



PS-22 / PS-42 PHASE SEPARATOR

Installation Manual

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This document covers the installation of Technifab's PS-22 and PS-42 Phase Separator. Additional information for initial startup and system operation is included in the Owner's Manual, Technifab part number LT-46490.

Consult the Cryogenic Equipment Safety and Handling Guide, Technifab part number LT-30084, for additional cautions and warnings of your cryogenic liquid system.

Symbols Used in this Manual



Warning - indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Caution - indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

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Safety

Use caution when installing the Phase Separator system. Phase Separator installation should be performed by qualified personnel familiar with cryogenic systems. Accidents caused by operator error in which the equipment is damaged are not covered by warranty and Technifab assumes no liability in such matters.

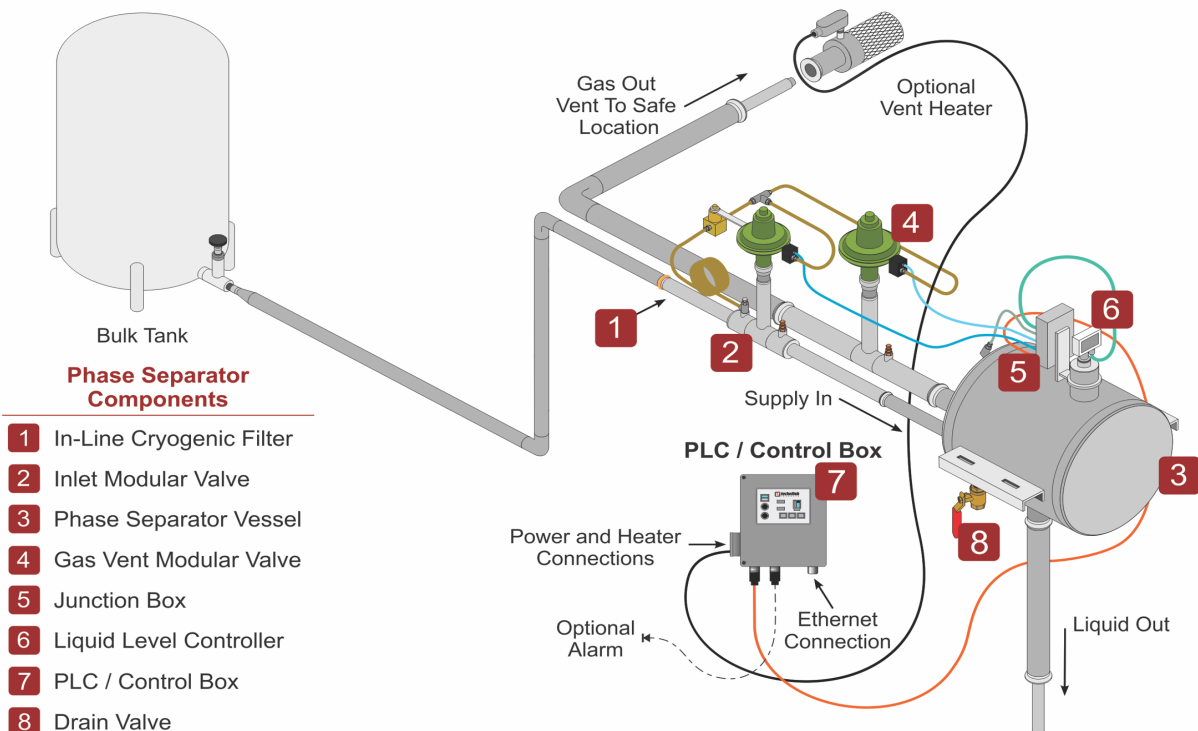
 **Caution - The PS system is not designed to nor will it act as a safety for over-pressurizing delicate equipment. It is the responsibility of the owner to add safety relief valves or other devices needed to protect equipment on the down-stream side of the System.**

 **Caution - Care should be taken around safety relief valves and gas vent line outlets in case cold cryogenic gas or liquid should ever be expelled.**

 **Caution - Technifab Products Inc. recommends routing the discharge lines from pressure relief devices to a safe place of discharge. The outlet of the discharge line should not be in a location where it could injure people or damage anything should cryogens be expelled.**

Phase Separator Layout Diagram

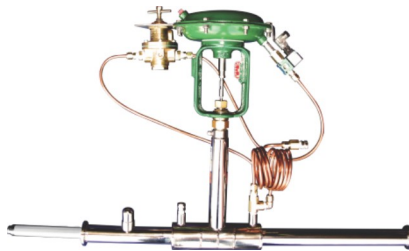
Back pressure system pictured with optional vent heater.



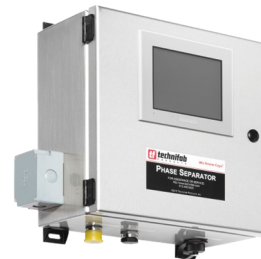
PS-22 / PS-42 Component Identification



**Phase Separator Vessel
(Horizontal Outlet Shown)**



**Inlet Modular Valve with
Process Gas Option**



Control Box



Control Cable



**Gas Vent Valve
(Backpressure Option Only)**



Junction Box



Liquid Level Probe



Vent Heater (Optional)



**Liquid Level
Probe Cable**



**Pressure Transducer
& Cable**



**Supply Valve
Cable & Solenoid**



**Gas Vent Valve
Cable & Solenoid**

Installation and Setup

⚠ Caution - Inadequate support of the PS-22/42 or failure to follow installation instructions may result in bodily injury. Be sure that the unit is mounted securely and that the support structure is rated appropriately for the weight of the unit, including liquid content. Refer to the specifications section for PS weights.

⚠ Caution - Technifab recommends that a vacuum jacketed vent line be used to carry the excess gas away from the system. The outlet of the vent line should not be in a location where it could injure people or damage anything should cold cryogenics be expelled.

The PS-22 and PS-42 phase separators are shipped with the modular and vent valves removed to allow easier vessel handling and mounting. Every phase separator is fully assembled and tested prior to shipment.

Technifab recommends you install the Liquid Level Probe first, mount the pressure vessel, then the valves and cables before connecting the phase separator into your system.

Liquid Level Probe Installation

Install the Liquid Level Probe thru the fitting at the top of the vessel. Use Teflon thread seal tape to assure sealing of threaded connection and tighten. Be careful not to damage the probe during installation. Mount the bracket that holds the Junction Box where the probe is threaded into the top of the PS-22/42.

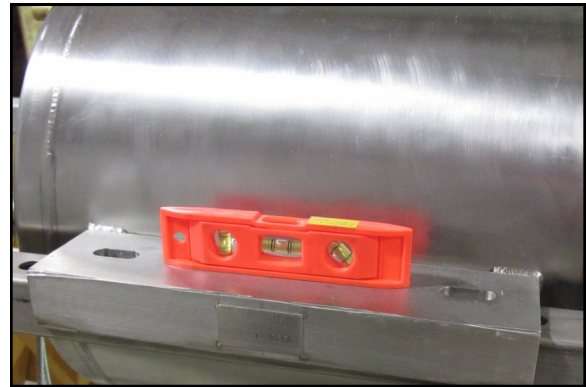
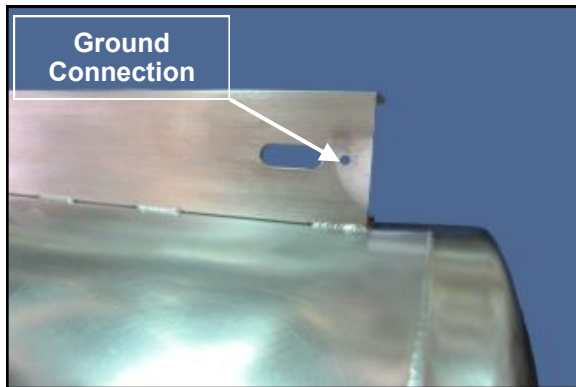


If not already installed, install the Liquid Level Probe cable from the bottom of the Liquid Level Probe to the probe connector on the Junction Box connected to the main vessel.

Installation and Setup (continued)

Vessel Mounting

1. The phase separator must be installed in a level orientation. Use a builder's level to set the orientation. Inclination of the unit more than three (3) degrees from horizontal will result in diminished performance.
2. The side mount channel brackets allow the unit to rest securely on top of standard support channel or be suspended from overhead structures using four, 1/2" (13 mm) or 3/8" (10 mm) diameter threaded rod.
3. Ground the phase separator to the nearest earth ground via the threaded connection on the mounting arm.



Modular Valves

Once the vessel is anchored, begin adding the modular components into the system. Other modular components may be added to the PS-22/42 between the modular valves and the vessel. Consult your piping design and layout for configuration.

Modular Inlet Supply Valve

1. Locate the o-ring on the male bayonet on the Inlet Modular Valve. Lightly grease the o-ring with vacuum grease and place it on the flange of the male bayonet on valve.

Installation and Setup (continued)

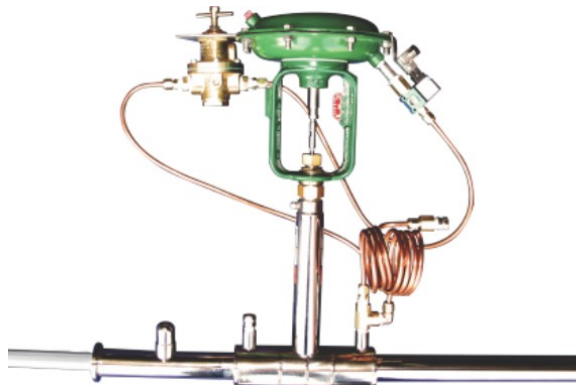


2. Install the Inlet Modular Valve (item 2 on the Phase Separator Layout Diagram) into the female bayonet on the vessel. Align the valve stem vertically and attach using supplied bayonet clamp. Tighten the wing nut clamp by hand.

Note: If the phase separator inlet transfer hose or pipe is installed before the gas vent valve, check that the inlet filter in the transfer hose that connects to the Inlet Modular Valve is installed. It will be threaded into the tip of the male bayonet. This is covered in the Installing the Inlet/Outlet Connections section.

Modular Gas Vent Valve (*only used with back pressure model phase separators*)

1. Locate the o-ring on the male bayonet for the Gas Vent Valve (item 4 on the Phase Separator Layout Diagram) on the main vessel. Lightly grease the o-ring with any standard vacuum grease (such as Technifab part number 3906) and place it on the flange of the male bayonet on the bayonet.
2. Install the gas vent modular valve onto the male bayonet on the main pressure vessel inlet side. Align the valve stem vertically and attach using supplied bayonet clamp. Tighten the clamp to 180 in/lbs (20 N/m).



Installation and Setup (continued)

Valve Actuator Connections

Phase Separators use air-actuated valves for controlling the inlet liquid flow and the main vessel pressure. Guidelines for using shop air (vs. process air) are available from Technifab, refer to document LT-35569.

Note: It is recommended to supply pressure to the actuators through filtered plant air. When plant air is not available process gas may be used but icing and dripping may occur on the fittings and copper lines.

1. Install the valve solenoids and cables to the valve actuators. Use Teflon thread tape on the pressure fittings to assure sealing of threaded connection.
2. Connect the shop air or copper tubing to the valve solenoids that supply pressure to the valve actuators. Referring to the Phase Separator Layout Diagram may help you with the connections. Inlet air goes through a pressure regulator before going to a tee that sends the air to the Inlet Modular Valve solenoid and the Gas Vent Modular Valve solenoid (if used). If you are using process air, the copper tubes may be pre-formed at the factory to make installation easier.

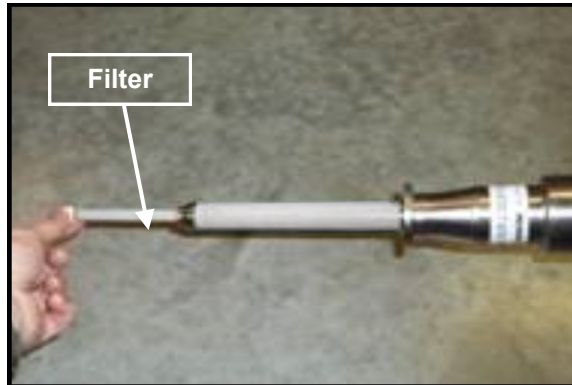


Install Inlet/Outlet Liquid & Gas Connections

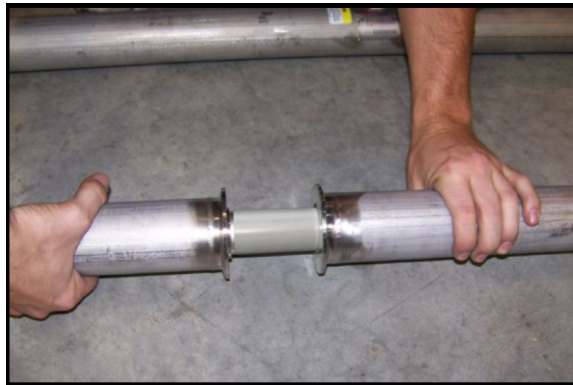
Connect the Phase Separator inlet connection.

1. Be sure to check that the filter is installed in the male bayonet of the transfer hose going to the Supply Modular Valve. It is threaded into the tip of the male bayonet.

Installation and Setup (continued)



2. Locate the male bayonet o-ring for the inlet line. Lightly grease the o-ring with any standard vacuum silicone grease and place it on the flange of the transfer hose male bayonet.
3. Gently push the bayonets together (a small twisting motion may help) until the flanges meet. Install the bayonet clamp and tighten clamp wing nut by hand until tight.



Connect the Phase Separator gas vent outlet

The gas vent outlet should be routed to a safe location away from the phase separator.



Caution - Technifab Products Inc. recommends routing the discharge lines from pressure relief devices and gas vents to a safe place of discharge. The outlet of the discharge line should not be in a location where it could injure people or damage anything should cryogenics be expelled.

Some installations may use a Vent Heater (see the Phase Separator Layout Diagram) so that any liquid if expelled will be changed to a gas. A Vent Heater, if used, has several possible locations:

Installation and Setup (continued)

- A. Directly on the phase separator vessel (the gravity feed option only).
- B. On the end of the vacuum jacketed line attached to the phase separator vent (gravity feed option only).
- C. On the end of the modular gas vent valve for back-pressure units.
- D. On the end of the vacuum jacketed line attached to the modular gas vent valve for back pressure units.

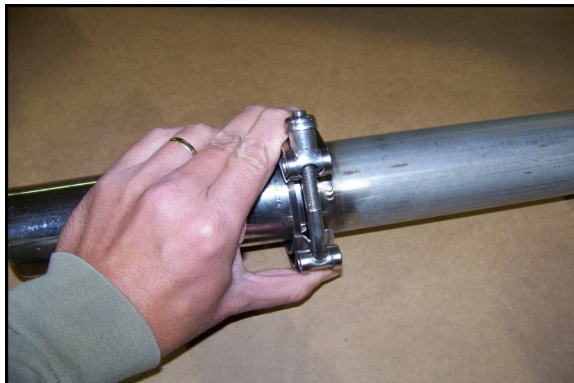
The Vent Heater will have a female bayonet connection, so installation is similar to the modular valves.

- 1. Locate the male bayonet o-ring that the Vent Heater is connected to and lubricate the male bayonet o-ring with standard vacuum silicone grease. Place the o-ring on the male bayonet, being careful not to get grease on the bayonet.
- 2. Align the Vent Heater so the junction box is pointing up $\pm 90^\circ$. **Never install with the junction box below the Vent Heater housing.** Gently push the bayonets together (a small twisting motion may help) until the flanges meet. Install the band clamp and tighten the clamp to 180 in/lbs (20 N/m).

Connect the Phase Separator liquid outlet

The Phase Separator outlet can be located on the bottom or end of the unit.

- 1. Lubricate the male bayonet o-ring with standard vacuum silicone grease and place it on the flange of bayonet (see previous photos).
- 2. Align the system bayonet with the Phase Separator male bayonet outlet. Gently push the bayonets together (a small twisting motion may help) until the flanges meet. Install the band clamp and tighten the clamp to 180 in/lbs (20 N/m).



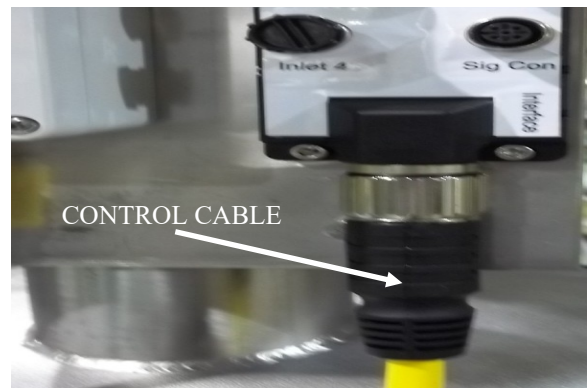
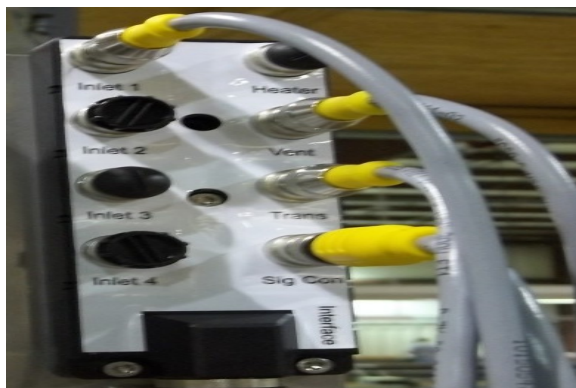
Installation and Setup (continued)

Cables

1. Locate all cable sets supplied with the PS-22/42 as shown on page 4.
2. The liquid level probe cable should have already been installed, if not, install the liquid level probe cable from the liquid level probe connector to the labeled fitting on the Junction Box.
3. If not already installed, install the pressure transducer to the fitting between the safety relief valves and connect the cable to the Pressure Transducer position on the Junction Box.



4. Connect the inlet and gas vent valve cables to the labeled locations on the Junction Box.



5. Install the yellow Control Cable to the bottom of the Junction Box.

Installation and Setup (continued)

Control Box

Note: The control box must be installed in a environment where the ambient temperature ranges from 32°F—120°F (0°C—49°C) as listed in the Specifications section. The control box can be easily mounted to structural channel along a wall. Do not use supplied brackets if the control box is mounted separate from the vessel.

The control box must be mounted on a rigid mount using the holes in the enclosure. The mount should be free from vibration and excessive temperatures. Mount the control box approximately eye level in height.

Note: The standard cables supplied with the system will allow the PS-67 to be mounted up to 32' (10 m) from the control box. Some applications may require custom cable extensions to be installed.

1. Mount the box to structural channel or to another rigid mount using the two holes at the top and two holes at the bottom of the enclosure. The mount should be free from vibration and excessive temperatures. Mount the control box approximately eye level in height.
2. Attach the control cable to the bottom side of the control box. An optional alarm connection is also available. The connections on the bottom of the control box will be labeled.

3. This control box is equipped with a single fuse on the phase conductor. As such, this control box is fused in accordance with most regulations for building wiring and permanently-connected equipment. Using a plug-and-socket with this control box is not allowable and could result in injury or death should a fault condition occur. Please consult your region's applicable wiring codes for additional information and guidance regarding permissible wiring of this control box.



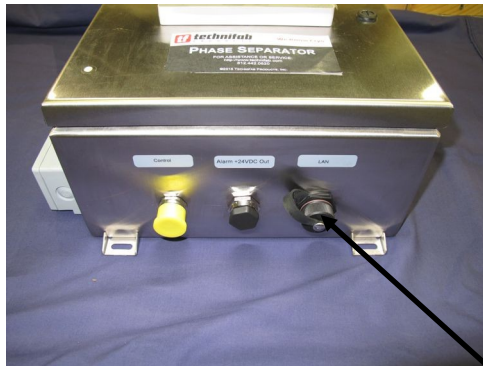
Installation and Setup (continued)

Optional Connections

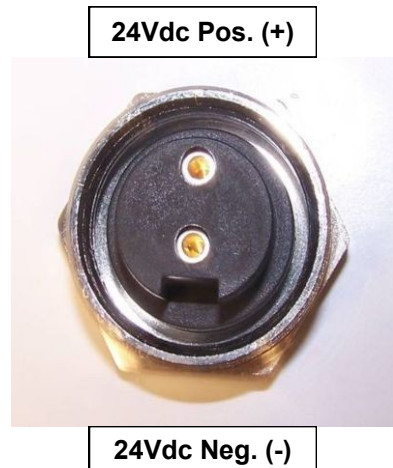
The Phase Separator can trigger an external device such as an auto dialer or alarm. This connector (middle connector) requires a 2-pole plug available from Technifab. The Phase Separator sends a 24 volt DC signal when the unit goes into an alarm condition. See the Owner's Manual for more information on the alarms.

On the far right of the bottom of the control box is an Ethernet port, for using this connection please consult with a Technifab sales or service representative.

The pin closest to the notch in the connector is the ground and the positive terminal is furthest away (see photo).



Ethernet Connection



System Startup

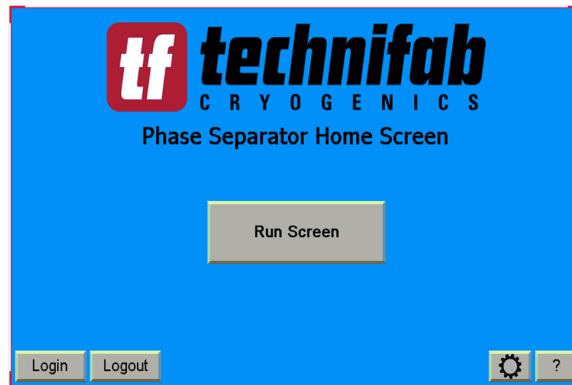
Interaction with the phase separator is carried out via a touch screen known as the Human Machine Interface (HMI) on the front panel of the Control Box. The Programmable Logic Controller (PLC) controls the liquid level, monitors pressure inside the vessel and adjusts the system as needed. At startup, the vessel and all associated piping will be at ambient temperatures.



Caution - Rapid introduction of liquid nitrogen into a warm pipe system will result in the rapid expansion and flash boiling of the liquid which could cause harm to the system components.

Note: This procedure is also covered in the Phase Separator Owner's Manual (LT-46490).

1. Plug the control box into the power source (refer to the Owner's Manual for power requirements).
2. Wait for the 'Home' screen to appear on the control panel as shown.



Note: PS-22/42 units leave the factory with a preset liquid level in the controller software. If you want to change or readjust the level setting, refer to the Owner's Manual, LT-46490.

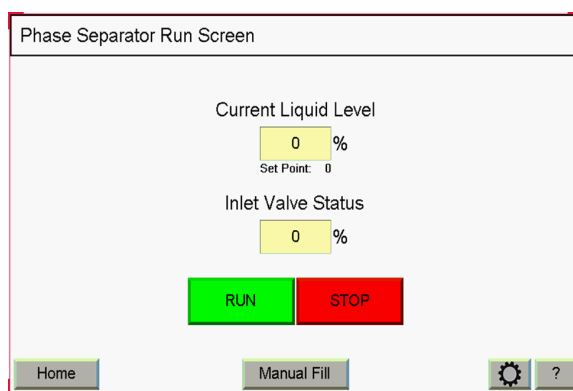
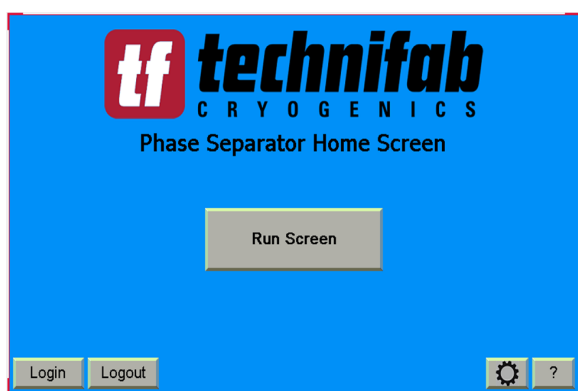
3. A red blinking light on the liquid level probe indicates the probe is functioning.

Note: If any error messages are displayed upon startup, contact Technifab for assistance.

4. Introduce liquid nitrogen to the PS-22/42 by turning on the supply. Open the manual supply valve 1/2 turn to allow low liquid nitrogen flow to the vessel, this will allow the system to cool.

System Startup (continued)

5. Press the *Run* button.
6. When cold gas starts to vent from the PS-22/42, the system supply valve can be fully opened.
7. The *Current Liquid Level* value will start climbing once liquid nitrogen enters the vessel. The gauge should approximately reach its high set point and shut off. If the unit does not shut off press the *Stop* switch and contact Technifab Products Inc. for assistance.



Refer to the Owners Manual (LT-46490) for complete operation of the PS-22/42 system.

Troubleshooting

Problem	Action
System will not power up. Screen is dark.	• Verify there is power supplied to the control box. • Unplug/reset the power to the control box.
Liquid is coming out of the Vent.	• Inspect inlet valve for leaking past the valve seat seal. • The liquid level probe may need recalibration. Contact Technifab Products for more details.
System has slow fill / no fill.	• Check liquid nitrogen supply to the phase separator to assure there is line pressure • Check supply line pressure to the phase separator. Low inlet pressure can cause slow fill. • Drain system and carrier piping and check all filters installed prior to inlet modular valve for blockage. • The pressure differential between the phase separator's inlet and outlet could be insufficient. Increase the pressure differential by increasing the inlet pressure or lowering the outlet pressure.
Error message shown on bottom of display during startup.	• Press the "X" to hide this message until the analog signals have reached the minimum acceptable values.

****Abide by all Lock out / Tag-out procedures when performing maintenance or troubleshooting the liquid nitrogen system.**

If the problem continues contact Technifab Products, Inc for further assistance.

Support Information

Crane Cryogenics actively and constantly seeks to improve its products. Customer feedback is one essential element of this process. Should any issue arise regarding this product's performance, please immediately notify:

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