To: John Effland
From: Clay Sheaff
Date: 2002-08-13
Subject: JT-2 Vacuum Pump Remote Control Device

The following summarizes the software written and the hardware constructed for the vacuum pump control device. This turns on and off remotely the Pfeiffer TSH 064D vacuum pump that is installed on the JT-2 Dewar test system. Two of these Remote Vacuum Pump Controllers were constructed, but this device was made specifically for the TSH 064D. The JT-1 measurement system uses a different model vacuum pump and a separate memo describes how to control that device remotely.

Summary

The Remote Vacuum Pump Controller consists of the following components:

(2) Potter and Brumsfield Solid State Relay
Model Number: SSR-240D25
Vendor: Newark Electronics
Price: $29.74 each

(1) Acopian AC to DC Power Module
Model Number: 15E10
Vendor: Acopian
Price: $49.00 each

The Remote Vacuum Pump Controller functions as a secondary power switch for the vacuum pump. Each of the two positions (labeled b1 and b3 on the schematic) of the manual front panel switch on the TSH 064D connect to the “contacts” side of a solid state relay inside the Remote Vacuum Pump Controller. The return path for the AC current is shared between the two relays, which connects to pin a1. The 15V power supply module in the Remote Vacuum Pump Controller obtains its AC power from contacts in the shell of the power cord of the pumping control unit. The 15V power supply module output is routed through the common terminal of relay 1 contained in the chassis of the Lakeshore 218 temperature monitor. Each Lakeshore relay consists of 3 pins. Pin 1 is the normally closed terminal, pin 2 is the common terminal, and pin 3 is the normally open terminal. The NC and NO terminals of the Lakeshore relay are connected to the control pins of solid state relay inside the Remote Vacuum Pump Controller. The Lakeshore relay routes the 15V control voltage to one of the solid state relays inside the Remove Vacuum Pump Controller and hence controls the power to the pumping station. The Lakeshore relay can be remotely controlled through the National Instruments General Purpose Interface Bus (or IEEE-488) interface system. Neither the manual switch nor the remotely controlled switch has any priority over the other so either switch can override the other. This means that the vacuum pump can be turned on and off independently of the remote switch, but it also means that the remote switch can control the vacuum pump without the operator’s knowledge. There are no facilities to provide a hardware override of the Remote Vacuum Pump Controller.

A Visual Basic for Applications computer program was written to test the remote control of the Lakeshore relay. The file name is \eagle\cv-cdl-sis\CSheaff\Lakeshore.xls, and the module that contains the program is named RelaySwitch. The program continually checks the temperature read by a sensor and toggles the position of a Lakeshore relay once a particular temperature has been reached. This effectively allows one to shut off the vacuum pump without having to be present when a temperature inside the Dewar falls below a certain threshold and cryo-pumping becomes effective. The user specifies within the module the number of the sensor to be monitored, the temperature threshold for vacuum pump shutoff, and the number of the Lakeshore relay (there are 8).

The following page displays the schematic of the circuit along with the device’s pin description.