



Materials, Chemicals, Automation

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**Tool Interface Suite and Instrument Datalogger**  
**Version 1.2**  
**March 1999**

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## Introduction

This program interfaces and monitors the following laboratory instruments: ESPEC ETS, ESPEC TSB, ESPEC EY-101, ESPEC HAST, and Heraeus Ovens. Other instruments may be programmed upon an individual agreement with Durability, Inc. This program transmits all data to a text file for review and post processing.

This manual does not replace the operating manuals for the specific devices. The user must be familiar with stand-alone operation of each chamber to effectively implement control from the Tool Suite.

The installation instructions follow and then the sections are organized by user interface panel.

## Installation Instructions

This distribution copy will work under Windows 95/98 and NT. A complementary trial CD may be obtained from contacting Durability, Inc. toll free at 877-Durability or by email at [info@Durability.com](mailto:info@Durability.com). The software may be ported to a different platform through discussions with Durability, Inc.

This CD has three directories. One is a run time version that may run directly from the CD. The other is an installation directory to install the Tool Suite software on a local hard drive. The last directory contains the interface files provided from National Instruments.

The user must first install NI-VISA from the National Instruments Directory. NI-VISA 2.0 should be unzipped itself and installed per its directions. This is distributed by National Instruments as a complementary download on their web site [www.natinst.com](http://www.natinst.com). It is packaged here for convenience.

If a GPIB controller is used the appropriate software needs to be installed for this controller. This software has only been tested using National Instruments hardware and may not function properly with other vendor's controllers. National Instruments GPIB software can be found on their web site [www.natinist.com](http://www.natinist.com) under the links to download software. Select the appropriate operating system version, download and install the proper drivers.

After the preliminary software has been properly installed, one may either run the Tool Suite from the CD, or install the software on a local hard drive and run the Tool Suite.

### Run Time Directory

Tool Suite.exe	The run time Tool Interface Suite and Instrument Datalogger.
Tool Suite.lcn	The encrypted license information provided by Durability, Inc. Trial versions have expiration dates. Purchased versions do not expire.
Serpdrv	A necessary file for serial communications.
Tool Suite Manual	The current file being viewed.

### Installation Directory

Setup.exe	The installation program for Tool Suite.
Data.00n	The compressed installation files.

### National Instruments

NIVisa20.zip	A zipped file containing NI-VISA software and necessary dynamic link libraries. It may also be located at <a href="http://www.natinist.com">www.natinist.com</a> .
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## Primary Panel: Tool Interface Suite and Instrument Datalogger

The main interface panel that is displayed while running the Tool Suite is in Figure 1. It becomes active after the setup routines in the beginning of execution. The number of licensed tools varies based on the licensing agreement.

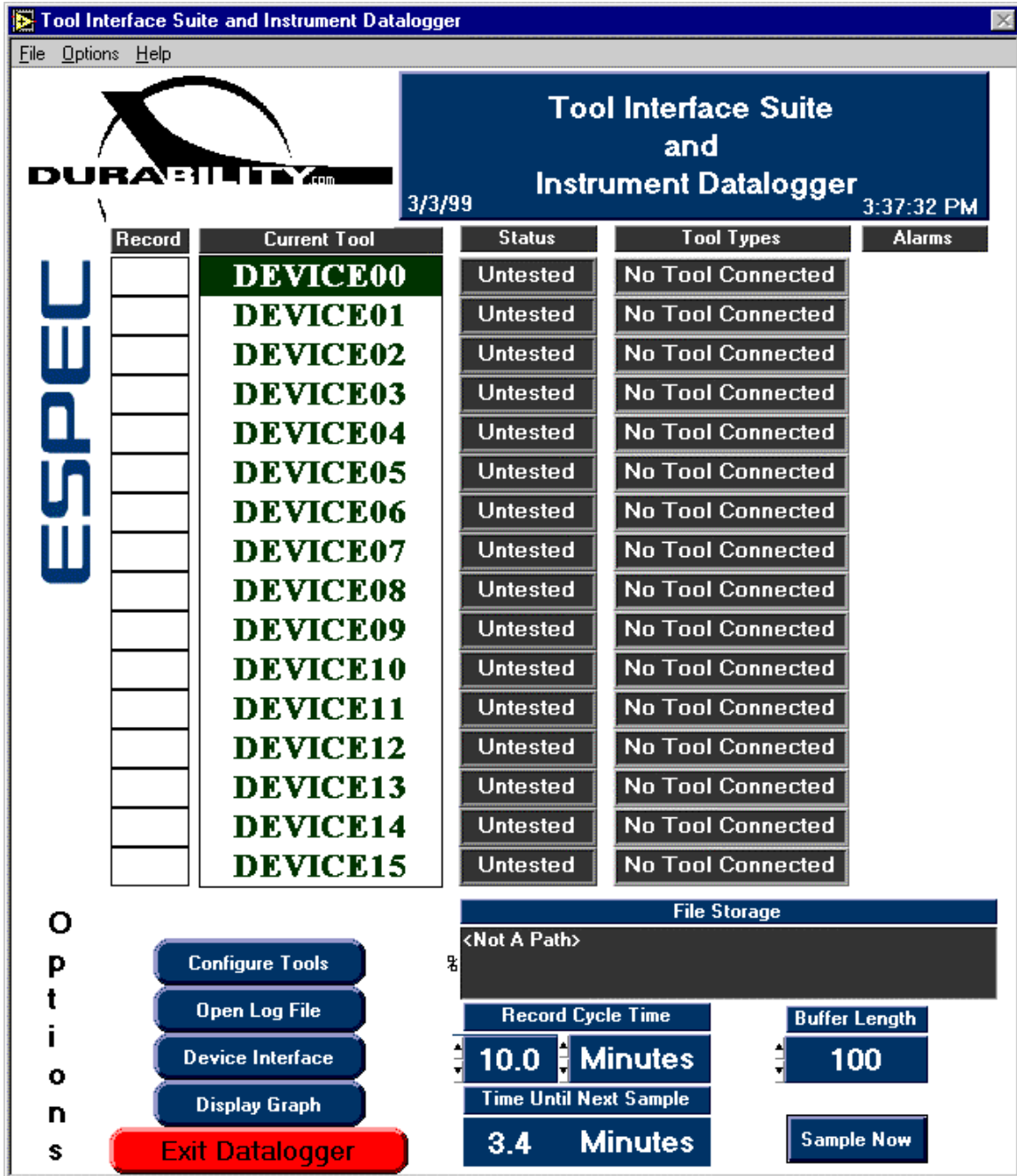


Figure 1: Primary Panel

The current computer date and time are shown in the upper panel and should be confirmed for correctness since this is the time stamp used in the file. The time and logo should continue to update as the program runs to indicate the system responsiveness.

#### Configure Tools (Alt-O,C or Ctrl-C)

The system configuration is set using the Configure Tools command. This moves to an additional panel for setting up the hardware parameters. The details of the configuration panel are described under its own section.

#### Open Log File (Alt-F,O or Ctrl-O)

This allows the user to enter a text comment for the ASCII file header and select the file storage location.

#### Close Log File (Alt-F,C or Ctrl-W)

This closes the current log file.

#### Device Interface (Alt-O,D, or Ctrl-D)

This opens the interface panel for the currently selected tool. All programmable features are accessed through these panels. Each chamber has its panels described later.

#### Display Graph (Alt-O,G, or Ctrl-G)

This toggles the display graph for the current tool. Current tools are changed on the front panel, with a small delay for the display graph.

#### Clear Alarms (Alt-O,A, or Ctrl-A)

This clears the currently displayed alarm conditions. These alarm conditions are defined by the individual instruments.

#### Help (Alt-H,H or Ctrl-H)

This toggles the help display. This may be turned on for context sensitive help by moving the cursor to the item in question.

#### About (Alt-H,A)

This display the current software version and contact information.

#### Record Buttons

These buttons enable recording for a particular chamber. An X indicates that the channel is being recorded.

#### Current Tool

This displays the names and allows selection of a tool for interfacing and graphing.

#### Status

Untested/Passed/Failed/Recording

#### Tool Type

Displays the connected tool.

#### Alarm

This displays an indicator with the alarm code that can be found in the error list.

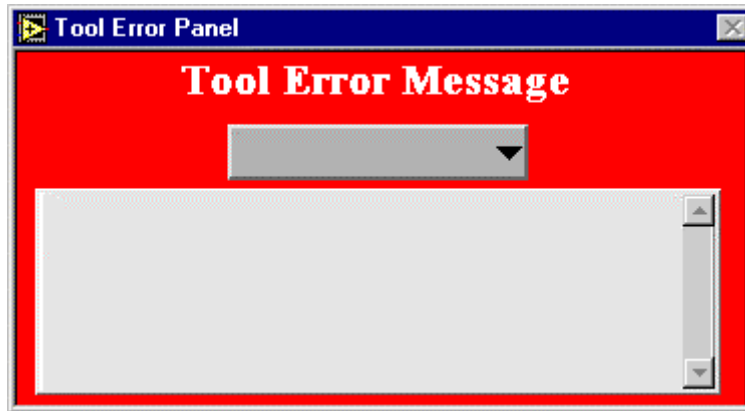
The record cycle time, located on the bottom right, controls the sample recording frequency during error free operation. When the countdown timer reaches zero it will read each instrument and record the available data. All chambers are always being scanned to check for alarm conditions and to update the screen display condition. Alarms are reported as soon as notified and the counter is reset. The screen displays the current temperature or chamber operation setting in the tool icon. "Record Now" overrides the timer and sends the current readings to storage.

Alarms indicate errors that have occurred at the chamber that the tool has successfully communicated to the program. In the case of communication errors, both an alarm and a COM ERR field will appear. The COM ERR indicates that no communication is available with the chamber. In this event a Tool Error Panel

will be displayed and the user can view the associated errors. If this happens the hardware connections and chamber power should be checked.

### ***Tool Error Panel***

This panel activates when any individual tool has an error. It has a list of tools and their error is shown in the description box.



**Figure 2: Tool Error Panel**



## Tool Configuration

This panel allows the user to set up the tool communication parameters. The specified tool hardware manuals should be consulted for the parameters for setting up new tools.

This routine first checks for the existence of a default file: “*Default Tool Configurations.cfg*” If this file exists it is always loaded into memory. If not, a dialog box will allow selection of the configuration file. If this is a new file, the internal defaults will be assigned and a new configuration file created.

This routine confirms all connected tools are as specified. It will not allow the user to exit unless all tools either pass the identification or are specified as “No Tool Connected”.

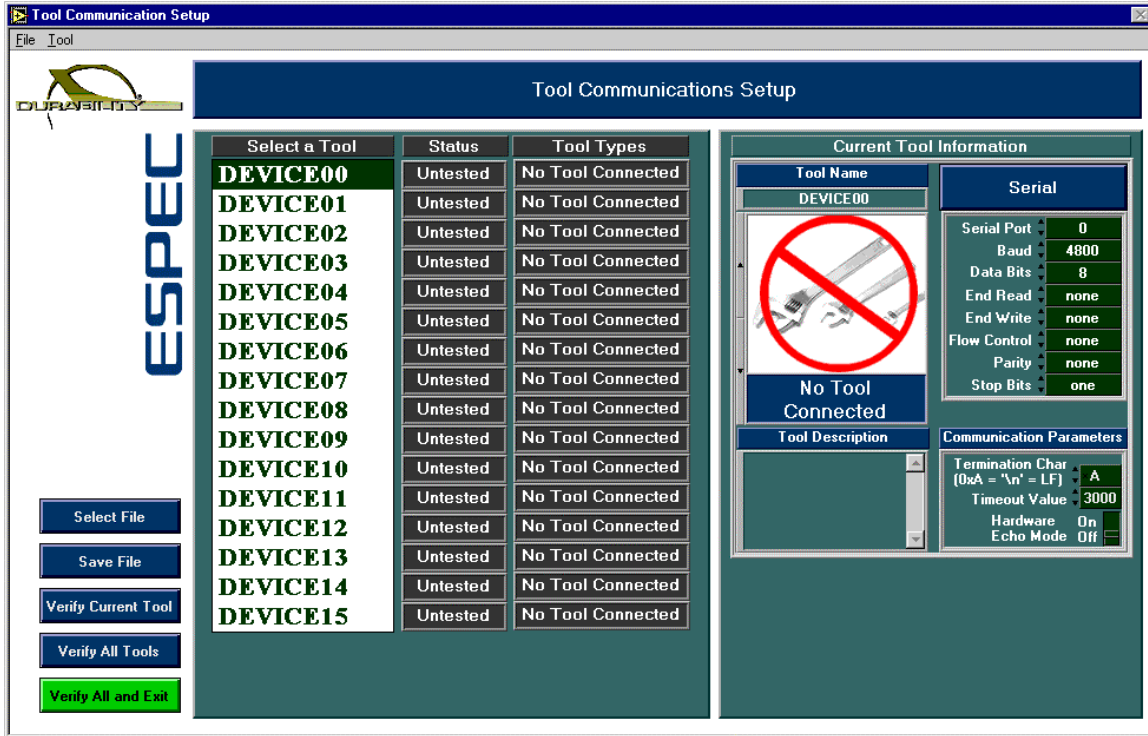


Figure 3: Tool Communication Setup Panel

## Display Data:

Select a Tool: Allows the user to examine different tool's parameters off to the right. Up to sixteen tools may be configured with this program.

### Status:

Untested	No verification has yet been done with this tool
Failed	Tool failed the initialization routine. See error screen under specified tool.
Passed	Tool passed the initialization routine.
Recording	Tool is currently set as recording from the primary panel. No changes can be made.

Tool Type: See below for selection.

### Current Tool Information

Tool Name: The tool name (up to eight characters) will be displayed on the primary panel for identification.

### Tool Type:

No Tool Connected  
ESPEC EY-101  
ESPEC HAST  
ESPEC ETS  
ESPEC TSB  
Heraeus Oven 6000  
DEMO EY-101

Tool Description: Text description of the tool for the user's information.

### Serial or GPIB

Communication: This switch toggles the communication standard.

[Serial] Serial Port	COM port number
[Serial] Baud	Baud rate setting
[Serial] Data Bits	Number of data bits
[Serial] End Read	None   Last Bit   Termination Character
[Serial] End Write	None   List Bit   Break
[Serial] Flow Control	None   X-On/X-Off   RTS/CTS
[Serial] Parity	None   Odd   Even   Mark   Space
[Serial] Stop Bits	Number of stop bits
[GPIB] GPIB Port	GPIB port number
[GPIB] Primary Address	GPIB primary address

### Communication

Parameters: Communication parameters used for both standards.

Termination Character	Hexadecimal code for the termination character.
Timeout Value	Millisecond timeout value.
Hardware Echo Mode	Set based on the hardware echo setting. Most devices should be configured without hardware echo.

## Commands:

Select File Allows selection of a new configuration file, disabled if there are any actively recording channels.

Save File Saves the current configuration parameters. Parameter changes must be saved explicitly.

Verify Current Tool Confirms the currently selected tool.

Verify All Tools Confirms all configured tools.

Verify All and Exit Confirms all configured tools and exits the configuration panel.

Select Next Tool Moves the active tool to the next tool on the list.

Select Previous Tool Moves the active tool to the previous tool on the list.

### ***Initialize Tools***

This panel comes up while each instrument's identification is tested.



**Figure 4: Initializing Tools Panel**

## ESPEC ETS Interface

This panel allows the user to interface directly with the ETS controller. From this panel the user may implement many commands as if at the instrument itself. See the following manuals for chamber operation and programming details: ESPEC Thermal Shock Chamber Air-to-Air Operation and Maintenance Instructions and ESPEC Thermal Shock Air-to-Air Option Instructions.

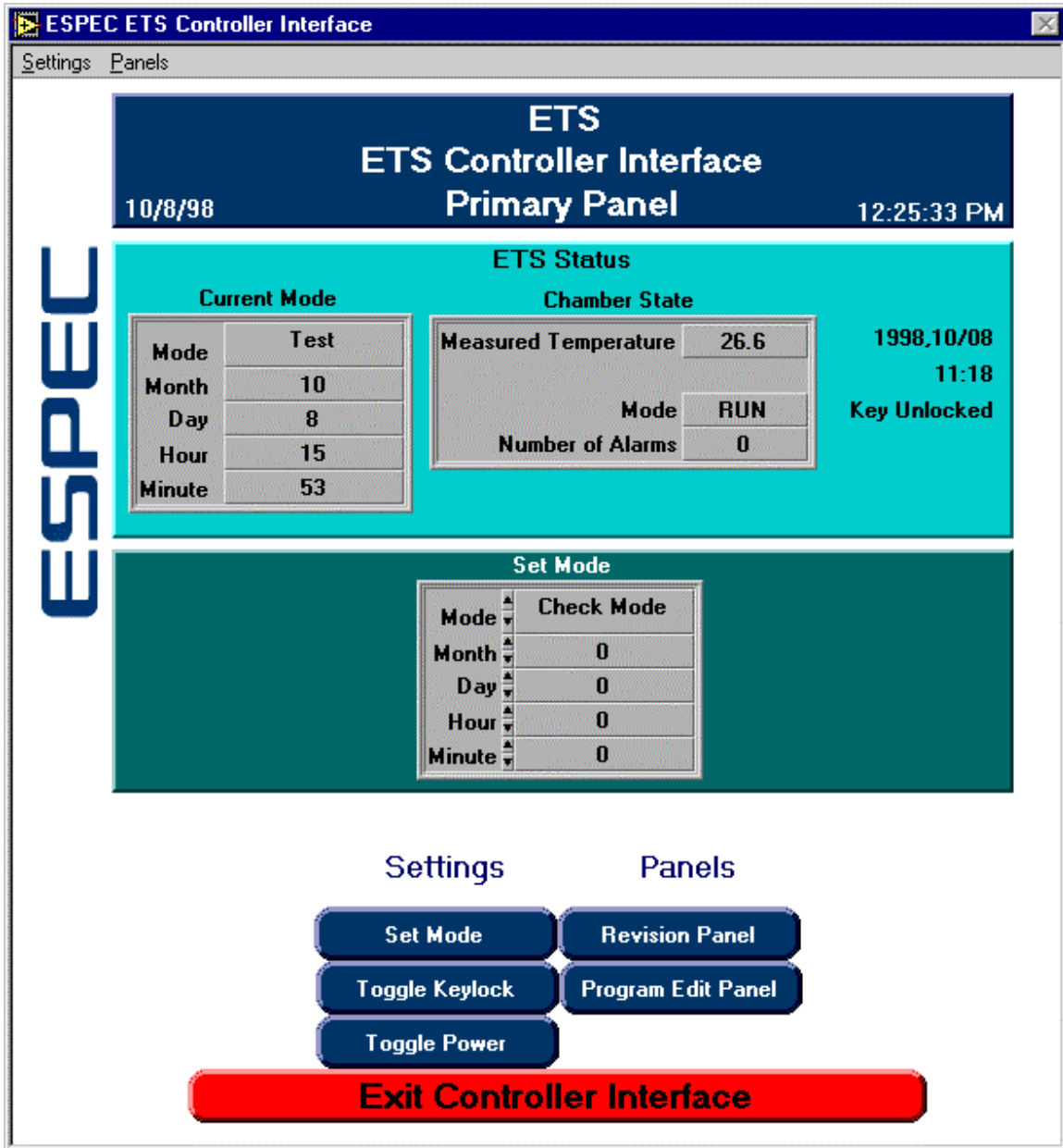


Figure 5: ESPEC ETS Controller Interface Panel

Display Data:

Current Mode:	Allows the user to monitor the current chamber status.		
Mode:	Operation	Meaning of Date and Time	
	Check Mode		
	Setup	Setup in progress	Scheduled setup time complete
	Standby	Standby	
	Standby: Setup	Preset setup standby	Preset start time
	Standby: Test	Preset test standby	Preset start time
	Ready	Setup complete	Setup complete time
	Test	Test in progress	Scheduled test end time
	Halt	Test halt	Test halt time
	End: Setup	Test end (during setup)	Test end time
	End: Off	Test end (end)	Test end time
	End: Defrost	Test end (defrost)	Test halt time
	Defrost	Manual defrost	Scheduled defrost complete time
	Power Off	Receiving electricity	

Month/Day/Hour/Minute: Time associated with the mode, see above table.

Chamber State:

Measured Temperature:	The chamber's current temperature		
Mode:	Status		
	Off	Chamber is OFF	
	Constant	Chamber under constant-mode operation	
	Run	Chamber program in operation	
	Pause	Chamber program operation temporary stop	
	Wait	Chamber program operation end	
Number of Alarms:	The number of new alarms.		

Chamber Date and Time

Keylock Status

Parameter Settings:

Set Mode: This allows the user to change the chamber mode. Active options vary based on current configuration

Mode:	Check Mode	Operation	Set Effects of Date and Time
		Read current mode	
		No change	
	Setup	Setup in progress	
	Standby	Standby	
	Standby: Setup	Preset setup standby	Set preset start time
	Standby: Test	Preset test standby	Set preset start time
	Ready	Setup complete	
	Test	Test in progress	
	Halt	Test halt	
	End: Setup	Test end (during setup)	
	End: Off	Test end (end)	
	End: Defrost	Test end (defrost)	
	Defrost	Manual defrost	
	Power Off	Receiving electricity	

Month/Day/Hour/Minute: Time associated with the mode, see above table.

Commands:

Set Mode:	Sends the user input Set Mode command to the chamber. If an inappropriate command is sent an error panel will be displayed showing the low level command error.
Toggle Keylock:	Switches the current keylock setting.
Toggle Power:	Switches the current power setting. Can not be executed when keylock is on.
Revision Panel:	Open a panel for the revision information.
Program Edit Panel:	Open a panel for programming the chamber.

## ESPEC ETS Revision Panel

This panel consists of information on the hardware and software revisions.

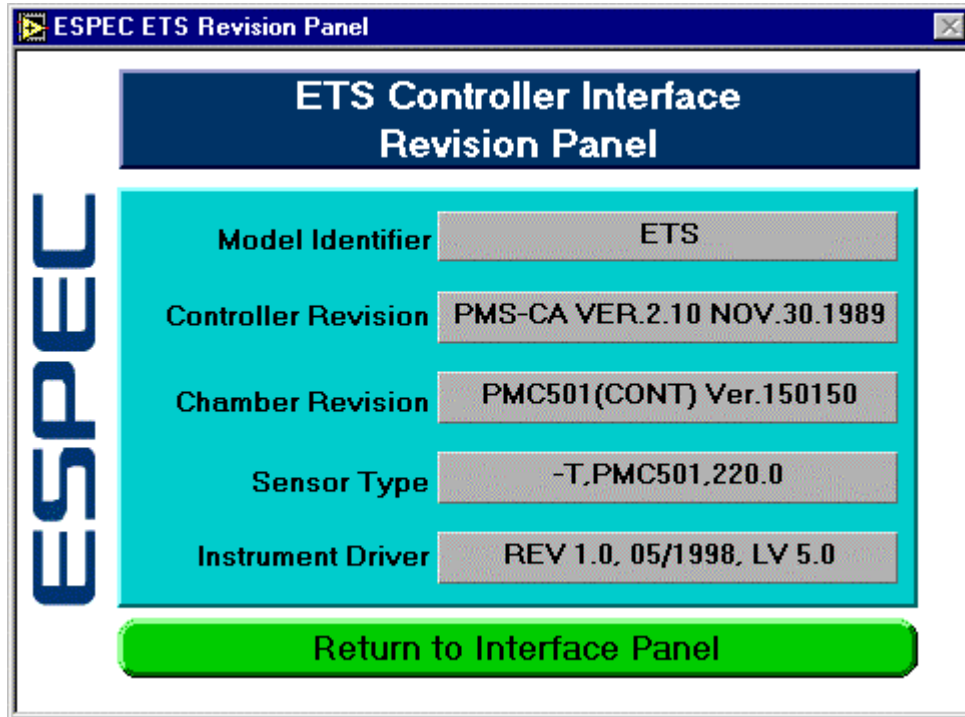


Figure 6: ESPEC ETS Revision Panel

### Display Data:

Model Identifier:	The model identifier set on the controller.
Controller Revision:	The controller ROM version
Chamber Revision:	The chamber ROM version
Sensor Type:	The thermocouple type and valid range.
Instrument Driver:	The low-level LabVIEW instrument driver software version.

### Commands:

Return to Interface Panel

## ESPEC ETS Program Edit Panel

This panel allows the user to view and edit programs on the ETS. Programs may be stored on the computer and transferred to the ETS RAM locations. See the following manuals for chamber operation and programming details: ESPEC Thermal Shock Chamber Air-to-Air Operation and Maintenance Instructions and ESPEC Thermal Shock Air-to-Air Option Instructions.

**ETS Controller Interface  
Program Edit Panel**

**Chamber State**

Measured Temperature	26.7
Mode	RUN
Number of Alarms	0

**Operational Program**

RAM	ROM
Pattern Number	2
Test Name	MIL-883C-B

**Test Information**

Initial Time (hrs)	11	Hot Zone Temp	92.0
Initial Time (min)	19	Cold Zone Temp	15.0
Initial Temperatures	27.0	Exposure	Cold
	27.0	Remaining Time (hrs)	0
	27.0	Remaining Time (min)	0
	27.0	Current Cycle	1
	27.0	Set Cycle	10

**Edit Program**

RAM	ROM
Pattern Number	2

**Program**

Name	MIL-883C-B		
Hot Temperature	125.0	Start Hot	Cold
Cold Temperature	-55.0	Defrost	-1
PreAl	OFF	Defrost Hot Control	OFF
Pre-Heat Temperature	135.0	G-soak	OFF
Pre-Cool Temperature	-65.0	Sensor Up	Down
Hot Time (hrs)	0	Aux Cool	OFF
Hot Time (min)	15	End	Off
Cold Time (hrs)	0	Overheat Temperature	135.0
Cold Time (min)	15	Overcool Temperature	-65.0
Test Cycles	10		

**File**

Open Program    Save Program

**ETS**

Set Operational    Load ETS Program    Send ETS Program    Delete ETS Program

**Return to Interface Panel**

Figure 7: ESPEC ETS Program Edit Panel



Display Data:

Chamber State:

Measured Temperature: The chamber's current temperature  
Mode: Status  
Off Chamber is OFF  
Constant Chamber under constant-mode operation  
Run Chamber program in operation  
Pause Chamber program operation temporary stop  
Wait Chamber program operation end  
Number of Alarms: The number of new alarms.

Test Information:

Initial Time: The time when the initial temperatures were recorded.  
Initial Temps: The one-minute duration temperature data (collected in 10-second intervals) just before the start of the test. [6 values]  
Hot Zone Temp: Hot zone temperature.  
Cold Zone Temp: Cold zone temperature.  
Exposure: Current exposure state. [Cold/Hot/Ambient]  
Remaining Time: Remaining time for current exposure.  
Current Cycle: The current execution cycle  
Set Cycle: The set number of cycles in the program.

Operational Program:

RAM: The storage location of the operational program. [RAM/ROM]  
Pattern Number: The currently assigned operational program number.  
[01-30 for RAM, 01-20 for ROM]  
Test Name: The name of the assigned operational test pattern.

Edit Program:

RAM: The storage location of the editing program. [RAM/ROM]  
Pattern Number: The editing program number.  
[01-30 for RAM, 01-20 for ROM]

Program:

Name: The program name.  
Hot Temperature: The hot zone temperature.  
Cold Temperature: The cold zone temperature.  
PreAI: The pre-cool/pre-heat AI setting. If off the controller selects the pre-heat/pre-cool temperatures.  
Pre-Heat Temperature: The pre-heat temperature.  
Pre-Cool Temperature: The pre-cool temperature.  
Hot Time: The hot exposure time.  
Cold Time: The cold exposure time.  
Test Cycle: The number of test cycles.  
Start Hot: The starting exposure setting. [COLD/HOT]  
Defrost: The number of cycle between defrosts, -1 indicates defrost off.  
Defrost Hot Control: Determines if the hot zone temperature is controlled during defrost. [OFF/ON]  
G-Soak: The guarantee soak setting. [OFF/ON]  
Sensor Up: The sensor position setting for upstream or downstream.  
[DOWN/UP]  
Aux Cool: The auxiliary cooler setting. [OFF/ON]  
End: The test end condition.  
OFF Test end condition is set to "Stop".  
DEFROST Test end condition is set to "Stop after defrost".  
SETUP Test end condition is set to "Setup".  
Overheat Temperature: The overheat temperature setting.  
Overcool Temperature: The overcool temperature setting.

Commands:

File: Open Program	Open a saved ETS program.
File: Save Program	Saves an ETS program to the computer. The default file extension is "ets".
ETS: Set Operational	Sets the operational program to the selected edit program location. Can only be executed when program is not executing.
ETS: Load Program	Load a program from the specified ETS memory location.
ETS: Send Program	Send a program to the specified ETS memory location. Can only be executed when RAM storage is specified.
ETS: Delete Program	Delete an ETS program at the specified memory location. Can only be executed when RAM storage is specified.
Return to Interface Panel.	

## ESPEC ETS Error Codes

**Table 1: ESPEC ETS Error Codes**

Feb 1992 and Older Models  
 Provided by facsimile to Durability, Inc.

Fault #	Fault Message	Possible Cause	Action	Safety Device	Position of Safety Dev
00	Controller fault	RAM READ WRITE, ROM CHECK SUM, analog board EEPROM, DISPLAY board EEPROM, compensation point adjustment data, cold junction adjustment data, zero span adjustment data, cold junction input, power recovery memory, clock (real time)	Service call	Controller	Controller
01	Power supply phases inverted	Power supply phases connected incorrectly	Reverse any 2 connections of main power.	Power Phase Monitor (PPM)	Electrical chassis
02	Test area upstream temp sensor fault	Disconnected or incorrectly connected temp sensor.	Replace or correctly connect temp sensor	Controller	Controller
03	Test area downstream temp sensor fault	Disconnected or incorrectly connected temp sensor.	Replace or correctly connect temp sensor	Controller	Controller
04	Hot zone temp sensor fault	Disconnected or incorrectly connected temp sensor.	Replace or correctly connect temp sensor	Controller	Controller
05	Cold zone temp sensor fault	Disconnected or incorrectly connected temp sensor.	Replace or correctly connect temp sensor	Controller	Controller
06	Cold storage temp sensor fault	Disconnected or incorrectly connected temp sensor.	Replace or correctly connect temp sensor	Controller	Controller
07	Ambient temp sensor fault	Disconnected or incorrectly connected temp sensor.	Replace or correctly connect temp sensor	Controller	Controller
08	Test area temp to high	External overheat protector incorrect, SSR3 or 4 faulty, heat emission from specimen, too many specimens	Reset overheat protector, check specimen.	Overheat protector (OHP1)	Operation Panel
09	Test area temp to low	External overcool protector incorrect, SSR 1 or 2 faulty, heater fault, precool temp too low	Reset overcool protector, check specimen	Overcool protector (OCP1)	Operation Panel
10	Test area temp to high	SSR 3-6 faulty or heat emission from specimen, preheat temp too high	Check specimen and preheat temp	Overheat setting unit (inside controller)	Controller
11	Test area temp to high	SSR 1 or 2 faulty, heater fault or precool temp too low	Check precool temp, install new SSR	Overcool setting unit (inside controller)	Controller
12	Sequence ROM checksum error	ROM in controller faulty	Service call	Controller self-diagnostic	Controller
13	Sequence scan time exceeded	Controller fault	Service call	Controller self-diagnostic	Controller

14	Parameter checksum error	Memory error in controller	Service call	Controller self-diagnostic	Controller
15	Hot zone temp to high	SSR 3-6 faulty	Install new SSR	Controller internal overheat (240°C)	Controller
16	Cold zone temp to high	SSR 1 or 2 faulty	Install new SSR	Controller internal overheat (+55°C)	Controller
17	Circulation fan/basket drive system fault	Circulation/chamber drive system overload	Reset CB3 and CB8	Circuit breaker (CB3 or CB8)	Electrical chassis
18	Hot zone circulation fan fault	Hot zone circulation fan overload, voltage fluctuation in excess of $\pm 10\%$	Reduce voltage fluctuation below $\pm 10\%$ , then press overload relay reset button	Overload relay OL5	Electrical chassis
19	Cold zone circulation fan fault	Cold zone circulation fan overload, voltage fluctuation in excess of $\pm 10\%$	Reduce voltage fluctuation below $\pm 10\%$ , then press overload relay reset button	Overload relay OL4	Electrical chassis
20	Basket drive fault	Drive motor or limit dog out of position	Service call	Controller	Controller
21	Basket safety catch drive fault	Link mechanism fault, drive motor or limit dog out of position	Service call	Controller	Controller
22	Hot zone heater fault	Hot zone heater overload	Service call	Circuit protector CB5	Electrical chassis
23	Hot zone not heating	SSR 3-6 faulty or heater fault	Install new SSR	Controller	Controller
24	Cold zone heater fault	Cold zone heater overload	Service call	Circuit protector CB4	Electrical chassis
25	Cold zone refrigeration system fault	Cold zone refrigeration system overload	Service call	Circuit breaker CB1 and CB2	Electrical chassis
26	Refrigeration second stage fault	Compressor overload, loss of refrigerant, cooling water temp too high or strainer blocked	Cool compressor to reset, clean strainer, reset OP201 and HL201	High/low pressure switch HL201, compressor thermostat, TH201 oil pressure switch OP201	Machinery compartment inside refrigeration sw box
27	Refrigeration first stage fault	Compressor overload, loss of refrigerant, cooling water temp too high or strainer blocked	Cool compressor to reset, clean strainer, reset OP101 and HL101	High/low pressure switch HL101, compressor thermostat, TH101 oil pressure switch OP101	Machinery compartment electrical instrumentation chassis inside refrigeration unit.

## ESPEC TSB Interface

This panel allows the user to interface directly with the TSB controller. From this panel the user may implement many commands as if at the instrument itself. See the following manuals for chamber operation and programming details: ESPEC Instruction Manual Liquid Bath Thermal Shock Chamber TSB-2.5 and ESPEC User's Manual Protocol Converter PMS-CA.

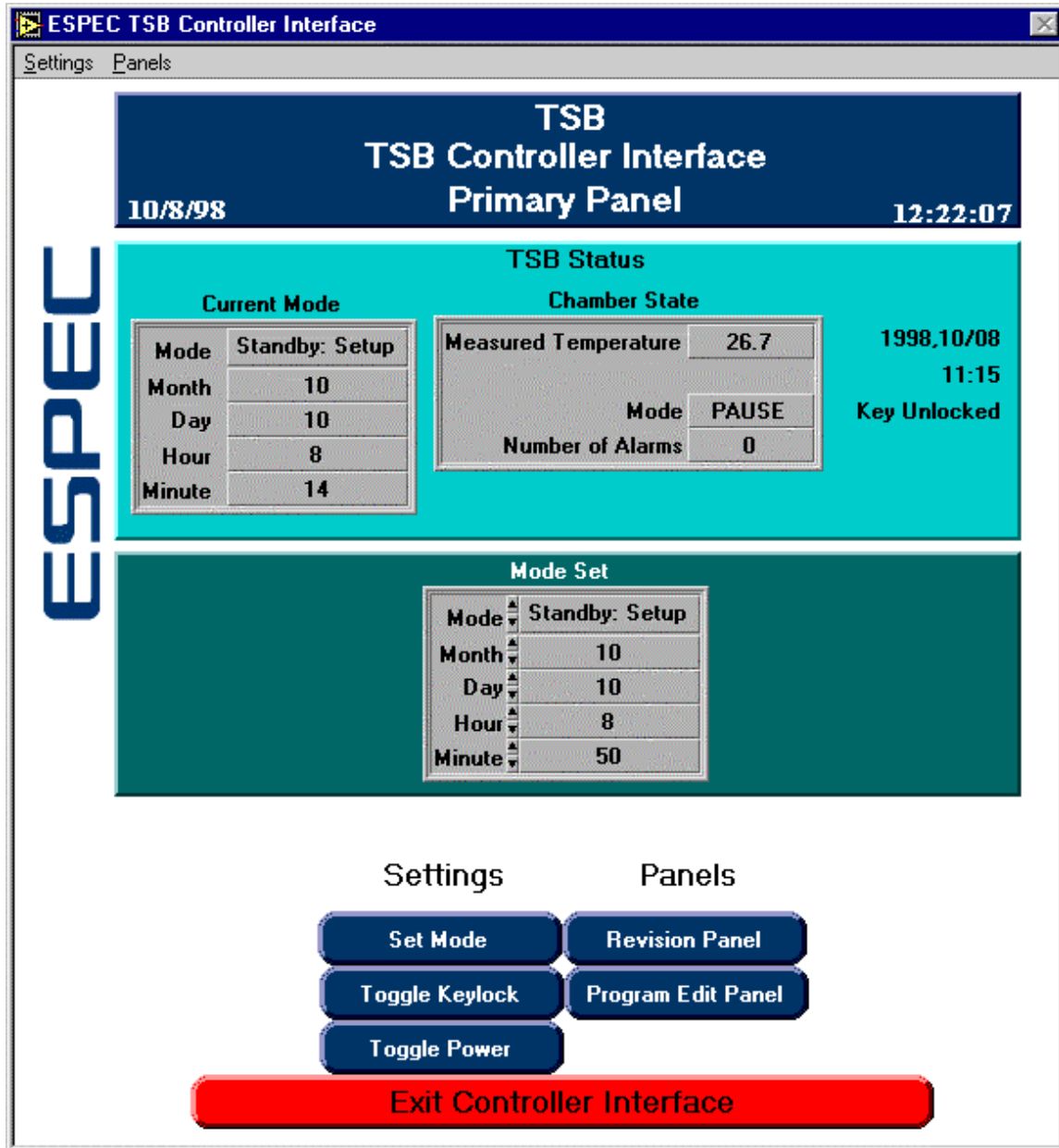


Figure 8: ESPEC TSB Interface Panel

Display Data:

Current Mode: This allows the user to monitor the current chamber status.

Mode:	Operation	Meaning of Date and Time
Check Mode		
Setup	Setup in progress	Scheduled setup time complete
Standby	Standby	
Standby: Setup	Preset setup standby	Preset start time
Standby: Test	Preset test standby	Preset start time
Ready	Setup complete	Setup complete time
Test	Test in progress	Scheduled test end time
Halt	Test halt	Test halt time
End: Setup	Test end (during setup)	Test end time
End: Off	Test end (end)	Test end time
End:Stable Temp	Test end (Liquid temp return)	Test halt time
Stable Temp	Liquid temp return	Scheduled liquid temp return complete time
Power Off	Receiving electricity	

Month/Day/Hour/Minute: Time associated with the mode, see above table.

Chamber State: Displays the chamber parameters.

Measured Temperature: The chamber's current temperature

Mode:

	Status
Off	Chamber is OFF
Constant	Chamber under constant-mode operation
Run	Chamber program in operation
Pause	Chamber program operation temporary stop
Wait	Chamber program operation end

Number of Alarms: The number of new alarms.

Chamber Date and Time

Keylock Status

Parameter Settings:

Set Mode: This allows the user to change the chamber mode. Active options vary based on current configuration

Mode:	Operation	Effect of Date and Time
Check Mode		
Setup	Setup in progress	
Standby	Standby	
Standby: Setup	Preset setup standby	Set preset start time
Standby: Test	Preset test standby	Set preset start time
Ready	Setup complete	
Test	Test in progress	
Halt	Test halt	
End: Setup	Test end (during setup)	
End: Off	Test end (end)	
End:Stable Temp	Test end (Liquid temp return)	
Stable Temp	Liquid temp return	
Power Off	Receiving electricity	

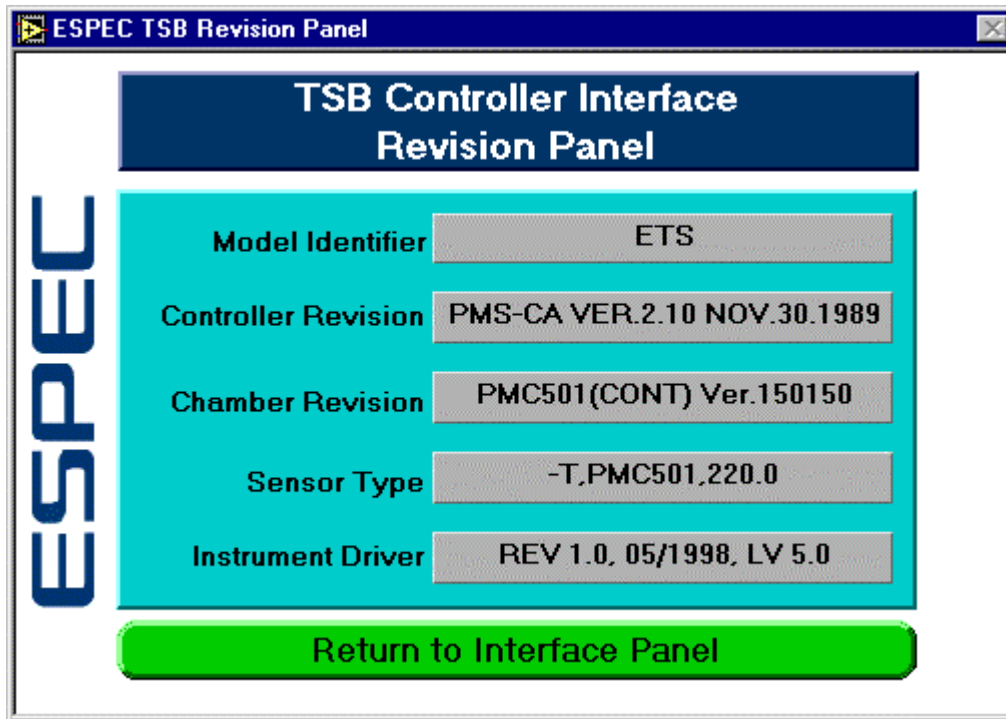
Month/Day/Hour/Minute: Time associated with the mode, see above table.

Commands:

Set Mode:	Sends the user input Set Mode command to the chamber.
Toggle Keylock:	Switches the current keylock setting.
Toggle Power:	Switches the current power setting.
Revision Panel:	Open a panel for the revision information.
Program Edit Panel:	Open a panel for programming the chamber.
Exit Controller Interface:	Returns to the primary panel.

## **ESPEC TSB Revision Panel**

This panel consists of information on the hardware and software revisions.



**Figure 9: ESPEC TSB Revision Panel**

### Display Data:

Model Identifier:	The model identifier set on the controller.
Controller Revision:	The controller ROM version
Chamber Revision:	The chamber ROM version
Sensor Type:	The thermocouple type and valid range.
Instrument Driver:	The low-level LabVIEW instrument driver software version.

### Commands:

Return to Interface Panel



## ESPEC TSB Program Edit Panel

This panel allows the user to view and edit programs on the ETS. Programs may be stored on the computer and transferred to the ETS RAM locations. See the following manuals for chamber operation and programming details: ESPEC Instruction Manual Liquid Bath Thermal Shock Chamber TSB-2.5 and ESPEC User's Manual Protocol Converter PMS-CA.

**ESPEC**

**TSB Controller Interface  
Program Edit Panel**

**Chamber State**

Measured Temperature	26.7
Mode	PAUSE
Number of Alarms	0

**Operational Program**

RAM	ROM
Pattern Number	2
Test Name	MIL-883C-B

**Test Information**

Initial Time (hrs)	11	Hot Zone Temp	92.0
Initial Time (min)	16	Cold Zone Temp	14.0
Initial Temperatures	27.0	Exposure	Cold
	27.0	Remaining Time (hrs)	0
	27.0	Remaining Time (min)	0
	27.0	Current Cycle	0
	27.0	Set Cycle	10

**Edit Program**

RAM	ROM
Pattern Number	2

**Program**

Name	MIL-883C-B		
Hot Temperature	125.0	Start Hot	Cold
Cold Temperature	-55.0		
PreAl	OFF		
Pre-Heat Temperature	135.0		
Pre-Cool Temperature	-65.0		
Hot Time (min)	0		
Hot Time (sec)	15		
Cold Time (min)	0	End	Off
Cold Time (sec)	15	Overheat Temperature	135.0
Test Cycles	10	Overcool Temperature	-65.0

**File**

Open Program    Save Program

**TSB**

Set Operational    Load TSB Program    Send TSB Program    Delete TSB Program

**Return to Program Panel**

Figure 10: ESPEC TSB Program Edit Panel

Display Data:

Chamber State:

Measured Temperature: The chamber's current temperature  
Mode: Status  
Off Chamber is OFF  
Constant Chamber under constant-mode operation  
Run Chamber program in operation  
Pause Chamber program operation temporary stop  
Wait Chamber program operation end  
Number of Alarms: The number of new alarms.

Test Information:

Initial Time: The time when the initial temperatures were recorded.  
Initial Temps: The one-minute duration temperature data (collected in 10-second intervals) just before the start of the test. [6 values]  
Hot Zone Temp: Hot zone temperature.  
Cold Zone Temp: Cold zone temperature.  
Exposure: Current exposure state. [Cold/Hot/Ambient]  
Remaining Time: Remaining time for current exposure.  
Current Cycle: The current execution cycle  
Set Cycle: The set number of cycles in the program.

Operational Program:

RAM: The storage location of the assigned pattern. [RAM/ROM]  
Pattern Number: The currently assigned pattern number.  
[01-30 for RAM, 01-20 for ROM]  
Test Name: The name of the assigned test pattern.

Pattern Set:

RAM: The storage location of the assigned pattern. [RAM/ROM]  
Pattern Number: The currently assigned pattern number.  
[01-30 for RAM, 01-20 for ROM]  
Test Name: The name of the assigned test pattern.

Program:

Name: The program name.  
Hot Temperature: The hot zone temperature.  
Cold Temperature: The cold zone temperature.  
PreAI: The pre-cool/pre-heat AI setting. If off the controller selects the pre-heat/pre-cool temperatures.  
Pre-Heat Temperature: The pre-heat temperature.  
Pre-Cool Temperature: The pre-cool temperature.  
Hot Time: The hot exposure time.  
Cold Time: The cold exposure time.  
Test Cycle: The number of test cycles.  
Start Hot: The starting exposure setting. [COLD/HOT]  
End: The test end condition.  
OFF Test end condition is set to "Stop".  
HEAT RETURN Test end condition is set to "Stop after liquid temp return"  
SETUP Test end condition is set to "Setup".  
Overheat Temperature: The overheat temperature setting.  
Overcool Temperature: The overcool temperature setting.

Commands:

File: Open Program	Open a saved TSB program.
File: Save Program	Saves an TSB program to the computer. The default file extension is "tsb".
TSB: Set Operational	Sets the operational program to the selected edit program location. Can only be executed when program is not executing.
TSB: Load Program	Load a program from the specified TSB memory location.
TSB: Send Program	Send a program to the specified TSB memory location. Can only be executed when RAM storage is specified.
TSB: Delete Program	Delete a TSB program at the specified memory location. Can only be executed when RAM storage is specified.
Return to Interface Panel.	

## ESPEC TSB Error Codes: Faults

Source: Instruction Manual Liquid Bath Thermal Shock Chamber TSB-2.5

Customer Support for ESPEC Corporation: 800-537-7320

### TSB-00                      Fault 0: Controller Fault

- Safety Device:
  - Controller self diagnostic
- Application:
  - Protection of controller
- Chamber status following activation of safety device
  - 1) Drive stops in current position.
  - 2) Chamber stops operation
  - 3) FAULT Indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 4) The specimen power supply control terminal is disconnected.
- Cause: The following table lists some possible causes

Table 4-1: Controller Fault List

Possible Fault	Action
RAM READ WRITE	Replace CPU module
ROM CHECK SUM	Replace ROM
Analog board EEPROM	Replace analog module (readjust)
Display Board EEPROM	Replace display board (reset)
Correction point adjustment data	Readjust
Cold junction adjustment data	Readjust
Zero-span adjustment data	Readjust
Cold junction input	Temperature compensation resistance check (replace and readjust)
Memory following power cut recovery	Replace CPU module
Clock (real time)	Reset Clock

- Action: Call service
- Reset Method:
  - 1) Switch the controller on.
  - 2) Check that the FAULT indication does not come on again and then restart the operation.
- Reference: Page 63

## TSB-01

## Fault 1: Drive system fault

- Safety Device:
  - Circuit protector (CP<sub>3</sub>).
  - See Figure 5.1, Electrical Instrumentation Chassis, on page 64.
  - Application:
    - To protect drive circuits from abnormal flows of current. In the event of a fault the manual switch clicks off.
- Chamber Status Following Activation:
  - 1) Drive stops in current position.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Chassis terminal area screws have worked loose or terminals have come into contact with each other.
  - 2) Drive motor insulation defective.
- Action:
  - 1) Switch the controller OFF. (Power switch on.)
  - 2) Check the chassis to make sure there are no loose screws or terminals in control with each other. (Refer to the electrical circuit diagrams.)
  - 3) Check the insulation of the drive motor. (10 MΩ or better)

If any of the above checks reveal a fault then put out a service call.
- Reset method
  - 1) Switch the circuit protector on.
  - 2) Switch on the controller.
  - 3) Make Sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 64

## TSB-02

## Fault 2: Vertical Drive Fault

- Safety Device:
  - Overtime (time exceeded for vertical drive movement)
  - Internal program processing inside controller
- Application: Drive unit protection
- Chamber Status Following Activation:
  - 1) Drive stops in current position.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Drive area damaged by a foreign body.
  - 2) Timing belt has stretched and friction in transfer bearings has increased.
  - 3) Photosensor has broken down or has been disconnected.
  - 4) Vertical drive motor has broken down or the wiring is faulty
- Action:
  - 1) Switch the controller OFF. (Power switch ON)
  - 2) Turn ON switch S<sub>8</sub> on the electrical instrumentation chassis and test the drive manually to see if it is moving smoothly or not.
  - 3) Check the operation of the photosensor by shielding it from the light and then seeing if the LED incorporated into the sensor goes out. Make sure the sensor is connected properly into its socket.
  - 4) Check the vertical drive motor and the photosensor are both correctly wired. Refer to the electrical wiring diagrams.

Note: If you turn on switch S<sub>8</sub> when the drive is at the top of its stroke, the brake will be released and it will descend under the force of gravity.

If any of the above checks reveals a fault then put out a service call.
- Reset Methods:
  - 1) Turn off switch S<sub>8</sub> on the electrical instrumentation chassis.
  - 2) Switch the controller ON.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 65-66

## TSB-03

## Fault 3: Photosensor for vertical drive fault

- Safety Device:
    - Vertical drive control photosensor input points exceeded
    - Internal program processing inside controller.
  - Application:
    - Photosensor fault detection
  - Chamber Status Following Activation
    - 1) Drive stops in current position.
    - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 5) External alarm is activated.
    - 6) The specimen power supply control terminal is disconnected.
  - Cause:
    - 1) A foreign body has got into the photosensor leaving it permanently in shielded mode.
    - 2) The photosensor has been disconnected at the socket or else the wiring is broken.
    - 3) The photosensor has broken down.
  - Action
    - 1) Switch the controller OFF. (Power switch on.)
    - 2) Wipe the photosensor with a soft cloth to remove the foreign body.
    - 3) Check the photosensor wiring,
    - 4) Check that the photosensor is connected correctly to its socket.
    - 5) Replace the photosensor.
- If any of the above checks reveal a fault then put out a service call.
- Reset Method:
    - 1) Switch the controller ON.
    - 2) Make sure that the FAULT indication does not light up and then restart the operation.
  - Reference: Page 66-67

## TSB-04

## Fault 4: Horizontal drive fault

- Safety Device:
    - Overtime, time exceeded for horizontal drive movement.
    - Internal program processing inside controller
  - Application:
    - Drive unit protection
  - Chamber Status Following Activation:
    - 1) Drive stops in current position, except that vertical drive returns to upper stroke limit.
    - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 5) External alarm is activated.
    - 6) The specimen power supply control terminal is disconnected.
  - Cause:
    - 1) Drive area damaged by a foreign body.
    - 2) Timing belt has stretched and friction in transfer bearings has increased.
    - 3) Photosensor has broken down or has been disconnected.
    - 4) Horizontal drive motor has broken down or the wiring is faulty
  - Action:
    - 1) Switch the controller OFF. (Power switch ON)
    - 2) Turn ON switch S<sub>7</sub> on the electrical instrumentation chassis and test the drive manually to see if it is moving smoothly or not.
    - 3) Check the operation of the photosensor by shielding it from the light and then seeing if the LED incorporated into the sensor goes out. Make sure the sensor is connected properly into its socket.
    - 4) Check the vertical drive motor and the photosensor are both correctly wired. Refer to the electrical wiring diagrams.
- If any of the above checks reveals a fault then put out a service call.
- Reset Methods:
    - 1) Turn off switch S<sub>7</sub> on the electrical instrumentation chassis.
    - 2) Switch the controller ON.
    - 3) Make sure that the FAULT indication does not light up and then restart the operation.
  - Reference: Page 67-68



## TSB-05

## Fault 5: Horizontal drive photosensor fault

- Safety Device:
  - Horizontal drive control photosensor input points exceeded
  - Internal program processing inside controller.
- Application:
  - Photosensor fault detection
- Chamber Status Following Activation:
  - 1) Drive stops in current position, except that vertical drive returns to the upper limit of its stroke.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) A foreign body has got into the photosensor leaving it permanently in shielded mode.
  - 2) The photosensor has been disconnected at the socket or else the wiring is broken.
  - 3) The photosensor has broken down.
- Action
  - 1) Switch the controller OFF. (Power switch on.)
  - 2) Wipe the photosensor with a soft cloth to remove the foreign body.
  - 3) Check the photosensor wiring.
  - 4) Check that the photosensor is connected correctly to its socket.
  - 5) Replace the photosensor.

If any of the above checks reveal a fault then put out a service call.
- Reset Method:
  - 1) Switch the controller ON.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 68-69

## TSB-06

## Fault 6: High temperature bath temperature sensor fault.

- Safety device:
  - Controller self diagnostic
- Application:
  - Temperature control protection
- Chamber Status Following Activation:
  - 1) Drive returns to start point.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) The controller terminals have been disconnected.
  - 2) The temperature sensor wiring is broken.
- Action:
  - 1) Switch the controller OFF. (Power switch on.)
  - 2) Remove the temperature sensor from the controller terminal area and check with a tester to make sure that the conductivity level meets the specification.
  - 3) Reconnect the sensor to the controller terminals.

If any of the above checks reveal a fault then put out a service call.
- Reset Method:
  - 1) Switch the controller ON.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Note:

A broken temperature sensor wire can result in burn out and the appearance on monitoring screen of the message “High temp bath temp to high”. When fault 06 is reset, however, this message will disappear from the screen.
- Reference: Page 69

## TSB-07

## Fault 7: Low temperature bath temperature sensor fault.

- Safety device:
  - Controller self diagnostic
- Application:
  - Temperature control protection
- Chamber Status Following Activation:
  - 1) Drive returns to start point.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) The controller terminals have been disconnected.
  - 2) The temperature sensor wiring is broken.
- Action:
  - 1) Switch the controller OFF. (Power switch on.)
  - 2) Remove the temperature sensor from the controller terminal area and check with a tester to make sure that the conductivity level meets the specification.
  - 3) Reconnect the sensor to the controller terminals.

If any of the above checks reveal a fault then put out a service call.

- Reset Method:
  - 1) Switch the controller ON.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Note:

A broken temperature sensor wire can result in burn out and the appearance on monitoring screen of the message “Fault 14: Low temp bath temp to high”. When fault 07 is reset, however, this message will disappear from the screen.
- Reference: Page 70

## TSB-08

## Fault 8: Transfer area temperature sensor fault.

- Safety device:
  - Controller self diagnostic
- Application:
  - Temperature control protection
- Chamber Status Following Activation:
  - 1) Drive returns to start point.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) The controller terminals have been disconnected.
  - 2) The temperature sensor wiring is broken.
- Action:
  - 1) Switch the controller OFF. (Power switch on.)
  - 2) Remove the temperature sensor from the controller terminal area and check with a tester to make sure that the conductivity level meets the specification.
  - 3) Reconnect the sensor to the controller terminals.

If any of the above checks reveal a fault then put out a service call.
- Reset Method:
  - 1) Switch the controller ON.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 71

## TSB-09

## Fault 9: Ambient temperature sensor fault.

- Safety device:
  - Controller self diagnostic
- Application:
  - Temperature control protection
- Chamber Status Following Activation:
  - 1) Drive returns to start point.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) The controller terminals have been disconnected.
  - 2) The temperature sensor wiring is broken.
- Action:
  - 1) Switch the controller OFF. (Power switch on.)
  - 2) Remove the temperature sensor from the controller terminal area and check with a tester to make sure that the conductivity level meets the specification.
  - 3) Reconnect the sensor to the controller terminals.

If any of the above checks reveal a fault then put out a service call.
- Reset Method:
  - 1) Switch the controller ON.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 72

## TSB-10

## Fault 10: High temp bath temperature too high

- Safety device: Overheat protector (OHP<sub>1</sub>). See Figure 5.2, Operation Panel, on page 73.
- Application:
  - 1) To protect specimens against exposure to temperatures in excess of the upper temperature limit during cycle testing.
  - 2) To prevent the liquid temperature from rising beyond its boiling point.
- Chamber Status Following Activation:
  - 1) Drive returns to start point.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) The setting of the chamber overheat protector is lower than the overheat setting on the controller.
  - 2) The solid state relay has broken down. (SSR<sub>1</sub>)
  - 3) Controller fault
- Action:
  - 1) Check the overheat temperature setting on the controller and reset the chamber overheat protector to a higher level.
  - 2) If current is being applied to the specimen, make sure that it is not overheating.

If any of the above checks reveal a fault then put out a service call.

- Reset Method:
  - 1) Switch the controller ON.
  - 2) When the liquid temperature has fallen switch the power OFF and then ON again.
  - 3) Switch the controller ON.
  - 4) Make sure that the FAULT indication does not light up and then restart the operation.

Note: The upper limit setting of the overheat protector is +240°C. Any temperature setting in excess of +240°C will be treated as +240°C by the overheat protector.
- Reference: Page 73-74

## TSB-11

### Fault 11: Low temp bath temperature too low

- Safety device: Overcool protector (OCP<sub>1</sub>). See Figure 5.3, Operation Panel, on page 75.

- Application:

To protect specimens against exposure to temperatures below the lower temperature limit during cycle testing.

- Chamber Status Following Activation:

- 1) Drive returns to start point.
- 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
- 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
- 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
- 5) External alarm is activated.
- 6) The specimen power supply control terminal is disconnected.

- Cause:

- 1) The setting of the chamber overcool protector is higher than the overcool setting on the controller.
- 2) The solid state relay has broken down (SSR<sub>1</sub>).
- 3) Either the heater itself or the heater circuit wiring is broken.
- 4) Controller fault.

- Action:

- 1) Check the overcool temperature setting on the controller and reset the chamber overcool protector to a lower level.
- 2) Check that current is flowing through the heater circuit. Refer to the electrical wiring diagrams.

If any of the above checks reveal a fault then put out a service call.

- Reset Method:

- 1) Switch the controller OFF.
- 2) When the liquid temperature has risen switch the power OFF and then ON again.
- 3) Switch the controller ON.
- 4) Make sure that the FAULT indication does not light up and then restart the operation.

- Reference: Page 75-76

## TSB-12

## Fault 12: High temp bath temperature too high

- Safety device:
    - 1) Overheat protector in controller, set during creation of test pattern. Refer to Chapter 3, The Controller, for details of how to set the overheat protector.
    - 2) Overheat protector in controller. (Set to +250 °C)
  - Application:
    - 1) To protect specimens against exposure to temperatures in excess of the upper temperature limit during cycle testing.
    - 2) To prevent the liquid temperature from rising beyond its boiling point.
  - Chamber Status Following Activation:
    - 1) Drive returns to start point.
    - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 5) External alarm is activated.
    - 6) The specimen power supply control terminal is disconnected.
  - Cause:
    - 1) The setting of the overheat protector is lower than the preset temperature.
    - 2) The solid state relay has broken down. (SSR<sub>2</sub> & SSR<sub>3</sub>)
    - 3) Input signal to the solid state relay input area remains on.
    - 4) The solid state relay output area is short circuiting.
  - Action:
    - 1) Check the overheat temperature setting
    - 2) Check the actual exposure temperature control to make sure it is not more than the overheat temperature.
    - 3) Check that a voltage of 24 V DC is not being applied to the solid state relay input area while the chamber is idling.
    - 4) Replace the solid state relay.
- If any of the above checks reveal a fault then put out a service call.
- Reset Method:
    - 1) Wait till the liquid temperature has fallen and then switch ON the controller.
    - 2) Make sure that the FAULT indication does not light up and then restart the operation.
  - Reference: Page 77-78.



## TSB-13

### Fault 13: Low temp bath temperature too low

- Safety device: Overcool protector in the controller, set during creation of the test pattern. Refer to Chapter 3, The Controller, for details of how to set the overcool protector.
- Application:

To protect specimens against exposure to temperatures below the lower temperature limit during cycle testing.
- Chamber Status Following Activation:
  - 1) Drive returns to start point.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) The setting of the overcool protector is higher than the preset temperature.
  - 2) The solid state relay has broken down (SSR<sub>1</sub>).
  - 3) The heater circuit has been disconnected.
  - 4) A voltage of 24 V DC is not being applied to the solid state relay input area.
- Action:
  - 1) Check that there is a flow of current in the heater circuit.
  - 2) Short the low temp bath heater output area on the controller to make sure there is a voltage of 24 V DC being applied to the solid state relay input area. Refer to the electrical circuit diagrams provided.

If any of the above checks reveal a fault then put out a service call.
- Reset Method:
  - 1) Wait till the liquid temperature has risen and then switch ON the power to the controller.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 78-79.

## TSB-14

## Fault 14: Low temp bath temperature too high

- Safety device: Overheat protector in the controller, set to +60 °C.
- Application: To prevent the liquid temperature from rising beyond its boiling point.
- Chamber Status Following Activation:
  - 1) Drive returns to start point.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) The solid state relay has broken down (SSR<sub>1</sub>).
  - 2) Input signal to the solid state relay input remains on.
  - 3) The solid state relay output area is short circuiting.
  - 4) A reduction of the refrigerator’s capacity has resulted in overheating due to the introduction of an increased thermal load from the high temp bath.
- Action:
  - 1) Check that a voltage of 24 V DC is not being applied to solid state relay input area while the chamber is idling.
  - 2) Check that the refrigerator is functioning properly.
  - 3) Replace the solid state relay.

If any of the above checks reveal a fault then put out a service call.
- Reset Method:
  - 1) Wait till the liquid temperature has fallen and then switch ON the power to the controller.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 79-80.

## TSB-15

### Fault 15: Heater boiled dry

- Safety device: Boil dry protectors (OHP <sup>2/3/4</sup>). See Figure 5.4, Distribution Compartment, on page 81.
- Application: To prevent the heater boiling dry.
- Chamber Status Following Activation:
  - 1) Drive returns to start point.
  - 2) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 3) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 4) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 5) External alarm is activated.
  - 6) The specimen power supply control terminal is disconnected.
- Cause: Liquid level in bath too low, high or low temperature bath.
- Action: Top off the liquid.
- Reset Method:
  - 1) When the liquid level has risen switch ON the controller.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 81.

## TSB-16

## Fault 16: Sequence ROM checksum error.

- Safety device: Controller self diagnostic.
- Application: To protect against abnormal operation of the baths.
- Chamber Status Following Activation:
  - 1) Drive stops in its current position.
  - 2) Chamber stops operation.
  - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 4) The specimen power supply control terminal is disconnected.

Note: The warning buzzer does not sound and no external alarm state is initiated.

- Cause: Controller fault. (ROM fault)
- Action: Switch off the controller and call service.
- Reset Method:
  - 1) Switch the power supply OFF and then back ON again.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 82.

## TSB-17

### Fault 17: Sequence scan time exceeded

- Safety device: Controller self diagnostic.
- Application: To protect against abnormal operation of the chamber.
- Chamber Status Following Activation:
  - 1) Drive stops in its current position.
  - 2) Chamber stops operation.
  - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 4) The specimen power supply control terminal is disconnected.

Note: The warning buzzer does not sound and no external alarm state is initiated.

- Cause: Controller fault. (Hardware fault)
- Action: Switch off the controller and call service.
- Reset Method:
  - 1) Switch the power supply OFF and then back ON again.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 82-83.

## TSB-18

### Fault 18: Parameter checksum error

- Safety device: Controller self diagnostic.
- Application: To protect against abnormal operation of the chamber.
- Chamber Status Following Activation:
  - 1) Drive stops in its current position.
  - 2) Chamber stops operation.
  - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 4) The specimen power supply control terminal is disconnected.

Note: The warning buzzer does not sound and no external alarm state is initiated.

- Cause: Controller fault. (Memory fault)
- Action: Switch off the controller and call service.
- Reset Method:
  - 1) Switch the power supply OFF and then back ON again.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 83.

## TSB-19

## Fault 19: Insufficient liquid of brine in high temp bath

- Safety device: Liquid level indicator
- Application: To detect low levels of brine to protect both chamber and operator.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) The high temperature bath heater and agitator stop operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause: Liquid level of brine in the high temperature bath is too low.
- Action: Top off the brine.
- Reset Method:
  - 1) Switch ON the controller.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 84-85.

## TSB-20

## Fault 20: Insufficient liquid of brine in low temp bath

- Safety device: Liquid level indicator
- Application: To detect low levels of brine to protect both chamber and operator.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Refrigerator and agitator stop operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause: Liquid level of brine in the low temperature bath is too low.
- Action: Top off the brine.
- Reset Method:
  - 1) Switch ON the controller.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 85-86.

## TSB-21

## Fault 21: High temperature bath heater fault

- Safety device: Circuit protector (CP<sub>2</sub>). See Figure 5.5, Electrical Instrumentation Chassis, on page 87.
- Application: To protect the high temperature bath heater circuit from abnormal flows of current. In the case of an abnormal current flow, the manual switch turns itself OFF automatically.

- Chamber Status Following Activation:

1. With test in progress
  - 1) High temperature bath heater stops operating.
  - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 4) External alarm is activated.
  - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
  - 6) The specimen power supply control terminal is disconnected.
2. With no test in progress
  - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 4) External alarm is activated.
  - 5) The specimen power supply control terminal is disconnected.

- Cause:

- 1) Heater shorting.
- 2) Terminal is shorting or has worked loose.

- Action:

- 1) Check for loose terminals or shorting.
- 2) Check the resistance levels of the heater and insulation.

If any of the above checks reveals a fault then put out a service call.

- Reset Method:

- 1) Switch ON the circuit protector’s manual switch.
- 2) Switch ON the controller.
- 3) Make sure that the FAULT indication does not light up and then restart the operation.

- Reference: Page 87-88.



## TSB-22

### Fault 22: High temperature bath agitator or condenser system fault

- Safety device: Circuit protector (MCB<sub>2</sub>). See Figure 5.6, Electrical Instrumentation Chassis, on page 88.
- Application: To protect the high temperature bath agitator and condenser circuit from abnormal flows of current. In the case of an abnormal current flow, the manual switch turns itself OFF automatically.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) High temperature bath agitator, condenser pump, condenser fan, and heater stops operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) High temperature bath agitator, condenser pump, or condenser fan has either broken down or been subject to an overcurrent.
  - 2) Terminal is shorting or has worked loose.
- Action:
  - 1) Check for loose terminals or shorting.
  - 2) Check the insulation resistance levels of each actuator.If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Switch ON the circuit protector’s manual switch.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 89-90.

## TSB-23

## Fault 23: High temperature bath agitator fault

- Safety device: Thermal Switch (TS<sub>2</sub>). Built in high temperature agitator motor.
  - Application: To protect the high temperature bath agitator from overload.
  - Chamber Status Following Activation:
    1. With test in progress
      - 1) High temperature bath agitator heater stops operating.
      - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
      - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
      - 4) External alarm is activated.
      - 5) The specimen power supply control terminal is disconnected.
    2. With no test in progress
      - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
      - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
      - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
      - 4) External alarm is activated.
      - 5) The specimen power supply control terminal is disconnected.
  - Cause:
    - 1) High temperature bath agitator motor locked.
    - 2) The liquid used was either inappropriate or else it was used outside its specified temperature range.
    - 3) The specimen has broken loose and become entangled in the agitator.
  - Action:
    - 1) Check to make sure that an appropriate liquid is being used within its specified range.
    - 2) Check to make sure that the specimen has not been dislodged from the specimen cage and become entangled in the agitator.
    - 3) Make sure that the high temperature agitator motor is not making any unusual noises.
- If any of the above checks reveals a fault then put out a service call.
- Reset Method:
    - 1) Cool the high temperature bath agitator motor.
    - 2) Switch ON the controller.
    - 3) Make sure that the FAULT indication does not light up and then restart the operation.
  - Reference: Page 90-91.

## TSB-24

## Fault 24: Condenser pump fault

- Safety device: Thermal Switch (TS<sub>3</sub>). Fitted to surface of condenser pump.
- Application: To protect the condenser pump from overload.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) High temperature bath heater, agitator, condenser pump, and fan stop operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Condenser pump locked.
  - 2) Not enough liquid in the expansion tank or else liquid polluted in some way.
- Action:
  - 1) Make sure there is enough liquid in the expansion tank.
  - 2) Make sure that the condenser pump is not making any unusual noises.If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 3) Cool the condenser pump.
  - 4) Switch ON the controller.
  - 5) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 91-92.

## TSB-25

## Fault 25: High temperature bath not heating

- Safety device: Controller self diagnostic.
- Application: To identify abnormalities in chamber status, abnormalities that can not be detected by an external safety device.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) High temperature bath heater and agitator stop operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Solid State relay has broken down.
  - 2) Heater disconnected.
  - 3) Heater circuit wiring broken.
  - 4) High temperature bath agitator broken down.
  - 5) Circuit breaker MCB<sub>2</sub> is OFF.
- Action:
  - 1) Check whether the solid state relay has broken down or not.
  - 2) Check the heater circuit.
  - 3) Make sure that the high temperature bath agitator is functioning.
  - 4) Check whether the circuit breaker (MCB<sub>2</sub>) is ON or not.

If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Switch ON the controller.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 93-94.

## TSB-26

## Fault 26: Recovery Circuit Fault

- Safety device: Circuit breaker (MCB<sub>3</sub>)  
See Figure 5.7, Electrical Instrumentation Chassis, on page 95.
- Application: To protect the recovery circuit refrigerator and fan circuit from abnormal flows of current. In the case of an abnormal current flow, the manual switch turns itself OFF automatically.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Recovery circuit refrigerator and fan circuit stop operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Recovery circuit refrigerator or fan has either broken down or been subject to an overcurrent.
  - 2) Terminal is shorting or has worked loose.
- Action:
  - 1) Check for loose terminals or shorting.
  - 2) Check the insulation resistance levels of each actuator.If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Switch ON the circuit breaker’s manual switch.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 95-96.

## TSB-27

## Fault 27: Recovery Circuit Refrigerator Fault

- Safety device:
  - Thermal Relay (Th<sub>5</sub>)
  - See Figure 5.8, Electrical Instrumentation Chassis, on page 97.
- Application:
  - To protect the recovery circuit refrigerator against overload.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Recovery circuit refrigerator stops operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Abnormal ambient temperature (40°C or more)
  - 2) Loss of refrigerant.
  - 3) Recovery circuit refrigerator locked.
- Action:
  - 1) Check that the ambient temperature is within 0°-40°C.
  - 2) Make sure that the recovery circuit refrigerator is functioning normally.

If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Press the reset button for either the thermal relay or the pressure switch, you should hear a clicking sound.
  - 2) Switch ON the controller.
  - 4) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 97-98.

## TSB-28

## Fault 28: Recovery Circuit Fan Fault

- Safety device:
  - Thermal Switch (TS<sub>4</sub>), fitted to the recovery circuit fan.
- Application:
  - To protect the recovery circuit fan against overload.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Recovery circuit refrigerator and fan stop operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - Recovery circuit fan motor locked.
- Action:
  - Make sure that no foreign body has got into the recovery circuit fan.
  - If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Cool the recovery circuit fan.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 98-99.

## TSB-29

## Fault 29: Low Temperature Bath Heater Fault

- Safety device:
  - Circuit protector (CP<sub>1</sub>).
  - See Figure 5.9, Electrical Instrumentation Chassis, on page 100.
- Application:
  - To protect the low temperature bath heater circuit from abnormal flows of current. In the case of an abnormal current flow, the manual switch turns itself OFF automatically.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Low temperature bath heater stops operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Heater shorting.
  - 2) Terminal is shorting or has worked loose.
- Action:
  - 1) Check for loose terminals or shorting.
  - 2) Check the resistance levels of the heater and insulation.

If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Switch ON the circuit protector’s manual switch.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 100-101.



## TSB-30

## Fault 30: Refrigerator or Low Temperature Bath Agitator System Fault

- Safety device:
  - Circuit protector (MCB<sub>1</sub>).
  - See Figure 5.10, Electrical Instrumentation Chassis, on page 102.
- Application:
  - To protect the low temperature bath agitator and refrigerator circuits from abnormal flows of current. In the case of an abnormal current flow, the manual switch turns itself OFF automatically.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Low temperature bath agitator and refrigerator stop operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Low temperature bath agitator or refrigerator has either broken down or been subject to an overcurrent.
  - 2) Terminal is shorting or has worked loose.
- Action:
  - 1) Check for loose terminals or shorting.
  - 2) Check the resistance levels of the heater and insulation.

If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Switch ON the circuit protector’s manual switch.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 102-103.

## TSB-31

## Fault 31: Low Temperature Bath Agitator Fault

- Safety device:
  - Thermal switch (TS<sub>1</sub>), built-in low temperature bath agitator motor.
- Application:
  - To protect the low temperature bath agitator from overload.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Low temperature bath agitator stops operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Low temperature bath agitator motor locked.
  - 2) The brine used was either inappropriate or it was used outside its specified temperature range.
  - 3) The specimen has broken loose and become entangled in the agitator.
- Action:
  - 1) Check to make sure that an appropriate brine is being used within its specified temperature range.
  - 2) Check to make sure that the specimen has not been dislodged from the specimen cage and become entangled in the agitator.
  - 3) Make sure that the low temperature bath agitator motor is not making any unusual noises.

If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Cool the low temperature bath agitator motor.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 103-104.

TSB-32

## Fault 32: Refrigerator Cooling Water Cut Off. [Water Cooled Models]

- Safety device:
  - Water supply control relay (PS<sub>6</sub>), located in machine compartment
- Application:
  - To protect the refrigerator.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Refrigerator stops operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - Refrigerator cooling water has either been cut off or is under insufficient pressure.
- Action:
  - Increase the cooling water pressure to at least 1 kg/cm<sup>2</sup> G.
- Reset Method:
  - 1) After the cooling water pressure has been corrected, switch ON the controller.
  - 2) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 104-105.

## TSB-33

## Fault 33: Refrigerator Number 1 Second Stage Fault

- Safety device:
  - 1) Thermal Relay (Th<sub>1</sub>).  
See Fig 5.11, Electrical Instrumentation Chassis, page 106.
  - 2) High pressure switch (PS<sub>1</sub>), located in the lower level machine compartment.  
See figure page 106.
  - 3) Compressor thermostat (CT<sub>1</sub>), built in the refrigerator.
- Application: To protect the refrigerator against overload.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Refrigerator Number 1 stops operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Abnormal ambient temperature (40°C or more).
  - 2) Loss of refrigerant.
  - 3) Refrigerator locked.
- Action:
  - 1) Check that the ambient temperature is within 0 – 40°C.
  - 2) Make sure that the refrigerator is functioning normally.

If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Press the reset button for either the thermal relay or the pressure switch, you should hear a clicking sound.
  - 2) Switch ON the controller.
  - 3) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 106-107.

## TSB-34

## Fault 34: Refrigerator Number 1 First Stage Fault

- Safety device:

- 1) Thermal Relay (Th<sub>2</sub>).  
See Fig 5.12, Electrical Instrumentation Chassis, page 106.
- 2) High pressure switch (PS<sub>2</sub>), located in the lower level machine compartment.  
See figure page 106.
- 3) Compressor thermostat (CT<sub>2</sub>), built in the refrigerator.

- Application: To protect the refrigerator against overload.

- Chamber Status Following Activation:

1. With test in progress
  - 1) Refrigerator Number 1 stops operating.
  - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 4) External alarm is activated.
  - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
  - 6) The specimen power supply control terminal is disconnected.
2. With no test in progress
  - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
  - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
  - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
  - 4) External alarm is activated.
  - 5) The specimen power supply control terminal is disconnected.

- Cause:

- 1) Abnormal ambient temperature (40°C or more).
- 2) Loss of refrigerant.
- 3) Refrigerator locked.

- Action:

- 1) Check that the ambient temperature is within 0 – 40°C.
- 2) Make sure that the refrigerator is functioning normally.

If any of the above checks reveals a fault then put out a service call.

- Reset Method:

- 1) Press the reset button for either the thermal relay or the pressure switch, you should hear a clicking sound.
- 2) Cool the refrigerator.
- 3) Switch ON the controller.
- 4) Make sure that the FAULT indication does not light up and then restart the operation.

- Reference: Page 108-109.

## TSB-35

## Fault 35: Refrigerator Number 2 Second Stage Fault [Model TSB-5]

- Safety device:
  - 1) Thermal Relay (Th<sub>3</sub>).  
See Fig 5.13, Electrical Instrumentation Chassis, page 110.
  - 2) High pressure switch (PS<sub>3</sub>), located in the lower level machine compartment.  
See figure page 106.
  - 3) Compressor thermostat (CT<sub>3</sub>), built in the refrigerator.
- Application: To protect the refrigerator against overload.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Refrigerator Number 1 stops operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Abnormal ambient temperature (40°C or more).
  - 2) Loss of refrigerant.
  - 3) Refrigerator locked.
- Action:
  - 1) Check that the ambient temperature is within 0 – 40°C.
  - 2) Make sure that the refrigerator is functioning normally.

If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Press the reset button for either the thermal relay or the pressure switch, you should hear a clicking sound.
  - 2) Cool the refrigerator.
  - 3) Switch ON the controller.
  - 4) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 110-111.

## TSB-36

## Fault 36: Refrigerator Number 2 First Stage Fault [Model TSB-5]

- Safety device:
  - 1) Thermal Relay (Th<sub>4</sub>).  
See Fig 5.14, Electrical Instrumentation Chassis, page 112.
  - 2) High pressure switch (PS<sub>4</sub>), located in the lower level machine compartment.  
See figure page 106.
  - 3) Compressor thermostat (CT<sub>4</sub>), built in the refrigerator.
- Application: To protect the refrigerator against overload.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Refrigerator Number 2 stops operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Abnormal ambient temperature (40°C or more).
  - 2) Loss of refrigerant.
  - 3) Refrigerator locked.
- Action:
  - 1) Check that the ambient temperature is within 0 – 40°C.
  - 2) Make sure that the refrigerator is functioning normally.

If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - 1) Press the reset button for either the thermal relay or the pressure switch, you should hear a clicking sound.
  - 2) Cool the refrigerator.
  - 3) Switch ON the controller.
  - 4) Make sure that the FAULT indication does not light up and then restart the operation.
- Reference: Page 112-113.

## TSB-37

## Fault 37: Low Temperature Bath Not Cooling

- Safety device: Controller self diagnostic.
- Application:
  - To identify any abnormalities in chamber status. Abnormalities which cannot be detected by an external safety device.
- Chamber Status Following Activation:
  1. With test in progress
    - 1) Low temperature bath agitator and refrigerator stop operating.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) Chamber stops operation at the end of the current cycle. Recovery circuit operates for 30 minutes from the time the chamber stops operating.
    - 6) The specimen power supply control terminal is disconnected.
  2. With no test in progress
    - 1) Chamber stops operation. Recovery circuit operates for 30 minutes from the time the fault occurs.
    - 2) Warning buzzer sounds continuously, providing “fault buzzer on” was selected when the controller’s initial settings were made.
    - 3) FAULT indication blinks on the monitoring screen. Press EXPLANATION key to display fault list on monitoring screen.
    - 4) External alarm is activated.
    - 5) The specimen power supply control terminal is disconnected.
- Cause:
  - 1) Solid state relay has broken down.
  - 2) Low temperature bath agitator has broken down.
  - 3) Circuit breaker MCB<sub>1</sub> is OFF.
- Action:
  - 1) Replace the solid state relay.
  - 2) Make sure that the low temperature bath agitator is functioning.
  - 3) Check whether the circuit breaker (MCB<sub>1</sub>) is ON or not.

If any of the above checks reveals a fault then put out a service call.
- Reset Method:
  - Switch ON the controller.
- Reference: Page 114.



## **ESPEC TSB Error Codes: Alarms**

### **TSB-80 Alarm 0: Controller Alarm**

- Safety Device: Controller self diagnostic
  - Chamber status following activation of safety device
- Only Display is showed. All operation continues.
- Cause: Possible causes are listed in table 4.2

Fault and Possible Cause Display	Action
Forced I/O set	Forced Cancel
Momentary halt (longer than standard period)	Check status of the power supply (5V down for 25ms or more)

- Action: Service Call.

### **TSB-81 Alarm 1: Test Area Door Is Open**

- Safety device: Test area switch (DS<sub>1-1, 1-2</sub>), operates when door is open
- Application: To protect the operator from the drive area.
- Chamber Status Following Activation:
  1. With test in progress (during specimen transfer)
    - 1) Drive stops in current position.
    - 2) Test is suspended.
    - 3) When the door is closed, the drive returns to the start point.
    - 4) The test can be restarted by pressing the TEST START key.
  2. With test in progress (during exposure)
    - 1) Drive stops in current position.
    - 2) Test is suspended on completion of the current exposure process.
    - 3) When the door is closed, the drive returns to the start point.
    - 4) The test can be restarted by pressing the TEST START key.
  3. With no test in progress  
There is no change in the status of the chamber.

### **TSB-82 Alarm 2: Power Cut (Test in Progress)**

- Application:

If there is a power cut of id the power is switched OFF for any reason during the course of a test, then this message is displayed when power is restored to advise the operator that there has been a cut.
- Chamber Status Following Activation:

When power is restored, the chamber assumes the initial settings appropriate to the power cut/restore mode.
- Reset method:

Press the CLR key to clear the alarm state message from the monitoring screen.
- Note:

If the power switch is set to OFF without cutting the power to the controller, the chamber will assume the power cut mode and the above alarm state message will, be displayed on the monitoring screen.

### TSB-83 Alarm 3: Ambient Temperature Not In Operate Limit

- Application:  
The performance of the chamber cannot be guaranteed when the ambient temperature is outside the 5°C-35°C range and the above alarm message is therefore generated.
- Chamber Status Following Activation:  
The status of the chamber remains unchanged. However, there may be times when the performance of the chamber does not meet its full specification.
- Reset method:  
When the ambient temperature returns to the 5°C-35°C range then reset will be carried out automatically. The alarm state message will also disappear from the monitoring screen.

### TSB-84 Alarm 4: Low Controller Battery Voltage

- Application:  
If the RAM backup battery voltage output starts to fall, there is a risk that the memory (test pattern registrations) may be cleared. To prevent this situation occurring, the above alarm state message is displayed on the monitoring screen beforehand (when the power is switched OFF).
- Action:  
Replace the battery, put out a service call.

### TSB-85 Alarm 5: Drive Is In Manual Mode

- Application:  
The display is showed if the TEST START key is pressed while the manual switch is in manual mode.
- Action:  
Change the manual switch over to automatic mode and then press the TEST START key.

## ESPEC HAST Interface

This panel allows the user to interface directly with the ESPEC HAST controller. From this panel the user may implement many commands as if at the instrument itself. See the following manuals for chamber operation and programming details: ESPEC User's Manual HAST Chamber EHS-211(M), 221(M), 411(M) Standard Option and ESPEC User's Manual HAST Chamber EHS-211(M), 221(M), 411(M).

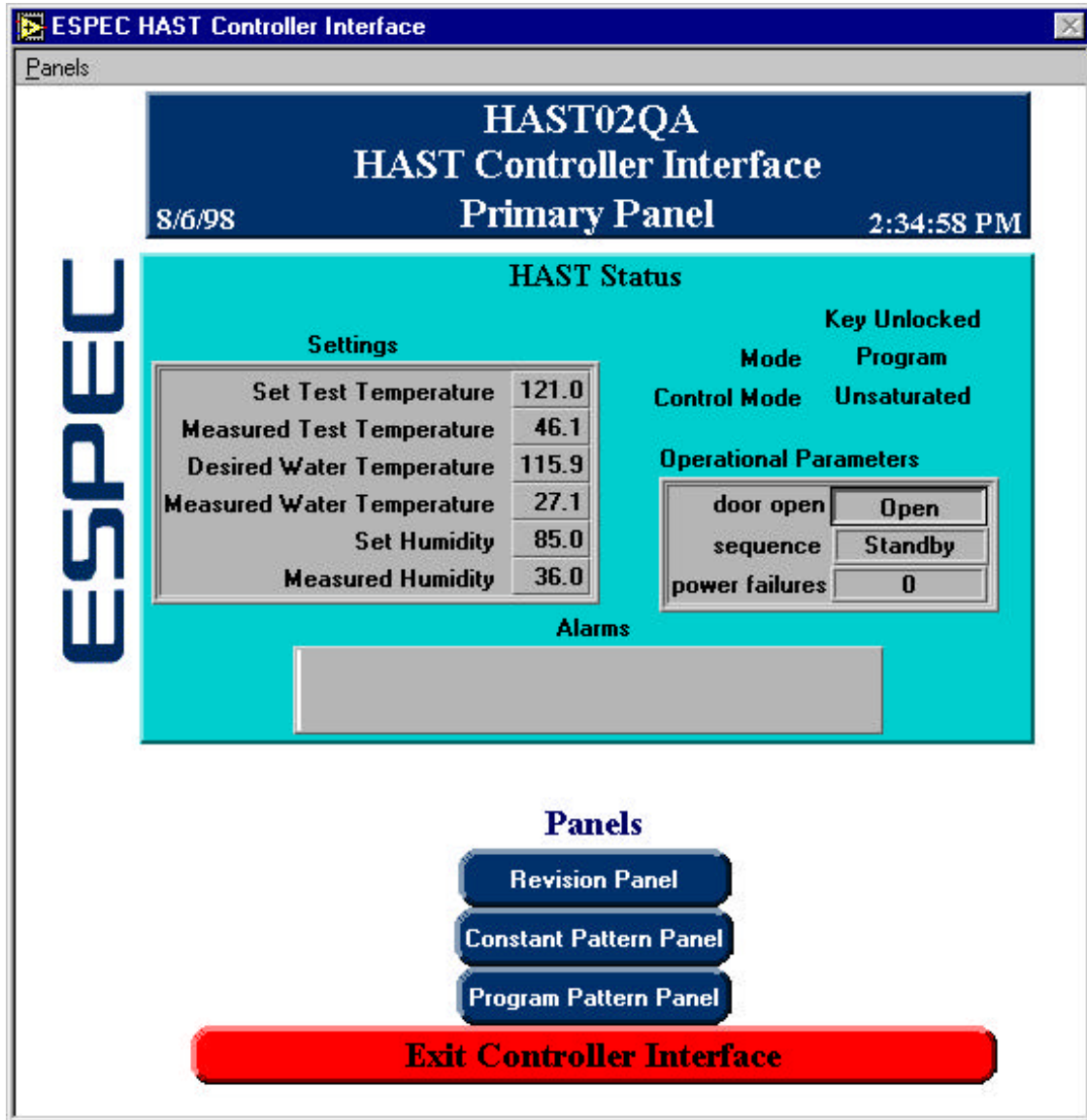


Figure 11: ESPEC HAST Interface Panel

Data Display:

Settings:

Set Test Temperature:	This is the chamber's current set temperature.
Measured Test Temperature:	This is the chamber's current temperature.
Desired Water Temperature:	This is the calculated water supply set temperature.
Measured Water Temperature:	This is the measured water supply temperature.
Set Humidity:	This is the chamber's set humidity.
Measured Humidity:	This is the chamber's measured humidity.

Keylock Status This indicates the HAST keylock setting.

Mode: Indicates that the chamber is in program mode.

Constant  
Program

Control Mode: Indicates control mode setting for chamber.

Unsaturated  
Saturated  
Dry/Wet Bulb

Operational Parameters:

Door Open: [Closed/Open]

Sequence: Indicates the current operational sequence.

Off  
Standby  
Timer On  
Ramp Up  
Run  
Ramp Down  
Exhaust  
Finish

Power Failures: The number of power failures since the key switch was turned on.

Alarms The alarm strings.

Commands:

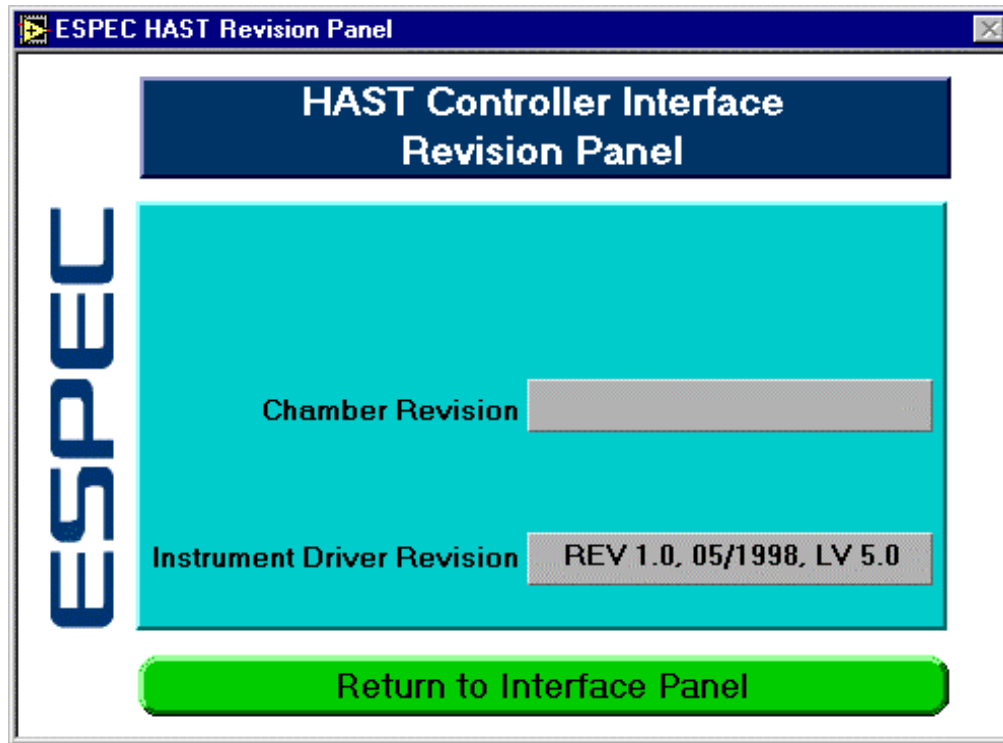
Revision Panel: Open a panel for the revision information.

Constant Pattern Panel: Open a panel for the constant mode settings.

Program Pattern Panel: Open a panel for programming the chamber.

## ***ESPEC HAST Revision Panel***

This panel consists of information on the hardware and software revisions.



**Figure 12: ESPEC HAST Revision Panel**

### Display Data:

Chamber Revision: The chamber ROM version  
Instrument Driver: The low-level LabVIEW instrument driver software version.

### Commands:

Return to Interface Panel

## ESPEC HAST Constant Pattern Panel

This panel allows the user to set the constant mode settings for the HAST chamber. See the following manuals for chamber operation and programming details: ESPEC User's Manual HAST Chamber EHS-211(M), 221(M), 411(M) Standard Option and ESPEC User's Manual HAST Chamber EHS-211(M), 221(M), 411(M).

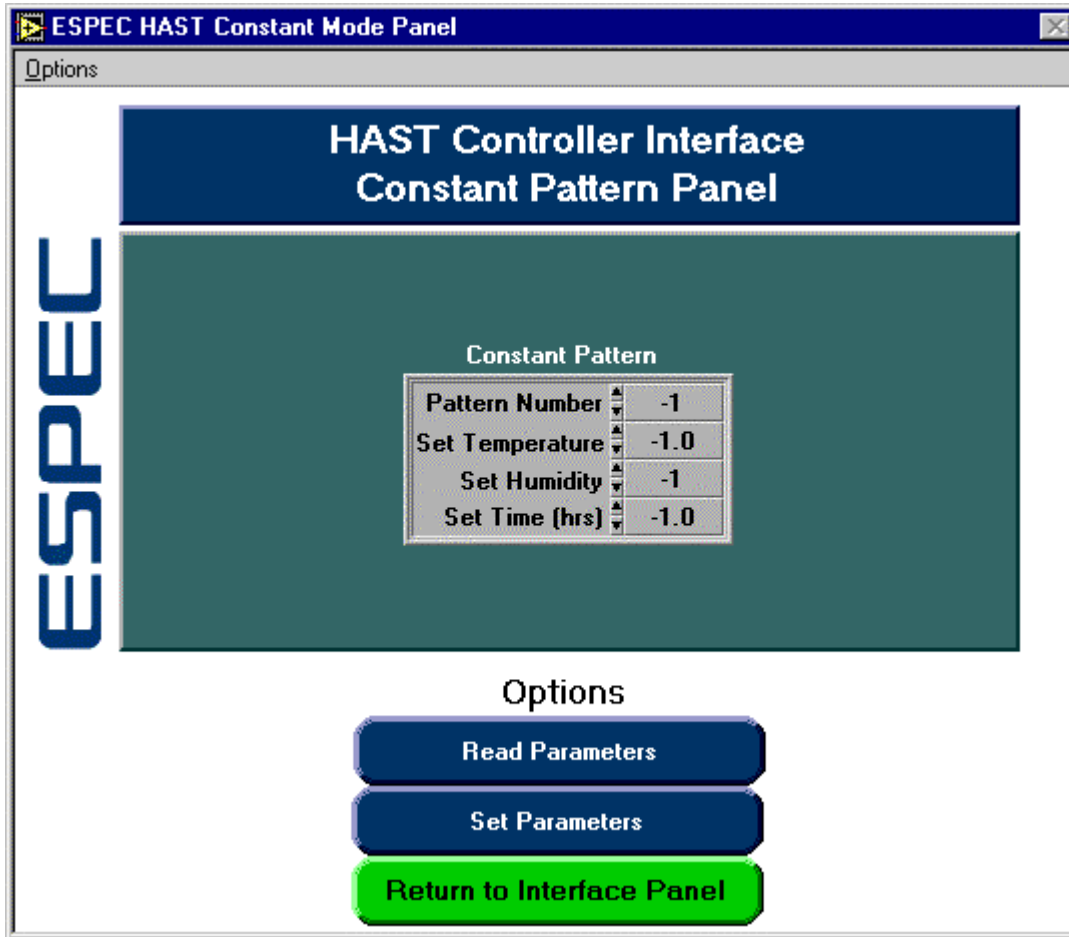


Figure 13: ESPEC HAST Constant Patten Panel

### Display Data:

#### Constant Pattern:

Pattern Number: The current select pattern  
Set Temperature: The current set temperature  
Set Humidity: The current set humidity  
Set Time: The current set time

### Commands:

Read Parameters: Re-reads the chamber's current set parameters.  
Set Parameters: Sends the displayed parameters to the chamber. After altering values they must be sent back in order to be changed at the controller.  
Return to Interface Panel.

## ESPEC HAST Program Edit Panel

This panel allows the user to set the program mode settings for the HAST chamber. See the following manuals for chamber operation and programming details: ESPEC User's Manual HAST Chamber EHS-211(M), 221(M), 411(M) Standard Option and ESPEC User's Manual HAST Chamber EHS-211(M), 221(M), 411(M).

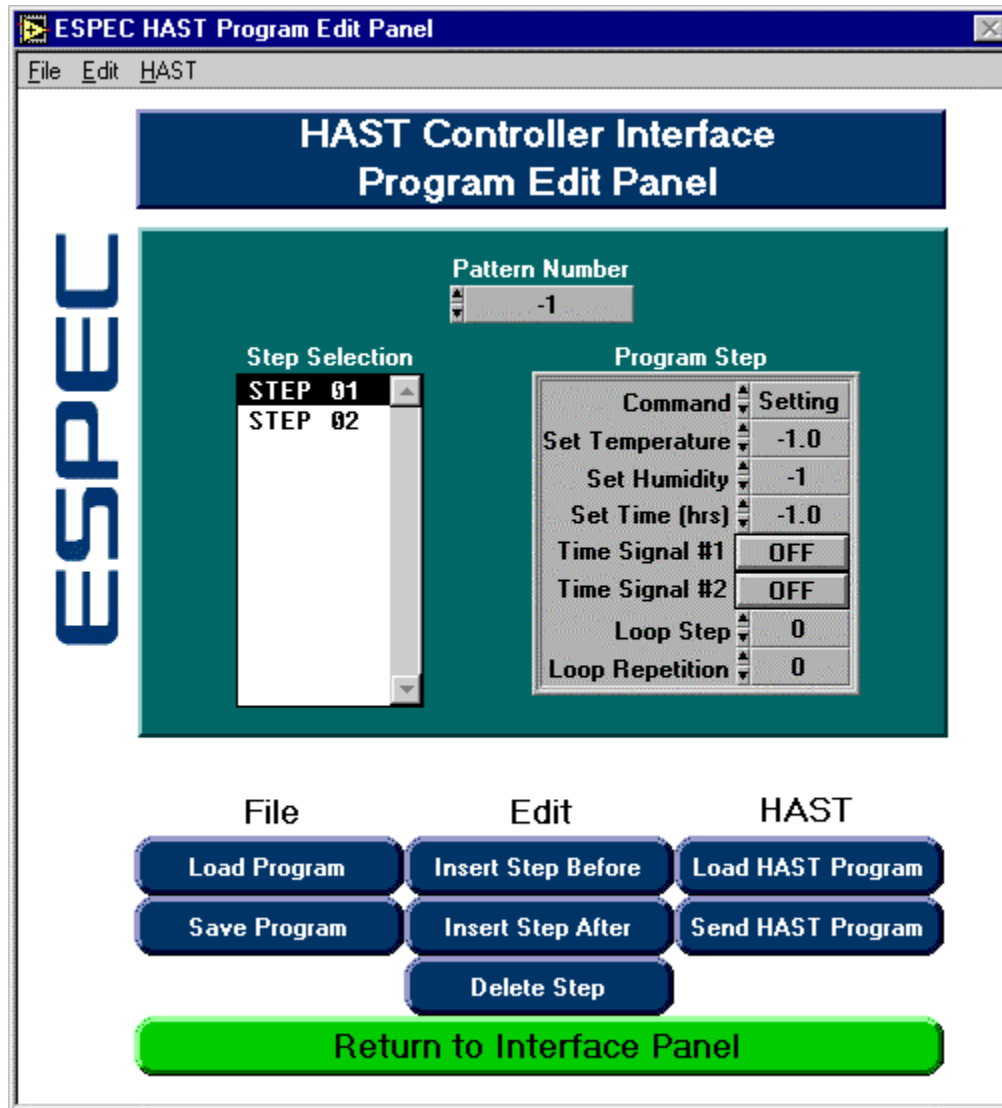


Figure 14: ESPEC HAST Program Edit Panel

Parameter Settings:        *SEE ESPEC MANUALS FOR FURTHER DETAILS.*

  Pattern Number:         The pattern number for editing.

  Step Selection:         The listing of the number of steps currently in the program.

  Program Step:

    Command:

      Setting   Used for setting parameter for the current step.

      Skip      Used to leave empty steps within programs.

      Loop      Used to provide looping within a program.

      End       Used as the last set in a program.

  Set Temperature

  Set Humidity

  Set Time

  Time Signal #1   See the ESPEC HAST Manuals.

  Time Signal #2   See the ESPEC HAST Manuals.

  Loop Step        The step with which to begin looping.

  Loop Repetition   The total number of repetitions for the loop.

Commands:

  File: Load Program       This loads a program from a computer file.

  File: Save Program       This saves the program to a computer file for latter recall. The default extension is "hst".

  Edit: Insert Step Before   This inserts a new step before the selected step.

  Edit: Insert Step After    This inserts a new step after the selected step.

  Edit: Delete Step         This deletes the selected program step.

  EY-101: Load HAST Program   This loads a program from the specified location of the ESPEC HAST memory.

  EY-101: Send HAST Program   This sends a program to the ESPEC HAST. If there are programming errors they will lead to an error panel. Some settings are not allowable.

  Return to Interface Panel   This closed the panel and returns to the interface panel.



## ESPEC HAST Error Codes

Source: *User's Manual- HAST Chamber EHS-211(M), 221 (M), 411(M) Standard Option IM00082*

**Customer Support for ESPEC Corporation: 800-537-7320**

**Table 2: ESPEC HAST Alarm Details [Manual Page: 35]**

<b>Alarm Code</b>	<b>Alarm Description</b>
HA-D-01	Temperature overheat (overheat protector)
HA-D-02	Humidifying heater boil dry (boil-dry detector)
HA-D-03	Test area temperature sensor- BURN-OUT
HA-D-04	Humidifying water temperature sensor. BURN-OUT
HA-D-05	Wet-bulb temperature sensor. BURN-OUT
HA-D-06	Exhaust temperature sensor. BURN-OUT
HA-D-07	Temperature compensation sensor abnormality
HA-D-08	Excess pressure
HA-D-09	Fan alarm
HA-D-10	Wick alarm
HA-D-11	Undefined
HA-D-12	Test area temperature sensor measurement overheat (Maximum setting temperature +10° C)
HA-D-13	Humidifying water temperature sensor measurement overheat (Maximum setting temperature +10° C)
HA-D-14	External alarm input
HA-D-15	Power failure alarm
HA-D-16	Door open alarm

**Table 3: ESPEC HAST Alarm Status [Manual Page: 28]**

<b>Alarm Code</b>	<b>Alarm Description</b>
HA-A-01	The door has been opened during a sequence after RAMP UP.
HA-A-02	Abnormal pressure
HA-A-03	Humidifying water temperature sensor BURN-OUT
HA-A-04	Test area temperature sensor
HA-A-05	Humidifying heater
HA-A-06	Test area heater
HA-A-07	POWER FAILURE

## ESPEC EY-101 Interface

This panel allows the user to interface directly with the ESPEC EY-101 controller. From this panel the user may implement many commands as if at the instrument itself. See the following manuals for chamber operation and programming details: ESPEC Digital Programmer EY-101 Instruction and ESPEC Digital Programmer EY-101 Option Instruction. There is a software demo that enables demonstration of the Tool Suite with a software version of the EY-101. This demo version does not simulate all aspects of the EY-101 controller, it simply enables showing the typical interface in the Tool Suite.

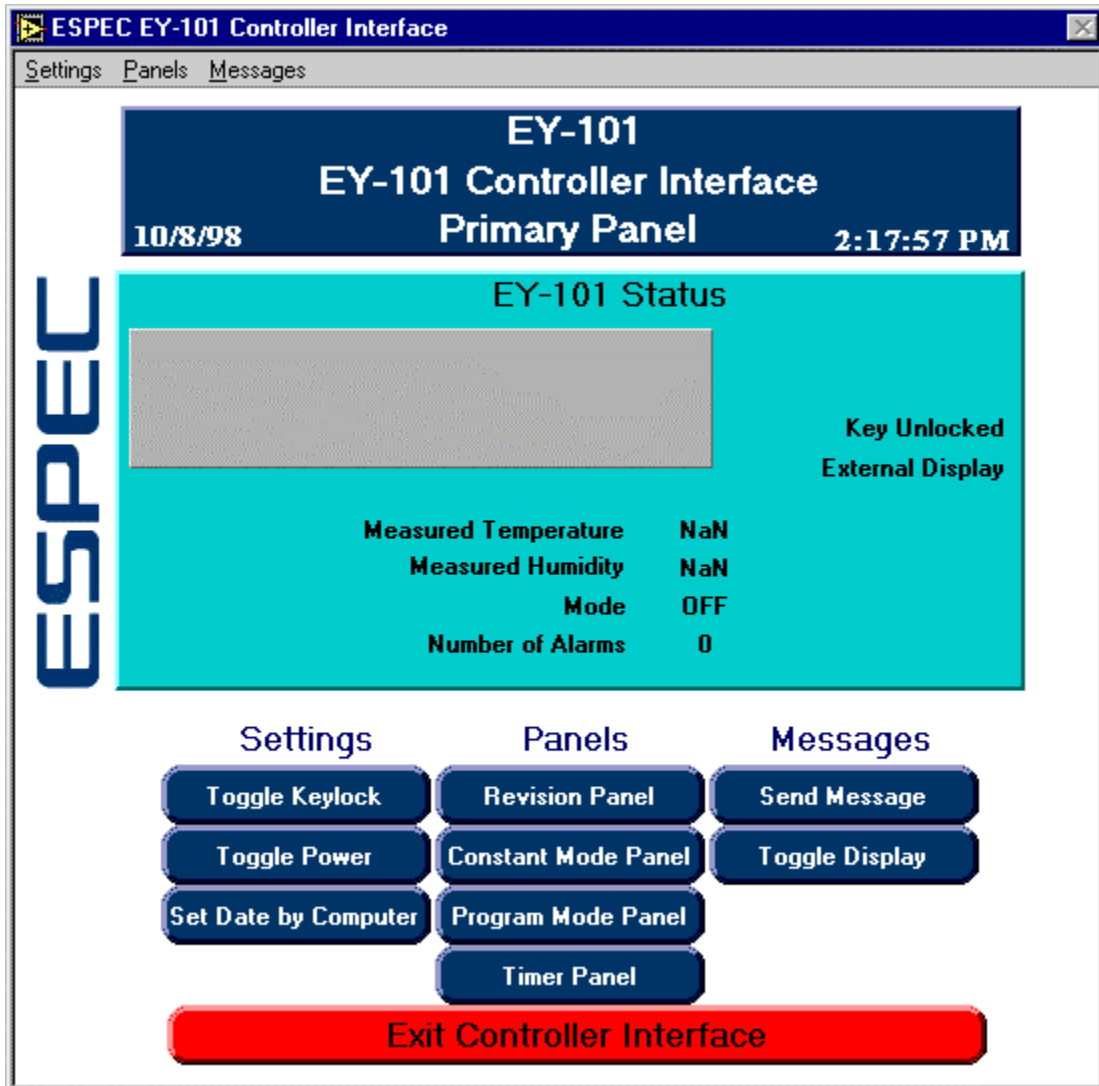


Figure 15: ESPEC EY-101 Interface Panel

#### Display Data:

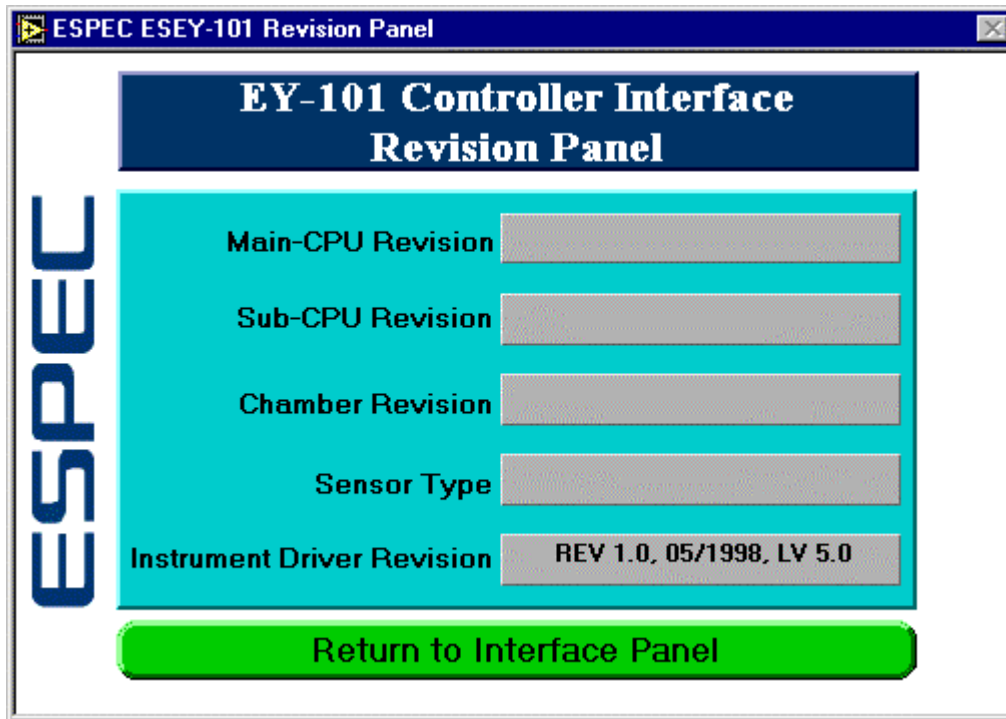
Display Screen	The chamber's screen display.
Chamber Date and Time	The chamber's date and time settings.
Keylock Status	The chamber's keylock setting.
Display Mode	The display setting. Internal indicates the standard display screen, while external is the user message display. [Internal/External]
Measured Temperature	The chamber's current temperature.
Measured Humidity	The chamber's current humidity.
Mode:	Status
Off	Chamber is OFF
Constant	Chamber under constant-mode operation
Run	Chamber program in operation
Pause	Chamber program operation temporary stop
End	Chamber program operation end
Number of Alarms:	The number of new alarms.

#### Commands:

Settings: Toggle Keylock	Switches the keylock setting.
Settings: Toggle Power	Switches the power setting.
Settings: Set Date by Computer	Sends the computer's date and time to the chamber.
Panel: Revision Panel	Open a panel for the revision information.
Panel: Constant Mode Panel	Open a panel for the constant mode settings.
Panel: Program Mode Panel	Open a panel for the program mode setting.
Panel: Timer Panel	Open a panel for the timer settings.
Messages: Send Message	Sends a user specified message to the display panel.
Messages: Toggle Display	Switches between display settings.
Exit Controller Interface	Returns to the Primary Panel.

## **ESPEC EY-101 Revision Panel**

This panel consists of information on the hardware and software revisions.



**Figure 16: ESPEC EY-101 Revision Panel**

### Display Data:

Model Identifier:	The model identifier set on the controller.
Controller Revision:	The controller ROM version
Chamber Revision:	The chamber ROM version
Sensor Type:	The thermocouple type and valid range.
Instrument Driver:	The low-level LabVIEW instrument driver software version.

### Commands:

Return to Interface Panel

## ESPEC EY-101 Constant Mode Panel

This panel allows the user to set the constant mode settings for the ESPEC EY-101 chamber. See the following manuals for chamber operation and programming details: ESPEC Digital Programmer EY-101 Instruction and ESPEC Digital Programmer EY-101 Option Instruction.

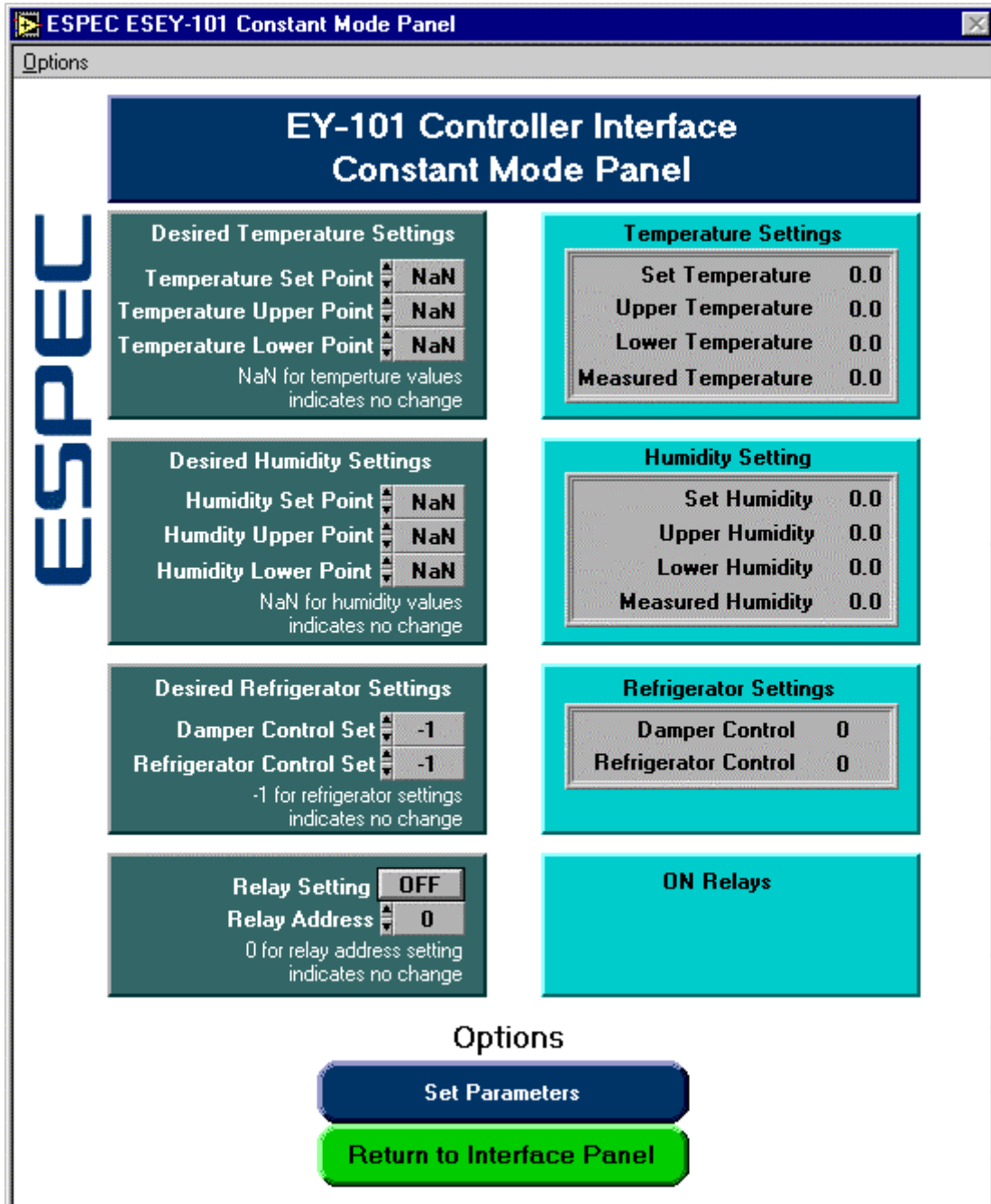


Figure 17: ESPEC EY-101 Constant Mode Panel

Parameter Settings: These are the user changes to the current parameters. After entering they must be sent with the set parameters command.

*SEE ESPEC MANUALS FOR FURTHER DETAILS.*

Desired Temperature Settings

Temperature Set Point  
Temperature Upper Point  
Temperature Lower Point

Desired Humidity Settings

Humidity Set Point  
Humidity Upper Point  
Humidity Lower Point

Desired Refrigerator Settings

Damper Control Set See hardware reference manual for settings.  
Refrigerator Control Set See hardware reference manual for settings.

Relay Setting Specify the desired relay state here.

Relay Address Specify the relay address to set.

Display Data: These are the current EY-101 settings.

Temperature Settings

Set Temperature  
Upper Temperature  
Lower Temperature  
Measured Temperature

Humidity Settings

Set Humidity  
Upper Humidity  
Lower Humidity  
Measured Humidity

Refrigerator Settings

Damper Control See hardware reference manual for settings.  
Refrigerator Control See hardware reference manual for settings.

On Relay This is a list of relays in the ON state.

Commands

Set Parameters This sends the settings to the chamber.

Return to Interface Panel

## ESPEC EY-101 Program Mode Panel

This panel allows the user to set the program mode settings for the ESPEC EY-101 chamber. See the following manuals for chamber operation and programming details: ESPEC Digital Programmer EY-101 Instruction and ESPEC Digital Programmer EY-101 Option Instruction.

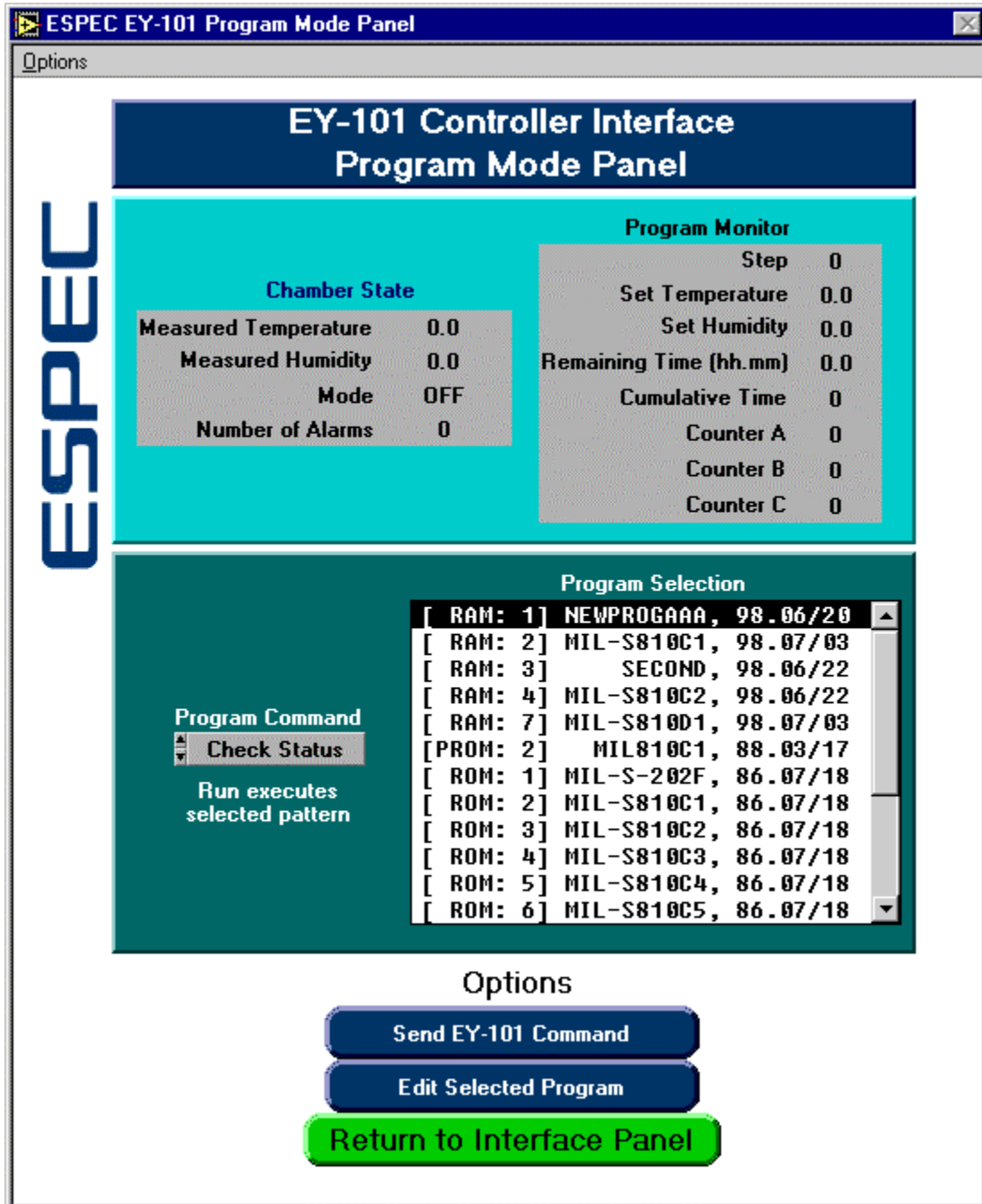


Figure 18: ESPEC EY-101 Program Mode Panel

## Display Data

Chamber State	
Measured Temperature	The chamber's current temperature.
Measured Humidity	The chamber's current humidity.
Mode:	
	Status
Off	Chamber is OFF
Constant	Chamber under constant-mode operation
Run	Chamber program in operation
Pause	Chamber program operation temporary stop
End	Chamber program operation end
Number of Alarms:	The number of new alarms.
Program Monitor	
Step	The current program step number
Set Temperature	The current program set temperature
Set Humidity	The current program set humidity
Remaining Time	The program remaining time.
Cumulative Time	The cumulative time that the program has run.
Counter A	The first counter value for looping. See manual.
Counter B	The second counter value for looping. See manual.
Counter C	The third counter value for looping. See manual.
Parameter Settings	
Program Command	
	Execution Result
Check Status	Checks the current settings
Run Pattern	Runs the selected program
Pause	Pauses the currently executing program
Continue	Continues a paused program
Advance Step	Advances past the current step manually
End, Hold	Ends the program and holds the chamber in the current state.
End, Constant	Ends the program and places the chamber in the constant mode.
End, Off	Ends the program and turns the chamber off.
Program Selection	List of all stored programs so the user can select a program to run or edit. It lists storage location, name, and creation date.
Commands	
Send EY-101 Command	Sends the specified program command to the chamber.
Edit Selected Program	Opens a panel to edit the selected program.
Return to Interface Panel	



## ESPEC EY-101 Program Edit Panel

This panel allows the user to set the program mode settings for the ESPEC EY-101 chamber. See the following manuals for chamber operation and programming details: ESPEC Digital Programmer EY-101 Instruction and ESPEC Digital Programmer EY-101 Option Instruction.

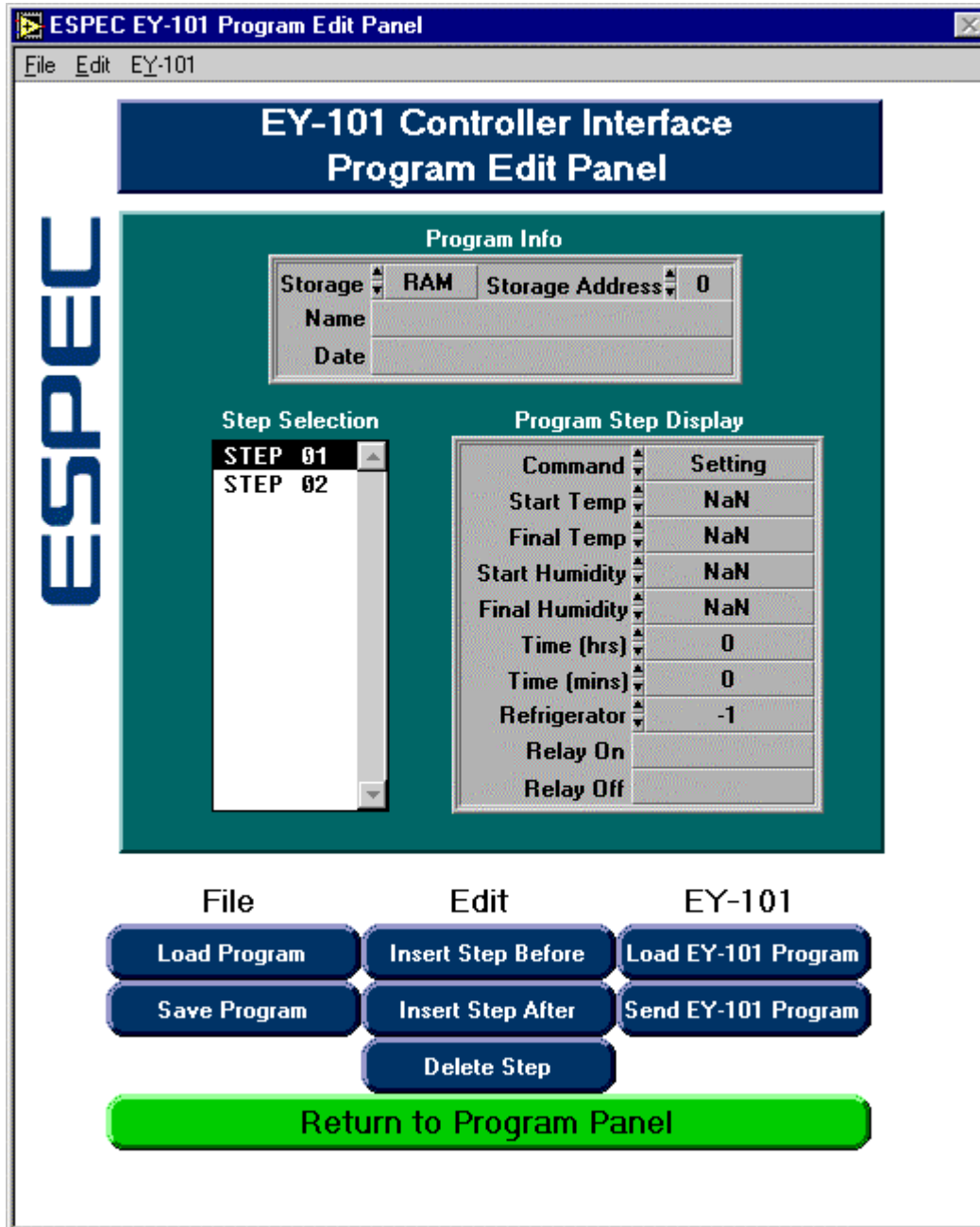


Figure 19: ESPEC EY-101 Program Edit Panel

Parameter Settings

*SEE ESPEC MANUALS FOR FURTHER DETAILS.*

Program Info

Storage This is the memory storage type. [ROM/PROM/RAM]  
Storage Address This is the memory location.  
Name This is the program name.  
Date This is the date the program was recorded. It is automatically set when the program is sent to the EY-101.

Step Selection

The current step is highlight within this list.

Program Step Display

Command

Setting  
Count This specifies a looping command. See parameters below.  
Pause This pauses a program for user intervention.  
End: Hold This ends a program and the chamber stays in the current settings.  
End: Constant This ends a program and the chamber is set in constant mode.  
End: Off This ends a program and the chamber is turned off.  
Start Temp This is the step's starting temperature setting. NaN (Not a number) is used if the prior temperature setting is to be used. This is only available for the Setting command.  
Final Temp This is the step's final temperature setting. NaN (Not a number) is used if the prior temperature setting is to be used. This is only available for the Setting command.  
Start Humidity This is the step's starting humidity setting. NaN (Not a number) is used if the prior humidity setting is to be used. This is only available for the Setting command.  
Final Humidity This is the step's starting humidity setting. NaN (Not a number) is used if the prior humidity setting is to be used. This is only available for the Setting command.  
Time This is the step's time setting. This is only available for the Setting command.  
Refrigerator This is the step's refrigerator setting. See ESPEC Manual for details. This is only available for the Setting command.  
Relay On This is a comma delimited list of the relays to turn on. This is only available for the Setting command.  
Relay Off This is a comma delimited list of the relays to turn off. This is only available for the Setting command.  
Count Register The counter register letter for looping. Only available if the Count command is selected.  
Repeat Step The first step to at which to begin looping. Only available if the Count command is selected.  
Repetitions The total number of repetitions to execute. Only available if the Count command is selected.

## Commands

File: Load Program	This loads a program from a computer file.
File: Save Program	This saves the program to a computer file for latter recall. The default extension is 101.
Edit: Insert Step Before	This inserts a new step before the selected step.
Edit: Insert Step After	This inserts a new step after the selected step.
Edit: Delete Step	This deletes the selected program step.
EY-101: Load EY-101 Program	This loads a program from the specified location of the EY-101 memory.
EY-101: Send EY-101 Program	This sends a program to the ESPEC EY-101. If there are programming errors they will lead to an error panel. Some settings are not allowable.
Return to Program Panel	This closed the panel and returns to the program panel.

## ESPEC EY-101 Timer Panel

This panel allows the user to set the timer settings for the ESPEC EY-101 chamber. See the following manuals for chamber operation and programming details: ESPEC Digital Programmer EY-101 Instruction and ESPEC Digital Programmer EY-101 Option Instruction.

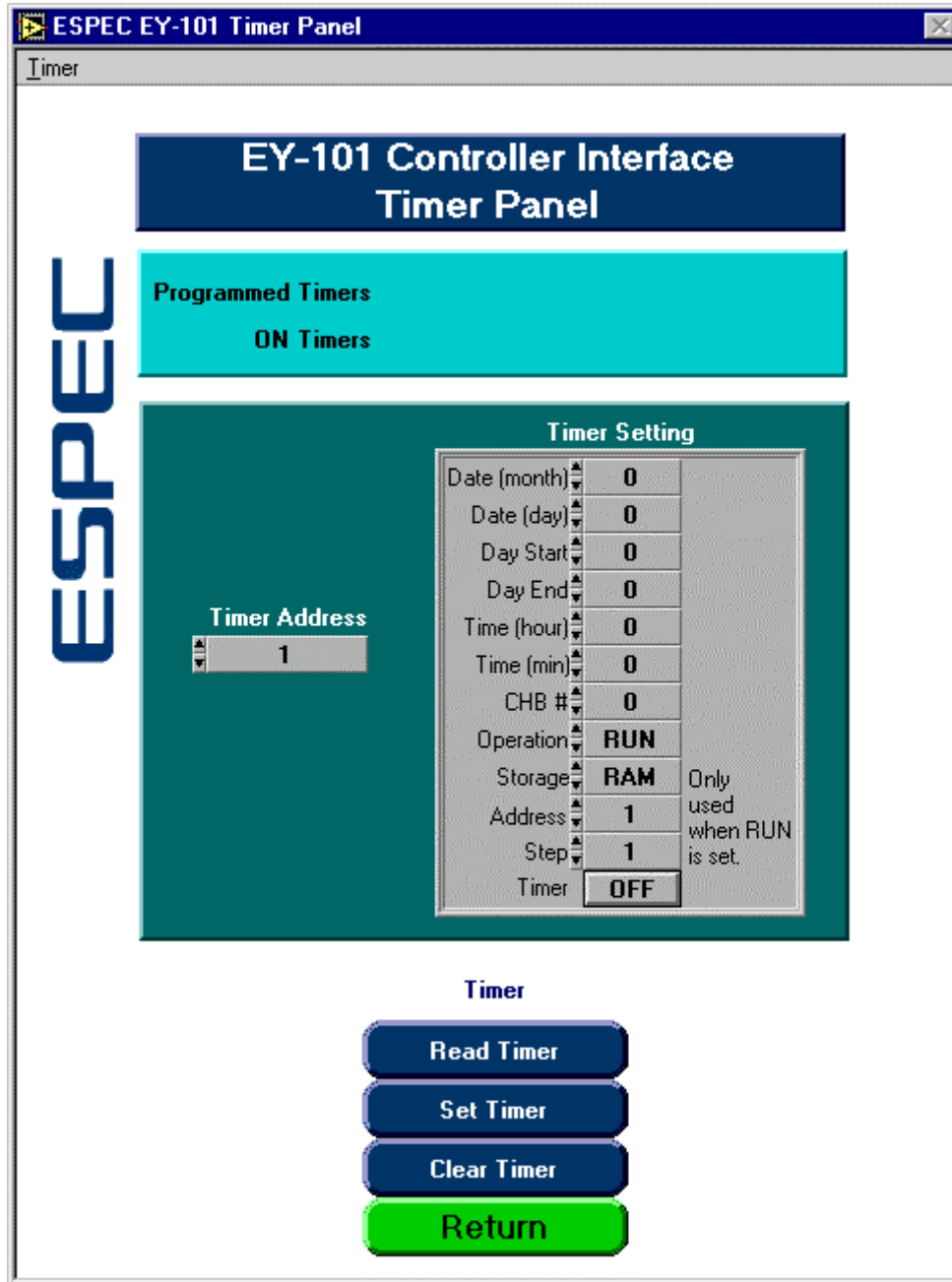


Figure 20: ESPEC EY-101 Timer Panel

Display Data:		SEE ESPEC MANUALS FOR FURTHER DETAILS
Programmed Timers		List of timers that have active programs stored.
On Timers		List of timers that are active.
Parameter Settings		
Timer Address		The timer address. [1-9]
Timer Setting		
Date		Specified date for the timer to activate.
Day Start		The starting day of the week the program is active. Either the Date field is used or the Day Start/End.
Day End		The ending day of the week the program is active. Either the Date field is used or the Day Start/End.
Time		The time of the day for the timer to activate.
CHB #		The chamber number.
Operation		
Run		Runs the specified program at the specified time.
On		Turns the chamber on at the specified time.
Off		Turns the chamber off at the specified time.
Storage		The memory storage of the program to run.
Address		The memory location of the program to run.
Step		The program step to begin on.
Timer		Specifies if the timer is active or inactive.
Commands:		
Read Timer		Reads the timer information from the EY-101.
Set Timer		Sets the timer according to the parameter settings.
Clear Timer		Clears the currently specified timer.
Return to Interface Panel		

## ESPEC EY-101 Error Codes

Source: Digital Programmer EY-101 Instruction Manual: Page 82

Customer Support for ESPEC Corporation: 800-537-7320

**Table 4: ESPEC EY-101 Error Codes**

Alarm Number	Alarm Contents	Screen Display	Cause	Remedy
EY-00	Burnout	"Burnout _" ‡	<ul style="list-style-type: none"> <li>Faulty temp. sensor connection</li> <li>Faulty temp. sensor</li> </ul>	<ul style="list-style-type: none"> <li>Reconnect temp. sensor</li> <li>Replace temp. sensor</li> </ul>
EY-01	Automatic upper limit	"Auto Hi Limit"	<ul style="list-style-type: none"> <li>Specimen heat generation excessive</li> <li>Insufficient refrigerator capacity</li> </ul>	<ul style="list-style-type: none"> <li>Select an appropriate refrigerator level</li> <li>Have refrigerator serviced</li> </ul>
EY-02	High temperature limit	"Hi-TEMP Limit"	<ul style="list-style-type: none"> <li>Faulty high-limit setting</li> <li>Heating stuck ON</li> </ul>	<ul style="list-style-type: none"> <li>Set correct setting</li> <li>Have heater serviced</li> </ul>
EY-03	Low temperature limit	"Lo-TEMP Limit"	<ul style="list-style-type: none"> <li>Faulty low-limit setting</li> <li>Heater does not operate</li> </ul>	<ul style="list-style-type: none"> <li>Set correct setting</li> <li>Have heater serviced</li> </ul>
EY-04 †	Heater on	"TE-Heater On"	<ul style="list-style-type: none"> <li>Faulty SSR or power relay</li> </ul>	<ul style="list-style-type: none"> <li>Service call</li> </ul>
EY-05 †	Heater off	"TE-Heater Off"	<ul style="list-style-type: none"> <li>Faulty SSR or power relay</li> </ul>	<ul style="list-style-type: none"> <li>Service call</li> </ul>
EY-06	Overheating	"Overheat"	<ul style="list-style-type: none"> <li>Faulty operation of external heater</li> <li>Heater does not operate</li> </ul>	<ul style="list-style-type: none"> <li>Reset</li> <li>Replace fuse after checking cause</li> </ul>
EY-07	Circulation fan	"Fan.Down"	<ul style="list-style-type: none"> <li>Thermal switch has actuated</li> </ul>	<ul style="list-style-type: none"> <li>Cool the motor of the circulation fan to reset it after checking the cause of the fault</li> </ul>
EY-08	Refrigerator	"Ref.Down"	<ul style="list-style-type: none"> <li>Pressure switch, overload relay or slow-blow fuse has actuated</li> </ul>	<ul style="list-style-type: none"> <li>Cool the motor of the circulation fan to reset it after checking the cause of the fault</li> </ul>
EY-09 †	Door	"Door Open"	<ul style="list-style-type: none"> <li>Chamber door is OPEN</li> </ul>	<ul style="list-style-type: none"> <li>CLOSE chamber door</li> </ul>
EY-10	Overcool	"Overcool"	<ul style="list-style-type: none"> <li>Faulty operation of external cooler</li> </ul>	<ul style="list-style-type: none"> <li>Set overcool protector correctly</li> </ul>
EY-11	Faulty heater system	"DRY. Trouble"	<ul style="list-style-type: none"> <li>Heater has short circuit Quick-blow fuse has blown</li> </ul>	<ul style="list-style-type: none"> <li>Replace fuse after checking the cause</li> </ul>
EY-21	Humidifier faulty	"WET. Trouble"	<ul style="list-style-type: none"> <li>Humidifier has short circuit Quick-blow fuse has blown</li> </ul>	<ul style="list-style-type: none"> <li>Replace fuse after checking the cause</li> </ul>
EY-22	Upper humidity	"Hi-HUMI"	<ul style="list-style-type: none"> <li>Inadequate capacity</li> </ul>	<ul style="list-style-type: none"> <li>Gas Charge</li> </ul>

	limit	Limit"	of cooling circuit • Wick is dried	<ul style="list-style-type: none"> <li>• Service call</li> <li>• Supply with water</li> </ul>
EY-23	Lower humidity faulty	"Lo-HUMI Limit"	• Humidifier heater does not energize	<ul style="list-style-type: none"> <li>• Check humidifier heater circuit</li> <li>• Service call</li> </ul>
EY-24 †	Humidifying hear ON	"HU-Heater On"	• Faulty SSR or power relay	<ul style="list-style-type: none"> <li>• Service call</li> <li>• Replace parts</li> </ul>
EY-25 †	Humidifying heater OFF	"HU-Heater Off"	• Faulty SSR or power relay	<ul style="list-style-type: none"> <li>• Service call</li> <li>• Replace parts</li> </ul>
EY-26	Water alarm	"WATER (Supply, Drain, etc.)"	<ul style="list-style-type: none"> <li>• No supply water</li> <li>• Drain remains OPEN</li> </ul>	<ul style="list-style-type: none"> <li>• Check supply line</li> <li>• Check water circuit</li> </ul>

(Notes) AL12~20 and 27~32 are currently not in use.

**Note †:** AL4, 5, 9, 24, and 25 are not used in *Platinous Series*.

**Note ‡:** In the case of a BURNOUT alarm, the analog input number is displayed simultaneously.

"Burnout 0, 1, 2, 6"

- 0....Room Temperature input
- 1....Dry-bulb temperature input
- 2....Wet-bulb temperature input
- 6....Inbuilst overheat protector sensor input

In the event of a BURNOUT alarm, the MONITOR display will show a temperature of 225.4 degrees C (this indicates that the measuring range has been exceeded).

## Heraeus BR6000 Oven Interface

This panel allows the user to interface directly with the Heraeus oven controller. The user may monitor the temperature at the oven.

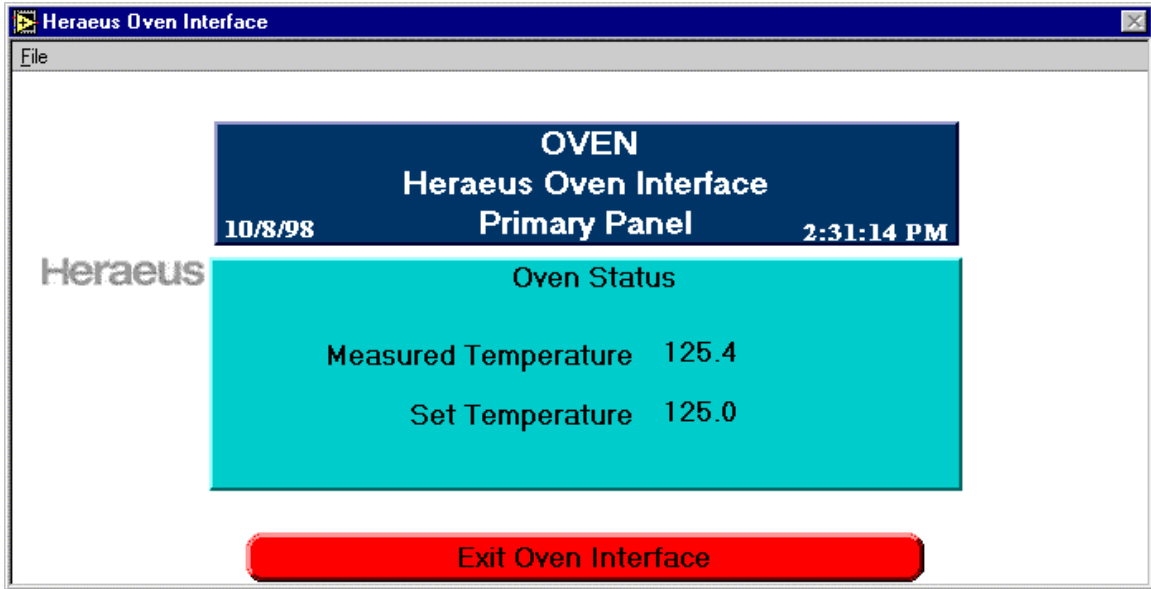


Figure 21: Heraeus Oven Interface Panel

Display Data:

Measured Temperature: The oven's current temperature  
 Set Temperature: The oven's set temperature.

## Heraeus BR6000 Oven Error Codes

Source: *Supplement to instruction manual 50047155- Interface RS232*

Customer Support for Heraeus Instruments Toll Free: 800-Heraeus (800-437-2387)

Table 5: Heraeus BR6000 Error Codes

Code	Possible error	Solution
HE-E-3	Memory data incorrect	<ul style="list-style-type: none"> <li>• Switch appliance off/on</li> <li>• Inform Customer service if necessary</li> </ul>
HE-E-4	Measured deviation of reference values	<ul style="list-style-type: none"> <li>• Inform Customer service</li> </ul>
HE-E-5	Actual temperature above permissible deviation	<ul style="list-style-type: none"> <li>• Inform Customer service</li> </ul>
HE-E-6	Actual temperature below permissible deviation	<ul style="list-style-type: none"> <li>• Inform Customer service</li> </ul>
HE-E-7	Temperature sensor or inlet faulty	<ul style="list-style-type: none"> <li>• Inform Customer service</li> </ul>
HE-E-8	Memory data incorrect	<ul style="list-style-type: none"> <li>• Inform Customer service</li> </ul>
HE-E-9	Reference values incorrect	<ul style="list-style-type: none"> <li>• Inform Customer service</li> </ul>



## Error Panel

This panel reports any unusual errors. Many of the interface panels may result in an error panel if inappropriate commands have been requested to be sent. It typically indicates an improper or unallowed parameter setting, see the hardware user manual.

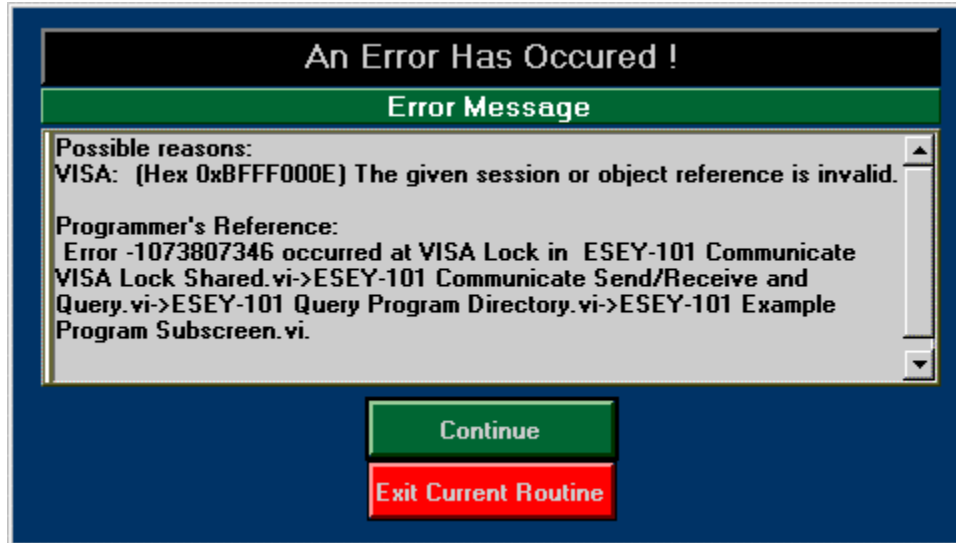


Figure 22: Error Panel

## Wait Panel

This panel is displayed while communication with a chamber is underway.



Figure 23: Wait Panel

## **General Communication Errors**

Customer Support for Durability, Inc. Toll Free: 877-Durability (877-387-2245)

- General Communication Errors: Check the cable integrity and connection in the back of the faulted instrument. If problem persists, call Durability, Inc. immediately.