420 Area RF Waveguide Switching Check List

D. Horan – RF Group

Date:_____

1st Revision: September 16, 1997
2nd Revision: November 12, 1997
3rd Revision: June 2, 2000
4th Revision: March 8, 2001
5th Revision: March 20, 2001
6th Revision: February 21, 2002
7th Revision: April 9, 2003
8th Revision: June 2, 2004
9th Revision: June 22, 2009

To complete the waveguide switch, follow the instructions below. If you encounter any problems in the switch process or in turning on any of the rf systems after the waveguide switch is completed, contact the RF Group Engineer in Charge (EIC).

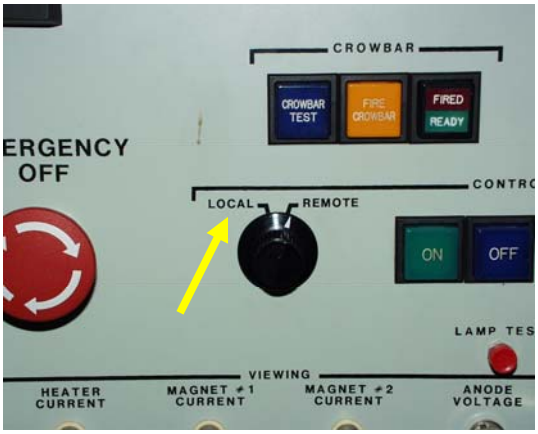
Note: Additional information on the 420 Area Waveguide Switching System is available on the RF Group web page in a document titled "APS 350-MHz RF Switching System – Sequence of Operations".

☐ 1. Obtain the waveguide switch enable keys from MCR.

☐ 2. Bring down ALL 352-MHz rf systems to zero output and turn off the rf drive at each system from the EPICS control screens.

☐ 3. Shut down ALL 352-MHz rf system UVC high voltage power supplies. *Leave the klystron filaments on*.

☐ 4. Place ALL UVC power supplies in "Local Control" (see below). Make sure that the UVC computer monitors display the "Fault Indicator" screen and not the "Meters/Setpoints" screen.



☐ 5. Place the waveguide switch, phase shifter, and waveguide shutter (in the case of switching to RF3/Booster mode only) enable keys in the appropriate locks and enable the switched 120VAC to the waveguide devices. These key switches are located at RF6 (see below).

☐ 6. Select the desired operating mode by inserting the MODE-select key into the desired mode key switch.

☐ *7.* As the waveguide system is switching, observe the system status screen on the waveguide switching system PLC. After approximately 80 seconds, all status blocks on the PLC should be green, indicating that the rf system can now be turned back on.

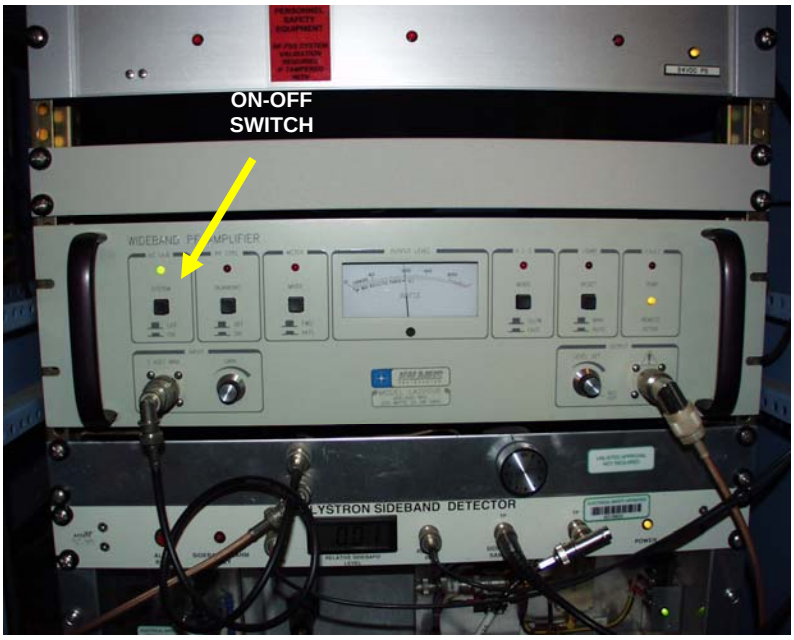
Note: The slowest devices in the switching action are the waveguide phase shifters which require approximately 80 seconds to complete a position change. The waveguide switches and shutters require approximately 2 seconds and 10 seconds respectively to complete a position change, and all other switching is completed within approximately 200msec.

☐ 8. If the PLC reports that the mode switch is successful, remove the waveguide switch, phase shifter, and waveguide shutter enable keys.

☐ 9. Make a note of the selected operating mode indicated on the PLC screen:

MODE NUMBER: _____

☐ 10. Manually turn off the Kalmus amplifiers in the rf systems that are switched off-line (in standby mode). See below:



☐ 11. Verify that the Kalmus amplifiers in the rf systems selected for operation are on.

☐ 12. Place the UVC power supplies in the rf systems selected for operation in "Remote Control" (see Figure 1).

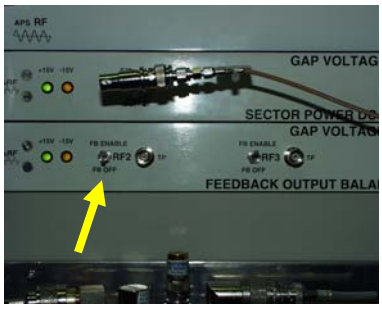
☐ 13. Set the manual Gap Voltage AGC control switches at each rf station to the correct position:

☐ a) For rf stations supplying rf power to the Storage Ring, set the local feedback control toggle switch (see below), located on the front of the AGC Control Logic Chassis in rack #3 at each rf station, to the **"FEEDBACK OPERATE"** (up) position.

NOTE: This switch should be kept in the "FEEDBACK KILL" position (down) at rf stations which are in standby ("diode") mode.

☐ b) For rf stations supplying rf power to the Storage Ring, set the feedback enable toggle switches (see below), located on the AGC Feedback Line Driver Chassis at A014/Rack #9, to the **"FB ENABLE"** (up) position.

Note: These switches should be kept in the "FB OFF" position (down) for rf stations which are in standby ("diode") mode.



☐ 14. From the rf control panel, bring up the waveguide switch screen and verify that it displays the correct mode for operation.

☐ 15. Coordinate with MCR Operations. If an ACIS shutdown validation is required for rf systems switched on line, bring the rf systems to the correct ACIS validation set point operating point (5kV cathode voltage, mod-anode off, rf drive off). If no ACIS validation is required, bring the operating Booster and Storage Ring rf systems to their nominal settings for Booster extraction and Storage Ring injection.

Return the waveguide switching enable keys to the MCR. Turn control of the rf systems to the MCR crew. The MCR Operations crew will prepare the rf systems for beam injection into the Storage Ring. The ACO is to check and determine if an ACIS shutdown validation is required for the selected rf operating mode. The ACO signature below indicates that they have checked the ACIS validation status.

RF Group Representative Signature: _____ Date: _____

The remaining portion of the check list is to be completed by, or under the guidance of, SR-Qualified Operators/ACOs in the MCR.

16. Check ACIS validation of the RF systems for the selected mode of operation.

ACIS shutdown validation is required ☐

OR

ACIS shutdown validation is not required ☐

Signature _____**Date** _____
ACO's verification of ACIS validation status

☐ 17. Re-open the RF phase knob screen and verify the correct stations are selected. (Found at OAGapps → Storage Ring RF → RF phase knobs)

☐ 18. If not previously engaged, engage the AGC for the two stations providing.

☐ 19. The phase between the two RF stations shown on HP 8508 VVM screen (also known as the Interstation Phase screen and located on the RFPanel → RF Source → Phase Det 38/40 to 36/37 Cav Phase) should be between -5 and 15 degrees. Adjust the phase if necessary using the RF phase knobs. An additional adjustment may be needed in Step 23 and 24. (The degree range is valid as of Run 2009-2.)

☐ 20. Verify the gap voltage for the two systems are correct.

☐ 21. Verify the AGC Feedback Output Voltage is at approximately 2.0V for each of the systems in use. Raise/lower the mod Anode voltage to decrease/increase the voltage to that level.

☐ 22. Bring up the SR scope signals for the Booster and SR RF waveforms on the monitor. The source and relative phases between RF stations could be adjusted (if it is needed) to optimize the beam injection efficiency into the Storage Ring.

☐ 23. While filling the ring to 102mA, monitor the klystron foward powers for the two systems in use. If the difference between the two is larger than 100kW make an adjustment to the RF interstation phase.

☐ 24. Once the ring is filled to 102mA make a final adjustment to the SR interstation phase to minimize the difference between the two klystron forward powers. If the Interstation Phase is outside of the alarm limits after the adjustment, e-mail the SR CO so the limits can be modified or the change can be investigated.

MCR OPS Signature: _____ Date:_____