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CUSTOM BIOGENIC SYSTEMS
2300 LN2 STORAGE UNIT
SET-UP & TECHNICAL MANUAL



Custom BioGenic Systems

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IMPORTANT INFORMATION

We at Custom Biogenic Systems are proud of our work, and appreciate your purchase of this product. With proper care, this equipment will be trouble-free for many years to come. Before setting up and using your new cryogenic storage unit, first check to see that all parts are accounted for and that no damage has occurred during shipping. Also, read this manual completely before proceeding to set-up. If at any time you are unsure of the procedures for set-up and use of this product, please contact CBS or your CBS sales representative.

NOTE: If equipment is used in a manner not specified by Custom Biogenic Systems, the protection provided by the equipment will be impaired.

PRODUCT WARRANTY

Custom Biogenic Systems warrants all manufactured cryogenic equipment to be free from defects in workmanship or materials for a period of three years.

Custom Biogenic Systems' liabilities under the warranty shall be limited to correcting or replacing defective workmanship or materials. A claimant under the warranty must notify Custom Biogenic Systems within (10) days after the discovery of the defect. Custom Biogenic Systems reserves the right, at their discretion, to correct the defect(s) in the field without return shipment to the factory.

This warranty does not cover defects on cryogenic equipment resulting from abusive handling and subsequent structural failure.

Serial Number_____

Model number_____

For Technical Assistance Call: 1.800.523.0072 (U.S. Only)
Phone: 586.331.2600 Fax: 586.331.2588
www.custombiogenics.com

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LIQUID NITROGEN SAFETY

IMPORTANT: The following section on LIQUID NITROGEN SAFETY should be read carefully and be followed completely, but is by no means a complete volume on the safe use of cryogenic liquids. All personnel should have a complete knowledge of the correct procedures, as well as the hazards of working with liquid nitrogen. Failure to do so could result in serious injury or death.

WARNING

LIQUID NITROGEN IS AN EXTREMELY COLD LIQUID - LIQUID NITROGEN EXISTS AT -196°C. BECAUSE OF THESE COLD TEMPERATURES, LIQUID NITROGEN WILL CREATE A FROST BITE IF THEY COME INTO CONTACT WITH SKIN. NEVER ALLOW DIRECT SKIN CONTACT WITH LIQUID NITROGEN OR SERIOUS FROST BITE WILL RESULT.

ALTHOUGH LIQUID NITROGEN ITSELF IS NON-TOXIC, WHEN RELEASED INTO A CONFINED SPACE IT CAN DISPLACE OXYGEN CAUSING ASPHYXIATION. ENTERING AN OXYGEN DEFICIENT ROOM CAN CAUSE UNCONSCIOUSNESS WITHOUT WARNING. ALWAYS CHECK AIR QUALITY UPON ENTERING A ROOM WHERE CRYOGENIC LIQUIDS ARE BEING USED, AND IF POSSIBLE, HAVE AIR RESPIRATORS AVAILABLE.

INTRODUCING EQUIPMENT WHICH IS AT ROOM TEMPERATURE INTO LIQUID NITROGEN IS ALWAYS SOMEWHAT HAZARDOUS. BEWARE OF SPLASHING AND "BOILING" WHICH MAY OCCUR. ALL PERSONNEL PERFORMING THESE OPERATIONS SHOULD BE FULLY INFORMED OF PROPER HANDLING PROCEDURES, AND SHOULD ALWAYS WEAR A FACE SHIELD AND PROTECTIVE CLOTHING.

LIQUID NITROGEN SHOULD NEVER BE USED IN COMBINATION WITH OTHER SUBSTANCES WITHOUT KNOWING WHAT THE RESULT WILL BE. WHEN IN DOUBT, CONTACT A COMPETENT AUTHORITY.

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HANDLING LIQUID NITROGEN

Personnel handling liquid nitrogen should be thoroughly instructed as to the nature of these materials. Proper training is essential to safety, and will ensure the accident-free use of this equipment.

Because of its low temperature, liquid nitrogen will cause frost bite to the skin much in the same way as hot liquids can burn. For this reason, always wear the proper protective clothing when handling these materials. It is advised that during use, handlers of liquid nitrogen should protect themselves by wearing goggles or face shields, cryogenic gloves (large enough to allow quick removal) and a cryogenic apron. It is preferable that shoes worn at these times have high tops, as to not permit accidently spilled liquid from entering, as well as pant legs which come down over the tops of shoes for further protection.

Also because of the extremely low temperatures, liquid nitrogen should only be handled and transported in approved containers. Many materials become brittle and may shatter when put into contact with liquid nitrogen.

FIRST AID

In the event a person has a frost bite from liquid nitrogen, the following first aid treatment should be given while awaiting the arrival of medics or a doctor:

1. If the material has contacted skin or eyes, flood those areas with large quantities of unheated water and protect frozen areas with loose, bulky, dry, and sterile dressings.

2. If the skin is blistered or there is a chance that the eyes have been affected, seek medical help immediately.

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V SERIES AND S SERIES DESCRIPTIONS

Throughout this manual references are made to the "S Series" and "V Series" storage unit vessels. In order to give a complete understanding of the difference between these two models, the diagrams at right are being provided. They show clearly the difference between the two, and the characteristics of each. Although the two are quite different physically, they operate in essentially the same way, and the electronic controls are identical for them both. Whenever there is a different procedure or operation for one, we've clearly stated the different instructions for each model. When not stated as different, the procedure or operation is the same for both.

What makes these two designs so different is this basic fact:

With the S Series models, the liquid nitrogen is contained within the storage vessel, and the stored samples are, or are *potentially*, in contact with the liquid.

With the V Series or Isothermal models, the liquid nitrogen is contained inside the vessel walls, and the stored samples never come into contact with the liquid nitrogen except in the case of an accidental overfill.

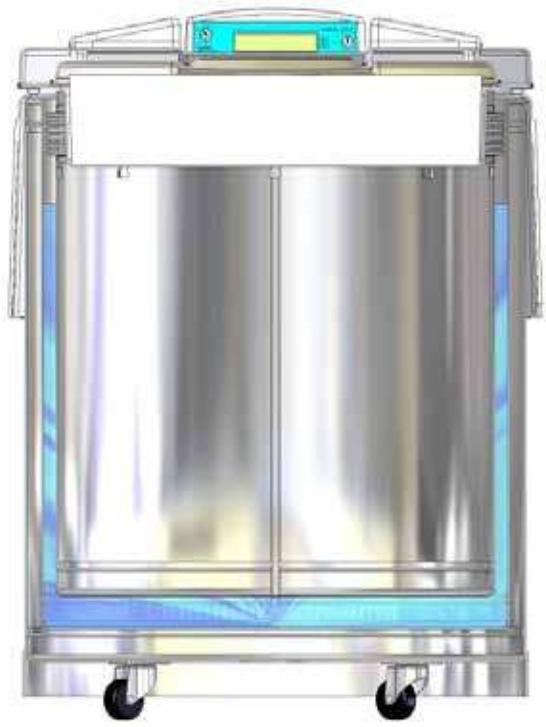
To understand the way the system operates, see the OPERATION section on the next page for a basic explanation of the mechanics of the system. Also, be sure to read this manual completely before attempting to use this equipment. If you are still not sure how to use this equipment properly, contact a competent authority, rather than risking your safety or the safety of the stored samples.

When the unit is placed into service, check daily to ensure proper operation and safety of the stored samples. For the V Series units, it is essential to lift the lid each day and check for vapor and signs of proper freezing.

S SERIES (STANDARD) VESSEL
LIQUID NITROGEN IS CONTAINED WITHIN THE VESSEL, AND IS DIRECT CONTACT WITH THE INVENTORY SYSTEM.



V SERIES (ISOTHERMAL) VESSEL
LIQUID NITROGEN IS CONTAINED INSIDE THE VESSEL WALLS, AND DOES NOT CONTACT THE INVENTORY SYSTEM.



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INITIAL SET-UP

This equipment is designed to operate in the following environmental conditions:

Temperature: 5°C (41°F) to 40°C (104°F)
Humidity: 80% at ≤ 31°C, decreasing linearly to 50% at 40°C
Altitude: ≤ 2,000 meters (6,650 feet)

Whenever working with Liquid Nitrogen in an enclosed space, the use of personal O_2 detection equipment is recommended.

As a first step in the set-up procedure, be sure to read this manual completely to become more familiar with this equipment. Next, remove all packing materials and wipe unit with a clean cloth inside and out to remove any debris left from shipping. Once the unit is wiped down, complete the following Steps: **(Note: The lid temp is set at +30°C from the factory. Thus, it will not alarm during the first fill and must be set by the user once the freezer cools.(-150°C)**

1. (Connect the LN^2 stainless steel flexible hose from the supply tank to the storage freezer), but do not open the manual supply valve until instructed to do so.
2. Connect Remote Alarm or Auto Dialer if desired.
3. Plug unit into an appropriate power source.
4. Turn the power key switch to the "ON" position.
5. Adjust the Liquid Level Set points. See display #4 on page 16 for instructions.**(press LIQ'D level)**
6. Adjust the Lid Temperature Set point after filling is complete. See display #5 on page 16 for instructions. **(press LID TEMP)**
7. Open the manual valve on the supply tank. Check for leaks at the connection points, then proceed to normal operation.

Check unit daily to ensure proper operation and safety of the stored samples. For the V Series

OPERATION

Storage units should not be disconnected from their supply while attempting to fill.

The ***S Series*** Storage Units are designed to maintain liquid nitrogen levels within specified parameters inside a cryogenic storage vessel. The ***V Series*** Storage Units are designed to maintain liquid nitrogen levels within specified parameters *inside the walls* of a cryogenic storage vessel. This is achieved by measuring gravitational weight of the liquid nitrogen with a pressure sensing unit in the controller. The controller activates the **FILL** solenoid valve when the liquid level goes below the **LOW** level set point, and deactivates the solenoid valve, stopping the fill, when the level reaches the **HIGH** set point.

Units equipped with the Bypass Option have an additional solenoid valve to vent vapor from the transfer lines before the **FILL** solenoid is activated. In the description below, the part of the sequence which is unique to the Bypass Option is in *[brackets]*. All other information refers to units with or without the Bypass Option.

During regular operation, the sequence of events is as follows: When the liquid level in the vessel falls below the low level set point, a signal is sent to the controller. At this time the **FILL** solenoid valve is activated, allowing the flow of liquid into the vessel. *[The Bypass Option will activate the* **VENT** *solenoid first to release gas or vapor from the transfer lines. The venting will continue until the line temperature reaches approximately -150° to -160°C. This can be adjusted, consult the factory for more information. When the line reaches this temperature the vessel will begin to fill.]* When the liquid level reaches the high level set point a signal is sent to the controller which deactivates the solenoid valve and stops the flow of liquid into the vessel. As long as the unit is powered up, this fill sequence repeats as necessary, maintaining the desired liquid level.

Check unit daily to ensure proper operation and safety of the stored samples. For the V Series units, it is essential to lift the lid each day and check for vapor and signs of proper freezing.

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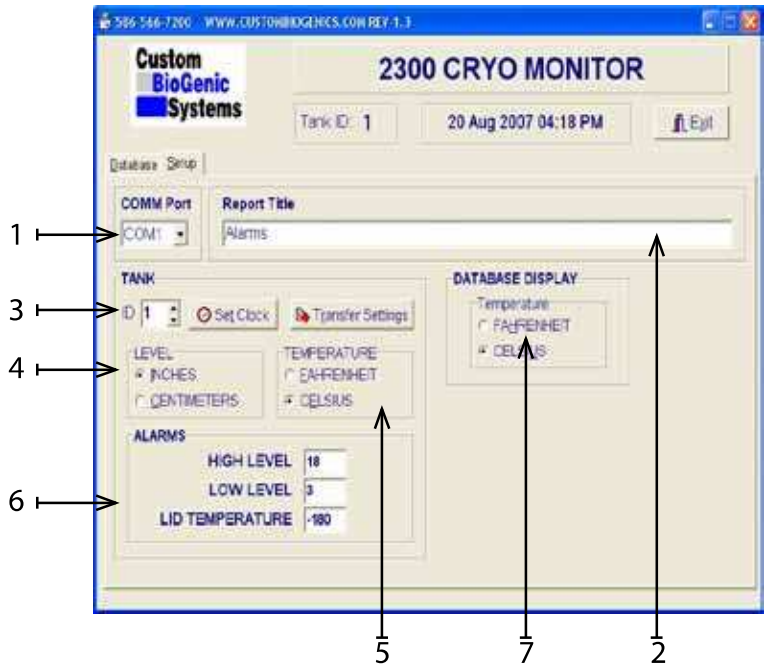
OPTIONAL CRYOMONITOR SOFTWARE

CryoMonitor software is available to connect your storage unit directly to a PC for full access to the setup and monitoring of the system electronics. Pictured below are the SETUP and DATABASE menus of the software. Contact Custom BioGenic Systems or your sales representative for more information about the CryoMonitor software.

SETUP MENU

Setup Menu Controls

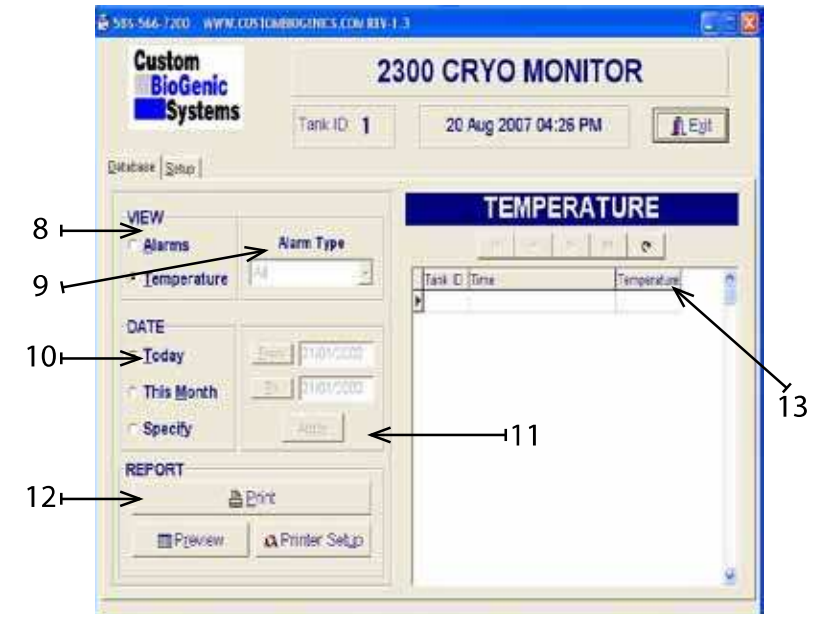
1. COMM Port - Connects the cryomonitor software to the desired port on your PC.
2. Report Title - Displays which data will be printed in the report.
3. Tank I.D. - Select which storage tank info will be displayed.
4. Level - Measurement selection.
5. Temp. - Select Fahrenheit or Celsius for the system electronics.
6. Alarms - Select LOW, HIGH and TEMPERATURE alarm set points.
7. Database Display - Select Fahrenheit or Celsius for the database display.



DATABASE MENU

Database Menu Controls

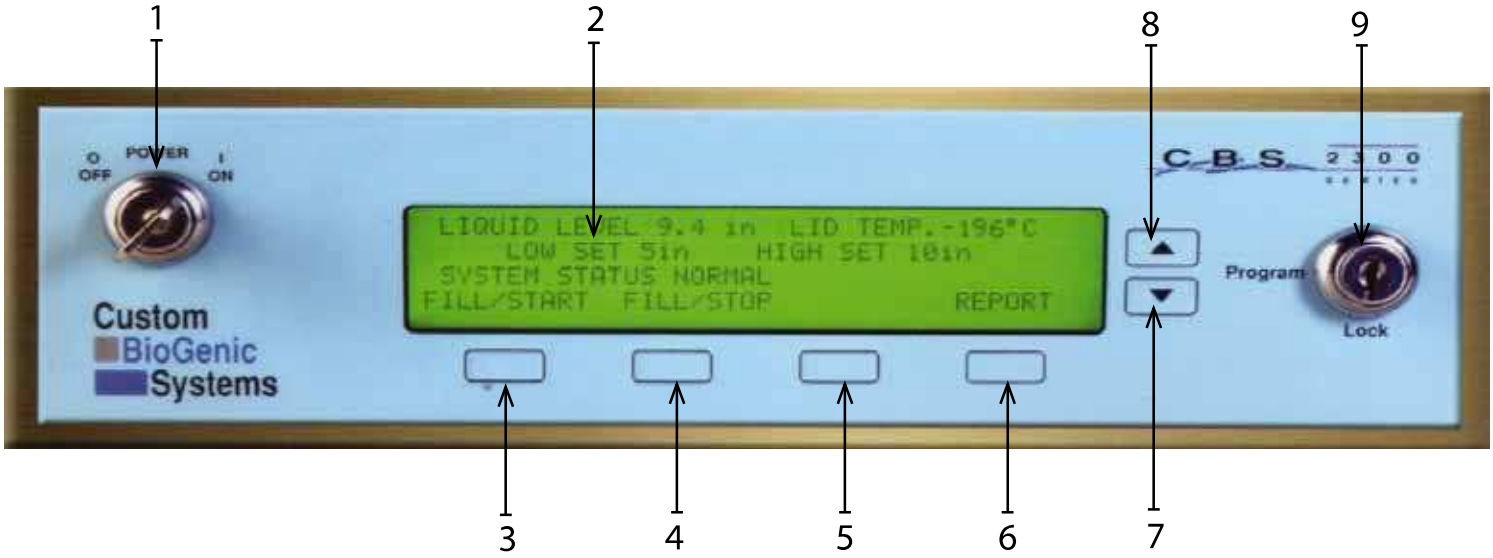
8. View - Alarms or Temperature history.
9. Alarm Type - View specific alarm types or all alarms in database report.
10. Date - Choose dates when viewing database history.
11. From / To - Further specify dates when viewing database history.
12. Report - Preview / Print reports.
13. Visual Database - View history as specified in the software setup.



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FRONT PANEL CONTROLS

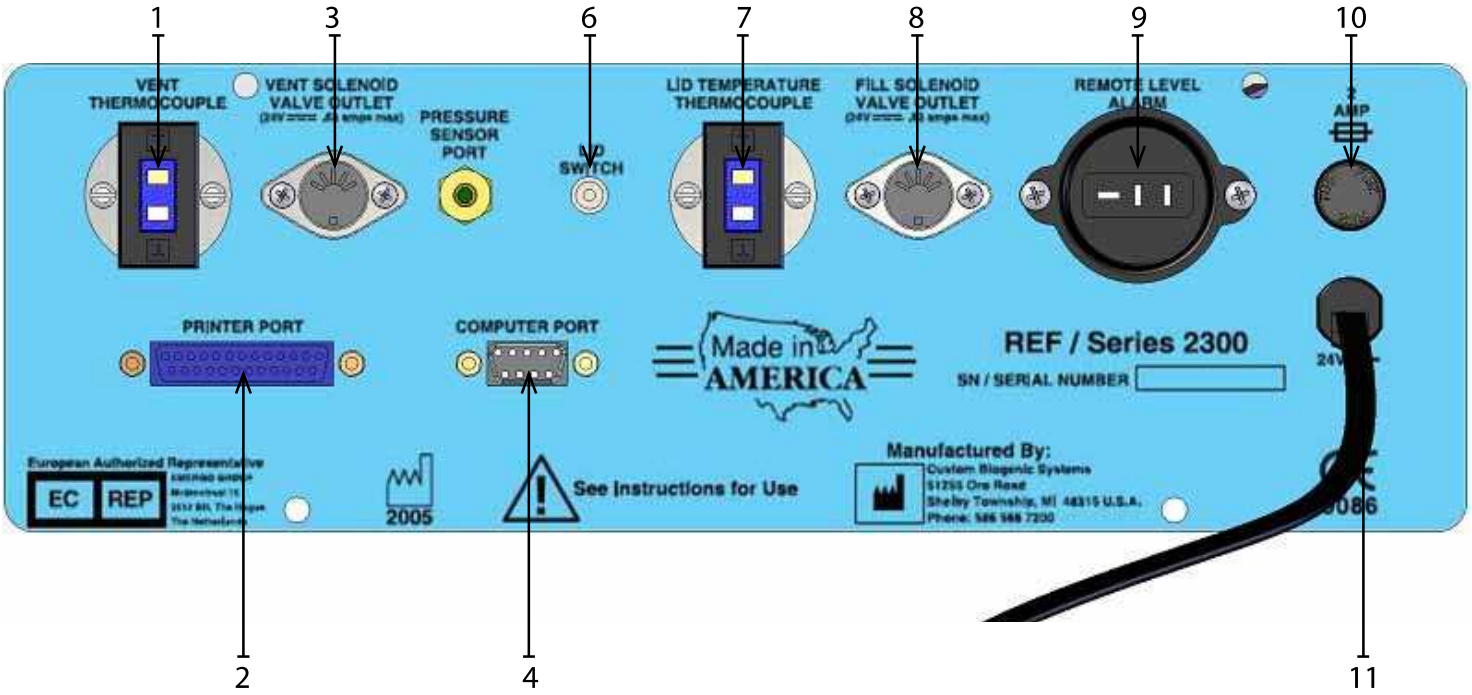
Warning: Depressing buttons with pointed objects (Pen, Pencil, etc.) will damage buttons



1. Key - Switch Power Control - Main power control for the unit.
2. LCD Display Window - Text interface for the storage unit electronic settings. See page 15 for complete listing of all display menus and functions.
3. First Menu Select Button - This is used to select various control menus and to make changes in programming as shown by the text which appears above the button.
4. Second Menu Select Button - This is used to select various control menus and to make changes in programming as shown by the text which appears above the button.
5. Third Menu Select Button - This is used to select various control menus and to make changes in programming as shown by the text which appears above the button.
6. Fourth Menu Select Button - This is used to select various control menus and to make changes in programming as shown by the text which appears above the button.
7. Scroll "Down" Button - Scrolls to higher numbers when programming electronics.
8. Scroll "Up" Button - Scrolls to higher numbers when programming electronics.
9. "Program / Lock" Key Switch - Switches the controller between the Standard Operating Mode and the Program Mode. Also protects electronic programming from being changed by unauthorized personnel.

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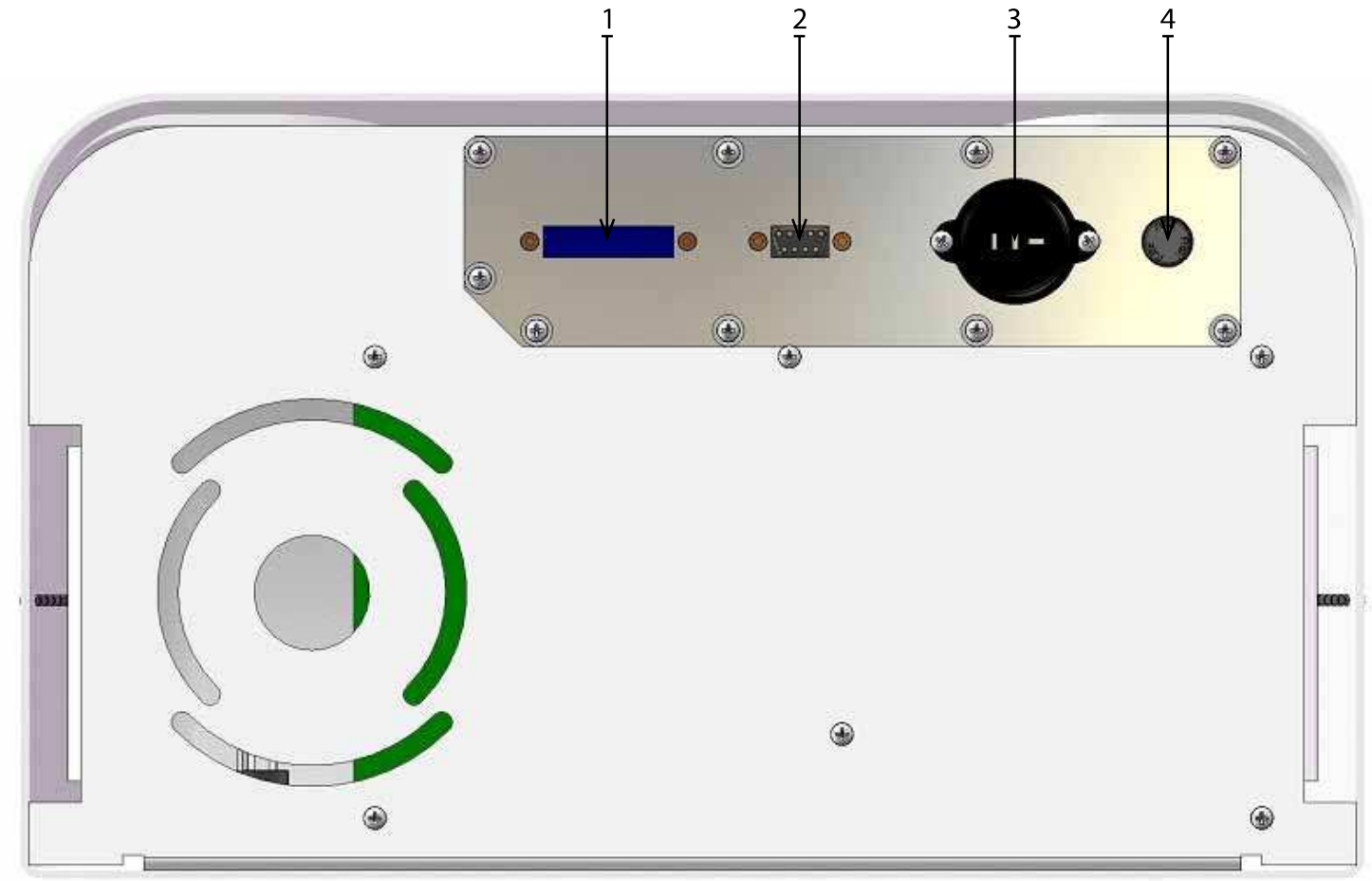
SERIES 2300 CONTROLLER BACK PANEL
(ALL SERIES 90, 1500 & 3000 STORAGE UNITS)



1. **Vent Probe Connector** - The vent thermocouple plugs in here.
2. **Printer Port-** connect a laser printer here for direct printout of activity log.
3. **Vent Solenoid Valve Connector** - The vent solenoid valve plugs in here.
   (Specifications: Rating: 100VAC 2A, Insulation Resistance: 300Ω minimum @500VDC,
   Dielectric Strength: 1,000VAC for 1 minute, Contact Resistance: 20mΩ maximum,
   Withstand Voltage: 1,000VAC for 1 minute, Insertion Force: 4Kg max, Withdrawal Force: 1-3.5Kg)
4. **Computer Port** - The ASC24T connects here allowing connection to a computer terminal for remote programming and monitoring.
5. **Sensor Hose Connection** - This port connects the sensor hose from the vessel.
6. **Lid Switch Connector** - The lid monitor switch plugs in here and gives a text message on the LCD screen whenever the lid is open. This information is also stored in memory and will appear in the activity log.
7. **Lid Probe Connector** - The lid temperature thermocouple plugs in here.
8. **Fill Solenoid Valve Connector** - The fill solenoid valve plugs in here. (see specification as listed above in #3)
9. **Remote Alarm Connector** - This port is used to attach an Auto-Dialer or a remote alarm monitor; This connector will give high and low level alarms, as well as power-loss alarm if power to the unit is cut off.
10. **Fuse** - VAC 2 amp Buss fuse; 220 volts slow-blow. (T2A 250V)
11. **Power Cord** - This is the main power supply cord to the unit, be sure to check for proper voltage- See voltage requirements listed on the controller.

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SERIES 5000 BACK PANEL



1. Printer Port - Connect a laser printer here for direct printout of activity log.

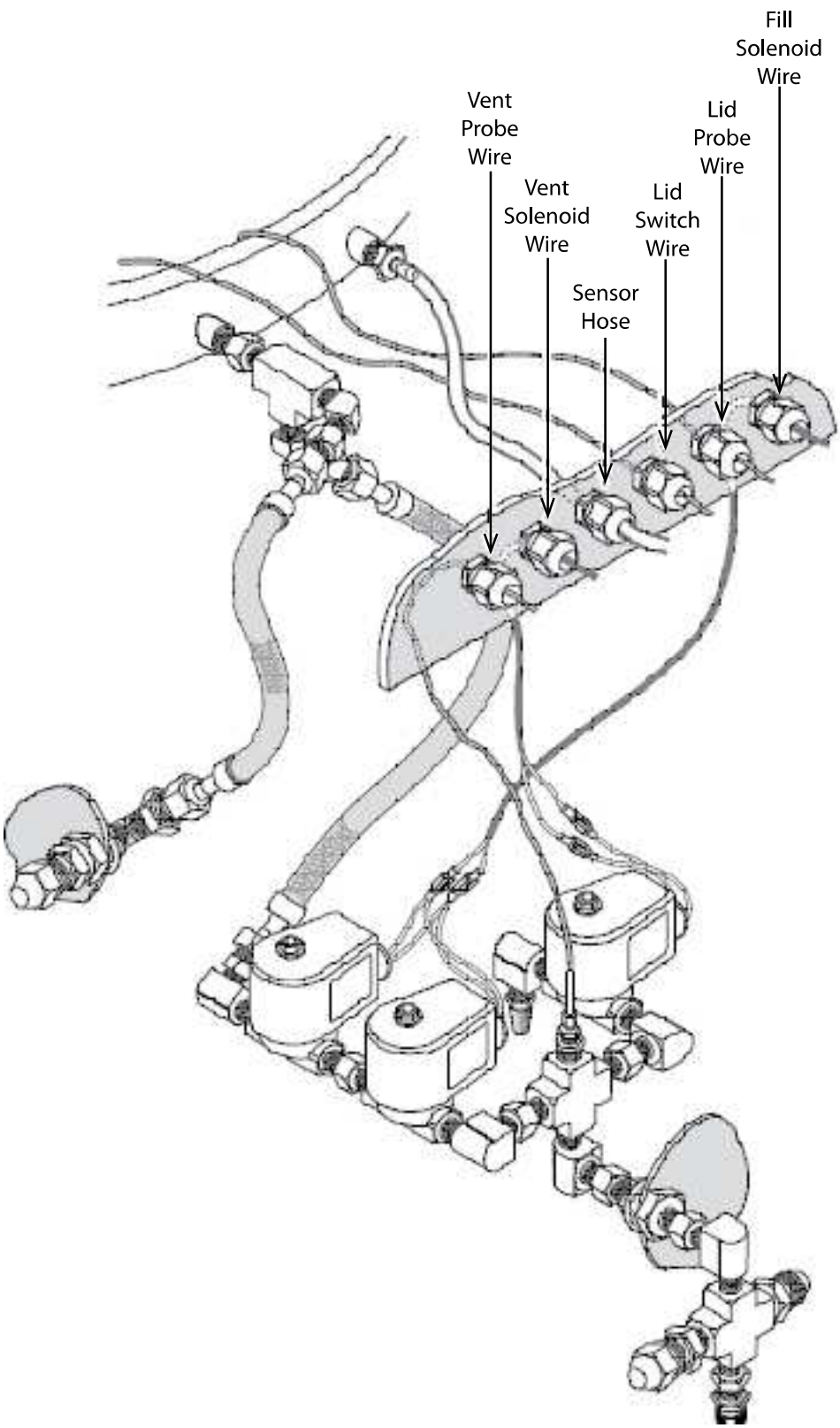
2. Computer Port - The ASC24T connects here allowing connection to a computer terminal for remote programming and monitoring.

3. Remote Alarm Connector - This port is used to attach an Auto-Dialer or a Remote Alarm Monitor; This connector will give high and low level alarms, as well as power-loss alarm if power to the unit is cut off. May also be wired in series with the Lid Temp Alarm connector to work on the same line.

4. Fuse - VAC 2 amp Buss fuse; 220 volts slow-blow. (T2A 250V)

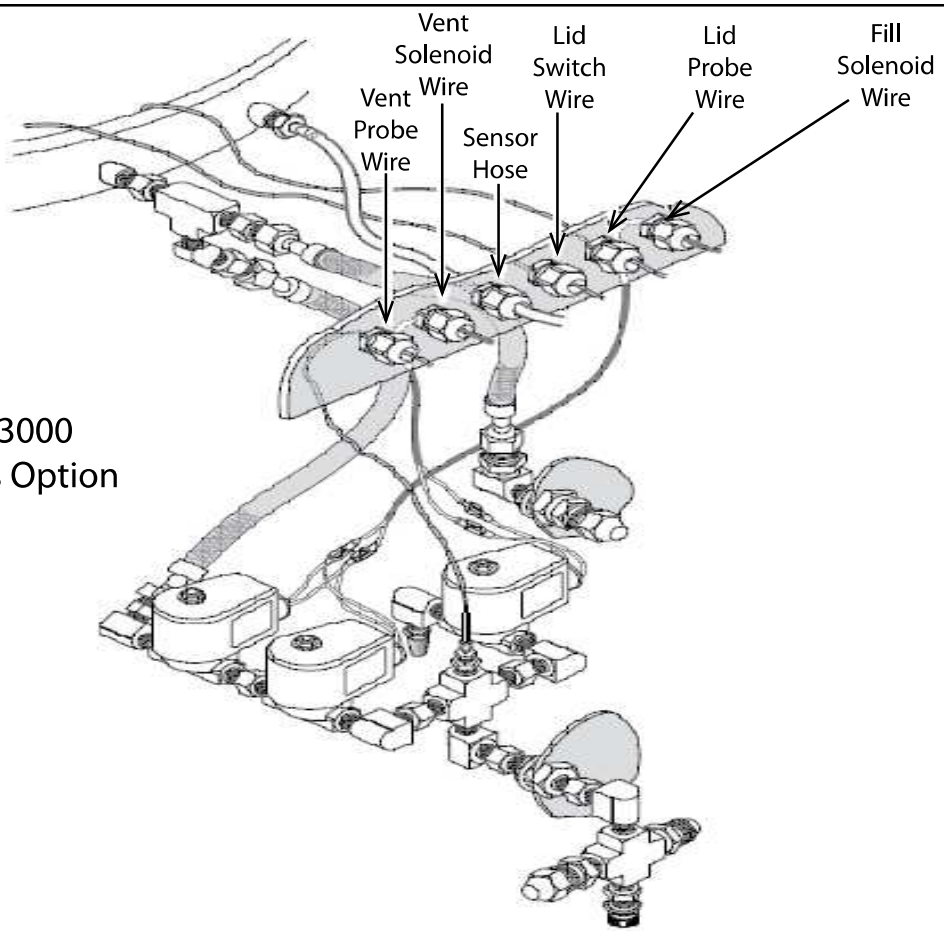
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Series S90, S1500 & V1500
Autofill with Bypass Option



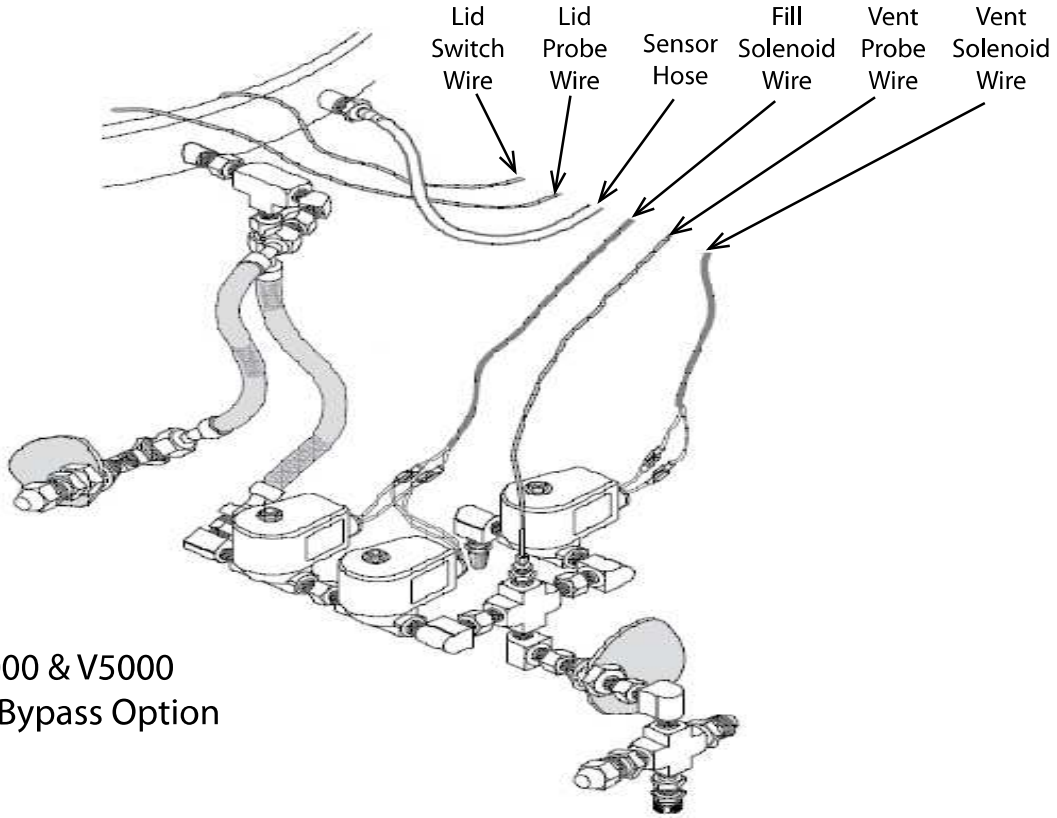
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SERIES S3000 & V3000 MANIFOLDS



Series S3000 & V3000
Autofill with Bypass Option

SERIES S5000 & V5000 MANIFOLDS



Series S5000 & V5000
Autofill with Bypass Option

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V SERIES MANUAL FILL INSTRUCTIONS

The unique design of the new Isothermal Storage Unit is such that it is no longer necessary to fill the storage chamber with liquid nitrogen. Instead, the inner walls of the storage vessel are filled with liquid nitrogen and the storage chamber holds no liquid at all. Because of this unique design, the manual filling of this equipment is very different from storage units of the past. Use the following instructions to manually fill the Isothermal Storage unit in the event of a power outage or if the auto-fill is not working properly.

IMPORTANT: It is not recommended to attempt to manually fill the Isothermal Storage Unit by opening the lid and placing a fill line over the edge into the vessel. This is an incorrect fill method and will cause liquid nitrogen to come in contact with the stored samples.

For the correct manual filling of the Isothermal unit perform the following steps:

1. Turn off the liquid nitrogen supply valve at the supply tank.

2. Disconnect the supply line from the Isothermal Unit at the port on the back of the unit.

3. Remove the cap from the manual fill port, also on the back of the unit.

4. Place the cap on the auto-fill port where the supply line was connected, and tighten down.

5. Connect the liquid nitrogen supply line to the manual fill port, and tighten down.

CAUTION: Before opening the supply valve to fill the Isothermal Unit, read the following text to learn how to gauge the liquid level, so the Storage Unit does not overfill and create hazardous conditions.

Without power there will be no digital display to give the liquid level, and the liquid cannot be seen visually since it is contained inside the walls of the Isothermal Unit. Thus the lid must remain open during the manual fill process. With this in mind, the best way to gauge the fill level is the last resort, because it is only noticeable when the vessel is nearly full. When the tank is nearing maximum fill, liquid nitrogen will begin to "spatter" through the vents located near the top edge of the inner walls of the vessel. When this is seen, the supply valve should be shut off immediately before excessive amounts of liquid nitrogen begin to spill into the storage space.

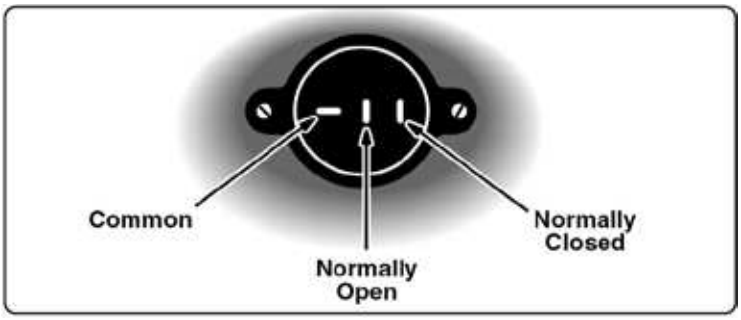
Check unit daily to ensure proper operation and safety of the stored samples. For the V Series units it is essential to lift the lid each day and check for vapor and signs of proper freezing.

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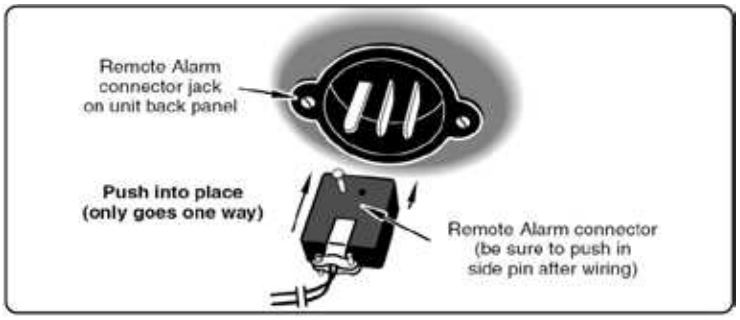
REMOTE ALARM WIRING

Locate the Remote Alarm Connector on the controller (#12 on page 7; #3 on page 8). This is where the remote alarm or auto dialer will plug into the control unit.

REMOTE ALARM CONNECTOR
Diagram shows connections for wiring arrangement.



First, wires from the remote alarm or auto dialer must be connected to the plug-end which plugs into the Remote Alarm Connector. Use the diagram to connect wires from the remote unit.



When unit goes into an alarm condition or loses power, the contacts will switch their "Open" or "Closed" state to be the opposite of when there was not an alarm condition, thereby sending a signal to the remote alarm or auto dialer.

STORAGE UNIT PARAMETERS

Cooling medium: **Liquid nitrogen only** (supplied by a pressurized cryogenic transport vessel)
Operating Pressure: **22 p.s.i.**

IMPORTANT: Normal operating pressure is 25 p.s.i. max/ 20 p.s.i. min (22p.s.i. recommended) if the pressure is greater or less than, the efficiency of your liquid nitrogen storage unit could be affected. This could be noticeable in ways such as increased liquid use, level and source

Power Supply Voltage: **120 Volts AC 60 Hz standard - 220 Volts AC 60/50 Hz optional**
Amperage: **2 amp max**
Fuse: **VAC 2 amp Buss fuse; 220 volts slow-blow. (T2A 250V)** (automotive glass tube type fuse)

Specification:	S90-AB	S1500-AB	V1500AB	S3000-AB	V3000AB	S5000-AB	V5000AB	S5000EH-AB	V5000EHAB
LN2 Capacity (Liters)	90	145	30	345	70	615	93	720	140
Static Evaporation Rate (Liters/Day)	2.75	4	5	7	9	9	11	9	11
Static Holding Time (Days)	33	41	6	49	8	61	8	80	12
External Dimensions									
Width (in/mm)	18 / 457	22 / 558	26 / 660	34 / 863	37 / 939	44 / 1117	47 / 1219	44 / 1117	47 / 1219
Depth (in/mm)	18 / 457	31 / 787	37 / 939	43 / 1092	48 / 1219	52 / 1320	54 / 1371	52 / 1320	54 / 1371
Height (in/mm)	38 / 965	41 / 1041	45 / 1143	42 / 1066	47.5 / 1206	48 / 1219	52 / 1320	55 / 1397	58 / 1473
Usable Interior Height (in/mm)	28 / 711	29 / 736	29 / 736	29 / 736	29 / 736	29 / 736	29 / 736	34 / 863	34 / 864
Usable Interior Diameter	16 / 406	20 / 508	21 / 534	31 / 787	31 / 787	40 / 1016	40 / 1016	40 / 1016	40 / 1016
Weight Empty (lbs/kg)	80 / 36	156 / 70	327/148	350 / 159	600/272	500 / 227	936/425	540 / 245	997/453
Weight Full (lbs/kg)	240 / 109	414 / 188	383/174	965 / 438	720/327	1594 / 724	1100/500	1128 / 827	1247/566

Operating levels for LN^2: **S** Series Models: **0 to 28 inches** (higher fill heights may be used, call CBS for more info)
V Series Models: **23 inches**

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LCD DISPLAY FUNCTIONS

This section shows each display window and gives important information necessary for understanding and operating the LCD text functions of the 2300 Controller.

To start, the index below shows where in this section to find each and every function of the controller. This will enable the user to correctly program all functions of the storage unit to meet their individual needs.

The overall operation consists of two basic modes: the Standard Operating Mode, and the Program Mode. The unit is in the Standard Operating Mode when the Program/Lock key switch on the front panel (Page 6, number 9) is turned to **Lock**. To enter the Program Mode, the key must be inserted and the switch turned to **Program**.

In the Standard Operating Mode, there are 6 different displays possible. They are as follows:

Standard Display - Display number 1 - page 14
Standard Display While Unit is Filling - Display number 2 - page 14
Standard Display With Lid Open - Display number 3 - page 15
Alarm Condition Display - Display number 90 - page 15
Alarm Condition Display With Audible Alarm Muted - Display number 91 - page 15
Printing Report - Display number 99 - page 15

The Alarm Condition display will give the specific cause of each alarm condition that may be occurring. The following is a list of the possible alarm conditions:

Low Alarm	Open Fill
High Alarm	Bypass Valve
Source Alarm	Lid Probe
Temperature Alarm	Open Vent Probe

In the Program Mode, there are various displays possible. The following is a list of programming functions and the corresponding display windows. For each of these programming functions, there may be sub-menus that follow the primary display window. The sub-menus are not listed here, but are shown and explained following the primary windows. The primary programming functions are as follows:

Main Menu - Display number 4 - page 16
Provides access to:
- **Date/Time Settings -** Display number 8 - page 17
- **Tank ID Settings -** Display number 13 - page 17
- **Liquid Level Settings -** Display number 15 - page 18
- **Main Menu 2 -** Display number 5 - page 16

  Provides access to:
  - **Lid Temp Settings -** Display number 19 - page 18
  - **Report Functions -** Display number 22 - page 19
  - **Bypass Settings -** Display number 24 - page 19
  - **Main Menu 3 -** Display number 6 - page 16

    Provides access to:
    - **Control Validation -** Display number 40 - page 19
    - **Fill Timer Settings -** Display number 7A - page 16
    - **Return to Main Menu -** Display number 4 - page 16

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LCD DISPLAY FUNCTIONS

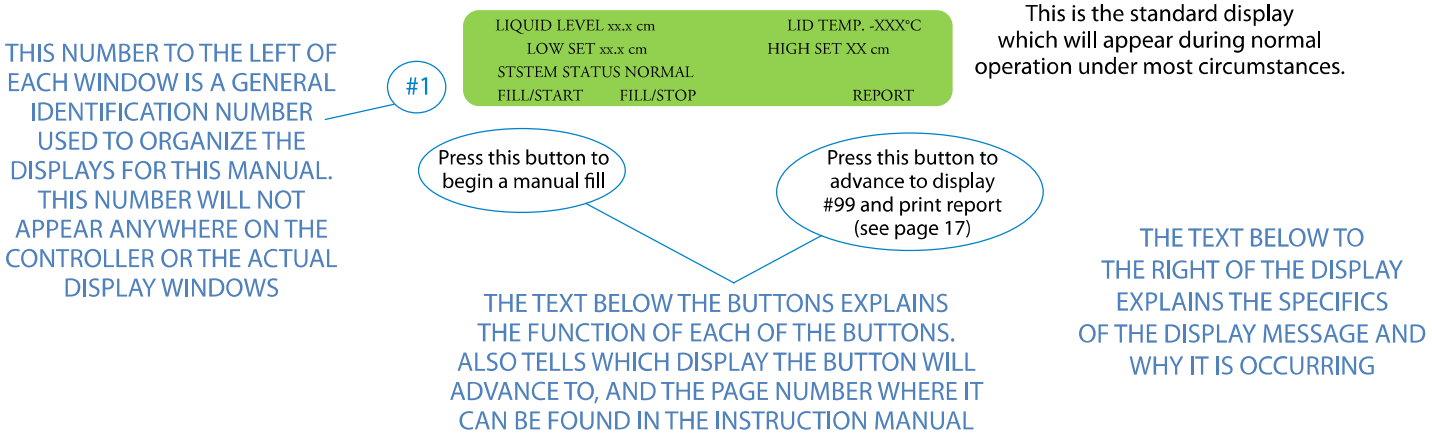
Using The Diagrams to Understand the Display Functions

WARNING: NEVER USE AN OBJECT OTHER THAN YOUR FINGER TO PRESS THESE BUTTONS. DOING SO WILL RESULT IN PERMANENT DAMAGE TO THE CONTROLLER OVERLAY.

Below is a sample display window as they're shown in the following section. Use the diagram to become familiar with the way this section is organized, and how the information is presented in reference to each display window and it's functions. (NOTE: Tolerance on Liquid Level Display is +/- 0.5" (1.2cm) and The Tolerance on the Temperature display is +/- 2°C)

SAMPLE DISPLAY WINDOW

X's ARE USED IN PLACE OF NUMBERS IN THE DISPLAY WINDOW, SINCE THE ACTUAL NUMBERS WILL VARY.



STANDARD OPERATING MODE DISPLAY WINDOW

#1

LIQUID LEVEL XX.X cm	LID TEMP. -XXX°C
LOW SET XX cm	HIGH SET XX cm
SYSTEM STATUS NORMAL	
FILL/START FILL/STOP	REPORT

This is the standard display which will appear during normal operation under most circumstances.

#2

LIQUID LEVEL XX.X cm	LID TEMP. -XXX°C
LOW SET XX cm	HIGH SET XX cm
SYSTEM STATUS NORMAL	**FILLING**
FILL/START FILL/STOP	REPORT

This display will appear during normal operation when either a manual or automatic fill is occurring.

Press this button to stop manual fill.

Press this button to advance to display #99 and print report (see page 15).

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LCD DISPLAY FUNCTIONS

Standard Operating Mode Display Windows

#3



Press this button to begin a manual fill.

Press this button to stop filling.

Press this button to advance to display #99 and print report (see page 15).

This display will appear during normal operation when the lid is opened.

#90



Press this button to reset alarm. If it re-occurs, repeat until all alarms are corrected.

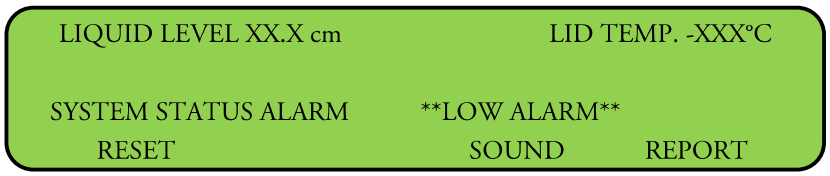
Press this button to mute audible alarm and advance to display #91(next).

Press this button to advance to display #99 and print report (bottom of page)

This display will appear when an alarm condition is occurring. The specific nature of the alarm will be shown in line 3 of the display text. The **ALARM** will flash on and off in one second intervals.

("LOW ALARM" is shown only as an example of the alarm display window. See page 15 for a complete list of alarms.)

#91



Press this button to reset alarm. If it re-occurs, repeat until all alarms are corrected.

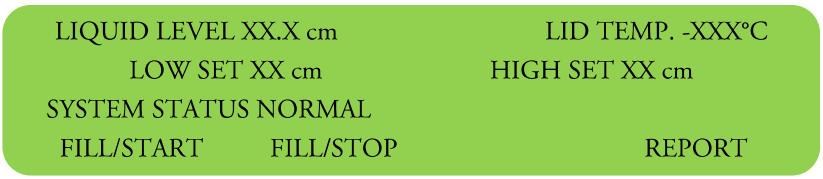
Press this button to enable audible alarm and return to display #90 (above).

Press this button to advance to display #99 and print report (see page 15).

This display will appear when an alarm condition is occurring AND the audible alarm is muted.

("LOW ALARM" is shown only as an example of the alarm display window. See page 15 for a complete list of alarms.)

#99



Press this button to begin a manual fill.

Press this button to stop filling.

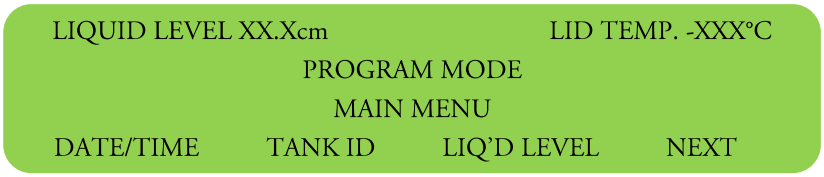
This display will appear during normal operation when "REPORT" is selected from displays 1, 2, 3, 90, or 91. After the report is printed, the display will go back to whatever screen was showing when the report was requested.

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LCD DISPLAY FUNCTIONS

Program Mode Display Windows

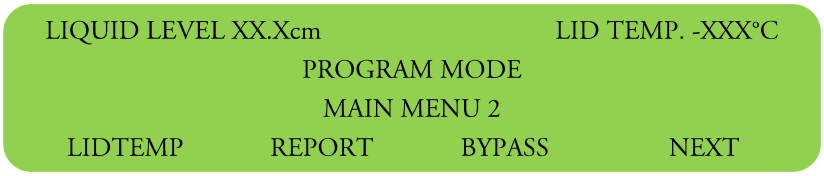
#4



This display will appear when the PROGRAM/LOCK switch is turned to PROGRAM.

Press this button to advance to display #8: DATE/TIME settings. (see page 17)	Press this button to advance to display #13 TANK ID settings. (see page 17)	Press this button to advance to display #15: LIQUID LEVEL settings. (see page 18)	Press this button to advance to display #5: MAIN MENU 2. (see below)

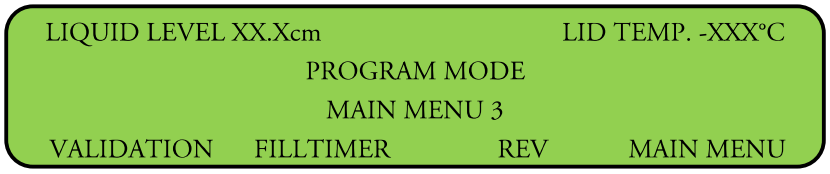
#5



This display will appear when "NEXT" is selected on display #4.

Press this button to advance to display #19: LID TEMP settings. (see page 18)	Press this button to advance to display #22: REPORT settings. (see page 19)	Press this button to advance to display #24: BYPASS settings. (see page 19)	Press this button to advance to display #6: MAIN MENU 3. (see below)

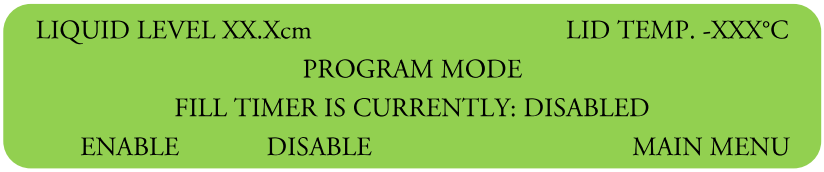
#6



This display will appear when "NEXT" is selected on display #5.

Press this button to advance to display #40: VALIDATION settings. (see page 19)	Press this button to advance to display #7A: FILL TIMER settings. (see below)	Press this button to advance to display #42:REVISION parameters. (see page 24)	Press this button to return to display #4: MAIN MENU. (see above)

#7A



This display will appear when "FILL TIMER" is selected on display #6. This is a prompt to ENABLE or DISABLE the Automatic Fill Timer. The Fill Timer gives the option of an automatic fill every 24, 48, or 72 hours at a specified time of day. These settings are programmed in the 2 menus that follow.

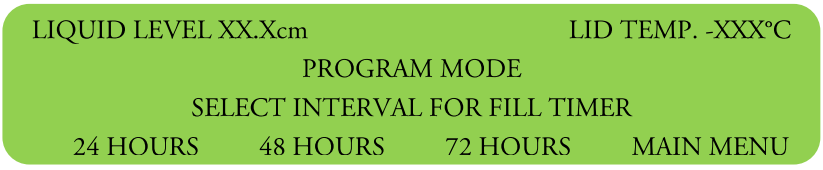
Press this button to enable the fill timer and advance to display #7B. (page 17)	Press this button to disable the fill timer and return to display #4: MAIN MENU (see above)		Press this button to end operation and return to display #4: MAIN MENU (see above)

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LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#7B



Press this button to select a 24 hour time interval and advance to display #7C. (next)

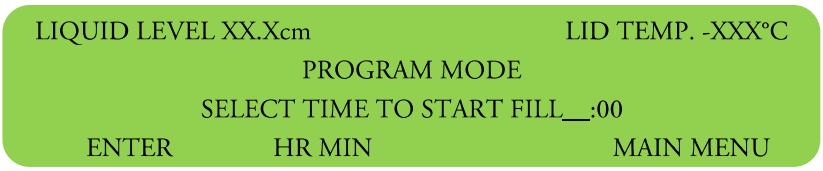
Press this button to select a 48 hour time interval and advance to display #7C. (next)

Press this button to select a 72 hour time interval and advance to display #7C. (next)

Press this button to discard changes and return to display #6: MAIN MENU 3 (page 16)

This display will appear when "ENABLE" is selected on display #7A. Use this menu to set the time interval that the automatic fill will occur.

#7C



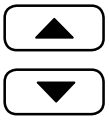
Press this button to advance to display #19: LID TEMP settings. (see page 18)

Press this button to advance to display #22: REPORT settings. (see page 19)

Press this button to advance to display #24: BYPASS settings. (see page 19)

Press this button to advance to display #6: MAIN MENU 3. (see below)

These arrows adjust value



This display will appear when any time interval is selected on display #7B. Use this menu to set the time of day that the automatic fill will occur.

#8

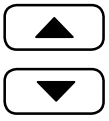


Press this button to move cursor left.

Press this button to move cursor right.

Press this button to discard changes and return to display #6: MAIN MENU 3 (page 16)

These arrows adjust value



This display will appear when "DATE/TIME" is selected on display #4. Use this menu to change the date and time settings.

NOTE:
DAY/MONTH/YEAR

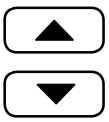
#13



Press this button to save the setting and return to display #4: MAIN MENU (page 16)

Press this button to discard changes and return to display #6: MAIN MENU 3 (page 16)

These arrows adjust value



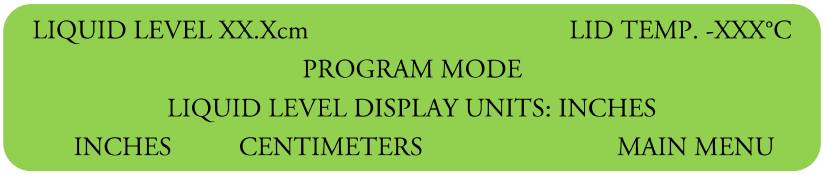
This display will appear when "TANK ID" is selected on display #4. The Tank ID is necessary when using the CryoMonitor 2300 computer interface software.

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LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#15



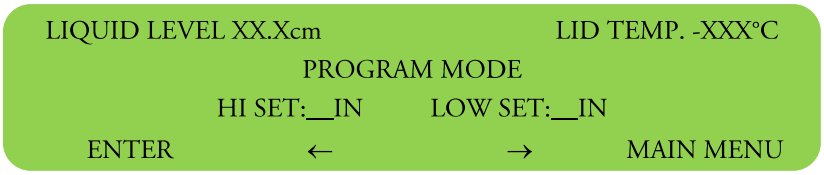
Press this button to select INCHES and advance to display #16. (next)

Press this button to select CENTIMETERS and advance to display #16. (next)

Press this button to discard changes and return to display #4: MAIN MENU (see page 16)

This display will appear when "LIQ'D LEVEL" is selected on display #4. Use this menu to select measurement preferences for the liquid level settings, i.e. inches or cm.

#16



Press this button to save settings and return to display #4: MAIN MENU (see page 16)

Press this button to move cursor to HI SET

Press this button to move cursor to LOW SET

Press this button to discard changes and return to display #4: MAIN MENU (see page 16)

These arrows adjust value

This display will appear when "INCHES" or "CENTIMETERS" is selected on display #15. Use this menu to select HI and LOW liquid level settings.

#19



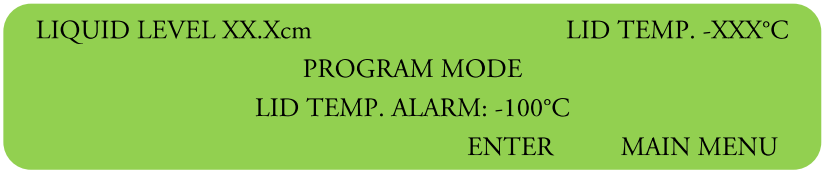
Press this button to select degrees Fahrenheit and advance to display #20 (next)

Press this button to select degrees Celsius and advance to display #20 (next)

Press this button to discard changes and return to display #4: MAIN MENU (see page 16)

This display will appear when "LID TEMP" is selected on display #5. Use this menu to select temperature preferences, i.e. °F or °C.

#20



Press this button to save changes and return to display #4: MAIN MENU (see page 16)

Press this button to discard changes and return to display #4: MAIN MENU (see page 16)

These arrows adjust value

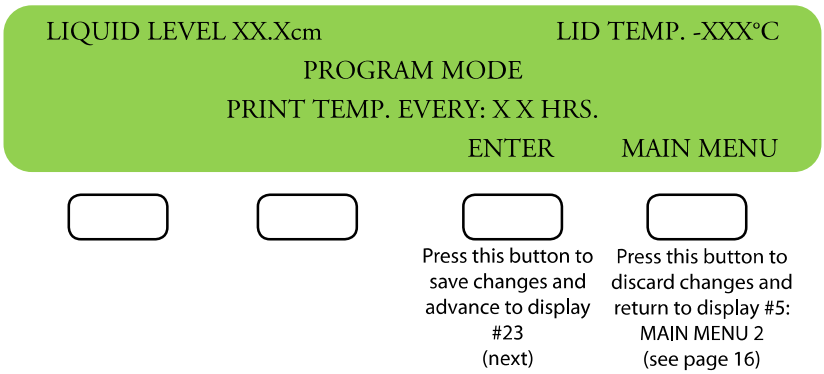
This display will appear when "°F" or "°C" is selected on display #19. Use this menu to select a temperature for the Lid Temp. Alarm to be activated.

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LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#22



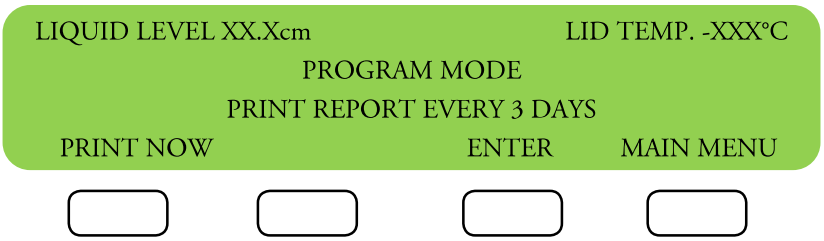
Press this button to save changes and advance to display #23 (next)

Press this button to discard changes and return to display #5: MAIN MENU 2 (see page 16)

These arrows adjust value

This display will appear when "REPORT" is selected on display #5. Use this menu to select the time interval between temperature reports. **NOTE:** A value of "--" means temp. report printing is disabled.

#23



Press this button to print report instantly.

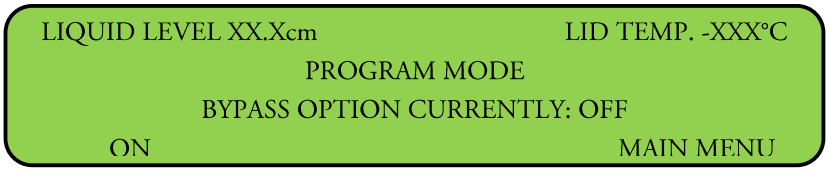
Press this button to save changes and return to display #5: MAIN MENU 2 (see page 16)

Press this button to discard changes and return to display #5: MAIN MENU 2 (see page 16)

These arrows adjust value

This display will appear when "ENTER" is selected on display #22. Use this menu to select number of days between temperature reports. **NOTE:** A value of "--" means temp. report printing is disabled.

#24

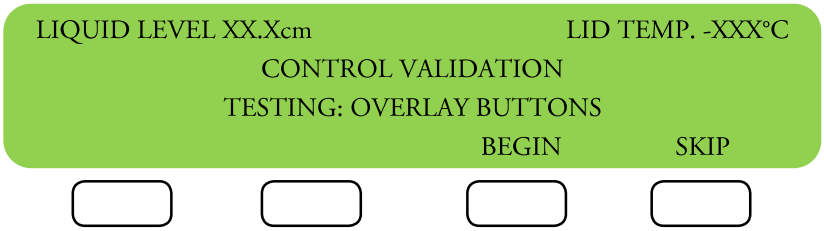


Press this button to change current setting and return to display #4: MAIN MENU (see page 16)

Press this button to maintain current setting and return to display #4: MAIN MENU (see page 16)

This display will appear when "BYPASS" is selected on display #5.
This menu is a prompt to enable or disable the Bypass Option.

#40



Press this button to begin testing the overlay buttons, to advance to display #41H1, and begin the final test.(page 22)

Press this button to skip test and advance to display #41I (see page 20)

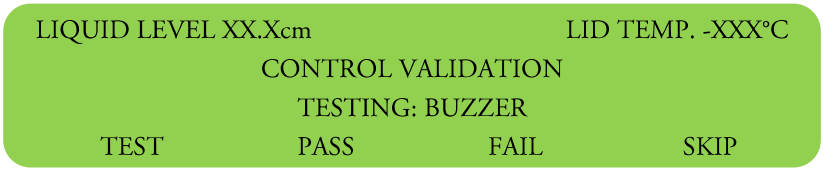
This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41G. This menu begins the testing of the overlay buttons. Select "BEGIN" to proceed or "SKIP" to advance to the final window of the validation process.

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LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#41



Press this button to test audible alarm. Buzzer should sound.	Press this button if test passes, to advance to display #41A, and next test. (next)	Press this button if test fails, to advance to display #41A, and next test. (next)	Press this button to skip test, advance to display #41A, and next test. (next)

This display will appear when "VALIDATION" is selected on display #6. This menu tests the audible alarm. This is the first in a series of test menus which will appear in sequence when "PASS", "FAIL", or "SKIP" is selected for each function being tested.

#41A



Press this button to toggle remote alarm contacts.	Press this button if test passes, to advance to display #41B, and next test. (next)	Press this button if test passes, to advance to display #41B, and next test. (next)	Press this button to skip test, advance to display #41B, and next test. (next)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #40. This menu tests remote alarm contacts. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

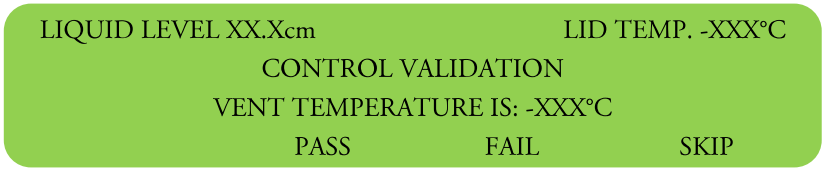
#41B



	Press this button if test passes, to advance to display #41C, and next test. (next)	Press this button if test fails, to advance to display #41C, and next test. (next)	Press this button to skip test, advance to display #41C, and next test. (next)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41A. This menu is for testing the lid temperature. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41C



	Press this button if test passes, to advance to display #41D, and next test. (next page)	Press this button if test fails, to advance to display #41D, and next test. (next page)	Press this button to skip test, advance to display #41D, and next test. (next page)

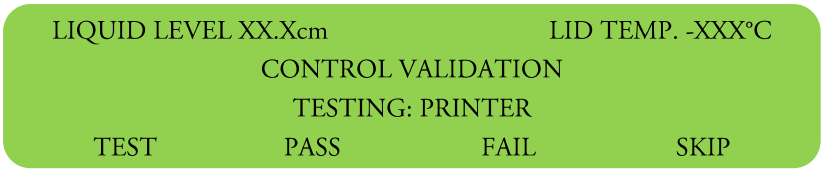
This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41B. This menu displays current vent temperature. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

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LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#41D



Press this button to send "TESTING PRINTER" to the printer.

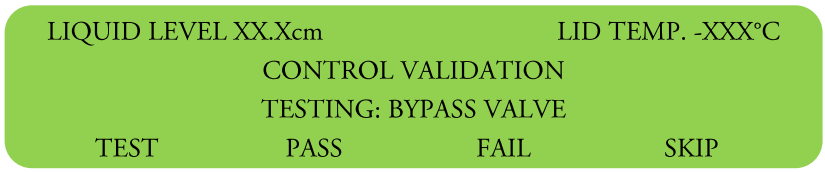
Press this button if test passes, to advance to display #41E, and next test. (next)

Press this button if test fails, to advance to display #41E, and next test. (next)

Press this button to skip test, advance to display #41E, and next test. (next)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41C. This menu tests printer. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41E



Press this button to activate the Bypass Valve for as long as the button is held.

Press this button if test passes, to advance to display #41F, and next test. (next)

Press this button if test fails, to advance to display #41F, and next test. (next)

Press this button to skip test, advance to display #41F, and next test. (next)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41D. This menu tests the fill valve. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41F



Press this button to activate Fill Valve for as long as the button is held.

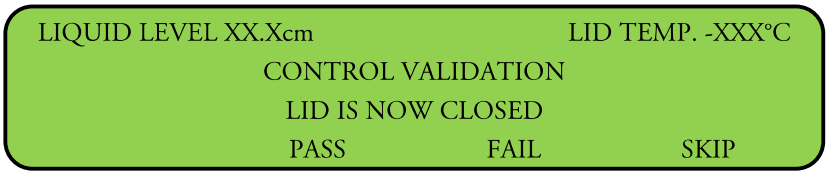
Press this button if test passes, to advance to display #41G, and next test. (next)

Press this button if test fails, to advance to display #41G, and next test. (next)

Press this button to skip test, advance to display #41G, and next test. (next)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41E. This menu tests the fill valve. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41G



Press this button if test passes, to advance to display #41H, and next test. (next)

Press this button if test fails, to advance to display #41H, and next test. (next)

Press this button to skip test, advance to display #41H, and next test. (next)

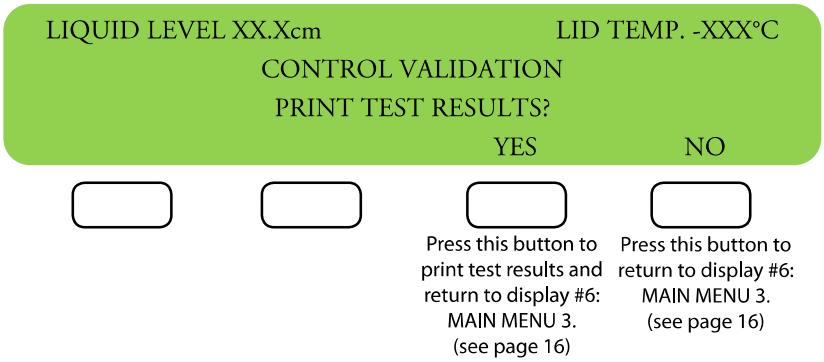
This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41F. This menu tests the lid switch. With the lid closed, the display should read "LID IS NOW CLOSED", with the lid open, it should read "LID IS NOW OPEN". Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

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LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#41H

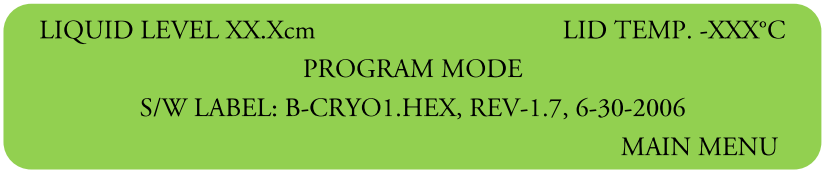


Press this button to print test results and return to display #6: MAIN MENU 3. (see page 16)

Press this button to return to display #6: MAIN MENU 3. (see page 16)

This display will appear when the final test button is selected on display #41H1, and when all tests have been completed or skipped. Use this menu to print test results if desired.

#41A

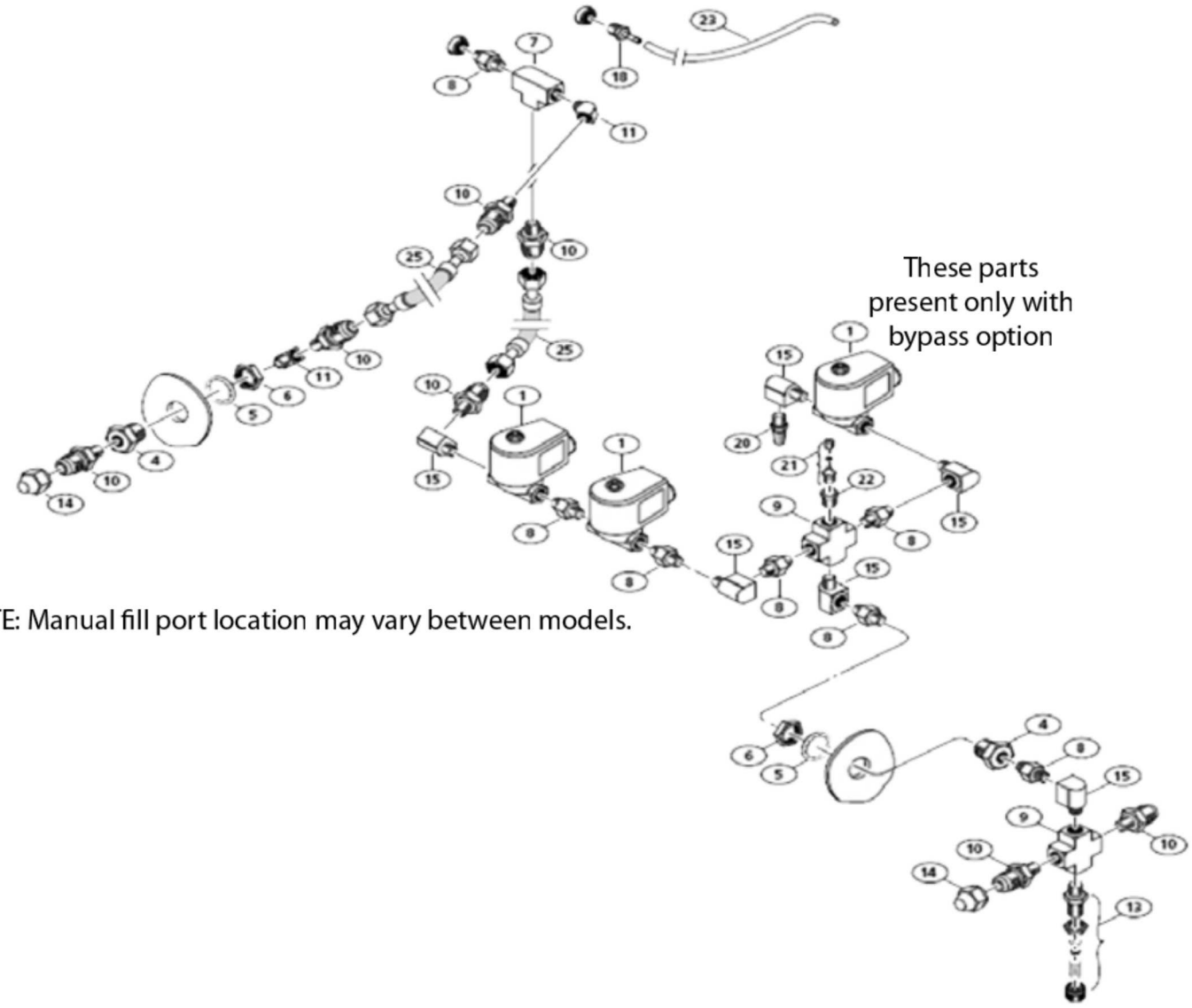


Press this button to maintain current setting and return to display #4: MAIN MENU (see page 16)

This display will appear when you hit the REV button on display #6, on PAGE 16. Use this menu to view your revision number and date.

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SERIES S90, S1500, V1500, S3000, V3000 S5000 & V5000 LN2 MANIFOLD ASSEMBLY



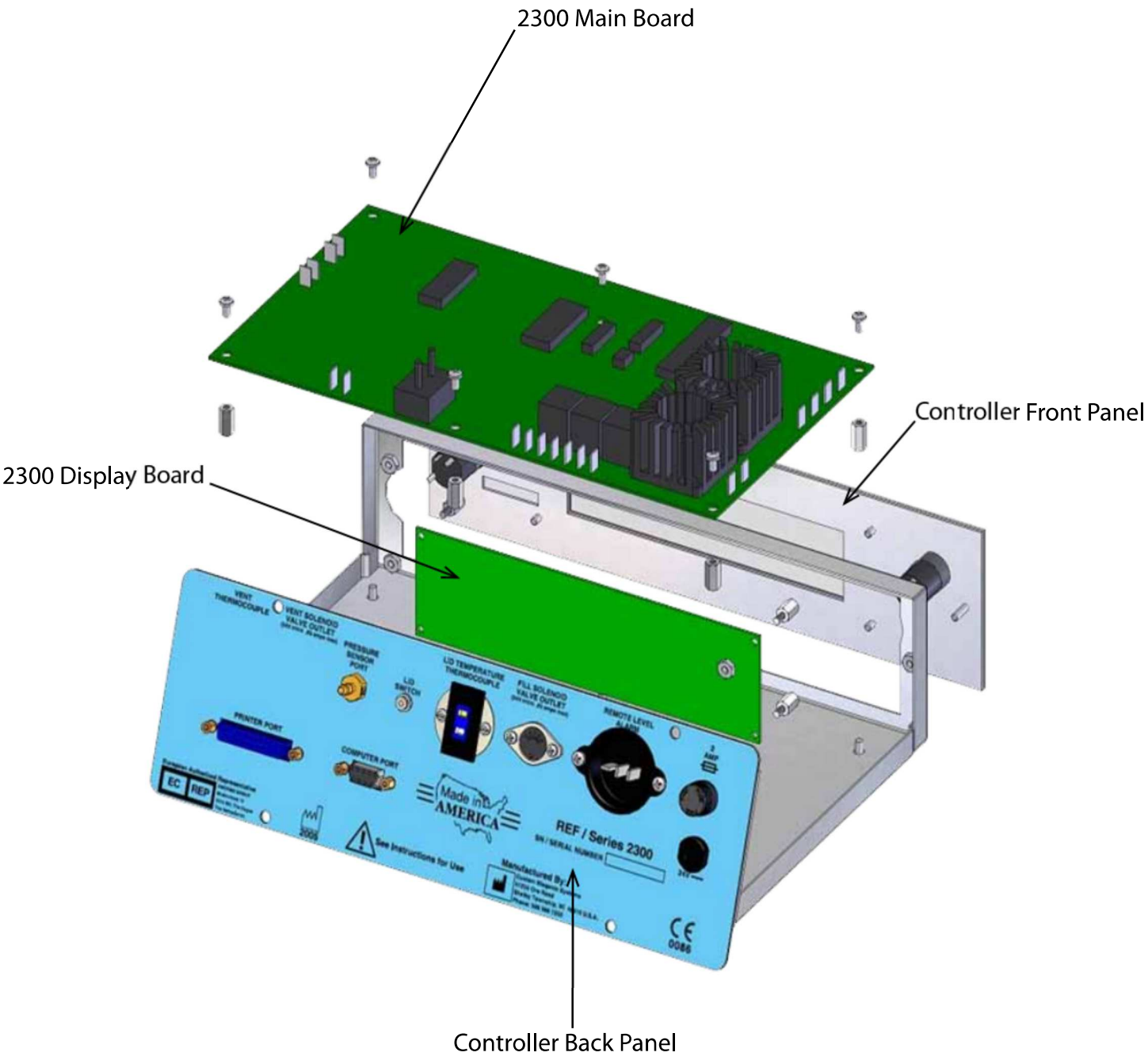
NOTE: Manual fill port location may vary between models.

1. Solenoid Valve
4. Anchor Coupling
5. Lock Washer
6. 3/4" Nut
7. 1/2" 3-Way
8. Hex Nipple
9. 1/2" 4-Way
10. Male Connector
11. 45° Street Elbow
12. Relief Valve
13. Cap Nut
14. 90° Street Elbow
15. Long Nipple (length will vary)
16. Hose Barb
18. Brass Vent
20. Thermocouple Fitting
21. Bushing
22. Sensing Hose
25. Braided Transfer Hose (length will vary)

Because this diagram covers several models, with and without the bypass option, there may be slight variations in the assembly from one unit to the next. Be sure to make note of your specific assembly whenever disassembling the manifold.

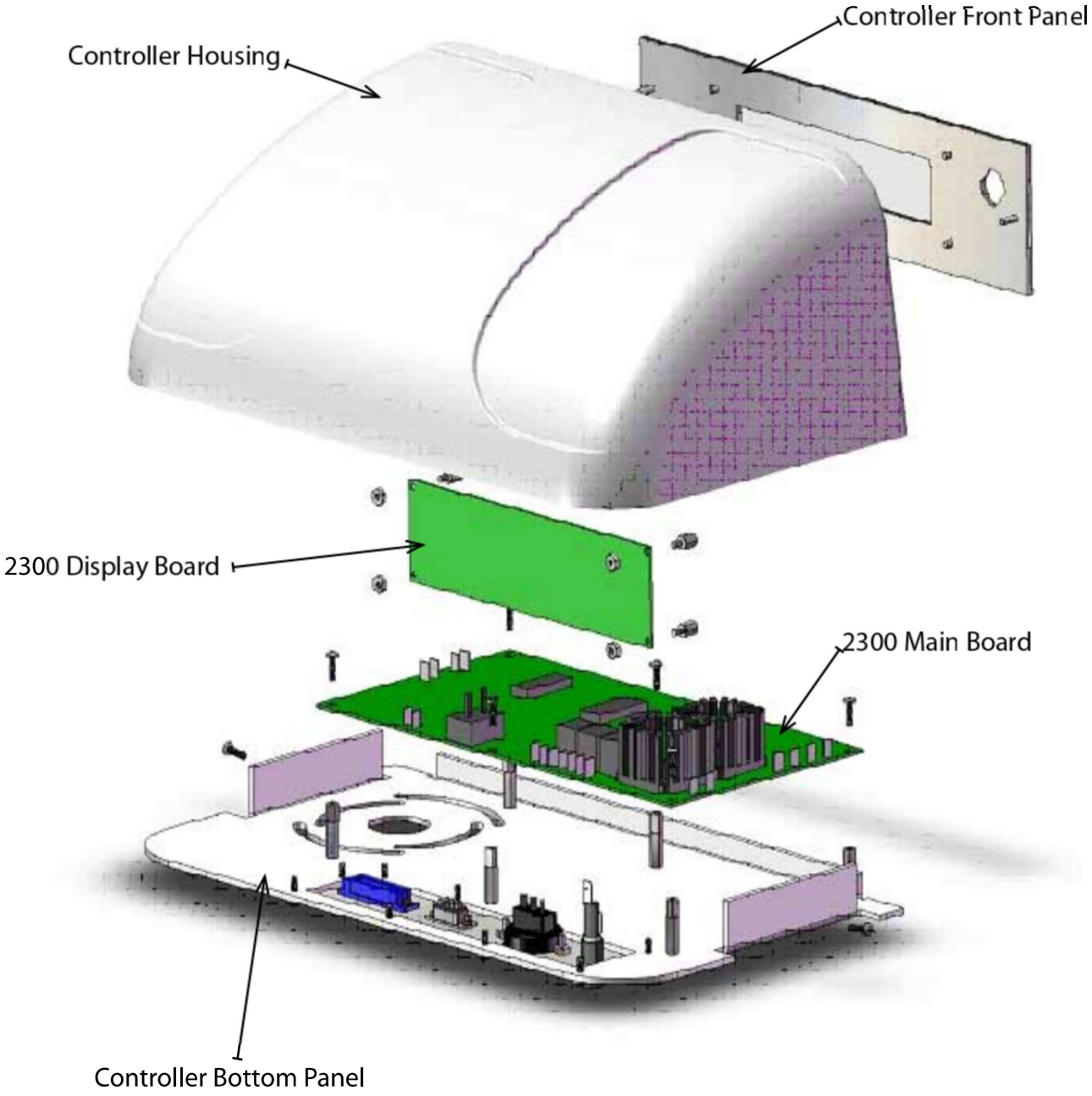
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90, 1500 & 3000 CONTROLLER ASSEMBLY



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5000 CONTROLLER ASSEMBLY

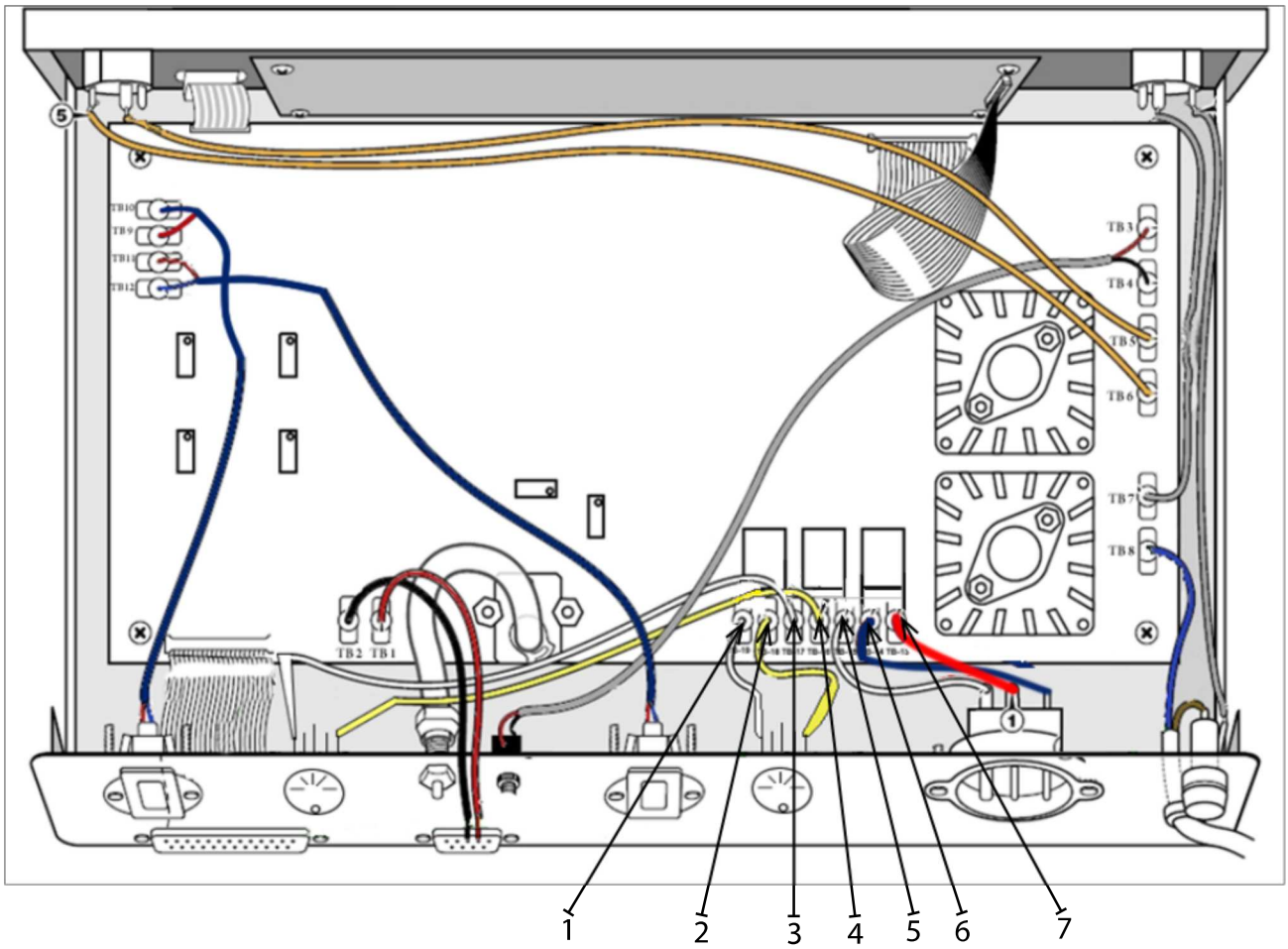


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SERIES 90, 1500 & 3000 CONTROLLER WIRING

Using these illustrations, correct wiring may be established by following the path of each wire and matching the color at both connection points. The numbers marking the ends of each wire correspond to the key shown at the bottom of the page.

AUTO-FILL WITH BYPASS OPTION

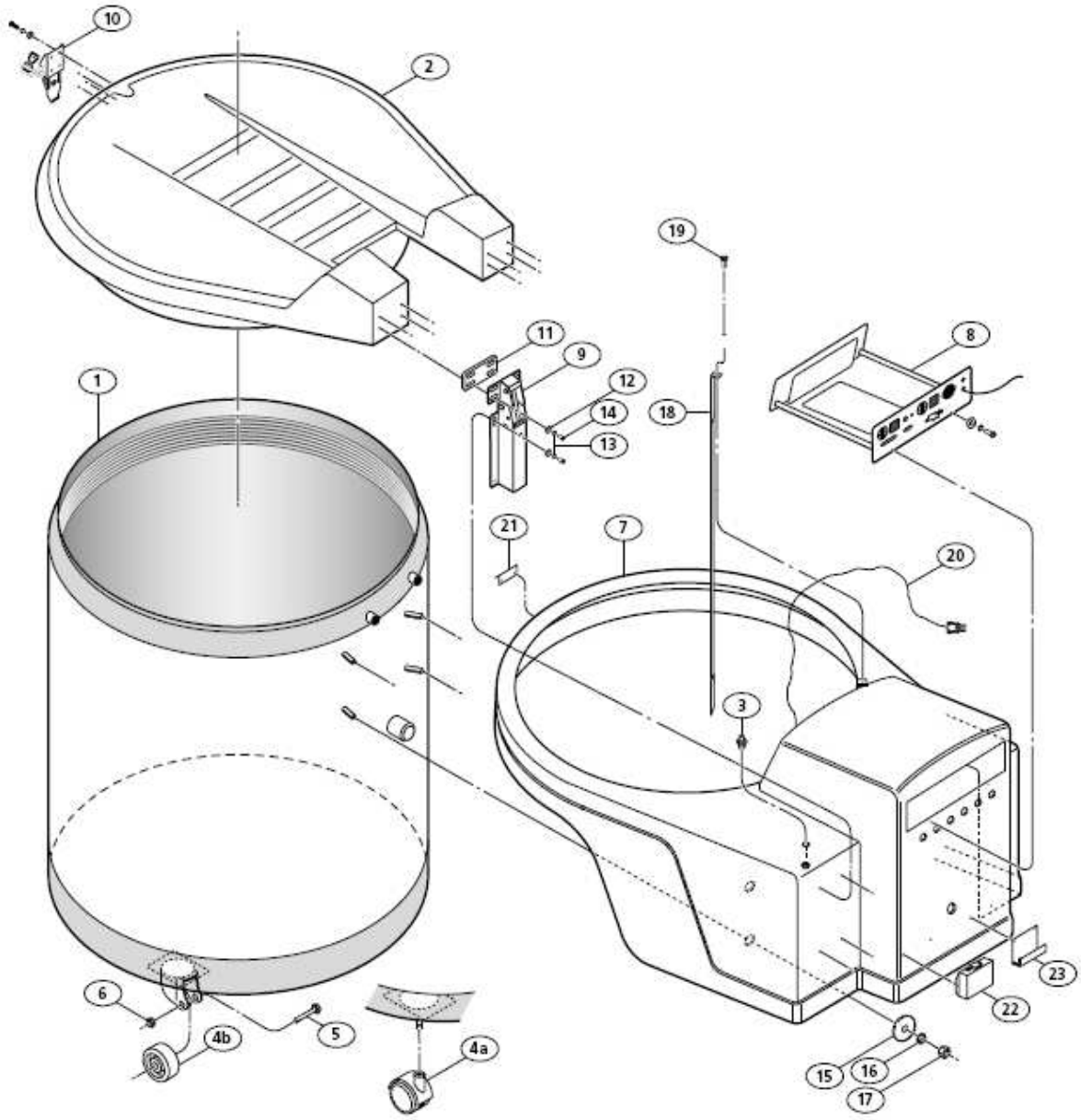


KEY

1. TB 19
2. TB 18
3. TB 17
4. TB 16
5. TB 15
6. TB 14
7. TB 13

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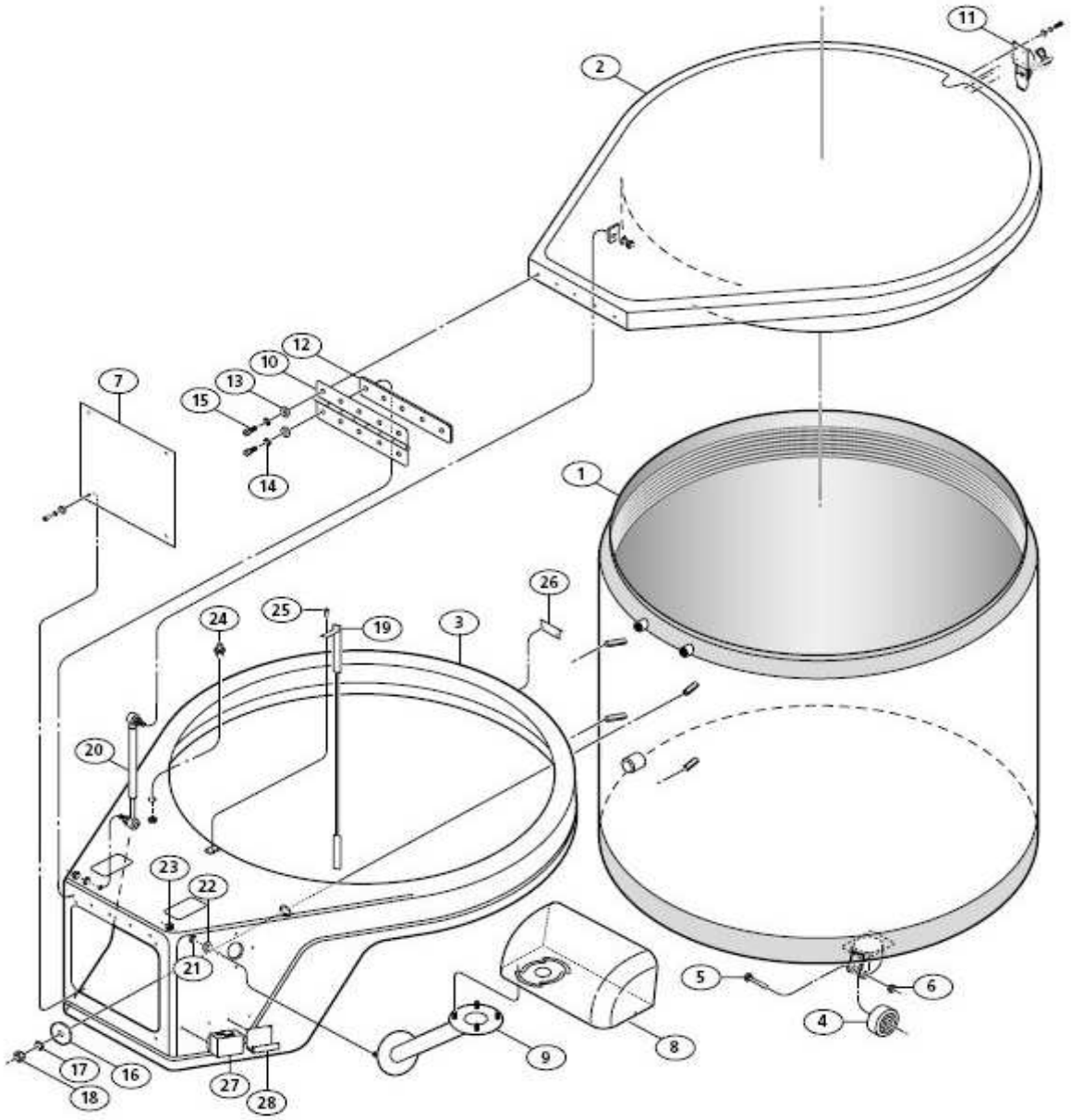
1500 & 3000 ASSEMBLY & PARTS LIST



1.	1500 ISO Vessel	- IV-1500
	3000 ISO Vessel	- IV-3000
2.	1500 ISO Lid	- IL-1500
	3000 ISO Lid	- IL-3000
3.	Lid Switch w/nut	- LS-153
4a.	1500 Caster	- C-1500
4b.	3000 Caster Wheel	- C-3000
5.	Wheel Bolt	- CWB-3000
6.	Wheel Nut	- CWN-3000
7.	Controller Console	
	1500	- CC-1500
	3000	- CC-3000
8.	Controller	- 2300
9.	Lid Hinge	- LH-153
10.	Lid Latch	- LL-1535
11.	Hinge Shim	- Hinge Shim (may not need)
12.	Flat Washer	- FW-#10
13.	Lock Washer	- LW-#10
14.	Screw	- S-10/24
15.	Flat Washer	- FW-1/2
16.	Lock Washer	- LW-1/2
17.	Hex Nut	- HN 1/2-13
18.	1500 Probe Sleeve	- PS-1500
	3000 Probe Sleeve	- PS-3000
19.	19) Sleeve Screw	- SS-6/32
20.	Lid Probe	- LP-153
21.	Lid Catch	- LC1535
22.	PC Adapter	- ASC-24T
23.	Power Bracket	-PSMB-1535

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5000 ASSEMBLY & PARTS LIST



1.	5000 ISO Vessel	- IV-5000	15.	Hex Screw	- HS-1/4-20
2.	5000 ISO Lid	- IL-5000	16.	Flat Washer	- FW-1/2
3.	Console	- CC-5000	17.	Lock Washer	- LW-1/2
4.	Caster Wheel	- CW-5000	18.	Hex Nut	- HN 1/2-13
5.	Wheel Bolt	- WB-5000	19.	Probe Sleeve	- PS-5000
6.	Wheel Nut	- WN-5000	20.	Hydraulic Piston	- 5300-060
7.	Console Cover	- RC-5000	21.	Lock Washer	-
8.	Controller	- 2300-5000	22.	Flat Washer	-
9.	Controller Arm	- CA-5000	23.	Hex Nut	-
10.	Lid Hinge	- LH-5000	24.	Lid Switch w/nut	- LS-5000
11.	Lid Latch	- LL-1535	25.	Sleeve Screw	- SS-6/32
12.	Hinge Shim	- Hinge Shim (may not need)	26.	Lid Catch	- LC1535
13.	Flat Washer	- FW-1/4	27.	PC Adapter	- ASC-24T
14.	Lock Washer	- LW-1/4	28.	Power Bracket	- PSMB-1535

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S SERIES LIQUID LEVEL DISPLAY VERIFICATION & CALIBRATION

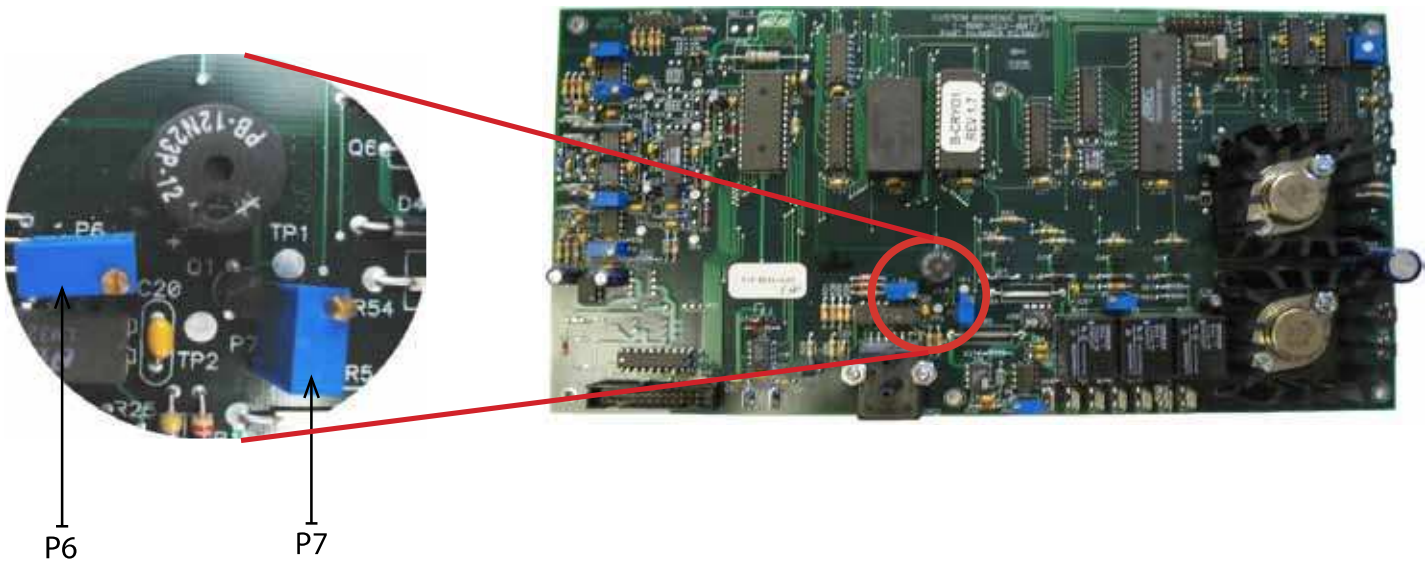
Display on the Standard Liquid Nitrogen Storage Units.

S Series Level Display Verification

1. With power on and no alarm condition occurring, look at the liquid level display and note the current reading.
2. With proper protection (Cryo-gloves or equivalent), place a yardstick into the liquid inside the storage vessel until it touches the bottom. Note where the liquid measures on the yardstick. If visibility is blocked by some port of an inventory system, simply hold the yardstick in place for thirty seconds, then remove it into open air and wave it around until frost forms. The liquid level is one half inch below the frost line on the yardstick.
3. Compare the reading on the level display to the measurement on the yardstick. If the level display is showing a discrepancy, the display should be calibrated using the following steps.

S Series Level Display Calibration

1. In order to calibrate the liquid level display, there must be at least 5 inches of liquid nitrogen in the storage vessel. With this in mind, bring the liquid level in the storage vessel up to the next highest inch and note the actual measure of the liquid level.
2. Unplug the storage unit from its power source.
3. Access the printed circuit board in the controller unit. On the Series 1500 and 3000, this is done by removing the four screws at the bottom of the controller back plate and sliding the controller out. On the Series 5000, the top cover of the controller comes off by removing the screw on each end which holds it in place.
4. Once the circuit board is in view, locate the P6 & P7 Level Display Calibration Trimmers. See diagram below for help identifying the proper location.
5. Reconnect power to the unit.
6. If display reading is below the actual liquid level, turn the P7 adjustment very slowly counterclockwise until display reading matches the actual liquid level.



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S SERIES LIQUID LEVEL DISPLAY VERIFICATION & CALIBRATION CONTINUED

7. If display reading is above the actual liquid level, turn the P7 adjustment very slowly clockwise until the display reads the actual liquid level.
8. Now disconnect the level sensor (Be sure to pinch it closed before removing), slowly turn the P6 adjustment counterclockwise until the display reads zero. Reconnect the level sensor.

IMPORTANT: Stop turning adjusters immediately when display reaches desired number.

9. Wait 15 minutes and re-check the level display against the actual liquid level to be sure the setting has remained accurate.
10. Once again, unplug the controller from its power source
11. Replace controller into the 90, 1500 or 3000, or top-cover onto the 5000, and secure the screws.
12. Reconnect all connections, power to the unit, and proceed to normal operation.

V SERIES LIQUID LEVEL DISPLAY VERIFICATION & CALIBRATION CONTINUED

Since the V Series storage units hold LN2 in a jacketed space between the vacuum insulated space and storage chamber it cannot be calibrated the same as S Series storage units. Customers have multiple options to choose from in how they want to go about calibrating their Isothermal storage unit.

For all options below please call for pricing and further details:

N.I.S.T. traceable options:

1. **Purchase Calibration Equipment**
2. **Rent Calibration Equipment**
3. **Have a qualified technician sent to your facility to perform the calibration**
4. **Return the controller to Custom Biogenic Systems to be calibrated**

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V & S SERIES HIGH & LOW LEVEL ALARM AND TEMPERATURE DISPLAY VERIFICATION

The following section includes verification procedures for the High and Low Level Alarms, and the Temperature Display on the Standard and Isothermal Liquid Nitrogen Storage Units.

V & S Series Low Level Alarm Verification

1. Using the manual valve on the liquid nitrogen supply tank, turn off the liquid supply.
2. Create a low level alarm condition. This is done by adjusting the level set-points above the actual liquid level. If necessary, refer to page 18, display #16, and #15.
   Example: The liquid level is 6 inches. Adjust the high level set-point to 10, and the low level set-point to 8. This will cause the controller to go into an auto fill.
   In 7 to 10 minutes, a low alarm should occur. This will be indicated by the **LOW ALARM** text flashing and the audible alarm sounding. The remote alarm output will activate also.
3. Return set-points to the desired settings.
4. Open manual valve on supply tank to resume normal operation.

V & S Series High Level Alarm Verification

1. Create a high level alarm condition. This is done by adjusting the level set-points at lease one inch below the actual liquid level. If necessary, refer to page 18, display #16.
   Example: The liquid level is 6 inches. Adjust the low set-point to 2 and the high set-point to 4.
   In 3 to 5 minutes, a high alarm should occur. This will be indicated by the **HIGH ALARM** text flashing and the audible alarm sounding. The remote alarm output will activate also.
2. Return set-points to the desired settings. Unit is now ready for normal operation.

If the alarm functions aren't occurring as described above, repeat the verification procedure. If one or both of the alarms are still not functioning properly, refer to the troubleshooting guide on page 36 for further instruction.

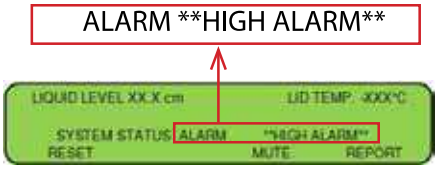
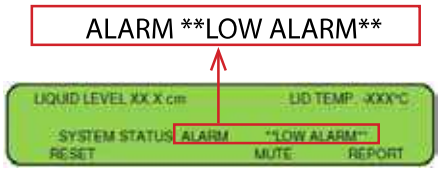
V & S Series Temperature Display Verification

1. Open storage unit lid and locate temperature sensing probe (see diagram: for Series 1500/3000 see page 27, #18; for Series 5000 see page 28, #19.
2. Remove probe from protective sleeve.
3. Submerge the sensor probe into liquid nitrogen. The digital temperature display should read -195° to -196° degrees celsius.
4. Remove probe from liquid nitrogen and place tip of probe in an ice bath (mixture of ice and water), and wait 30 seconds. While the probe is submerged, the digital display should read -1° to +1° degrees celsius.
5. Return probe into its protective sleeve at the desired depth.
6. Close the storage unit lid and resume normal operation.

If the temperature display doesn't operate as described, there may be a problem with the probe, or the probe connections. See the Troubleshooting Guide on page 36 for further information if a problem is detected.

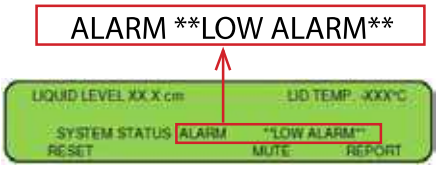
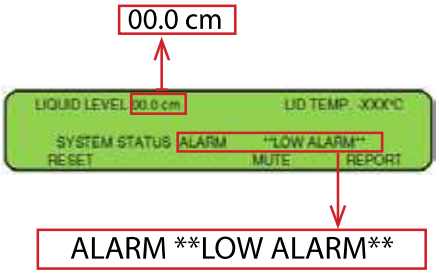
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TROUBLESHOOTING GUIDE: ALARMS

CONDITIONS	CAUSES	SOLUTIONS
HIGH ALARM text is flashing and audible alarm is present. (screen #90 on page 15)  *Liquid level in the vessel has risen above the HIGH level set-point.	◆ Check to see if unit is filling: -If unit is filling: -If unit is not filling:	◆ Push the STOP button, if fill continues, the solenoid valve may be frozen open; push the FILL and STOP buttons 15 to 20 times to un-stick the valve. If the fill continues, turn off the manual valve on the liquid nitrogen supply tank and let the solenoid valve warm to room temperature, then re-open the manual valve to see if proper operation returns. If not, the solenoid valve may need to be disassembled for service (see page 37 - *Cleaning and Maintenance)* ◆ There may be an obstruction in the solenoid valve. Remove solenoid valve and disassemble for service. (see page 37- *Cleaning and Maintenance)*
LOW ALARM text is flashing and audible alarm is present. (screen #90 on page 15)  *Liquid level in the vessel has fallen below the LOW level set-point.	◆ Supply tank is empty ◆ Supply tank is shut off ◆ Supply tank pressure is too low ◆ 3 or more storage units are filling at one time from a single supply line	◆ Replace supply tank ◆ Open manual valve on the supply tank ◆ Check pressure in supply tank - 25 p.s.i. maximum, 20 p.s.i. minimum **(22 p.s.i. recommended)** ◆ Storage vessels will fill very slowly and alarm will correct itself. ☞ Continued on next page

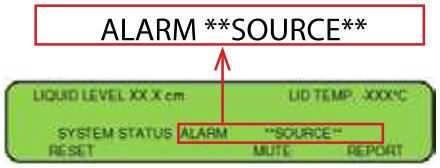
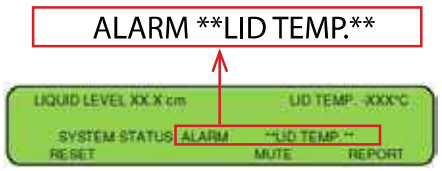
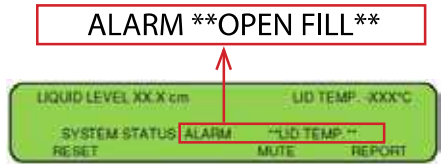
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TROUBLESHOOTING GUIDE: ALARMS

CONDITIONS	CAUSES	SOLUTIONS
LOW ALARM text is flashing and audible alarm is present. (screen #90 on page 15) 	◆ Solenoid valve operating erratically	◆ Push STOP button briefly and listen for the fill solenoid valve to "click". This sound is the valve operating. If the "click" is heard and the supply tank still has liquid and pressure in it, there may be an obstruction in the valve or in the line. If no "click" is heard, check to see that the valve is plugged in, and/ or that there is power to the outlet which the valve is plugged into. If power is present at the valve, but the vessel is still not filling with liquid nitrogen, the valve may be defective.
LOW ALARM text is flashing, audible alarm is present, and level display reads "00.0 cm" (or "00.0 in") (screen #90 on page 15) 	◆ The LN^2 level in the vessel has fallen below the pressure sensing port.	◆ An automatic fill will begin, and when the liquid level rises above the LOW level setpoint and the pressure port, the alarm will subside. ◆ Check pressure hose at all connection points; a white clamp should be in place at each end of the hose inside the controller, and at the hose connection on the back of the controller. If hose appears loose, disconnect it, remove an inch off the end by cutting it with scissors, and reconnect it. (If the vessel is holding liquid, it may take some time to read the corrected level.)

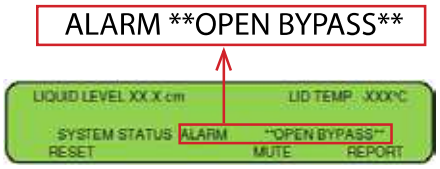
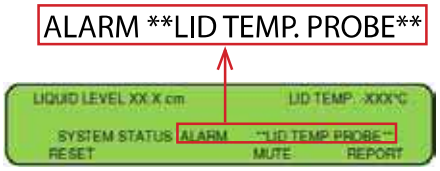
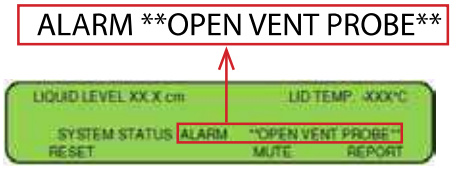
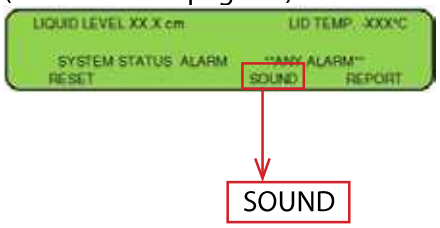
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TROUBLESHOOTING GUIDE: ALARMS

CONDITIONS	CAUSES	SOLUTIONS
SOURCE text is flashing and audible alarm is present. (screen #90 on page 15)  *This indicates a weak or empty liquid supply. Liquid level is above the LOW level set-point, but isn't rising fast enough to satisfy the system.	◆ Supply tank is empty ◆ Supply tank is shut off ◆ Supply tank pressure is too low or to high ◆ 3 or more storage units are filling at one time from a single supply line	◆ Replace supply tank ◆ Open manual valve on supply tank if closed ◆ Check pressure in supply tank - 25 p.s.i. maximum, 20 p.s.i. minimum **(22 p.s.i. recommended)** ◆ Source alarms are not self correcting.
LID TEMP text is flashing and audible alarm is present. (screen #90 on page 15) 	◆ Temperature has risen above set-point. ◆ Probe has been inadvertently moved.	◆ Lid has been open too long. ◆ Low liquid nitrogen level. ◆ Move probe to original location.
OPEN FILL text is flashing and audible alarm is present (screen #90 on page 15) 	◆ Fill valve disconnected from power source. ◆ Fill valve defective.	◆ Connect fill valve power cord correctly using diagram on page 7. ◆ Replace fill valve.

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TROUBLESHOOTING GUIDE: ALARMS

CONDITIONS	CAUSES	SOLUTIONS
OPEN BYPASS text is flashing and audible alarm is present. (screen #90 on page 15) 	• Bypass valve disconnected from power source. • Bypass valve defective.	• Connect bypass valve power cord correctly using diagram on page 7. • Replace bypass valve.
LID TEMP PROBE text is flashing and audible alarm is present. (screen #90 on page 15) 	• Thermocouple probe plug is disconnected. • Thermocouple probe is damaged.	• Connect probe plug properly using diagram on page 7. • Replace damaged probe.
OPEN VENT PROBE text is flashing and audible alarm is present. (screen #90 on page 15) 	• Thermocouple probe plug is disconnected. • Thermocouple probe is damaged.	• Connect probe plug properly using diagram on page 7. • Replace damaged probe.
Any **ALARM** text is flashing and an audible alarm is **NOT** present. (screen #91 on page 15) 	• There is an alarm condition of some kind and the alarm MUTE is activated.	• Correct the alarm condition and then push the SOUND switch, so the audible alarm will be activated at the next alarm occurrence.

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TROUBLESHOOTING GUIDE: ALARMS

CONDITIONS	CAUSES	SOLUTIONS
Liquid Nitrogen has flooded vessel through internal vents. (V Series units only)	◆ Liquid level has become too high inside the vessel walls because of stuck solenoid, user error, etc.	◆ Shut off manual valve on liquid supply, wait for the liquid to settle and do one of the following: - Carefully bail liquid out of vessel using approved cryogenic container and proper personal safety equipment, or - Wait for liquid to evaporate from vessel on it's own.
No lights	◆ Blown fuse ◆ No power at wall outlet. ◆ AC power cord not plugged in. ◆ ON/OFF switch in OFF position	◆ Replace with two amp fuse. ◆ Use live power source. ◆ Plug the AC power cord into a wall socket. ◆ Move power key-switch into the ON position.
Liquid level display showing incorrect reading.	◆ Obstructed pressure port. ◆ Loose sensor hose. ◆ Unit out of calibration.	◆ Clear blockage from pressure port in bottom of vessel. ◆ Check sensor hose connection. ◆ Calibrate unit using the calibration guide on page 29, 30.
Remote alarm working improperly or not at all.	◆ Remote alarm wires connected to the wrong terminals.	◆ Reconnect wiring using the guide on page 12: *Remote Alarm Wiring*

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CLEANING & MAINTENANCE

Cleaning

Use a mild, non-abrasive household type cleaner for cleaning all surfaces of the unit.

System Check

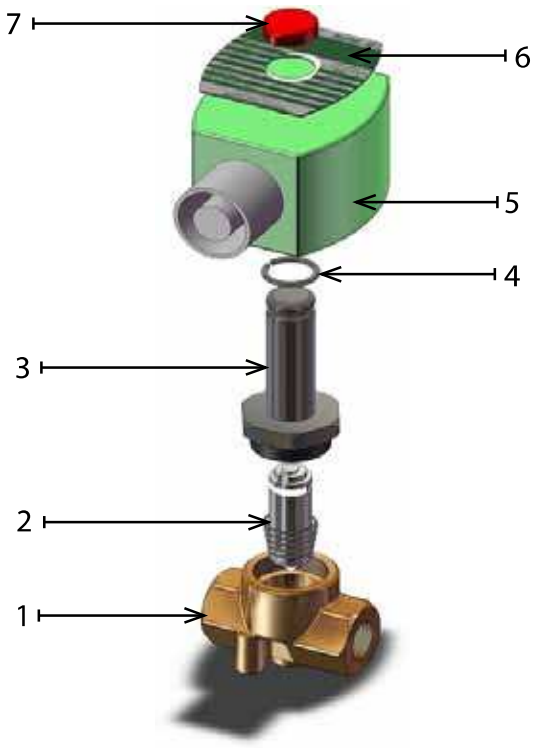
1. Test all alarm functions for proper operation.
2. Check accuracy of liquid level display, by measuring the liquid level manually using a yard stick. See pages 29&30 for detailed instructions on how to verify the liquid level depending on your type of storage unit (V Series or S Series).
3. Check any connected Remote Alarms or Automatic Dialing Systems to ensure proper operation. See page 31 for detailed instructions on how to manually cause a HIGH ALARM or LOW ALARM to test the remote alarm contacts.
4. Check for leaks at all connection points of the liquid nitrogen lines.
5. Be sure that all electrical wires are free of damage and plugs are firmly in place.

SOLENOID VALVE MAINTENANCE

IMPORTANT: This should be done ***only as required,*** and is not a necessary part of maintenance.
Solenoid valve(s) may be opened to inspect for cleanliness and to check seals for wear.
Wipe seals with a clean, lint-free cloth. Distilled ammonia may be used to wipe seals if needed.

The solenoid valves may be opened and cleaned if they are not working smoothly. If this is done, use the diagram below to reassembly the valves properly. If the valve is found to be defective, it must be replaced, as replacement parts are not available individually.

1. Valve Body
2. Plunger
3. Flange
4. Valve Coil Locknut
5. Coil
6. Spec. Plate
7. Valve Cap



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