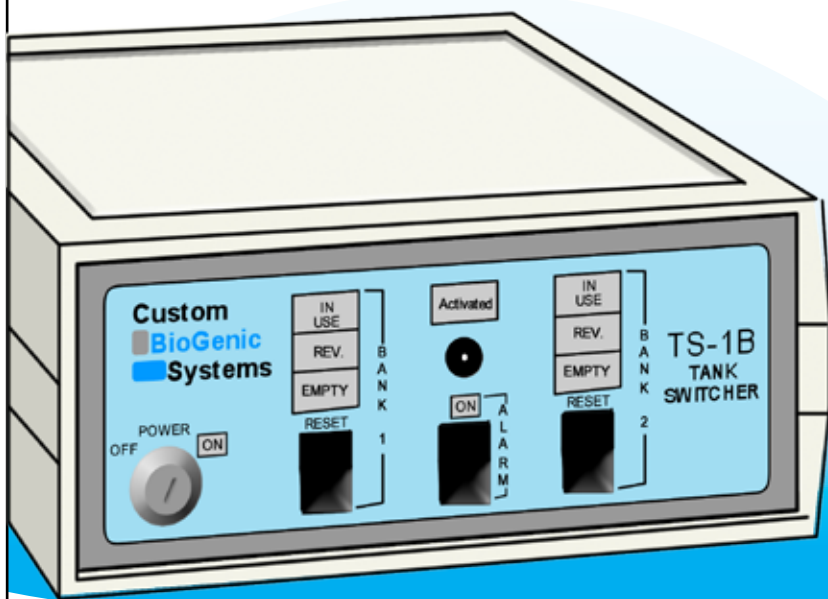


TS-1B

TANK SWITCHER

SET-UP AND TECHNICAL MANUAL



Custom
BioGenic
Systems

www.custombiogenics.com

150 Shafer Drive ♦ Romeo, MI 48065 ♦ USA

1.800.523.0072 ♦ Tel: 1.586.331.2600 ♦ Fax: 1.586.331.2588



Leading the World with Innovative Cryopreservation Technology Solutions

- 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 system, 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 Custom Biogenic Systems or your Custom Biogenic Systems representative.

The following is a list of the items which have been provided with your new controller. For accessories and replacement parts see page 17.

TS-1B

- (1) TS-1B Controller
- (2) Power keys
- (1) Bank Thermocouple probe w/brass pipe fitting
- (2) Velcro hold-downs
- (1) Technical manual

PRODUCT WARRANTY

Custom BioGenic Systems warrants all manufactured cryogenic equipment to be free from defects in workmanship and materials for a period of one year.

Custom BioGenic Systems' liabilities under the warranty shall be limited to correcting or replacing the defective workmanship or materials. A claimant under the warranty must notify Custom-BioGenic Systems within ten (10) days after discovery of the defect and immediately discontinue use of the defective equipment. Custom BioGenic Systems reserves the right, at their discretion, to correct the defect(s) in the field without return shipment to Romeo, Michigan.

This warranty does not cover defects on cryogenic equipment resulting from abusive handling and subsequent 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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- SAFETY -

IMPORTANT!

The following section on LIQUID NITROGEN SAFETY should be read carefully and followed completely, but is by no means a complete volume on the 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

LIQUEFIED GASES ARE EXTREMELY COLD LIQUIDS. LIQUID NITROGEN EXISTS AT -196°C. BECAUSE OF THESE TEMPERATURES, LIQUEFIED GASES WILL “BURN” IF THEY COME INTO CONTACT WITH SKIN. NEVER ALLOW DIRECT SKIN CONTACT WITH LIQUID NITROGEN OR SERIOUS BURNS WILL RESULT.

ALTHOUGH LIQUID NITROGEN ITSELF IS NON-TOXIC, WHEN RELEASED IN TO 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 A RESPIRATOR 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.

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

- SAFETY -

HANDLING

Personnel handling liquefied gases 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 their low temperatures, liquefied gases will burn the skin much the same way as hot liquids can. 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, heavy rubber gloves large enough to allow quick removal and a heavy rubber apron. It is preferable that shoes worn at these times have high tops as to not permit accidentally 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 and other cryogenic liquids.

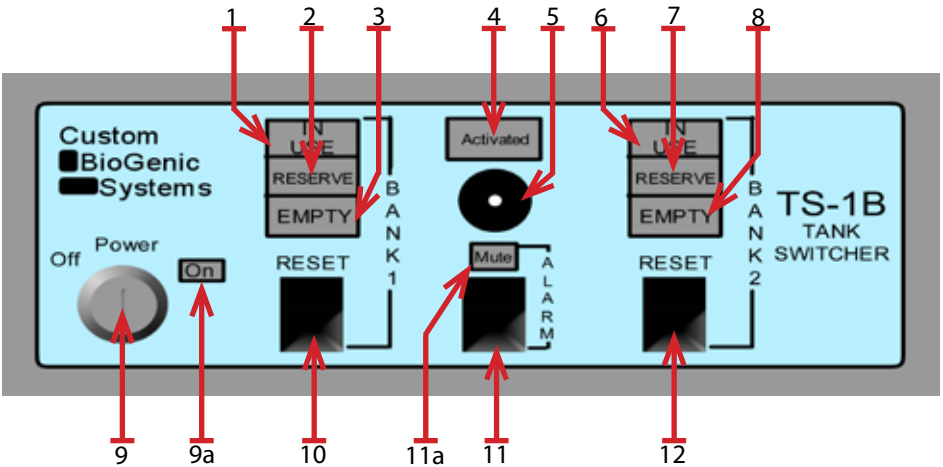
FIRST AID

In the event a person is burned by liquefied gas, 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.

- FRONT PANEL PARTS IDENTIFICATION -

Use this section to become familiar with the controls and as a reference during initial set up and operation.



1. Bank 1 In Use indicator Light

When lit, Bank 1 (first supply) is in-line to be used when TS-1B is activated by the level controller.

2. Bank 1 Reserve indicator Light

When lit, Bank 1 is in reserve and will go into use automatically when Bank 2 (second supply tank) is empty.

3. Bank 1 Empty Indicator Light

Lights-up when Bank 1 is empty. Once the tank is refilled or replaced, the Bank 1 reset switch must be depressed to put it back into use or reserve.

4. Activated indicator light

Lights-up when TS-1B is activated by the level controller.

5. Audible Alarm Horn

This horn creates a loud audible alarm when an alarm condition occurs.

6. Bank 2 In Use Indicator light

When lit, Bank 2 (second supply tank) is in-line to be used when TS-1B is activated by the level controller.

7. Bank 2 Reserve indicator light

When lit, Bank 2 is in reserve and will go into use automatically when Bank 1 (first supply tank) is empty.

- FRONT PANEL PARTS IDENTIFICATION -

8. Bank 2 Empty Indicator Light

Lights-up when Bank 2 is empty. Once the tank is refilled or replaced, the Bank 2 reset switch must be depressed to put it back into use or reserve.

9. Key-Switch Power Control

Main power control switch for the unit.

9a. Power-On Indicator Light

Lights-up when power is turned on.

10. Bank 1 Reset Switch

Depressing this switch resets Bank 1 to In Use or Reserve:

If Bank 1 is reset to In Use, Bank 2 will be in reserve;

If Bank 1 is reset into Reserve, Bank 2 will be in use.

11. Alarm Mute Switch

Depressing this switch mutes the audible alarm.

11a. Alarm Mute Indicator Light

Lights-up when audible alarm is muted.

12. Bank 2 Reset Switch

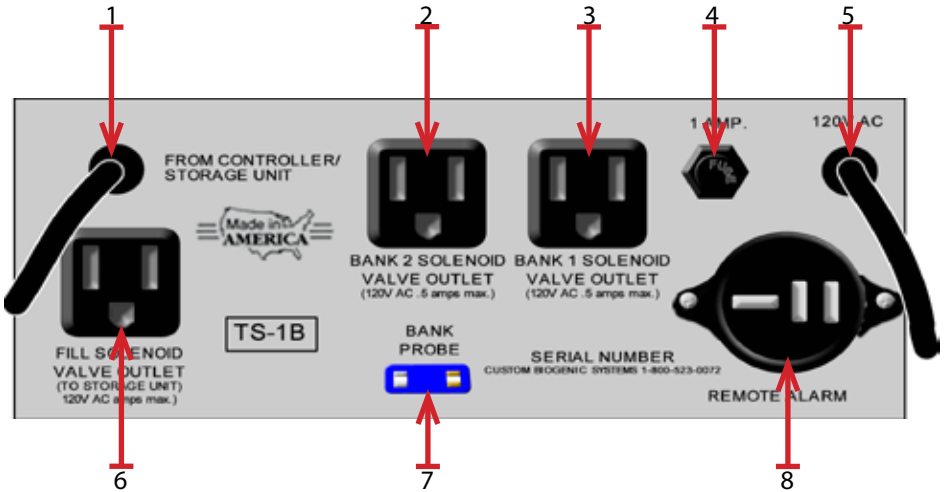
Depressing this switch resets Bank 2 to In Use or Reserve:

If Bank 2 is reset to In Use, Bank 1 will be in Reserve;

If Bank 2 is reset into Reserve, Bank 1 will be in use.

- BACK PANEL PARTS IDENTIFICATION -

Use this section to become familiar with the controls and as a reference during initial set up and operation.



1. Controller/Storage Unit Connection Cord

This line provides the connection between the TS-1B and the controller or storage unit which controls the TS-1B.

2. Bank 2 Solenoid Valve Connector

The Bank 2 solenoid valve plugs in here.

3. Bank 1 Solenoid Valve Connector

The Bank 1 solenoid valve plugs in here.

4. Fuse

1 amp Buss fuse; 220 volts slow-blow.

5. Power Cord

This is the main power cord to the unit, be sure to verify proper voltage before connecting to power supply - see voltage requirements listed on the unit.

6. Fill Solenoid Valve Connector

The fill solenoid valve plugs in here.

7. Bank Probe Connector

The bank thermocouple plugs in here.

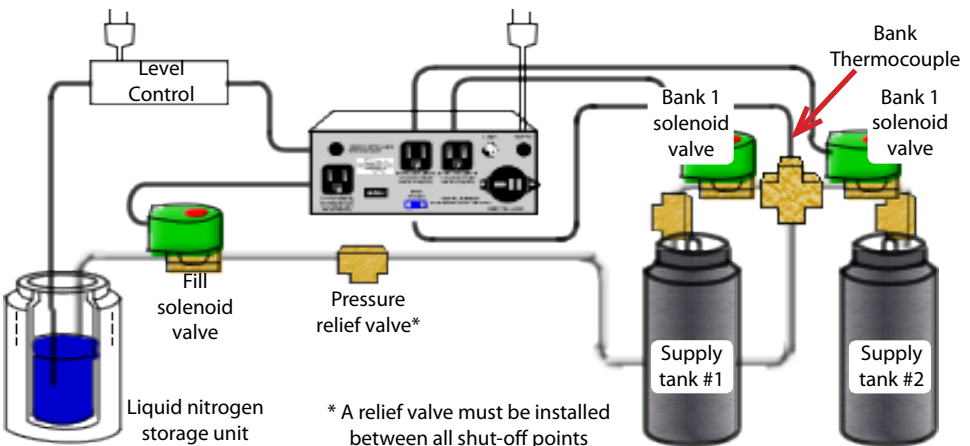
8. Remote Alarm Connector

An Auto-Dialer or Remote Alarm Monitor may be plugged in here.

- INITIAL SET UP -

Use the following steps to connect the TS-1B to a liquid level controller or storage unit.

1. Disconnect level controller or storage unit from power supply.
2. Disconnect fill solenoid valve power cord from level controller and connect to Fill Solenoid Connector on TS-1B back panel (#6 on page 5)
3. Connect From Controller cord (1), to fill solenoid valve outlet on level controller.
4. Connect supply tank solenoid valves (Bank 1 & Bank 2), to the corresponding outlets on the TS-1B back panel (#2 and #3).
5. Connect thermocouple sensor to Bank Probe Connector on TS-1B back panel (#7).
6. If desired, connect remote alarm or auto dialer to Remote Alarm Connector on TS-1B back panel (#8). See complete wiring instructions on page 7.
7. Connect liquid output line from supply tanks to manifold bank solenoid valves.
8. Connect liquid output from manifold assembly to storage unit fill solenoid valve.
9. Plug power cords from the TS-1B and level controller/storage unit into an appropriate power source. This will be a standard wall socket for most applications - 120 volts AC, properly grounded. Check the voltage requirements listed on the equipment.
10. Turn the power ON to the level controller/storage unit and the TS-1B.
11. Open the manual valves on the supply tanks. Check for leaks at the connection points and proceed to normal operation.



- OPERATION -

The TS-1B Tank Switcher is designed to operate the level control solenoid valve as well as the bank solenoid valves, when activated to do so by the level controller. During regular operation, the sequence of events is as follows: The storage container sends a signal that the liquid level is low and the level control passes that signal on to the TS-1B. The **ACTIVATED** window on the TS-1B lights up, the **IN USE** solenoid valve (Bank 1 or Bank 2) is opened and the fill solenoid is opened allowing the flow of liquid nitrogen to the storage container.

The main function of the TS-1B is to sense when a supply tank runs dry and automatically switch to a fresh tank with no interruption of cooling. This is achieved by the placement of a thermocouple into the manifold which connects the supply tanks to the storage vessel. The sequence of events is as follows: The TS-1B receives a signal from the manifold thermocouple when the bank in use runs dry, the **IN USE** indicator light for that bank goes dark and the **EMPTY** indicator light lights up. The bank which is in **RESERVE** then switches to **IN USE** status. Once this occurs, the empty supply should be refilled or replaced. When the tank is reconnected, depress the **RESET** switch for this bank and the fresh tank goes into **RESERVE** until needed.

- CHANGING THE ALARM OPTION -

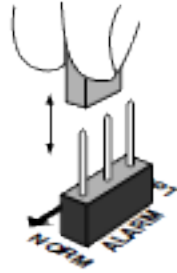
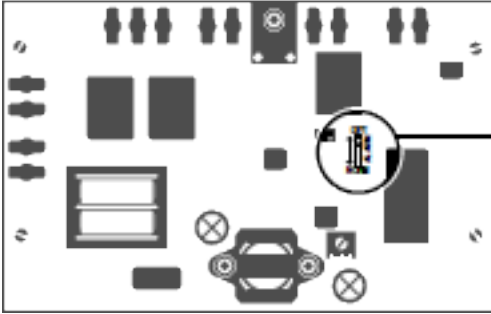
The TS-1B uses both an audible and visual alarm to alert the user that an alarm condition is occurring. In addition, a remote alarm or an auto dialer may be connected via the remote alarm connector on the back of the unit, (see page 7 for Remote Alarm connection). The TS-1B may be configured for the alarms to be activated when either one or both of the supply tanks (Bank 1 and/or Bank 2) register as empty. The unit is pre-set for the "both tanks empty" option at the factory. When the "one tank empty" alarm is chosen, the alarm is activated when either bank registers as empty.

To change the alarm option setting, use the following steps and the diagram to make the change.

1. Disconnect power from the system.
2. Open the TS-1B enclosure by removing the two phillips head screws from the bottom face of the unit. Once they are removed place the unit right side up on a flat surface and remove the top half of the enclosure.
3. Using the diagram below, locate the alarm option "jumper" on the circuit board which is facing up from bottom of unit. To change the setting, pull the jumper straight up from the circuit board to remove it. Then place it down into the new position, referring to the diagram for proper placement.

- CHANGING THE ALARM OPTION -

4. Replace the top half of the enclosure and re-secure the screws.



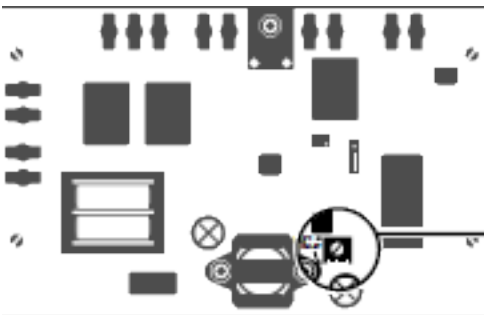
Connect center pin with "OPT" (upper) pin for alarm when one tank is empty:

Connect center pin with "NORM" (lower) pin for alarm when both tanks are empty.

- ADJUSTING THE DELAY TIMER -

This adjustment determines the amount of time between the TS-1B becoming activated and the bank which is IN USE being seen as empty. The factory preset is for two minutes of delay time. The minimum delay time is one second. The maximum possible is approximately 19 minutes. To change the delay time use the following steps and the diagram to make the change.

1. Disconnect power from the system.
2. Open the TS-1B enclosure by removing the two phillips head screws from the bottom face of the unit. Once they are removed, place the unit right side up on a flat surface and remove the top half of the enclosure.
3. Using the diagram below, locate the RA2 Delay trimmer on the circuit board which is facing up from the bottom of unit and make adjustment.
4. Replace the top half of the enclosure and re-secure the screws.



Turn Delay Trimmer anti-clockwise to increase delay time;

Turn Delay Trimmer clockwise to decrease delay time.

- REMOTE ALARM WIRING -

Locate the Remote Alarm Connector on the TS-1B back panel (#8 on the TS-1B Back Panel parts list on page 5). This is where the Remote Alarm or Auto Dialer will plug into the control unit.

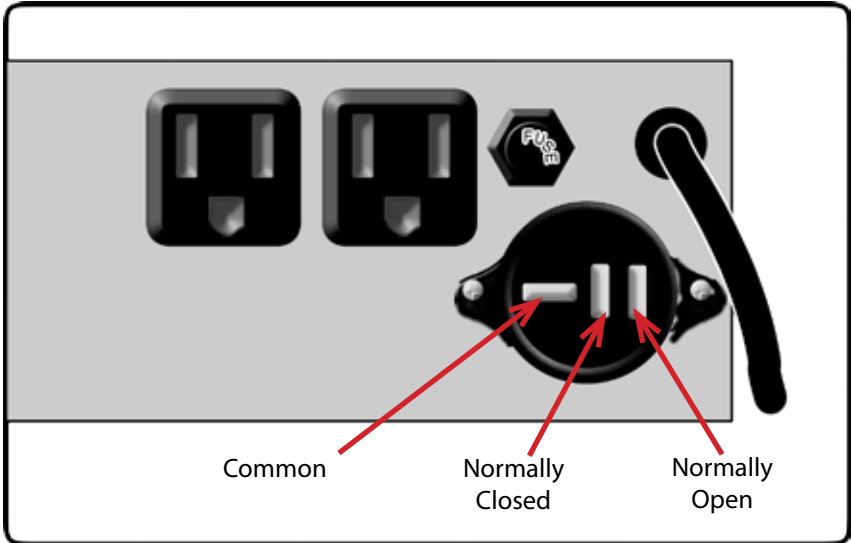
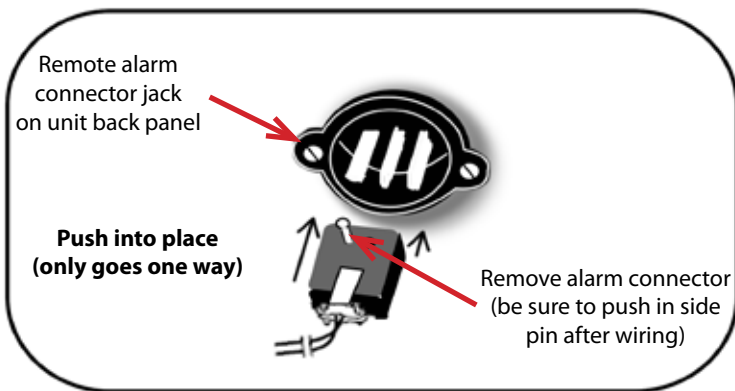


DIAGRAM SHOWS CONNECTION FOR ARRANGEMENT WITH UNIT AND NO ALARM PRESENT

First, wires from the Remote Alarm or Auto Dialer must be connected to the plug-end which will connect to the Remote Alarm Connector. Use the diagrams to configure the wiring from the remote unit.



When unit goes into an alarm condition or loses power, the contacts will close, thereby sending a signal to the Remote Alarm or Auto Dialer.

- UNIT PARAMETERS -

Cooling medium: Liquid nitrogen

Power supply voltage: 120 volts AC 60 Hz standard
220 volts AC 60/50 Hz optional

Amperage: 1 amp max

Fuse: 1 amp "slow blow" - 200 volts AC automotive glass-tube type fuse

Remote contact type: Normally open / normally closed

Remote contact rating: 10 amp - 120 volts AC; 6 amp 220 volts AC

Dimensions (L x W x H): 6 1/4" x 8" x 3 1/4" or 15.9 cm x 20.3 cm x 8.3 cm

Weight: 48 oz. or 1.36 kg

- CLEANING & MAINTENANCE -

Cleaning

- ◆ Use a mild, non abrasive household type cleaner for cleaning the unit.

Preventative Maintenance

- ◆ Visually check all lights regularly to ensure proper operation.
- ◆ Visually check wires and connections for signs of wear and locate potential future problems.
- ◆ Avoid exposing the unit to conditions that may cause damage or interrupt proper operation.
- ◆ Regularly check any connected remote alarms or automatic dialing systems for proper operation.

- PARTS & ACCESSORIES -

When ordering replacement parts and accessories be sure to use the following part numbers to ensure that you get the correct parts.

<u>Part Number</u>	<u>Description</u>
51013	TS-1B Tank Switcher
51013-1	Installation kit* for TS-1B
51000-0C01	Power keys
51000-3	Main power fuse
51012-3	Probe fitting
51002-4	Remote alarm female plug
51013-2	Bank probe
51000-1	Velcro hold-down

* Installation kits include all the necessary components for complete operation

- TROUBLE SHOOTING GUIDE -

Use this chart to help correct any problems you may encounter. If further assistance is needed, contact your **Custom BioGenic Systems** representative.

CONDITION	CAUSES	SOLUTIONS
<ul style="list-style-type: none"> ◆ No Lights 	<ul style="list-style-type: none"> ◆ Blown fuse ◆ No power at wall outlet ◆ AC power cord not plugged in ◆ ON/OFF switch in OFF position 	<ul style="list-style-type: none"> ◆ Replace with 1 amp fuse ◆ Use live power source ◆ Plug the AC power cord into a wall socket ◆ Move power switch into the ON position
<ul style="list-style-type: none"> ◆ Alarm occurring with audible and visual alarm 	<ul style="list-style-type: none"> ◆ Probe plug is disconnected ◆ Probe is damaged ◆ Banks were not reset after being replaced ◆ Thermocouple damaged or disconnected ◆ Low pressure in supply tanks ◆ Liquid nitrogen transfer lines too long ◆ Solenoid valve malfunction ◆ Defective solenoid valve 	<ul style="list-style-type: none"> ◆ Check supply tanks and replace if necessary ◆ Press reset switch ◆ Check for proper thermocouple connection ◆ Replace if damaged ◆ Allow time for supply tank pressurization ◆ Shorten transfer lines ◆ Allow valve to warm to room temperature, then check for normal operation ◆ Disassemble valve for cleaning ◆ Replace solenoid valve
<ul style="list-style-type: none"> ◆ Alarm occurring with no audible alarm 	<ul style="list-style-type: none"> ◆ Mute switch enabled 	<ul style="list-style-type: none"> ◆ Turn mute switch off

- TROUBLE SHOOTING GUIDE -

Use this chart to help correct any problems you may encounter. If further assistance is needed, contact your **Custom BioGenic Systems** representative.

CONDITION	CAUSES	SOLUTIONS
<ul style="list-style-type: none"> ◆ Bank registers as empty when supply tank is not really empty 	<ul style="list-style-type: none"> ◆ Thermocouple damaged or disconnected ◆ Low pressure in supply tanks ◆ Liquid nitrogen transfer lines too long ◆ Solenoid valve malfunction ◆ Defective solenoid valve 	<ul style="list-style-type: none"> ◆ Check thermocouple connection ◆ Replace if damaged ◆ Allow time for supply tank pressurization ◆ Shorten transfer lines ◆ Allow valve to warm to room temperature, then check for normal operation ◆ Disassemble valve for cleaning ◆ Replace solenoid valve
<ul style="list-style-type: none"> ◆ Storage unit not filling 	<ul style="list-style-type: none"> ◆ Incorrect hookup ◆ Liquid nitrogen transfer lines too long 	<ul style="list-style-type: none"> ◆ Check all connections using the diagram on page 6 for reference ◆ Shorten transfer lines
<ul style="list-style-type: none"> ◆ Remote alarm not working properly 	<ul style="list-style-type: none"> ◆ Incorrect wiring ◆ Remote alarm connector not connected 	<ul style="list-style-type: none"> ◆ Re-wire using the diagram on page 9 ◆ Connect properly using the diagram on page 9

AVAILABLE FROM CBS

Liquid Nitrogen Equipment Including:

Freezers & Dewars

Controlled Rate Freezing Systems

Freezer Racks and Boxes

Transfer Lines

Solenoid Valves

Liquid Level & Temperature Alarms

Liquid Level & Temperature Controls

Temperature Recorders / Monitors

Cryogenic Accessories



**Custom
BioGenic
Systems**

**150 Shafer Drive
Romeo, Michigan 48065 U.S.A.**

TS1B.TM0609

Revision: B

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