



CHEMICAL & VOLUME CONTROL SYSTEM

Section 4.1



Learning Objectives:

1. List the purposes of the Chemical and Volume Control System (CVCS).
2. List in flow path order and state the purpose of the following major components of the CVCS:
 - a. Regenerative heat exchanger
 - b. Letdown orifices
 - c. Letdown heat exchanger
 - d. Demineralizers (ion exchangers)
 - e. Letdown filter
 - f. Volume Control Tank (VCT)
 - g. Charging pump

Objectives (Cont.)

3. Identify the components in the CVCS that are used to purify the reactor coolant and the types of contaminants each is designed to remove.
4. Describe how the makeup system is used to borate, dilute, and makeup a blended flow of boric acid to the reactor coolant system (RCS).
5. Explain why and for what plant conditions the following chemicals are added to the RCS:
 - a. Lithium hydroxide
 - b. Hydrogen
 - c. Hydrazine

Objectives (Cont.)

6. Describe the emergency boration flow path, and identify the plant conditions which would require its use.
7. State the purpose of the connection between the Residual Heat Removal System (RHR) and CVCS letdown.
8. List the plant operations that result in large amounts of influent into the Boron Recovery System (BRS).
9. Identify the changes in the CVCS that occur upon the receipt of Engineered Safety Features Actuation Signals (ESFAS).

Objectives (Cont.)

10. Explain how the CVCS is designed to prevent the following:
 - a. Flashing and pressure transients in the regenerative and non-regenerative heat exchangers.
 - b. Loss of suction to the charging pumps.
 - c. High temperature in the letdown ion exchangers (demineralizers).
 - d. Over- and underpressurization of the volume control tank.

Objectives (Cont.)

11. State when and why excess letdown would be used.
12. List the automatic actions initiated by VCT level instrumentation.

Purposes

- Adjust the RCS boric acid concentration.
- Maintain the proper water inventory in the RCS in conjunction with the pressurizer level control system.
- Provide seal water flow to the reactor coolant pump shaft seals.

Purposes

- Add corrosion inhibiting chemicals to the RCS.
- Purify the reactor coolant in order to maintain it within its design activity limits.
- Provide borated water for emergency core cooling.

Purposes

- Process reactor coolant for the reuse of boric acid and reactor makeup water, through the boron recovery system.
- Degas the RCS.
- Provide a means of emergency boration of the RCS.

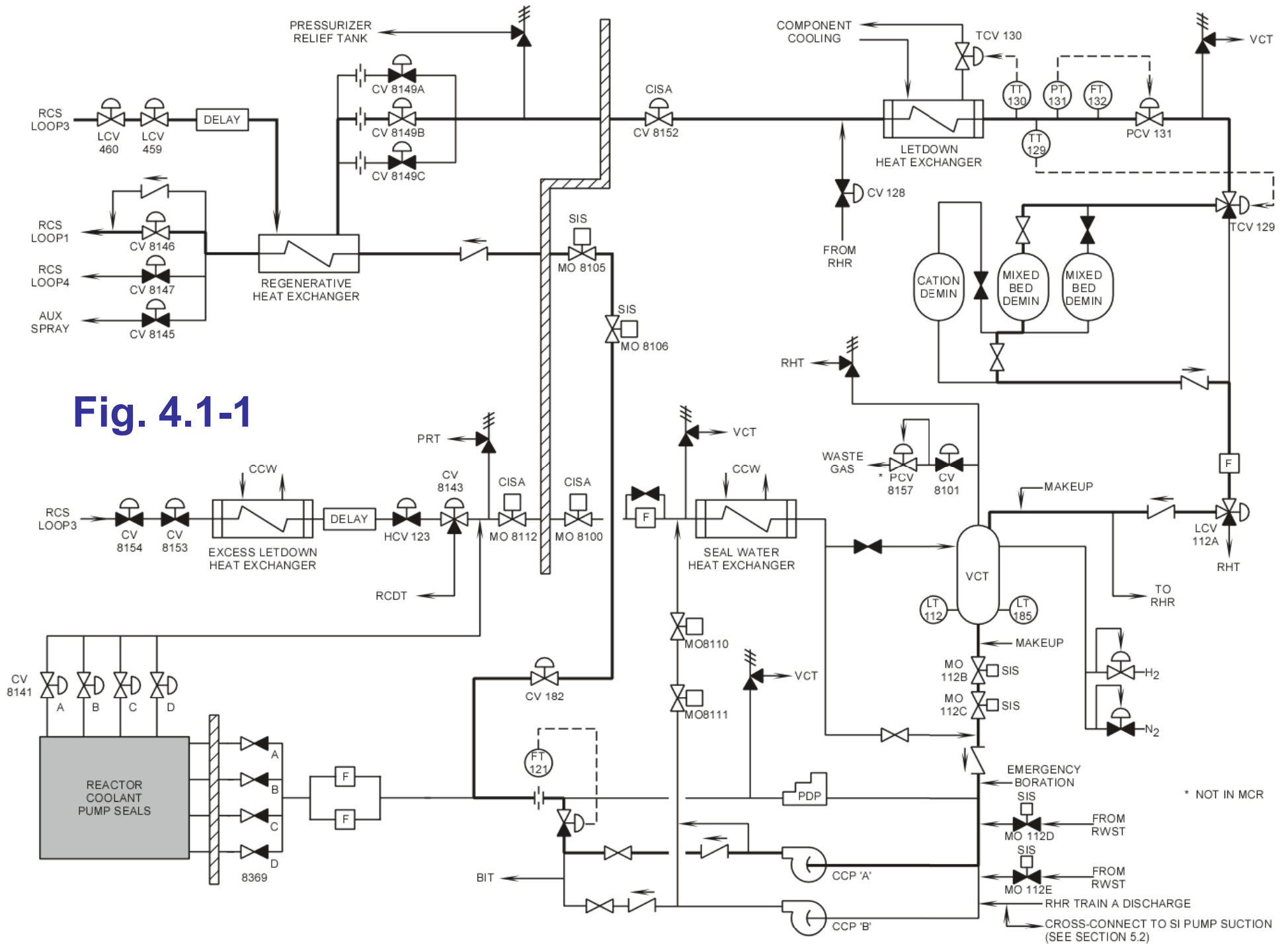


Fig. 4.1-1

Fig. 4.1-2

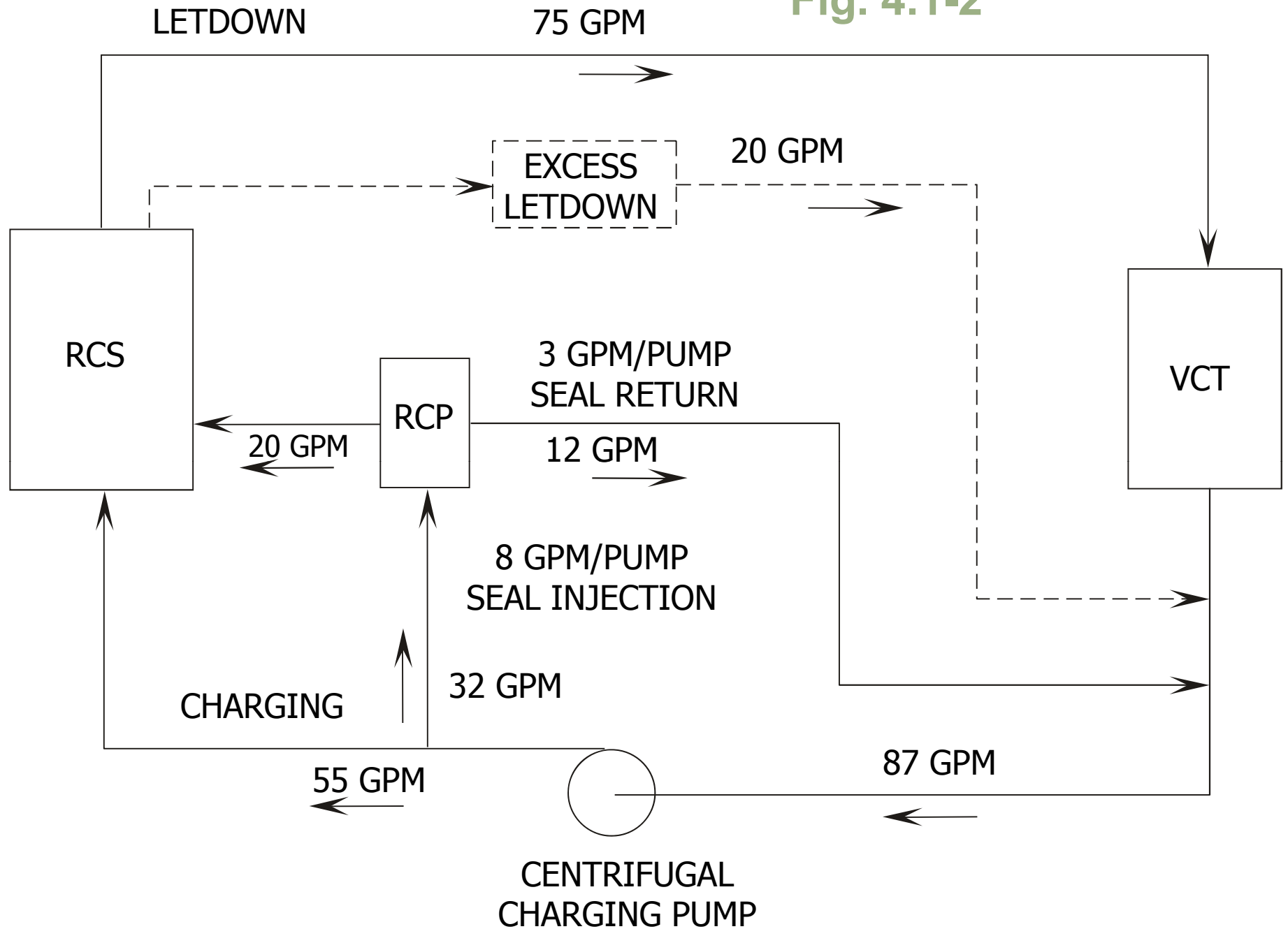


Fig. 4.1-5 RMS

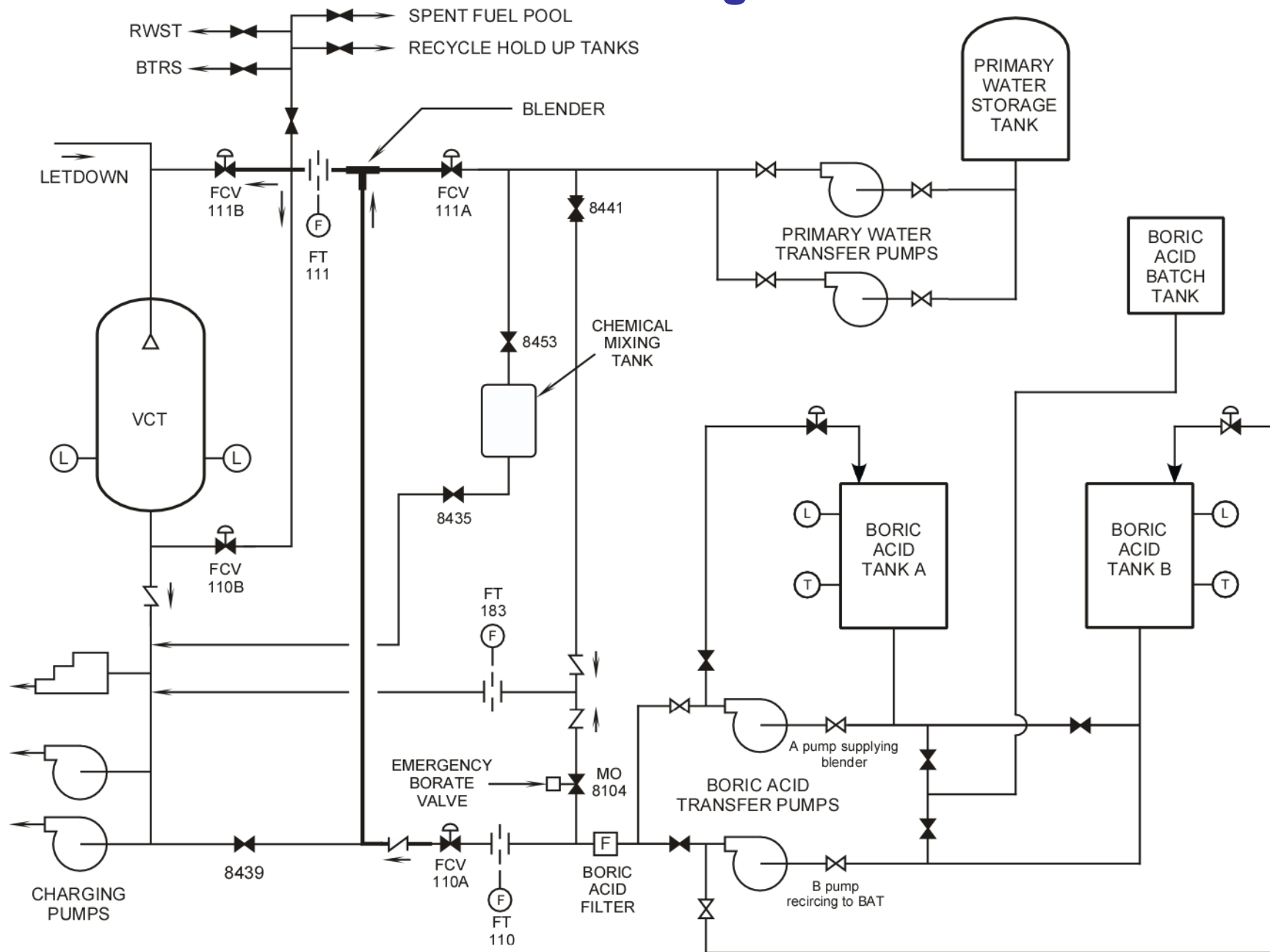


Fig. 4.1-6 Blender

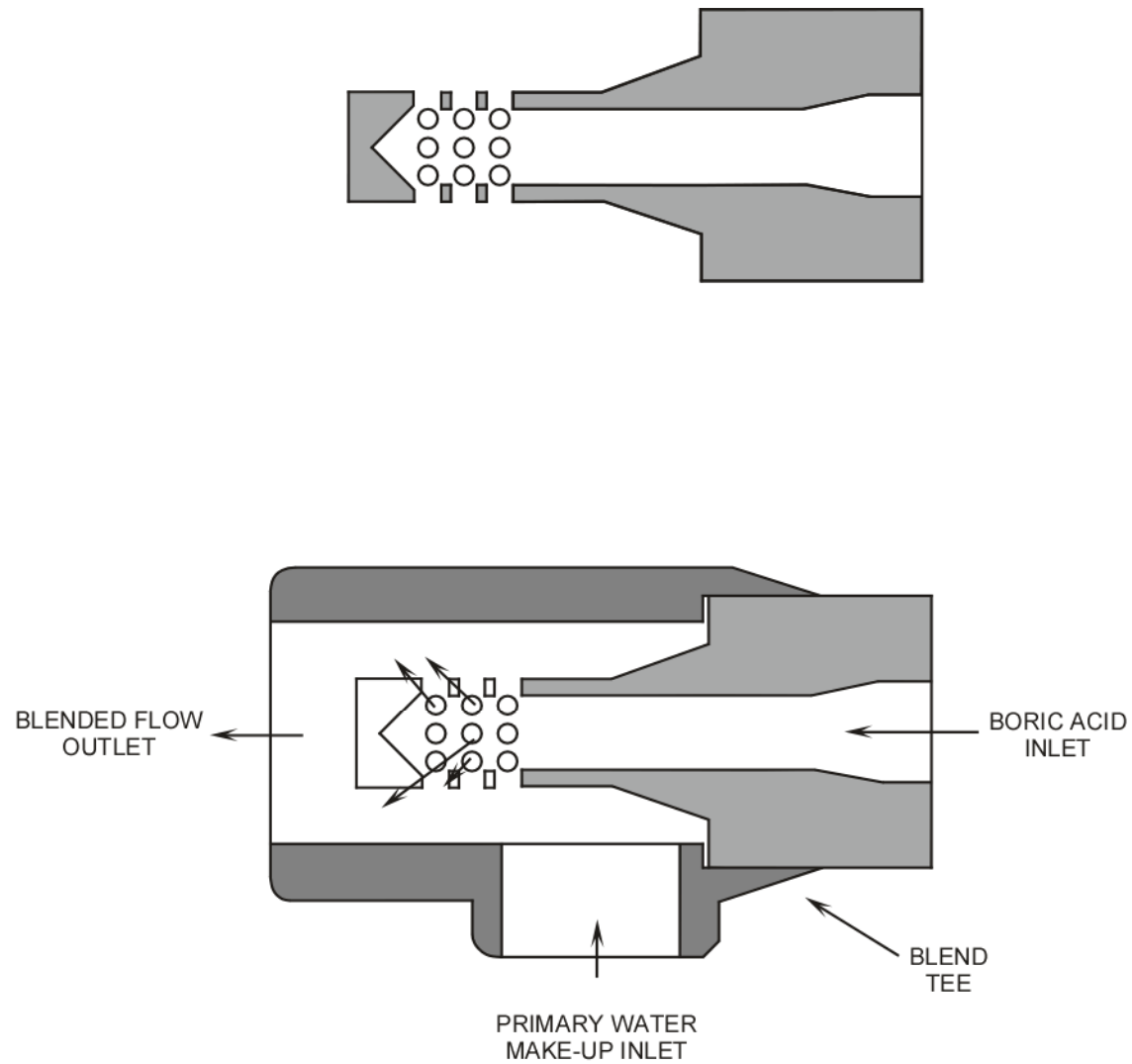


Fig. 4.1-7 VCT Level Control

IF LT-112 AND LT-185 DEVIATE FROM EACH OTHER BY MORE THAN 10%, ACTIVATES ANNUNCIATOR

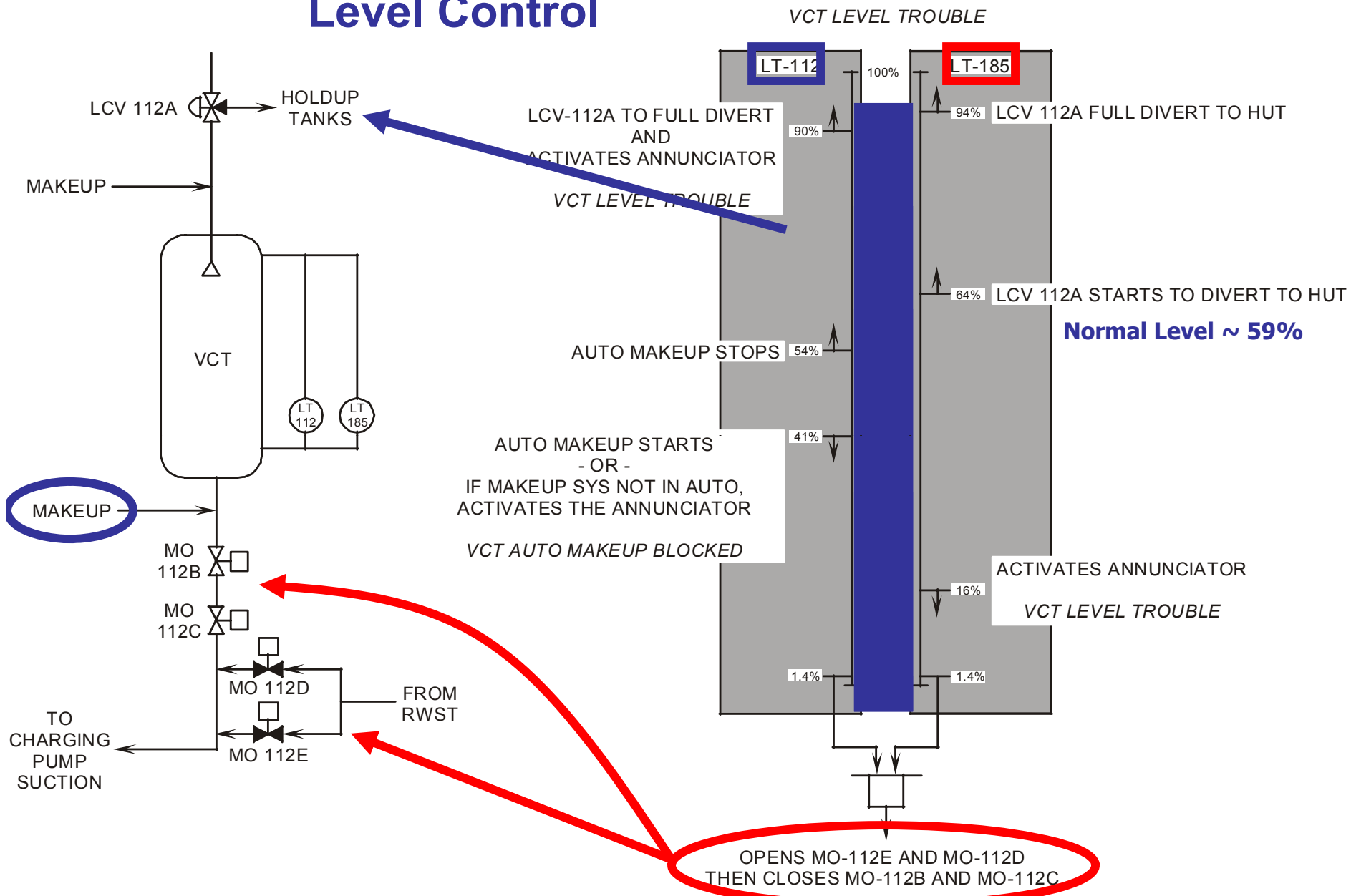
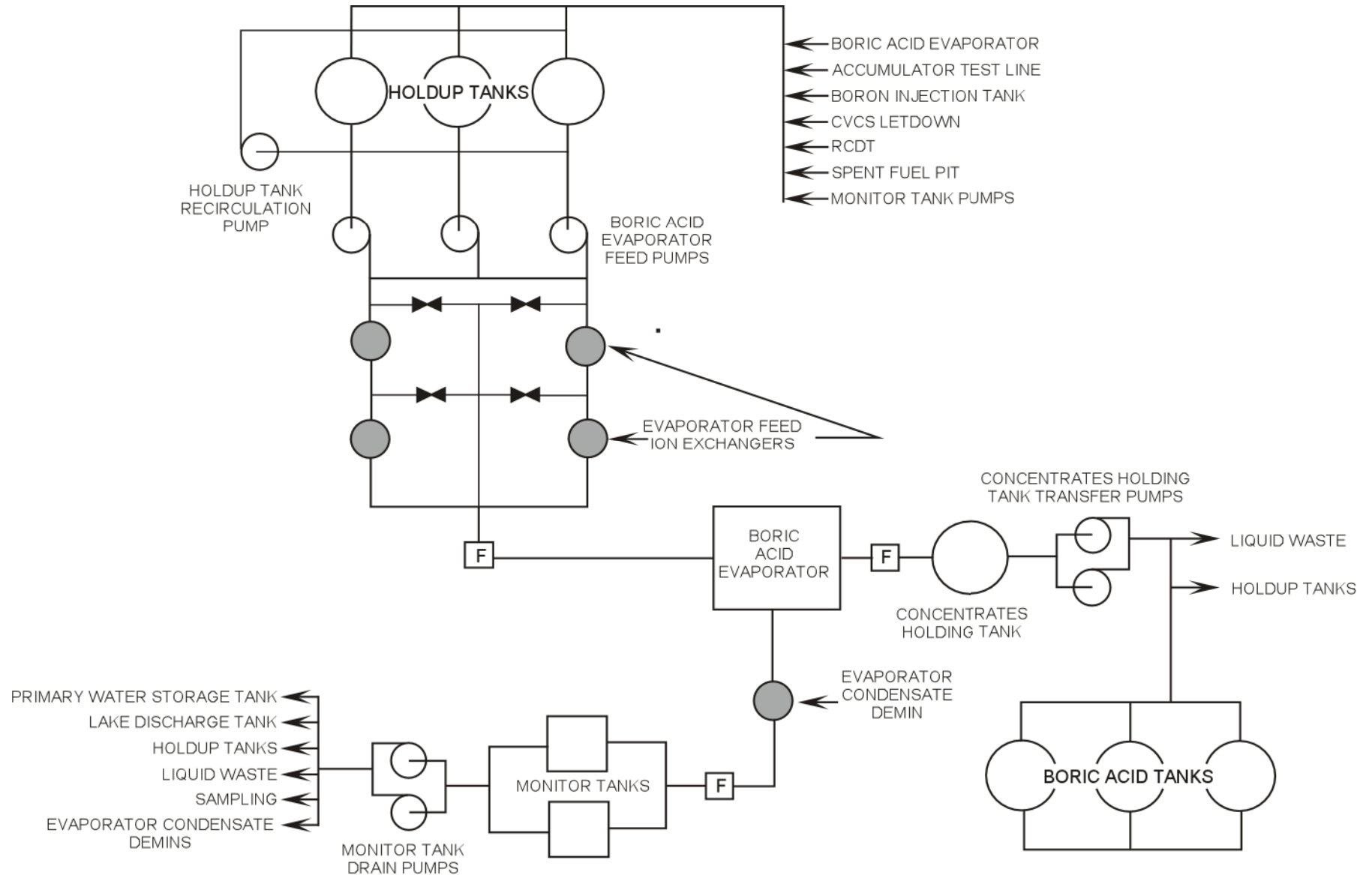


Fig. 4.1-3 Boron Recovery System



PRESSURIZER LEVEL CONTROL SYSTEM

Westinghouse Technology Systems Manual
Section 10.3



Learning Objectives:

1. State the purposes of the pressurizer level control system.
2. List and describe the purposes (bases) of the protective signal provided by pressurizer level instrumentation.
3. Identify the instrumentation signal that is used to generate the pressurizer level program, and explain why level is programmed.

Learning Objectives:

4. Explain how charging flow is controlled in response to pressurizer level error signals during the following:
 - a. Centrifugal charging pump operation.
 - b. Positive displacement charging pump operation.
5. Explain the purposes of the pressurizer low level interlocks.

Purposes Obj 1

- Control charging flow to maintain a programmed level in the pressurizer.
- Provide inputs to pressurizer heater control and letdown isolation valves for certain pressurizer level conditions.

Fig 10.3-1

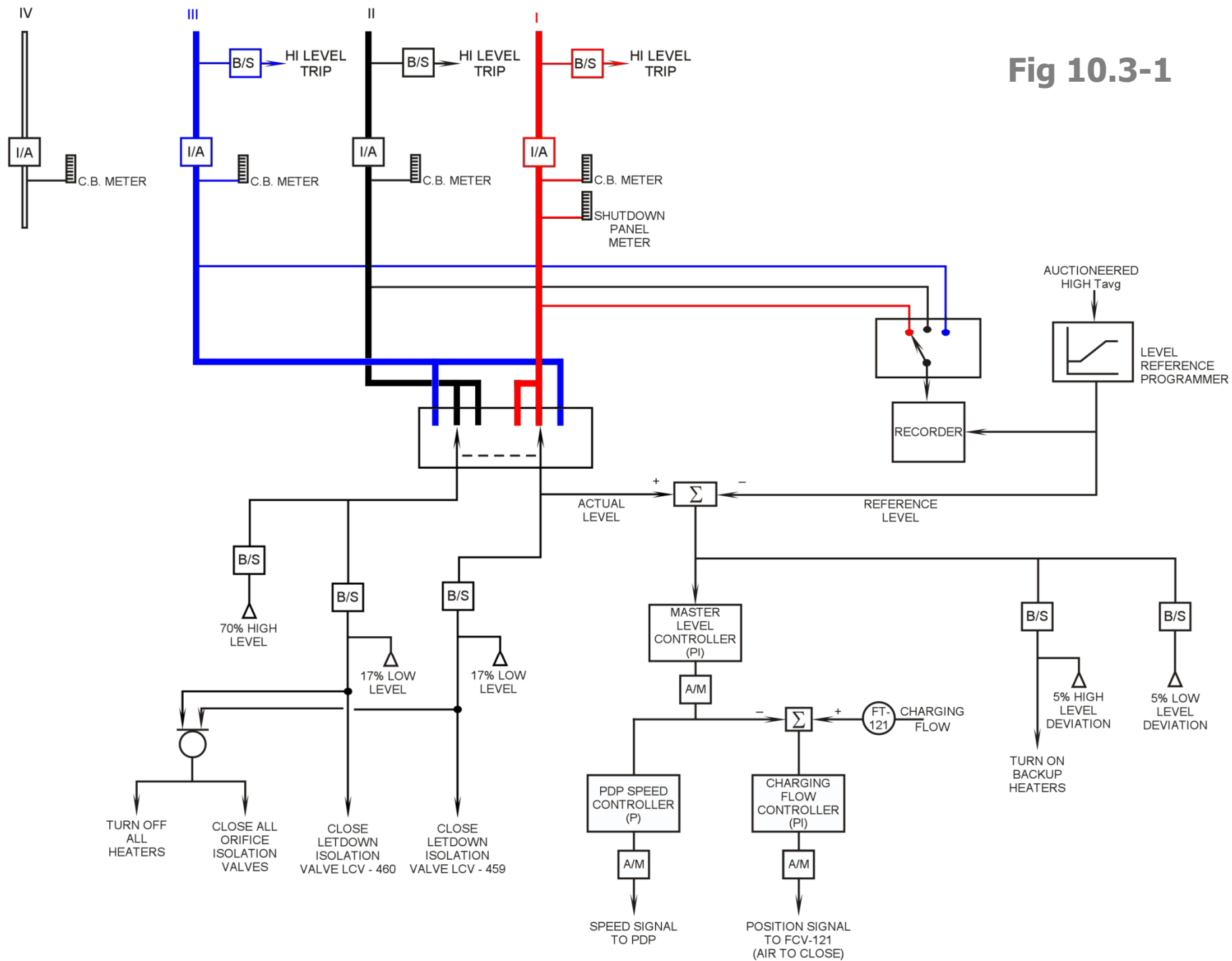


Fig 10.3-2

