

108050000-TD8012-R00

Spallation Neutron Source

CHL DI Water Controls

Functional System Design (FSD)

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SPALLATION NEUTRON SOURCE

Argonne National Laboratory • Brookhaven National Laboratory • Lawrence Berkeley National Laboratory • Los Alamos National Laboratory • Oak Ridge National Laboratory

**CHL Building DI Water System Controls Description
TD8012 Rev 0**

Operating Philosophy

Purpose:

The purpose of DI water system operation is to:

- a) Maintain the DI water at an appropriate temperature setpoint.
- b) Provide alarms if the resistivity in the circulating loop or polishing loop are abnormal

Assumptions: None

Operator Controls and Operating Modes

- 1) OFF: Pump is de-energized. Tower water return line control valve at 50% open.
- 2) ON: Pump is energized. Tower water return line control valve is modulated to control DI water supply temperature at setpoint selected by the operator.

OPERATOR INTERFACE DEFINITIONS

Local Hardware Displays/Operator Controls

- 1) Post heat exchanger DI water pressure (*PI 5200A*)
- 2) Pre heat exchanger DI water pressure (*PI 5200B*)
- 3) Post heat exchanger DI water temperature (*TI 5200A*)
- 4) Pre heat exchanger DI water temperature (*TI 5200B*)
- 5) Tower water supply pressure (*PI 5200C*)
- 6) Tower water return pressure (*PI 5200D*)
- 7) Tower water supply temperature (*TI 5200C*)
- 8) Tower water return temperature (*TI 5200D*)
- 9) HOA switch for Pump A (*HS 5200A*)
- 10) Pressure differential across pump (*PDIS 5200A*)
- 11) DI water pump isolation valves (*HV 5200W, HV 5200X*)
- 12) DI water pressure gauge isolation valves (*HV 5200A,B*)
- 13) Tower water pressure gauge isolation valves (*HV 5200C,D*)
- 14) Tower water return flow indicator (*FI 5200A*)
- 15) Pre heat exchanger DI water flow (*FI 5200B*)
- 16) Polish to re-circulate DI valve (*HV 5200I*)
- 17) Polish return DI valve (*HV 5200H*)
- 18) FAULT indicator light on MCC
- 19) READY indicator light on MCC
- 20) RUN indicator light on MCC

Software HMI/EPICS Digital Operator Controls

- 1) Pump Mode
 - a. OFF
 - b. ON

Software HMI/EPICS Digital Displays

- 1) Pump Mode switch status
 - a. OFF
 - b. ON
- 2) Pump energized or de-energized. (*PDIS 5200A*)

Software HMI/EPICS Analog Operator Controls

- 1) DI water temperature

Software HMI/EPICS Analog Displays

- 1) DI water supply temperature (*TT 5200A*)
- 2) Tower water return line controller output (*IP 5200A/TCV 5200A*)
- 3) Resistivity of circulating loop (*AIT 5200A*)
- 4) Resistivity of polishing loop (*AIT 5200B*)

Alarms

- 1) Glycol supply temperature high and low
- 2) Low Flow due to Pump failure or massive leak (pump energized and differential pressure is low)
- 3) Flow path blocked (Pump energized and high differential pressure)
- 4) Circulating loop resistivity low
- 5) Polishing loop resistivity low

Control Logic Description

In the OFF mode, the pump is de-energized and the Tower Water Return Line Control Valve is set to 50 % open.

In the ON mode, the pump is energized and the Tower Water Return Line Control Valve is modulated by a PID algorithm to maintain the DI Water Temperature Setpoint. After a delay period the differential pressure for the pump will be periodically checked for high or low flow. If either condition exists, the pump will be de-energized and the appropriate alarm returned to the operator.

Limit values for the Circulating Loop Resistivity and Polishing Loop Resistivity will be set in the EPICS system to generate alarms.

