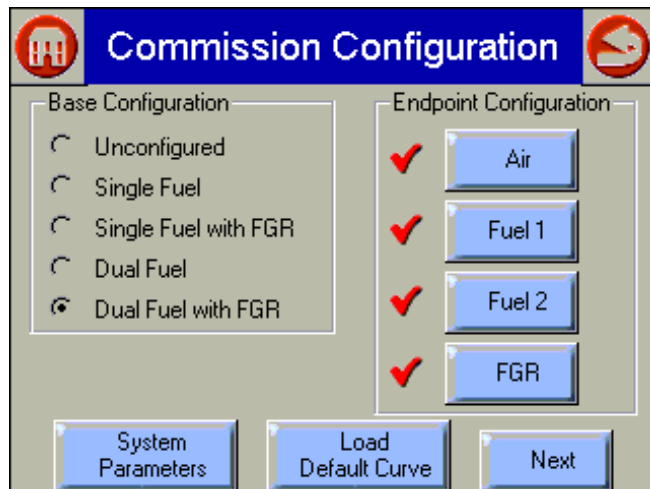


Fig. 27. Commission Configuration screen.

NOTE: Clicking the Home or Back or button will exit this screen and display the Homepage.

NOTE: Actuators that have completed their configuration have a checkmark next to their button.

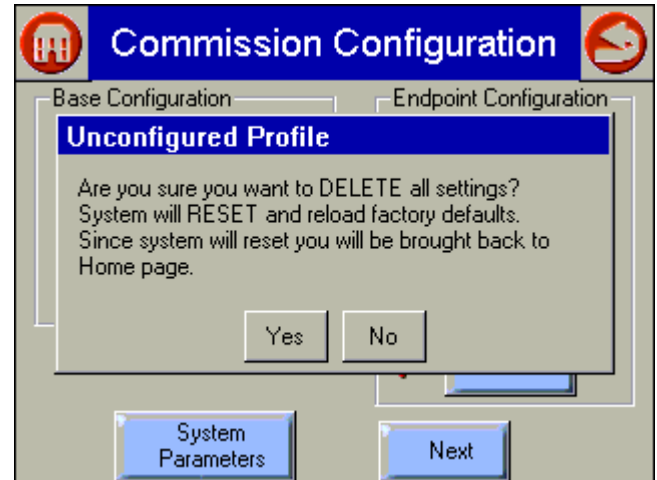


Fig. 28. Commissioning Configuration—unconfigured profile.

## Actuator Configuration

Clicking on an actuator button displays a screen similar to Fig. 29.

The direction that the actuator travels when it moves to its closed position, and whether the actuator moves in fixed stops or continuously rotates until it is told to stop, is selected on this screen. Press the Next button when the settings are correct for the actuator to advance to the next screen.

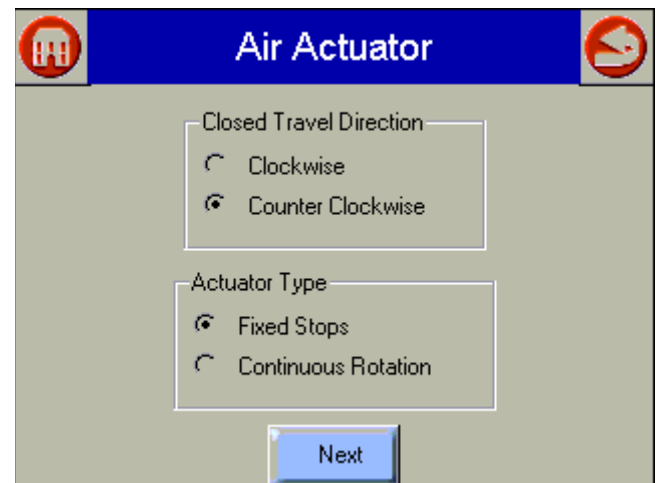


Fig. 29. Selecting Air Actuator type and travel direction.

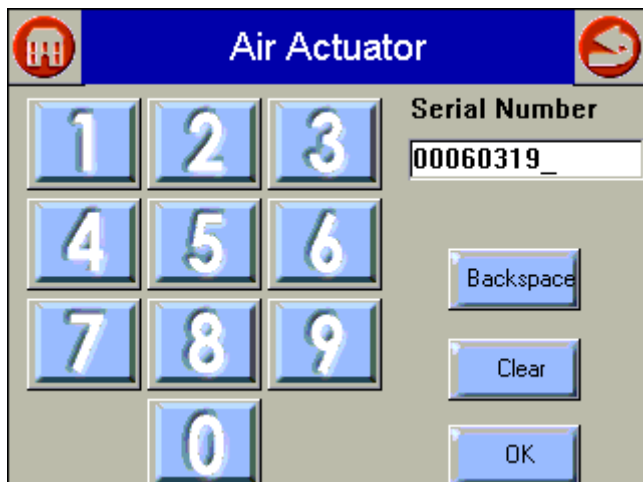


Fig. 30. Entering Air Actuator serial number.

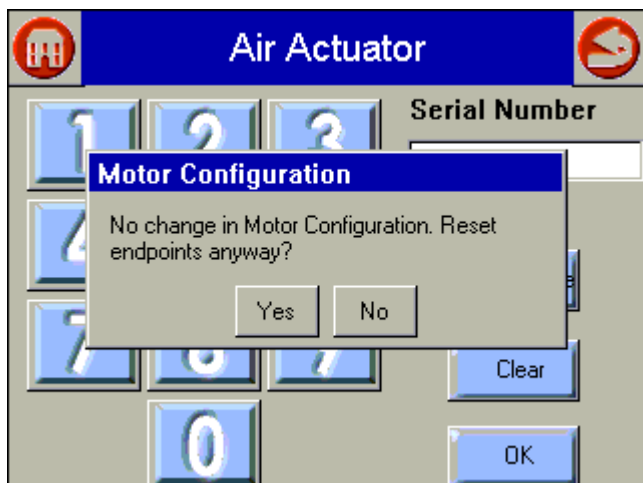


Fig. 31. Air Actuator endpoint reset.

## Actuator Serial Number

This screen allows (Fig. 30) the user to enter the serial number to unlock and configure the corresponding actuator.

Refer to the ControlLinks™ Control Software Configuration Users Manual for further details.

The user must enter the 8-digit serial number into the Serial Number field and click on the OK button to proceed.

The Backspace button allows the user to erase the last digit entered into the Serial Number field.

The Clear button erases the entire Serial Number field and forces the user to enter eight new digits.

If the serial number has been entered for the actuator earlier (revisiting the actuator configuration), the current serial number displays. If the OK button is selected at this point, a popup similar to Fig. 31 displays. Answering Yes causes the actuator endpoints to be cleared, requiring the open and closed endpoints to be reset.

## Actuator Endpoints

Set the endpoints as shown (see Fig. 32 and 33).

1. Maximum Open Position.
2. Maximum Closed Position.

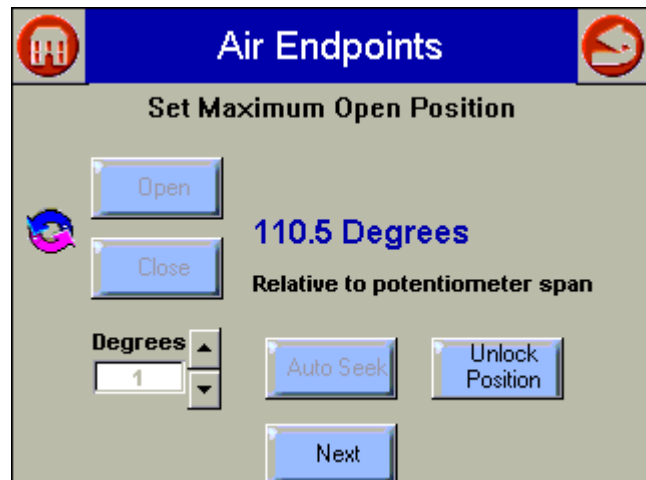


Fig. 32. Set Actuator Max Open Endpoint.

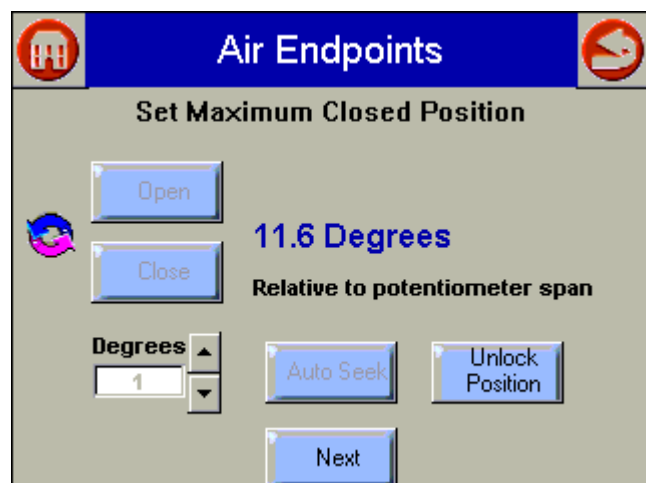


Fig. 33. Set Actuator Max Close Endpoint.

The Open and Close buttons step the actuator in approximate degree increments specified by the Degrees spin button. These buttons must be used repeatedly to get the actuator to the desired endpoint. The current position of the actuator is displayed in the center of the screen. While the actuator is moving, the selected button changes to a Stop button to permit the user to stop the movement.

For Fixed Stop actuator types, the Auto Seek button is enabled to permit a seeking operation where the actuator continuously moves to find its endpoint under the control of the R7999. The Auto Seek can be stopped by selecting this same button (it changes to a Stop button).

The Lock/Unlock position is used to lock the current actuator position for the Open or Closed endpoint or to unlock the current endpoint setting and permit setting a new one. The button displays Lock Position when the endpoint is currently set and displays Unlock Position when it is currently set.

Select the Next button to continue to the next screen.

## Curve Commissioning

The following screens depict the options possible to create or change the profile curve for the currently selected fuel. The operation of this screen is explained in the Commission Curve screen, defined earlier.

Curve commissioning can only occur after all actuators have been completely configured. The Next button on the Commission Configuration screen is not enabled until this is true. Once the actuators are configured, the Next button brings the user to the Curve Commissioning screen.

NOTE: The Load Default Curve button also brings the user to this screen. It is also only enabled after the actuators have been configured and only if a default curve exists.

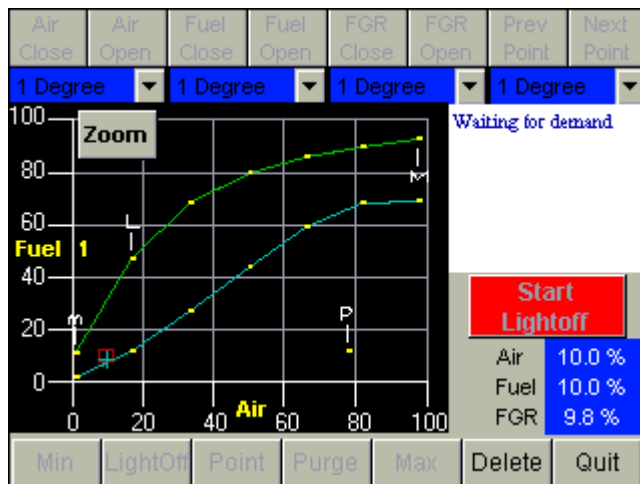


Fig. 34. Create Fuel Ratio Curve Screen.

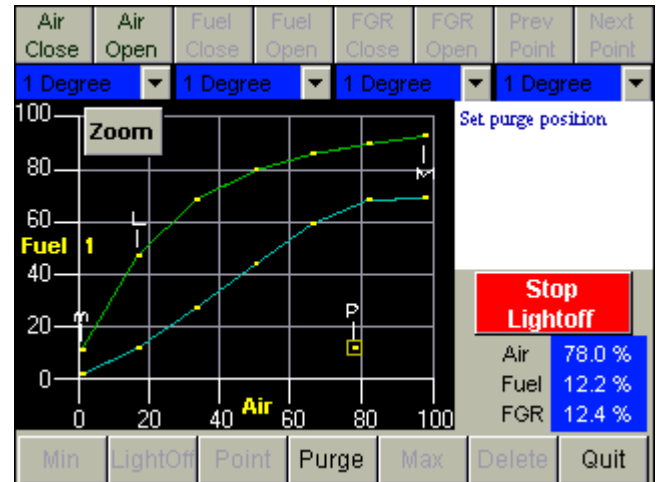


Fig. 35. Purge setting on Commission screen.

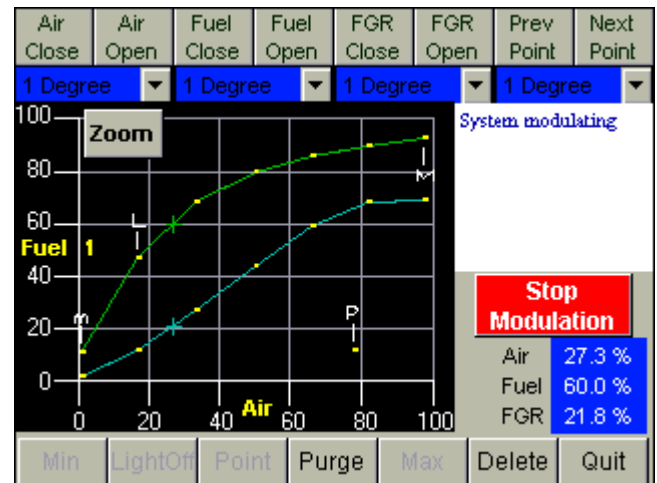


Fig. 36. Commissioning curve—7 points.

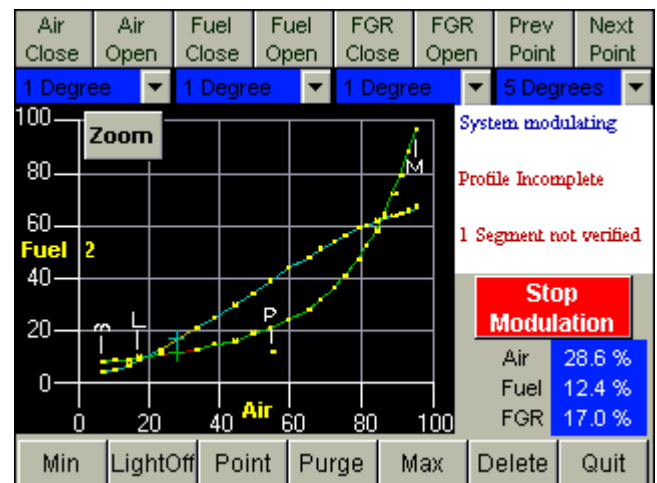


Fig. 37. Commissioning curve—24 points.

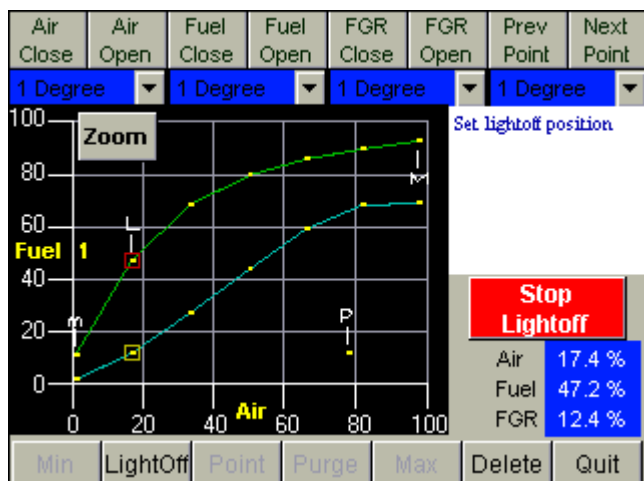


Fig. 38. Commissioning Curve—7 points, set lightoff position.

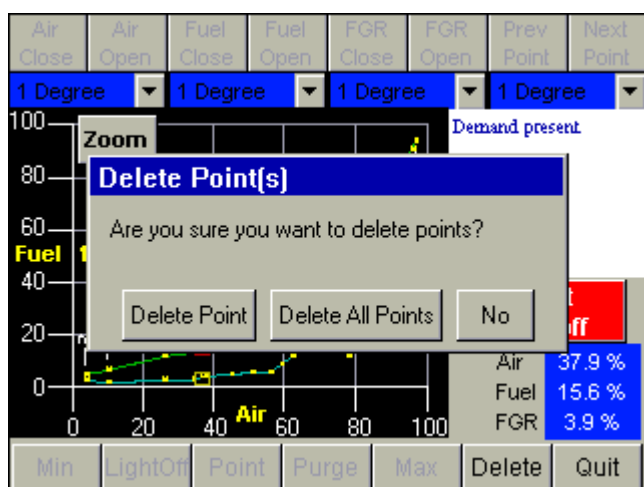


Fig. 39. Commissioning—delete points screen.

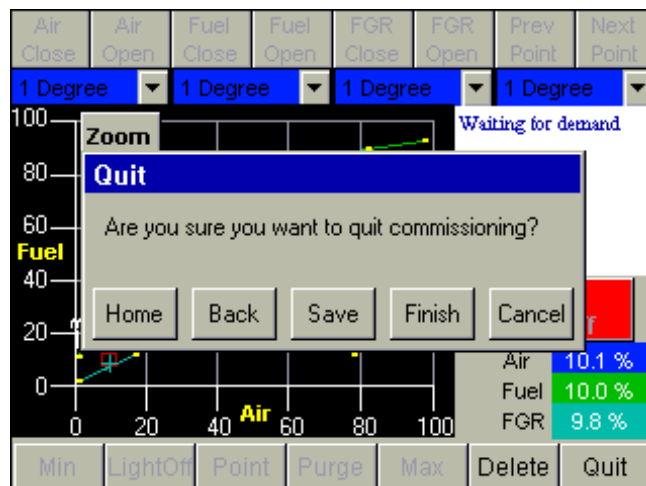


Fig. 40. Quit commissioning screen.

## TROUBLESHOOTING

### Burner Control Locks Out Due to Loss of Air Flow Switch.

- The R7999 ControlLinks™ Control Controller has a preset of 25% air position/0% fuel for the initial lightoff point. Depending on the air damper topology, this may not provide enough airflow to maintain the air flow switch and cause the burner control to lock out. The R7999 is still functional at this time even though the burner control is locked out. Therefore, before resetting the burner control and restarting the light off process, you should first set a new temporary light off point to a higher airflow value to prevent the air flow switch from dropping out. The next time through the sequence, the new higher light off point may allow the air flow switch to be maintained or you will have to repeat the process, i.e., move the light off point air value to a more open value such that the new point can maintain the air flow switch.

### Purge Setting Beyond Maximum Modulation Point.

- A finished profile requires the purge position to be lower than the maximum modulation. If you encounter a condition where you are required to place the maximum modulation point below the current purge setting, you must first move the purge point to a lower position. The purge position can be moved at any time by reselecting the *Air Purge* button in the *Save Position* command window.

### Cannot Establish Communications.

- Beyond the difficulties associated with communications polarity wiring errors, RS232 to RS485 converter problems, and lack of power to the devices (RS232 converter or R7999), there are several subtle system errors that preclude



communications. All of the errors are indicated by the green LED and red Lockout LED being continuously “on.” Fuel select problems after power up are indicated with all LED’s being “on” continuously.

- a. If no fuel select inputs are on, or both fuel selects are made, you cannot establish communications with the controller. The corrective action is to select one of the fuels or remove one of the fuel select inputs.
- b. R7999 is in a locked out state. The corrective action is to first reset the control. If that does not work, you must remove the fault.

the end of the curve. If you are experiencing problems, back up from the problem point at least 5 degrees, then move back to the point using a 3-degree, 1-degree or 0.1-degree movement. This should allow you to complete your curve verification or land on a problem point for deletion.

## Password no Longer Valid

- Bringing a system to an unconfigured state utilizing the S7999 tool wipes out your custom password and returns the system password to “password”. Enter a new password.

## Unable to Land on a Predefined Point

- Under unique actuator loading conditions, it may be difficult to land on an existing programmed point. This can occur while using the “Move Along the Curve” command. It can also occur when you are completing the curve verification process on extremely flat or steep line segments as you reach

## R7999 OUTPUTS AND INPUTS

The current state of the R7999 outputs and inputs are displayed on the Monitor screen for convenience and diagnostics purposes. The inputs and outputs are defined as follows:

**Table 3. Outputs.**

Abbreviation	Description	Meaning when ON
LCO	Limit Control Output	Limits are satisfied and demand exits. The R7999 is operational and able to move all actuators.
HFP	High Fire Proved	The R7999 has moved the actuators to the Purge position.
LFP	Low Fire Proved	The R7999 has moved the actuators to the Light Off position.
Fuel 1	Fuel Select Channel 1	Fuel 1 is selected.
Fuel 2	Fuel Select Channel 2	Fuel 2 is selected.
ALM	Alarm	The system is in an alarm state.

**Table 4. Inputs.**

Abbreviation	Description	Meaning when ON
LCI	Limit Control Input	Limits are satisfied and demand is present.
HF	High Fire Input	R7999 is being commanded to drive actuators to the Purge position.
LF	Low Fire Input	R7999 is being commanded to drive actuators to the Light Off position
MV	Main Valve Input	The main valve input is active. Normally only active during “Run,” and transitional with LF during light off.

## R7999 FAULT CODES AND CORRECTIVE ACTIONS

The R7999 incorporates two methods to retrieve fault information:

- Press and hold the reset button. The fault code is indicated by the blinks of the LED. All codes are two digits. The 10’s digit is indicated by a series of slow blinks while the 1’s digit is indicated by a series of short blinks following the slow ten’s digit. For example, 64 is made up of six slow blinks followed by four fast blinks. The cadence is repeated as long as you hold the reset button. The device will not reset by the action of the reset switch once it enters the flash mode. To reset the R7999, push and release the reset button within one second.

- Read the code directly from the Monitor screen of the S7999 via the Show Faults buttons.

**Table 5. Fault Codes and Corrective Actions.**

<b>Fault/ Blink Code</b>	<b>Description</b>	<b>Corrective Action</b>
11	Device is operating properly.	
13	MV input energized at an improper time.	Reset control. Check Burner Control Interface wiring and correct error. This error causes the device to remain in initiate state at power up.
14	HF and LF are energized at the same time.	Reset control. Check Burner Control Interface wiring and correct error. This error causes the device to remain in initiate state at power up.
15	Transition to the requested Burner Control input state is not allowed from the current state. E.g., Standby to Modulate is not allowed.	Check wiring to burner control and/or burner control operation.  NOTE: Moving a RM78XX Run/Test switch to Test will Induce this fault during commissioning mode.
21	Internal Error - Time base.	Reset Control <sup>a</sup> .
22	Internal Error - KEY decode .	Reset Control <sup>a</sup> .
23	Internal Error - Rdlow.	Reset Control <sup>a</sup> .
24	Internal Error - Time storage.	Reset Control <sup>a</sup> .
25	Internal Error – Limited move.	Reset Control <sup>a,c</sup> .
26	Internal Error – Targeted move.	Reset Control <sup>a,c</sup> .
27	Internal Error- LVD.	Reset Control <sup>a</sup> .
28	Internal Error- ISR check.	Reset Control <sup>a</sup> .
31	Internal Fault- A2D Range.	Reset Control <sup>a</sup> .
32	Internal Fault – A2D Matching.	Reset Control <sup>a</sup> .
33	Internal Fault - LCO Drive.	Reset Control <sup>b</sup> .
34	Internal Fault – LCO/I Feedback.	1.) Reset Control <sup>b</sup> . Check actuator wiring. See Channel LED for actuator. 2.) Terminal 14 has voltage present from an external source, correct wiring problem. 3.) <sup>d</sup> .
35	Internal Fault – Commanded State.	Reset Control <sup>a</sup> .
36	Fuel Selection Problem.	Check wiring through fuel select switch, at least one fuel must be selected at any given time (not zero, not two).
37	Fault HFP or LFP output.	Verify correct wiring to burner control. Specifically check wiring at LFP and HFP.
38	Internal Fault – memory curve.	Reset control <sup>a</sup> .
39	Internal Fault – AC sampling .	Reset control <sup>b</sup> .
41	Feedback potentiometer Interface circuit fault - Air.	Verify correct wiring of Potentiometer <sup>a</sup> .
42	Feedback potentiometer Interface circuit fault – Fuel 1.	Verify correct wiring of Potentiometer <sup>a</sup> .
43	Feedback potentiometer Interface circuit fault – Fuel 2.	Verify correct wiring of Potentiometer <sup>a</sup> .
44	Feedback potentiometer Interface circuit fault – FGR.	Verify correct wiring of Potentiometer <sup>a</sup> .
45	Feedback potentiometer wiper resistance problem, Air.	Check for loose potentiometer wiring <sup>a,c</sup> .
46	Feedback potentiometer wiper resistance problem, Fuel 1.	Check for loose potentiometer wiring <sup>a,c</sup> .

Table 5. Fault Codes and Corrective Actions. (Continued)

Fault/ Blink Code	Description	Corrective Action
47	Feedback potentiometer wiper resistance problem, Fuel 2.	Check for loose potentiometer wiring <sup>a,c</sup> .
48	Feedback potentiometer wiper resistance problem, FGR.	Check for loose potentiometer wiring <sup>a,c</sup> .
49	Feedback potentiometer total resistance problem, Air.	Check for loose potentiometer wiring <sup>a,c</sup> .
51	Feedback potentiometer total resistance problem, Fuel 1.	Check for loose potentiometer wiring <sup>a,c</sup> .
52	Feedback potentiometer total resistance problem, Fuel 2.	Check for loose potentiometer wiring <sup>a,c</sup> .
53	Feedback potentiometer total resistance problem, FGR.	Check for loose potentiometer wiring <sup>a,c</sup> .
54	Internal memory function problem, Air.	Repeat actuator ID On-line process.
55	Internal memory function problem, Fuel 1.	Repeat actuator ID on-line process.
56	Internal memory function problem, Fuel 2.	Repeat actuator ID on-line process.
57	Internal memory function problem, FGR.	Repeat actuator ID on-line process.
58	Stuck Reset button.	Turn off remote reset switch. Check operation of controller button.
61	Actuators not reaching light off point.	Check for actuator wiring problems or stuck valves/dampers. Place controller in standby and use actuator manual keys to verify actuator travel.
65	Internal Memory fault.	Reset control <sup>a</sup> .
66	Internal Initialization Error.	Reset control <sup>a</sup> . Check the wiring and range capability for both the CmA+- input and XmA+- input (if configured).
67	Fuel Actuator off curve (selected fuel type).	Check for stuck fuel actuator and/or proper shielding on actuator interface.
68	FGR Actuator off curve.	Check for stuck FGR actuator and/or proper shielding on actuator interface.
69	Air Actuator off curve.	Check for stuck Air actuator and/or proper shielding on actuator interface.
71	Verifies that the Air actuator accepted the off-line, on-line, move counterclockwise and move clockwise commands. Furthermore, all potentiometer tests must successfully passed to bring an actuator online.	Check wiring of actuator, verify correct ID is being used. Use Actuator LED to verify that the actuator that is being brought "online". A fast flash in the actuator equates to "off line" state while a 1 second flash equates to an "online" state.
72	Verifies that the Fuel 1 actuator accepted the off-line, on-line, move counterclockwise and move clockwise commands. Furthermore, all potentiometer tests must successfully passed to bring an actuator online.	Check wiring of actuator, verify correct ID is being used. Use Actuator LED to verify that the actuator that is being brought "online". A fast flash in the actuator equates to "off line" state while a 1 second flash equates to an "online" state.
73	Verifies that the Fuel 2 actuator accepted the, off-line, on-line, move counterclockwise and move clockwise commands. Furthermore, all potentiometer tests must successfully passed to bring an actuator online.	Check wiring of actuator, verify correct ID is being used. Use Actuator LED to verify that the actuator that is being brought "online". A fast flash in the actuator equates to "off line" state while a 1 second flash equates to an "online" state.
74	Verifies that the FGR actuator accepted the off-line, online, move counterclockwise and move clockwise commands. Furthermore, all potentiometer tests must successfully passed to bring an actuator online.	Check wiring of actuator, verify correct ID is being used. Use Actuator LED to verify that the actuator that is being brought "online". A fast flash in the actuator equates to "off line" state while a 1 second flash equates to an "online" state.
75	Internal memory fault.	Reset Control <sup>a</sup> .
76	Internal check sum error.	Reset Control <sup>a</sup>

Table 5. Fault Codes and Corrective Actions. (Continued)

Fault/ Blink Code	Description	Corrective Action
82	Actuator secondary fault.	Check Actuator wiring. See Channel LED for Actuator.
83	Air actuator non-responsive.	Check actuator wiring and stuck damper/valve <sup>c</sup> .
84	Fuel 1 actuator non-responsive.	Check actuator wiring and stuck damper/valve <sup>c</sup> .
85	Fuel 2 actuator non-responsive.	Check actuator wiring and stuck damper/valve <sup>c</sup> .
86	FGR actuator non-responsive.	Check actuator wiring and stuck damper/valve <sup>c</sup> .
87	Internal math error.	Reset Control <sup>a</sup> .
91	The 4 to 20 mA firing rate input is below 3 mA, Out of Range—Low. (Actuators return to or remain at the minimum modulation point with the alarm on; the control remains operational only to the extent that Minimum Modulation firing operation is allowed.) Not supported on Version 1.2 controllers.	Check CmA+- input (Terminals 39 and 40) for proper operation polarity and range. The input must be within 3.0 mA to 21.0 mA. The voltage at this terminal must be within 0.7 to 5.0 Vdc, respectively.  Conditional Alarm—Alarm output is energized; controller continues to run. <sup>e</sup>
92	The manual potentiometer rate input is higher than an allowable range, i.e., Out of Range—High. (The actuators move to the maximum modulation point with alarm on, control will remain operable, yet when MANUAL MODE is selected, maximum modulation and alarm output shall occur.) Auto mode operation is <b>not</b> affected. Not supported on Version 1.2 controllers.	The manual potentiometer is out of range high. Make sure a 5000 ohm ( $\pm 10\%$ ) potentiometer is being used and wiring to it is correct. Shielded cable is recommended.  Conditional Alarm—Alarm output is energized; controller continues to run. <sup>e</sup>
93	The auxiliary 4 to 20 mA input must be below 3. mA when configured for use. (The actuators return or remain at the minimum modulation point with alarm on, the control will remain operable only to the extent that Minimum Modulation firing operation is allowed.) Not supported on Version 1.2 controllers.	Check XmA+- input (Terminals 37 and 38) for proper operation polarity and range. The input must be within 3.0 mA to 21.0 mA. The voltage at this terminal must be within 0.7 to 5.0 Vdc, respectively.  Conditional Alarm—Alarm output is energized; controller continues to run. <sup>e</sup>
94	After LCO is set by the R7999, the Burner Control must provide a Lightoff or Purge request within 20 seconds. (Controller remains in a processing demand condition indefinitely, waiting for valid inputs on the LF, MV and HF inputs; the alarm sounds after the 20-second period expires.) Not supported on Version 1.2 controllers.	Check burner control interface wiring and burner control operation (Terminals 10, 11, 12). The R7999 is waiting for a command via these terminals.  Conditional Alarm—Alarm output is energized; controller continues to run. <sup>e</sup>

<sup>a</sup> It is possible that a random external electrical noise event has caused a fault checking algorithm to be detected. Resetting the control will allow recalculation of the fault and, provided it is not a hard failure, the device will continue to operate. If the condition will not clear, the control must be replaced.

<sup>b</sup> Check AC waveform, severe noise on AC lines can corrupt the sampling of AC signals.

<sup>c</sup> Verify actuator total resistance and wiper measurements, check the ability of the actuator to travel full stroke using the Manual override buttons within the actuator. Verify input power to the actuator. If actuator is not functioning, replace the actuator.

<sup>d</sup> Verify a short does not exist at terminal 14. The control will need replacement if a sustained fault code 34 exists after the noted items 1 and 2 have been performed. Fuse line voltage power to control system with type SC15 fuse or fuse Limit input (terminal 13) with type SC5 fuse.

<sup>e</sup> Conditional Alarm. Causes the alarm output to be energized. The system may still be operating but requires attention in order to modulate or to proceed with the light off sequence. The actuators would be positioned at light off point, minimum modulation point or maximum modulation point, dependent on what the particular fault is and when the fault is introduced relative to the R7999 operating state.

## DISPLAY SETUP AND DIAGNOSTICS

The following screens apply to display setup and diagnostics for the Display device.

The Setup button on the Home Page is selected to go to these screens. The setup screen (see Fig. 41) is displayed first. It allows for some Display device settings. The Advanced Setup button permits the user to run some diagnostic functions for the Display device. These screens are displayed starting at Fig. 45.

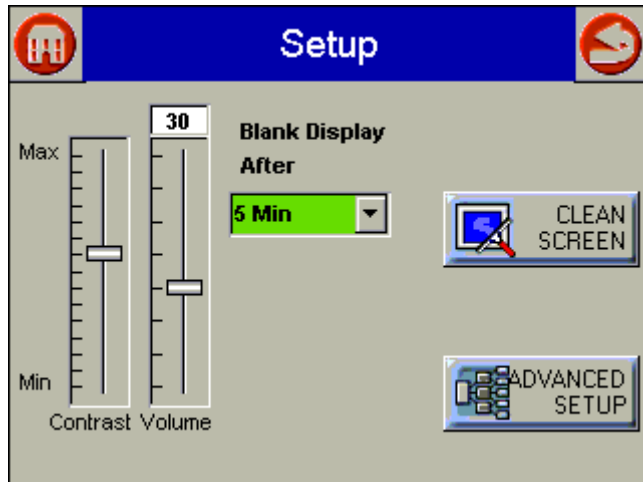


Fig. 41. Setup screen.

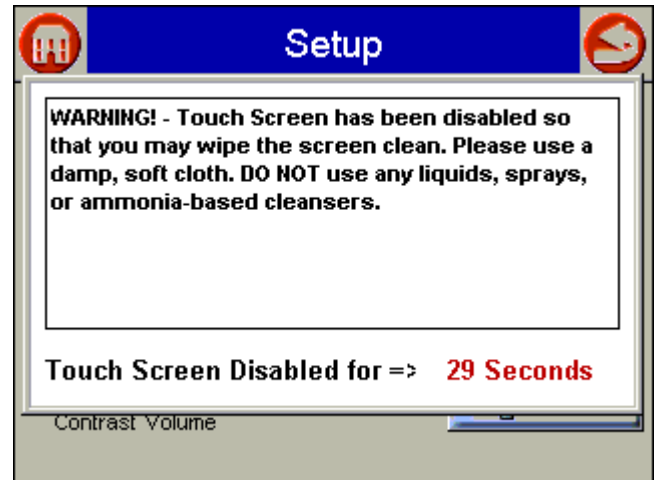


Fig. 44. Screen disabled for cleaning.

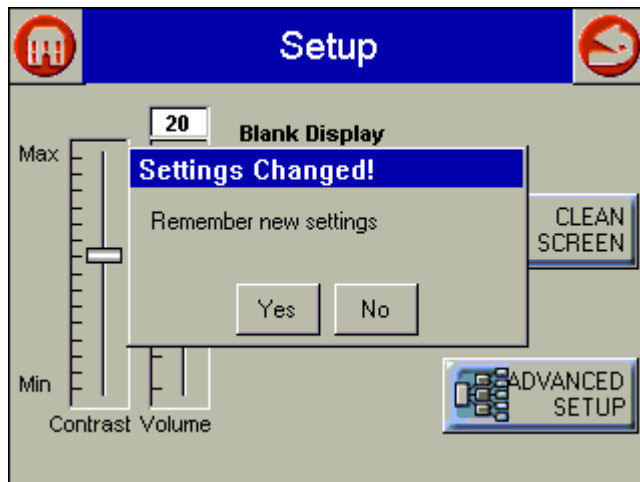


Fig. 42. setup screen—Settings changed.

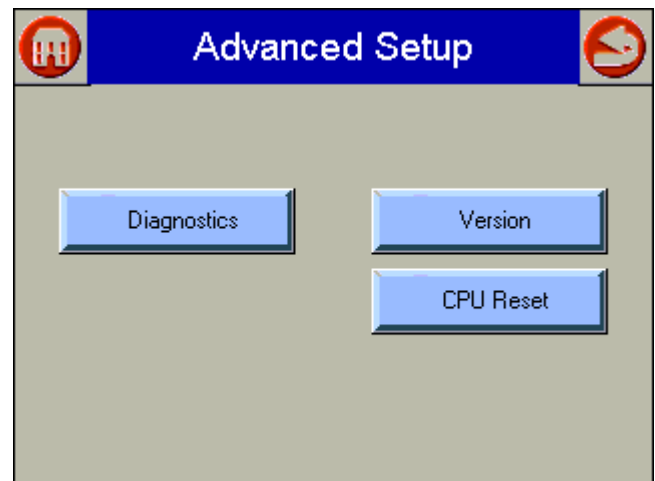


Fig. 45. Advanced setup.

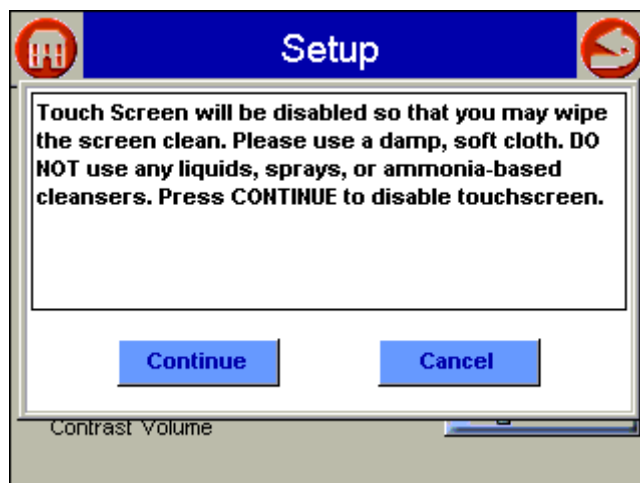


Fig. 43. Clean screen setup.

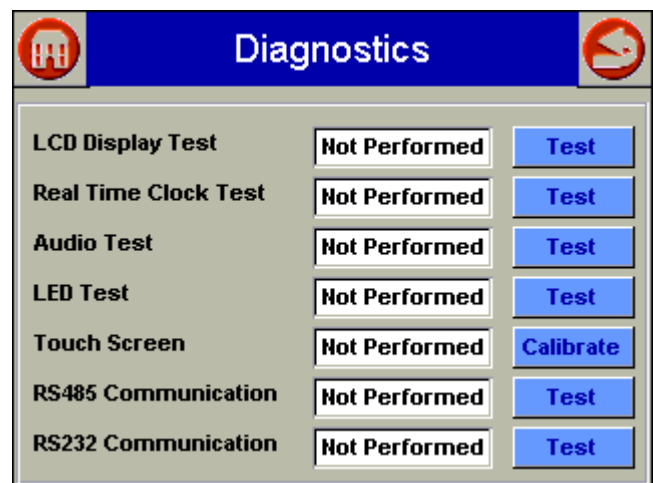


Fig. 46. Diagnostics.

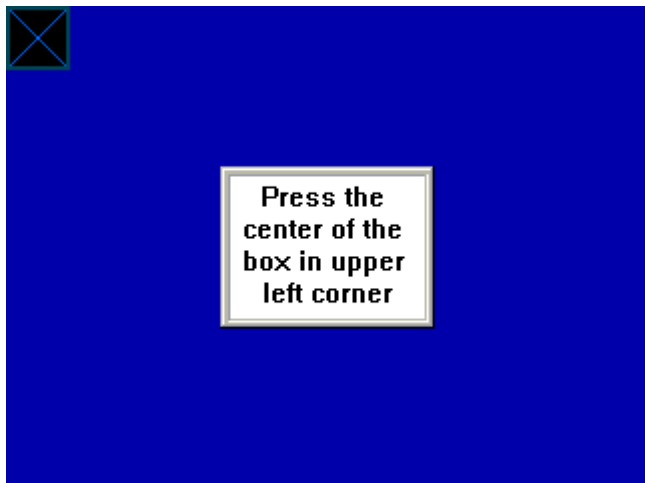


Fig. 47. Touch screen calibration screen.

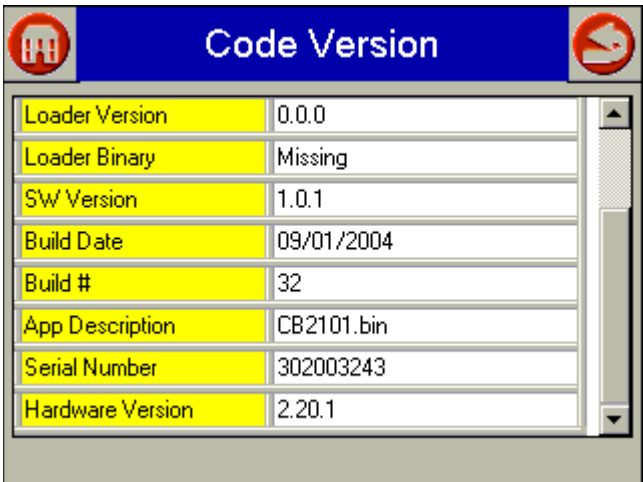


Fig. 49. Code version, page 2.

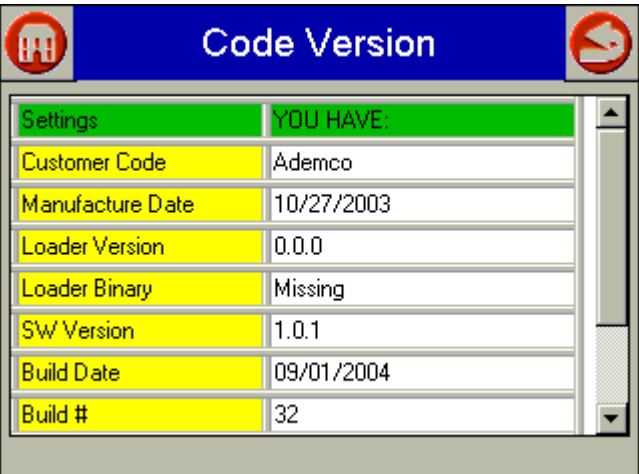


Fig. 48. Code version, page 1.

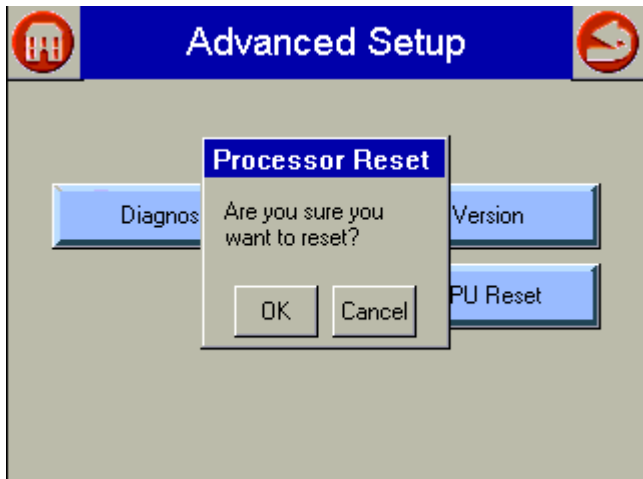


Fig. 50. Processor reset.

# SOFTWARE UPGRADE ADDENDUM

New software can be downloaded to the Configuration Display through the Internet. Downloading software to the display should only be done when recommended by Cleaver Brooks. This feature is intended to permit field upgrades for bug fixes and new software features.

Requirements for using this feature include:

- Ethernet connection for Internet access (RJ45 male connector). Careful insertion of the RJ45 connector into the Ethernet jack in the back lower right corner of the display is needed to ensure no damage to the jack.
- Dynamic IP addressing (DHCP assigned).

## **IMPORTANT**

*If this requirements can't be met at the location of the Display device, this procedure should not be done or the device should be moved to a location where these requirements can be met.*

The Display device must be reset to initiate the download procedure. Initial boot procedure of the device permits the user to enter into Advanced Startup options within the first five seconds after power up.

Follow these steps:

1. Select Advanced Startup Options button.
2. Select OK to proceed after Warning message.
3. Select Force Application Update checkbox.
4. Deselect Use Existing Application checkbox.
5. Select Continue button.
6. Upgrade should be automatic after the above steps. Upgrade connects to Honeywell server, verifies configuration file, erases the old application and downloads the new one. Unit may have difficulty finding configuration file at first. In this case, start procedure over again until it works.

**Honeywell**

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