Linac Upgrade Vacuum Interface to the Control System

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A vacuum system interface to the Linac Upgrade control system is proposed in the attached series of sketches. Two chassis are documented here; a *Vacuum Pump Interface* chassis and *Vacuum Valve Control* chassis. The figures assume the use of the PBar 250 ma pump power supply (Dwg# 8000-ED-170121) designed by Leon Bartelson. This supply is adequate to power two of the vacuum pumps that will be used for the Upgrade Two pump power supplies will be needed to operate the four vacuum pumps attached to each of the seven modules. Additional supplies are required for the transition section. Safe operation of the gate valves between modules requires the valves to be interlocked to the vacuum upstream and downstream from a given valve. The condition used in this proposal requires that at least one of the pump power supplies upstream and downstream from a valve must be *ON* before that gate valve will open. Similarly, the valve will close if both supplies for a section go to *OFF*.

Vacuum Pump Power Supply Interface The vacuum pumps are controlled either manually, using the front panel switches on the pump power supplies, or remotely via control bits supplied by a Smart Rack Monitor (SRM). The interface shown in the attached drawings allows remote control of eight power supplies, the number that conveniently fit in a single relay rack. Two racks and two interface chassis should operate all the supplies needed for the upgrade. Analog and digital connections from eight pumps are redistributed from P0-P7 into connectors that mate with the 37-pin "D" I/O connectors on the SRM chassis. ON, OFF and ENABLE command bits are provided for each power supply from two 16-bit digital connectors P8 and P9, and the pump ON and ENABLED status are connected to a 16-bit digital connector P10. Eight 8-contact Burndy connectors P0-P7 on the interface chassis mate with the control connector on the pump supplies. Each pump Log/Lin analog signal, also included in the pump power supply connector, is output to the SRM on connector P11. The *Pump Status Out* connector P12 will be cabled to the valve controller chassis described below.

The high level RF systems need an indication that the vacuum in a given cavity is good enough to allow that module to be powered. Developing such a signal requires an analog discriminator to compare the Log/Lin pump signal to a potentiometer reference. The enable condition is satisfied if one of the two pumps in a given module is ON with its Log/Lin signal higher than the associated reference set point. Both conditions are necessary because the Log/Lin signal goes to a high value when the pump is turned off or unplugged. A high active TTL level signal will be generated to send to the RF system. Four RF Enable signals are output from each Vacuum Pump Interface Chassis on connectors P13, P14, P15, and P16.

Vacuum Valve Control Chassis The control of the vacuum valves requires a powered chassis that connects to each of up to eight valves using 6-pin Burndy connectors P0-P7 and to a Smart Rack Monitor through 37-pin "D" connectors P11, P12 and P13. Connectors P14 and P15 contain the ON status of 16 vacuum pumps. Additional connectors are provided for *Upstream Status Input*, *Downstream Status Output*, and *Valves-Open Status Output*. For each valve, logic in the controller chassis examines the upstream and downstream status to determine if a valve is *READY* to open. A valve that is *READY* can be latched open either by a local pushbutton or by remote computer command. The valve is latched closed by local pushbutton or remote computer command, or by the upstream or downstream pumps going off. One pump in a module is all that is required to maintain a valve open. The OPEN, CLOSE valve microswitch status is displayed on front panel LEDs and sent to the RM on connector P12. READY status, UPSTREAM and DOWNSTREAM status is also displayed and sent to the SRM on connector P13. When all the valves are open, an isolated set of contacts is activated to indicate that the Linac is ready for beam. The valve interface connectors P0-P7 contain AC power to operate the valve and the open and closed microswitch contacts from the valve. Pinouts for all the Valve Controller connectors are included.