Instructions and FAQ's regarding the Longitudinal Feedback Systems

The longitudinal feedback systems consist of several hierarchical layers of programmable hardware and software. The top layer is an EPICS GUI, which allows control of all aspects of the systems. The next layer is the IOC layer - each system contains 5 independent computers (packaged in VME or VXI format) that communicate with the EPICS GUI, and run the VxWorks operating system. Each IOC controls the modules in its' crate, and maintains communications between the high speed hardware (the actual feedback hardware, many error counters and diagnostics) and the EPICS GUI. The actual feedback computation is performed in a 80 processor array of 16 bit integer signal processors, in conjunction with the 250/500 MHz front end and back end hardware.

All of these elements are programmable, and in starting and operating the systems various programs and configurations are loaded from a file server. Various diagnostic programs can unload information from the system and put the diagnostic files on the file system.

The Low Group Delay Woofer uses the same front-end signals as the broadband feedback, but sends it's output signal to the RF systems via a fiber optic link.

When Should I push REBOOT on the LFB EPICS panel?

Reboot is very invasive - it reloads and restarts the 5 IOC processors, restarts error logs, etc. It is necessary if the VxWorks processors have crashed. This is very rare - if the power is interrupted the processors will restart and reconnect automatically. The state of the various IOC processors is indicated in the top level panels - if they are not communicating with EPICS they show in white color as "not connected". They also write error messages out in the "System Messages" panel on the top level buttons.

REBOOT does not reload configurations into the various modules, or restart the DSP codes, or recompile parameters from the various panels. It halts the DSP processors via crate level hardware reset, leaves them halted. A REBOOT takes several minutes to complete depending on the network and server loads.

Push REBOOT if the crates are hung up, not responding to epics commands. This is very rare. You can see if the network is connecting to the crates using the ping command (e.g. ping lfb04ler00).

On a REBOOT the power amplifiers are turned OFF - so if the system automatically restarts after a power failure, or a manual reboot, you must manually turn the amps on (assuming you want that state).

When should I hit the RUN or STOP buttons?

The RUN and STOP buttons communicate with the various programmable modules in the system. STOP shuts off the feedback process, so that the output signals are no longer actively recomputed from the input. RUN loads the production feedback code (actually the Grow/Damp code) into the

DSP processors, complies the various look-up tables, computes the filter coefficients, loads the programmable registers from the specifications in the DS and HB panels, loads the DSP executable and data tables, etc. It then starts the 80 processors going. This process takes roughly 10 seconds. If the system is running, and you hit STOP, then RUN - you halt, resynchronise, and reload all the actual feedback processing elements, then restart them.

Hitting STOP, then RUN is the best way to restart the DSP farm after typing new parameters, or after a power cycle or reboot. Because the process takes several seconds, if you hit STOP while there is beam in the machine you likely will lose control. The RELOAD command on the growdamp panel is the mechanism to change filter coefficients, filter parameters on-the-fly while not interrupting the feedback control process.

What to do if the system loses the RF clock distribution?

If the RF clock goes away, the systems tend to self-oscillate or clock themselves on noise. This can hang up the various high-speed functions, confuse the links, the DSP processors, etc. The first thing to do if you think the system has lost the RF is to hit STOP. When the RF is back, hit RUN. If one of the IOCs is not responding or is crashed, you would need to reboot - after the processors are running the STOP, then RUN commands will restart the broadband feedback.

The timing module in the VXI crate has error counters for the RF and fiducial signals - if these counters are clocking away there are significant problems with the RF and timing distribution.The System Oscillator panel (via the front-end VXI module) has several error indicators for acceptable RF power levels in several oscillators and phase-lock status of the3 GHz oscillator.

A brief checklist regarding operational status of an LFB System:

#1) IOCs Running and Ready? (look at the top level panel, do the crates have color pictures in them? A disconnected crate is “whited out” and says “not connected” or “not ready”)

#2) System in RUN state? Look at the error counters in the DS and HB panels - you should not be counting errors. If one or more backplanes are counting errors, you should STOP, then RUN the system.

#3) Amps turned ON? The toggle in the top VXI crate acts on all amplifiers - they can be individually controlled via their own panels.

#4) Are the HARDWARE OK or the BEAM OK indicators (on the top level panel) GREEN? If one is RED - you can find the source by looking for RED indicators in the lower level crates and modules. There is some “help” file information on the panels available via the “help” button on each panel which can be a guide as to why something is reporting an error status.

#5 WOOFER ON? (controlled from the LGDW panels)