



ROD CONTROL SYSTEM

Section 8.1

Objectives:

1. State the purposes of the Full Length Rod Control System.
2. List the inputs to the automatic full length rod control system and explain why each is used.
3. Explain why the rate of change of the difference between turbine and nuclear power is used in the power mismatch circuit.

Objectives:

4. Deleted
5. Given a list, arrange in proper order the stepping sequence of the Control Rod Drive Mechanisms (CRDM).
6. List the rod withdrawal stops that occur in both "auto" and "manual" rod control.
7. Describe the effects of an "urgent failure" in the logic cabinet and in a power cabinet.

Objectives:

8. Explain how individual rod motion is achieved.
9. Briefly describe the functions of the Bank Overlap Unit (BOU).
10. Briefly describe the rod speed program and explain the purpose of "deadband" and "lock-up".

Purposes:

Obj 1

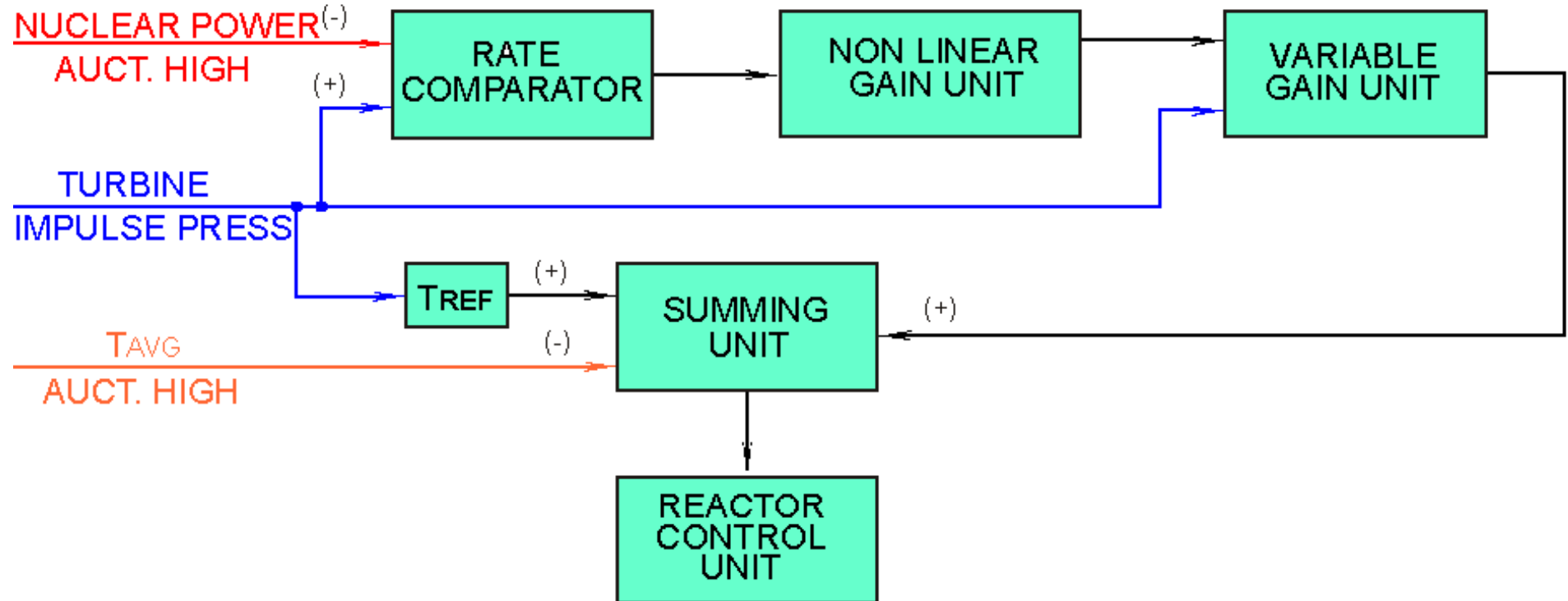
- Provide manual positioning of the control rods for startup, shutdown, and power operations.
- Automatically positions the control rods to maintain a programmed T_{avg} during power operations between 15% and 100% power.

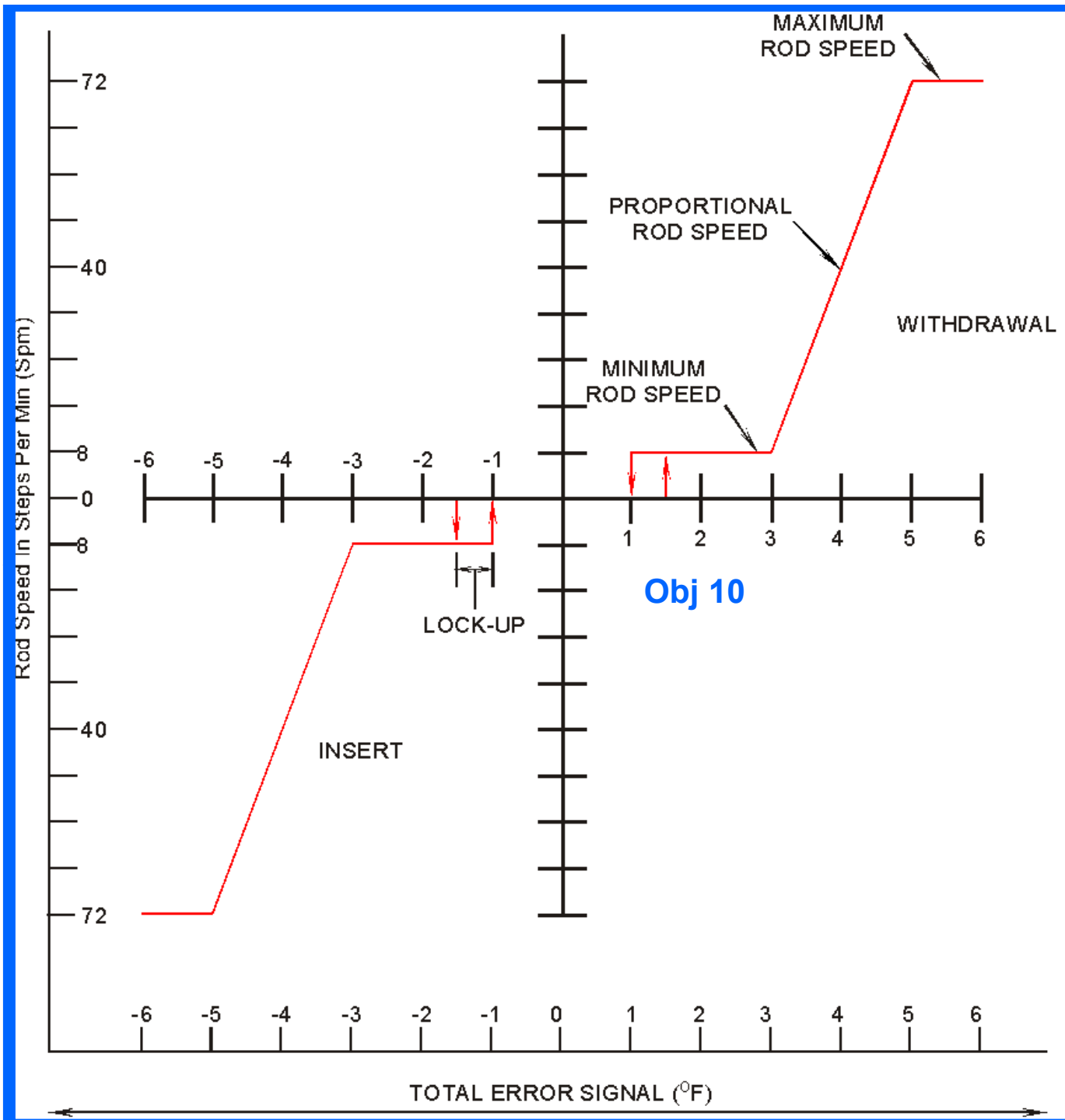
Purposes (cont.):

Obj 1

- The rod control system is designed to accommodate the following transients without a reactor trip:
 - $\pm 5\%$ per minute ramp change in power.
 - $\pm 10\%$ step change in power.
 - 50% step load decrease with the aid of the steam dumps.

Objective 2: Inputs





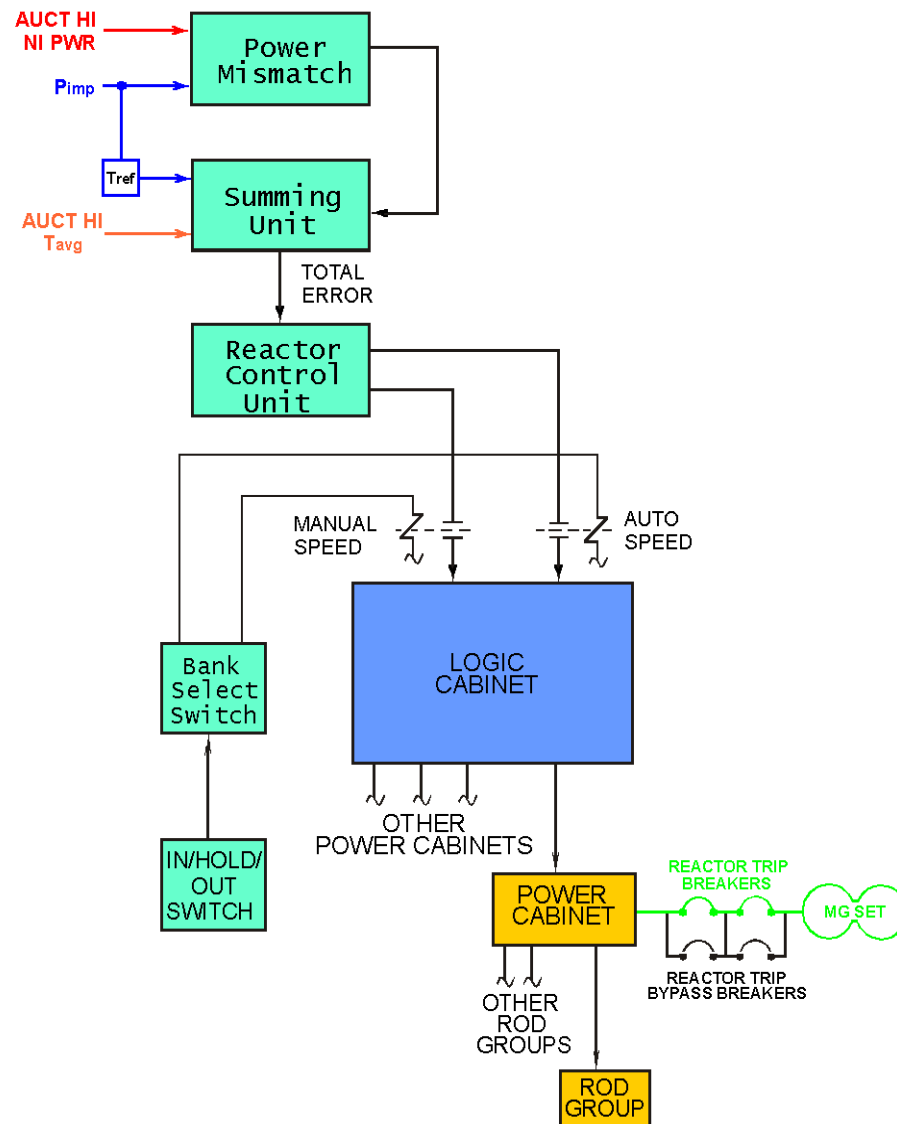
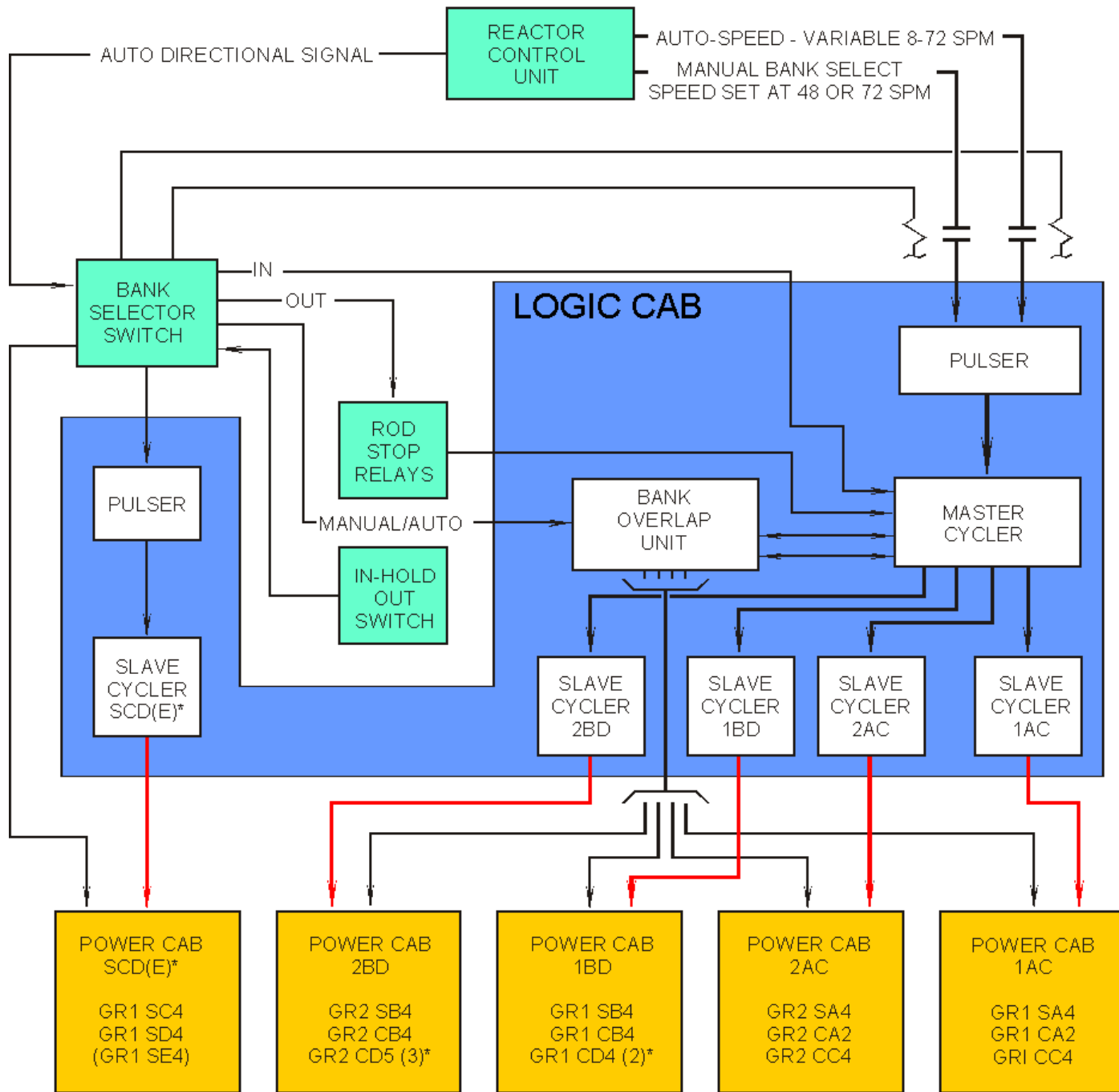
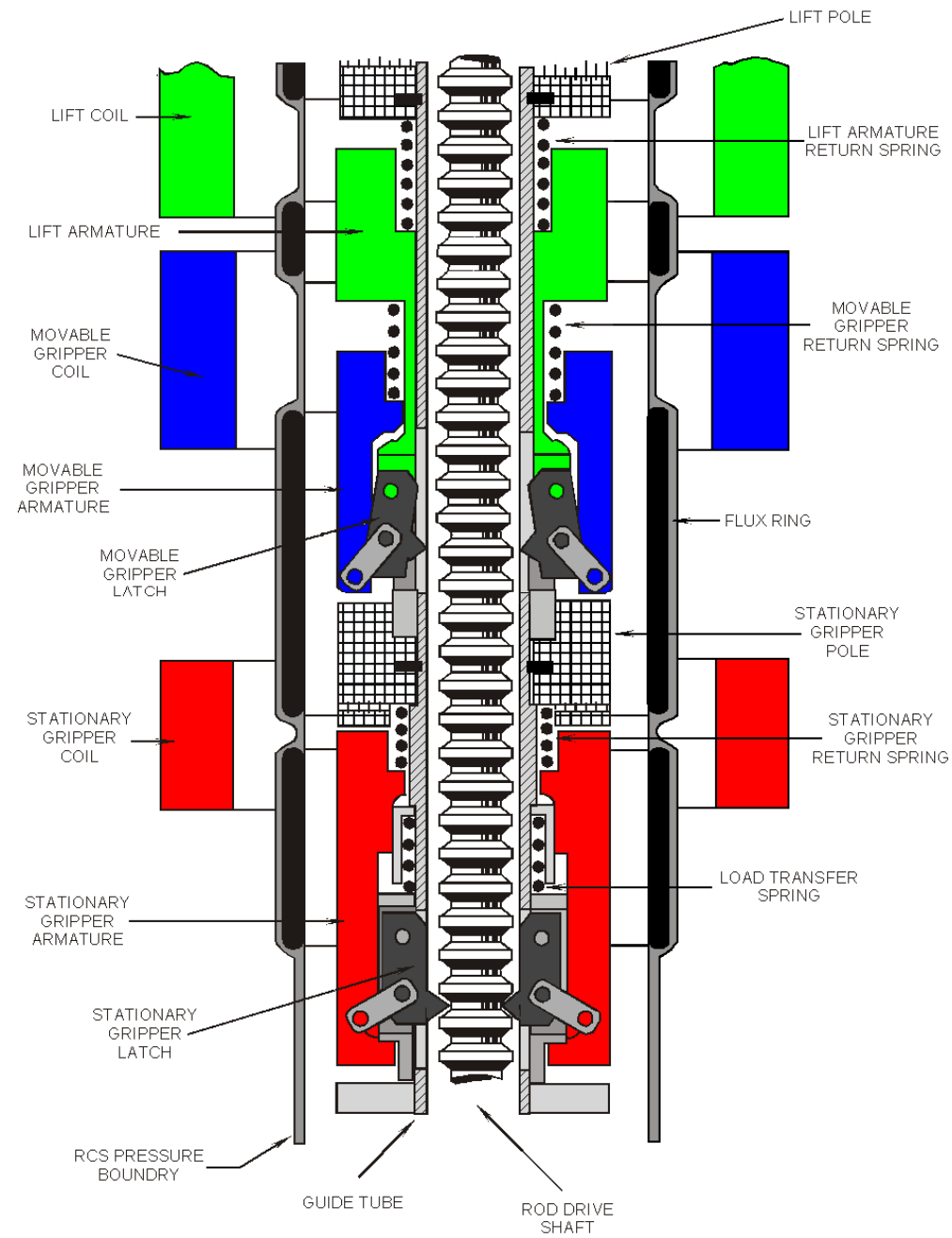


Figure 8.1-1 Rod Control System Block Diagram



Bank Overlap Unit **Obj 9**

- **The bank overlap unit performs three functions;**
 - 1.) It selects the control banks to be moved.**
 - 2.) It overlaps the banks in accordance with preset instructions.**
 - 3.) It signals the master cycler which bank to cycle.**



Rod Stops – Manual & Auto

Obj 6

- PR hi flux rod stop, 1/4, PR power > 103%.
- IR hi flux rod stop, 1/2, IR power > 20%.
- OT ΔT rod stop and runback, 2/4, loop ΔT > 3% below trip setpoint.
- OP ΔT rod stop and runback, 2/4, loop ΔT > 3% below trip setpoint.

Rod Stops – Auto only **Obj 6**

- Low power interlock, 1/1, turbine power (impulse pressure) < 15%, and
- Control bank D withdrawal interlock, demanded bank D position > 220 steps.

Urgent Failure Alarms

Obj 7

- A failure which could affect rod motion and includes the possibility of dropping a rod.
- The urgent failure alarm can be generated from either the logic or power cabinets.