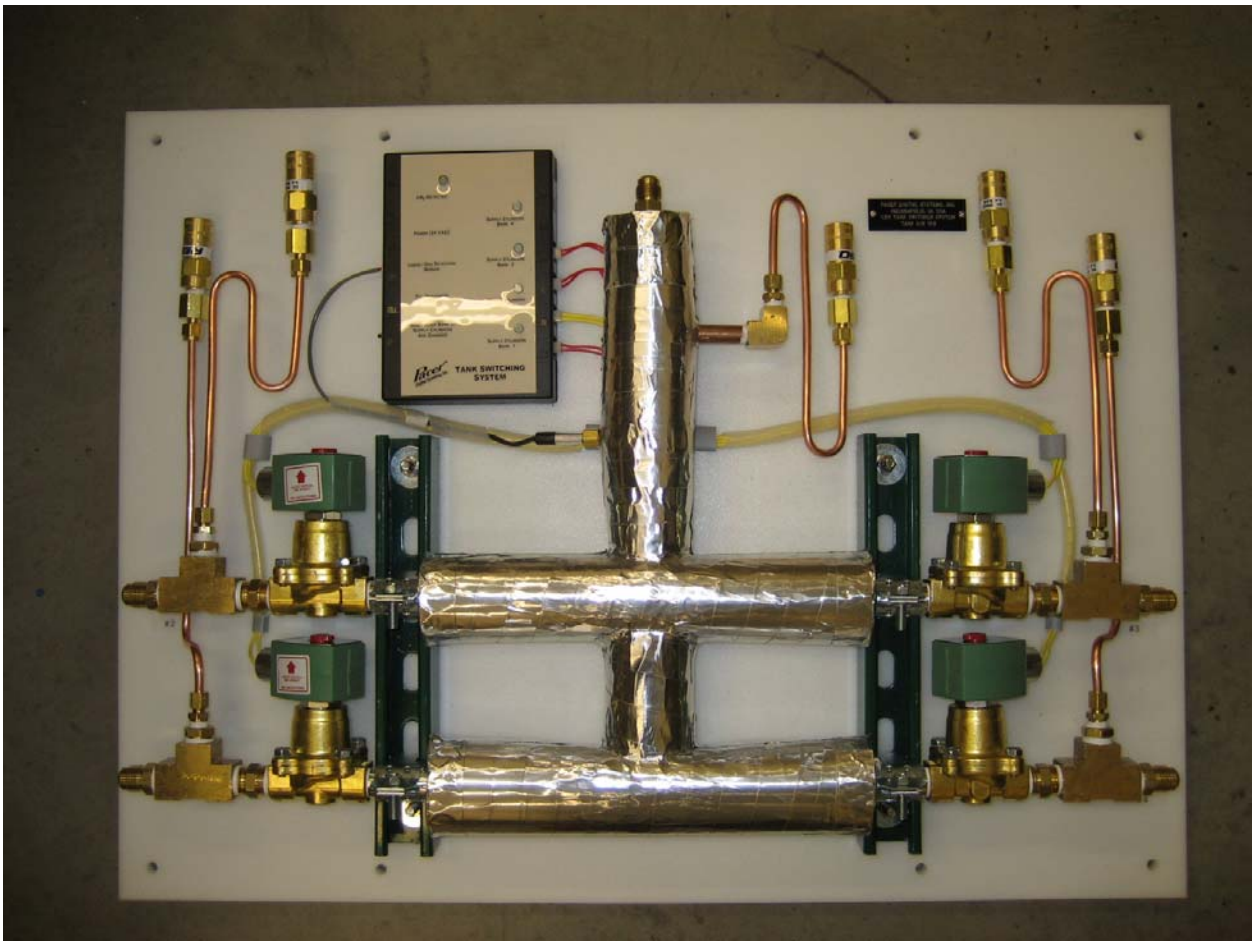
Operating Instructions
for
Standard Tank Switching System



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Safety:

Please use proper handling procedures when working with Liquid Nitrogen. It is an extremely cold refrigerant and can cause serious injury. Also, the liquefied gas can cause asphyxiation in a confined area so be sure that all confined areas have adequate ventilation. For detailed information on the handling of cryogenic liquids, refer to the publication: P12 “Safe Handling of Cryogenic Liquids” available from the Compressed Gas Association Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202.

Introduction:

The Pacer Tank Switching System has been designed for use with Taylor-Wharton freezers and a Pacer Fill Sequencer. When a freezer calls for a fill, it notifies the Fill Sequencer which then tells the tank switcher to open a valve to let LN2 start flowing through the system. The tank switcher then monitors the flow of LN_2 through the use of a thermistor (thermal resistor). When the thermistor detects that LN_2 is no longer flowing, the tank switcher switches to an alternate supply.

Hardware Requirements:

- 25.2 VAC, 2.5 amp Wall Transformer
- TSH Tank Switching System box.
- Manifold piping containing Liquid/Gas detector and supply solenoid valves
- Wiring connections:
  - Cable from Fill Sequencer to port (#11) on Tank Switching System box.
  - Cable from Liquid/Gas sensor to port (#10) on Tank Switching System box.
  - Connection to Remote Alarm Connector. (See “Diagram of TSH Tank Switching System)”
  - Cables from solenoid valves to ports (#1) and (#2) on Tank Switching System box. (optionally, ports #3 through #8 can be used to control more solenoid valves)

Installation:

The tank switcher is shipped attached to a piece of HDPE board suitable for mounting directly to a wall. The components are all connected so it can simply be plugged in and it is operational.

Operation:

This microcontroller driven system monitors the presence or absence of liquid nitrogen in the manifold. Each supply tank connects to the manifold through a 24 VAC solenoid valve. A feature of the system is that a supply tank’s solenoid valve is energized only when liquid needs to be delivered to the freezers. The tank switching system monitors the signal from the fill sequencer and turns on and off when instructed. It also monitors the flow of LN2 in the manifold to confirm either the viability of the supply, or that a switchover to another supply tank is needed.

Visual Status Indicator:

The Tank Switching System provides an indication of which tank is in service by keeping lit, a green LED located alongside the connectors to the valves. When a tank is empty, the green LED goes into a flashing mode.

The system also provides an indication when the Liquid/Gas sensor is detecting LN_2 in the manifold. A green LED is located at port #8 and is lit when the LN_2 is detected.

Resetting the Tank Switcher:

The Tank Switching System can be reset when new supply cylinders are connected into the manifold. Pressing the Reset button at port #12 will extinguish each green LED associated with a supply cylinder and will mute the audible tone. In addition, the remote alarm relay will be reset.

Alarm Conditions:

An alarm will occur when the Tank Switching System detects that all supply cylinders are empty. An alarm causes an audible tone to sound and the remote alarm relay to trigger. All green LED's that indicate supply cylinder status will be flashing.

A loss of power will cause the remote alarm relay to trigger. This will be detected if the remote alarm is connected into a building alarm system, a buzzer or a light.

Turning off the Audible Tone:

The audible alarm can be enabled or disabled on the Tank Switching System at startup. Remove power from the switcher box. While holding down the reset button, restore power. If the beeper sounds once then the audible alarm is enabled and if the beeper sounds twice then the audible alarm in disabled. To change this setting, repeat the process.

Manual Switch of Supply Cylinders:

Supply cylinders can be switched manually by pressing the Reset button at port #12 when no alarms are indicated. (No green flashing LED's). Pressing the button will cause the next supply cylinder in line to become the "active" supply. If an alarm is indicated, the first press of the reset button clears the alarm and subsequent button presses will switch between the different supply cylinders.

Troubleshooting:

No lights on the tank switcher box and solenoid valves will not open

- Check the power. The wall transformer (24 VAC) should be plugged into the wall and the other end should be plugged into port #9 of the tank switcher box.

Never switches between supply cylinders.

- Damaged Liquid/Gas Sensor. An open circuit on the sensor will cause this problem. Replace the sensor.

Frequently Asked Questions:

Q: How many supply cylinders will the Tank Switching System manage?
A. Two to eight

Q. Does the Tank Switching System need UL approval?
A: No. Because the Tank Switching System runs on low voltage (24 VAC) no UL approval is required.

Q: Is the Tank Switching System hard to install?
A: No. Because it has been developed from state of the art components, the Tank Switching System is light and housed in a small telephone box, which can easily be mounted on the wall. Also, the system comes pre-mounted on a HDPE board that can be hung on the wall.

Q: What if I have special requirements?
A: Because the Tank Switching System is microcontroller based it allows for flexible reconfiguration of hardware and software to meet a variety of special requirements.

Specifications:

Power Source:

- 115 VAC/24 VAC wall transformer, plugs into standard electrical outlet

Control System Compatibility:

- Works with Taylor-Wharton Kryos Control system and a Pacer Fill Sequencer

Alarms:

- When all supply cylinders are empty
- Whenever a power outage occurs (Remote Alarm relay output must be wired)

Liquid/Gas Detection:

- Thermistor

Dimensions:

- Tank Switcher Box 5” wide x 7 3/8” deep x 5/8” high
- HDPE board with all components mounted 21” x 24”

Weight:

- Tank Switcher box Less than 1 lb.
- HDPE with all components mounted – 2 valves 32 lbs

Maximum Number of Valves to Control:

- 2 Valves up to 8

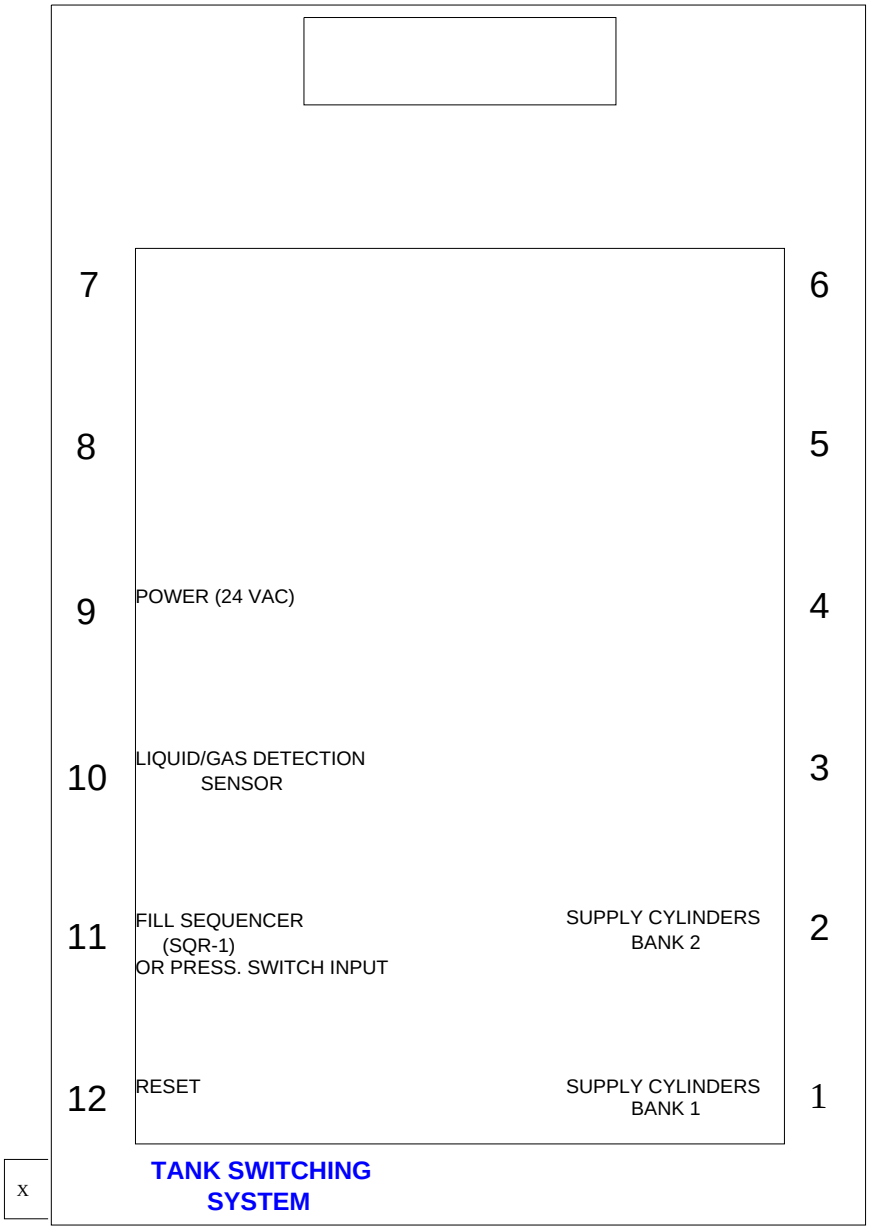
Start/Shutoff Solenoid Valves:

- Automatic

Spare Parts:

Part Number	Description
SVH1	24 VAC Cryogenic Solenoid Valve, ½ ” NPTF
5140-1161	Liquid/Gas Sensor for LN_2
TSWT	25.2 VAC, 2.5 amp transformer
49315K61	Relief Valve, Low Temperature, ¼” NPTM, 50psig
CVH	½ “ Check Valve

Diagram of TSH Tank Switching System



X is remote alarm output.
In alarm condition, pins #1 and #2 are connected.
In non-alarm condition, pins #2 and #3 are connected.

Warranty

Pacer Digital Systems, Inc.

Pacer Digital Systems, Inc. warrants that each of its electronic control products will be free from defects in material and workmanship, in the normal service for which the product was designed and manufactured, for a period of two years from the date of purchase. Pacer Digital Systems, Inc. at its option will either repair or replace any item covered under this warranty.

This warranty is void if the product is used for any other purpose than that for which it was designed, including but not limited to connection with third party systems. This warranty is also void if the product is in any way altered or repaired by others. Pacer Digital Systems, Inc. shall not be liable under this warranty, or otherwise, for defects caused by negligence, abuse or misuse of this product, corrosion, fire or the effects of normal wear.

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