e-TRIM

OPERATIONS MANUAL

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e-TRIM Overview

e-TRIM is designed to be installed on indirect fired burners. With e-TRIM, the operator will be able to monitor and alarm based on a desired oxygen percentage during high fire.   The system will provide continuous indication of oxygen and will warn the operator when the burner is outside of the desired oxygen band.

Additionally, e-TRIM is equipped with a critical alarm. This alarm is designed to provide an audible and visual indication when a burner is either not lit or running extremely lean.

Typical settings are as follows:
Desired percent on high fire is 2% per the DOE, which would provide 10% excess air. The band alarm should be set to 1%. When on high-fire, if the reading is below 1% or above 3%, the screen will show an out-of-band condition.   Additionally, SSi recommends the critical alarm be set to 8%. When on high fire, if the reading goes above 8% and the trim delay expires, the horn will sound. This is notification that a burner that is not lit or is extremely lean.

WARNING:

It is recommended that the desired oxygen percentage be verified with the burner manufacturer prior to adjusting. It is important to make sure that the Carbon Monoxide PPM limit is not increased when adjusting the burner.

e-TRIM electronics enclosure must not be exposed to temperatures above 120°F (49°C). It should not be mounted on the furnace unless proper cooling is installed. Contact SSi at 513-772-0060 for questions about mounting and cooling.

Sensor installation:
The sensor should be mounted on the exhaust leg of the burner prior to any gaps or possible air drafts. The sensor should be installed in a location that will not exceed 1000° F on high fire.

Sensor Mounting:
The thread for the e-TRIM O_2 sensor is M18 x 1.5. It is a metric thread.

Please refer to the electrical print provided with the panel for all wire terminations.

IMPORTANT: When first warming up, the 0_2 percentage for each burner will read 99.99%. This is expected, and the value will change to an appropriate value within 30 to 60 seconds. If the 0_2 percentage should read 99.99% at any time other than during the warm-up period or if it remains 99.99% after the first two minutes of operation, there may be a problem with the sensor. Call Super Systems Inc. technical support at 513-772-0060 for assistance.

Examples of e-TRIM installations are shown in Appendix D – Typical Installations Based on Application.

e-TRIM Touchscreen Interface

Main Screen

NOTE: This manual was written with oxygen readings from the ambient air, not in a valid run-time environment.

This is the main screen for the e-TRIM Touchscreen software. Once the software has booted up, this screen will be displayed. This screen will list the Burners, along with the % Oxygen reading, the Status of each burner, and the status of high fire or low fire. The possible messages are:

- **OK** – everything (coms, burner conditions, etc.) is ok.
- ****coms**** - there is bad communication to the sensor board.
- **Alarm Pending** – there is an out of band condition, and the system is waiting for the delay timer to expire.
- ****Out of Band**** - The burner is out of band. Status Disabled – The board has been disabled.
- ****Critical Alarm**** - There is a critical alarm active.
- **Critical Alarm Ack'd** – The critical alarm is active, but the alarm has been acknowledged.

The yellow icon signals that the burner is on high fire.

Details

NOTE: This manual was written with oxygen readings from the ambient air, not in a valid run-time environment.

This will display a details screen for the e-TRIM system.

The *Details* screen is basically an expanded version of the main screen. Four burners are shown on the screen at one time, and each burner will have its oxygen reading and status displayed on the screen. Clicking on the **Toggle** button will display the next four burners, etc.

Clicking on the **Close** button will close the *Details* screen.

Clicking on the burner number will display some details about the specific burner: The board address, baud rate, board version, TC type, TC temperature, Cold Junction temperature, diagnostic, and percent oxygen.

Menu
This will display the menu, which will allow the user to configure the e-TRIM system. See the section e-TRIM Menu for instructions on using the menu.

e-TRIM Menu

NOTE: This manual was written with oxygen readings from the ambient air, not in a valid run-time environment.

This screen is the main menu for the e- TRIM system. Currently, there are seven options:
- Offset
- Status
- System Setup
- Board Setup
- Burner Zones
- Shutdown
- Close

Offset

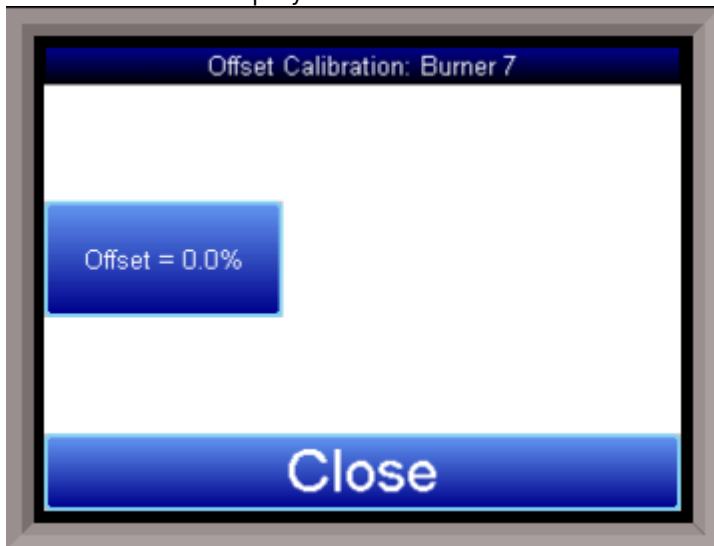The offset screen displays the $\%O_2$ and Offset percentage for eight burners at a time. Pressing the **Toggle** button will show the other eight burners. To change the offset of one of the burners, press the **Set** button and select the burner number.

This screen will display:

Click the **Offset=** button to enter the offset percentage. Click **OK** to save it.

This option will allow the user to enter an offset for each specific burner to match an external calibration source such as a hand held oxygen monitor. Adjustments should only be made when on high fire for more than 120 seconds.

To change an offset for a specific burner, select the burner from the drop-down list. The button below the list will show the current offset. Click on this button to change the offset. The range is **-20.9%** to **20.9%**.

Status
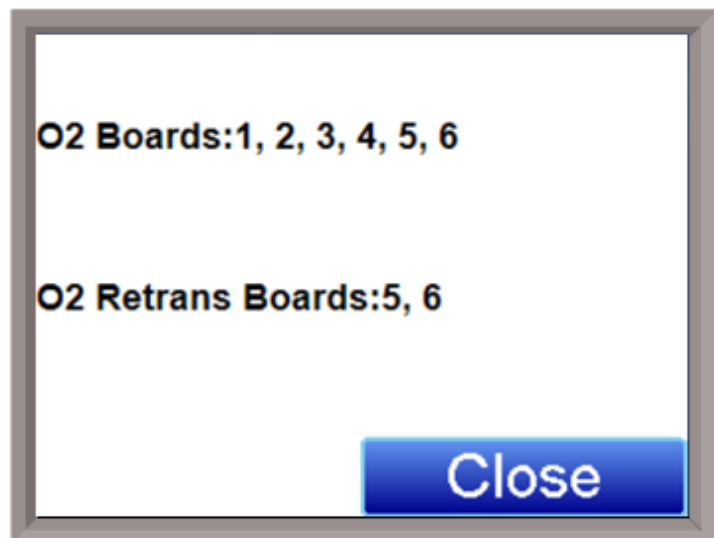
The *Status* screen shows the addresses of the connected boards that are communicating with the controller.

The O_2 Boards are the active circuit boards that are obtaining the oxygen measurement from each sensor.

The O_2 Retransmission Boards (optional) are the circuit boards that provide an analog output (4-20mA) of the oxygen measurement from each sensor. The electrical connections should be made in accordance with the electrical schematic located at the back of this manual, with 4 to 20mA corresponding proportionally to 0 to 25% oxygen. The ability to retransmit the oxygen signal requires circuit boards that are not part of the standard system. For additional information regarding this feature, please contact Super Systems Inc. (513-772-0060).

System Setup

This option will allow the user to make changes to the current system settings. Currently, there are six options to modify.

Alarm Delay
This setting is the number of seconds that the system will wait before showing an out of band alarm condition, if an alarm condition is present. This is entered in seconds. The range is **0 to 60,000 seconds (0 minutes to 1,000 minutes)**.

Alarm Band
This setting is the band for the boards' setpoint. If the setpoint is 3%, and the band is 2%, then an alarm indication condition will not be present until the reading goes under 1% or above 5%. This is entered in percentages. The range is 0% to 20.9%. **NOTE:** The alarm band will not sound the horn and is for indication only. Output 7 can be wired to an external horn or light if needed (see the electrical prints for termination details).

Master High Fire/Individual High Fire/Editable Zones
Clicking on this button will toggle between **Master High Fire, Individual High Fire,** and **Editable Zones**. The Master High Fire setting will allow the controller to see the one digital input signal as a high fire signal for all burners. Individual high fire will put the burners in groups of 4, each group being a separate zone. Editable Zones will allow the user to determine the burner and zone configuration. The high fire digital input is required for the e-TRIM system to provide band

alarm and critical alarm information. The default setting is master high fire. The master high fire contact is terminal 1270 to terminal 1340, as shown in the electrical drawing in "Appendix C – Electrical Drawings (For Reference ONLY)". See the electrical prints for more termination details.

Master SP: 3.0%
This setting will control the master setpoint for the burners. This setting will set the desired setpoint for all of the burners at once. This is entered in percentages. The range is **0%** to **20.9%**. A setpoint of **0%** will disable the master setpoint and allow the individual burners to use their setpoints.

All Low Alarms (All Low Alm)
This allows the controller to edit the low alarms for all 16 burners at once. They can be changed individually through the Board Setup option. See IMPORTANT note below.

All High Alarms (All High Alm)
This allows the controller to edit the high alarms for all 16 burners at once. They can be changed individually through the Board Setup option. See IMPORTANT note below.

IMPORTANT: Note the following about Low Alarm and High Alarm characteristics:

Low Alarm	High Alarm
Active anytime, not just during high fire	Only active during high fire
A 0 (zero) setpoint blocks the alarm; alarm disable does not block the alarm	Alarm disable blocks the alarm

Note that the default critical high alarm value is 8%. The default critical low alarm value is 0% (disabled).

Defaults
This will return all of the settings to the factory default settings. The user will have to confirm this action before the defaults are set.
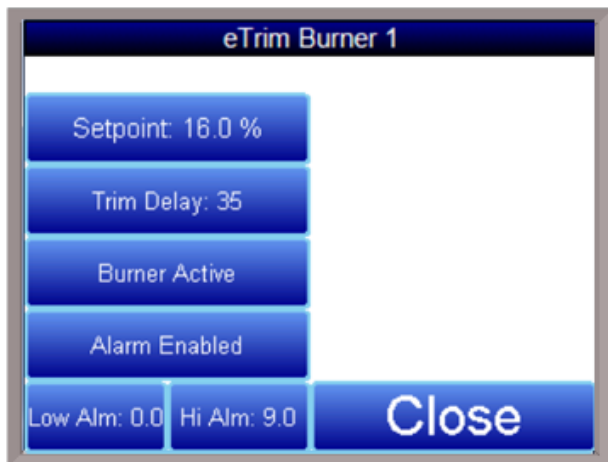
Close
This will close the *System Startup* screen.

Board Setup

This option will allow the user to make changes to each of the boards and their setup parameters.

The user will have to select the board to modify from the "Select Burner" list that appears after Board Setup is selected (see screen shot above). The options are **Board 1 – Board 16**.

Once the burner is selected, the screen above appears, allowing the user to change configuration on that board.

Setpoint
This will modify the individual setpoint for control (not currently available). This setting is the desired amount of oxygen for the burners. This is entered in percentages. The range is **0%** to **20.9%**.

Trim Delay
This setting will affect how long the system waits before activating any alarms, if necessary, or the control trim. Since it takes a few seconds for the burner combustion gasses to reach the sensor, the trim delay holds off any action until the sensor is truly seeing the gasses. This is entered in seconds. The range is **0** to **10,000 seconds**.

Burner Active/Burner Inactive
This setting will modify whether the selected burner is active or inactive. Clicking on this option will toggle between **Burner Active** and **Burner Inactive**.

Alarm Enabled
This setting will modify whether the selected burner's Band alarm is active or inactive. An inactive alarm will not sound if an alarm condition is present. Clicking on this option will toggle between **Alarm Enabled** and **Alarm Disabled**.

Low Alm
This will modify the low alarm setpoint. This alarm will sound when the amount of oxygen is lower than the value indicated when the high fire input is wired to the external high fire contact. The low alarm will sound when there is a low amount of oxygen being read, which could mean that too much fuel is being consumed or there is an extremely rich environment. This is entered in percentages. The range is **0** to **100**.

High Alm
This will modify the critical alarm setpoint. This alarm will sound when the amount of oxygen exceeds the value when the high fire input is wired to the external high fire contact. The critical alarm will sound when there is a high amount of oxygen being read, which could mean that a burner is not lit, or there is an extremely lean environment. This is entered in percentages. The range is **0** to **100**.

Close
This will close down the *Board Setup* menu.

Burner Zones
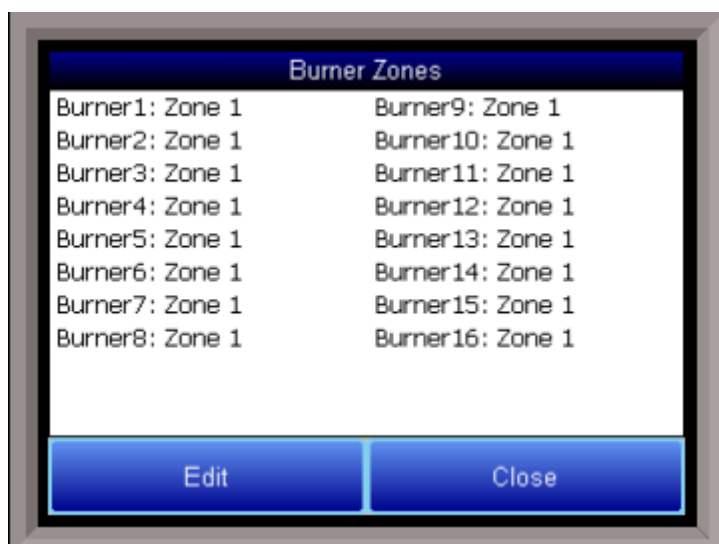
This option will allow the user to view all the burners and their corresponding zones. To change the zones, press the **Edit** button, and choose the proper burner number. Enter the new zone

and press **OK**. Note that Editable Zones must be configured in the System Setup menu in order to edit the burner and zone settings.

Edit
This option will allow the user to select the burner and set the zone.

Close
This will close down the Burner Zones menu.

Shutdown
This option will show the e-TRIM Touchscreen software down and display the Windows CE© desktop. This option is useful if the user needs to make any changes to the Touchscreen itself, or if the user is removing the memory card from the Touchscreen for data transfer.

Close
This option will close the menu screen and return the user to the main screen.

Chart

NOTE: This manual was written with oxygen readings from the ambient air, not in a valid run-time environment.

This will display a chart of the data points for the e-TRIM system. Currently, the data points that are logged are the Oxygen readings for up to sixteen burners. Each oxygen reading will be a separate line and color on the graph.

The red line on the graph will act as a cursor. Holding down the stylus on the red line and moving to the left or the right will modify the time on the bottom of the chart and update the oxygen values displayed.

The red "X" in the top right corner will close the *Chart* screen.

The date for display can be changed by clicking on the down arrow next to the date in the top left corner.

The beginning time for the display range will be listed in the bottom left corner of the chart. The middle of the display range will be listed in the center of the chart. The chart will always use the current system time as the starting point for the display range. If the range is 8 Hours, then the time in the left corner of the chart will be 8 hours ago, and the time in the middle of the chart will be 4 hours ago. If the range is 12 Hours, then the time in the left corner of the chart will be 12 hours ago, and the time in the middle of the chart will be 6 hours ago.

If the user holds the stylus or their finger down on the white area of the chart for three (3) seconds, a sub chart menu will be displayed.

The button on the left - - is the Trend Lines button. This button will allow the user to select which trend lines (data points) to display on the chart, as well as view statistics for each data point. Note – Removing a trend line from display does not stop logging the data for that point. If the checkbox is checked, that data point will be displayed on the chart. If the checkbox is unchecked, the data point will not be displayed. Clicking on the check box will toggle between checked and unchecked. The "**fx**"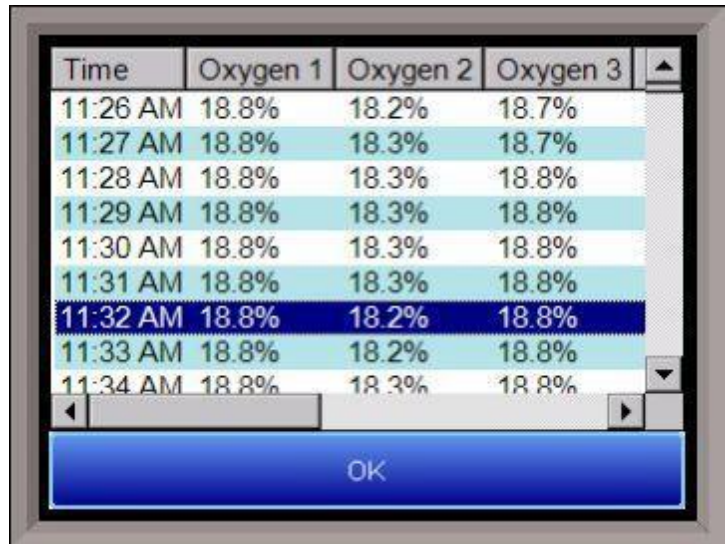 button will display the statistics for the selected data point. The statistics that are displayed are: the name of the data point, the minimum value for the date/time range, the maximum value for the date/time range, the number of data points in the date/time range, the average value for the date/time range, and the standard deviation for the date/time range.

Name	Oxygen 5
Minimum	18.500
Maximum	18.900
Datapoints	240
Average	18.725
Std. Deviation	0.068
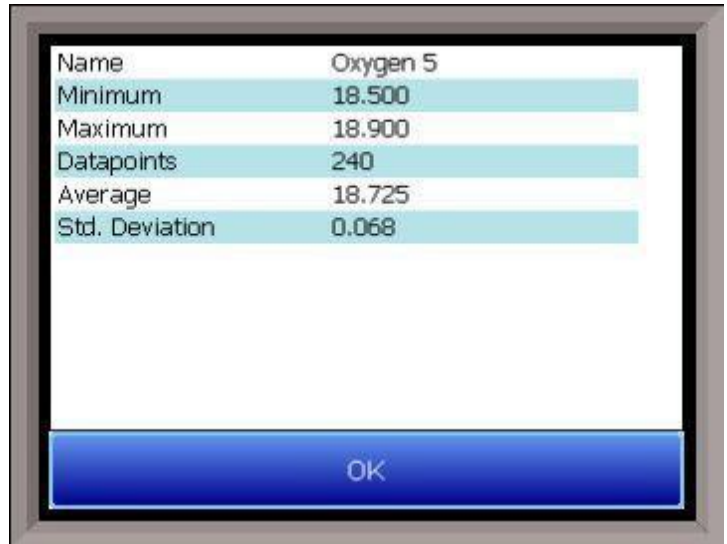
The **OK** button will save any changes made and close down the Trend Lines screen. The **Cancel** button will simply close down the Trend Lines screen and not save any changes that have been made.

 - is the datagrid button. This will display all of the data points for the trend lines in a column format. The date/time range for the display will be the same as the date/time range for the chart.

Time	Oxygen 1	Oxygen 2	Oxygen 3
11:26 AM	18.8%	18.2%	18.7%
11:27 AM	18.8%	18.3%	18.7%
11:28 AM	18.8%	18.3%	18.8%
11:29 AM	18.8%	18.3%	18.8%
11:30 AM	18.8%	18.3%	18.8%
11:31 AM	18.8%	18.3%	18.8%
11:32 AM	18.8%	18.2%	18.8%
11:33 AM	18.8%	18.2%	18.8%
11:34 AM	18.8%	18.3%	18.8%

 - is the undo button. This will undo any zooming on the chart and return it to the original aspect.

 - will move the chart display back in the past by half of the display range. For example, if the display range is 12 Hours, then clicking on this button will display six more previous hours.

 - will allow the user to change the display time range for the chart. The options are:
1 hour
2 hours
4 hours
8 hours
12 hours
24 hours

 - will move the chart display forward in the future (up to the current time) by half of the display range. For example, if the display range is 12 Hours, then clicking on this button will display the next six hours.

 - will put the chart into real-time mode. When in realtime mode, the chart cursor (red line) will move to the far right of the chart and display those values. Once a minute, these values will be updated as the time refreshes.
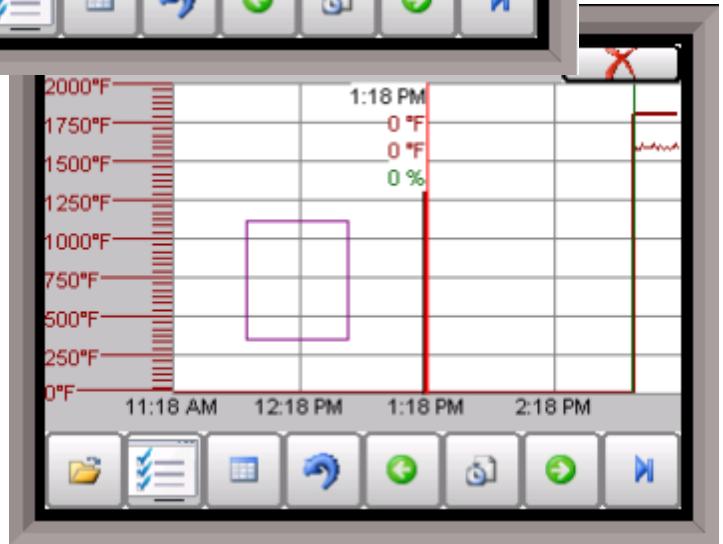
Chart Sub Menu
There is a sub-menu available by putting a finger or a stylus anywhere on the chart and holding it there for a couple of seconds. The sub-menu will have the following options available: **Zoom, Restore, Add Note, Data,** and **Exit**.

The **Zoom** option will allow the user to zoom in on a particular part of the screen. Once this has been selected, the user can take a stylus or a finger and create a box around the desired data. Once the user releases the stylus or finger, a zoom is no longer possible, and the user will need to re-select the option from the sub-menu to zoom in again.
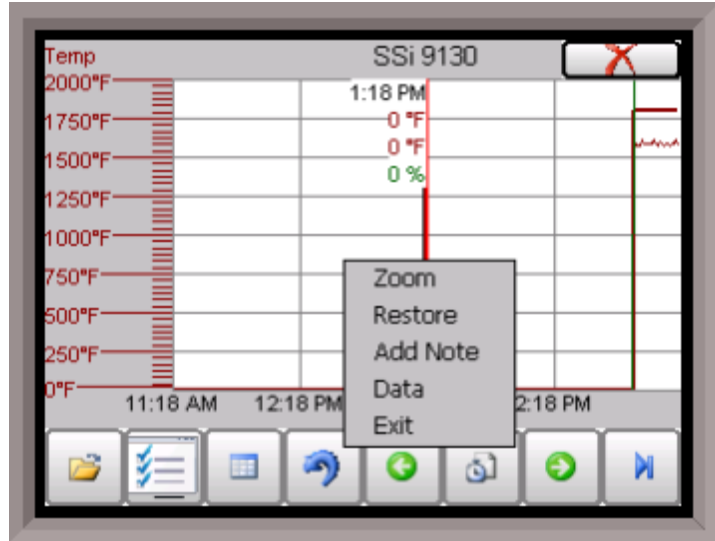
The **Restore** option will back out of any zoom options that have been performed and display the chart screen as it initially was.

The **Add Note** option allows the operator to enter a note on the chart, similar to writing on a paper chart. The note shows up when the chart is printed out using the utility software included with the SERIES 9130 instrumentation. Pressing the **Add Note** option displays a screen where the operator can enter the operator ID or initials and a note.
The user has the option to enter a note using the operator interface keyboard, where he or she will be able to type in the note; or the user can use the Signature mode, which will allow them to write a note using a stylus.

The **Data** option will show the trend data as a data grid instead of the trend lines on a chart. This

functionality is exactly the same as if the user pressed the Datagrid View button - - from the chart screen.

Exit will close out the sub-menu without selecting an item.

Warranty

Limited Warranty for Super Systems Products:

The Limited Warranty applies to new Super Systems Inc. (SSI) products purchased direct from SSI or from an authorized SSI dealer by the original purchaser for normal use. SSI warrants that a covered product is free from defects in materials and workmanship, with the exceptions stated below.

The limited warranty does not cover damage resulting from commercial use, misuse, accident, modification or alteration to hardware or software, tampering, unsuitable physical or operating environment beyond product specifications, improper maintenance, or failure caused by a product for which SSI is not responsible. There is no warranty of uninterrupted or error-free operation. There is no warranty for loss of data—you must regularly back up the data stored on your product to a separate storage product. There is no warranty for product with removed or altered identification labels. SSI DOES NOT PROVIDE ANY OTHER WARRANTIES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OF IMPLIED WARRANTIES, SO THIS LIMITATION MAY NOT APPLY TO YOU. SSI is not responsible for returning to you product which is not covered by this limited warranty.

If you are having trouble with a product, before seeking limited warranty service, first follow the troubleshooting procedures that SSI or your authorized SSI dealer provides.

SSI will replace the PRODUCT with a functionally equivalent replacement product, transportation prepaid after PRODUCT has been returned to SSI for testing and evaluation. SSI may replace your product with a product that was previously used, repaired and tested to meet SSI specifications. You receive title to the replaced product at delivery to carrier at SSI shipping point. You are responsible for importation of the replaced product, if applicable. SSI will not return the original product to you; therefore, you are responsible for moving data to another media before returning to SSI, if applicable. Data Recovery is not covered under this warranty and is not part of the warranty returns process. SSI warrants that the replaced products are covered for the remainder of the original product warranty or 90 days, whichever is greater.

Appendix A – e-TRIM Modbus Registers

The following list is a description of the relevant Modbus registers in the e-TRIM system. For communications, the e-TRIM supports Modbus on the Host 485 port and ModbusTCP through Ethernet.

11	Active burner bitmap
14	Modbus address
15	Master Setpoint (2 decimal places)
16	Deviation alarm band setpoint (2 decimal places)
17	Out of band alarm delay time
18	Alarm disable bitmap
19	Alarm bitmap, burners 1 - 16.
20 - 35	O_2 readings, sensors 1 - 16, 2 decimal places.
68 - 83	High Fire ON, sensors 1 - 16.
116 - 131	O_2 trim delay, sensors 1 - 16.
132 - 147	O_2 trim interval time, sensors 1 - 16.
148 - 163	O_2 alarm state, sensors 1 - 16.
	0 = normal, 1 = bad communications, 2 = out of and pending, 3 = out of band.
164 - 179	Alarm delay timer (sec), sensors 1 = 16.
180 - 195	O_2 offset, sensors 1 - 16.
220 - 235	Slave communications status, boards 1 - 16. 0 = bad communications, 4 = OK.
460	Critical alarm bitmap
461 - 476	Critical alarm, sensors 1 - 16.
477 - 492	Critical alarm set point, sensors 1 - 16.
493	Critical alarm acknowledge. 1 = acknowledged.
600	High fire total time (sec), sensor 1
601	High fire total time (hr), sensor 1
602	Low fire total time (sec), sensor 1
603	Low fire total time (hr), sensor 1
604	High fire timer, sensor 1
605	Low fire timer sensor 1
606 - 611	Timers for Sensor 2
612 - 617	Timers for sensor 3
618 - 623	Timers for sensor 4
624 - 629	Timers for sensor 5
630 - 635	Timers for sensor 6
636 - 641	Timers for sensor 7
642 - 647	Timers for sensor 8

648 - 653	Timers for sensor 9
654 - 659	Timers for sensor 10
660 - 665	Timers for sensor 11
666 - 671	Timers for sensor 12
672 - 677	Timers for sensor 13
678 - 683	Timers for sensor 14
684 - 689	Timers for sensor 15
690 - 695	Timers for sensor 16

Appendix B – Spare Parts List

The following is a list of spare parts, with SSi part numbers, for the e-TRIM system.

31296	3.5" Touch Screen
13562	e-TRIM Controller
13584	e-TRIM Sensor Cable
31430	Oxygen Sensor
31594	Oxygen Sensor Control Circuit Board
31621	4-20 mA Output Board

Appendix C – Electrical Drawings (For Reference ONLY)

DENOTES TERMINAL BLOCK

☐ OR ☐

AOM-243 ANALOG OUTPUT MODULE

1-24VDC
2-COM
3-COM
4-RT-
5-RT+

COMMS FROM DPVT-123 (RS-485)
1360 SHLD — 136
1380 BLK — 138
1370 WHT — 137

1060 BLU
1070 WHT/BLU

OUTPUT #01 SENSOR #01 0 - 25% (4 - 20mA) (OPTIONAL)
OUTPUT #02 SENSOR #02 0 - 25% (4 - 20mA) (OPTIONAL)
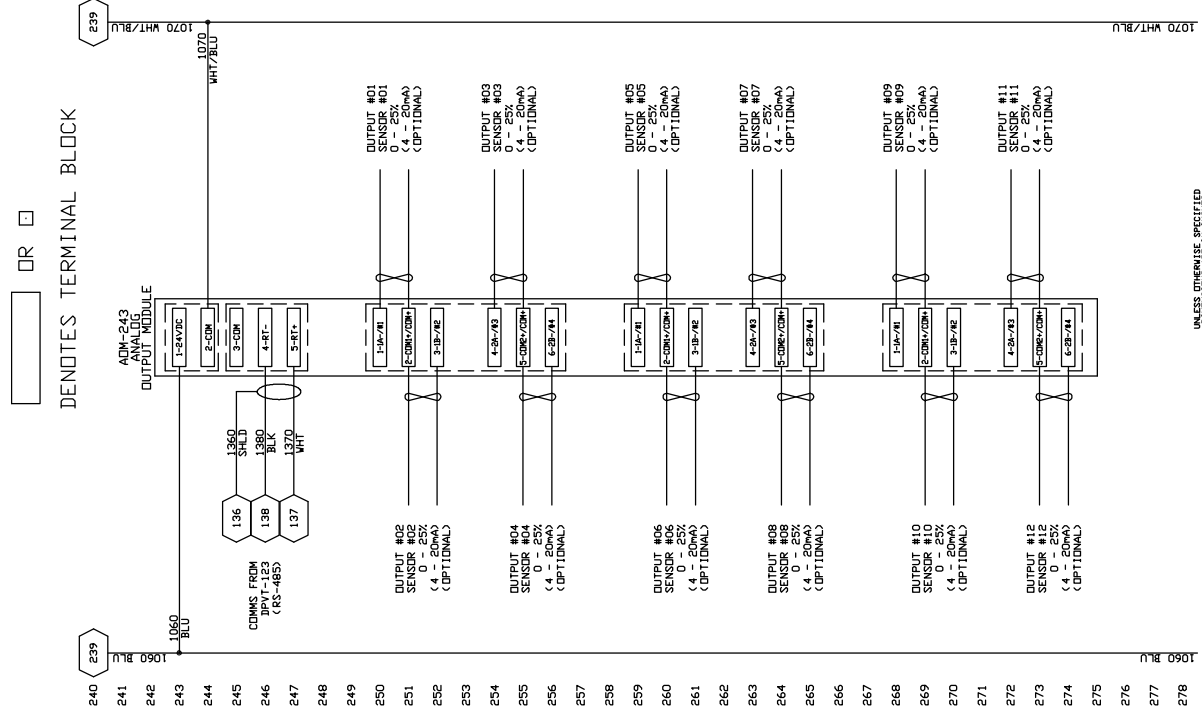1-1A+/A1
2-COM+/COM1
3-1B+/A2

OUTPUT #03 SENSOR #03 0 - 25% (4 - 20mA) (OPTIONAL)
OUTPUT #04 SENSOR #04 0 - 25% (4 - 20mA) (OPTIONAL)
4-2A+/A3
5-COM+/COM4
6-2B+/A4

OUTPUT #05 SENSOR #05 0 - 25% (4 - 20mA) (OPTIONAL)
OUTPUT #06 SENSOR #06 0 - 25% (4 - 20mA) (OPTIONAL)
1-1A+/A1
2-COM+/COM1
3-1B+/A2

OUTPUT #07 SENSOR #07 0 - 25% (4 - 20mA) (OPTIONAL)
OUTPUT #08 SENSOR #08 0 - 25% (4 - 20mA) (OPTIONAL)
4-2A+/A3
5-COM+/COM4
6-2B+/A4

OUTPUT #09 SENSOR #09 0 - 25% (4 - 20mA) (OPTIONAL)
OUTPUT #10 SENSOR #10 0 - 25% (4 - 20mA) (OPTIONAL)
1-1A+/A1
2-COM+/COM1
3-1B+/A2

OUTPUT #11 SENSOR #11 0 - 25% (4 - 20mA) (OPTIONAL)
OUTPUT #12 SENSOR #12 0 - 25% (4 - 20mA) (OPTIONAL)
4-2A+/A3
5-COM+/COM4
6-2B+/A4

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE
FRACTIONS   ANGLES
±1/64"   ±0.5°
X.X=±0.100
X.XX=±0.010
X.XXX=±0.001

TYPICAL SENSOR WIRING DIAGRAM

SSI# - 13584
SSI# - 31430
SSI# - 31594

SENSOR THREAD = M18 X 1.5

BMM-203 BURNER MANAGEMENT MODULE
IP   — RED - PIN 6
VS/P — BLU - PIN 5
VS   — BLK - PIN 1
Rcal — GRN - PIN 2
I+   — WHT - PIN 4
I+   — DRN - PIN 3

239   1070 WHT/BLU
239   1060 BLU
179   1070 WHT/BLU
179   1060 BLU
240   1070 WHT/BLU
240   1060 BLU
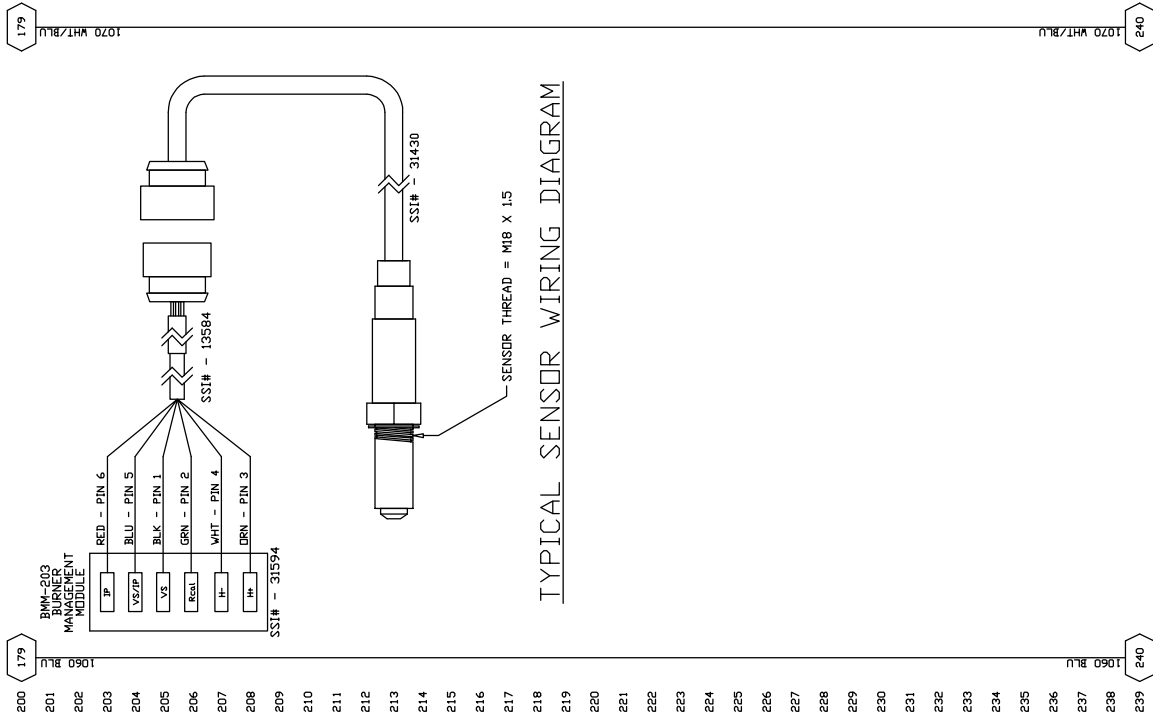
Appendix D – Typical Installations Based on Application

The following pictures show typical installations based on common e-TRIM applications. Your installation requirements may vary; the pictures in this section provide examples only and should not be used as instructional pictures.

Typical Setup of e-TRIM with BIQ Furnace
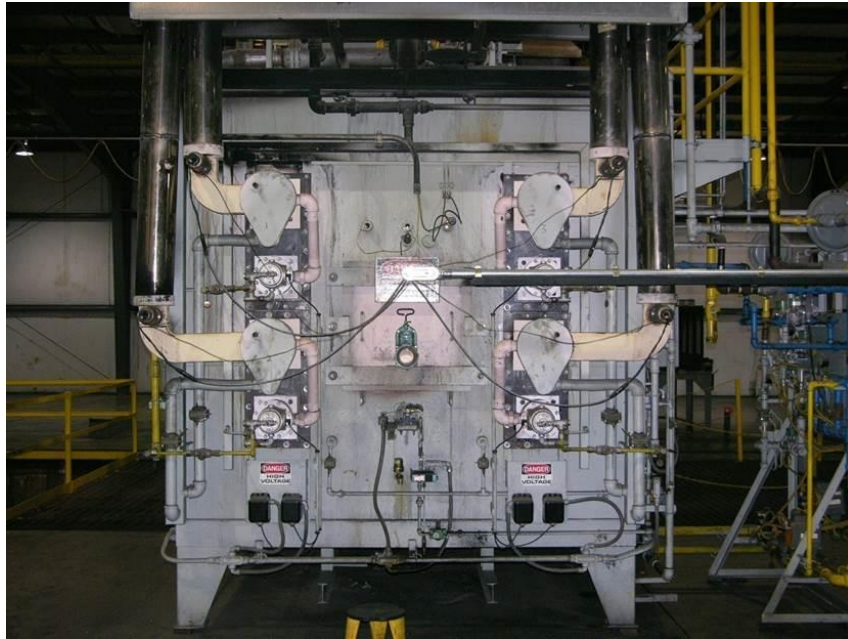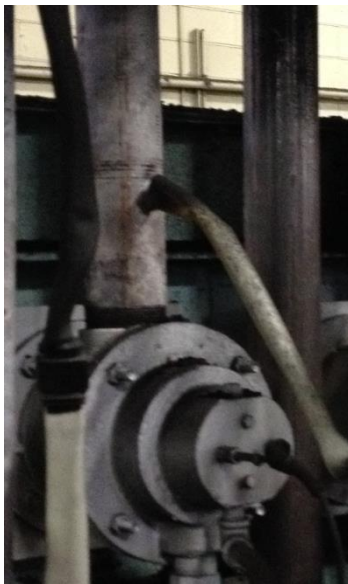

Typical BIQ Furnace Installation

Close-Up of BIQ Sensor Installation with Top Exhaust

Typical Setup of e-TRIM with Continuous Furnace

Typical Continuous Furnace Installation

Close-Up of Continuous Furnace Sensor Installation

Example Setup of e-TRIM in a Custom Installation

Example Custom Installation

Revision History

Rev.	Description	Date	MCO #
-	Initial Release	6/11/2010	N/A
A	Changed the "alarm delay" to "trim delay" in the overview section; Changed the "Trim Delay" description; Changed the "Alarm Enabled" description; Modified some of the Modbus registers (Appendix A)	6/23/2010	2076
B	Updated Screen Shots & descriptions, added new photo, added electrical drawings, added high fire info	10/31/11	2086
C	Updated specification to include the Quad board for the 4-20mA retransmission and/or control Updated the wiring diagram to identify which digital input is for the master high fire Updated manual text to cover new screen options Changed screen shots as needed	1/18/2013	2108
D	Added warning related to exposure of electronics enclosure to high temperatures, as well as electronic enclosure mounting. Added default values for critical low alarm and critical high alarm. Added example installation pictures for typical applications. Updated parts list. Added warranty information.	05/20/2015	2162