FEE LVPS

1. INTRODUCTION

This section describes the Low Voltage Power Supplies (LVPS) for the TPC FEEs and RDOs. Plans currently call for all of the old TPC electronics to be replaced during the summer of 2008, but the controls and interlocks for the LVPS will remain the same. So this chapter will just cover the hardware that will be carried over to the DAQ1000 electronics, but not the old FEEs and RDOs.

2. HARDWARE INSTALLATION

The LVPS are installed on the second floor platform (Racks 2B 1-4 and 2B6-9. There are 6 LVPS chassis per rack, plus a cooling blower at the bottom of the rack. In addition, there is an interface and interlock panel at the top of each rack. The VME control crate is in Rack 2B5. Each LVPS chassis has three commercial linear power supplies inside and each power supply powers 1 RDO and its FEEs. Since there are 6 RDOs per supersector (inner and outer) there are 2 chassis per supersector. The output cable for each supply connects at the back of the chassis with a latched connector. The cables then are routed to the east/west TPC face via the cable trays.

The air cooling for the LVPS chassis is supplied by the common blower at the bottom of the rack. This consists of a chassis with a squirrel cage blower inside. The cooling air exits the back of the blower chassis and is ported to each power supply chassis using flexible dryer hose. The blower is mounted with a filter and heat exchanger below the chassis - the air is pulled from below. The LVPS are interlocked so they shut off in case the blower stops – see below for the interlock scheme.

On the front of each chassis are the LED indicators and a 3 way selector switch for each LVPS. A common blue LED is lit if the interlocks for the LVPS are enabled. A green LED is lit if the supply is on. A yellow LED is lit if the PS is in remote mode. The three way switch (VERY fragile!) selects between local off, local on or remote (ie slow controls operation). We have added some plexiglas covers to the front of each chassis because people kept inadvertently backing into the supplies and switching them to local.

In addition to the main TPC supplies there are 4 more LVPS chassis mounted on the first floor platform (Rack Row 1B). These are for the MWPC FEEs and RDOs that terminate the anode wires. These will be removed for the DAQ1000 installation and the LVPS will become spares.

3. VME INSTALLATION

The VME crate that controls the LVPS is mounted in Rack 2B5 – see picture:

Some of the LVPS are also visible to the right of the crate. The crate is canbus #58 and has two VME processors: one for the control of the LVPS (scserv port 9004) and one for the HDLC readout of the RDOs (scserv port 9015). The LVPS are controlled by the processor through VME digital I/O boards (Model # AVME948x). These I/O modules are seen in the right hand slots of the crate with the ribbon cables plugged in. The I/O signals are used to send an “ON” signal to each PS, and to readback the status of the PS (ON or OFF). There is also a signal that tests the status of the interlock for each rack (see the section on the GUI.)

The other processor in the crate (port 9015) was supposed to be use for the HDLC readout of the RDOs through the Radstone boards seen in the left hand slots of the crate. This setup has not been used after the system was installed at BNL. The new DAQ1000 electronics will not use this HDLC readout, so the Radstone boards can be removed from this crate and used as spares for other subsystems. Note, however, that the processor 9015 is also used to readout the platform hygrometer and the TPC gas system parameters, so the processor will have to stay in the crate.

Above the VME crate, and barely visible in the picture, is the water interlock fanout panel. This takes the TPC cooling water skid signal from the TPC AB interlock system in rack 2A8) and fans it out to the interlock crossconnect panels in each rack.

4. INTERLOCKS

There are two interlock signals that are used uniquely by the LVPS system – TPC cooling water and a blower OK signal from the blower at the bottom of each rack. Any other global interlock signals (water leaks in the rack, smoke in the rack or on the detector etc) will kill the AC power to all of Rack Row 2B.

TPC cooling water skid – the skid is located in the second floor power supply room at STAR. The TPC interlock system measures five digital flowmeters installed in various places in this system. If these flow rates drop below a certain level, or if the STAR global interlock system detects a leak, the TPC interlock system will drive the supply and return valves closed and the skid will shutdown. A signal is also sent to the water interlock fanout panel mounted at the top of Rack 2B5. From this panel, the permissive is sent to each of the crossconnect panels at the top of the LVPS racks (including the MWPC LVPS in row 1B.

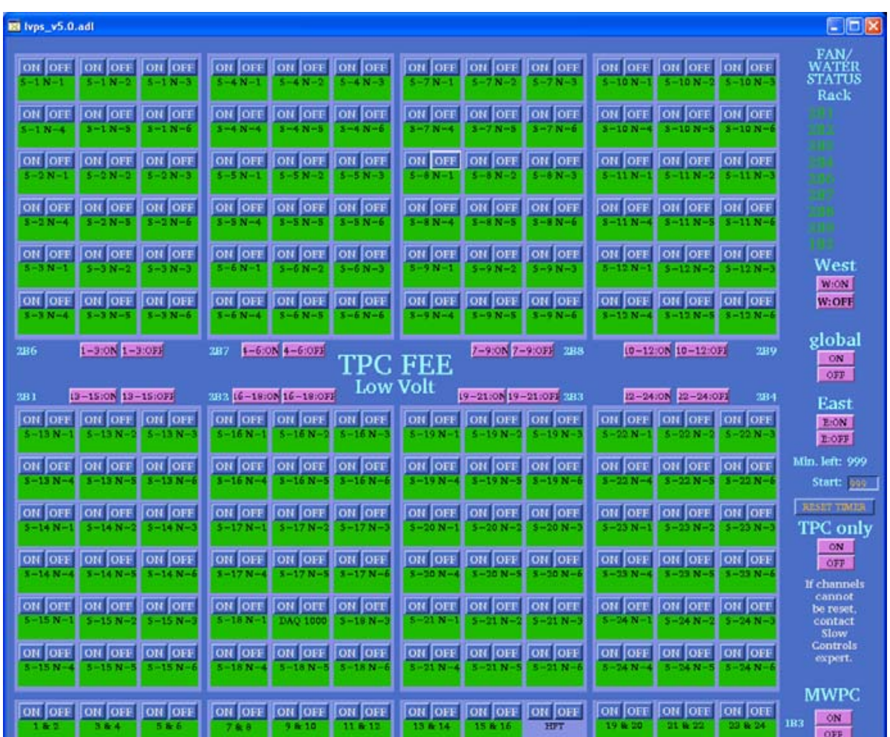
Blower permissive – each blower chassis contains a pressure switch inside. The switch compares the pressure between atmospheric pressure (measured via a small plastic tube that connects to a small port on the back panel) and the pressure in the box generated by the blower. A voltage level is sent to each blower chassis via an isolated RG58 cable - a ground isolated BNC connector is mounted on the back panel of the blower. This level goes through the pressure switch and back to the crossconnect panel which enables each of the LVPS in that rack. If the blower stops, the pressure switch will measure 0 differential pressure and the permissive will drop, turning off all LVPS in that rack.

Dan Padrazo and his group have the schematics for this system and will maintain it. He has spare blowers and pressure switches and one spare crossconnect board. All of the blowers were replaced during the summer of 2006, except for one, which failed in Run 8 and was replaced during an access. Various failures of this system occurred over the years and are documented in my notebooks. Most failures can be avoided by replacing the blowers every 3-4 years.

5. GUI

The GUI for controlling the LVPS is shown below:

LVPS OFF



LVPS ON

As seen on the GUI there are various buttons for turning on the LVPS. The usual way is to click on the “Global On” button. The program then turns on each LVPS in turn, and the display turns green. You can also just turn on the east or west LVPS, each rack, or individual supplies. Note that the LVPS for the MWPC FEEs are shown across the bottom of the GUI – these supplies will not be used for DAQ1000, so a slow controls expert can remove these from the GUI.

The status of the crossconnect interlock panel is shown in the upper right of the GUI for each rack. If the blower or water interlocks are not valid the display for that rack will turn red and the supplies can not be turned on. (If the water skid is off all the racks’ status should be red.)

There is also a timer on the GUI that will turn all the LVPS off after a specified number of minutes – I usually used this for Tonko, who always forgot to turn the LVPS off when he worked late.

Note that after the slow controls sends the command to turn on the LVPS it checks a status bit to make sure the supply actually turned on. If you turn a supply on and it displays “DB Check” instead of turning green, this indicates a problem with the supply.

6. CHANGES FOR DAQ1000

During the summer of 2007 all of the old electronics for the TPC is scheduled to be replaced by the DAQ1000 electronics. Some of the LVPS system will be incorporated into this new setup. Specifically:

1. The LVPS chassis and controls will be the same – the actual power supplies inside (3 “bricks”) will be replaced.

2. The power cable from the chassis to the TPC face will be the same – a short adapter will be used to connect from the old cable end to the new RDO.

3. The old clock and trigger cable will be reused.

4. The HDLC readout will be discarded

5. The MWPC FEEs and RDOs will be removed and passive grounding cards will be used to terminate the anode wires (16 cards per supersector).

6. The interlock system will be the same.

7. The FEE and RDO cooling manifolds and TPC water skid will be reused.

8. New dual optical fibers for the RDOs will have to be run to the DAQ room.

7. PROBLEMS & TROUBLESHOOTING

The LVPS system has been stable over the years. I recall having to replace only one LVPS. The biggest problems have been with the blowers, which seem to have a ~ 3 year lifetime. The usual failure mode is for the bearings to get worn and the blower turns slower and slower and then seizes. All of the blowers were replaced in summer of 2006. Dan Padrazo has spare blowers and pressure switches.

Recently, one of the new LVPS for the DAQ1000 electronics installed this year developed a problem – in trying to turn the supply on using the GUI the supply turned green, but then turned back off, tried to turn on, turned off etc. It was then switched off. A few hours later, it was turned on again with no problem. Bob Scheetz investigated and finally replaced that supply and sent it back to the factory. It’s currently unclear what the problem was.

For past blower problems, see my notebook.