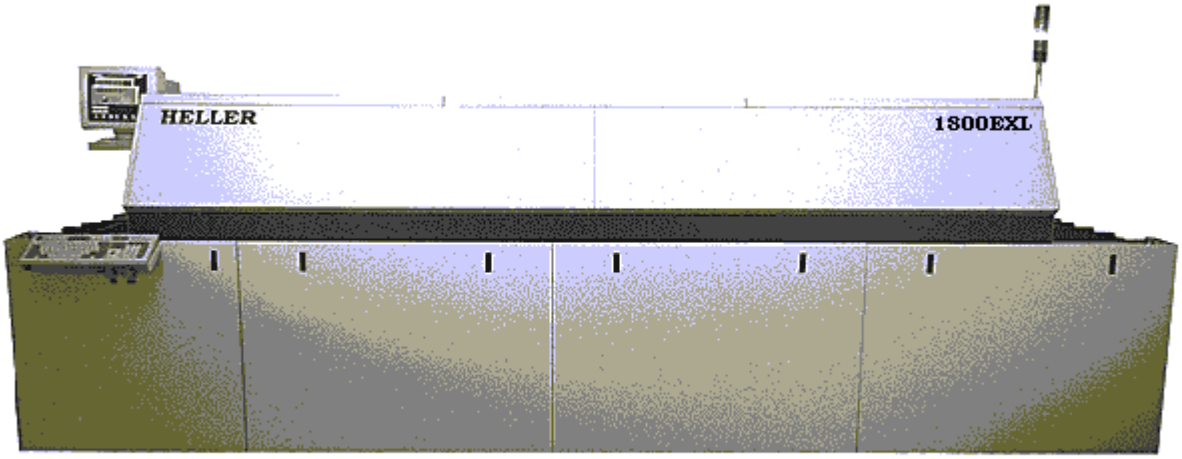
# HELLER

I N D U S T R I E S

## Operation Manual, Troubleshooting and Maintenance Guide for Oven Models 1500EXL, 1700EXL, 1800EXL & 1900EXL

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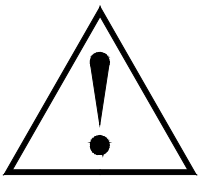
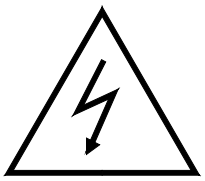
# Introduction

## I. How to Use this Manual

This manual is applicable to all Heller oven models 1500EXLA, 1700EXLA, 1800EXLA and 1900EXLA running WINDOWS based software. It contains installation, operation, troubleshooting and maintenance procedures for electrical and mechanical systems on all models, including most of the common optional equipment available for the ovens. Schematics, nitrogen plumbing diagrams and additional information may be found at the back of this manual and/or OEM instruction manuals.



**CAUTION: Although most installation and service routines can be performed easily, extreme caution should be exercised when working with live electrical circuits. ONLY a trained electrical technician or engineer following all required codes and lockout/tagout procedures should perform this work.**



The first section of the manual describes for the technician the requirements and necessary steps to uncrate and install the oven.

For a detailed explanation of software operation, please refer to the section entitled “Operating System Software Guide”.

The section entitled “Standard and Optional Equipment Operating Guide” explains each of the features and available standard options. It includes operating instructions as well as schematics and diagrams.

To use the troubleshooting guide, please refer to the contents to select the troubleshooting section most applicable to the symptoms exhibited by the machine. It is recommended that the technician read the entire applicable section first before starting the troubleshooting procedure. Once he is familiar with all the required tests, he may then decide upon the most logical troubleshooting steps to take. The troubleshooting section contains a page useful for determining computer channel assignments for the various heating zones as well as a guide for determining which SSR (Solid State Relay) is controlling a particular zone. It also includes a section that will instruct the technician as to which covers will need to be removed to access internal components.

The technician should refer to the final section of the manual for any maintenance procedures that need to be performed.

If any further assistance should be required, contact

24 Hr Technical support: 1-800-759-8888 and enter pin 2022063

Factory: 1-973-377-6800 Monday – Friday, 8:30AM – 5:00PM EST

E-mail: service_dept@hellerindustries.com

To perform the procedures presented in this manual you may need the following equipment:

- **Medium and large Phillips head screwdrivers**
- **Large, medium and small flat blade screwdrivers**
- **Set of Allen (hex) keys (.050" to 5/16")**
- **Set of open end wrenches (SAE 3/8" to 3/4") or socket set**
- **Medium adjustable wrench**
- **Channel-lock pliers or pipe wrench with 3" capacity**
- **Wire cutters (diagonal cutters)**
- **Needle-nose pliers**
- **Wire strippers**
- **Terminal crimpers with assorted terminals**
- **Backup software disks**
- **RS-232 port tester**
- **Multimeter (voltmeter/ohmmeter)**

## II. Safety Precautions

**Facility Installation**

The oven should be uncrated and installed using an appropriate forklift and following the procedures as outlined. Failure to use appropriate equipment may result in personal and/or property damage.

The oven should be connected to power by a qualified electrician and must comply with all appropriate electrical and safety codes. See instruction manual Section III for power supply requirements. Failure to follow electrical codes or the use of under-rated supply conductors may cause property damage and may subject the operator to hazardous voltages.

The exhaust ducting for the oven should be designed and installed by a qualified HVAC technician capable of calculating air flow from suction blowers and flow losses in upstream and downstream ducting. Improper exhausting may allow flux fumes to be inhaled by the operator.

Ensure packing material is removed.

Read instruction manual.

**Operating the Equipment**

When oven is in use, the edge hold conveyor system and other machine components will become hot. Please observe all hot surface warning placards applied to the machine. Please also observe all other warning placards and instructions. Do not open the oven while it is in operation. This will expose the operator to high temperature air.

**Power Hood Lifts**

When closing the top shell of the oven be aware that long hair or loose fitting clothing may become entangled in the system. The shell may also pose a crushing threat to bodily extremities.

**Software Operation**

Do not alter settings in the system software beyond that which is described in this manual without first contacting the factory. Doing so may affect safe operation of the machine.

**Nitrogen Operation**

Even though nitrogen is an inert substance, a few simple precautions should be made. Proper ventilation in the area where the system is being used must be maintained to keep the oxygen level in the air at safe levels. Otherwise the continuous flow of nitrogen can displace the air and deplete the normal oxygen level. Create sufficient ventilation in the area of the reflow oven to exhaust the excessive nitrogen laden air and replace it with normal atmosphere. Installation of a room oxygen monitoring system is recommended especially if the oven is installed in a small enclosed area.

**Edge Hold/Mesh Belt Operation**

Caution must be exercised when working near the belt or conveyor. Do not operate the system with guards removed and be aware of all pinch point warning decals. Also, be aware that long hair or loose fitting clothing may become entangled in the system. Should this occur, an EMERGENCY STOP button is located at each end of the oven. Pressing this button will immediately stop the conveyor system.

**Troubleshooting and Maintenance**

Please be aware that although many service routines can be performed easily, extreme caution should be exercised when working with live electrical circuits. ONLY a trained electrical technician or engineer should perform this work. Before removing any panels, all power to the oven should be switched off and the temperature should be room ambient.

# Facility Installation

## I. Unpacking

The Heller oven is packed in two containers. The large skid contains the reflow unit. The corrugated box contains a computer, keyboard, color monitor and connection cables. (For international shipments this computer system is packed inside the crate.) Backup software disks and profile thermocouples are packaged with the instruction manual inside the computer box. The signal light tower will be packaged with the reflow unit in a cardboard tube and may be installed on the entrance end of the oven by plugging in the connector and installing four mounting screws.

To remove the oven from the skid it will be necessary to remove the 3/8" x 5 ½" lag screws (Remove panels to access lag screws) from the bottom cross tube of frame. (See Figure 1.) The oven may now be lifted from the skid with a 5000-6000 pound capacity forklift and moved into position by means of the casters mounted to the oven base.
**IMPORTANT: Lift the oven from the center ONLY. The unit may fall from the forklift if not lifted FROM THE CENTER.**

Immediately check all components for any apparent damage.

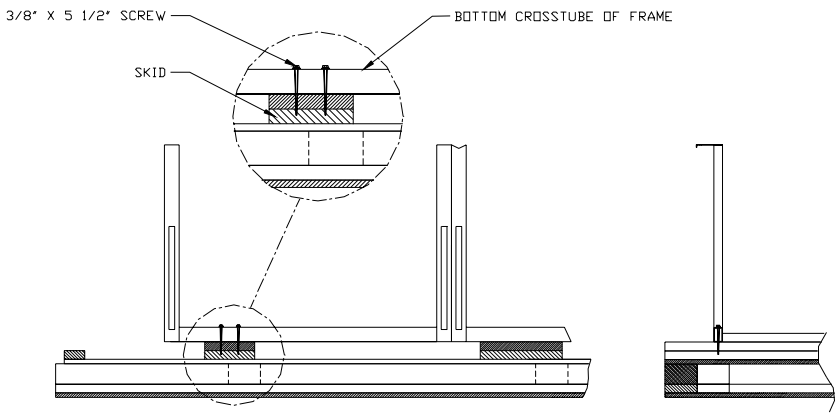



Figure 1

## II. General Operating Conditions

Ambient Operating Temperature - The equipment should be operated in an ambient temperature range of 5 to 32°C (41 to 89.6°F) under no load to full load conditions.

Relative Humidity - The equipment should operate within a relative humidity range of 20% - 95% (non-condensing).

Transportation and Storage - The equipment is designed to withstand storage and transportation temperatures within the range of -25°C to 55°C (-13°F to +131°F). Suitable means are provided to prevent damage from excessive moisture, vibration, stress and mechanical shock during shipment.

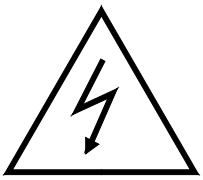
## III. Power Requirements

Figure 2 shows the service conductor current capacity required for all Heller oven models. Please refer to the serial tag on the machine and/or warning labels near the main terminals for the correct machine voltage. Caution: Use a voltmeter to verify the proper voltage before connecting the machine.

| Model Voltage⇒ ⇓ | 208, 240 Volts 3 phase | 380, 400, 415 or 480 Volts 3 phase |
|---|---|---|
| 1500EXL/1700EXL | 100 Amps / phase | 100 Amps / phase |
| 1800EXL | 100 Amps / phase | 100 Amps / phase |
| 1900EXL | ——————— | 100 Amps / phase |

CE Models wired for 63 Amps maximum current draw for high and low voltages. For other currents or voltages, please consult the factory.

Figure 2



The electrical power should be wired to the terminal block (labeled-$X_2$) mounted at the rear left side on the base. Use minimum of 6 AWG (16 mm²) wire for 63 Amps/phase service and 3 AWG (25 mm²) wire for 100 Amps/phase service. Be sure to make connections that comply with all appropriate electrical and safety codes

Two different electrical configurations are also available: 4 wire system - consisting of 3 phase lines and a combined ground/neutral connection, and 5 wire system - consisting of 3 phase lines, a neutral line and a ground line. Please be aware of your requirements and wire the machine accordingly.

## IV. Exhaust Requirements

The exhaust ducting for the Heller oven should be designed and installed by a qualified HVAC (Heating, ventilation, and air conditioning) technician capable of calculating air flow from suction blowers and flow losses in upstream and downstream ducting. Refer to enclosed facility install drawing for appropriate exhaust requirements.

The latitude for exhaust airflow is quite wide and tolerant of variations in exhaust blower efficiency. As a general guideline, exhaust volume is insufficient if an odor comes out of the oven. If the heaters in the reflow zones are operating above 70% power during production processing, there is too much exhaust flow.

## V. Nitrogen Requirements

If the oven is equipped for a nitrogen atmosphere, a nitrogen supply line with a capacity of 100 PSI (6.8 atmospheres) and 2000 SCFH (56 m³/hr) should be connected to the nitrogen input. The nitrogen should be supplied in the gaseous state from a cryogenic source with a minimum purity of 5 - 10 PPM of oxygen. See the facilities drawing in section X for the location and size of the input fitting.

## VI. Leveling the Machine

There are adjustable feet to level the machine. Use an open-end wrench to turn the leveling feet to raise or lower the unit.

## VII. Computer Installation

If the computer system was shipped in a separate carton, it may be mounted either in base (TOWER PC) or on the computer swing arm tray (DESKTOP PC).

Tower PC installation instruction:

With oven power OFF, remove the front entrance side base panel of the oven by lifting up and pulling forward using the pulls. Place the computer on the base of the oven. Make sure the power selector switch (located behind the computer) is set to 240V. Plug the computer in to the outlet mounted to the machine frame. Connect the oven communication cable (9-pin D-connector) to the COM2: port on the rear of the computer. If oven has another communication cable for dansensor or satellite KIC, connect to COM1: port. (If oven has another two communication cable for dansensor and satellite KIC, connect dansensor communication cable to COM1: port and satellite KIC communication cable to COM3: port.)

Place the monitor on the platform provided. Connect monitor cable to the video port on the rear side of the computer and the power cord to the monitor power input.

Connect the printer cable to the parallel port on the rear of the computer. The other end of the printer cable is pre-installed on the panel.

Route the keyboard cable through the hole under the keyboard tray and connect to the rear side of the computer.

Desktop PC installation instruction:

Plug the cables that are tie-wrapped to the computer swing arm support to the computer. Connect the cable with the 9-pin D-connector to the COM2: port on the rear of the computer.

Place the monitor on top of computer case on the swing arm. Connect the monitor cable to the video port on the rear side of the computer and the power cord to the monitor power input.

Route the keyboard cables through the hole under the keyboard tray and connect the keyboard and mouse cables, which are tie-wrapped, to the panel.

## VIII. Battery Backup Installation

Remove the center rear base cover by removing the screws, lifting up and pulling forward. (Note: The following steps 1, 2, and 3 may have been performed at the factory.) (See figure 3)

1. Plug the line cord from the oven into any empty outlet on the rear of the battery backup unit.
2. Connect the power cord to its socket on the battery backup and plug into either outlet mounted to the base of the oven.
3. Plug the cable with the 9pin D-connector into the socket on the rear of the unit.
4. The battery backup turns ON and OFF with the main rotary switch.

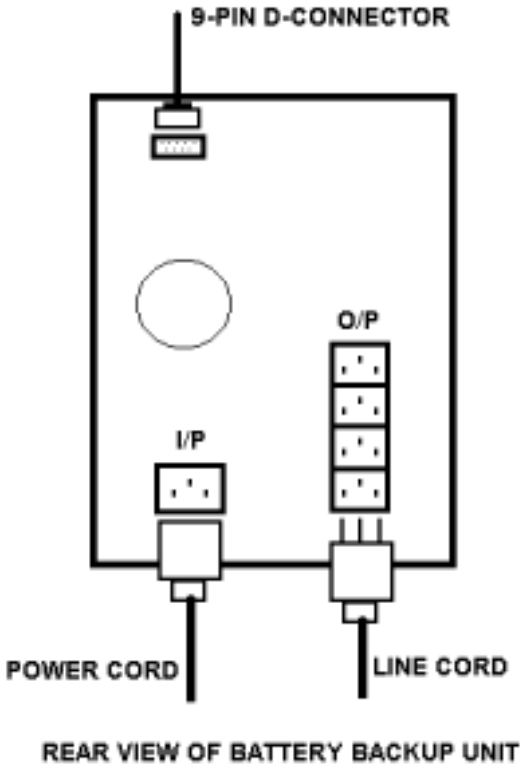



Figure 3

## IX. Final Things to Do

- Verify that all connections (electrical or otherwise) have been made according to the above instructions
- Ensure all packing material is removed.
- Read the instruction manual**.**

## X. Facility Drawings

The facility drawing for this oven is found on the following page.

# Operating System Software Guide

## *Windows Software Operating Guide*

This section will give an overview of the windows system software operation. The software is common to all oven models; the Main Overview Screen is a graphical representation of the oven model. Depending on the configuration of the oven, many different parameters and controls can be displayed. For the sake of simplicity, only the Overview screen for the model 1900 oven will be shown in the manual. Information that refers only to a particular oven model will be specifically noted. At any time while running the operating software, the user may obtain additional Help by depressing the F1 function key or by selecting topics from the Help menu.

**Caution: Please do not make changes to any software settings beyond that which are described in this manual without first consulting Heller Industries or an authorized representative. Doing so may cause unpredictable oven operation or lead to a hazardous condition.**

This manual is not intended to be a tutorial on Windows Software. It assumes that the user is familiar with the fundamentals of the Windows operating environment such as mouse operation, toolbars, and menus. If the user requires more information, please refer to the Windows system documentation.

### A. Starting the Program

Turn the computer on. Wait until the Desktop appears as shown in **Figure 1.** Then double-click on the Heller Operating Program Icon as shown in **Figure 2.**

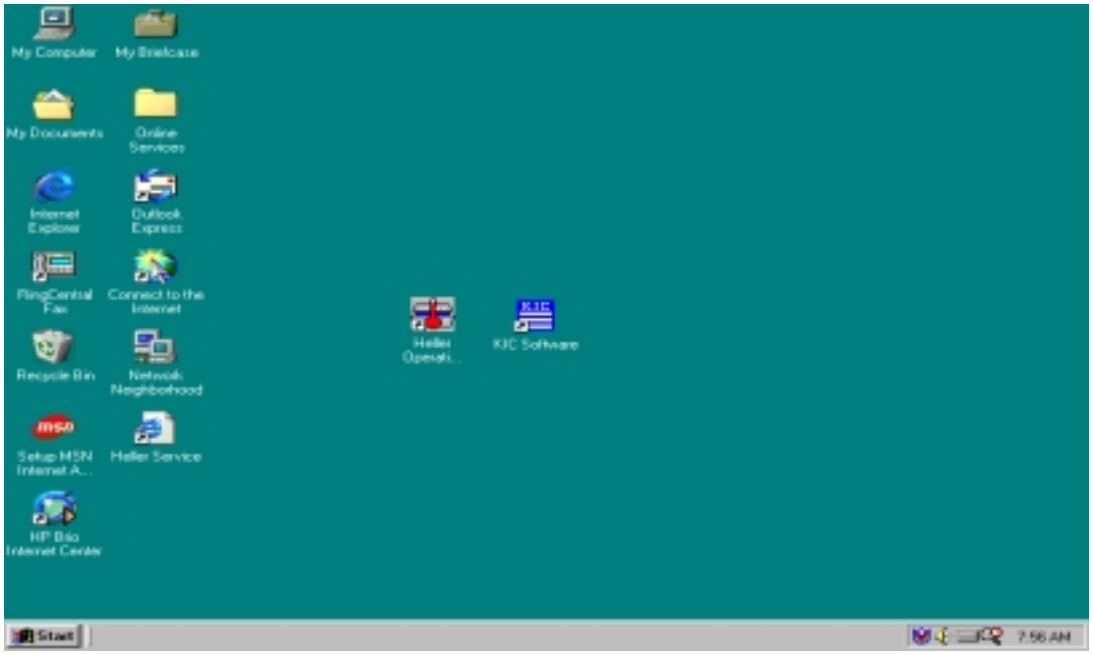



Figure 1


Figure 2

The screen will prompt for a User Name and a Password: as shown in **Figure 3**. Type “heller” for the User Name, click on the Password: dialog box and type “heller”, then depress the Enter key or click on OK.

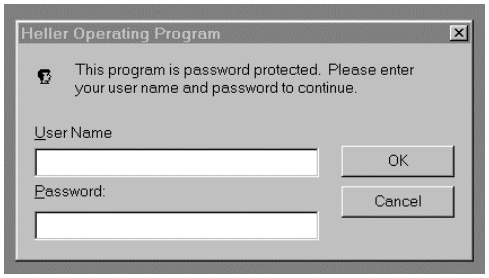



Figure 3

The user will be prompted to enter a Recipe to run. **See Figure 4**. Double-click on a Recipe name in the dialog box, click on a Recipe name then depress the Enter key or click on Open, or type the Recipe name in the File name: dialog box then depress the Enter key or click on Open.

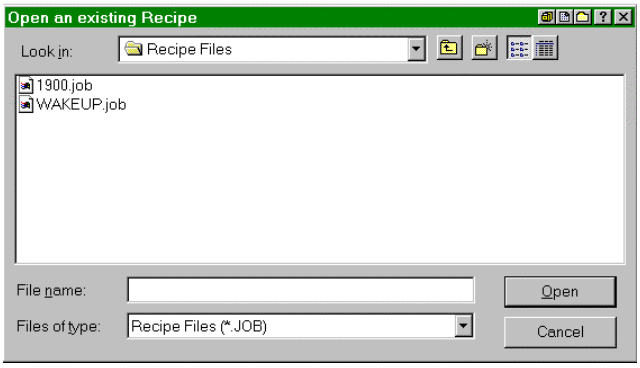



Figure 4

The software will now run the selected recipe and monitor the oven parameters via the Main Overview Screen. This default user is setup for limited access of functions, which includes access to existing recipes, cooldown mode, alarm window and quit the application. For more access see section **(E.) Setting up User Security.**

## B. Main Overview Screen

The Main Overview Screen is a graphical representation of the Heller oven. Depending on the individual configuration of the oven, many different parameters and controls will be displayed. This is the central screen / view of the program and will appear after logging on and a recipe has been loaded. The Main Overview Screen also serves as the recipe editor. **See Figure 5**. Information, parameters and controls on the overview screen will vary depending on the options of each oven. The above only lists a sampling, a complete description of all parameters and controls can be found by going to the Help menu.

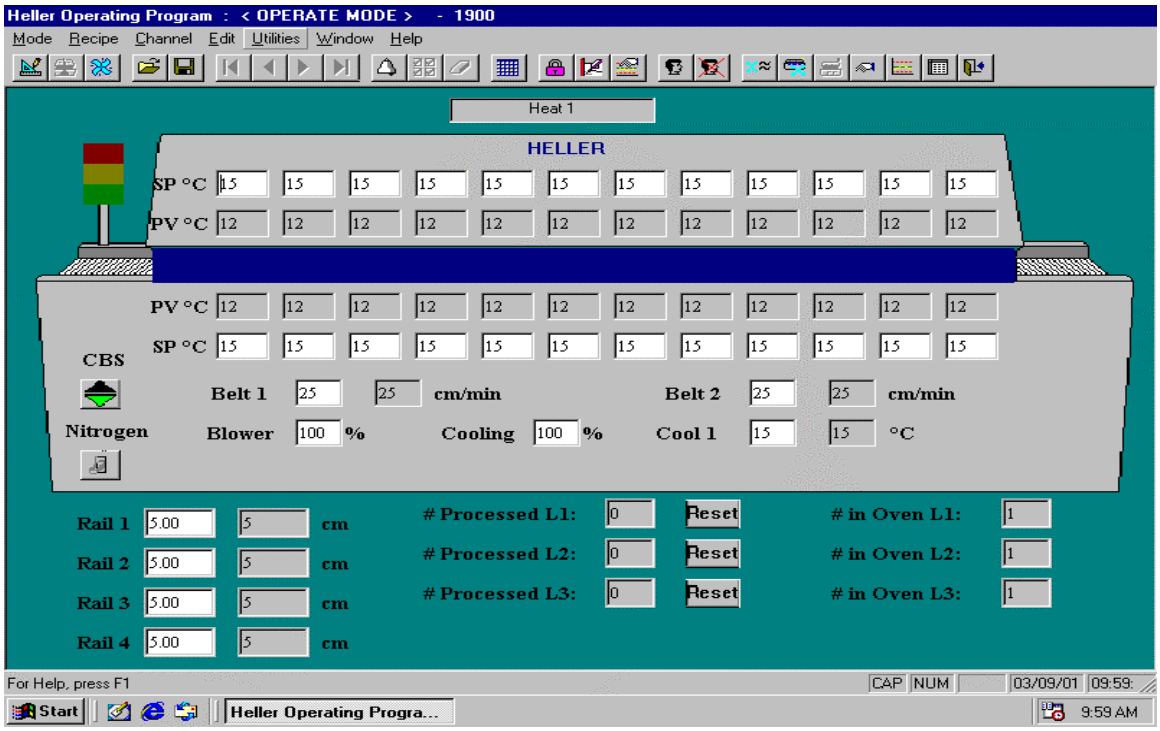



Figure 5

1.) The temperature control for each heat channel will display the setpoint (SP) and the actual temperature process value (PV). Clicking on the temperature channel (SP) box, and then inserting a new setpoint can change the setpoint. Setpoints are editable by the user in the Operate mode. The process value (PV) is constantly monitoring and updating in the Operate mode.
2.) A description box located on the top of the screen displays the currently selected channel.
3.) The conveyor speed can be changed by clicking on the conveyor (SP) box, and inserting a speed in units of distance / time.
4.) The light post animation tracks the condition of the oven status. A red light indicates that the oven is currently in an alarm state. A yellow light indicates that there is a warning state present or the oven is in its startup sequence. The green light indicates that the oven is in process ready state and able to accept boards.
5.) Clicking on the (SP) box and inserting a new width in units of length can change the rail edge width (for computer controlled edge hold systems only). The actual position is displayed in the (PV) box.
6.) The cooling fan speed can be adjusted by entering a number between 0 and 100% (if equipped). For oven with heater in cool zone cool fan speed is in between 65 and 100%.
7.) Board tracking is monitored through the oven by displaying the actual size of the board as it passes under the incoming board sensor (if equipped).
8.) The supply of nitrogen to the machine can be turned on or off by clicking on the toggle switch labeled ‘nitrogen’ on the overview screen.
9.) The board drop option will allow the detection of a board falling off the edge hold conveyor during the reflow process and to establish a warning signal so that the operator can take corrective action.
10.) The board count option allows the computer to display a count of the number of boards processed by the oven since a particular recipe has been loaded. As a board enters the oven, it activates a sensor at the entrance, counting a board “in." As the board leaves the oven it activates a sensor at the exit of the oven, counting a board “processed". This feature may be used to count the number of boards processed.

## C. Selecting Screens and Functions

The main toolbar **See Figure 6** depicts icons for different screens and function buttons. By clicking on an icon screens can be displayed or the function button can be activated. Moving the mouse arrow over an icon without clicking the mouse button a functional description of the chosen icon will be displayed.

Figure 6

When clicking on the menu bar a pull down menu will be displayed also depicting the icons and there related functions. **See Figure 7A through 7H**.


Figure 7A


Figure 7B


Figure 7C


Figure 7D


Figure 7E

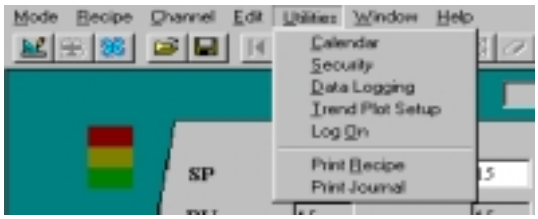



Figure 7F

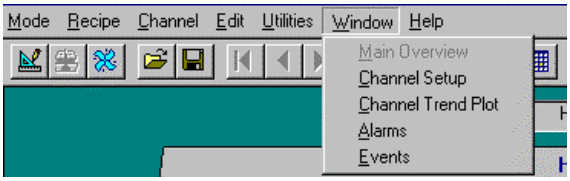



Figure 7G

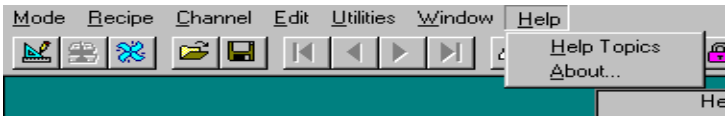



Figure 7H

Either method of selecting screens and functions will produce the same results it is left up to the user's preference.

1. Mode
   a. Operate mode will allow the software to communicate with the temperature controller via comm. Port 2 only. The software will continually monitor and control all digital I/O as well as all the temperature and conveyor/rail channels. From the main toolbar click the Operate icon or from the menu bar Mode then Operate, you will then be prompted to open an existing file **See Figure 8**. To open an existing file single click on a recipe click Open or depress the Enter key, or double click on a recipe. The overview screen will appear and the software will monitor the oven.

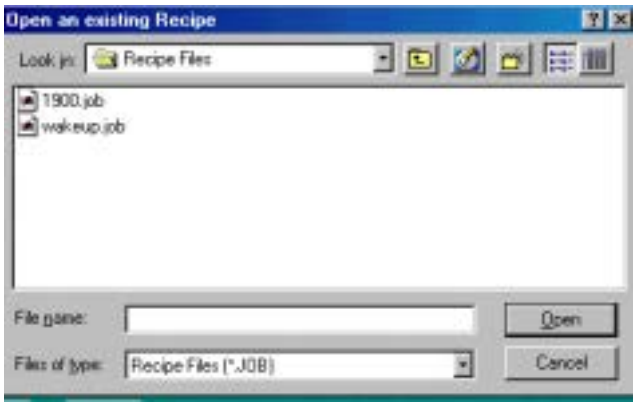



Figure 8

   b. Cooldown mode will terminate the oven process in an orderly manner turning off the power to the heaters while leaving the conveyor and blowers operating until all the temperature channels are below 95 degrees centigrade. From the main toolbar click the Cooldown icon or from the menu bar Mode then Cooldown, then confirm to load Cooldown **See Figure 9**.

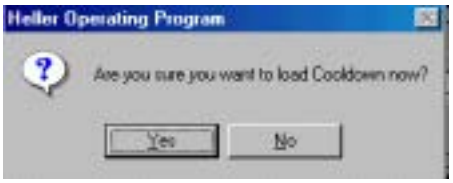



Figure 9

   Clicking Yes will load Cooldown, clicking No will return to the previous screen. After Cooldown is loaded the user can leave the screen as shown and reload another recipe at a later time or exit to the desktop. To exit follow the procedures as outlined in section 1.c. To load another recipe the user must be in the Operate mode, the user cannot load recipes from the Cooldown mode overview screen. From the main toolbar click the Operate icon or from the menu bar click Mode then Operate. Follow the procedure for loading a recipe as outlined in section 1.a. **Figure 8**.

   c. Edit mode will allow the operator to generate or change recipes off line or while the oven are being controlled by another recipe.
   Click on the main toolbar Edit icon or the menu bar Mode then Edit, you will be prompted to program password. Enter user name and password.
   To open an existing file: type an existing File name: click Open or depress the Enter key, single click on a recipe click Open or depress the Enter key, or double click on a recipe.

**If the oven is currently operating while the user is editing an existing file, the file that is controlling the oven cannot be opened. See figure 10.**

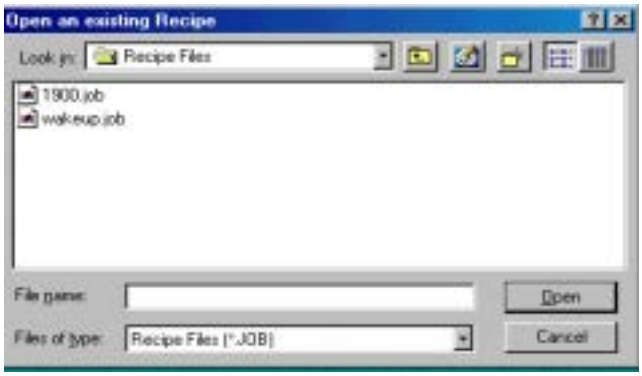



Figure 10

After the recipe file has been edited click Recipe on the menu bar, click Save to save file under same name or Save As… if the recipe will have a different file name, type a File name: click Save As or depress the Enter key. **See Figure 11**.

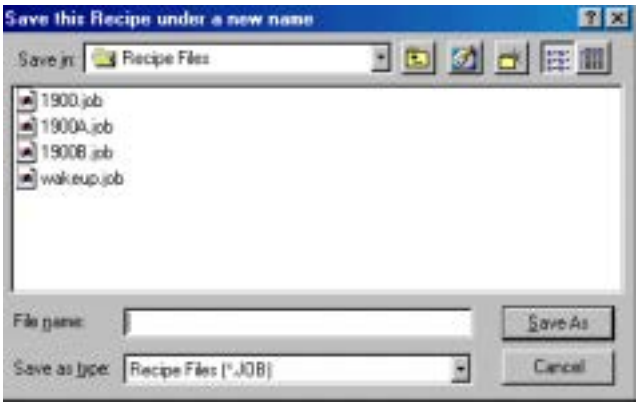



Figure 11

To exit the edit mode, from main toolbar click the Shutdown + Exit icon or from the menu bar Mode then Shutdown + Exit.

d. Shutdown + Exit mode will terminate the oven process in an orderly manner turning off the power to the heaters and leaving the conveyor and blowers operating until all the temperature channels are below 95 degrees centigrade. From the main toolbar click the Shutdown + Exit icon or from the menu bar Mode then Shutdown + Exit, confirm to load cooldown **See Figure 12**. After clicking Yes cooldown will be loaded.

.

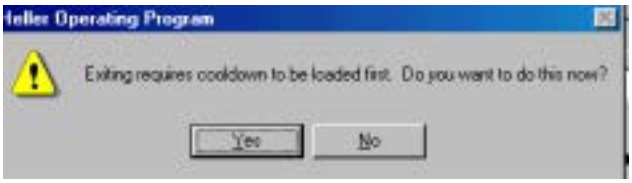



Figure 12

The program will remain in the overview screen in cooldown mode **See Figure 13.**

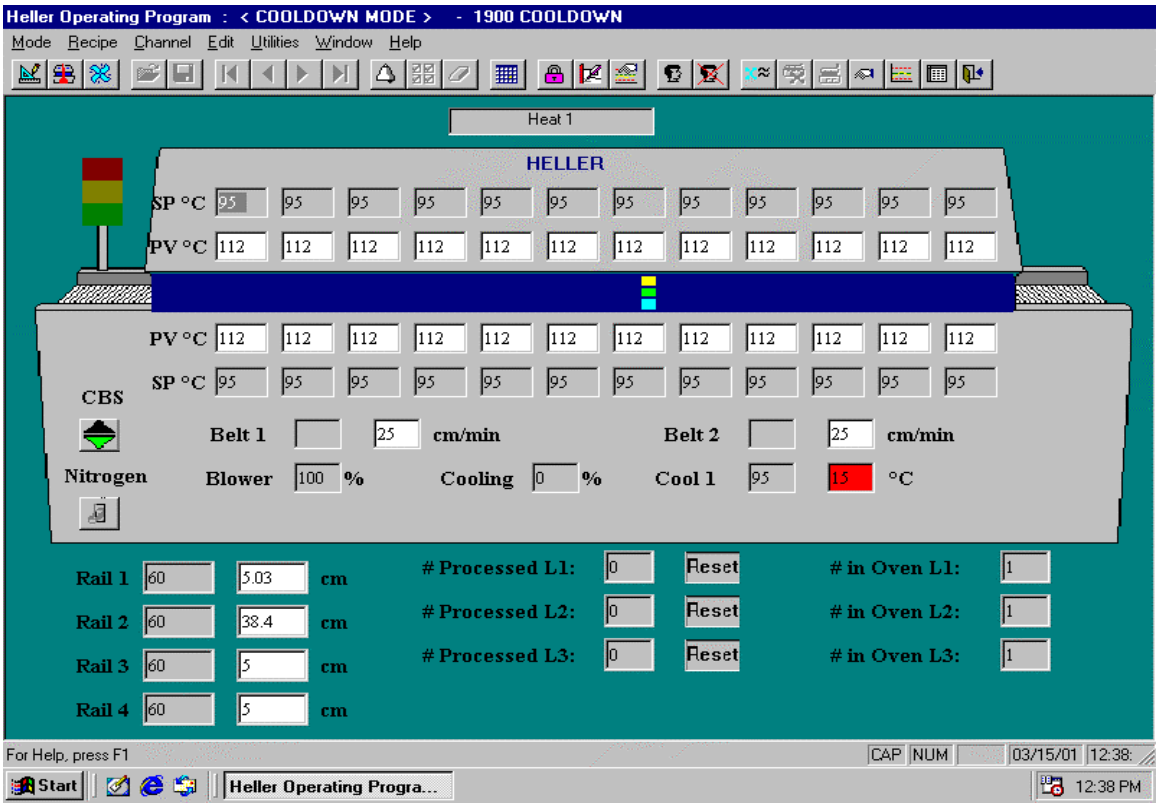



Figure 13

At this point the user can leave the screen as shown and reload another recipe at a later time or exit to the desktop. To load another recipe the user must be in the Operate mode, the user cannot load recipes from the cooldown mode overview screen. From the main toolbar click the Operate icon or from the menu bar click Mode then Operate. Follow the procedure for loading a recipe as outlined in section 1.a. **Figure 8**. To exit click the Shutdown + Exit icon on the main toolbar or from the menu bar Mode then Shutdown + Exit.

2. Recipe

   a. Open recipe will prompt to open an existing recipe only in the Operate mode. In Operate mode click the Open icon on the main toolbar or from the menu bar click Recipe then Open. A prompt confirming load a different recipe will appear **See Figure 14**. Typing Yes will allow loading an existing recipe from the recipe menu **See Figure 15**. This recipe will now control and monitor the oven. Typing No will return to the original overview screen.

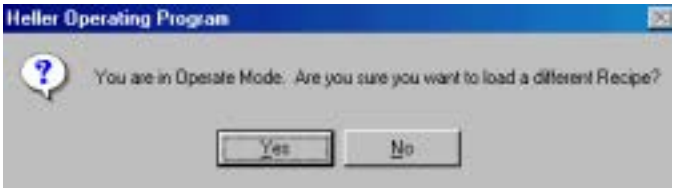



Figure 14

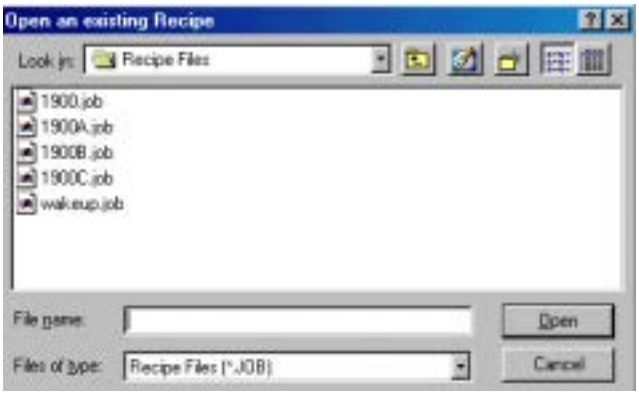



Figure 15

b. Save recipe will save an active recipe under the same file name with no further prompting in both the Operate and Edit modes. From the main toolbar click the Save icon or from the menu bar click Recipe then Save.

c. Save As.. recipe will save an active recipe under a new file name. From the menu bar click Recipe then save as… Type a new recipe name in File name: and click Save As or depress the Enter key. **See Figure 16.**

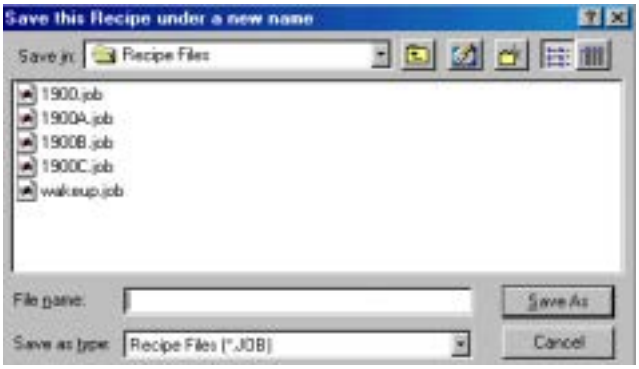



Figure 16

3. Channel

a. First channel will return to the first channel number SP (setpoint) on the overview screen or the first channel number parameters in the Channel Setup window. Click the First icon on the main toolbar or from the menu bar click Channel then First.

b. Next channel will increment to the next higher channel number SP (setpoint) on the overview screen and to the next higher channel number parameters in the Channel Setup window. Click the Next icon on the main toolbar or from the menu bar click Channel then Next. Depressing the Enter key will perform the same function on the overview screen. When the highest channel number is reached the function will wrap around to the lowest channel number.

c. Prev channel will decrement to the next lower channel number SP (setpoint) on the overview screen and to the previous channel number parameters in the Channel Setup window. Click the Prev icon on the main toolbar or from the menu bar click Channel then Prev.

d. Last channel will place the cursor to the highest channel number SP (setpoint) on the overview screen and display the highest channel number parameters in the Channel Setup window.

1. Edit

a. Acknowledge Alarm will acknowledge the most recent alarm listed in the alarm log window. From the menu bar click Edit then Acknowledge Alarm.

b. Ack All Alarms will acknowledge multiple alarms in the alarm log window that have not been previously acknowledged. From the menu bar click Edit then Ack All Alarms or click the Ack All icon on the main toolbar.

c. Clear Alarms will erase all of the alarms listed in the alarm log window. From the menu bar click Edit then Clear Alarms or click the Clear Alarms icon on the main toolbar. **Note the alarms are stored to the daily journal file and if the software is terminated and restarted the alarms for the present journal will be redisplayed**.

d. Heat Zone Blower (optional) will control the blower speed as Low, Medium or high. This Low, Medium and High values are set at the factory. From the menu bar click Edit then Heat Zone Blower or click the set the Heat Zone Blower icon on the main toolbar. **See Figure 17.**

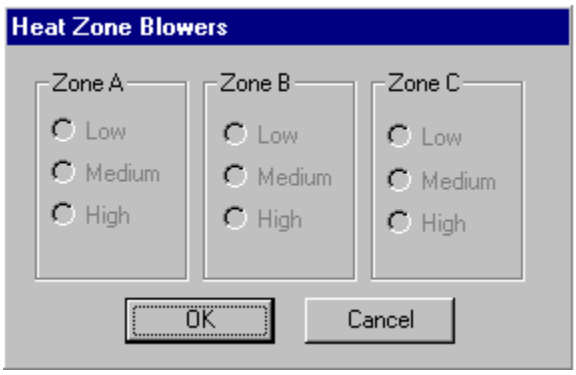



Figure 17

2. Utilities

a. Calendar displays the calendar setup screen that allows the user to generate an automatic recipe or cooldown start event. Click the Calendar icon on the main toolbar or from the menu bar click Utilities then Calendar. **See Figure 18**.

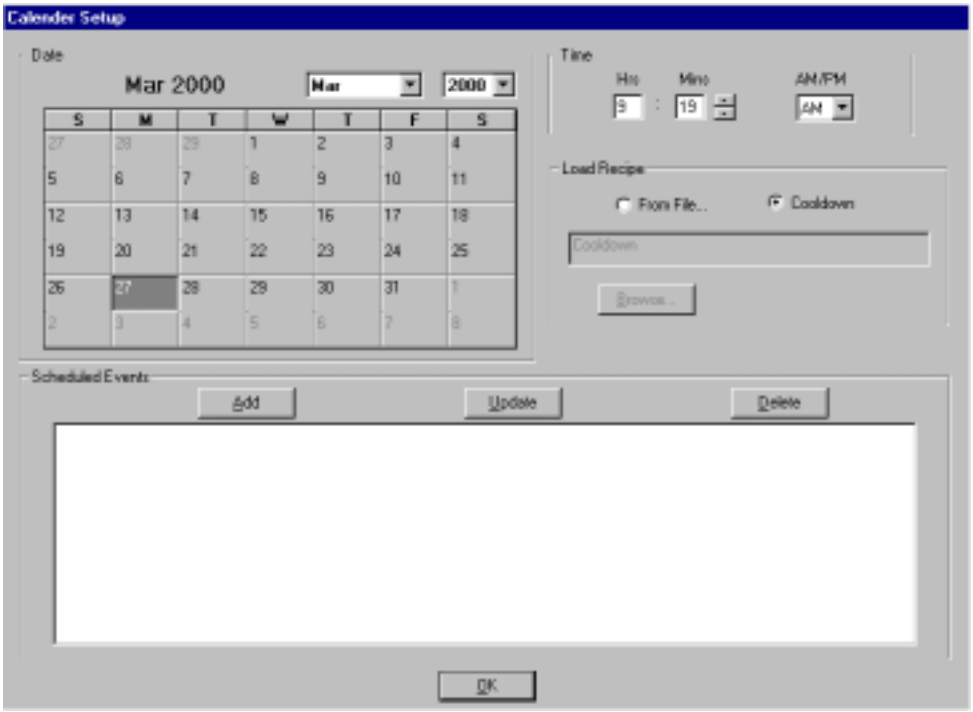



Figure 18

b. Security displays the security setup screen that allows the user with the proper password, to enter, edit or delete users and their accessible functions. Click the Security icon on the main toolbar or from the menu bar click Utilities then Security**. See Figure 19**.

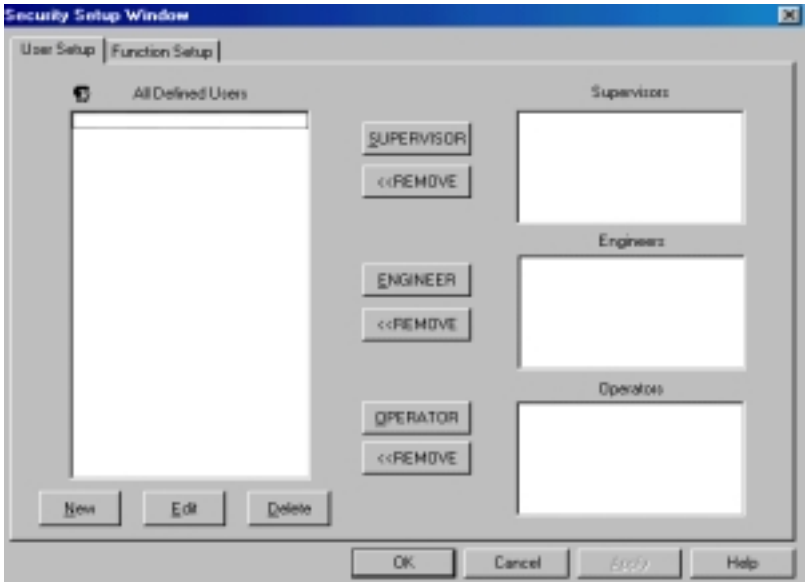



Figure 19

c. Data logging displays the data logging dialog box that allows the user to enable and select the time interval for the oven data. Click the Data logging icon on the main toolbar or from the menu bar click Utilities then Data Logging. **See Figure 20**.

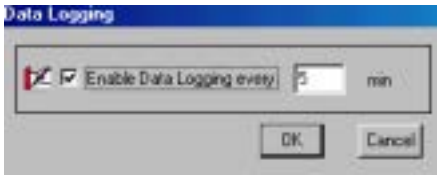



Figure 20

d. Trend Plot Setup displays the channel trend plot setup screen that allows the user to enter specific colors, line styles, and channel variables to the channel plot views. Click the Trend Plot Setup icon on the main toolbar or from the menu bar click Utilities then Trend Plot Setup. **See Figure 21**.

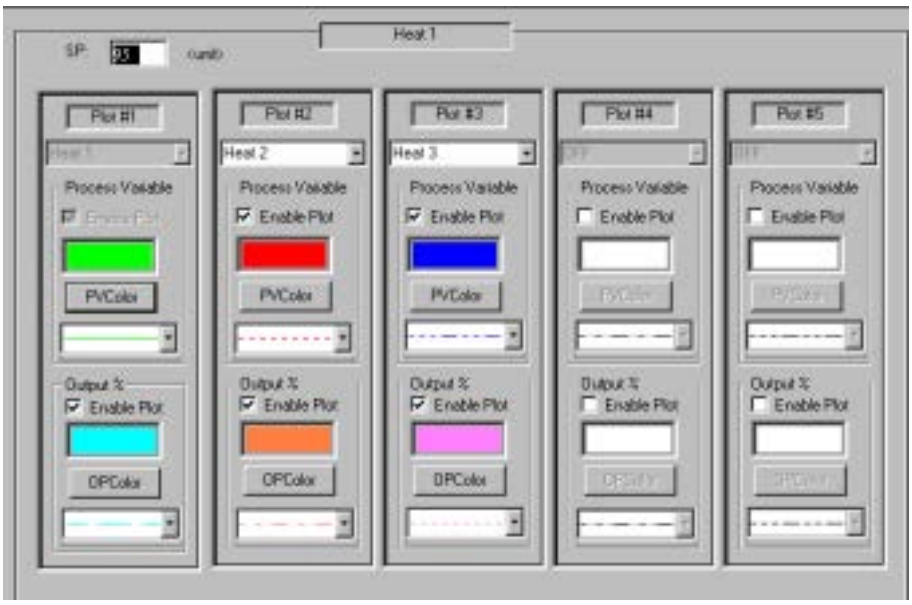



Figure 21

e. Log On displays the new user log on screen that allows a change to the user name and password for the current user. This user will gain access to the functions available to his/her assigned user level. **Note this screen is password protected**. Click the Log On icon on the main toolbar or from the menu bar click Utilities then Log On. **See Figure 22.**


Figure 22

f. Print recipe will print the existing recipe on the connected printer. From the menu bar click Utilities then Print recipe. Select the recipe file and click Open or depress the Enter key. Select the print icon from the menu toolbar. (Note: The user cannot print current open recipe in the Operate Mode.)

g. Print Journal will print all the events, which has been taken on the oven. From the menu bar click Utilities then Print Journal. Select the Journal file and click Open or depress the Enter key. Select the print icon from the main toolbar. (Note: The user cannot print current open journal.)

3. Window

a. Main Overview displays a graphical representation of the oven usually the screen that is left displayed and can be returned to from any other screen. Click the Main Overview icon on the main toolbar or from the menu bar click Window then Main Overview. **See Figure 23**.

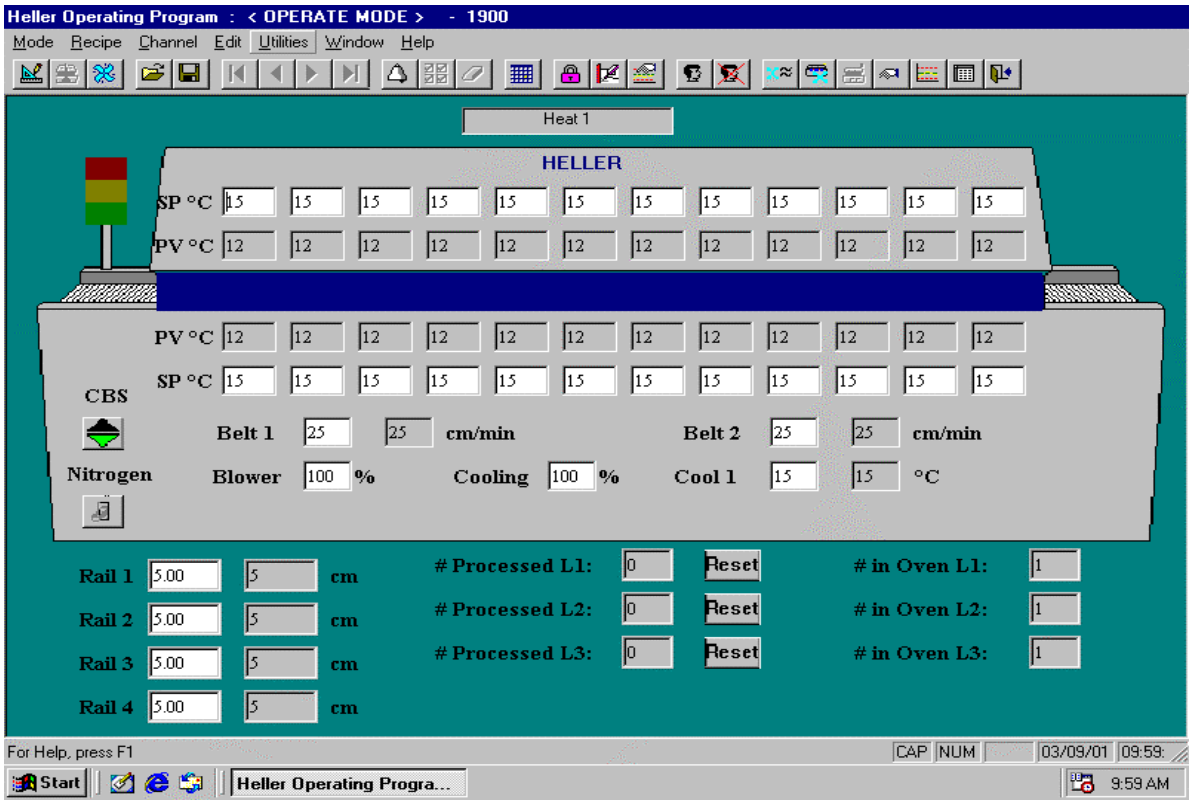



Figure 23

b. Channel Setup Screens display all the data for the individual channels. It also serves to allow the user to enter control and alarm setup information. Click the Channel Setup icon on the main toolbar or from the menu bar click Window then Channel Setup. **See Figure 24**.

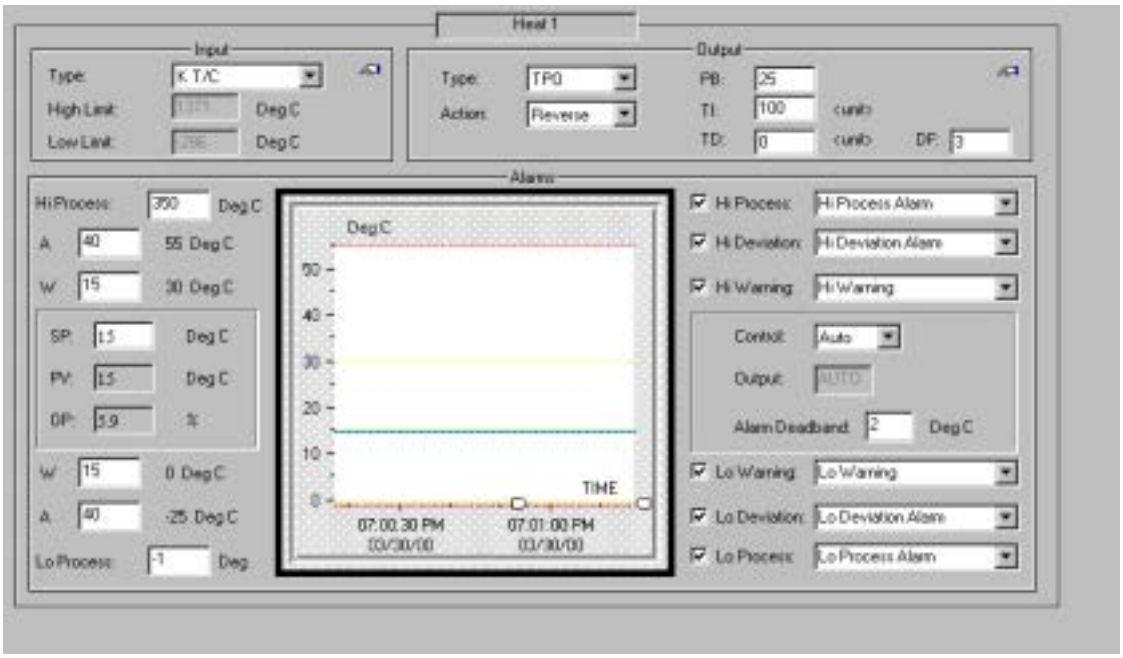



Figure 24

c. Channel Trend Plot displays the individually configurable graph plots for each channel. The history data in the graph is recoverable from the daily journal database file. Click the Channel Trend Plot icon on the main toolbar or from the menu bar click Window then Channel Trend Plot. **See Figure 25**.

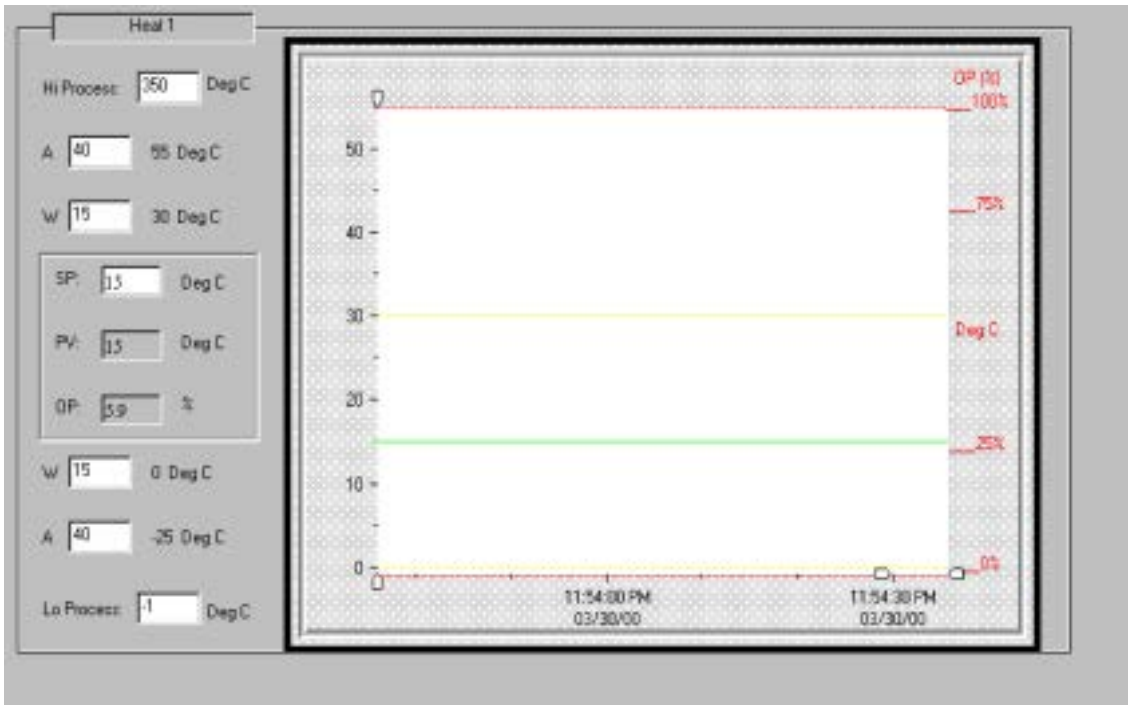
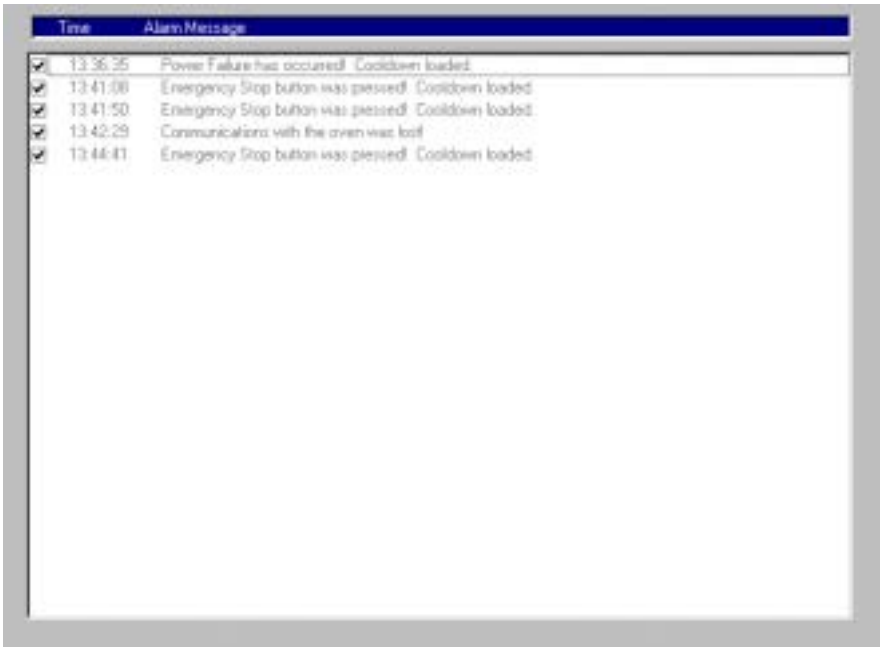



Figure 25

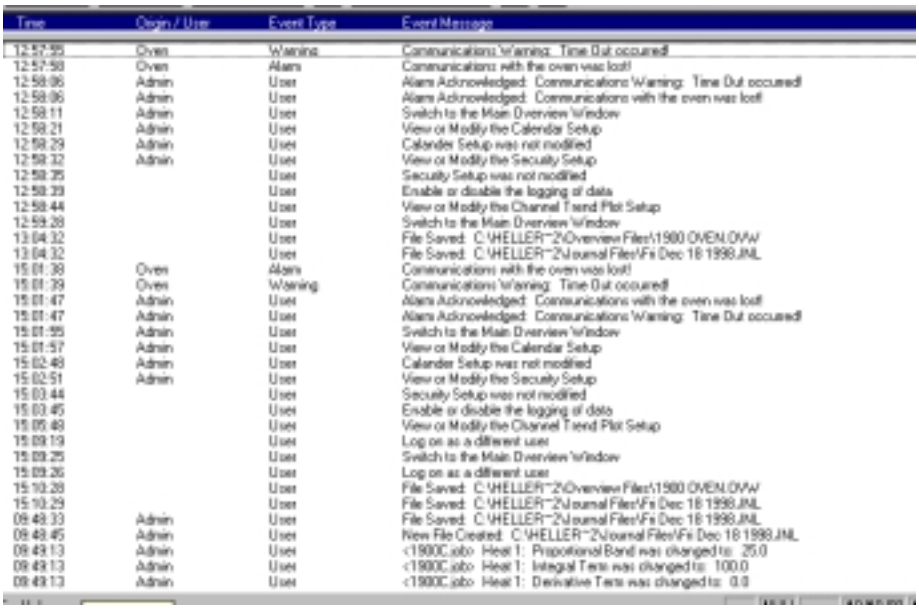
d. Alarm Screen displays a list of alarms and warnings that have occurred. Next to each alarm or warning there are check boxes for acknowledgement. Click the Alarm icon on the main toolbar or from the menu bar click Window then Alarm. **See Figure 26**.



| Time | Alarm Message |
|---|---|
| 13:36:35 | Power Failure has occurred! Cooldown loaded |
| 13:41:08 | Emergency Stop button was pressed! Cooldown loaded |
| 13:41:50 | Emergency Stop button was pressed! Cooldown loaded |
| 13:42:29 | Communications with the oven was lost! |
| 13:44:41 | Emergency Stop button was pressed! Cooldown loaded |

Figure 26

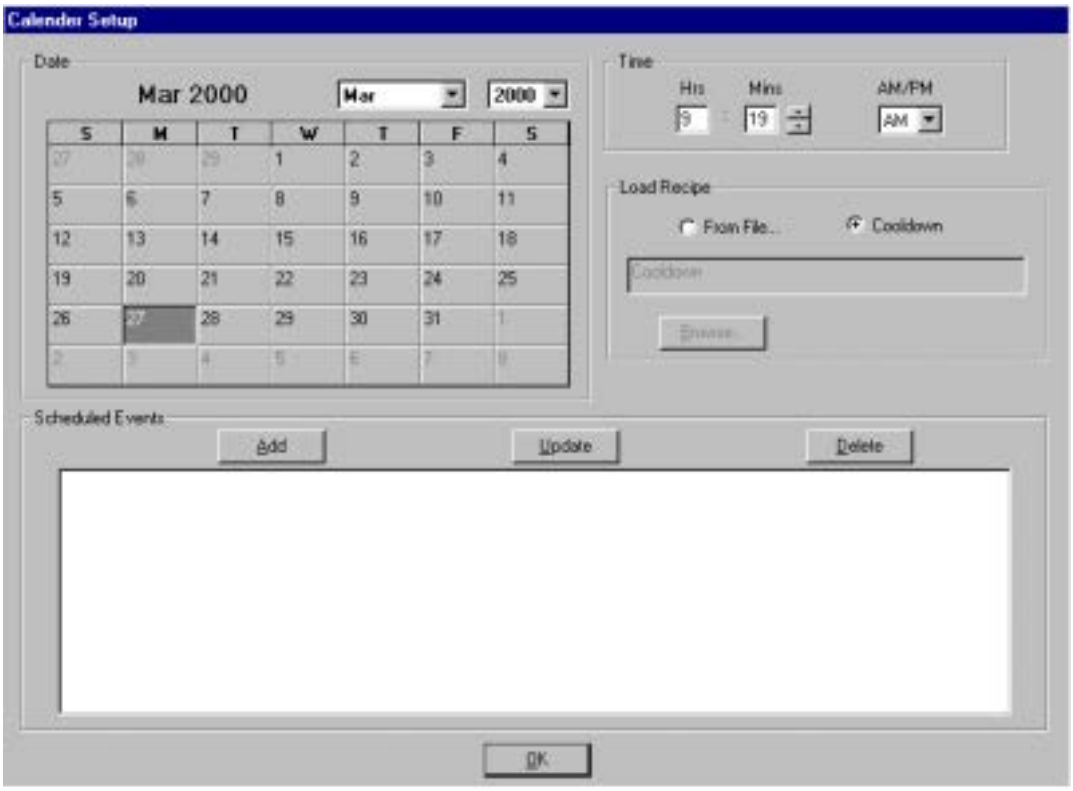
e. Events Screen displays the information stored in the daily journal file. Every keystroke, alarm, warning and user data manipulation will be stored in the daily journal database file. Click the Events icon on the main toolbar or from the menu bar click Window then Events. **See Figure 27.**



| Time | Origin / User | Event Type | Event Message |
|---|---|---|---|
| 12:57:55 | Oven | Warning | Communications Warning: Time Out occurred! |
| 12:57:58 | Oven | Alarm | Communications with the oven was lost! |
| 12:58:06 | Admin | User | Alarm Acknowledged: Communications Warning: Time Out occurred! |
| 12:58:06 | Admin | User | Alarm Acknowledged: Communications with the oven was lost! |
| 12:58:11 | Admin | User | Switch to the Main Overview Window |
| 12:58:21 | Admin | User | View or Modify the Calendar Setup |
| 12:58:29 | Admin | User | Calander Setup was not modified |
| 12:58:32 | Admin | User | View or Modify the Security Setup |
| 12:58:35 | | User | Security Setup was not modified |
| 12:58:39 | | User | Enable or disable the logging of data |
| 12:58:44 | | User | View or Modify the Channel Trend Plot Setup |
| 12:59:28 | | User | Switch to the Main Overview Window |
| 13:04:32 | | User | File Saved: C:\HELLER~2\Overview Files\1980 OVEN.OVW |
| 13:04:32 | | User | File Saved: C:\HELLER~2\Journal Files\Fri Dec 18 1998.JNL |
| 15:01:38 | Oven | Alarm | Communications with the oven was lost! |
| 15:01:39 | Oven | Warning | Communications Warning: Time Out occurred! |
| 15:01:47 | Admin | User | Alarm Acknowledged: Communications with the oven was lost! |
| 15:01:47 | Admin | User | Alarm Acknowledged: Communications Warning: Time Out occurred! |
| 15:01:55 | Admin | User | Switch to the Main Overview Window |
| 15:01:57 | Admin | User | View or Modify the Calendar Setup |
| 15:02:48 | Admin | User | Calander Setup was not modified |
| 15:02:51 | Admin | User | View or Modify the Security Setup |
| 15:03:44 | | User | Security Setup was not modified |
| 15:03:45 | | User | Enable or disable the logging of data |
| 15:05:48 | | User | View or Modify the Channel Trend Plot Setup |
| 15:09:19 | | User | Log on as a different user |
| 15:09:25 | | User | Switch to the Main Overview Window |
| 15:09:26 | | User | Log on as a different user |
| 15:10:28 | | User | File Saved: C:\HELLER~2\Overview Files\1980 OVEN.OVW |
| 15:10:29 | | User | File Saved: C:\HELLER~2\Journal Files\Fri Dec 18 1998.JNL |
| 09:48:33 | Admin | User | File Saved: C:\HELLER~2\Journal Files\Fri Dec 18 1998.JNL |
| 09:48:45 | Admin | User | New File Created: C:\HELLER~2\Journal Files\Fri Dec 18 1998.JNL |
| 09:49:13 | Admin | User | <1900C.job> Heat 1: Proportional Band was changed to: 25.0 |
| 09:49:13 | Admin | User | <1900C.job> Heat 1: Integral Term was changed to: 100.0 |
| 09:49:13 | Admin | User | <1900C.job> Heat 1: Derivative Term was changed to: 0.0 |

Figure 27

## D. Scheduling Calendar Events




When the user enters the Calendar screen the current year, month and date are displayed. The screen consists of five data areas that need to be setup.

1.Set the date the recipe is to run by clicking the down arrow for the month, then click on the desired month. Click the down arrow for the year, then click the desired year. Last click the desired day on the calendar. If only the day is to be changed it is not necessary to make any entries to the month and year.

2.Set the time you want the recipe to run. Click on the hours box and either enter the hours or click the up or down arrows to the desired hour. Then click the minutes box and either enter the minutes or click the up or down arrows to the desired minute. Last set AM or PM by clicking the down arrow at the AM/PM box.

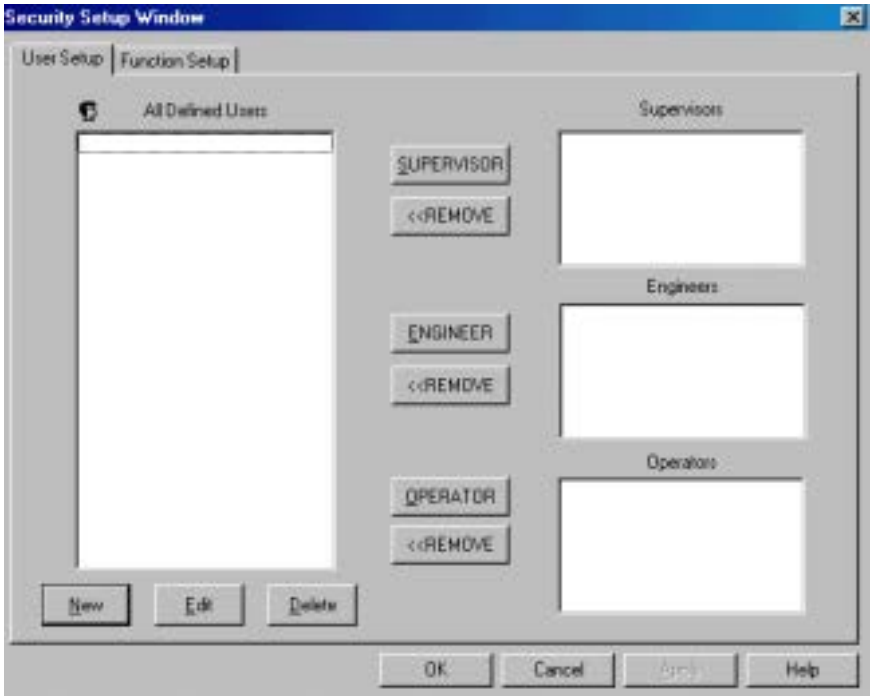
3.Select the desired Recipe by either clicking From File… or defaulting to Cooldown. If a recipe other than cooldown needs to be scheduled click on Browse for a listing of available recipes. Double-click on a Recipe name in the dialog box, click on a Recipe name then depress the Enter key or click on OK, or type the Recipe name in the File name: dialog box then depress the Enter key or click on OK.

4.Click on the Add button for Scheduled Events to display the recipe information selected. Repeat these steps for all the desired entries. An entry can be removed from the list by clicking on the selected recipe then click the Delete button. Entries can be modified by selecting new data then clicking on the entry to be changed and clicking the Update button.

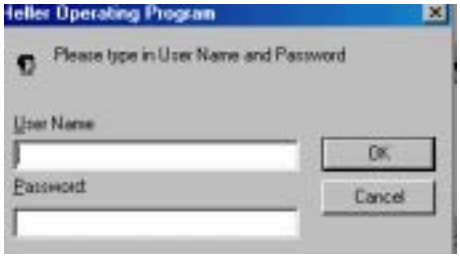
5.Click the OK button to approve all the present entries.

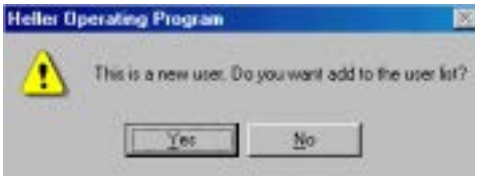
On line help is available by depressing the F1 function key while in the calendar setup screen or from the menu bar Help choose Calendar start screen.

## E. Setting Up User Security




To define users of the system, click on the New button and insert the User Name and Password in the box shown below then click OK or depress the Enter key. A prompt will appear to confirm the addition of this new user to the list. Click Yes or No.



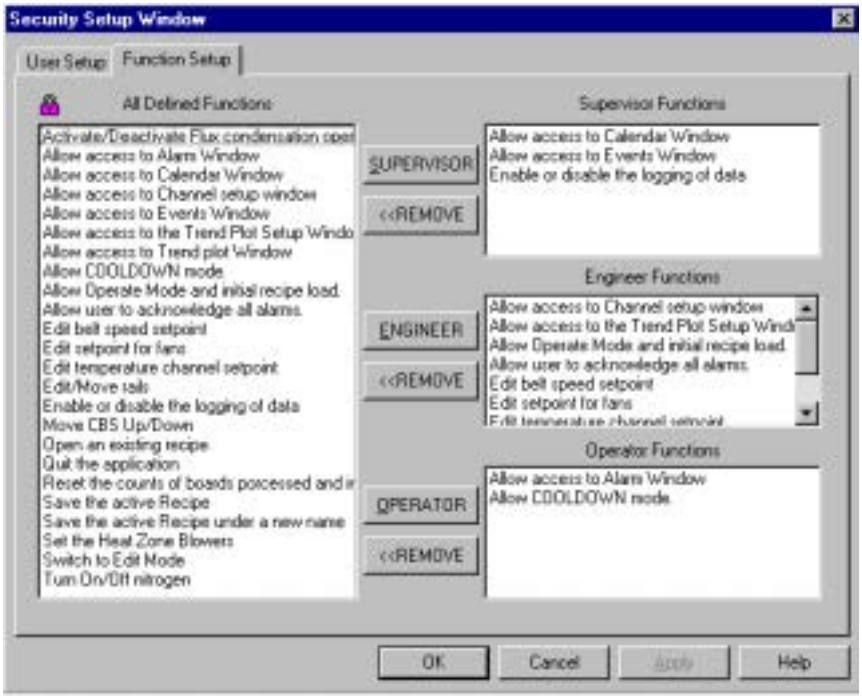




Finally you must re-enter the password to confirm the entry onto the user list.

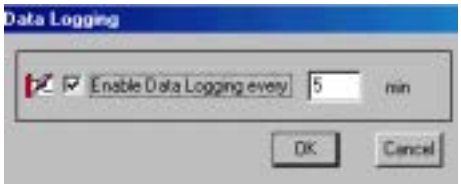

Repeat the above steps until all of the users of the oven are defined. Changes to a user password can be accomplished by clicking on the user name then click the Edit button and re-enter a new password. A user can be deleted from the list by clicking on the user name then click the Delete button. When all entries are made you can define the level of security for each user by clicking on the user name and click on the OPERATOR, ENGINEER, or the SUPERVISOR button. The user names will appear in the selected boxes. Users can be

added, edited or deleted from the security database list at any time. Click the OK button to save the information and return to the previous screen, click the Cancel button to negate any entries or click on the Function Setup tab to assign functions to the user groups.

To assign accessible software functions to the user status groups click on the defined function then click the OPERATOR, ENGINEER, or the SUPERVISOR button the function will appear in the status window. Functions can be removed from status groups by first clicking on the function in the status window then click the <<REMOVE button for the associated window. The function will be deleted. Now you can click the defined function then click a new status button and that function will appear. Click the OK button to save the information and return to the previous screen or click the Cancel button to negate any entries.

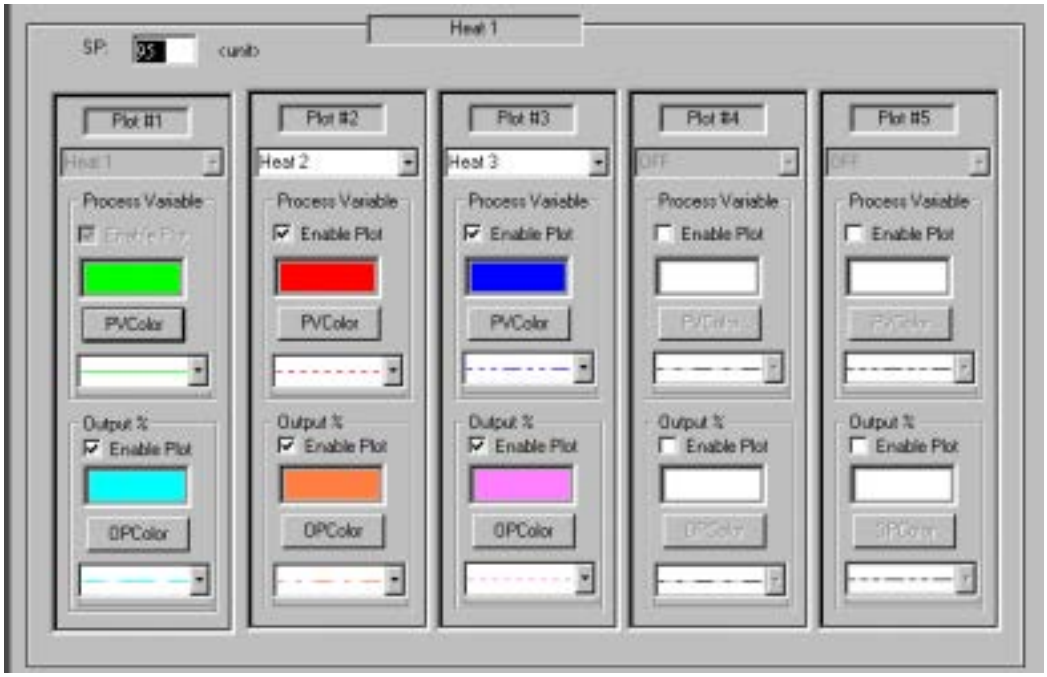



## F. Enable Data Logging and Interval Time




To enable data logging click the Enable check box then click the interval time box and enter a time. Click the OK button to save the present settings and return to the previous screen or Cancel to negate the settings entered. At the expiration of the interval time, oven data is logged to the current journal database file. This data is also used as history data for the graphs in the channel trend plot screen and the channel setup screen. Data logging is enabled and defaulted to 5-minute intervals. Data log files are stored in c:\Heller\Journal Files folder. File name includes day and date when file gets created.

## G. Channel Trend Plot Screen Setup



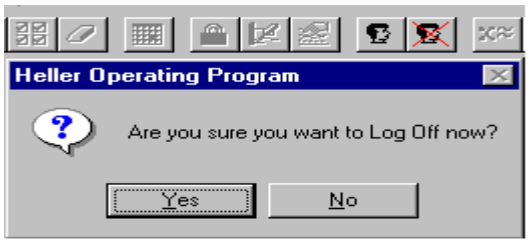

Each channels trend plot screen may contain a separate plot for up to five process variables and corresponding output percentages. One Process Variable is always enabled by default. To edit or add more plots click on the Enable Plot check box, then click on the PVColor or OPColor buttons. A screen with different color boxes will be displayed. Click on the desired color box then click the OK button. Next to insert a line style click on the down arrow button of the plot box, select a line style by clicking on the style desired. Repeat this process for the number of desired plots on a screen. The description box on top of the screen displays the current selected channel. Also shown is an edit box for the temperature setpoint of the selected channel and this setpoint is changeable by clicking the edit box and typing in a new setpoint. Clicking the down arrow on the plot variable combo box will allow the user to specify a variable name for a given channel plot view.

## H. New User Log-In


All system users have a User Name and Password: this must be entered when a new user is operating the oven. The user will then gain access to the software functions available to the assigned user level. Also this information will be stored in the daily event journal database file. Type the User Name then Password, click the OK button to accept the new user or click the Cancel button to negate the input.

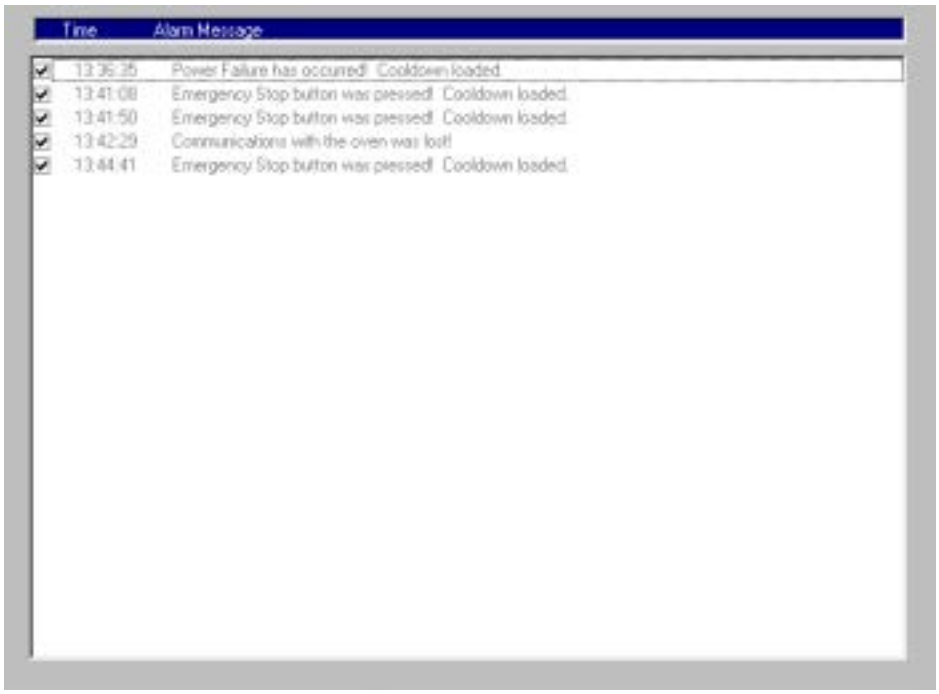
## I. User Log Off

To Log Off click the logoff icon and click “yes”. This will disable access to all ‘ Heller Operating Program ‘ operations. Only Log On icon is accessible.




## J. Acknowledge Alarms





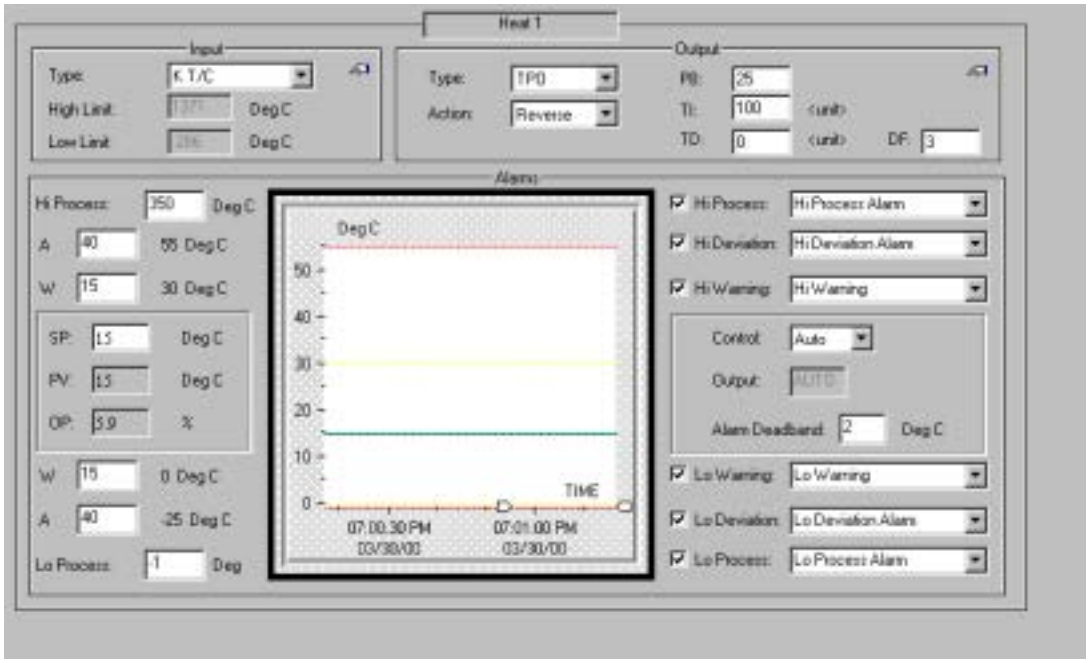

If an alarm should occur on the oven a box explaining the type of alarm will be displayed over the screen that is presently in use the user must acknowledge these messages. The oven will go into the cooldown mode before the Alarm Screen is displayed. The user must then click on the check boxes to acknowledge the alarm before returning the system to the operate mode and reloading a recipe. Alarms can also be acknowledged from the main tool bar by clicking the acknowledge all icon. Also the acknowledged alarms can be cleared from the main tool bar by clicking the clear all acknowledged alarms icon. These alarms are only cleared from the screen and not the daily event journal database, if the oven program is re-started all the alarm messages will re-appear, call for authorized service.

## K. Shutting Down the System

It is recommended that the oven be cool before turning off the system. From the main toolbar click the Cooldown icon or from the menu bar click Mode then click Cooldown. Also from the menu bar click Mode then click Shutdown+Exit or from the main toolbar click the Exit icon. If the system is shutdown without first running cooldown the user will be prompted that exiting requires cooldown be loaded first. After all the heat channels have cooled below a pre-determined temperature the digital outputs for the blowers and conveyor drive will turn off. The user must then repeat the shutdown process by either clicking the Exit icon on the main toolbar or from the menu bar click Mode then Shutdown+Exit to return to the desktop. From the desktop screen the user can shutdown the computer before removing power to the oven.

## L. Editing Parameters from the Channel Setup Screen

**It is not recommended that the channel parameters other than the Setpoint be changed without first consulting with the factory service department. Making changes may cause abnormal machine operation and may lead to a hazardous condition and void the warranty.**




There is a screen for every channel on the system, which contains 7 sections of information.

1. The Input section can be used to edit the thermocouple type being used on the oven along with displaying the high and low limits. Type K is the default thermocouple type and linear is the default input for the conveyor channel.
2. The Output section contains edit boxes that allow the user to edit control action, PID and filtering data. PB is the proportional band coefficient, TI is the integral constant, and TD is the derivative constant all for the PID equation. The DF is the number of PV readings that are averaged for display purposes.
3. The Alarm and Warning section contain edit boxes that allow the user to insert a deviation number around the setpoint and process values as redundant alarm setpoints.
4. The current channel data section displays the current actual measured variable in temperature, speed or position process variable (PV) and the percentage of full-scale output being applied output percentage (OP). There is an edit box for the channel setpoint (SP).

5. The graph section plots the actual readings of the current channel. The history data of the graph is recoverable from the daily journal database file.
6. The alarm and warning enable section contain check boxes to enable or disable deviation and process alarms and warnings. Also list boxes to display actual messages associated with the values.
7. The control section contains a list box for the type of control for the channel (Auto, Manual or Off), an edit box to enter a percentage of output for manual control, and an edit box to enter an alarm deadband.

   **Again it is not recommended that the channel parameters other than the Setpoint be changed without first consulting with the factory service department. Making these changes may cause abnormal machine operation and may lead to a hazardous condition.**

## M. Modifying a Recipe / Creating a new Recipe

Recipes can be modified in operate or edit mode. In the operate mode make the setpoint changes, the oven will respond to these changes and if the user is satisfied with the results click the Save icon on the main toolbar or from the menu bar click Recipe the Save.
New recipes can be created in operate or edit mode. Change the setpoints as required for the new recipe, click on Recipe -> Save As, type new name and save the recipe. In operate mode channels will respond to setpoint changes.

## N. Loading a Recipe

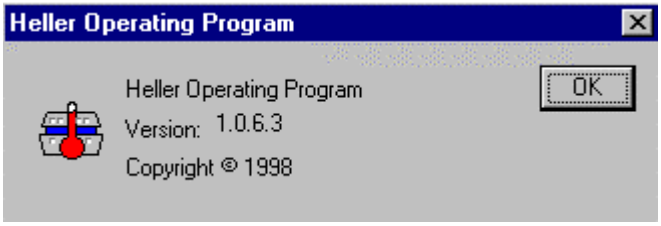
In the operate mode Recipe Open will allow the user to load a new recipe to the oven. The user will be prompted that you are in the operate mode are you sure you want to load a different recipe. Clicking yes will display the recipe listing for the user to load.

## O. Deleting a recipe

To delete a recipe, open Windows Explorer. Under the 'C:' drive, open the folder labeled 'Heller', and then open the folder labeled 'Recipe Files'. This folder contains the recipes for the machine (file names with extension 'job'). The system default recipe (1088.job, 1500.job, 1700.job, 1800.job, 1800z.job, 1900.job corresponding to the model number) should not be deleted. A recipe in operation cannot be deleted.

## P. Software Version

The version of software currently running the system can be found by clicking from the menu bar Help then About. This information may be necessary when calling the factory service department for assistance.



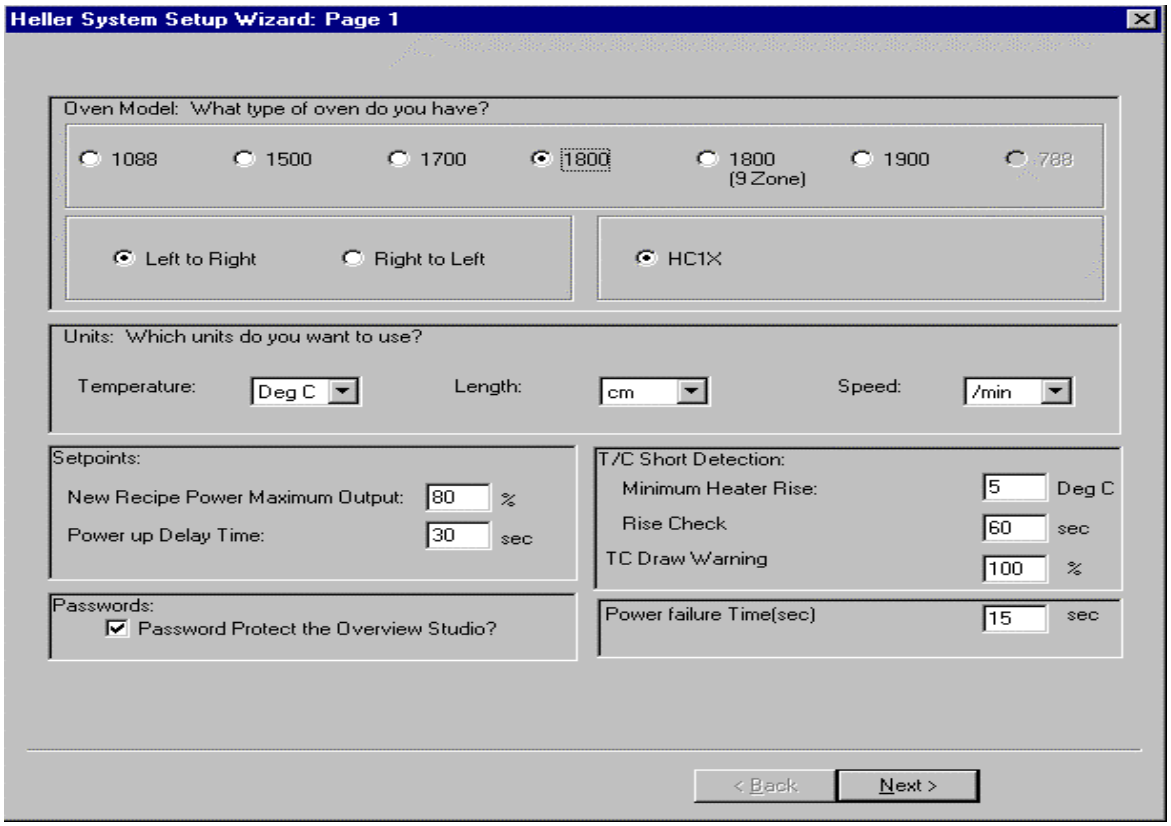
## Q. System Setup Wizard

This information is shown for reference only; all parameters are pre-set at the factory per the oven specifications.
**DO NOT ATTEMPT TO ALTER ANY PARAMETERS WITHOUT FIRST CONSULTING THE FACTORY SERVICE DEPARTMENT.**

The System Setup Wizard screen will prompt for a User Name and a Password: as shown in **Figure 3**. Type "heller" for the User Name, click on the Password: dialog box and type "heller", then depress the Enter key or click on OK.

**Page 1** defines the oven model, the direction of board feed, the type of temperature controller and units for temperature, length and speed. Also the parameters for limiting power consumption on sequential startup and thermocouple short detection.
**Page 2** defines the options of the oven and their associated parameters. Check boxes enable the options in software and edit boxes allow for the parameters to be set.
**Page 3** defines the rail configurations and their associated parameters.
**Page 4** defines the options for belt, channel grouping, alarms etc.
**Page 5** defines the type of belt speed control, board tracking, animation, drop alarm, system line component interface type and associated parameters.
**Page 6** defines channel parameters associated with the oven. The channel can either be enabled or disabled, define the description of the channel, set the high and low setpoint temperatures, define the limit units and define the startup sequence for the oven power consumption.

At the bottom of each page are buttons for moving through the screens. The <Back button returns to the previous page, the Next> button advances one page and the Finish button prompts one to exit the program.
It is recommended that one finish the setup wizard on last page.



**Heller System Setup Wizard: Page 2**

Options

- [ ] Center Board Support Up/Down
- [ ] CBS Up/Down Feedback
- [ ] Second Center Board Support Up/Down
- [ ] Second CBS Up/Down Feedback

- [x] Flux Condensation Service Option
  - ( ) Air [Timed] Interval 168 Hr
  - (•) Nitro [Recipe]
    - Cycle Duration 60 min
    - Cycle Start Check 90 min
    - Flux Heater Delay 40 min
  - [x] Second Flux Heater

- [x] Analog Fan Min % 65
- [x] Computer Control Global Blowers Min % 65
- [ ] Flux Filter Interval Time: Hr
- [x] Nitrogen Option
- [x] Auto Purge / Standby Purge Time: 20 min; Normal Time: 15 min

- [x] Auto Lube #1 [x] Auto Lube #2
  - Interval: 5 Hours 5
  - Duration: 0.5 Seconds 0.5

- [ ] Oxygen Monitoring
  - Low Range:
  - High Range:
  - Units

Heat Zone Blowers

| | Low | Medium | High |
|---|---|---|---|
| [x] Zone A enabled | 65 | 70 | 100 |
| [x] Zone B enabled | 65 | 70 | 100 |
| [x] Zone C enabled | 65 | 70 | 100 |

Misc. Options

- [ ] Redundant Overtemp
- [ ] LTO Green On
- [ ] LTO Green Off
- [ ] Heat Fan Fault
- [ ] Lane #3 Tracking
- [ ] Lane #4 Tracking
- [ ] High Water Temp Alarm

Low Exhaust (Sec)

- [x] Warning: 15
- [x] Alarm: 30

< Back | Next >

**Heller System Setup Wizard: Page 3**

Movable Rails and Rail Configuration:

[x] 1st Computer controlled Rail Width
- Coast Offset 0.05 cm [x] Home IN
- Backup Dist 2 cm [x] Hunt as Home In
- Home Distance: 5 cm
- Travel Distance: 5 Min 25 Max
- Pulse per cm 1576
- Tolerance + 0.1 - 0 cm
- Maximum Hunt Tries 5
- Control Type Automatic

[x] 2nd Computer controlled Rail Width
- Coast Offset 0.1 cm [ ] Home IN
- Backup Dist 2 cm [x] Hunt as HomeOut
- Home Distance: 40 cm
- Travel Distance: 7 Min 40 Max
- Pulse per cm 1576
- Tolerance + 0.1 - 0 cm
- Maximum Hunt Tries 5
- Control Type Automatic

[x] CBS Logic for 1st set of Rails

[ ] 3rd Computer controlled Rail Width
- Coast Offset 0 cm [ ] Home IN
- Backup Dist 2 cm [x] Hunt as Home In
- Home Distance: cm
- Travel Distance: 5 Min 75 Max
- Pulse per cm
- Tolerance + 0.1 - 0 cm
- Maximum Hunt Tries 5
- Control Type

[ ] 4th Computer controlled Rail Width
- Coast Offset 0 cm [ ] Home IN
- Backup Dist 2 cm [x] Hunt as Home In
- Home Distance: cm
- Travel Distance: 5 Min 75 Max
- Pulse per cm
- Tolerance + 0.1 - 0 cm
- Maximum Hunt Tries 5
- Control Type

[ ] CBS Logic for the 2nd set of Rails

Number of Fixed Rails

( ) 1 Fixed Rail ( ) 2 Fixed Rails ( ) 3 Fixed Rails ( ) 4 Fixed Rails [ ] Lanes Overlap

< Back | Next >

**Heller System Setup Wizard: Page 4**

Belt Options
- [ ] Wafer belt display & warning bands
- [ ] Show Actual Belt PV in Deadband
- [ ] Audible Alarm on Belt Deviation

Dansensor Configuration
- [ ] Dansensor Map Mon(3 Channel)
- [x] Dansensor Map Mon(single)
- [ ] Enable Secondary Dansensor Alarm

- [ ] Audible Alarm on Low Exhaust Warning
- [ ] Audible alarm on Dansensor Warning

Secondary Board Options
- [ ] Enable Secondary Control Board
- [x] Direct /Reverse control (board 2)

- [ ] Disable Heat Zone Alarms
- [ ] Disable Auto Acknowledge Alarms
- [x] Disable New Job Output

Create Channel Groupings

Channel 01: Heat 1
Channel 02: Heat 2
Channel 03: Heat 3
Channel 04: Heat 4
Channel 05: Heat 5
Channel 06: Heat 6
Channel 07: Heat 7
Channel 08: Heat 8
Channel 09: Heat 9
Channel 10: Heat 10
Channel 11: Heat 11
Channel 12: Heat 12
Channel 14: Belt 1 Speed
Channel 15: Heat 15
Channel 16: Heat 16
Channel 17: Heat 17
Channel 18: Heat 18
Channel 19: Heat 19
Channel 20: Heat 20

Add
Remove
Remove All

Group 1 | Group 2 | Group 3 | Group 4

< Back | Next >

**Heller System Setup Wizard: Page 5**

Belt Speed Control

NUMBER OF LANES 2

| BELT ONE | | BELT TWO | |
|---|---|---|---|
| Belt Speed Control: | Closed Loop | Belt Speed Control: | Closed Loop |
| Maximum Output: | % = cm/min | Maximum Output: | % = cm/min |
| Minimum Output: | % = cm/min | Minimum Output: | % = cm/min |
| Input Range High: | 188 cm/min | Input Range High: | 188 cm/min |
| Input Range Low: | 0 cm/min | Input Range Low: | 0 cm/min |
| Max Frequency: | 82 Hz | Max Frequency: | 82 Hz |

| | | | |
|---|---|---|---|
| [x] Boards Processed | [x] Animation | [x] Boards Processed | [x] Animation |
| [x] Board in Oven | [ ] Third lane Smema | [x] Board in Oven | [ ] Fourth lane Smema |
| [x] Board Drop Alarm | Timed | [x] Board Drop Alarm | Timed |
| Interface Type: | SMEMA II | Interface Type: | SMEMA II |
| Board Spacing: | 5.00 cm | Board Spacing | 5.00 cm |
| Sensor Distance: | 455 cm | Sensor Distance: | 455 cm |

< Back | Next >

# Heller System Setup Wizard for Analogic Controller

| MODEL: | CUSTOMER NAME: | | |
|---|---|---|---|
| CO# | S/N: | SOFTWARE VER: | DATE: |

***Page 1***

Oven Model:

❑ 1088 ❑ 1500 ❑ 1700 ❑ 1800 ❑ 1800 (9 Zone) ❑ 1900

Oven Direction:

❑ Left to Right ❑ Right to Left

Units:

Temperature: ❑ Deg C or ❑ Deg F Length: ❑ Cm or ❑ inch Speed: /min

Setpoints:
New Recipe Power Maximum Output: **80**%
Power up Delay Time: ____ sec.
Passwords:
☑ Password Protect the Overview Studio?

T/C Short Detection:
Minimum Heater Rise: **5** Deg C or **9** Deg F (**1** Deg C for IR-panels)
Rise Check: **60** sec
T/C Draw Warning: **100**%
Power Failure Time: **15** sec

***Page 2***

Options:

❑ Center Board Support Up/Down
❑ CBS Up/Down Feedback
❑ Second Center Board Support Up/Down
❑ Second CBS Up/Down Feedback

❑ Flux Condensation Service Option
- ❑ Timed (for Air) Interval: **168** Hrs.
- ❑ Recipe (for Nitro)
  - Cycle Duration: **60** Min.
  - Cycle Start Check: **90** Min.
  - Flux Heater Delay: **40** Min.

❑ Second Flux Heater
- Analog TC Input: _____
- TPO Output: _____

❑ Analog Fan (for cooling) Min%____
❑ Computer Control Global Blowers Min%____
❑ Flux Filter (with service indicator option) Interval Time:____Hr.
❑ Nitrogen Option Purge Time:____min
❑ Auto Purge / Standby Normal Time:____min
❑ Auto Lube # 1
Interval: _____Hrs.
Duration:____ sec

❑ Auto Lube # 2
Interval: _____Hrs.
Duration:____ sec

| Heat Zone Blowers | Low | Medium | High |
|---|---|---|---|
| ❑ Zone A Enabled | _____ | _____ | _____ |
| ❑ Zone B Enabled | _____ | _____ | _____ |
| ❑ Zone C Enabled | _____ | _____ | _____ |

Misc. Option
- ❑ Redundant Overtemp
- ❑ LTO Green On
- ❑ LTO Green Off
- ❑ Heat Fan Fault
- ❑ Lane #3 Tracking
- ❑ Lane #4 Tracking
- ❑ High Water Temp Alarm

Low Exhaust (sec)
- ❑ Warning: **15**
- ❑ Alarm: **30**

***Page 3***

Movable Rails and Rail Configuration: (Computer controlled rails)

- ❑ 1st Computer controlled Rail Width
  Coast Offset:____cm Home IN
  Backup Dist:____cm Hunt as Home _____
  Home Dist:_____cm
  Travel Dist:_____Min _____Max
  Pulse per cm: 1576
  Tolerance +_____ -_____ cm
  Maximum Hunt Tries: ___
  Control Type: Automatic
- ❑ 2nd Computer controlled Rail Width
  Coast Offset:____cm Home IN
  Backup Dist:____cm Hunt as Home _____
  Home Dist:_____cm
  Travel Dist:_____Min _____Max
  Pulse per cm: 1576
  Tolerance +_____ -_____ cm
  Maximum Hunt Tries: ___
  Control Type: Automatic
- ❑ CBS Logic for 1st set of Rails
- ❑ 3rd Computer controlled Rail Width
  Coast Offset:____cm Home IN
  Backup Dist:____cm Hunt as Home _____
  Home Dist:_____cm
  Travel Dist:_____Min _____Max
  Pulse per cm: 1576
  Tolerance +_____ -_____ cm
  Maximum Hunt Tries: ___
  Control Type: Automatic
- ❑ 4th Computer controlled Rail Width
  Coast Offset:____cm Home IN
  Backup Dist:____cm Hunt as Home _____
  Home Dist:_____cm
  Travel Dist:_____Min _____Max
  Pulse per cm: 1576
  Tolerance +_____ -_____ cm
  Maximum Hunt Tries: ___
  Control Type: Automatic
- ❑ CBS Logic for 2nd set of Rails

(Set rail drive motor voltage for EXL Model between 48V to 53V, for SX Model set between 28V to 33V)
(For single edge hold select 1st Computer Controlled Rail Width,
For dual edge hold select 1st and 2nd Computer Controlled Rail Width,
For single edge hold w/ CBS select 1st, 2nd Computer Controlled Rail Width and CBS Logic for 1st set of Rails.)

Number of Fixed Rails:

- ❑ 1 Fixed Rail
- ❑ 2 Fixed Rail

***Page 4***

Belt Options

- ❑ Wafer belt display & warning bands
- ❑ Show actual Belt PV in Deadbad
- ❑ Audible Alarm on Belt Deviation
- ❑ Audible Alarm on Low Exhaust Warning
- ❑ Audible Alarm on Dansensor Warning
- ❑ Disable Heat Zone Alarms
- ❑ Disable Auto Acknowledge Alarms

Dansensor Configuration

- ❑ Dansensor Map Mon(3 Channel)
- ❑ Dansensor Map Mon(single)
- ❑ Enable Secondary Dansensor Alarm

Secondary Board Options

- ❑ Enable Secondary Control Board
- ❑ Direct / Reverse control (board 2)
- ❑ Disable New Job Output

Channel Groupings:

| Group1 | Group2 | Group3 | Group4 |
|---|---|---|---|
| | | | |

***Page 5***

Belt Speed Control

NUMBER OF LANES: _____

BELT ONE

❑ Closed Loop

Input range high: _____ /min

Input range low: **0** cm/min or in/min

Max Frequency: _____ Hz

BELT TWO

❑ Closed Loop

Input range high: _____ /min

Input range low: **0** cm/min or in/min

Max Frequency: _____ Hz

(For 'Bridge for Heller' program in config → clicks per CM= _____ to read belt speed in KIC software)

❑ Open Loop (for 1088)

Maximum output: 100% = **100** cm/min

Minimum output: 0% = **0** cm/min

(For 'Bridge for Heller' program in config → clicks per CM= _____ to read belt speed in KIC software)

Board Tracking option

❑ Board processed ❑ Animation

❑ Board in Oven ❑ Third lane Smema

❑ Board drop alarm – **Timed**

Interface type: _____

Board spacing: **5.00** cm

Sensor distance: _____ cm or _____ inch

❑ Board processed ❑ Animation

❑ Board in Oven ❑ Fourth lane Smema

❑ Board drop alarm – **Timed**

Interface type: _____

Board spacing: **5.00** cm

Sensor distance: _____ cm or _____ inch

(Measure distance between sensors on oven and enter value.

**Must enter a sensor distance value for all ovens with board count or board drop option.)**

***Page 6***

On this page heat channel will be enable as per oven model selected on page 1.

(In heat channel setup Hi process: 50 + High Limit)

| Cha. # | Enabled State | Channel Name | High Limit | Startup Group # |
|---|---|---|---|---|
| 1 | ON/OFF | Heat 1 | | |
| 2 | ON/OFF | Heat 2 | | |
| 3 | ON/OFF | Heat 3 | | |
| 4 | ON/OFF | Heat 4 | | |
| 5 | ON/OFF | Heat 5 | | |
| 6 | ON/OFF | Heat 6 | | |
| 7 | ON/OFF | Heat 7 | | |
| 8 | ON/OFF | Heat 8 | | |
| 9 | ON/OFF | Heat 9 | | |
| 10 | ON/OFF | Heat 10 | | |
| 11 | ON/OFF | Heat 11 | | |
| 12 | ON/OFF | Heat 12 | | |
| 13 | ON/OFF | Cool 1 Flux Heater | | |
| 14 | ON/OFF | Belt 1 Speed | | |
| 15 | ON/OFF | Heat 15 | | |
| 16 | ON/OFF | Heat 16 | | |
| | | | | |

| Cha. # | Enabled State | Channel Name | High Limit | Startup Group # |
|---|---|---|---|---|
| 17 | ON/OFF | Heat 17 | | |
| 18 | ON/OFF | Heat 18 | | |
| 19 | ON/OFF | Heat 19 | | |
| 20 | ON/OFF | Heat 20 | | |
| 21 | ON/OFF | Heat 21 | | |
| 22 | ON/OFF | Heat 22 | | |
| 23 | ON/OFF | Heat 23 | | |
| 24 | ON/OFF | Heat 24 | | |
| 25 | ON/OFF | Heat 25 | | |
| 26 | ON/OFF | Heat 26 | | |
| 27 | ON/OFF | Profile 1 | | |
| 28 | ON/OFF | Profile 2 | | |
| 29 | ON/OFF | Profile 3 | | |
| 30 | ON/OFF | Profile 4 | | |
| 31 | ON/OFF | Profile 5 | | |
| 32 | ON/OFF | Belt 2 Speed | | |
| 56 | ON/OFF | Cool 2 Flux Heater | | |

# Standard and Optional Equipment Operating Guide

## INTRODUCTION

1. To check if the machine is equipped with an analogic controller, locate the serial tag located at the rear of the top shell. “Serial no.” on the serial tag indicates the oven is analogic if serial no. has “A” as the 7th character. **See Figure 1.**

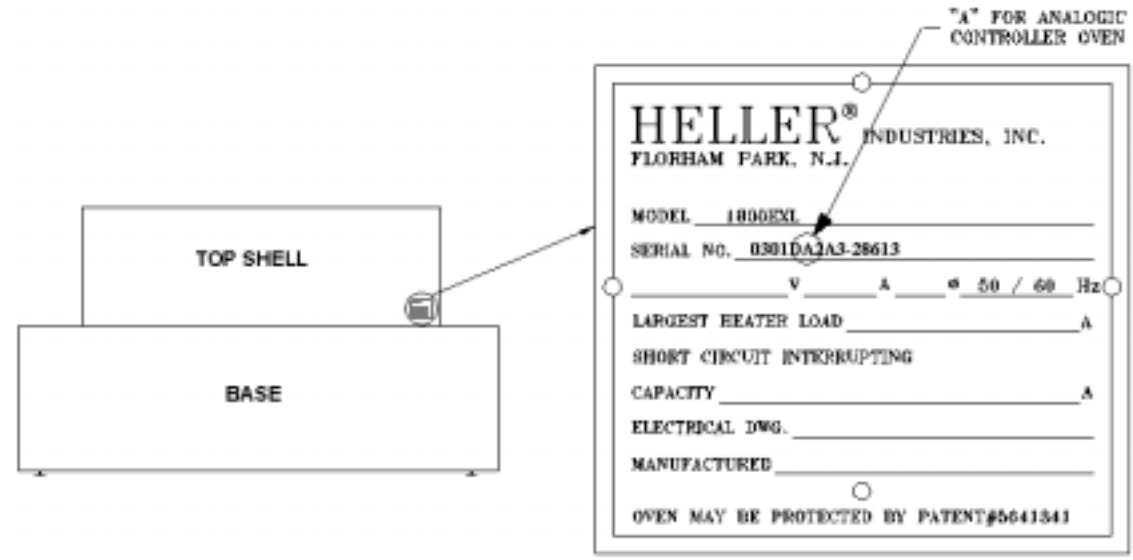



Figure 1

## I. Inert Atmosphere System and Options

### A. Features and Controls

If the oven is equipped for a nitrogen inert atmosphere, a nitrogen supply line with a capacity of 100 PSI (6.8 atmospheres) and 2000 SCFH (56 m³/hr) should be connected to the nitrogen input. This line should be 3/4” copper with a 1/2” NPT fitting or equivalent. The nitrogen should be supplied in the gaseous state from a cryogenic source with a minimum purity of at 5 - 10 PPM of oxygen.
The Heller reflow systems uses a single 1800 SCFH (51 m³/hr) flowmeter for controlling the rate that nitrogen is supplied to the oven. (**See Figure 2**.)

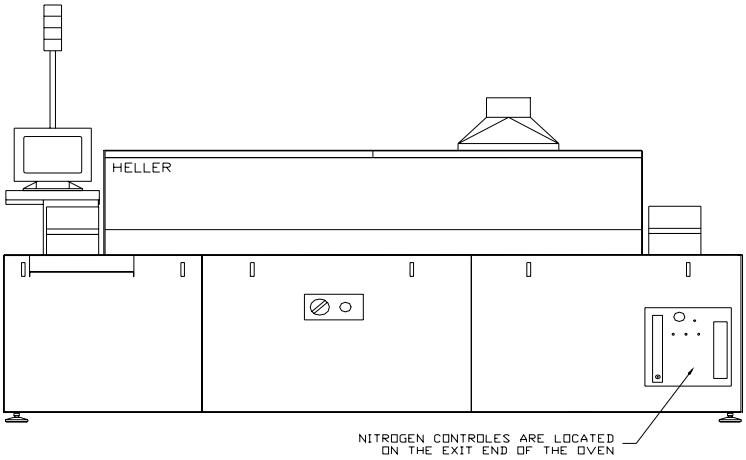



Figure 2

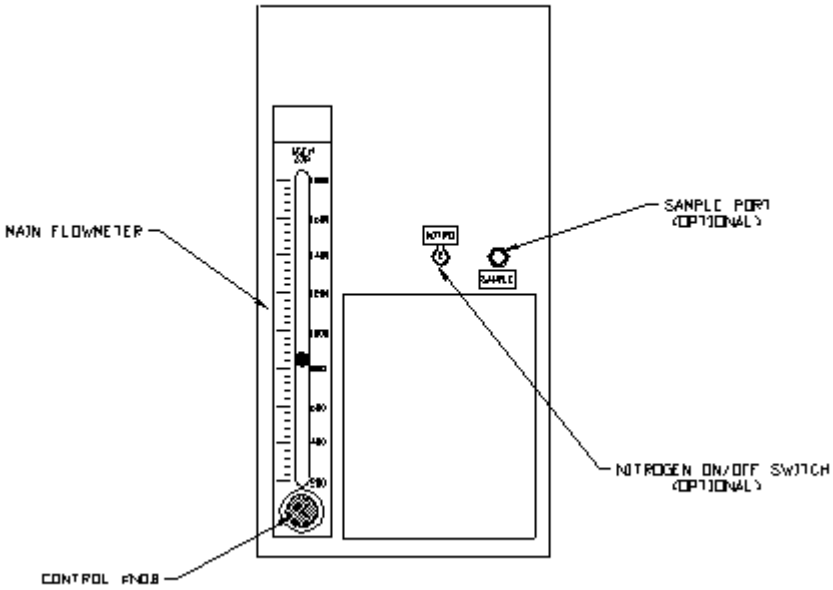



Figure 3

Brushes and flexible atmosphere barriers are used to minimize openings in the tunnels. The level of the upper barriers should be adjusted so they are as low as possible without touching the PCB's at the entrance end of the machine. At the exit of the machine they may be adjusted so that they touch the board, but they should not impede the board's travel. Tunnel opening has a significant effect on nitrogen consumption. Smaller openings yield lower consumption rates. PCB width also effects the consumption of nitrogen. Narrower PCB's will require less nitrogen to maintain the desired oxygen PPM level.

The PPM level of oxygen at which the oven should be operated is typically dependent on the type of flux used in the solder paste. The paste manufacturer's guidelines should be followed closely with regard to temperature profile and nitrogen level. For most applications 100-200 PPM are acceptable. Others can operate at PPM levels as high as 1000 PPM.

As an example, the next section will describe flow rates and oxygen PPM levels obtained with the oven set to process PCB's 6" (15cm) wide. Larger PCB's will require somewhat higher flow rates.

## B. Operation

Adjust the main flowmeter to full flow rate [approximately 1800 SCFH (51 $m^3$/hr)]. The black knob at bottom of the meter (See Figure 3 above) controls flow. Flow rates are measured by the position of the center of the ball in the chamber of the meter.

Allow the oven to purge at this flow rate for 10-20 minutes during warm up. The oven atmosphere will now be at an oxygen concentration level of < 50 PPM. Reduce the flow rate to about 1000 SCFH (28 $m^3$/hr). This flow rate will typically maintain oxygen PPM levels of 25 to 100.

A sampling tube is installed in the reflow zone to enable the monitoring of the oxygen PPM level. Using an oxygen analyzer can monitor the actual level. The connection to this sampling tube is at the port labeled "SAMPLE" (Note: The analyzer connected to this port must be equipped with a pump for drawing the sample from the oven.)

## C. Oxygen Analyzer Option

As an option, the atmosphere sampling probe mentioned above may be plumbed into an oxygen monitoring system built into the base of the oven to enable the user to continuously monitor the Oxygen PPM level inside the oven. This meter to call attention to an out-of-specification situation may activate an optional alarm, either audible or visual.

The manual for this optional analyzer has been included with the Heller oven manuals. Follow the instructions for proper use, calibration and maintenance for the meter and to comply with the warranty program.

## D. AutoPurge/standby Option

This option allows the oven to automatically purge itself at 2000 SCFH (56 $m^3$/hr) for 10 - 20 minutes during warm up. After this time period, the flow rate is automatically turned down to a normal operating level.

For ovens equipped with an analogic controller, time interval for oven purging is pre-set at the factory. To adjust the purge time interval, see the “system setup” section in the “operating system software guide” section.

For ovens equipped with anafaze controller, time interval for purging is pre-set at the factory. The purge time can be adjusted by changing a “POT” settings on the AUTOPURGE / STANDBY – PLC. For instruction see the “AUTO PURGE / STANDBY – PLC“ drawing.

The oven is also equipped with sensors that will allow it to run a "nitrogen standby mode" when no product is in the oven. In this mode, the nitrogen flow rate is reduced and the oven oxygen PPM level is allowed to increase. When a board enters the oven, the sensors activate circuitry, which brings the oven back to the purge nitrogen flow rate and oxygen PPM level.

For ovens equipped with an anafaze controller: To adjust the length of time that oven will remain at the normal operating flow, follow the instructions on the “AUTO PURGE / STANDBY – PLC“ drawing.

For ovens equipped with an analogic controller: The time interval for oven standby is pre-set at the factory. See the “system setup” section in the “operating system software guide” section.

## E. Nitrogen On/Off Options

As an option, go to main over view screen, select the “NITROGEN” switch with your mouse pointer to nitrogen turn on/off. This “NITROGEN” switch is controlled the flow of the nitrogen depending upon the current recipe. (Note: the oven will automatically turn off the flow of nitrogen after the Cool Down mode has ended with or without these options.)

As an option, some ovens are equipped with manually control nitrogen on/off switch. This switch is mounted on the flowmeter panel (**See Figure 4**).

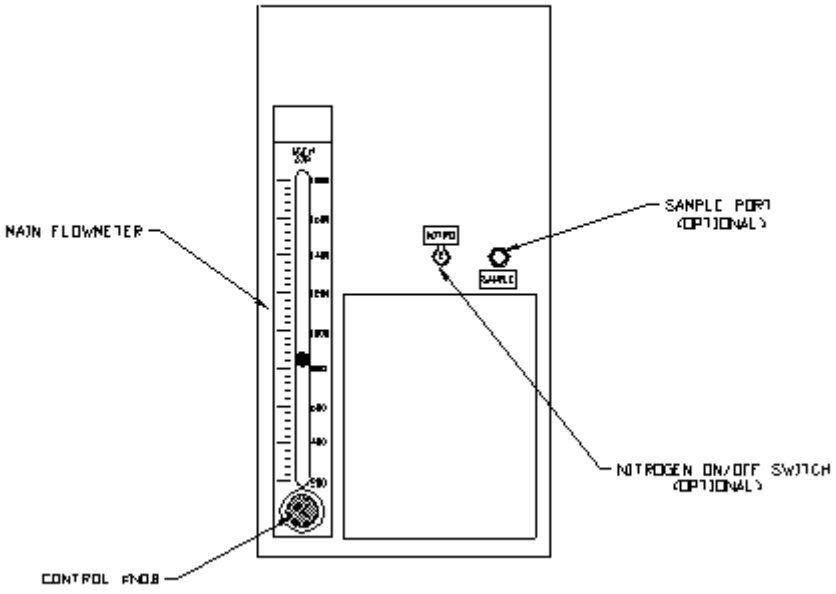



Figure 4

## F. Cooling Module Blower Speed Control Option

The blowers in the cooling module have enough cooling power for heavy PC boards. The cooling rate may be adjusted for lighter boards by means of the software. As an option cooling rate may also be adjusted manually using knobs (located under the keyboard). If optional topside or bottom side external cooling units are installed, their speed is also controllable (if equipped).

For adjusting the computer control cooling rate, select the “Heat Zone Blowers” from Edit menu. Choose Low, Medium or High cooling rate as require.

For manually adjusting the cooling rate (optional), use the knobs located under the keyboard. Since the dials provided on the knobs are not calibrated to actual blower output, the proper settings must be determined experimentally.

## G. Nitrogen Safety

Even though nitrogen is a completely inert substance, a few simple precautions should be followed. Proper ventilation in the area where the system is being used must be maintained to keep the oxygen level in the air at safe levels. Otherwise, the continuous flow of nitrogen can displace the air and deplete the normal oxygen level. Create sufficient ventilation in the area of the reflow oven to exhaust the excessive nitrogen laden air and replace it with normal atmosphere. Installation of a room oxygen monitoring system is recommended especially if the oven is located in a small enclosed area. These systems are available from Beckman Instruments, Delta F, Illinois Instrument and Teledyne.

## H. Nitrogen Flux Filtration Option:

THEORY OF OPERATION
As an option, your oven may be equipped with a flux filtration system. This system filters out flux particles from within the oven, preventing them from accumulating inside the cooling modules in the cool zone. This allows for a simple filter change to service the system, and lowers the frequency at which the cooling module must be removed from the cooling zone for cleaning. The system functions by drawing the flux gases through an exhaust mounted between reflow and cooling module in the oven. A two-stage filter system, consisting of a cyclonic separator as well as fiberglass filter which removes most of the flux particles from the atmosphere before returning it to the oven.

SYSTEM COMPONENTS (**See Figure 5 & 6**)

(A) EXHAUST STACK between REFLOW and FIRST COOL ZONE.

(B) BLOWER EXHAUST BOX above EXHAUST STACK.

(C) A three-inch diameter (3") [7.62-cm] INSULATED EXHAUST TUBE.

(D) TWO two-inch diameter (2") [5.08-cm] RETURN TUBES.

(E) CYCLONIC SEPARATOR - located inside flux filtration unit.

(F) FIBERGLASS FILTER - located inside flux filtration unit.

(G) ROTRON COOLING FAN – located on base of the oven.

(H) FLUX COLLECTION TRAY – located below cyclonic separator compartment.

FUNCTION OF COMPONENTS:

- Flux laden gas from oven is exhausted through exhaust stack (A) via flux box blower above exhaust stack (B).
- The flux box transfers the flux-laden gas via 3-inch diameter insulated tubing (C) to cyclonic separator (E).
- Some flux-laden gas will accumulate in a collection tray at the bottom of the cyclonic separator blower housing (H).
- Gas then passes through the filter (F), which is located on the inside of the sealed flux filter unit. The unit is then cooled by the two external rotron fans (G).
- Clean cooled gas returns to the first cool zone via the two 2-inch diameter tubes (D).

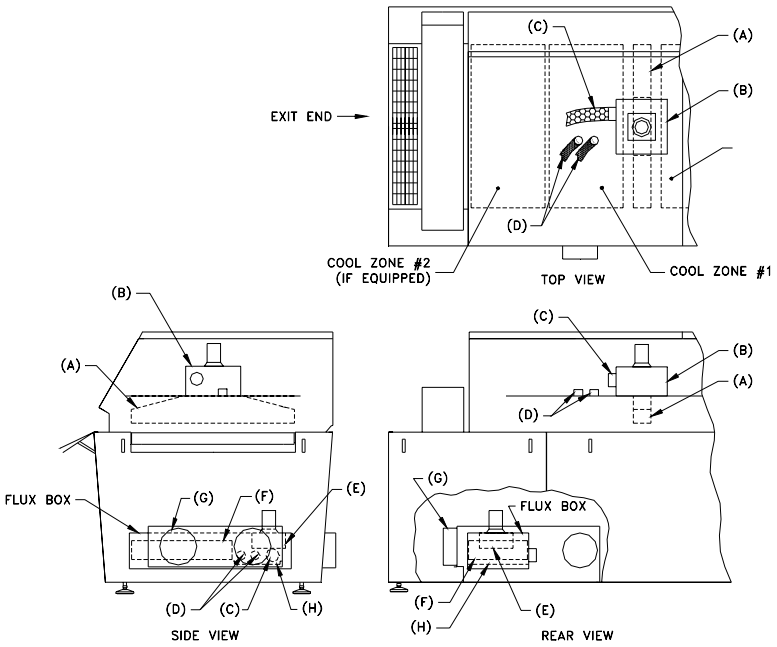



Figure 5

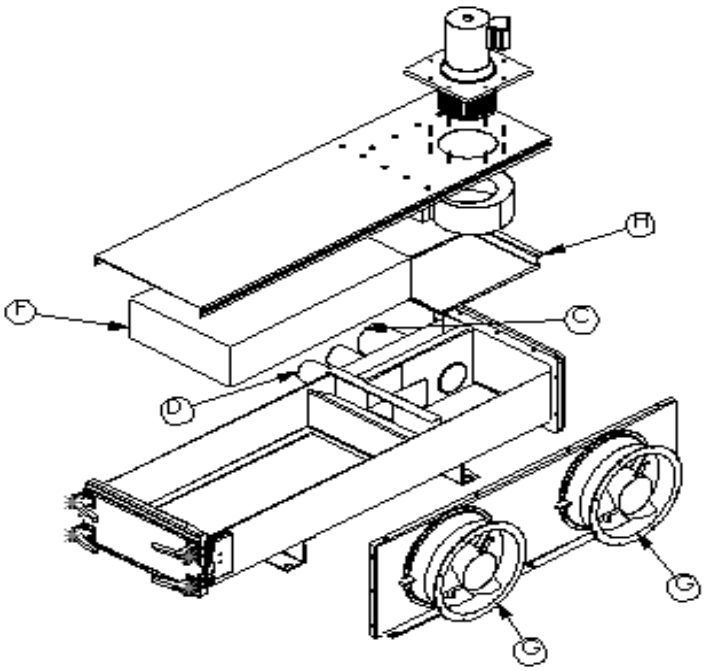



Figure 6

## II. Cooling Operation

The blowers in the cooling module have enough cooling power for heavy PC boards. The cooling rate may be adjusted for lighter boards by means of the software. As an option cooling rate may also be adjusted manually using knobs (located under the keyboard). If optional topside or bottom side external cooling units are installed, their speed is also controllable (if equipped).

For adjusting the computer control cooling rate, select the “Heat Zone Blowers” from Edit menu. Choose Low, Medium or High cooling rate as require.

For manually adjusting the cooling rate (optional), use the knobs located under the keyboard. Since the dials provided on the knobs are not calibrated to actual blower output, the proper settings must be determined experimentally.

## III. Alarm and Warning Options and Operation

### A. Light Tower Output

The process status box on the overview screen will display the status of the system. The possible status messages and associated light tower outputs for a standard Light Tower are shown in **Figure 7**. An optional Light tower configuration is shown in **Figure 8**.

The light tower gives a visual indication of the machines status. This following table lists the conditions and related tower color on a standard Light Tower Configuration.

| STATUS | COLOR | Reasons |
|---|---|---|
| Alarm | Flashing Red | Alarm conditions |
| Warning | Flashing Yellow | Warnings, Board Drop, Board Backup |
| OK | Green | Ready |
| New Job | Flashing Yellow | Job startup |

Figure 7

This following table lists the conditions and related tower color on an optional Light Tower Configuration(LTO). This is enabled via the Heller System Setup wizard under miscellaneous options.

| STATUS | COLOR | Reasons |
|---|---|---|
| OK | No Light or Green Light | Ready |
| New Job | Flashing Green | Job Startup |
| Alarm | Flashing Red | Alarm, Board Drop, Board Backup |
| Warning | Flashing Yellow | Warning |

Figure 8

Only one light tower output will be set at any time. When the Heller operating program is terminated, all light tower outputs will be turned off. For special ovens as per customer requirement Figure 7 and Figure 8 may not apply.

### B. Audible Alarm Option

This option consists of an audible signal that sounds when the system goes into an alarm mode or board drop occurs. The signal is activated whenever the red light on the light tower is illuminated. In the event of an alarm, the light tower turns red, the audible alarm sounds and the machine load the Cooldown job.

The operator can silence the audible alarm by acknowledging it. See the “Operating System Software Guide” section.

### C. Redundant Alarm Scanner Option (RAS) (Anafaze controller only)

This option acts as a redundant monitor of each heating module. It will remove power to the heaters in the rare case where a fault occurs in the machine controller or computer that results in a temperature runaway.

Each heating module has two independent thermocouples. One is wired to the oven controller and the second is wired to an alarm scanner located in the base of the oven. There is no interconnection or interaction between the main controller and the alarm scanner except to the main contactor that will remove power to the heaters if there is a machine over temperature condition. Please refer to the OEM instruction manual for further operating instructions.

### D. Independent Alarm Sensor Option (IAS)

This option adds several bi-metallic thermostats in the oven tunnel that will remove power from the heaters should an over temperature condition exist. For anafaze controller oven, a light on the entrance of the oven will illuminate. Once the over temperature condition has been corrected, the “Thermal Reset” light will turn off. For analogic controller oven, a message window comes up on the computer screen and the oven loads the cooldown job.

### E. Power Hood Lifts

To gain access to the tunnel of the oven, use the key switch mounted on the entrance end of the oven near by the computer keyboard.

## IV. Battery Backup Option

The optional battery back up unit is located in the base of the oven. The unit is charged whenever the oven is connected to power and turned on. The unit will be activated in cases of total power failure, low input voltage, or failure of the transformer or associated circuit breaker. The purpose of this system is to maintain the programs in the computer and controller until they can be backed up as well as to provide power to the conveyor system to enable clearing out any product in the oven. A larger capacity battery backup unit (optional) will allow the top shell of the oven to be opened by the use of the power lifts. The battery backup system provides temporary power to the above mentioned circuits only. No power is provided to the heaters and the blowers.

The OEM instruction manual for the backup unit should be consulted for more information about the theory of operation of the device.

## V. Edge Hold Conveyor System and Options

### A. Description and Standard Operation

Each Heller oven model can be equipped with either a single conveyor or a dual conveyor system. Each conveyor system has one fixed position rail and one adjustable rail. The adjustable rail can be moved to position by means of its power drive or optional computer control. The control for the power width adjusting drive is at the entrance end of the oven above the computer keyboard. A key switch controls the direction of adjustment. The speed control mounted near the switch will vary the speed of rail travel. High speed can be used to bring the rail to position when a long distance needs to be traveled. Slow the speed to make final position adjustment. Switches are provided to prevent over travel at the limits of the adjustment of the conveyor rails. The edge hold conveyor system should be adjusted so the chain pins support as much of the PCB as possible to reduce the possibility of board dropping, but not so tight against the board as to cause a jam. The board should slide freely on the chains when they are properly adjusted.

In a dual conveyor system, the edge hold conveyors may transport boards at the same speed, or optionally at different speeds.

If necessary, pressing an emergency stop button will stop all movement of the conveyor system. It may be restarted, by pulled the stop button back up and pressing the reset button.

### B. Computer Controlled Edge Hold Positioning Option

This option enables the conveyor width to be adjusted automatically when a recipe is loaded.

When any new recipe is entered, the conveyor will first travel to the home position and then move to the desired location.

Should it be desirable to adjust the position of the conveyor due to manufacturing variations in the width of the PCB's, it may be accomplished through the software. To adjust the position of the conveyor width, go to the main overview screen select the “RAIL 1” and enter new width value and then hit enter key on your key board or press the left mouse button. And rail will be adjusted at the new width value.

To adjust the position of the conveyor for computer controlled dual edge hold through software, select the desired window “RAIL 1” or “RAIL 2” from the main overview screen for width adjustment and follow the same procedure as described above.

## C. Center Board Support Option

This option will prevent drooping/sag at the center of the wide or thin PCB's being processed through the reflow oven on the edge hold rails. Excessive drooping can cause the PCB to fall off the pins on the edge hold rail chain or cause undue strain on the PCB solder connections when an attempt is made to straighten the plane of the board after soldering.

The location of the center board support between the edge hold rails is adjusted to the desired position by means of a lead screw. This lead screw is powered by its own motor and is separate from the motor/lead screw that adjusts the position of the edge hold rail. The controls for adjusting the center board support are located next to the controls for the edge hold rails.

To adjust the location of computer controlled center board support, go to main overview screen. The window “RAIL 1” is for center board support location adjustment and “RAIL 2” is for edge hold location adjustment. Select “RAIL 1” window and enter the desire value and hit enter key on your keyboard or press the left mouse button. The center board support will move on that location.

For manually adjusting the vertical alignment of the center board support, turn the shoulder screw (located on the entrance center board support plate) to move center board rail up or down.

For vertical alignment of the computer controlled center board support, go to main over view screen and select the CBS tab with your mouse to move the center board up or down.

For align the center board support rail, loosen the two screws located on the roller brackets mounted on both side of the center board support rail and adjust the rail up or down and tighten the screws. Make sure that center board support chain is +0 to –0.08” (+0 to -0.20 cm) in height to the edge hold chain so that it will be able to hold or support sagging PCB’s but not allow the board to drop or push PCB’s above edge hold chain pins.

For install the center board support chain, make sure that finger of this chain must locate as shown in **Figure 9**.

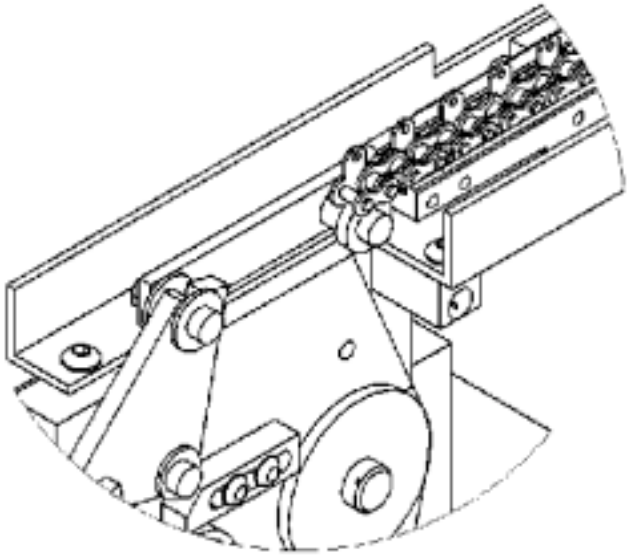


Figure 9

### D. Board Counter/Board Drop Option

**Board Drop:** This option will allow the detection of a board falling off the edge hold conveyor during the reflow process and to establish a warning signal so that the operator can take corrective action.

**Board Count:** This option allows the computer to display a count of the number of boards processed by the oven since a particular recipe has been loaded. As a board enters the oven, it activates a sensor at the entrance, counting a board “in." As the board leaves the oven it activates a sensor at the exit of the oven, counting a board “processed". This feature may be used to count the number of boards processed. Board drop option gives warning when board does not hit exit sensor within certain period of time.

### E. Upstream and Downstream Machine Interfaces (SMEMA)

Options are available to allow communication between devices that are upstream of and downstream of the Heller reflow oven. The communication is in the form of contact closures. Several standard types of interfaces are available including SMEMA standard interfaces. The interface connectors are found at both the entrance and exit ends of the oven at the rear.

## VI. EHC / Mesh Belt Motor Controller Adjustments

This section specifies the procedure for the calibration of the oven EHC/mesh belt transport system motor controller located on the electrical panel. (CP # 4491)

The calibration procedure should be performed after the oven has been powered and computer control of the EHC/mesh belt transport system has been established.

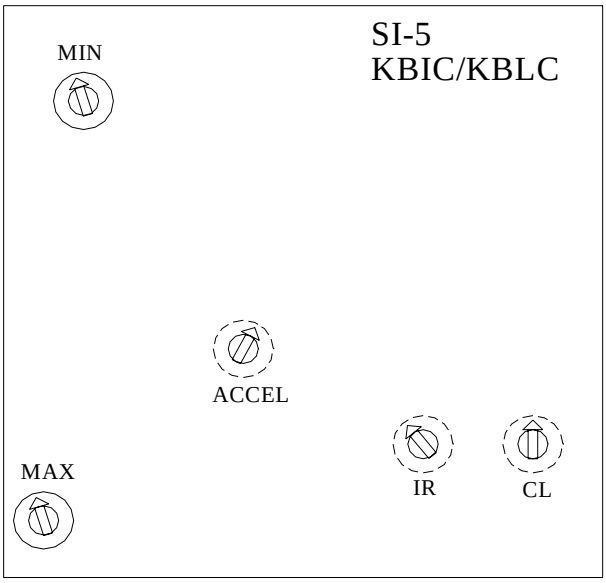
The calibration should be performed in the following order:

1. MIN speed trimpot adjustments.

2. MAX speed trimpot adjustments.

3. Current Limit adjustment.

Before start any adjustment, check that “ACCEL” trimpot on controller is set at 9 o’clock position and “IR” trimpot is set at 11 o’clock position (**See Figure 10**).




MOTOR SPEED CONTROLLER

Figure 10

I. MIN Speed Adjustment.

A. Adjust both the MAX and MIN trimpot to the max. Setting (Full CW) and adjust the current limit trimpot (CL) to the middle of its adjustment range (12 o’clock position).
B. Set the Edge Hold Width to a sample board width. (Profile board, Edge Width board, etc…)
C. Make sure the Motor Controller is powered on.
D. In the software application program, set the computer control speed setting to 0 cm/min. (0% power).
E. Observe the transport system and note any movement of the system.
F. If the transport system is moving, slowly adjust the MIN trimpot CCW until the transport system stops.
G. In the software application program, set the computer control speed setting to 19 cm/min. (~10% power).
H. Observe the transport system and check for movement of the system.
I. If the transport system is not moving, slowly adjust the MIN trimpot CW until the transport system starts moving.
J. Repeat the above steps as necessary.

II. MAX Speed Adjustment.
This calibration should be done ONLY AFTER the MIN speed adjustment has been completed.

A. In the software application program, set the belt speed setpoint to 188 cm/min. Adjust MAX trimpot for PV = 188 and OP = 100% slowly. Adjust MAX trimpot CW (to increase speed or decrease OP %) or CCW (to decrease speed or increase OP %) accordingly.
B. Place the sample board on the EHC/Mesh Belt and using any reference mark, time the board speed. Compare the calculated speed (distance/time) in cm/min. to the computer setting. (± 1.2 sec tolerance)
C. If calculated speed is not 188 cm/min (equal to PV), check belt speed control parameter in Heller system setup wizard page 4.
D. If calculated belt speed is less than 188 cm/min and MAX trimpot is on maximum setting then change the motor speed controller.

After setting MIN and MAX trimpot set the belt speed setpoint = 90 cm/min and observe OP %. It should be around 48 %. If it is not then adjust the MIN and MAX setting again.

After completing the speed adjustments, test the transport system at different speeds and compare the calculated value to the computer setting.

III. Current Limit Adjustment. (Applies **only** for **clutchless** operation system)

This calibration should be done ONLY AFTER the MAX and MIN speed adjustments have been completed. The desired threshold for the transport is 25 to 50 in-lbs. of force. This is the force required to cause the transport motor controller to stop (current limit) the mesh belt.

A. In the software application program, set the computer control speed setting to 90 cm/min. (50% power).
B. For mesh belt transport systems, place the “fish scale” hook on the mesh belt and hold the handle end of the scale in a stationary position. (For non-mesh belt transport systems, consult the oven Supervisor.)
C. Note the reading on the scale when the mesh belt transports system stalls/stops. (Caution: Release the scale if the reading exceeds the range of the scale.)
D. If the transport system stops with a scale reading more than 50 in-lbs., reduce the current limit threshold by turning the trimpot CCW.
E. If the scale reading is less than 25 in-lbs., increase the threshold by turning the trimpot CW.
F. Repeat steps B through E until the scale reading is between 35 and 40 in-lbs. for the 90-cm/min-belt speed setting.

After completing the current limit adjustment, test the transport system at different speeds and check to see if the scale reading falls within the 25 to 50 in-lbs. range.

## VII. Air Flux Collection Option:

### THEORY OF OPERATION

As an option, your oven may be equipped with an air flux collection system. This system collects condensed flux particles from within the oven, minimizing the accumulation of flux particles in your external air exhaust ventilation piping. This system allows for simple service of flux collection trays, and lowers the frequency at which the collection modules must be removed from

the system for flux removal. The system functions by drawing the flux gases through a primary exhaust mounted next to reflow. Center draw air ovens may be equipped one or two additional exhausts located before reflow.

The system utilizes a series of condensing cooling tubes, which removes most of the flux particles from the atmosphere before sending it into your external exhaust ventilation piping. As flux particles collect on the inner walls of the collection system, crystals will form after approximately two to three weeks. At this time, a condensation system "refresh cycle" can be initiated either automatically or manually. This will heat the flux crystals to melting temperature so as to liquefy the crystals and have them drain into removable collection trays. This refresh cycle can be performed without any interruption to product flow. During this refresh cycle, the temperature of the heated cool zone must be set above 140C. If this will affect product profile then refresh cycle should occur during schedule shutdown when NO product is in oven**.**

The capacity of the collection trays can hold three to six months worth of flux, depending on actual flux production consumption. Refresh cycle frequency (interval) and duration time can be set in the Heller System Setup Wizard. Refresh duration will be from 50 minutes to 80 minutes depending on the temperature of the flux laden air being removed from the oven.

## FLUX CONDENSATION SERVICE OPTION:

This option is of two types –Timed and Recipe.
With the Timed option the interval between the refresh cycle and duration time of refresh cycle needs to be selected in the setup wizard. (see page 116 for setup)

With the Recipe option, an 'autoclean' recipe needs to be created. When this recipe is loaded, the refresh cycle will start and continue until the autoclean recipe is operating. (see page 117 for setup)

There is a ' Flux Condensation Manual Override ' icon on the overview screen **(See Figure 11).** Using the icon, the refresh cycle can be started or stopped manually. In the auto cycle, the manual override is not active. Refresh cycle will start only in the operate mode and when the oven is in green light condition and run for the preset duration of time. (see page 118)

Figure 11

During the Manual refresh cycle, the following message " Flux Condensor Manual Cycle in Progress "**(See Figure 12A)** will appear in the upper right hand corner of Overview Screen. In auto refresh cycle it will be " Flux Condensor Auto Cycle in Progress "**(See Figure 12B).**

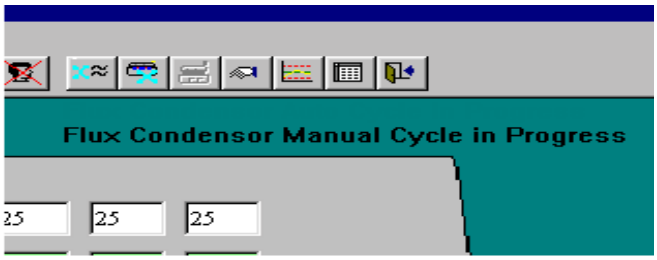



Figure 12A


Figure 12B

The capacity of the collection trays can hold three to six months worth of flux, depending on actual flux production consumption. Permitting the refresh cycle to be performed every two to three weeks without the need to open the system and remove the trays each time. The trays can either be cleaned with solvents and reused, or simply disposed of along with the collected flux; and replaced by a new set of trays.

SYSTEM COMPONENTS (**See Figure 13 & 14**)

(A) EXHAUST STACK - at reflow, with optional exhaust stacks in pre-heat.

(B) BLOWER EXHAUST BOX - above exhaust stack.

(C) INSULATED EXHAUST SUPPLY TUBE - a three-inch diameter (3") [7.62-cm] tube.

(D) EXHAUST WASTE TUBE – a three-inch diameter (3") [7.62-cm] tube.

(E) FLUX CONDENSATION COOLING ASSEMBLY - located at rear inside the top shell.

(F) CONDENSATION COLLECTION BASIN – series of collection chambers to hold the removable flux collection trays.

(G) CONDENSATION COOLING TUBES – a series of cooling tubes positioned vertically for efficient drainage during the refresh cycle.

(H) FLUX COLLECTION TRAYS – located inside the base of the Condensation Cooling Assembly.

(J) CONDENSATION COOLING BLOWERS, UPPER - supplying cooling air to the condensation cooling assembly.

(K) CONDENSATION COOLING BLOWERS, LOWER - supplying cooling air to the condensation cooling assembly.

(L) REMOVABLE CONDENSATION COOLING MODULES - supplying cooling air to the condensation cooling assembly.

FUNCTION OF COMPONENTS:

- Flux laden gas from the oven is exhausted through the exhaust stack (A) via the flux box blower above the exhaust stack (B).
- The flux box transfers the flux-laden gas via the 3-inch diameter insulated tubing (C) to the entrance of the flux condensation cooling assembly (E).
- As the flux laden gas passes through a series of collection basins (F) and cooling tubes (G), flux will accumulate on the inner walls of the cooling tubes and the inner walls of the collection trays (H).
- Cooling air is supplied to the outside of the cooling tubes by two external blowers (J) mounted inside the rear of the top shell. A third blower (K) mounted in the oven's base supplies cooling air to the condensation basin.
- Clean cooled gas is then exhaust to the oven's external exhaust port via a 3-inch diameter tube (D).

- The condensation cooling modules (L) are easily removable for flux accumulation inspection or exchanging of the flux collection trays.

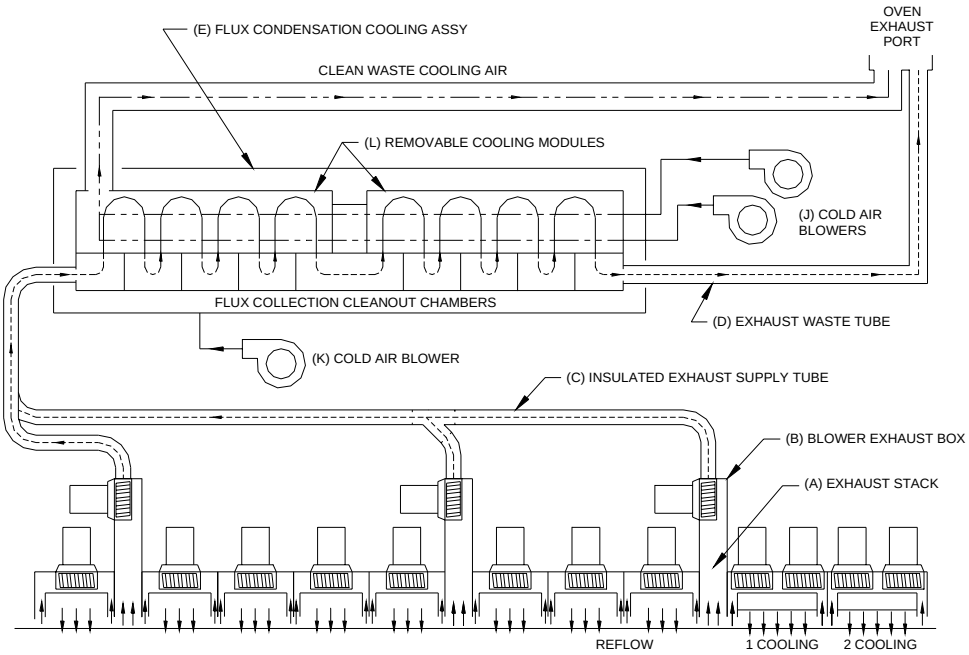



Figure 13

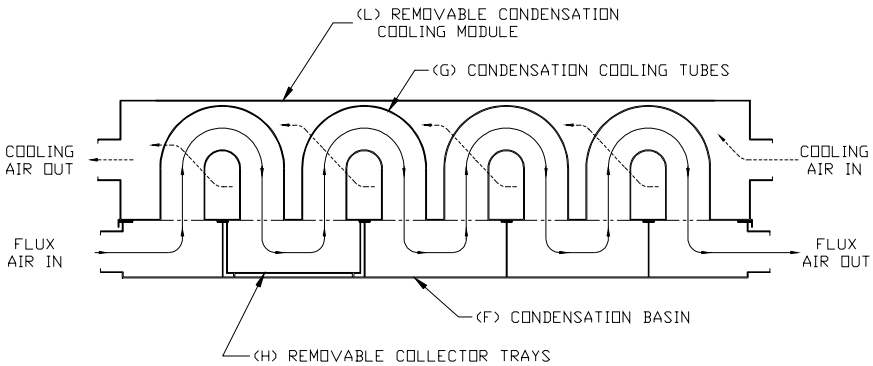



Figure 14

# Troubleshooting Guide
# (Analogic version)

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# *INTRODUCTION*

Important steps before using this section.

1. This section applies to ovens with Analogic controllers only.
2. To check if the machine is equipped with an Analogic controller, locate the serial tag located at the rear of the top shell. “Serial no.” on the serial tag indicates the oven is analogic if serial no. has “A” as the ‘7’ character. (**See Figure 1**)

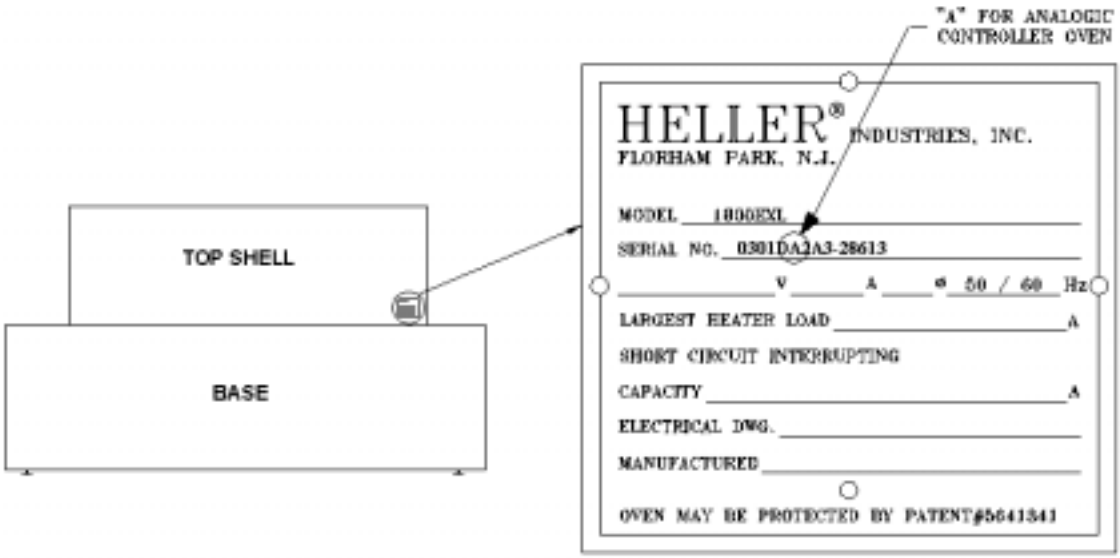


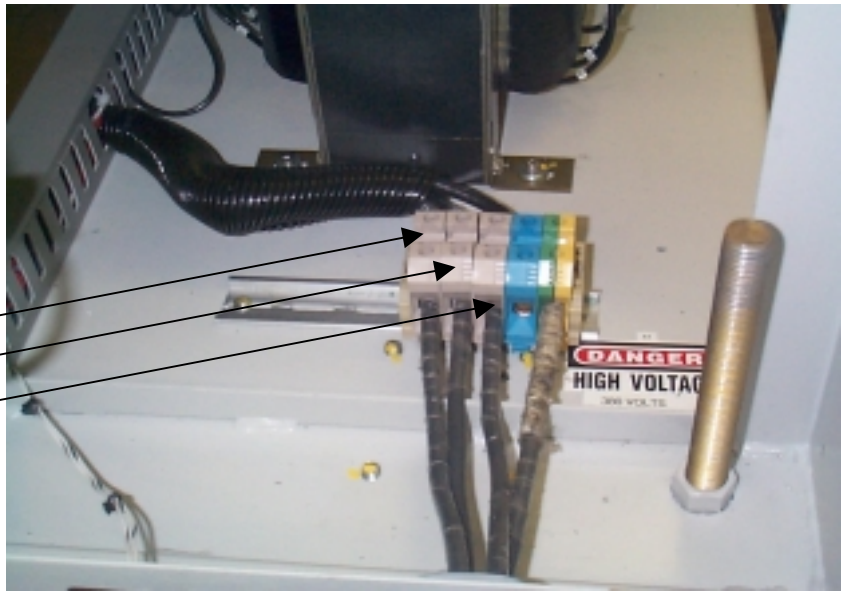

Figure 1

3. If any further assistance should be required, contact

   24 Hr Technical support: 1-800-759-8888 and enter pin 2022063

   Factory: 1-973-377-6800 Monday – Friday, 8:30AM – 5:00PM EST

   E-mail**:** **service_dept@hellerindustries.com**

| **I. It appears there is no power to the machine.** | Check For: |
|---|---|
| A. Main Power | Verify that the main switch located at the front of the oven is in the "ON" ( Θ ) position.<br>  |
| | 1. Check the incoming supply lines to the oven and verify they are supplying the required voltage as marked on the serial tag. Using a multimeter set to measure AC volts, probe the main switch terminals L1, L2 and L3. Each combination (L1-L2, L2-L3 and L1-L3) should be verified. If the correct voltage is not found on one or more phases, there is a problem with the power supply in the facility.<br>  <br> |

| | |
|---|---|
| B. Secondary Power | 1. Verify voltage on the primary side of the main transformer (High Voltage Machine Only) located at entrance base of the oven. This voltage should be equal to the machine incoming voltage. (**See Figure 2**.).<br><br>2. Verify 240 volts on the RED # 53 and RED # 54 wires on the transformer secondary. (See figure 2.) A lack of voltage could indicate a faulty transformer that should be replaced. (For low voltage machines, verify power between circuit breakers Q27 and Q28. It should be 208-240V) Note: If machine is 208-240V, no transformer is required.<br><br>  <br><br>3. Check for tripped circuit breakers Q27 and Q28 located on the upper row of circuit breaker's on the left side of the electrical panel. |

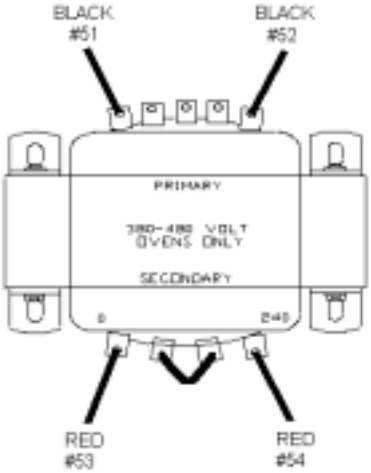
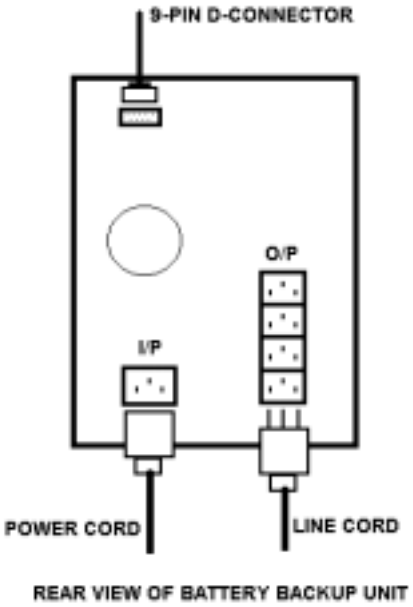



Figure 2

| | |
|---|---|
| C. Battery Backup (option) | 1. Verify that the battery backup unit mounted on the base of the oven is installed properly as per the instructions below. Be sure the line cord from the oven electrical panel is plugged into an outlet on the rear of the battery backup unit. Be sure the battery backup power cord is plugged into the outlet mounted to the base of the oven. Verify that the cable with the 9-pin D-connector is plugged into the battery backup unit. Battery backup turn's ON and OFF with main rotary switch located at front of the oven.<br>  <br>  <br><br>Figure 3<br>2. The battery backup unit may be removed from the oven if is necessary to test. It may be bypassed by unplugging the line cord and power cord from the rear of the unit and connecting the line cord with the power cord. (**See Figure 3**) Please refer to the OEM Instruction Manual for further instructions for troubleshooting the battery backup unit. |

| | |
|---|---|
| D. Computer | 1. Verify that the computer and monitor are plugged in and turned on.<br><br>2. Check for voltage on the computer outlet. Voltage should be 240 VAC. (For low voltage machines, voltage should be 208-240V.)<br>  <br><br>3. Check for tripped breaker Q31 located at left end of electrical panel.<br>  <br><br>4. Check the computer itself by plugging it into another outlet. (computer will work on 120V or 240V)<br><br>Note: Set the power selector switch (located on backside of the computer) for the applicable voltage.<br>  |

| **II. Alarm message "communication with the oven was lost"** | Check For: |
|---|---|
| A. Power | 1. Verify proper operation of "Secondary Power" (See section I.B.)<br><br>2. Check the power input on HC1-X (Analogic) controller board between the terminals marked J1-1 and J1-2. It should be approximately 230V. (**See Figure 4**)<br><br>3. Make sure fuses F1 & F2 on the controller board are not open. (**See Figure 4**)<br><br>4. Check the proper connection of communication cable and also check wiring for communication cable.<br><br>  |

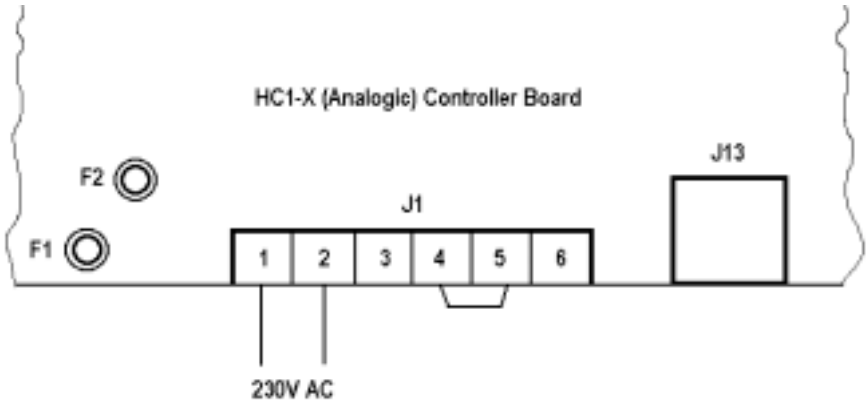
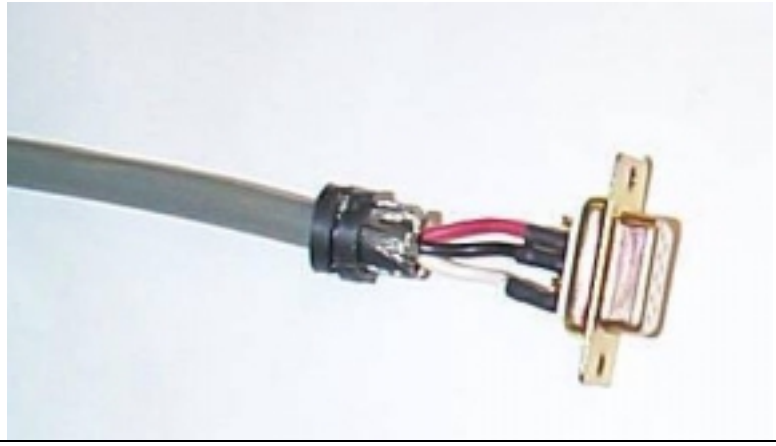



Figure 4

| | |
|---|---|
| B. Software | The Heller Operating System was factory configured to operate in Windows environment. If other applications are being run simultaneously with Heller Operating System, please refer to your Windows instruction manuals or your computer administrator to check for the following:<br><br>1. Verify that you are not running any other program that may try to use COM2:<br>2. Verify that Windows port settings are correct for your system. Make sure that COM 2-IRQ setting is not conflicting with the other devices, such as modem, networks card, etc. |
| C. Hardware | 1. Verify that the communication cable from the oven is plugged into COM2: on the computer.<br><br>  <br><br>Remove the D-connector covers on both ends of the cable and check for broken wires. Verify continuity of each wire by using a multimeter set to measure ohms.<br><br>  |

| | |
|---|---|
| | 2. Verify that any other devices such as modem, network card, COM card, etc. are not conflicting with the address or interrupts used by COM2.<br><br>3. Verify that the computer COM2: port is functioning. (Use an RS-232 port tester to test for activity on transmit data line pin 3. Or change the computer if a replacement is available.) |
| **III. Computer reports low deviation of a heat zone or a zone not reaching temperature.** | Check For: |
| A. Software | 1. Choose Channel Setup from the Window menu. Select the Heat zone channel in question using arrow key. (A typical alarm screen for a heat zone is shown in **Figure 5**.) |

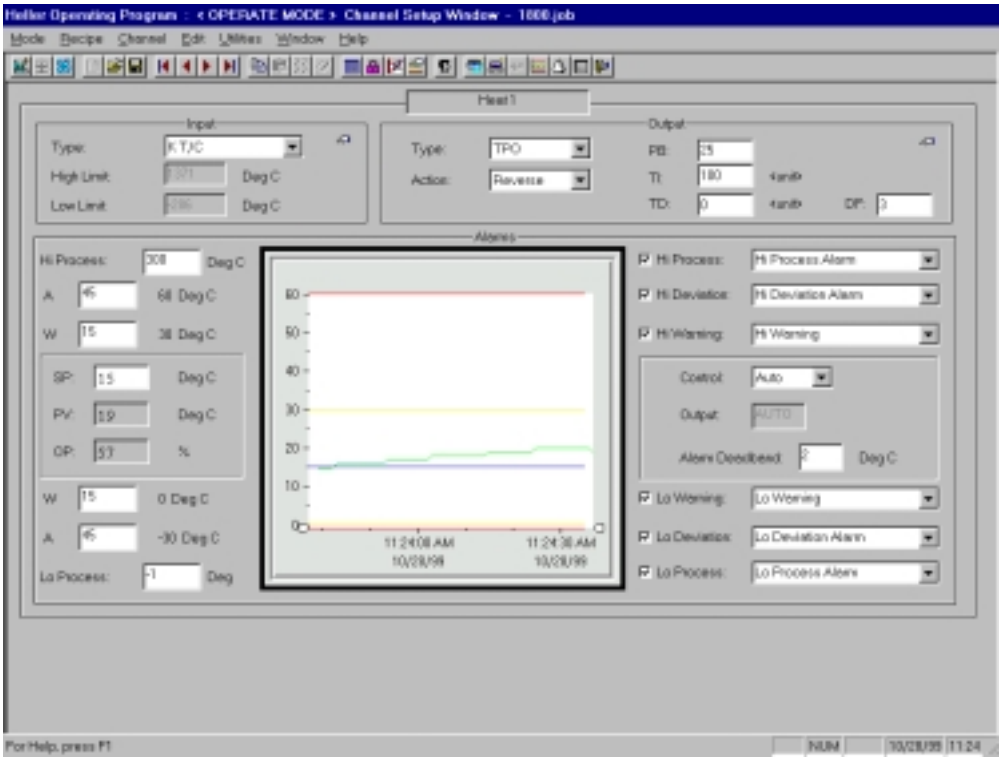



Figure 5

| | |
|---|---|
| | 2. Verify that the alarm deviation is set to at least 40 degrees C. (The deviation is factory set to 40 $^{o}$C)<br><br>3. Verify that the control output is set in “AUTO” mode. (The software should automatically set the power output to 100%.) |
| B. Hardware | 1. First be sure that the zone is indeed not heating. A thermocouple may have shorted or a blower motor may have burned out thus causing this situation. To verify this situation, run the Wakeup recipe with the machine cold. (See “Operating System Software Guide” section.) Change the setpoint of the suspect zone to 50 °C. Open the top shell of the machine and check for heat and blower operation at the zone output. If the blower is operational but the zone is indeed failing to heat, follow the steps below. If the blower is not functioning, troubleshoot as “loss of air flow at a heating module.”<br><br>a. Verify that the heat contactor located on the left side of the electrical panel is activated. (It is activated if the contactor “plunger” is pulled in. This is normally located in the center of the contactor or along the right side.) (**See Figure 6**.) |

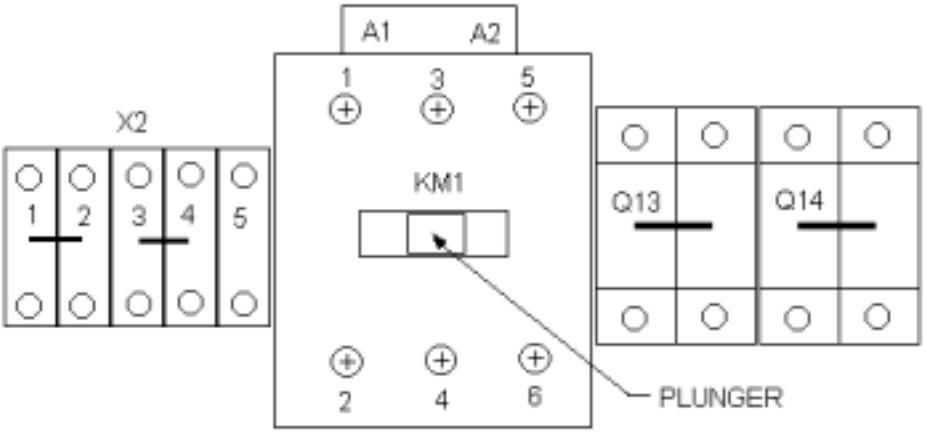



Figure 6

| | |
|---|---|
| | Check for tripped breaker for the heat zone in question. Reset if necessary and reload jobs. The heater wiring and elements should be checked next. Set the meter to the ohms scale. With the main power off, measure across the heater coils for the suspected zone [example: for heat zone -1 (L-R) wires # 101 and 2, etc.] (**See Figure 7**). If the input line voltage to the machine is either 208 or 240 VAC, the line-to-line resistance should be ≈ 9.0 OHMS. If the input voltage to the machine is between 380 and 480 VAC the line-to-line resistance should be ≈ 36.0 OHMS. Should the readings be significantly different, the wiring to |

| | |
|---|---|
| | The heater element and the heater element itself need to be checked out for opens or shorts. Using the meter, test the continuity of each heater wire (black wires) and heater coil. Also test between each wire and ground. Continuity here indicates a short to ground that must be corrected. |

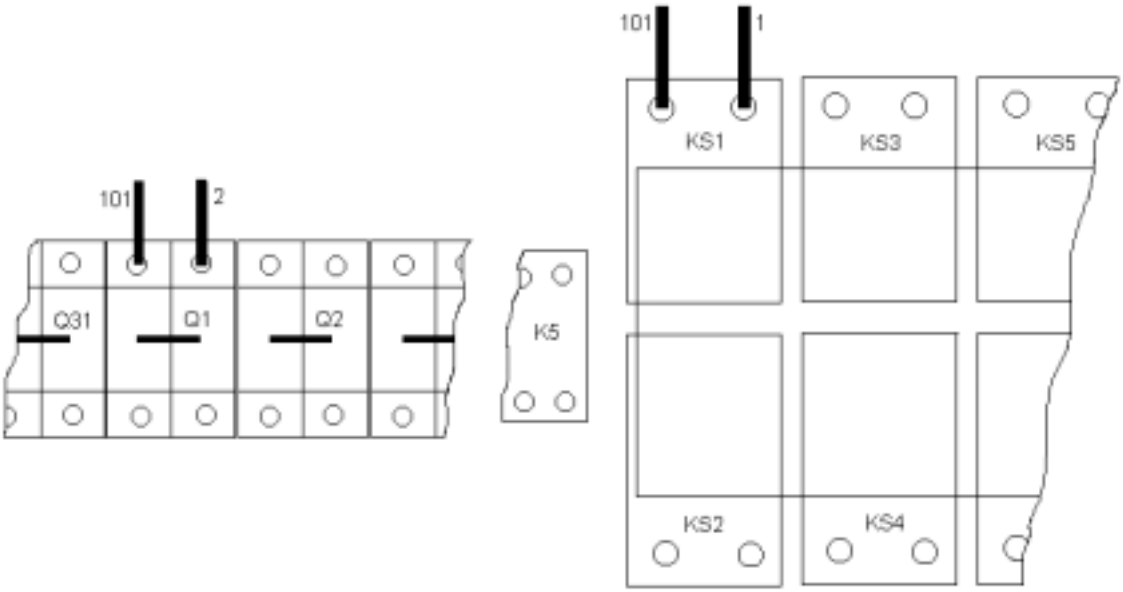
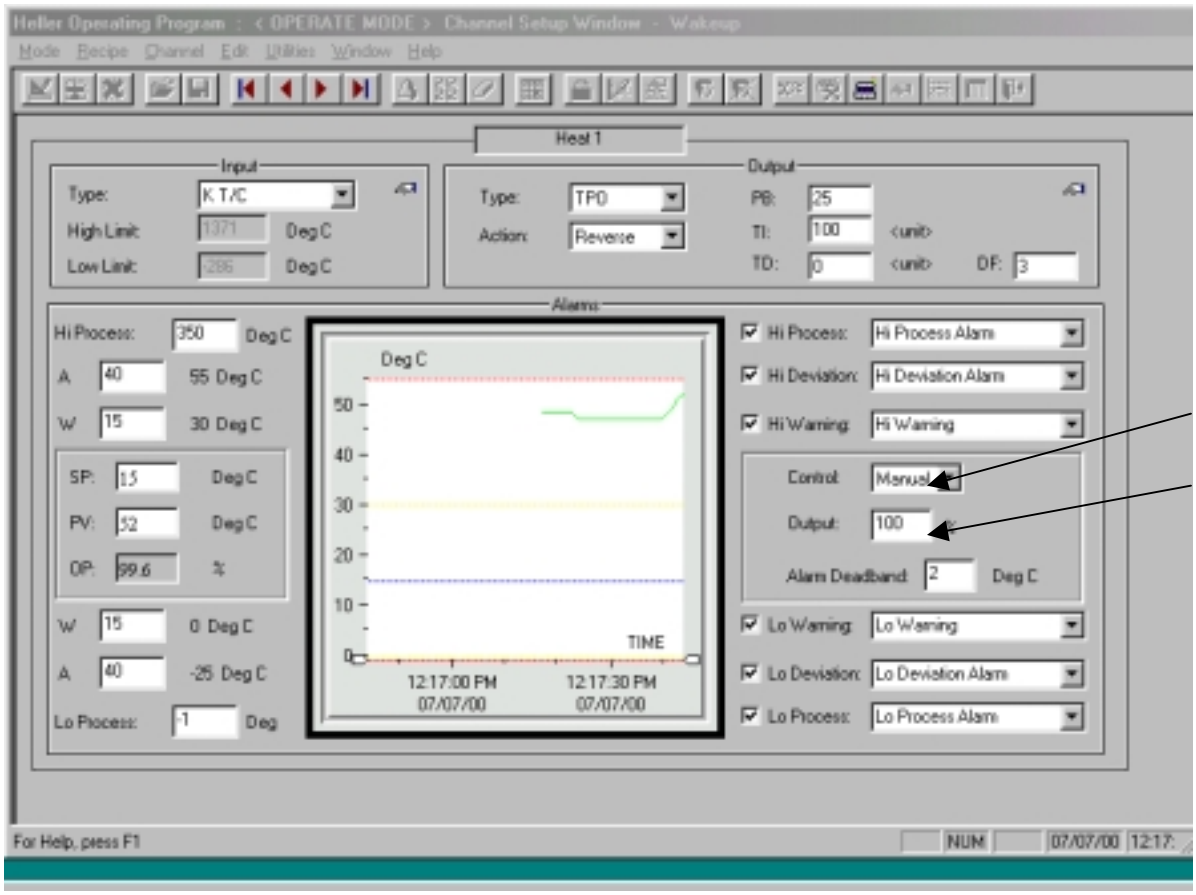



Figure 7

| | |
|---|---|
| | b. Restore power and load a recipe. Set the output power percentage to manual 100%. Using a voltmeter set to VDC scale, check the input control voltage on the SSR for the non-heating zone with the common lead to terminal 4 (-) and the (v) lead on terminal 3(+). |


Heller Operating Program : < OPERATE MODE > Channel Setup Window - Wakeup
Mode Recipe Channel Edit Utilities Window Help
Heat 1
Input
Type: K T/C
High Limit: 1371 Deg C
Low Limit: -286 Deg C
Output
Type: TPO
Action: Reverse
PB: 25
TI: 100 <unit>
TD: 0 <unit>
DF: 3
Alarms
Hi Process: 350 Deg C
A 40 55 Deg C
W 15 30 Deg C
SP: 15 Deg C
PV: 52 Deg C
OP: 99.6 %
W 15 0 Deg C
A 40 -25 Deg C
Lo Process: -1 Deg
Deg C
50
40
30
20
10
0
TIME
12:17:00 PM 07/07/00
12:17:30 PM 07/07/00
Hi Process: Hi Process Alarm
Hi Deviation: Hi Deviation Alarm
Hi Warning: Hi Warning
Control: Manual
Output: 100
Alarm Deadband: 2 Deg C
Lo Warning: Lo Warning
Lo Deviation: Lo Deviation Alarm
Lo Process: Lo Process Alarm
For Help, press F1
NUM
07/07/00 12:17:


HELLER Industries Inc. P.N.681686-1 REV.A
KS

| | |
|---|---|
| | If a DC voltage reads 4.5 to 5V, the SSR is receiving a signal to turn on the zone. If no voltage is present, verify the continuity of the wiring between the analogic controller remote terminal and SSR board # 681686-1. If all the wiring checks out, the controller itself may be faulty and should be replaced.<br><br>c. The next step is to check SSR output. Using a voltmeter set to AC voltage scale greater than or equal to voltage input of the machine, probe terminals 1 and 2. If voltage reading is equal to machine input voltage, the SSR is <u>not</u> conducting and should be replaced (see maintenance procedures). If no voltage is read on the meter, the SSR is functioning properly.<br><br>2. Verify that the blower motor for the suspect zone is functioning. If it is not see section X.<br><br>See also section VI. |
| **IV. Computer reports a high deviation of a heat zone or a zone overheating.** | Check For: |
| A. Software | 1. Choose <u>C</u>hannel setup from the <u>W</u>indow menu. Select the Heat zone channel in question using arrow key. (A typical alarm screen for a heat zone is shown in **figure 8**.) |

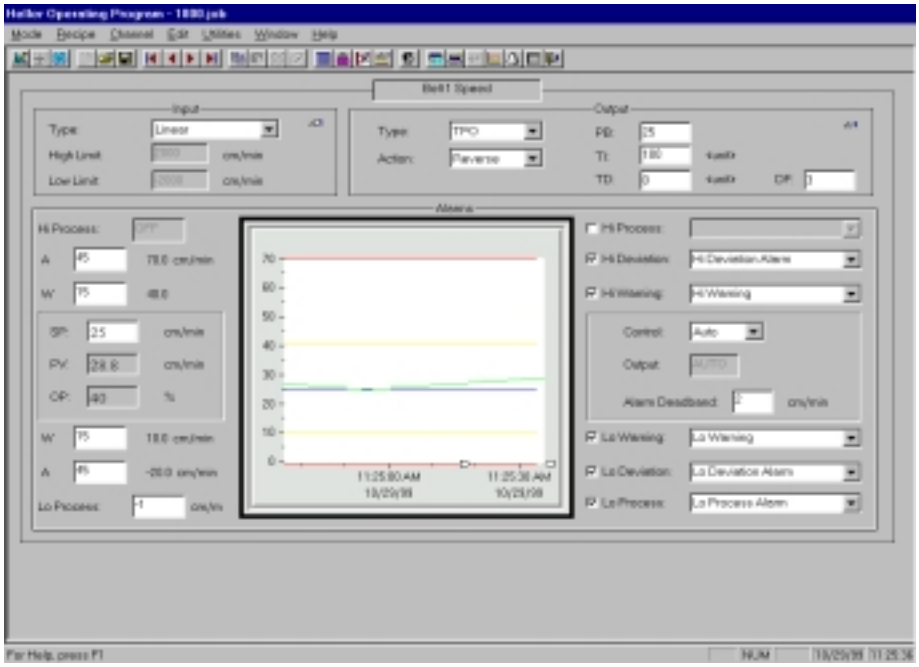


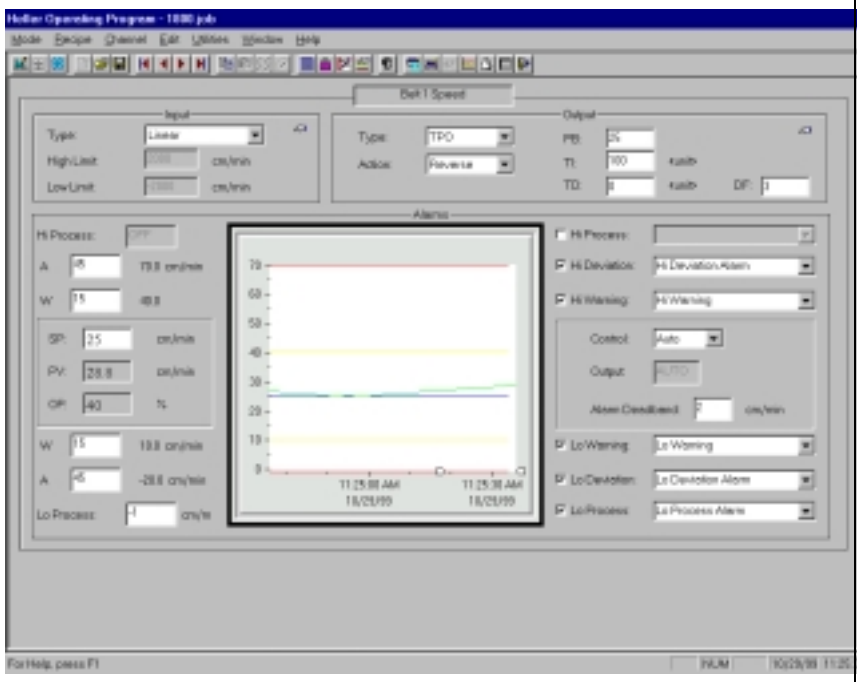

Figure 8

| | |
|---|---|
| | 2. Verify that the alarm deviation is set to at least 40 degrees C.<br><br>3. Verify that the control output is set in “AUTO” mode, Type is “TPO” and Action is “REVERSE”. The computer lowers the output % power once the zone temperature has reached the setpoint. Once the zone heats beyond the setpoint, the computer will begin to decrease to output % power and the one heat value should start dropping. If the heat zone temperature does not start dropping with the output power % value, follow the Thermodynamics and Hardware sections explained below. |
| B. Thermodynamics | 1. If the setpoints of adjacent zones differ by more than about 70 degrees C, the zone with the lower setpoint may, in fact, be heated by the other zone, thus causing an over-temperature condition. This condition may be corrected by adjusting the setpoints of the zones in question.<br><br>2. The situation, in fact, may be caused by another zone overheating. If all of the tests in this section check out, perform the tests on each adjacent zone. |
| C. Hardware | 1. Determine the location of the SSR that controls the suspect heater module. Also identify the channel number. Verify that the blower motor is functioning for this zone.<br><br>2. Verify that the heater coil has not shorted to ground by following this procedure. Open the breaker for the suspect zone and test for continuity between each heater wire and ground. Continuity indicates a shorted heater coil or frayed wire, which should be replaced. (See maintenance section I.)<br><br>3. Using a voltmeter set to VDC scale, check the input control voltage on the SSR for the over-heating zone with the common lead to terminal 4 (-) and the (v) lead on terminal 3(+). |


(Note: you must be running a recipe, and set the zone in question to manual 0% power.) If the DC voltage reads 0V, the SSR is receiving a signal to turn the zone off. If voltage is present, the Analogic controller may be faulty and should be replaced.

4. The next step is to check SSR output. Using a voltmeter set to AC voltage scale greater than or equal to voltage input of the machine, probe terminals 1 and 2. (Note: you must be running a recipe, and set the zone in question to manual 0% power.) If voltage reading is equal to machine input voltage, the SSR is <u>not</u> conducting and is functioning normally. If no voltage is read on the meter, the SSR is faulty and should be replaced by following the procedure in the maintenance section.


See also section VI.

| **V. Computer reports a "High process alarm."** | Check For: |
|---|---|
| A. Software | 1. Load the same recipe that was running at the time this alarm occurred (see software section).<br><br>2. Choose Channel setup from the Window menu. Select the Heat zone channel in question using arrow key. (A typical alarm screen for a heat zone is shown in **figure 9**.)<br><br>  <br><br>Figure 9 |
| | 3. Verify that the High Process alarm is set to 350 degrees (400 or more degrees for high temperature machine). (Also verify that the high process alarm temperature is greater than the high deviation alarm temperature. If not, also see section IV.) |
| B. Controller | 1. If the process value (PV) reads 3277 in all zones, then reset the thermocouple module. |

Thermocouple Module

To reset the thermocouple module, turn OFF the main power of the oven using the rotary switch (located at front side of oven) for about 10 to 15 seconds and then turn the power back ON. If the problem persists, thermocouple module is faulty and should be replaced.

2. Disconnect the thermocouple for the suspect zone (Note: For thermocouple numbers refer to the main schematic or check zone thermocouple blocks itself). Install a short length of wire between the terminals where the thermocouple was connected.

View the zone on the overview screen. It should read about 25 degrees C. If the zone reads 3277, the controller is faulty and should be replaced.

| | |
|---|---|
| C. Thermocouple | Verify that the thermocouple for the zone in question is not open by performing the following steps. (Note: If the controller checked out in step B, the computer will read 3277 if the thermocouple is open.) Visually check for proper connections at the thermocouple blocks and controller. If all connections are visually OK, disconnect the thermocouple from the Analogic controller and test with an ohmmeter. You must perform this test with the thermocouple both hot and cold. If either test indicated an open condition, the thermocouple is faulty and should be replaced.<br>  <br><br>See also section VI. |
| **VI. Zone temperature is not stable.** | Check For: |
| A. Thermodynamics | 1. If the setpoints of adjacent zones differ by more than about 70 degrees C, the zone with the lower setpoint may in fact be heated by the other zone, thus causing an over-temperature condition. This condition may be corrected by adjusting the setpoints of the zones in question. |
| B. Thermocouple/SSR | 1. Choose Plot Setup from the Utilities menu. Configure the plot to show the setpoint, output %, and process variable for the zone in question. (See software section C-5d.) Then choose Channel Trend Plot from Window menu. A typical trend plot is shown in **figure 10**. |

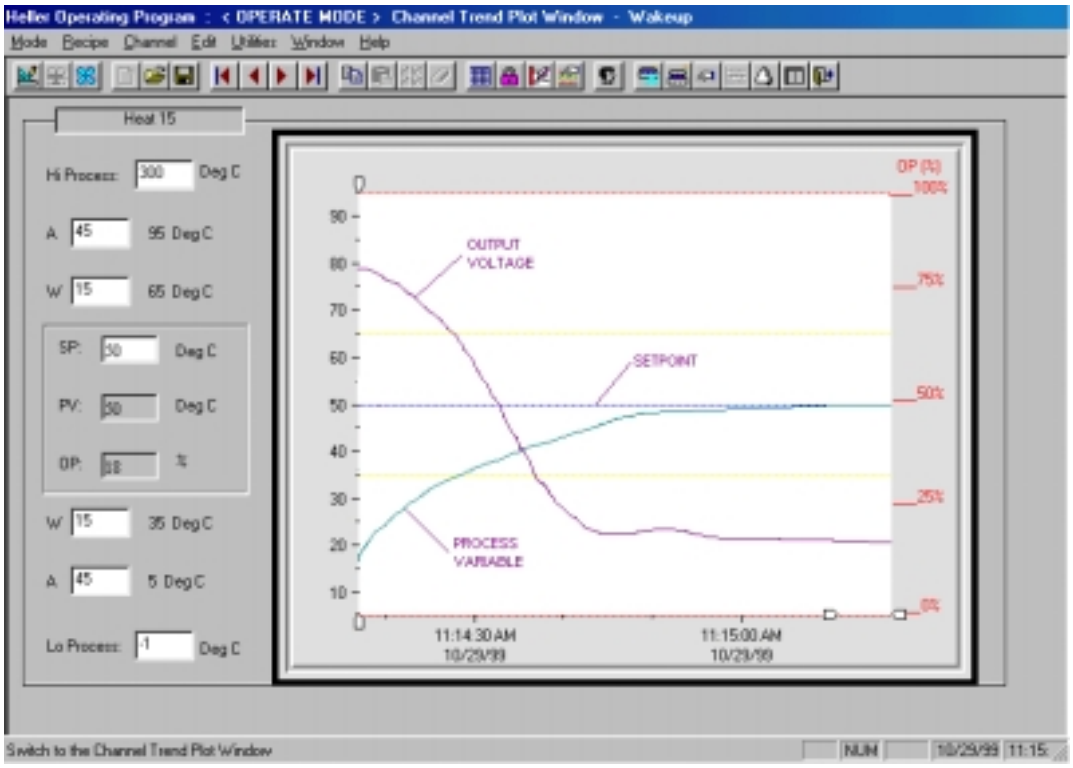



Figure 10

| | |
|---|---|
| | 2. Examine the plots on the screen. If the PV (Process Value) curve is very erratic, as shown in **figure 11**, suspect a faulty thermocouple that is shorted to earth ground. Verify this by disconnecting the suspected thermocouple from the controller and checking for continuity between each wire and ground by using a multimeter set to the ohms scale. Perform this test with the thermocouple both hot and cold. If continuity to earth ground exists, replace the thermocouple. (See maintenance section.)  |

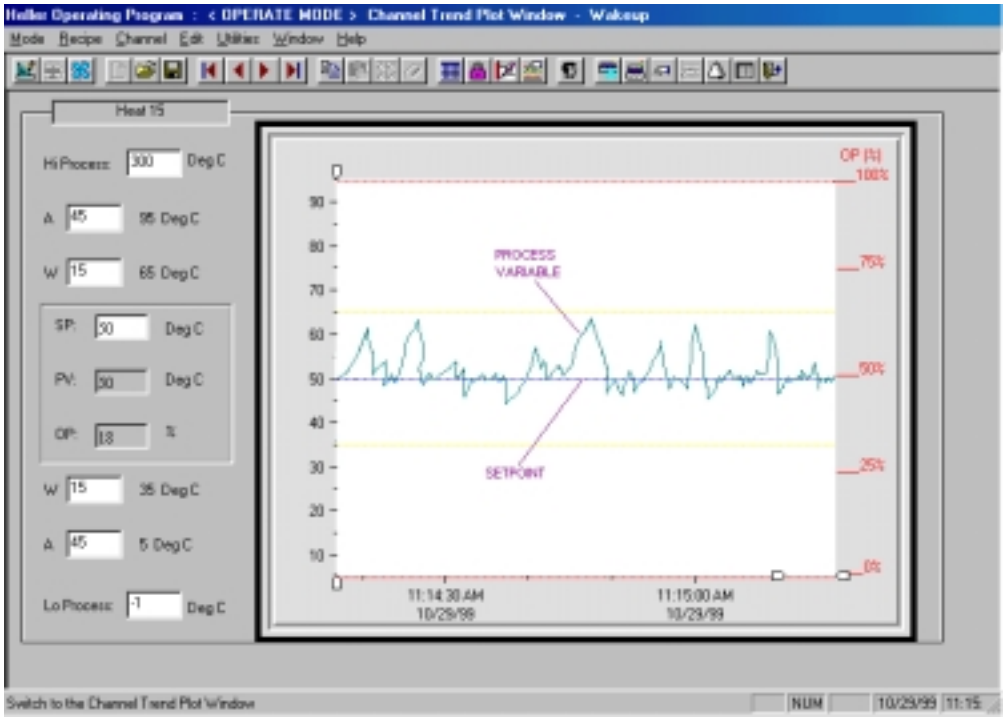



Figure 11

| | |
|---|---|
| | 3. If the output voltage (OUT) curve oscillates by more that about 20% or is erratic, suspect a faulty SSR or burned out blower motor. (Provided the thermocouple was OK. See step 2.) If the trend plot resembles **figure 12**, check to see if the blower motor is functioning. (With the oven cool, open the top shell and verify airflow at the suspected heat module.) If the trend plot resembles **figure 13**, replace the SSR (Solid State Relay) for the suspected zone. (See maintenance section.) |

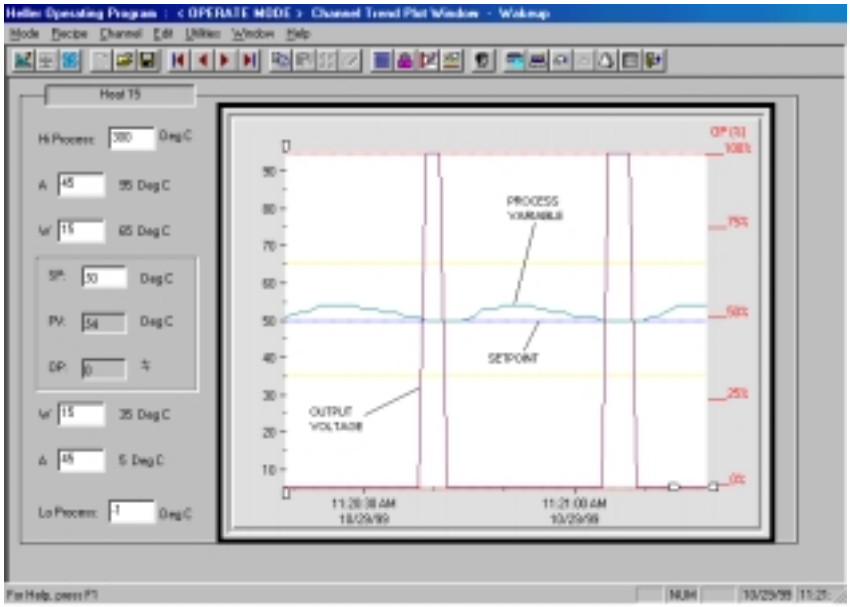



Figure 12

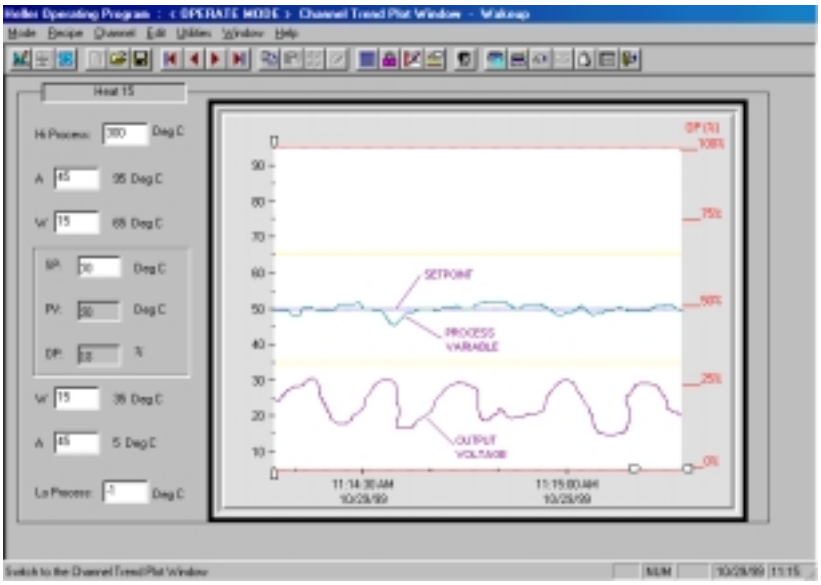
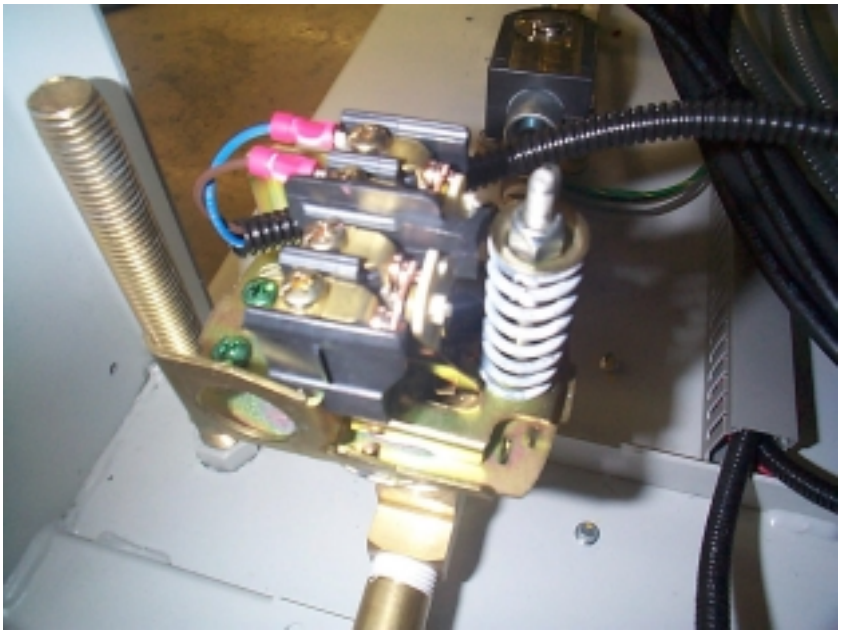



Figure 13

| **VII. Computer reports: "High rise rate alarm."** | Check For: |
|---|---|
| A. Thermocouple | 1. The computer expects to see 5 $^{o}$C temperature rise within 60 seconds after applying power to a heat zone. (Note: see section 'System Setup' in 'Operating System Software Guide' section for adjusting these values.) If the computer does not see such a rise, it reports a "Heat Rise Rate Alarm" for that particular channel, and the thermocouple may be shorted for that channel. (If the thermocouple is shorted outside of the heater module, it will not read the temperature of the zone, but instead a temperature outside of the oven.)<br>2. Open the oven and run the Wakeup recipe. (See Operating System Software Guide section) Change the setpoint of the suspect zone to 50 degrees. Verify that the zone is actually heating. If it is not, then see section III.<br>3. Visually check for shorts at the thermocouple terminal blocks and controller connection. If none are visually detected, replace the thermocouple by referring to the maintenance section. (The thermocouple insulation may have become frayed causing a short between the thermocouple wires.<br>  |

| **VIII. Computer reports: "High $H_2O$ Temp/ Low $N_2$ Pressure." (If pressure switch installed)** | Check For: |
|---|---|
| A. Pressure switch | 1. Check the setting on the pressure switch near the main nitrogen input. Note: When purging the oven at high flow, the incoming pressure may drop. The setting of the pressure switch must take this into account.<br>  <br>2. Verify that the facility main nitrogen supply is turned on and operating at the correct pressure and flow. |

| IX. The PPM of oxygen will not stabilize or is high. | Check For: |
|---|---|
| | Ensure that the oven shell is fully closed and that the flux filter access cover in the base of the oven is securely latched. (See **figure 14**.)<br><br>The reasons for unstable oxygen PPM readings can be attributed to one or more of the following,<br>a) Low inlet $N_2$ gas pressure (100PSI or 6.89 Bar minimum).<br>b) The $N_2$ plumbing system in the oven may be damaged requiring the replacement of $N_2$ hoses.<br><br>c) Insufficient flow rate, requiring adjustment of the flowmeter.<br><br>  |

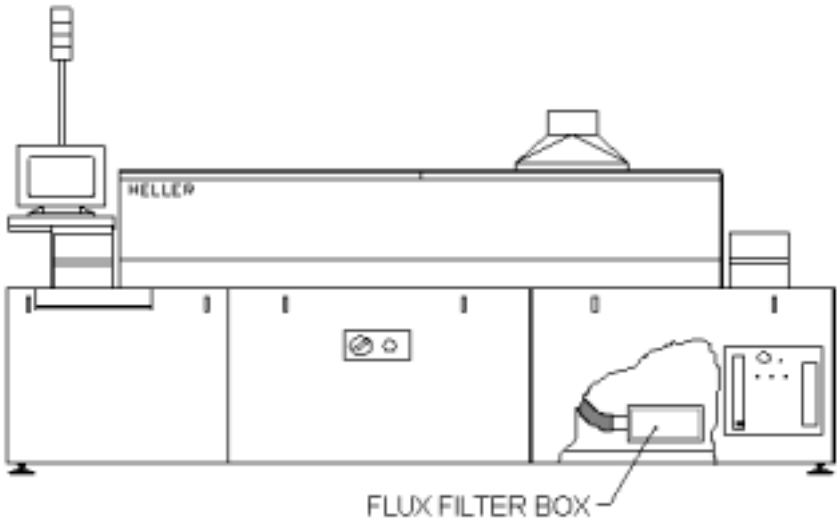
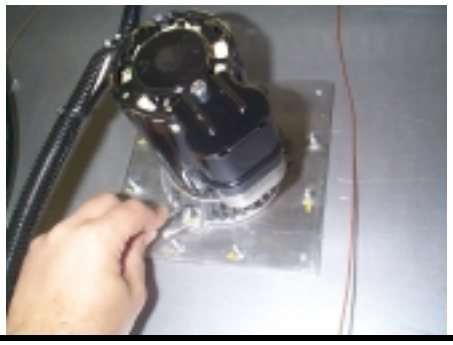


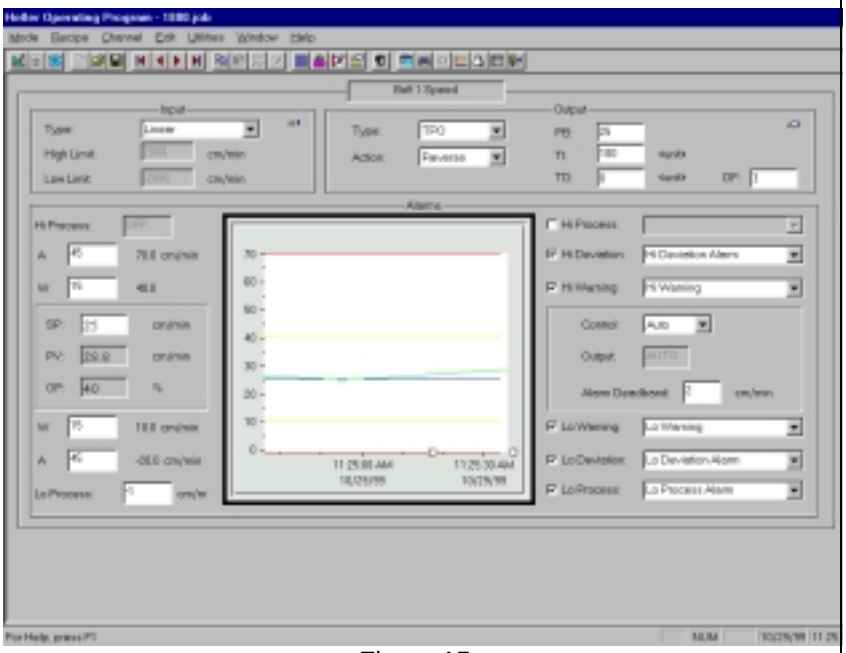

Figure 14

| **X. Loss of air flow at a heating module.** | Check For: |
|---|---|
| A. Low voltage problem<br><br>B. Secondary Power<br><br>C. Motor | Check main power. See section I.A.<br><br>See Section I.B.<br><br>If the motor is receiving power, but not rotating, replace the motor. (See maintenance procedures.) |

| **XI. A blower motor is noisy.** | Check For: |
|---|---|
| | If the noise is corrected or changes when pressure is applied to the motor, it is out of alignment. This must be corrected by loosening the motor mounting bolts and re-aligning the motor.<br><br>  |

| **XII. Board cooling is insufficient.** | Check For: |
|---|---|
| | 1. In an air-cooled machine, verify there is sufficient exhaust connected to the exhaust port of the cooling module. (See facility installation section)<br>2. Examine board profile criteria (zone setpoints and conveyor speed).<br>3. Check setpoint of blower speed control. |

| **XIII. The software "locks-up" or exhibits odd behavior.** | Check For: |
|---|---|
| | NOTE: Verify that your Windows system resources and settings are adequate for the programs you are running. (Also see section II.B.)<br>1. Restart the computer to see if the problem persists.<br>2. Reinstall the software if restarting the computer did not solve the problem.<br>3. Turn off other running applications like KIC to see if that has an effect<br>4. If problem still persists, **contact factory for service.** |

| **XIV. The conveyor is not moving.** | Check For: |
|---|---|
| A. Emergency stop pressed | Verify that an emergency stop has not been pressed. Also be sure to press the blue E-Stop reset button, if installed. |
| B. Setpoint | 1. Verify that the setpoint for the conveyor speed is not set to zero. (See main Over View screen)<br>2. Choose Channel Setup from the Window menu and select the Belt 1 Speed Channel. Verify that the Control for this channel is set to AUTO mode and Output % is not 0. (**See Figure 15**).<br>  <br>Figure 15 |
| C. Motor | 1. Look at the shaft of the conveyor drive motor located behind the conveyor cover on the front, exit end of the machine. If it is turning, proceed to step D.<br>  |

| | |
|---|---|
| | 2. With the power leads removed from motor, check the DC voltage between the motor leads. If it is zero volts, proceed to step E.<br>  <br>3. With the power leads removed from the motor, check for continuity between the motor leads and earth ground using the multimeter set to the ohm scale. Continuity indicated that the motor should be replaced. Also check the resistance of the motor windings. If there is a short or open circuit, replace the motor. |
| D. Conveyor jammed | 1. Loosen the motor mounting bolts and remove the drive chain from the motor.<br>2. Using an adjustable wrench on the shaft flats or 1/2” open end wrench on the square shaft, rotate the drive sprockets for both the mesh belt and edge hold conveyor. If both turn freely, proceed to step 4. (Caution: Do not mark the square shaft with the wrench. This will cause edge hold width adjustment problems.) |

3. Locate the source of binding in the conveyor system:

   a. Mesh belt bent or catching. Check specifically the belt splicing clips and the belt tension. If the belt has stretched, remove master links from the belt using needle nose pliers.

Verify clearance between the bottom of the edge hold rails and the mesh belt-especially when the movable edges hold rail is directly over a mesh belt support rod. If the mesh belt is rubbing the rails under the center rack on an 1800 or 1900 model, the height of the rack may be adjusted by loosing the four mounting screws, raising the rack, and re-tightening the screws.

| | |
|---|---|
| | b. Over lubrication of sprockets or chain may cause "gumming." If lubrication has gotten into the oilite (bronze) bearings in the sprockets, the sprockets should be removed and cleaned.<br><br>c. Worn sprockets, bearings, or shoulder screws. Sprocket with worn or broken teeth or worn bearings or shoulder screws should be replaced.<br><br>d. See section VI in "Operating Guide" section for overload current limits settings for the motor speed controller. |
| E. Motor speed controller | 1. Choose Channel Setup screen form windows menu. Check for PV is '0' and output is 100%.<br><br>2. On motor speed controller (mounted on electrical panel), measure DC output voltage between 'A+' & 'A-' terminal. It should be ~ 70 V. if it is 0 V, then measure AC voltage between 'L1' & 'L2' terminal. It should be ~ 230 V. Also measure signal voltage between 'SIG' & 'COM' terminal.<br><br>  <br><br><br>It should be +5.00 V DC at 100% output. If AC voltage OR signal voltage is zero (0 V) then check the wiring for motor speed controller. (see main electrical wiring schematics) |

## EHC/MESH BELT Motor Controller Adjustments

This section specifies the procedure for the calibration of the oven EHC/mesh belt transport system motor controller located on the electrical panel. (CP # 4491)

The calibration procedure should be performed after the oven has been powered and computer control of the EHC/mesh belt transport system has been established.

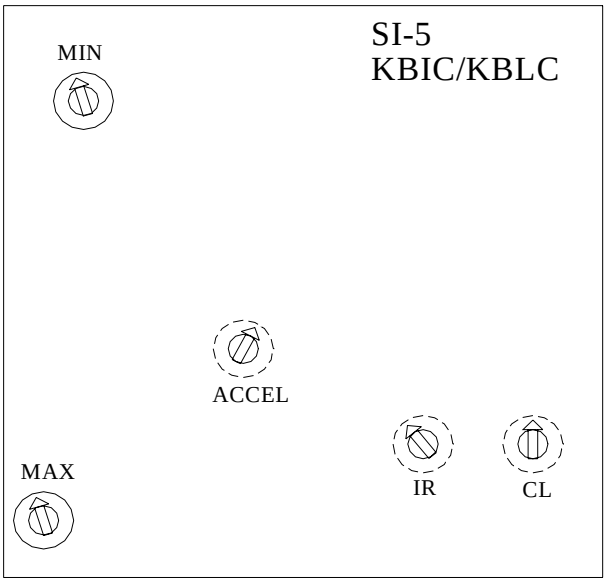
The calibration should be performed in the following order:

1. MIN speed trimpot adjustments.

2. MAX speed trimpot adjustments.

3. Current Limit adjustment.

Before start any adjustment, check that “ACCEL” trimpot on controller is set at 9 o’clock position and “IR” trimpot is set at 11 o’clock position (**See Figure 10**).




MOTOR SPEED CONTROLLER

Figure 10

IV. MIN Speed Adjustment.

K. Adjust both the MAX and MIN trimpot to the max. Setting (Full CW) and adjust the current limit trimpot (CL) to the middle of its adjustment range (12 o’clock position).

L. Set the Edge Hold Width to a sample board width. (Profile board, Edge Width board, etc…)

M. Make sure the Motor Controller is powered on.

N. In the software application program, set the computer control speed setting to 0 cm/min. (0% power).

O. Observe the transport system and note any movement of the system.

P. If the transport system is moving, slowly adjust the MIN trimpot CCW until the transport system stops.
Q. In the software application program, set the computer control speed setting to 19 cm/min. (~10% power).
R. Observe the transport system and check for movement of the system.
S. If the transport system is not moving, slowly adjust the MIN trimpot CW until the transport system starts moving.
T. Repeat the above steps as necessary.

V. MAX Speed Adjustment.
This calibration should be done ONLY AFTER the MIN speed adjustment has been completed.

E. In the software application program, set the belt speed setpoint to 188 cm/min. Adjust MAX trimpot for PV = 188 and OP = 100% slowly. Adjust MAX trimpot CW (to increase speed or decrease OP %) or CCW (to decrease speed or increase OP %) accordingly.
F. Place the sample board on the EHC/Mesh Belt and using any reference mark, time the board speed. Compare the calculated speed (distance/time) in cm/min. to the computer setting. (± 1.2 sec tolerance)
G. If calculated speed is not 188 cm/min (equal to PV), check belt speed control parameter in Heller system setup wizard page 4.
H. If calculated belt speed is less than 188 cm/min and MAX trimpot is on maximum setting then change the motor speed controller.

After setting MIN and MAX trimpot set the belt speed setpoint = 90 cm/min and observe OP %. It should be around 48 %. If it is not then adjust the MIN and MAX setting again.

After completing the speed adjustments, test the transport system at different speeds and compare the calculated value to the computer setting.

VI. Current Limit Adjustment. (Applies **only** for **clutchless** operation system)

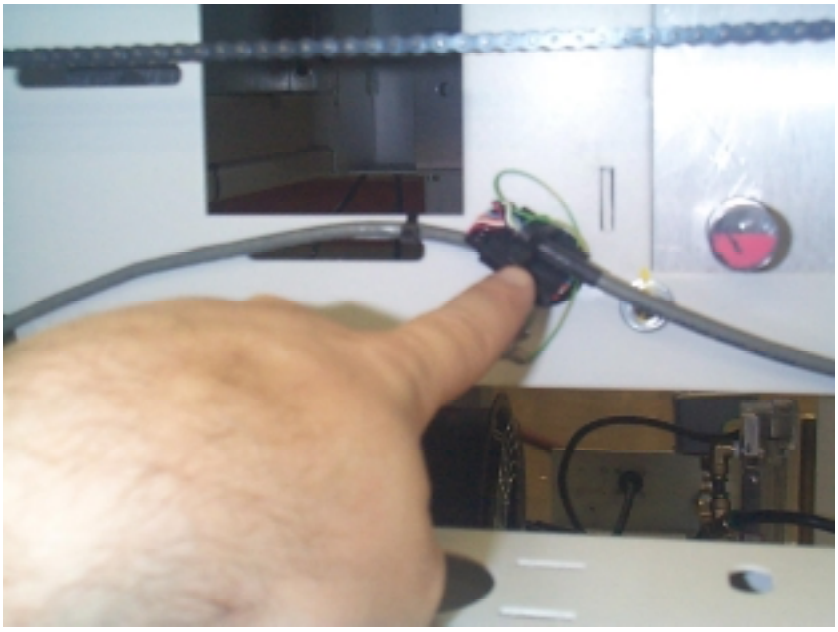
This calibration should be done ONLY AFTER the MAX and MIN speed adjustments have been completed. The desired threshold for the transport is 25 to 50 in-lbs. of force. This is the force required to cause the transport motor controller to stop (current limit) the mesh belt.

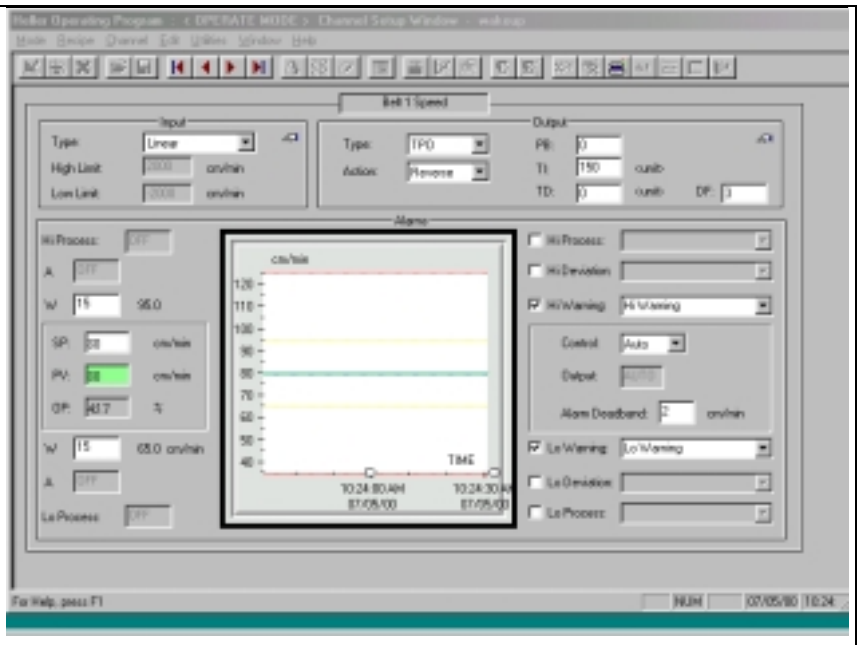
G. In the software application program, set the computer control speed setting to 90 cm/min. (50% power).
H. For mesh belt transport systems, place the “fish scale” hook on the mesh belt and hold the handle end of the scale in a stationary position. (For non-mesh belt transport systems, consult the oven Supervisor.)
I. Note the reading on the scale when the mesh belt transports system stalls/stops. (Caution: Release the scale if the reading exceeds the range of the scale.)
J. If the transport system stops with a scale reading more than 50 in-lbs., reduce the current limit threshold by turning the trimpot CCW.
K. If the scale reading is less than 25 in-lbs., increase the threshold by turning the trimpot CW.
L. Repeat steps B through E until the scale reading is between 35 and 40 in-lbs. for the 90-cm/min-belt speed setting.

After completing the current limit adjustment, test the transport system at different speeds and check if the scale reading falls within the 25 to 50 in-lbs. ranges.

F. Low voltage problem See section I.A.

G. Secondary power See section I.B.

| **XV. The conveyor does not run at the correct speed or does not maintain a constant speed.** | Check For: |
|---|---|
| A. Hardware | 1. Check for a mechanical conveyor jam as outlined is section XIV. D.<br>2. Verify that the setscrews on the encoder are tight.<br>3. Be sure the wiring to the encoder is securely attached. Both at the encoder and at the connection to the analogic controller.<br>  |
| B. Software | 1. Choose Channel Setup from the Window menu and select the Belt 1 Speed Channel. Verify the following values: |




Input: Type: Linear

Output:

Type: TPO PB: 0

Action: REVERSE TI: 150

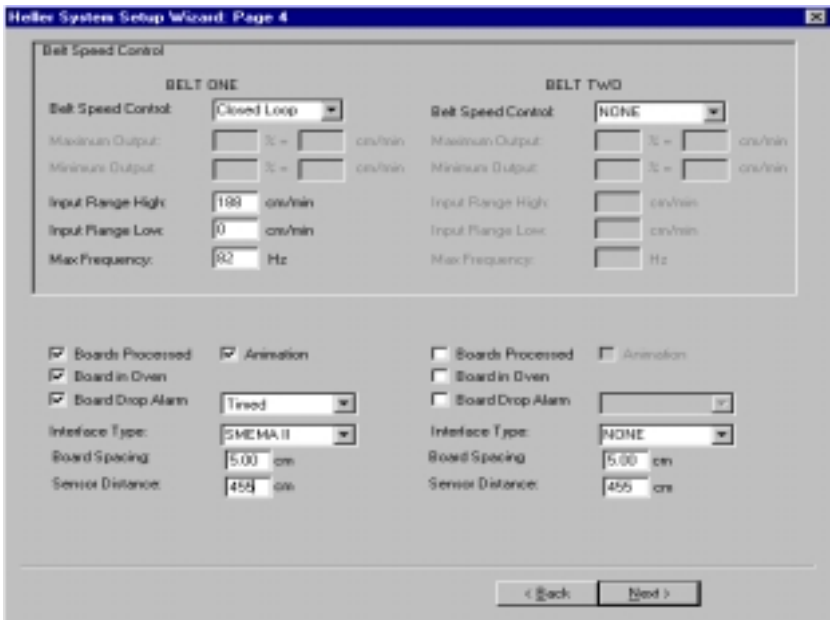
TD: 0

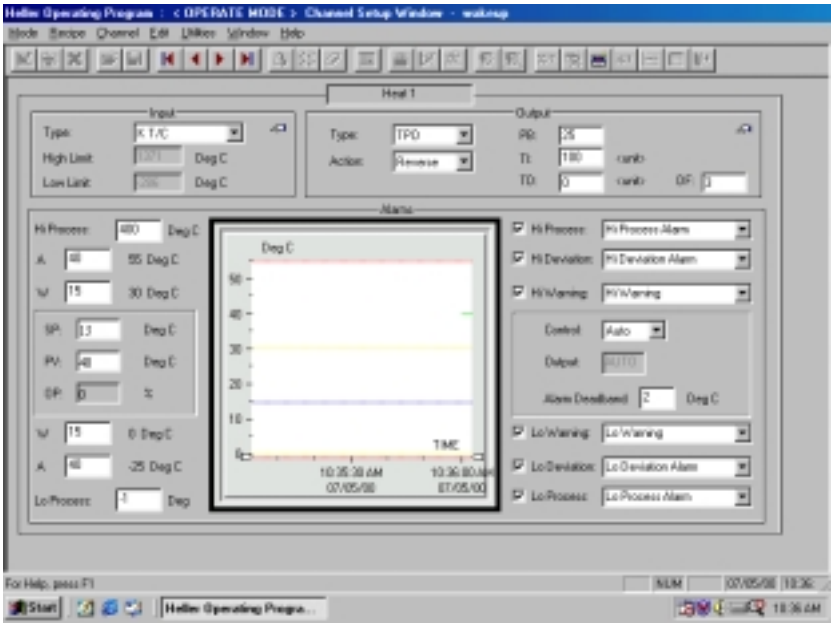
DF: 3

Alarms:

Control: AUTO

1. Check the values for Belt Speed Control in “Heller System Setup Wizard (page 4)”. See section ‘System Setup’ in ‘Operating System Software Guide’ section for adjusting these values.



| XVI. The machine is always in a warning condition. | Check For: |
|---|---|
| | Choose Channel Setup from the Window menu and verify that the warning deviation is set greater than the deadband. The deadband is factory set to 2 at the factory. Verify these settings for any channel displaying a warning.  |

| XVII. The machine trips breakers. | Check For: |
|---|---|
| A. Heater breaker | Heater or wiring may have shorted to ground. See sections III and IV. |
| B. Q29 | The 24 VDC power supply may be faulty and should be replaced. |
| C. Q31 | The computer outlet is fused for 6 Amps to operate the computer and monitor only. Do not run any other equipment from this outlet. |

| | |
|---|---|
| D. Q30 |  The conveyor drive motor may be faulty or overloaded. See section XIV. |

## XVIII. Nitrogen Management (Standard)

### A. Features and Controls

If the oven is equipped for a nitrogen inert atmosphere, a nitrogen supply line with a capacity of 100 PSI (6.8 atmospheres) and 2000 SCFH (56 $m^3$/hr) should be connected to the nitrogen input. This line should be 3/4" copper with a 1/2" NPT fitting or equivalent. The nitrogen should be supplied in the gaseous state from a cryogenic source with a minimum purity of 5 - 10 PPM of oxygen.
The Heller reflow systems use a single 1800 SCFH (51 $m^3$/hr) flowmeter for controlling the rate that nitrogen is supplied to the oven. (**See Figure 1**.)

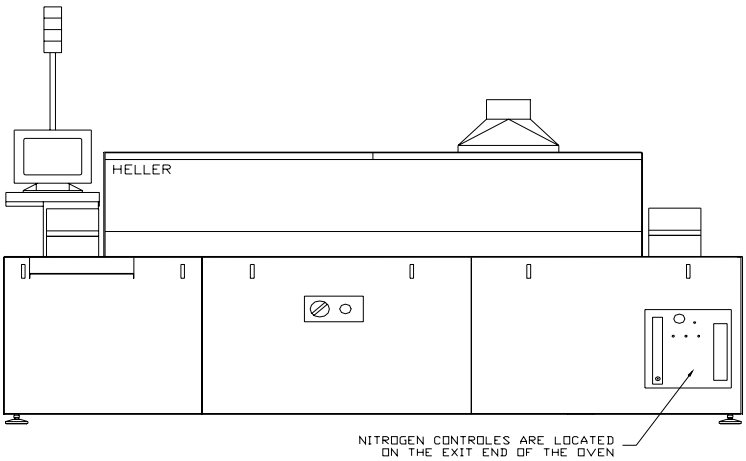



Figure 1

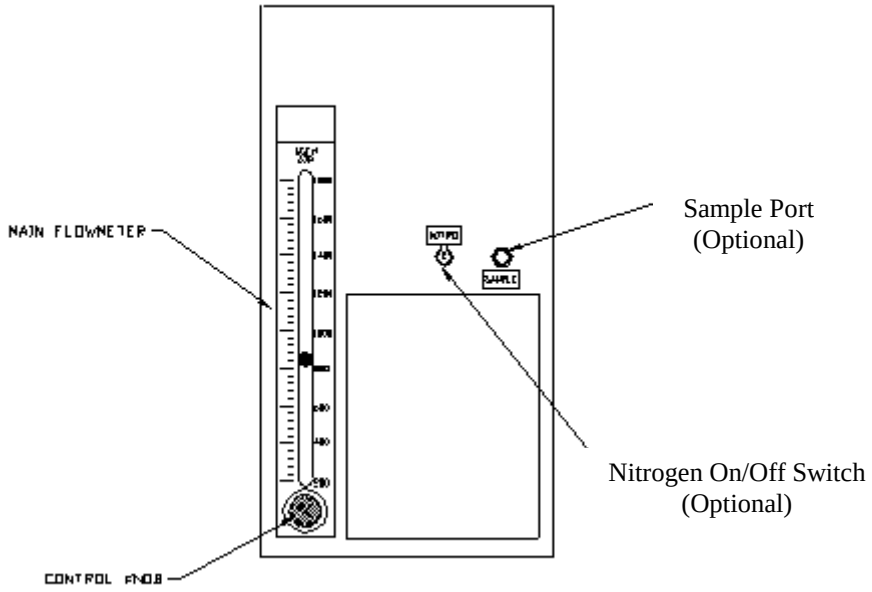



Figure 2

Brushes and flexible atmosphere barriers are used to minimize openings in the tunnels. The level of the upper barriers should be adjusted so they are as low as possible without touching the PCB's at the entrance end of the machine. At the exit of the machine they may be adjusted so that they touch the board, but they should not impede the board's travel. Tunnel opening has a significant effect on nitrogen consumption. Smaller openings yield lower consumption rates. PCB width also effects the consumption of nitrogen. Narrower PCB's will require less nitrogen to maintain the desired oxygen PPM level.

The PPM level of oxygen at which the oven should be operated is typically dependent on the type of flux used in the solder paste. The paste manufacturer's guidelines should be followed closely with regard to temperature profile and nitrogen level. For most applications 100-500 PPM are acceptable. Others can operate at PPM levels as high as 1000 -2000 PPM.

As an example, the next section will describe flow rates and oxygen PPM levels obtained with the oven set to process PCB's 6" (15cm) wide. Larger PCB's will require proportionally higher flow rates.

## B. Operation

Adjust the main flowmeter to full flow rate [approximately 1800 SCFH (51 $m^3$/hr)]. Flow is controlled by the black knob at bottom of the meter (**See Figure 3** above). Flow rates are measured by the position of the center of the ball in the chamber of the meter.

Allow the oven to purge at this flow rate for 15-20 minutes during warm up. The oven atmosphere will now be at an oxygen concentration level of < 50 PPM. Reduce the flow rate to about 1000 SCFH (28 $m^3$/hr). This flow rate will typically maintain oxygen PPM levels of 25 to 100.

A sampling tube is installed in the reflow zone to enable the monitoring of the oxygen PPM level. The actual level can be monitored by using an oxygen analyzer. The connection to this sampling tube is at the port labeled "SAMPLE" (Note: The analyzer connected to this port must be equipped with a pump for drawing the sample from the oven.)

### C. Oxygen Analyzer Option

As an option, the atmosphere sampling probe mentioned above may be plumbed into an oxygen monitoring system built into the base of the oven to enable the user to continuously monitor the oxygen PPM level inside the oven. An optional alarm, either audible or visual may be activated by this meter to call attention to an out-of-specification situation.

The manual for this optional analyzer has been included with the Heller oven manuals. Follow the instructions for proper use, calibration and maintenance for the meter and for compliance with the warranty program.

### D. AutoPurge/standby Option

This option allows the oven to automatically purge itself at 2000 SCFH (56 $m^3$/hr) for 10 - 20 minutes during warm up. After this time period, the flow rate is automatically turned down to a normal operating level.

For ovens equipped with an analogic controller, time interval for oven purging is pre-set at the factory. To adjust the purge time interval, go to section XIX: “Nitrogen Management”.

The oven is also equipped with sensors that will allow it to run a "nitrogen standby mode" when no product is in the oven. In this mode, the nitrogen flow rate is reduced and the oven oxygen PPM level is allowed to increase. When a board enters the oven, the sensors activate circuitry, which brings the oven back to the purge nitrogen flow rate and oxygen PPM level.

For ovens equipped with an analogic controller: The time interval for oven standby is pre-set at the factory. See section XIX: “Nitrogen Management” (Auto Purge / Stand-By).

### E. Nitrogen On/Off Options

As an option, go to main overview screen; select the “NITROGEN” switch with your mouse pointer to turn nitrogen on/off. This “NITROGEN” switch controls the flow of the nitrogen depending upon the current recipe. (Note: the oven will automatically turn off the flow of nitrogen after the Cool Down mode has ended with or without these options.)

As an option, some ovens are equipped with manually control nitrogen on/off switch. This switch is mounted on the flowmeter panel (**See Figure 4**).

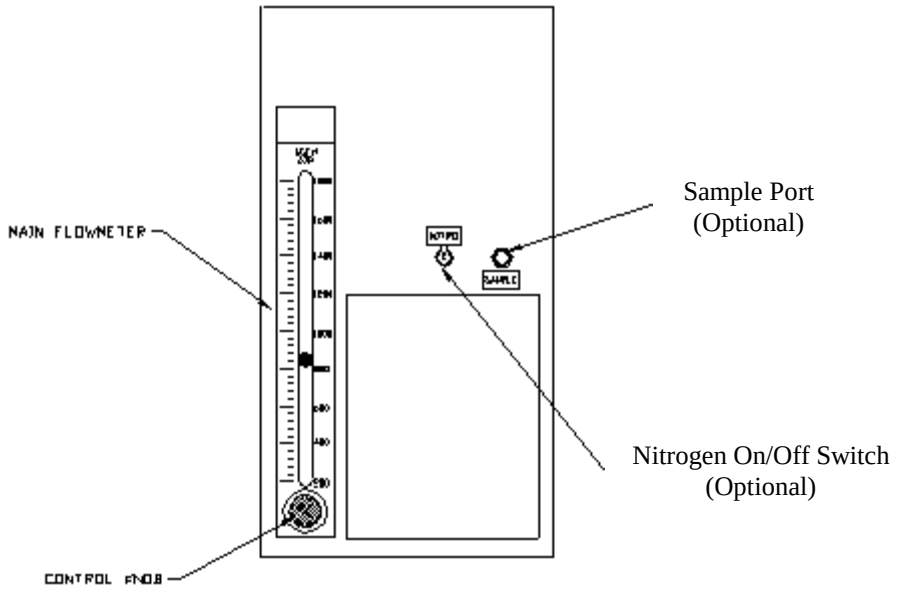



Figure 4

## F. Cooling Module Blower Speed Control Option

The blowers in the cooling module have enough cooling power for heavy PC boards. The cooling rate may be adjusted for lighter boards by means of the software. As an option, the cooling rate may also be adjusted manually using knobs (located under the keyboard). If optional topside or bottom side external cooling units are installed, their speed is also controllable (if equipped).

For adjusting the computer control cooling rate, select the “Heat Zone Blowers” from Edit menu. Choose Low, Medium or High cooling rate as require.

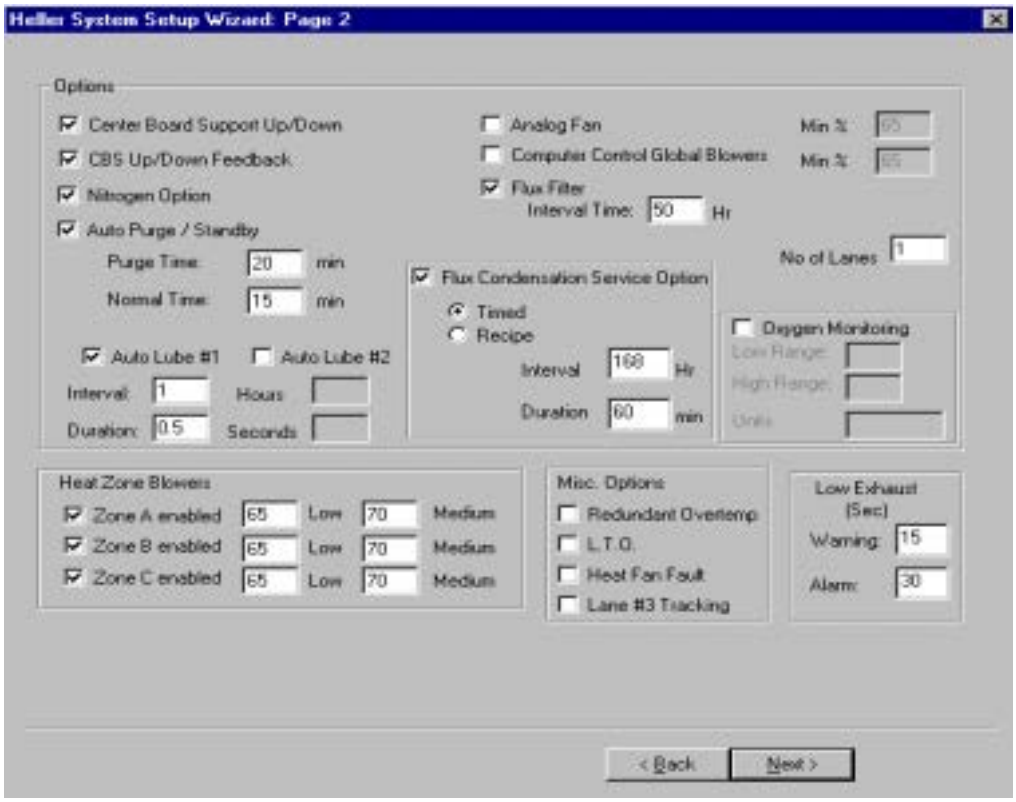
For manually adjusting the cooling rate (optional), use the knobs located under the keyboard. Since the dials provided on the knobs are not calibrated for actual blower output, the proper settings must be determined experimentally.

## G. Nitrogen Safety

Even though nitrogen is an inert substance, a few simple precautions should be followed. Proper ventilation in the area where the system is being used must be maintained to keep the oxygen level in the air at safe levels; otherwise, the continuous flow of nitrogen can displace the air and deplete the normal oxygen level. Create sufficient ventilation in the area of the reflow oven to exhaust the excessive nitrogen laden air and replace it with normal atmosphere. Installation of a room oxygen monitoring system is recommended especially if the oven is located in a small enclosed area. These systems are available from Beckman Instruments, Delta F, Illinois Instrument and Teledyne.

## XIX. Nitrogen Management (Auto Purge / Stand-By)

1. Go to “Heller System Set-up Wizard”




2. Click on “Nitrogen Option” and “Auto Purge / Standby”

3. Enter 20 minutes for “Purge Time” and 15 minutes for “Normal Time”

4. Load Hot Job. Oven will purge for 20 minutes

5. Once completed, oven will run in “Normal” mode. At this time, adjust the normal flow valve to obtain the required flow rate and use an $O_2$ analyzer to check PPM

6. If the entrance sensor is not blocked for 15 minutes, that is, no production being run, the oven will go into “Standby”. Adjust low flow valve to obtain 500 SCFH to keep nitrogen consumption to a minimum.

7. While in “Stand by”, if production begins to run, the oven will purge for 1/2 the set point time. In this case it will be 10 minutes.

8. After production has been running for 10 minutes, the oven will switch to “Normal” mode again.

9. This “Purge”, “Normal” and “Standby” process will continue as production throughput changes.

10. Be sure to check $O_2$ levels monthly to verify performance. If PPM levels are higher at the same flow rates and board sizes, confirm your nitrogen quality and pressure have stayed the same and that your exhaust did not change.

11. If these areas check out, contact the Heller Service Department for further support.

## XX. Flux Separation

### IF FLUX CONDENSES IN COOL ZONE.

- Inspect the filter and replace if necessary.

- Ensure blowers are operating. To verify if blowers are operating, lift top hood and check to see that blower above exhaust is turning.
  Remove rear panel and ensure cyclonic separator motor is turning.

  NOTE: If both motors are not spinning, check micro switch at front access door of the flux filter box. If the switch is not depressed, the motor will not operate.

  Open front of filter system, depress micro switch and check for airflow. The system was designed to flow at 80 CFM (2.26 $m^3$/min). If there is little or no flow, the 3" diameter tube may be clogged and may have to be replaced.

If this is the case, it is recommended that the 3-inch (7.62-cm) and 2-inch (5.08-cm) tubes be replaced as flux may accumulate and reduce flow. (Consult Factory for Details).

Check external cool fans on the filter box. These 10” diameter axial flow fans that cool the flux filter box must be operating and clean.

Some models exhaust from the rear; please ensure that the factory exhaust is drawing at 600CFM (17 $m^3$/min).

For models that exhaust from the end panels, make sure the grill is clean and not blocked by any foreign objects.

# Maintenance Procedure

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## I. Replacing a Topside Heater Element

**Note:** It is recommended that both heater elements in a module be changed at the same time.

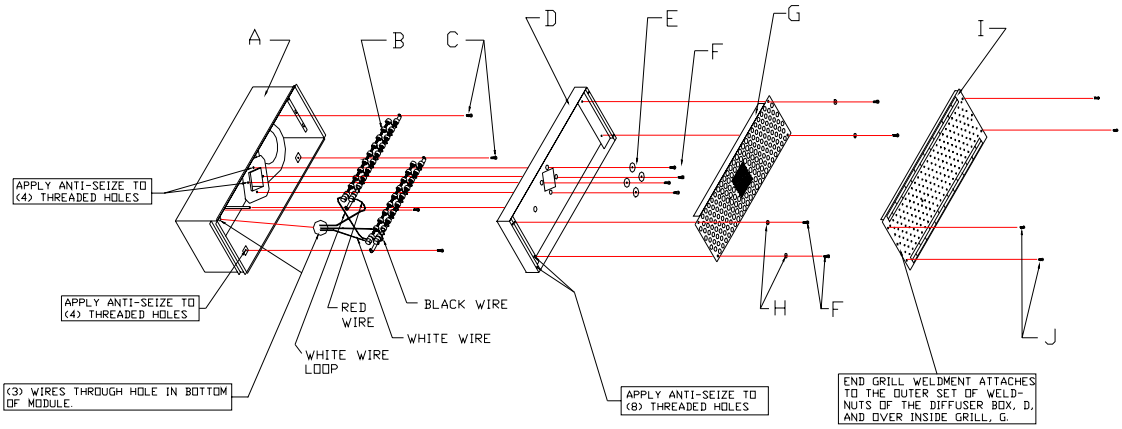
1. Turn main power off
2. Remove the Diffuser grill, which is held in place by four (4) or two (2) - depending on module type - #10-32 x 3/8" Button Head Screws.

3. Remove the heater element. Each heater element is held in place by two (2) 10-32 captive screws and (2) 3/8 10-32 nuts.

4. Disconnect the wires attached to the heater element. Be sure to mark the wires and terminals from which they came.

5. Inspect the condition of the heater wires and ring connectors. If the wires are frayed, or the connector is questionable, the wire should be cut and a new connector should be attached
6. Reverse the above process to reassemble the module.

| ITEM | ITEM DESCRIPTION | # REQ. | ITEM | ITEM DESCRIPTION | # REQ. |
|---|---|---|---|---|---|
| A | D-671635 OUTER BOX WELDMENT | 1 | G | D-673093 INSIDE GRILL WELDMENT | 1 |
| B | D-672264 HEATER ELEMENT ASSEMBLY | 1 | H | CP-3536 WASHER | 4 |
| C | CP-3632 CAPTIVE PANEL SCREW | 4 | I | D-673094-XX END GRILL WLDMNT | 1 |
| D | D-673095 DIFFUSER BOX WELDMENT | 1 | J | 95785 10-32x3/8" BHCS ST. STEEL | 4 |
| E | CP-3537 WASHER | 4 | | | |
| F | 95416 10-32x3/8" SHCS | 8 | | | |




Note: Anti-seize is Loctite Part Number 76764

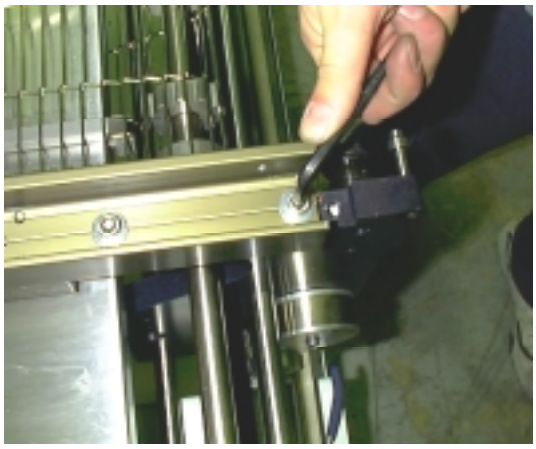
Figure 1

## II. Replacing a Bottom Heater Element

1. With the oven cool, run the WAKEUP job until the master link on the edge hold chain is visible on the sprocket at the exit end of the machine.
2. Stop the conveyor by pressing the emergency stop switch.
3. Remove the master link by lightly prying on the clip with a small flat blade screwdriver.

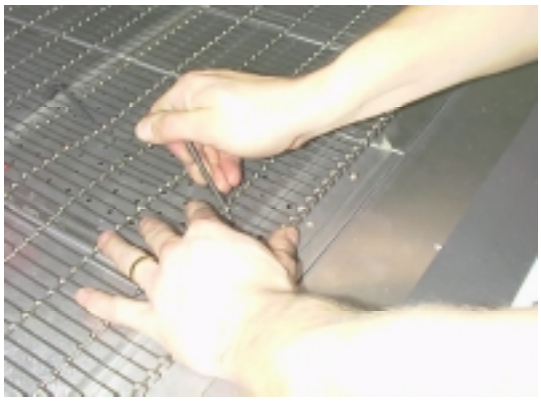
4. Disengage the chain from the drive sprockets
5. Pull the chain all the way out of the rail. Repeat for each rail.

6. Remove the socket head screw from the long section of rail.



7. Pull the rails out toward you firmly. The rails will slide from a steel expansion block, which connects them to the shorter set of rails.

8. Remove the lacing clips from the mesh belt using needle nose pliers.



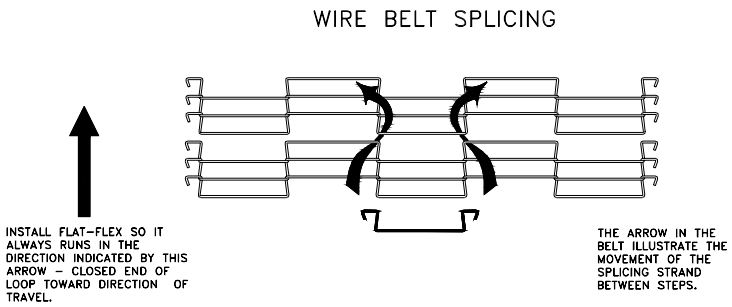



Figure 2

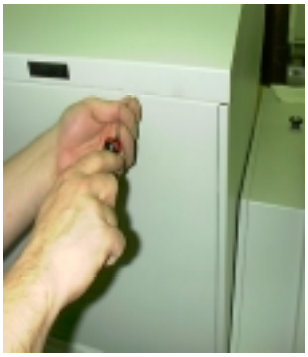
9. Repeat the same procedure for replacing a top heater element.
10. When sliding the rail back in place and over the Splice Bar, be sure that there is plenty of anti- seize compound on the Splice Bar. The Splice Bar is also the heat expansion joint.

Note: Rail adjustment is not required when removing the rails in this manner.

## III. Replacing a Blower Motor

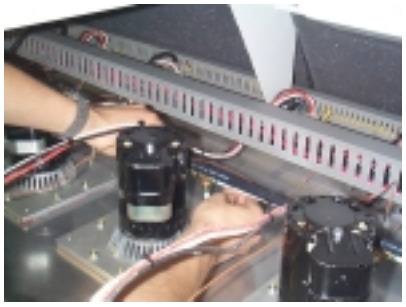
### Disassembly

1. Turn Main power off.
2. Remove Screws from the back corners of the top covers.

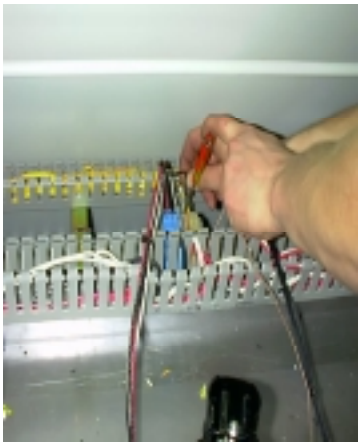


3. Lift the cover and place it on its strut to hold it up.

4. Disconnect the Nitrogen line. (If applicable)

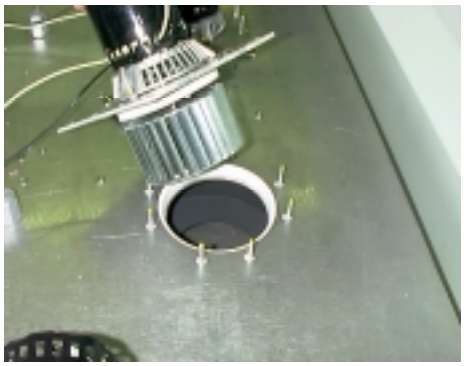


5. Disconnect the wiring.



6. Remove the nuts and washers on the studs of the motor mounting plate.

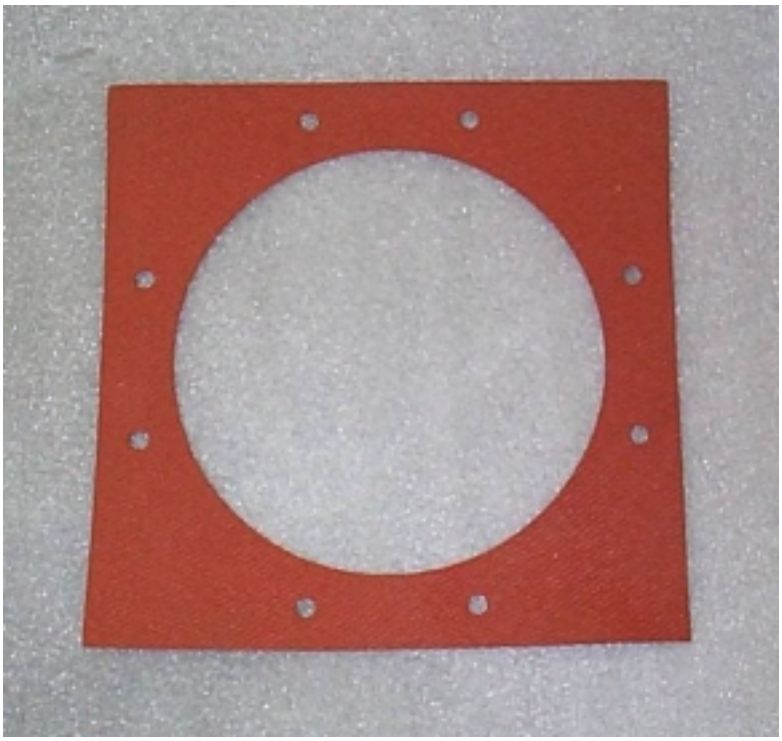
7. Slip a flat blade screwdriver under one corner of the mounting plate to break the seal.
8. Lift out the motor/plate assembly.



**Reassembly**
(TOP AND BOTTOM)

Before remounting the replacement blower, be sure that it is the same type and same thickness of insulation (1/2" or 1").

1. On Nitrogen ovens only, slip a Nitrogen gasket (P/N 5341) over the 10-32 studs before mounting motor.



2. Replace the motor/plate assembly with a new one. (Heller part numbers are as follows in following table)

3. Tighten the nuts evenly on the studs to hold the blower motor securely in position and to assure an airtight seal on nitrogen machines.

4. Reconnect the nitrogen line. (On nitrogen ovens only).

| P/N | Air | P/N | N2 (Nitrogen) |
|---|---|---|---|
| 682441 | 1" Air | 682443 | 1" N2 |
| 682440 | 1/2" Air | 682442 | 1/2" N2 |
| 682456 | 1/2" Air High temp | 682127 | 1/2" N2 High temp |
| 682457 | 1" Air High temp | 681538 | 1" N2 High temp |

NOTE: The dimensions of 1" and ½" refer to the thickness of the white insulation between the impeller and the motor mounting plate. High temp ovens have a maximum temperature of 350° or 400° Celsius

## IV. Adjusting the Slip Clutch (No Edge Hold Oven Only)

A slip clutch is included to release power from the conveyor system in case the mesh belt or conveyor becomes jammed. It is located on the end of the conveyor drive motor shaft at rear exit side of the machine.

The slip clutch is set at the factory at 30 - 40 lbs. linear force on the mesh belt. The clutch will usually need to be reset in the first 30 to 90 days of operation (reset to 25 - 35 lbs. linear force on the mesh belt) and again any time the conveyor has become jammed. To adjust the torque at which the clutch slips, lift the wire spring in the center of the clutch - using a pair of long nose pliers - so that the end of the spring is out of its notch. Using a spanner wrench (Heller Part Number 4830) with 1.75" (4.45 cm) centers, adjust the plate with the four indentations clockwise to increase the slip torque or counterclockwise to decrease the torque. After a satisfactory setting has been established (25 - 35 lbs. linear force on the mesh belt.), the end of the wire spring should be dropped back into a notch in the outside diameter of the clutch, thus locking the setting. (See Figure 4.)

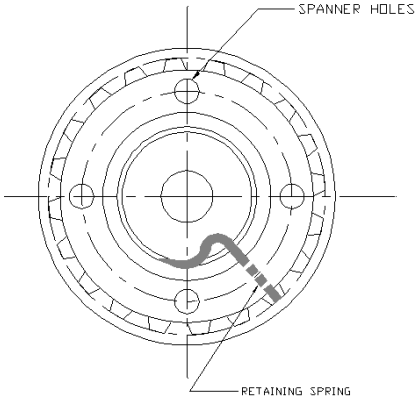
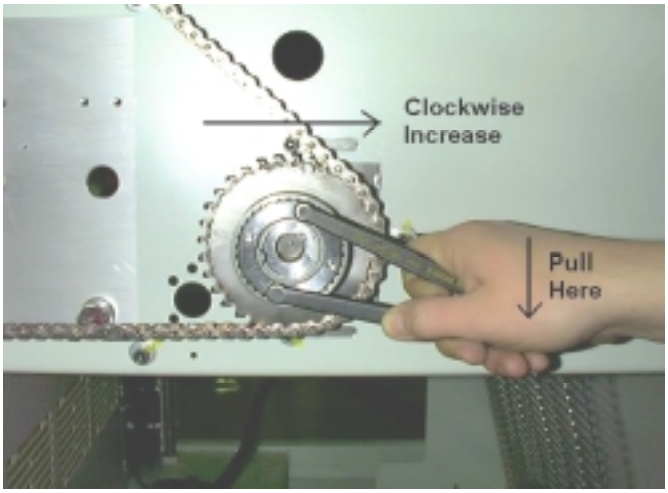
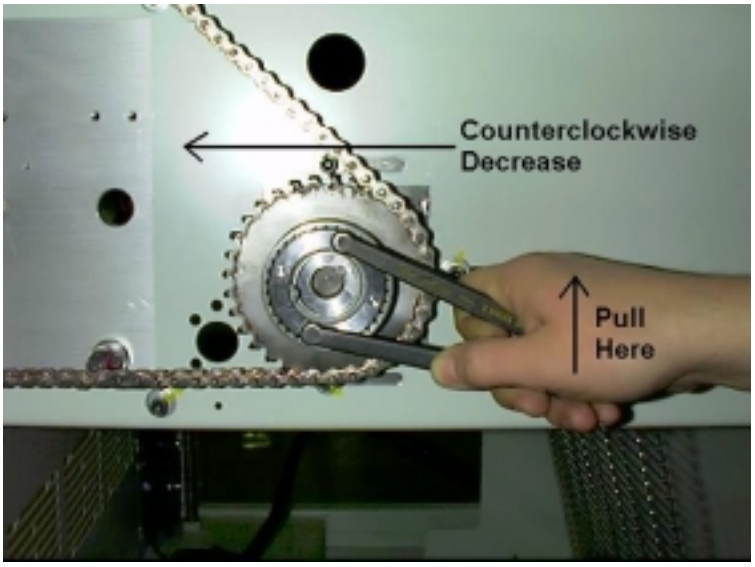



Figure 4



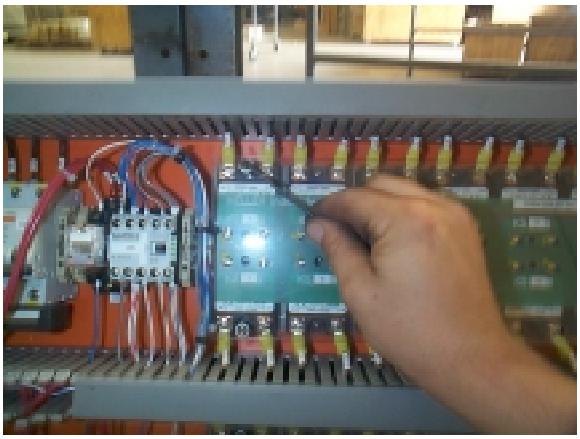



## V. Replacing a SSR (Solid State Relay)

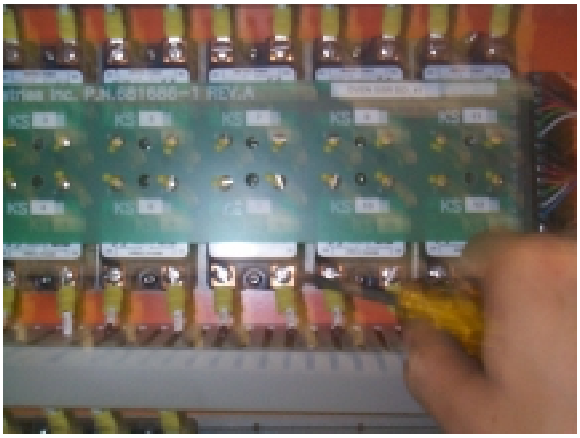
1. **WARNING: Turn Main power off by following Lockout/Tagout procedure**
2. Locate the Oven SSR Board

**Warning: Use appropriate Power Lock Procedures for Safety**

3. Remove plastic cover by removing the four button head screws



4. Locate the corresponding SSR with the zone in question. Remove the four screws holding the SSR to the relay board and heater wires. (These are also the terminals of the SSR and will be labeled 1, 2, 3, & 4.)



5. Slide the SSR relay down or up, depending on the location.

Reverse the previous procedure to install the new SSR making sure that terminals 3& 4 are mounted to the SSR board.

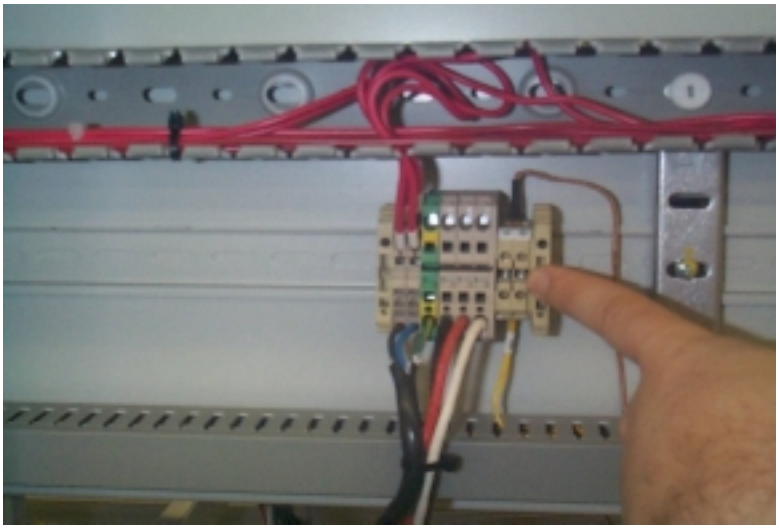
There is white heat sink compound on the back of the SSR's to improve thermal conductivity. Be sure to use some on the replacement SSR. If none is available, scrape off what you can from the defective SSR & re-use it.

## VI. Replacing a Thermocouple

1. Turn off power from the oven following lockout procedures and open the top shell for upper thermocouples or see section II for accessing lower thermocouples.
2. Remove the end grill that is held in place by #10-32 x 3/8" BHCS.

3. Cut off the ceramic bead at the end of the thermocouple with wire cutters.

4. Disconnect the thermocouple from the terminal block located in the blower motor compartment or unplug it from the mating connector.



5. The thermocouple is held in place with RTV. It is necessary to pull the thermocouple through the RTV. Remove as much RTV as possible.
6. Install a new thermocouple through the thermocouple tube from the “grill” side of the module.
7. Reseal with RTV using a high temperature (600°F) RTV such as Heller Part # 5063 (Dow Corning #736 RTV or equivalent).
8. Reconnect the thermocouple at the terminal block or mating connector being careful of the polarity (red to -, yellow to +).

## VII. Correcting for Stretch in Mesh Belt

During the first few months of operation it is common that the mesh belt conveyor will stretch by up to 4" to 8" (10cm to 20cm). It has been observed that the length of the mesh belt stabilizes after this initial period. After the first month of operation it is recommended that 4 or more links be removed from the belt and a like amount after the second month of operation if the conveyor has stretched. A sign of a stretched belt is that there is a pronounced droop of 3"- 4" (7.5cm - 10.0cm) of belt on the return loop after the mesh belt goes around both the drive end and idler end of the conveyor. To

remove the extra links load Wakeup, lift the hood of the oven, and run the belt until the splice in the belt is over one of the lower heaters. Remove the splicing strands (See section II, figure 2).

Cut off about 4-8 links of the belt - approximately 2"- 4" (10cm - 20cm) and re-splice. Use a heavy-duty wire cutter -- preferably with carbide edges -- to cut the wire links. If your oven has an edge hold conveyor installed, position the belt splice so that it just passes the idler end of the conveyor, slightly underneath the conveyor frame. Even though it is now necessary to work on the underside of the conveyor, the need to disturb the edge hold system is thereby avoided. The rollers located under the entrance and exit conveyor frames can also be adjusted to increase tension in the belt.

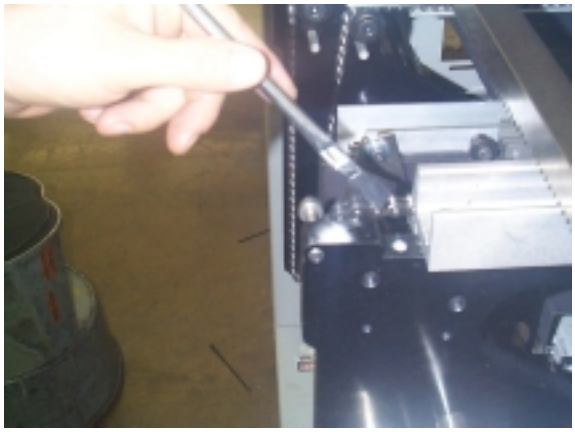
## VIII. Lubrication

Apply lightweight oil (SAE 20 or equivalent) to the 1/4” or 3/8” pitch drive chains that are used to drive the edge hold conveyor to the lead screws and to the square shaft. Flux residue on the drive chains should be removed with a suitable solvent before lubricating. The round shafts on which the edge hold conveyor is supported should also be kept clean of flux residue. Lubricate them only with lightweight oil. DO NOT use lubricants like WD-40, PTFE spray, fluorocarbons or silicon oils.

Heller recommends using Klübersynth CEH 2-440 US Micro lubricating oil or Oberon – High temp synthetic base chain oil F232-ISO VG 220 for lubricating the edge hold rails. This oil is silicon and does not contain a solid component so it will not leave a residue that will interfere with the rotation of the sprockets. Also, this lubricant is safe to apply while the oven is hot. The use of other lubricants may require cooling the oven before application. For machines with automatic lubrication systems, do not use lubricants that require frequent mixing. They will clog the delivery system.

The chain used for the edge hold conveyors on Heller systems is made of stainless steel and does not require lubrication. There is, however, friction between the chain and the channel in the edge holds rails. This is where the lubrication is required.

With no boards in the oven, load Wakeup. Using the supplied brush, dab a small amount of lubricant on each chain at the entrance end of the machine and wait five seconds. Dab both chains with the brush again. Repeat this procedure 15-20 times at the entrance end of the machine. Move to the exit end, and repeat the procedure. The lubrication will come off the chain and flow into the rail channel where it is needed.



Heller recommends lubricating every 40 hours for worst case operating conditions. This interval may be increased depending on conditions such as flux, temperature or belt speed. It should be evaluated and adjusted for each application to prevent over-lubricating.

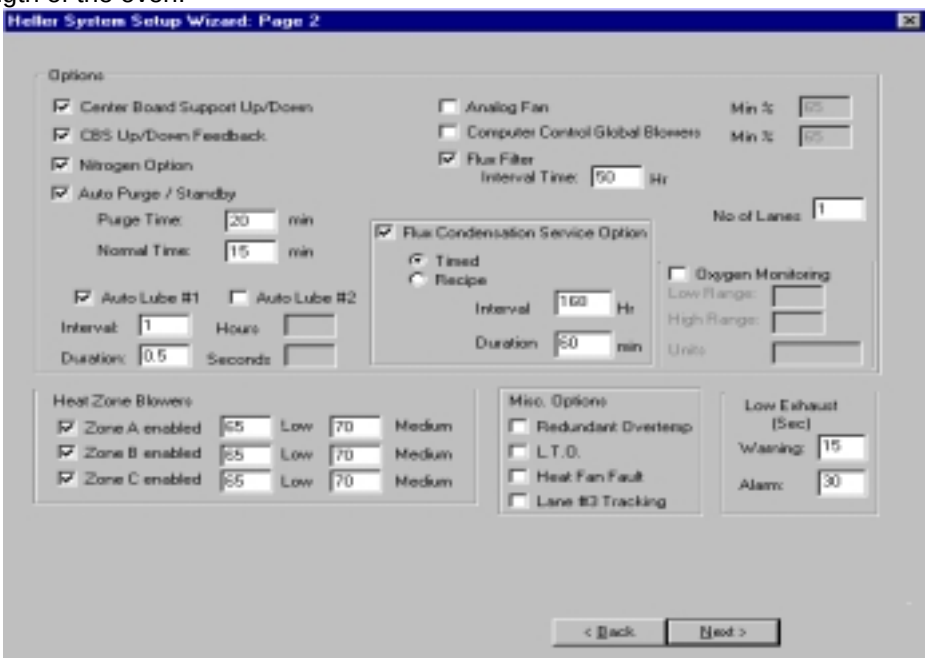
CAUTION: Avoid getting too much lubricant on the edge hold sprockets by applying oil only on the chain. A thin coat on the top of the chain is adequate. Be sure the oil is not dripping after the application. If the lubricant comes in contact or is applied to the bushings inside the sprockets, damage could occur.

## A. Automatic Lubrication

The autolube option has two settings (see “system setup” in software section). The first setting is for the time interval at which lubrication is to take place.

Heller recommends an interval setting of 5 Hr. This interval may be changed depending on conditions such as flux, temperature or belt speed. It should be evaluated and adjusted to prevent over-lubricating. The software will trigger the lubrication cycle at the end of interval timer count down and lubricant will be applied to the chain for the duration time.

The second setting is for the length of time that the lubricant is applied to the chain. This time is factory set to 0.5 seconds. Again, this value will vary with the belt speed, viscosity of the lubricant or the length of the oven.



## IX. Verifying Calibration of the System

### A. Calibration of Thermocouples

As an option, the oven may be equipped with a second K-type thermocouple in each heat zone. The thermocouples are routed to sockets mounted through the front panel of the machine and may be connected to an external temperature measuring device. The readings obtained from this device may then be compared to the readings reported by the controller in the Heller oven.

### B. Verifying Calibration of Thermocouples

The accuracy of the thermocouple inputs for the temperature control module in the Heller oven may be checked by using any NIST certified thermocouple calibrator to simulate the operating temperatures of the sensor. Heller recommends an Omega Model PCL-420 Process Voltage Analyzer (Heller Part #4350) for this procedure. The PCL-420 analyzer is accurate to ± 0.5°C. K-type thermocouple wire is accurate to ± 1.1°C, and the controller is accurate to ± 2.0°C. In total, an acceptable tolerance for the Heller oven is ± 3.6°C at room temperature.

The testing may be performed by selecting a channel in the Channel setup screen of the Heller Operating System software and connecting the wires of the test equipment to the thermocouple inputs at the controller.

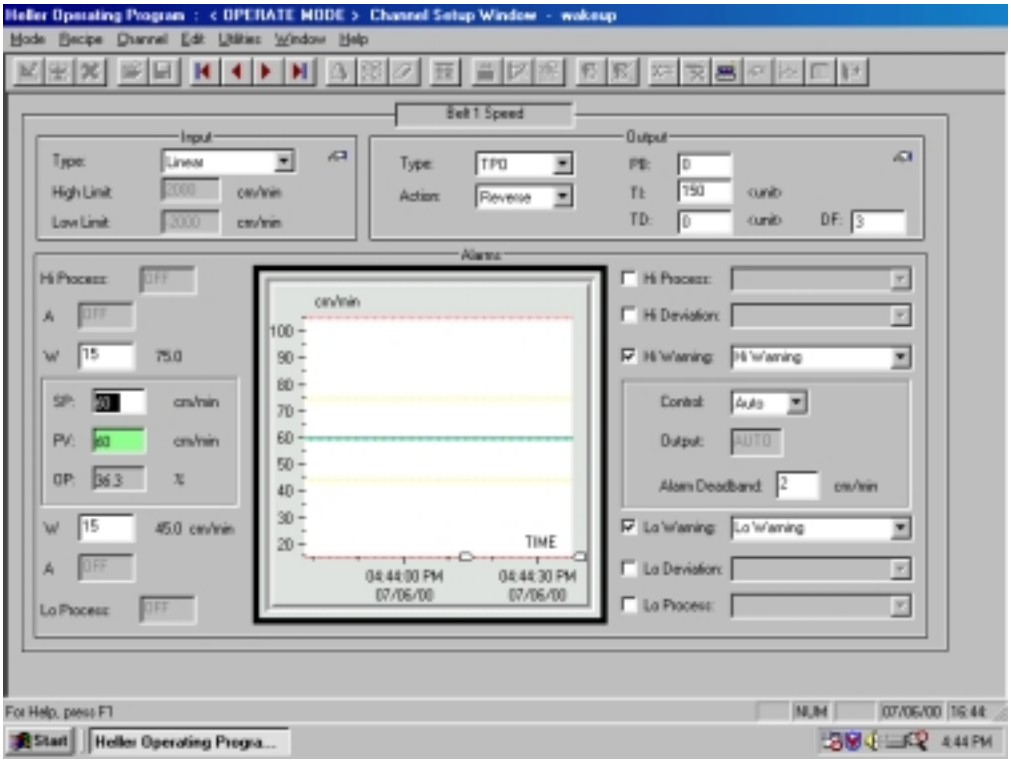

Connect the calibrator to the channel and check the following voltages:

| | |
|---|---|
| 1.611 mV | 40°C |
| 13.039 mV | 320°C |
| 25.964 mV | 625°C |
| 40.918 mV | 991°C |
| 51.025 mV | 1261°C |

If the readings are within the above ranges, then the controller is within calibration. If the controller is out of range by more than ± 3.6°C, contact the factory so arrangements can be made to have the controller calibrated.

## C. Verifying Calibration of Belt Speed

Belt speed channel of the analogic controller is the channel dedicated to the control of the belt speed. It may be calibrated easily. Choose Channel setup from Window menu, select Belt speed channel. Adjust the setpoint of the belt to 60 cm/minute. Using a tape measure and a stopwatch, time the conveyor over a 60-cm distance and note the time. If the conveyor is off by more than ±2% (1.2 cm), see section VI (EHC/MESH BELT motor controller adjustment) in operating guide section and also check the system setup wizard section in operating system software guide section.




## X. EHC/MESH BELT Motor Controller Adjustments

This section specifies the procedure for the calibration of the oven EHC/mesh belt transport system motor controller located on the electrical panel. (CP # 4491)

The calibration procedure should be performed after the oven has been powered and computer control of the EHC/mesh belt transport system has been established.

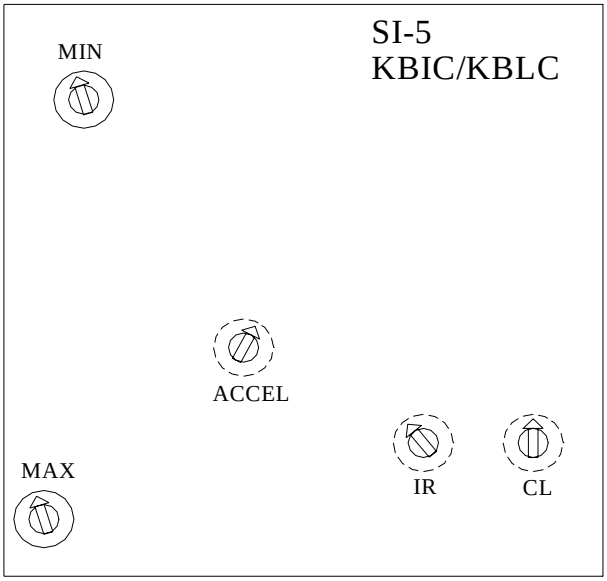
The calibration should be performed in the following order:

1. MIN speed trimpot adjustments.

2. MAX speed trimpot adjustments.

3. Current Limit adjustment.

Before starting any adjustment, check that the “ACCEL” trimpot on the controller is set at 9 o’clock position and “IR” trimpot is set at 11 o’clock position (**See Figure 10**).




MOTOR SPEED CONTROLLER

Figure 10

## VII. MIN Speed Adjustment.

A. Adjust both the MAX and MIN trimpot to the max. Setting (Full CW) and adjust the current limit trimpot (CL) to the middle of its adjustment range (12 o'clock position).
B. Set the Edge Hold Width to a sample board width. (Profile board, Edge Width board, etc…)
C. Make sure the Motor Controller is powered on.
D. In the software application program, set the computer control speed setting to 0 cm/min. (0% power).
E. Observe the transport system and note any movement of the system.
F. If the transport system is moving, slowly adjust the MIN trimpot CCW until the transport system stops.
G. In the software application program, set the computer control speed setting to 19 cm/min. (~10% power).
H. Observe the transport system and check for movement of the system.
I. If the transport system is not moving, slowly adjust the MIN trimpot CW until the transport system starts moving.
J. Repeat the above steps as necessary.

## VIII. MAX Speed Adjustment.

This calibration should be done ONLY AFTER the MIN speed adjustment has been completed.

K. In the software application program, set the belt speed setpoint to 188 cm/min. Adjust MAX trimpot for PV = 188 and OP = 100% slowly. Adjust MAX trimpot CW (to increase speed or decrease OP %) or CCW (to decrease speed or increase OP %) accordingly.
L. Place the sample board on the EHC/Mesh Belt and using any reference mark, time the board speed. Compare the calculated speed (distance/time) in cm/min. to the computer setting. (± 1.2 sec tolerance)
M. If calculated speed is not 188 cm/min (equal to PV), check belt speed control parameter in Heller system setup wizard page 4.
N. If calculated belt speed is less than 188 cm/min and MAX trimpot is on maximum setting then change the motor speed controller.

After setting MIN and MAX trimpot set the belt speed setpoint = 90 cm/min and observe OP %. It should be around 48 %. If it is not then adjust the MIN and MAX setting again.

After completing the speed adjustments, test the transport system at different speeds and compare the calculated value to the computer setting.

IX. Current Limit Adjustment. (Applies **only** for **clutchless** operation system)

This calibration should be done ONLY AFTER the MAX and MIN speed adjustments have been completed. The desired threshold for the transport is 25 to 50 in-lbs. of force. This is the force required to cause the transport motor controller to stop (current limit) the mesh belt.

O. In the software application program, set the computer control speed setting to 90 cm/min. (50% power).
P. For mesh belt transport systems, place the "fish scale" hook on the mesh belt and hold the handle end of the scale in a stationary position. (For non-mesh belt transport systems, consult the oven Supervisor.)
Q. Note the reading on the scale when the mesh belt transports system stalls/stops. (Caution: Release the scale if the reading exceeds the range of the scale.)
R. If the transport system stops with a scale reading more than 50 in-lbs., reduce the current limit threshold by turning the trimpot CCW.
S. If the scale reading is less than 25 in-lbs., increase the threshold by turning the trimpot CW.
T. Repeat steps B through E until the scale reading is between 35 and 40 in-lbs. for the 90-cm/min belt speed setting.

After completing the current limit adjustment, test the transport system at different speeds and check if the scale reading falls within the 25 to 50 in-lbs. ranges.

## PROFILING

Affix one of the thermocouples to the point on the circuit board assembly that normally will come up to temperature most slowly. This point could be the leads of a PLCC, QFP, or BGA. First, remove the solder from the joints of several leads on the component to be thermocoupled and resolder them with high melt point alloy. It is necessary to remove the existing solder to avoid diluting the high temperature solder and reducing its melting point. Then attach the thermocouple junction to these leads using the high temperature solder.

Solder the second thermocouple in a location that will usually be the hottest. This hot spot will normally be in an unpopulated bare section at the corner of the board. Avoid placing two thermocouple junctions on the same circuit path, as they may interfere with each other.

Use as little solder as possible when attaching thermocouples to component and board to minimize change to local thermal mass that can effect the accuracy and response time of the thermocouple.

Tape the thermocouples to the board to avoid stress at the joints during handling and dress the thermocouple wires into a neat pigtail to prevent tangling in the conveyor belt.

Place the board on the conveyor and fasten it in place with a suitable clip so that the board will not slip on the belt. If a thermocouple junction is located on a trace, this trace must be isolated from the machine ground.

By properly setting the temperature in each zone and the conveyor speed, the desired results can be attained. Please refer to "KIC software guide" section for instructions on running the profile.

It is not necessary to profile every assembly before production. The Heller reflow systems are very forgiving and have wide process latitude. Boards with similar size and density to others that have been programmed will often be able to use the same profile without any changes to the setpoints.

Sometimes a change in belt speed is all that is needed for different PCB's unless there is a radical difference in assembly density. The existence of heavy ground planes or heat sinks in multi-layer PCB's may require refining of profiles.

Correct profiling depends on board configuration, throughput requirements and solder paste. Consult the solder paste manufacturer's recommendations for ramp-up rates, activation temperature, reflow time and reflow temperatures. Heller ovens have been used successfully with a wide variety of solder pastes including the new generation of "no clean" pastes.

Ideally the maximum differential between the highest and lowest temperature on the circuit board should be less than 20°C, the hottest spot should be less than 40°C above the solder melting temperature and the lowest temperature should be greater than 15°C above the solder melting temperature.

In general, it is possible to set up one generic profile and vary the belt speed to obtain acceptable results with different types of board assemblies. Boards that are predominately populated with small resistor or capacitor chips may be run at a faster rate than boards densely populated with large PLCC's. Belt speeds for all boards must be determined experimentally. {Factory set belt speeds are 1500 model 23.6 in/minute (60 cm/minute), 1700 model 27.6 in/minute (70 cm/minute), 1800 model 35.4 in/minute (90 cm/minute), and 1900 model 47.2 in/minute (120 cm/minute)}

Good starting points for setting temperature are as follows:

| 1500 | 1700 | Temperature |
|---|---|---|
| Zone 1 | Zones 1 & 4 | 150-180°C |
| | Zones 2 & 3 | 150-180°C |
| Zones 2, 3 & 4 | Zone 5 | 180-200°C |
| Zone 5 | Zone 6 | 250-300°C |
| | | |
| 1800 | | Temperature |
| Zones 1 & 2 | | 180-200°C |
| Zones 3, 4, 5 & 6 | | 150-180°C |
| Zone 7 | | 200-250°C |
| Zone 8 | | 250-300°C |

| 1809 | | Temperature |
|---|---|---|
| Zones 1, 4, 5, 6 & 7 | | 150-180°C |
| Zones 2 & 3 | | 180-200°C |
| Zone 8 | | 200-250°C |
| Zone 9 | | 250-300°C |
| 1900 | | Temperature |
| Zones 1, 2, 7 & 8 | | 150-180°C |
| Zones 3, 4, 5 & 6 | | 150-180°C |
| Zones 9 & 10 | | 180-200°C |
| Zones 11 & 12 | | 250-300°C |

Typically, top and bottom zones are set to the same temperature. Experimentation will determine the best setting for each type of board assembly.

The board should be heated in the preheat and dwell section to approximately the paste flux activation temperature. The ramp-up rate should be between 1-2°C/second. If solder balls are encountered, review the quality and amount of solder paste deposited and the heating rates. An excessive amount or old solder paste and excessive temperature ramp-up rates promote solder balling.

Reflow time should range from 30 seconds to 1 minute.

Use a fine gauge K-type thermocouple wire with high temperature insulation for all profiling. We recommend: **GG-K-36 WIRE**

Purchase from: **OMEGA ENGINEERING, INC.**
**P.O. BOX 4047**
**STAMFORD, CT 06907-0047**
**(203) 359-1660**

K-type thermocouples with properly welded junctions and plug terminations are available from Heller Industries. Please state the machine model being used when ordering these assemblies to insure the proper length thermocouples are supplied.

## XI. PM Schedule

Bi-Weekly Basis

| Procedure: | OEM Manual References (if any): |
|---|---|
| Change flux filter & clean filter compartment. (See note- 2 & 4) | |

Monthly Basis

| Procedure: | OEM Manual References (if any): |
|---|---|
| Lubricate square shaft with light oil. | |
| Check mesh belt for expansion or tension. | |
| Lubricate edge hold chain, rails, and CBS chain (If applicable) (See note 1). | |
| Check alignment of edge hold conveyor. | |
| Clean exhaust ducting. (see note 4) | |
| Vacuum dust and lint out of all blowers and external muffin fans. | |
| Clean Thompson rods with alcohol (if applicable) and apply light oil. | |
| Clean lead screws of any debris (If applicable). | |
| Clean edge hold conveyor (EHC) sprockets of any debris accumulation and lubricate with light oil. | |
| Clean exterior of machine and any grease or oil that may be deposited by the autolube system onto the entrance and exit conveyor panels (If applicable). | |
| Wipe down painted surface of the machine with Fantastic or 409 cleaner (or equivalent). | |

3 Month Intervals

| Procedure: | OEM Manual References (if any): |
|---|---|
| Clean flux accumulation compartment. (See note 3 & 4) | |

6 Month Intervals

| Procedure: | OEM Manual References (if any): |
|---|---|
| Verify operation of battery backup unit (If applicable). | Refer to “operation” section in “Liebert” battery backup manual. |
| Verify calibration of oxygen analyzer. | Refer to Dansensor manual section # 6. |
| Visually check for worn sprockets on edge hold conveyor system. | |

Annual Basis

| Procedure: | OEM Manual References (if any): |
|---|---|
| Lubricate edge hold conveyor width adjust drive chain (If applicable). | |
| Lubricate edge hold conveyor drive chains (If applicable). | |
| Vacuum dust out of inside of machine. | |
| Replace Gas Spring (At entrance and exit). | |

**NOTES:**

1. Label each chain for the specific rail from which it was removed. Roll chain up in a “pyramid” shape (see figure 5) and secure the ends so that it does not come loose. BAKE chain at 400°C for 2 hrs.
2. This schedule is for a machine, which is operating 8 hours a day, 5 days a week.
3. Remove the 10-screws from the back of the flux filter box (see figure 6) and clean out the tray. Clean the inside of the compartment using Alpha (Heller Part Number 2110) Flux Cleaner and a clean rag. Replace the cover and verify the integrity of the O-Ring. After securing the cover, seal the contact perimeter with a thin film of RTV.
4. Do not start oven until all the cleaning solvent and vapors have been evacuated from inside of the oven. Run Wakeup Job with hood open for 20 minutes.

Figure 5

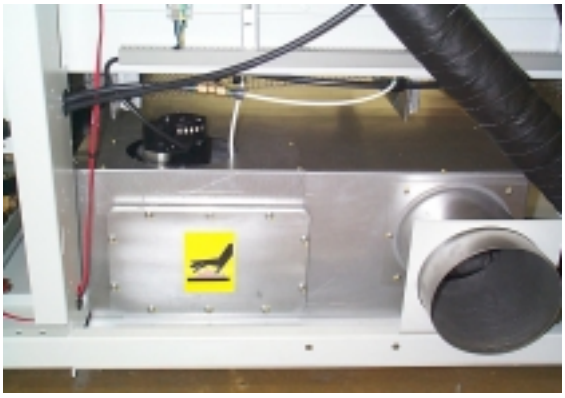


Figure 6

## XIII. Flux Filtration Option:

THEORY OF OPERATION

As an option, your oven may be equipped with a flux filtration system. This system filters out flux particles from within the oven, preventing them from accumulating inside the cooling modules in the cool zone. This allows for a simple filter change to service the system and lowers the frequency at which the cooling module must be removed from the cooling zone for cleaning. The system functions by drawing the flux gases through an exhaust mounted between the reflow and cooling modules in the oven. A two-stage filter system, consisting of a cyclonic separator as well as fiberglass filter, removes most of the flux particles from the atmosphere before returning it to the oven.

SYSTEM COMPONENTS (**See Figure 5 & 6**)

(I) EXHAUST STACK between REFLOW and FIRST COOL ZONE.

(J) BLOWER EXHAUST BOX above EXHAUST STACK.

(K) A three-inch diameter (3") [7.62-cm] INSULATED EXHAUST TUBE.

(L) TWO two-inch diameters (2") [5.08-cm] RETURN TUBES.

(M) CYCLONIC SEPARATOR - located inside flux filtration unit.

(N) FIBERGLASS FILTER - located inside flux filtration unit.

(O) ROTRON COOLING FAN – located on base of the oven.

(P) FLUX COLLECTION TRAY – located below cyclonic separator compartment.

FUNCTION OF COMPONENTS:

- Flux laden gas from oven is exhausted through exhaust stack (A) via flux box blower above exhaust stack (B).
- The flux box transfers the flux-laden gas via 3-inch diameter insulated tubing (C) to cyclonic separator (E).
- Some flux will accumulate in a collection tray at the bottom of the cyclonic separator blower housing (H).
- Gas then passes through the filter (F), which is located on the inside of the sealed flux filter unit. The unit is then cooled by the two external rotron fans (G).
- Clean cooled gas returns to the first cool zone via the two 2-inch diameter tubes (D).

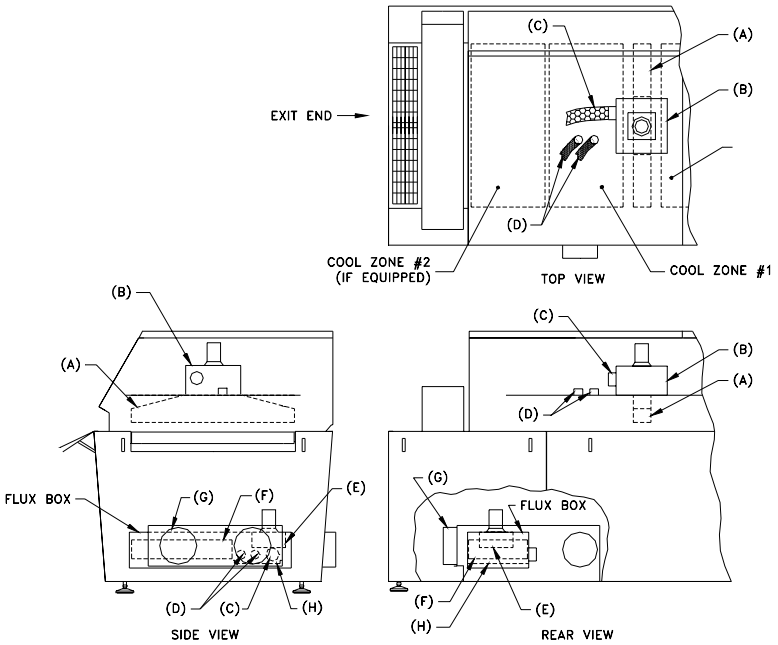



Figure 5

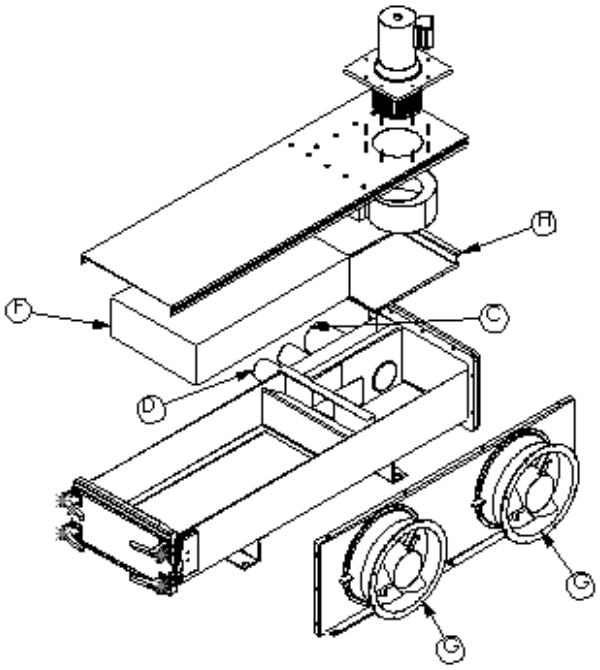
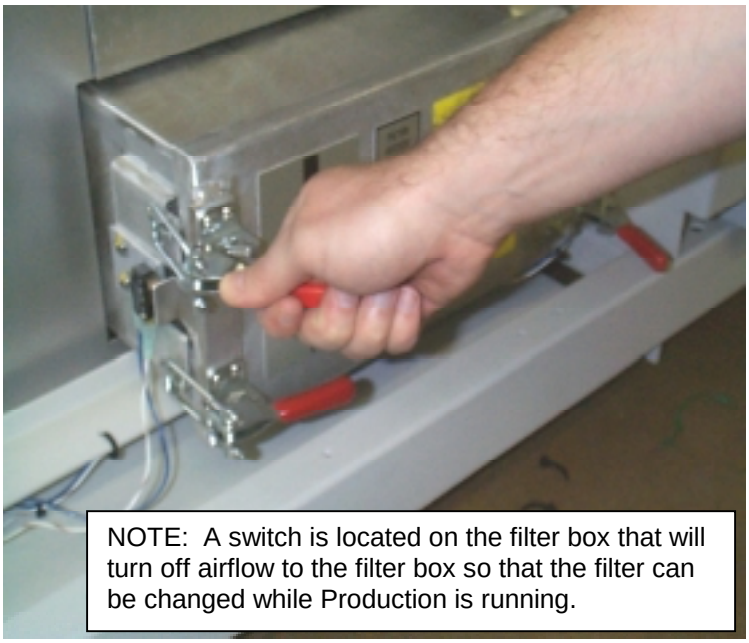



Figure 6

## A. Flux Maintenance Gen. IV Flux System

### Gen IV Flux System: Flux Filter Replacement

1. In the setup wizard, set time for filter replacement. (360 hrs. recommended).
2. Replace filter every 360 hours. Filter life will depend on amount of flux, profile temperature and type of flux.
3. An optional "filter replacement" light is available. This will flash when oven has been in operation for 360 hours.



NOTE: A switch is located on the filter box that will turn off airflow to the filter box so that the filter can be changed while Production is running.

## B. Gen IV Flux System: Inside the Tunnel

The system is designed so that the majority of flux is deposited on the filter. However, depending on cooling temperature and profile temperature, some flux will be deposited in the tunnel.
A non-flammable cleaning agent (such as Alpha Saponifier (Part Number 2110)) is recommended.

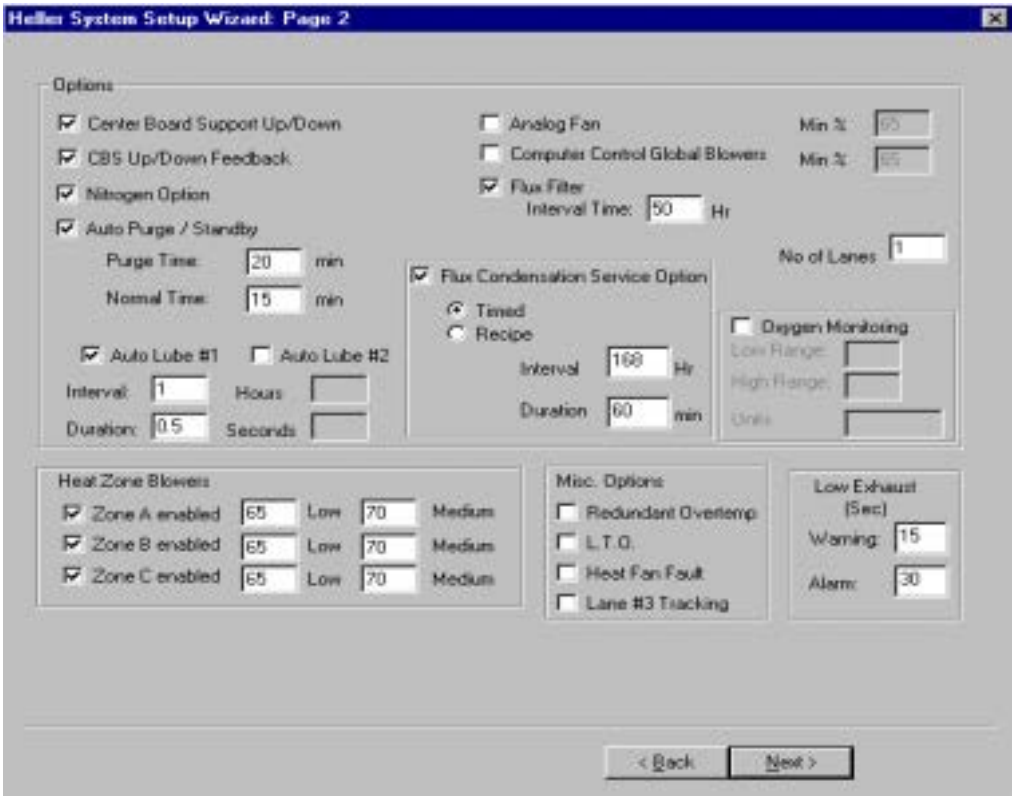
## C. Gen IV Flux System: Exhaust Hoses

Check entrance and exit exhaust hoses yearly. It is easier and more cost effective to replace the inexpensive corrugated hose rather than cleaning the corrugated hose.

## D. Flux Maintenance Gen. V Flux System

**To set up the Self-Cleaning function in the Software using the "TIMED" function. This will enable the self-cleaning function to come on for 60 minutes every 168 hours. Use this function for AIR Ovens only.**

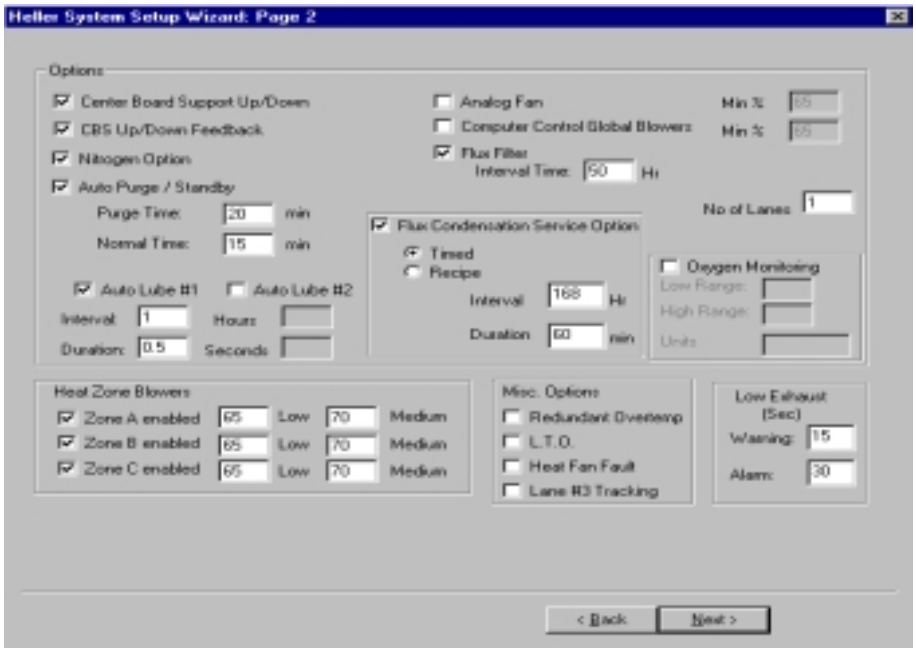
Note: 168 hours represents 24 hours a day, 7 days per week production time. The actual interval and duration times will depend on the number of boards processed, the amount of solder paste on the boards and the amount and type of flux used in the solder paste. Adjust the interval and duration time to suit your specific requirements.



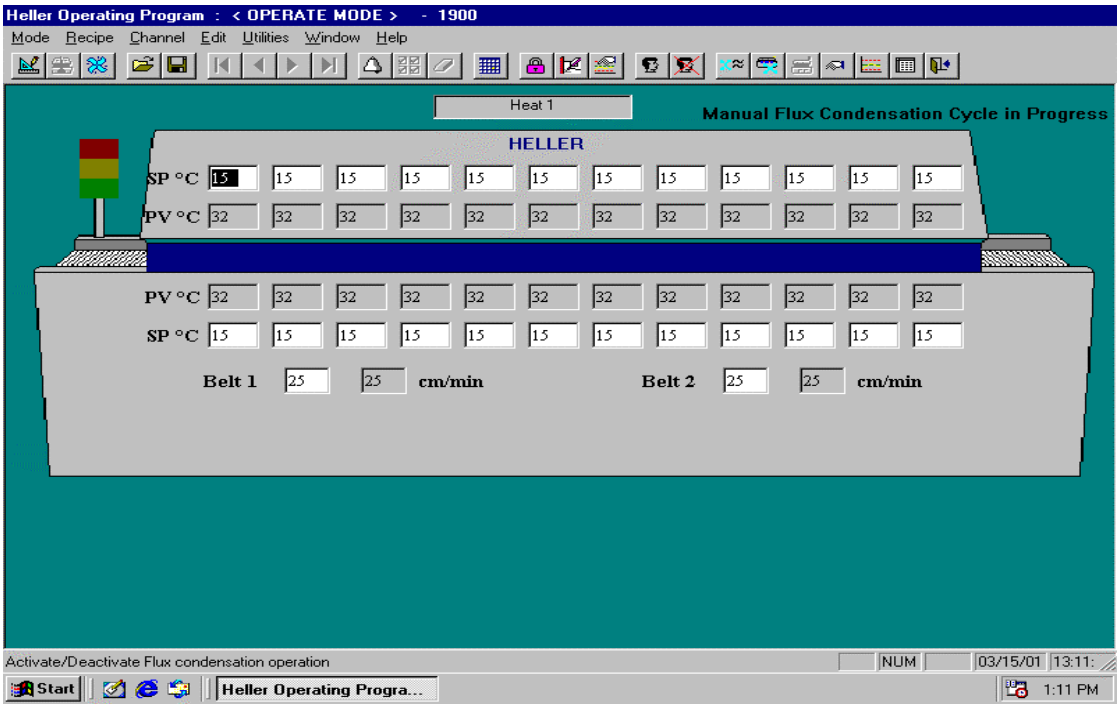

1. From the program menu, Heller Workstation selects Heller System Setup Wizard.
2. Go to the "Heller system setup wizard: page 2".
3. Make sure the "flux condensation service option" is selected by putting a check in the box.
4. In the "interval" box enter 168 hours.
5. In the "duration" box enter 60 minutes.
6. This function will be ON and OFF automatic for the pre-selected interval and duration time.
7. Make sure the temperature of reflow zone and cool zone are 260C and 140C respectively while running refresh cycle. For this function above zones must be at least 260C and 140C. If processing jobs is less then 260C and 140C for above zones then timed method should not be used, see section F. (page 118) for manual procedure with above temperatures and is to be used during a schedule shutdown.

## E. To set up the Self Cleaning Function in the Software Using the "RECIPE" Function

1. From the program menu, Heller Workstation selects Heller System Setup Wizard.

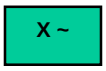



2. Go to the "Heller system setup wizard: page 2"
3. Make sure the "flux condensation service option" is selected by putting a check in the box.
4. Select Recipe function (NITRO Ovens only), the interval time will be voided for this function.
5. Create a recipe named "autoclean.job" for desired High temperature set point (reflow zone and cooling zone temperatures should be 260C and 140C respectively).
6. Load the recipe named autoclean.job. Oven must operate for at least 60 min after green light and this should be done in schedule shutdown. After one hour either load cool down or load desired production job to resume oven in to production.



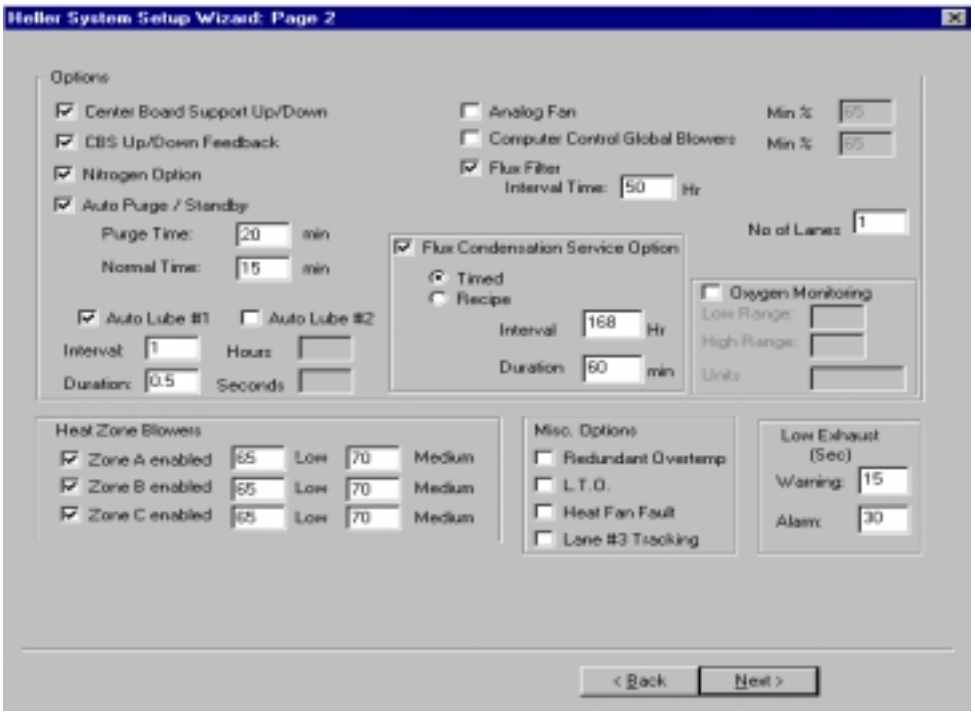
## F. Gen V Flux System

A manual over-ride may be used to operate the self-cleaning function under both Timed and Recipe function. To use this function, all zones MUST be at high temperature. (All zones must be green).

- From the toolbar of the main over view screen, depress the 

icon.

- The self cleaning option will run for the amount of time indicated in the 'duration: time' listed on the "flux condensation service option" and it will reset the interval time in the setup wizard.




**Options:**
Center Board Support Up/Down
Nitrogen Option (Computer Control $N_2$ On/Off)
Auto Purge / Standby
Purge Time: 20 min, Normal Time: 15 min.
Auto lube
Interval Time: 1 Hrs, Duration Time: 0.5 sec.
Analog Fan (for optional cooling control w/o heater in cool zone)
Computer Control Global blowers
Flux Filter (with service indication option)
Interval Time: 50 Hrs.
Flux Condensation Service Option: Timed or Recipe
Timed – Interval: 168 Hrs, Duration: 60 min
Recipe – Crease AUTOCLEAN.JOB, Duration: 60 min.
Heat Zone Blowers: (High, Medium or Low control),
Enable Blower 1, 2, 3 accordingly
Redundant Overtemp (Bi-metallic switches)
Heat Fan Fault (Blower Failure)
L.T.O. – for Sony light tower operation
New job: flashing green; OK: stable green; Warning: yellow;
Alarm, board drop, board stop: flashing red

## G. To Remove the Accumulated Flux from the Gen V Flux Collection System:

1. Power down the oven.
2. Open the rear top covers.
3. Using a screwdriver, remove the 4 large knurled screws (two in the front and two in the back) of the Flux Condensation Cooling Assembly, and remove the cover. This will expose the Condensation Basin.

4. If your flux system has optional collection trays, remove them individually and clean them by removing the flux with only APPROVED cleaners.
5. If your flux system does not have optional collection trays, clean the bottom of the condensation collection basin using only approved cleaners.

Caution: Ensure that all cleaner vapors have evaporated prior to covering the flux condensation cooling assembly.

- Reinstall cover to the condensation cooling assembly.

## XIII. Flux Separation

### CHANGING THE FILTER

NOTE 1: The Filter will be approximately 100° C, wear gloves when handling.
NOTE 2: If nitrogen is in use, PPM level will be momentarily effected by an “on the fly” filter change.

- Remove second panel from exit, front end of oven.
- Open Flux Filter Unit Door by retracting the four clamps.
- The filter can be serviced while machine is operating.
- The Micro-switch shuts down the filter operation when flux box door is opened.
- Replace Filter. (Remember to position filter with the arrow facing in the direction indicated on the filter-box cover).

Filter Replacement is dependent on the volume and duration of production that the oven experiences. The following Graph gives baseline figures for the frequency at which the filter should be replaced.

To arrive at a definitive value for how often the filter should be changed, the Person(s) in charge of the oven should monitor the number of hours that production is run, and the color of the filter. The filter usually starts out white in color, and as production is run, the color progresses to amber or brown as flux is filtered. (The color is dependent on the Flux/Paste used). A medium to dark amber, or brown color, indicates that flux accumulation has reached the level for a filter change to occur.

## CLEANING FLUX COLLECTION TRAY

NOTE 3: The door is sealed with an O-Ring, take care not to damage the o-ring with sharp tools.

- Cool down the oven and initiate proper facility power lockout procedure.
- Remove the two panels at the exit rear of the oven.
- Unbolt the (10) ¼ x 20 Socket Head Cap Screws.
- Relief is provided in access door so that it can be gently pried off if held by flux.
- Remove flux collection tray and scrape out accumulated flux residue.

TIP 1: Use ∝- type saponifier(part # 2110), or other similar chemical agent, to clean the interior of the unit and the flux collection tray. Cleaning the unit while the interior is still warm (approximately 60° C) is recommended. Flux will tend to remain soft and is easier to scrape out and eliminate at this temperature.

TIP 2: Lining the flux collection Tray with aluminum foil before replacing it makes the future maintenance of the next flux collection tray easier.

May 2002

# Warranty

## Reflow Ovens

All Heller Industries' Reflow Ovens and Spare Parts are warranted to be free from defects in material and workmanship to the original purchaser as follows:

- The basic system and controls, excluding heaters, blowers and special systems manufactured by others and installed on the equipment are warranted for **one year** from the date of shipment.
- All heaters and blowers operating up to 350°C Maximum have a **lifetime guarantee** from the date of shipment.
- All heaters and blowers operating up to 400°C Maximum have a **three year guarantee** from the date of shipment.
- The warranty on special systems manufactured by others and installed on the equipment (such as auxiliary profilers or oxygen monitors) are as specified by the manufacturer of such devices and are passed along to the original purchaser of the Heller products.
- The warranty covers all labor for **three months** from the date of installation and parts and material thereafter for the balance of the warranty period.
- All Spare Parts are warranted for 90 days from the date of shipment.

Heller Industry's obligation under this warranty is limited to the free replacement or repair, at our option, of such parts as determined by the manufacturer upon inspection to have been defective.

This warranty becomes void under the following conditions:

1. When the equipment is abused or not used or maintained in accordance with instruction manuals.
2. When performance is attempted that exceeds specifications.
3. When machine is serviced, adjusted or modified by unauthorized agencies in a manner contrary to the methods specified in the instruction manual.
4. When the machine is used to process circuit boards containing highly active or corrosive fluxes, chemicals or material or when the machine is operated in a corrosive environment.
5. When nominal input voltage or frequency varies from that which is specified on nameplates.

Defective parts or equipment returned to the factory for inspection, analysis or service should be carefully packaged and shipped ***Prepaid*** to Heller Industries, Inc. Timely notice and symptoms of problems must be forwarded to our service department before any product may be returned for service. A "Return Material Authorization" should also be secured from the Heller Sales or Service department before returning the product to expedite handling and service during or after the warranty period.

No other warranties, expressed or implied, including liability for consequential damages are made herein; nor may terms of this warranty be modified without factory consent in writing.

HELLER

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