If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

7.1.73 Yellow Ring Cooldown, 80K to 4.5K

Text Pages 2 through 5

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

C. Salat

7.1.73 Yellow Ring Cooldown, 80K to 4.5K

1. Purpose

This procedure describes cooling the yellow ring to 4.5 K while the blue ring is being maintained at operating temperature.

2. Responsibilities

2.1 The Shift Supervisor, or an Operator designated by the Shift Supervisor, is responsible for conducting the procedure and providing documentation in the Cryogenic Control Room Log.

2.2 Should a problem arise during the completion of this procedure, the Shift Supervisor shall contact the Technical Supervisor for instructions before continuing.

3. Prerequisites

3.1 The Shift Supervisor/Operator shall be familiar with the following drawings:
3A995005 25 KW refrigerator P&ID.
3A995108 RHIC 80K cooler integration diagram
3A995121 RHIC 80K cooling system P&ID
3A995006 Ring block diagram
3A995066 6:00 yellow valve box P&ID
3A995073 LSA liquid storage P&ID
Refrigerator valve reference guide

3.2 The Shift Supervisor/Operator shall be familiar with the physical location of components on the drawings listed under 3.1**.**

3.3 The Shift Supervisor/Operator shall be familiar with the CRISP and Indusoft computer control systems.

3.4 Completion of C-A-OPM 7.1.72 - "Blue Ring Cooldown, 80K to 4.5K".

4. Precautions

4.1 Confirm the availability of Particle Accelerator Safety System (PASS) in the refrigeration wing of 1005R.

4.2 All personnel entering the refrigeration wing of 1005R must have a personal ODH monitor and carry an emergency escape pack, if there is liquid helium in the pots.

4.3 All personnel entering Bldg. 1005H must wear double hearing protection.

5. Procedure

Note:
Throughout this procedure, liquid injection from the LSA may be necessary. See instructions at end of this procedure.

_____ 5.1 Isolate yellow ring "M" line from the 80 K maintenance loop. At 80K cooler, shut off circulators, close valves H9626A and H9369A, and H9370A. Put valve H9598A in manual and close. On screen D15, close valve H9901A and H5062A. Shift supervisor shall designate personnel to shutdown remainder of 80K system while continuing with this procedure.

_____ 5.2 Slowly drain yellow "M" line pressure down to 3 atm. At refrigerator, ensure closed H5M and H4644A. Open/ensure open H849A and H9935M. At 8 YVB, ensure closed H6803A. At 6YVB, cycle open & closed H6737A and utilize H6706A to control "M" line pressure reduction. Once PI3714 is approximately 3 atm., put H6706A in auto with setpoint of 3 atm.

_____ 5.3 Line up CR path from 6:00 YVB to first refrigerator bypass. Close/ensure closed H4644A, H4643A, and H26A. Open/ensure open H849A, H9935M, H5M, H827M. Slowly open H425M.

_____ 5.4 Initiate flow through yellow ring "M" line at 6:00 YVB. At 6:00 YVB: open H6623M and H6600A. Slowly open H6607A.

_____ 5.5 Adjust H206A and H6706A setpoints to achieve approximately 100g/s flow rate.

_____ 5.6 When the 4 K wave hits the 12:00 VB, begin cooling the S and R lines and recoolers.

Configure the R-line for connection to the VJRR CR as follows:
Open: H6736A, H6636A.
Open all yellow R-line series valves at 4:00, 2:00, 12:00, 10:00, 8:00

_____ 5.7 Check all yellow recooler valves are in manual and closed.

_____ 5.8 Check closed yellow S-M and S-U cross-connects around ring.

_____ 5.9 Open all yellow S-line series valves around ring except at 6:00, (leave H6701A closed).

_____ 5.10 At 6:00 yellow, Open H6705M, H6609M. Slowly open H6601A to charge S-line. If M-line flow FE4010 drops off significantly, close down on H6601A.

_____ 5.11 After the S-line is fully charged and H6601A is fully open in manual, begin opening recooler JT valves with attention to the refrigerator cold end. This will

be a major load increase and you may need to reduce the cold end flow by adjusting H206A. As a starting point, set all JT open limits to 5% and switch to auto with levels set at 50%. The object here is to get the S and R lines, and the recoolers cold near the time the 4 K wave gets to 6:00, so balance recooler flow and magnet flow accordingly to accomplish. (Cold magnets with recoolers not ready is NG)

Note:
When Valve Box and sextant recooler outlet temperatures are under 5K, enable level probe power located on each VB control page. Once 4.5K wave passes through each lead pot, set mass flow controllers in auto (pages D205-D215).

_____ 5.12 Slowly raise the upper limits of the J-T vales in the ring, watch for effects on cold turbines, liquid pots. Maintain refrigerator balance.

_____ 5.13 When the 4K wave passes through 8:00, begin cooling 6:00 yellow lead pot.
- Check closed H6894M
- Open H6739A (override on page 247 – click "yellow circ offline" to green)
- Crack open H6606A to approximately 1%
- Watch CR temp TI6710 and M-line temps in sector 4/5, and adjust H6606A accordingly

_____ 5.14 As the cold wave pushes through, monitor CR temp TI105 and make appropriate bypasses 425/825, 157, 409/809. Verify H123A is closed.

_____ 5.15 Send personnel into ring to open all yellow thermistor isolation valves. Enable thermistor power.

_____ 5.16 The final bypass into the R-line will be made at 6:00 YVB. When TI6710 at 6:00 YVB is less than or equal to TI106 on the refrigerator R-line, open H6604A and H6704A. Close H6736A and H6636A.

_____ 5.17 Transition to M - S - recooler supply mode (prerequisite: recoolers full)
- Verify H6701A closed.
- Put H6601A in auto with setpoint equal to the current m-line pressure PI3714
- When S-line pressure PI6058 equals M-line pressure PI3714, Open H6730A
- Close H6606A
- Close H6706A
- Open H6607A to 100% in manual

_____ 5.18 Use liquid from LSA to aid refrigeration process
- Close the following valves at the LSA.
  H4526A, H9703A, H9704A, H4525A, H9711A, H9713A, H9726A,

H9705A, H9706A, H9731A, H9733A, H9782A

- Select a dewar, open H9723A or H9709A or H9742A. Open H9704A.
- Pressurize selected dewar to .75 atm above return pressure, as read on PI4841. Open H4525 to about 10% until TI8002 is stable and below 5K.
- When TI8002 is stable, set H4525 to 20%.
- Begin initializing liquid through H4505A back to return. Close H4525A and slowly open H4505A to direct flow back to the return line. Observe TI8001. When TI8001 is below 5K, close H4525A fully. H4505A is now functioning as a makeup valve. The flow through it should match the load with no makeup or pumpback coming from the tank farm.

6. Documentation

6.1 The check-off lines on the procedure are for place-keeping only. The procedure is not to be initialed or signed, it is not a record.

6.2 The Shift Supervisor shall document the completion of the procedure in the Cryogenics Control Room Log

7. References

7.1 Drawing 3A995009, 25°kW Helium Refrigerator P&ID.

7.2 Drawing 3A995066, 6:00 Yellow Ring P&ID.

7.3 Drawing 3A995086, 6:00 Blue Ring P&ID.

7.4 Refrigerator Valve Reference Guide.

8. Attachments

None