Plant Protection System (PPS)

Chapter 12.4

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

HRTD
Human Resources
Training & Development

OBJECTIVES

1. State the purpose of the reactor protection system (RPS).

2. State the purpose of the engineered safety features actuation system (ESFAS).

3. Explain the purpose of each reactor trip.

OBJECTIVES

4. Explain how the two (2) out of four (4) RPS trip logic is derived.

5. Explain the reactor trip circuit breaker trip logic.

6. List the operating bypasses incorporated into the Plant Protection System.

7. Explain the effect of placing an RPS trip in trip bypass.

OBJECTIVES

8. Explain the operation of the low pressurizer pressure trip circuitry.

9. Explain the operation of the low Steam generator pressure trip circuitry.

10. Explain the ESFAS logic.

11. Explain the purposes of the ESFAS signals.

The 7 Digital CE plants have a Plant Protection System

- Arkansas Nuclear One 2
- Waterford 3
- San Onofre 2 & 3
- Palo Verde 1, 2, & 3

RPS Purpose

The Reactor Protection System (RPS) monitors various plant parameters and trips the reactor when a limit is approached. A reactor trip under these circumstances is intended to maintain the integrity of the fuel cladding and RCS boundaries during any Anticipated Operational Occurrence (AOO) and limit offsite radiation doses to within the limits of 10CFR100 during any design basis accident.

ESF Purpose

The Engineered Safety Features Actuation System (ESFAS) and associated Engineered Safety Features (ESF) systems are designed to ensure that accident consequences are kept within acceptable limits.

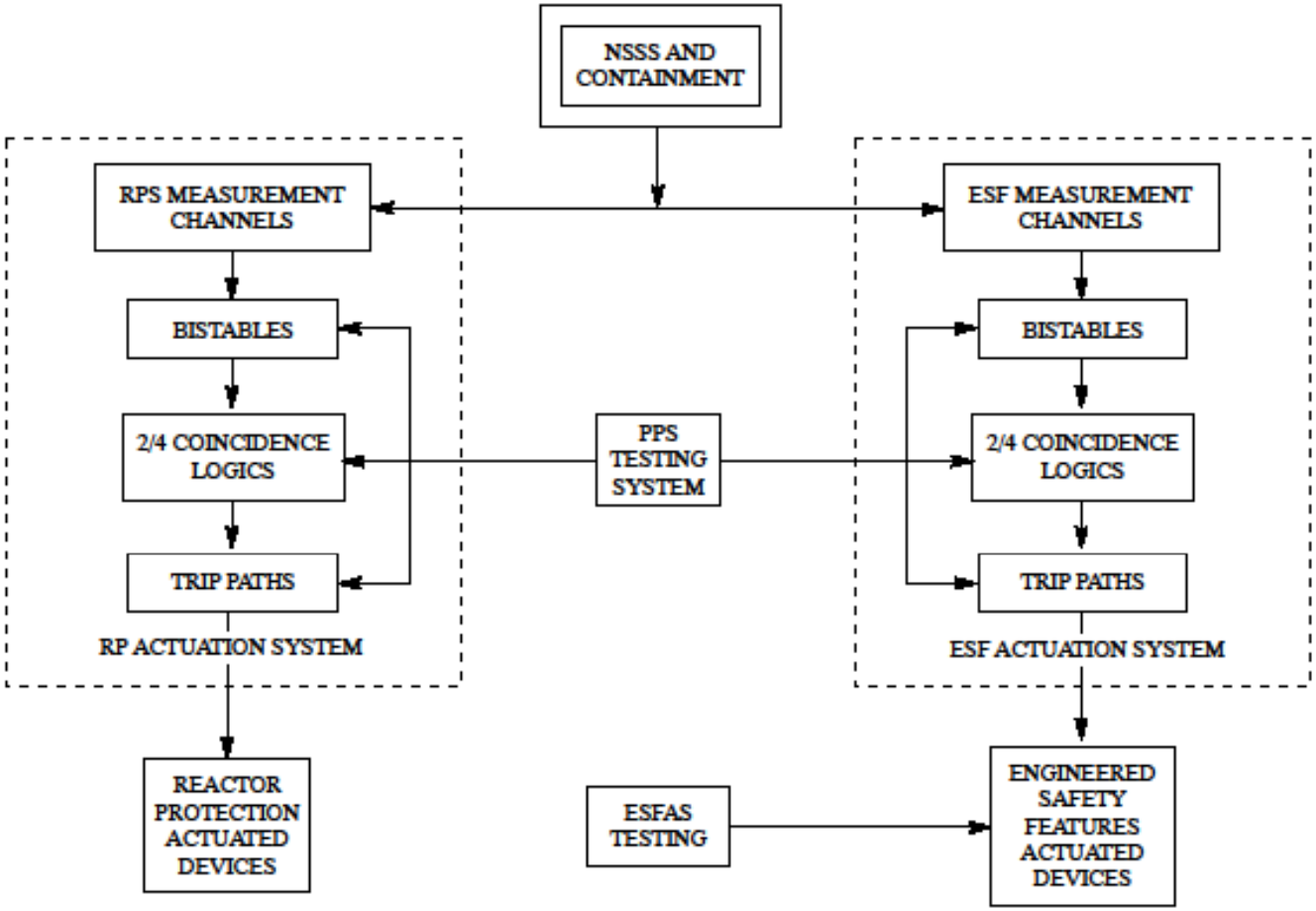

Figure 12.4-1 Plant Protection System Basic Block Diagram

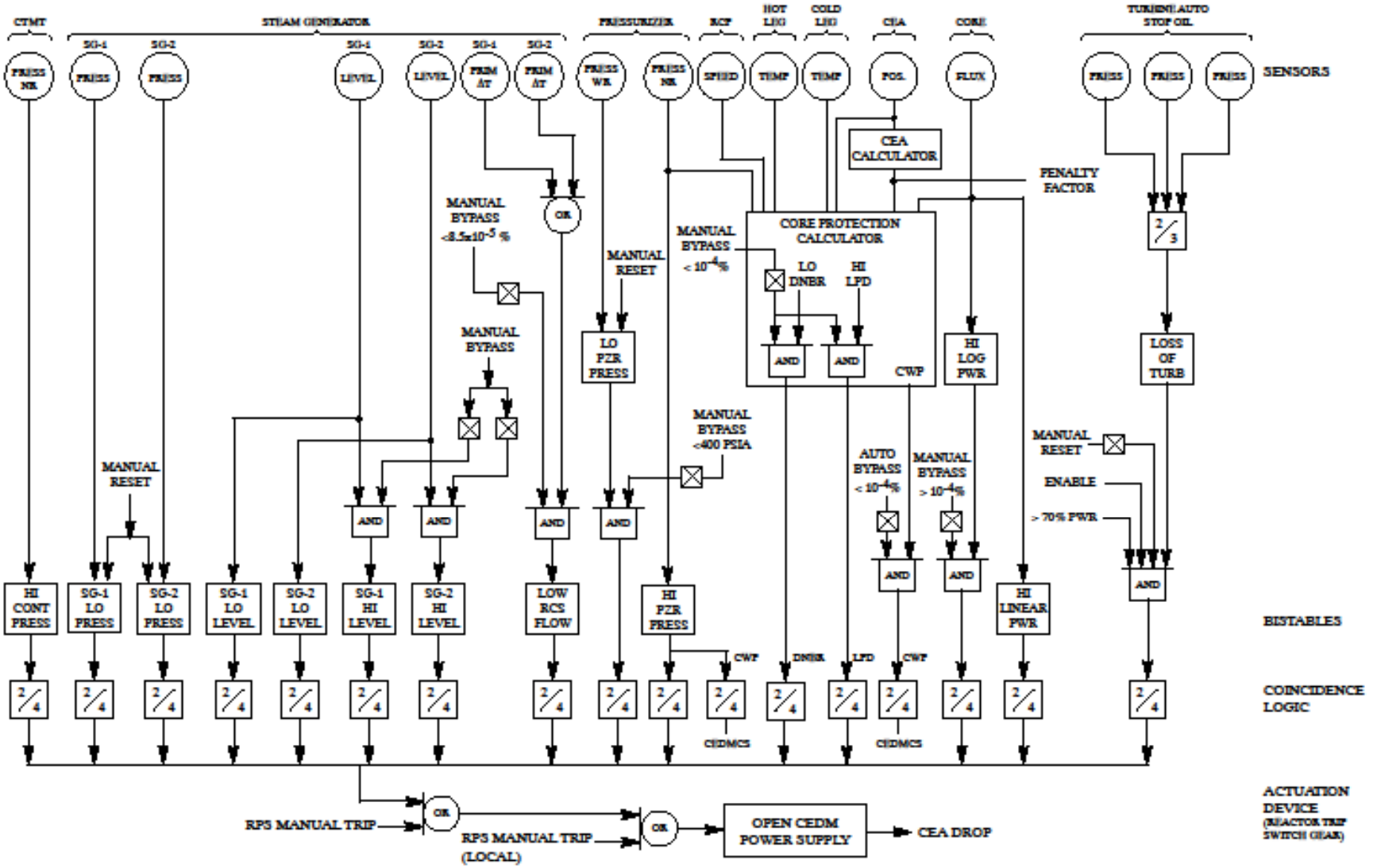

Figure 12.4-2 Reactor Trip Logic Diagram

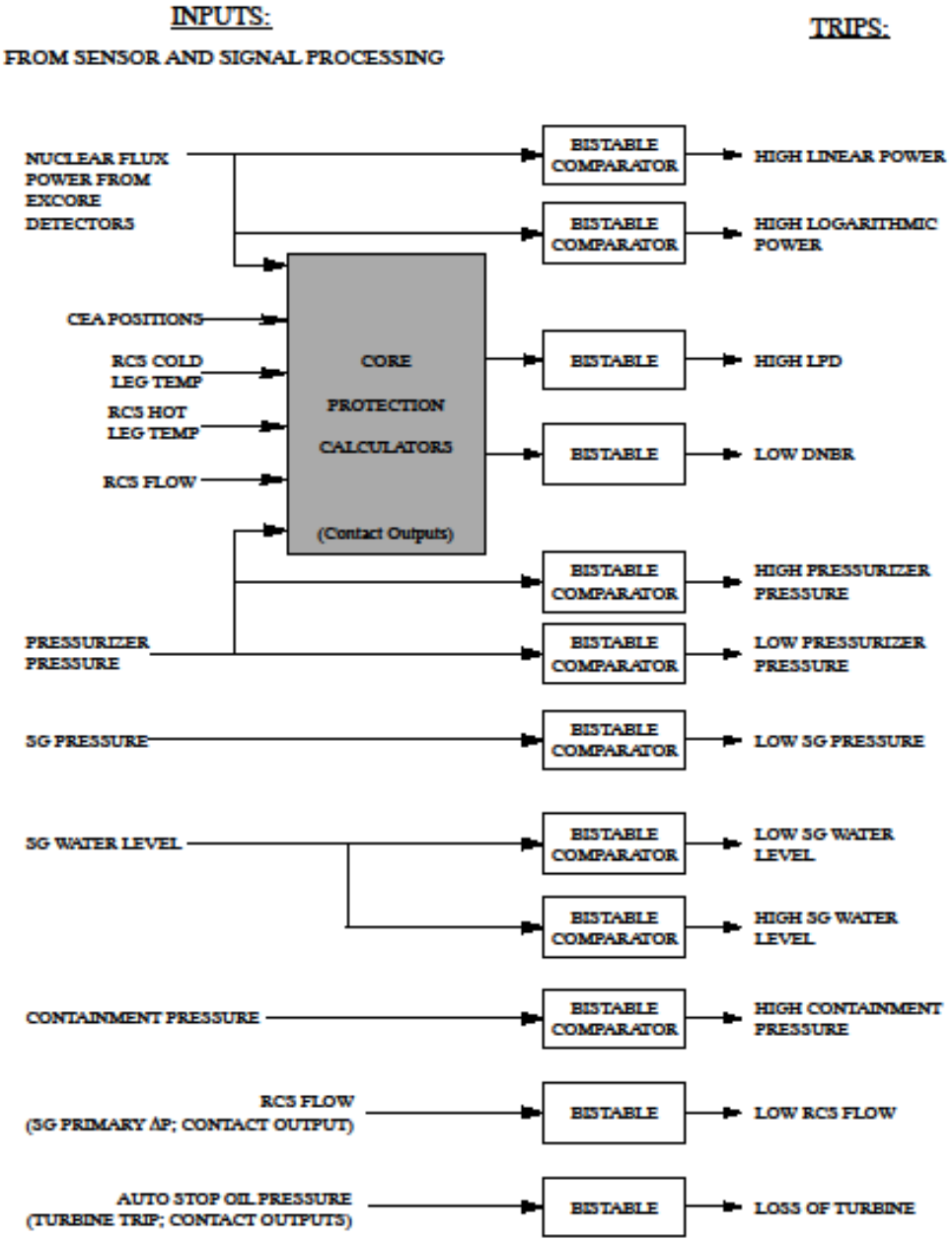

Figure 12.4-3 Bistable Comparator and CPC Process

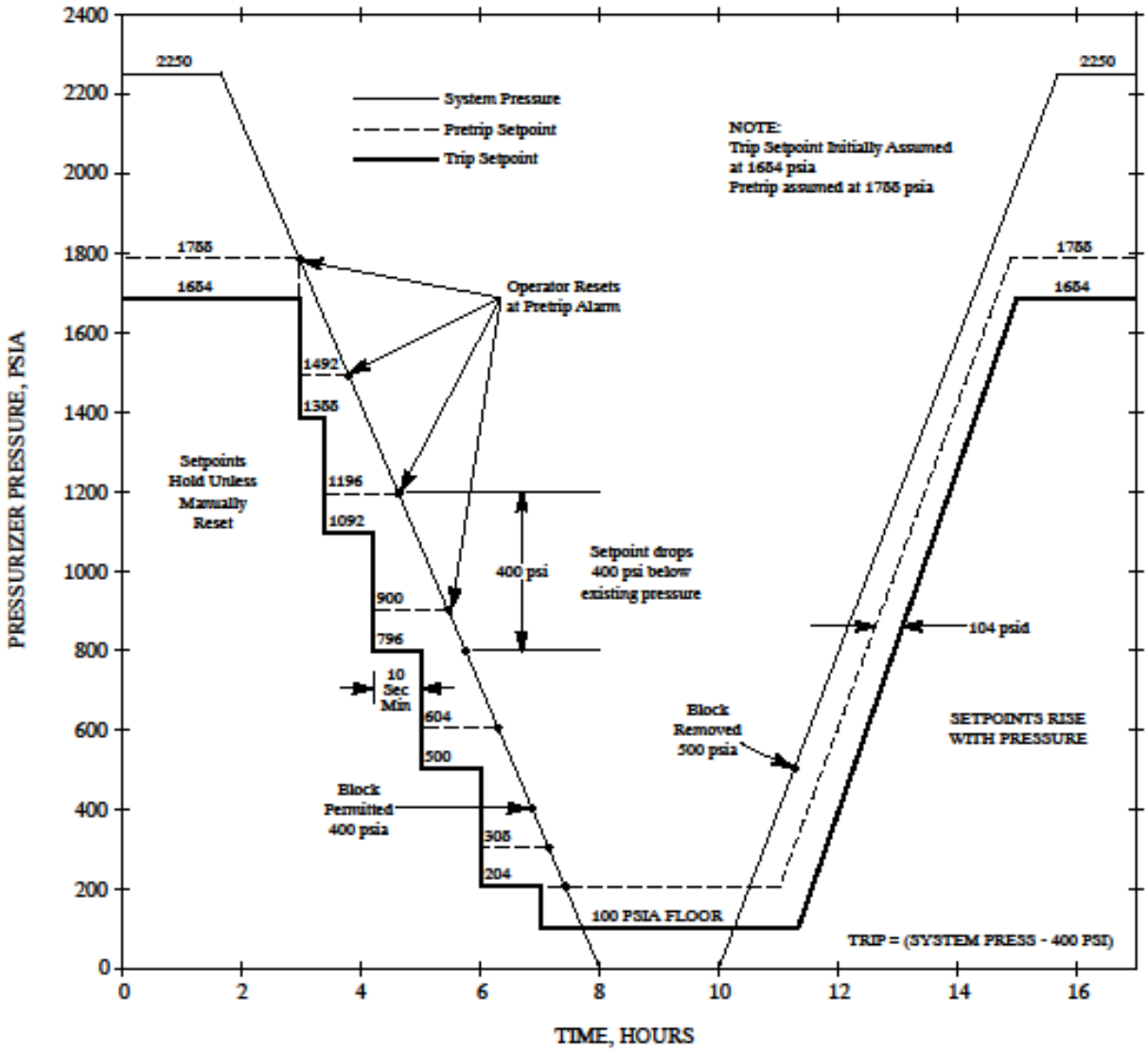

Figure 12.4-4 Low Pressurizer Pressure Variable Setpoint Operation

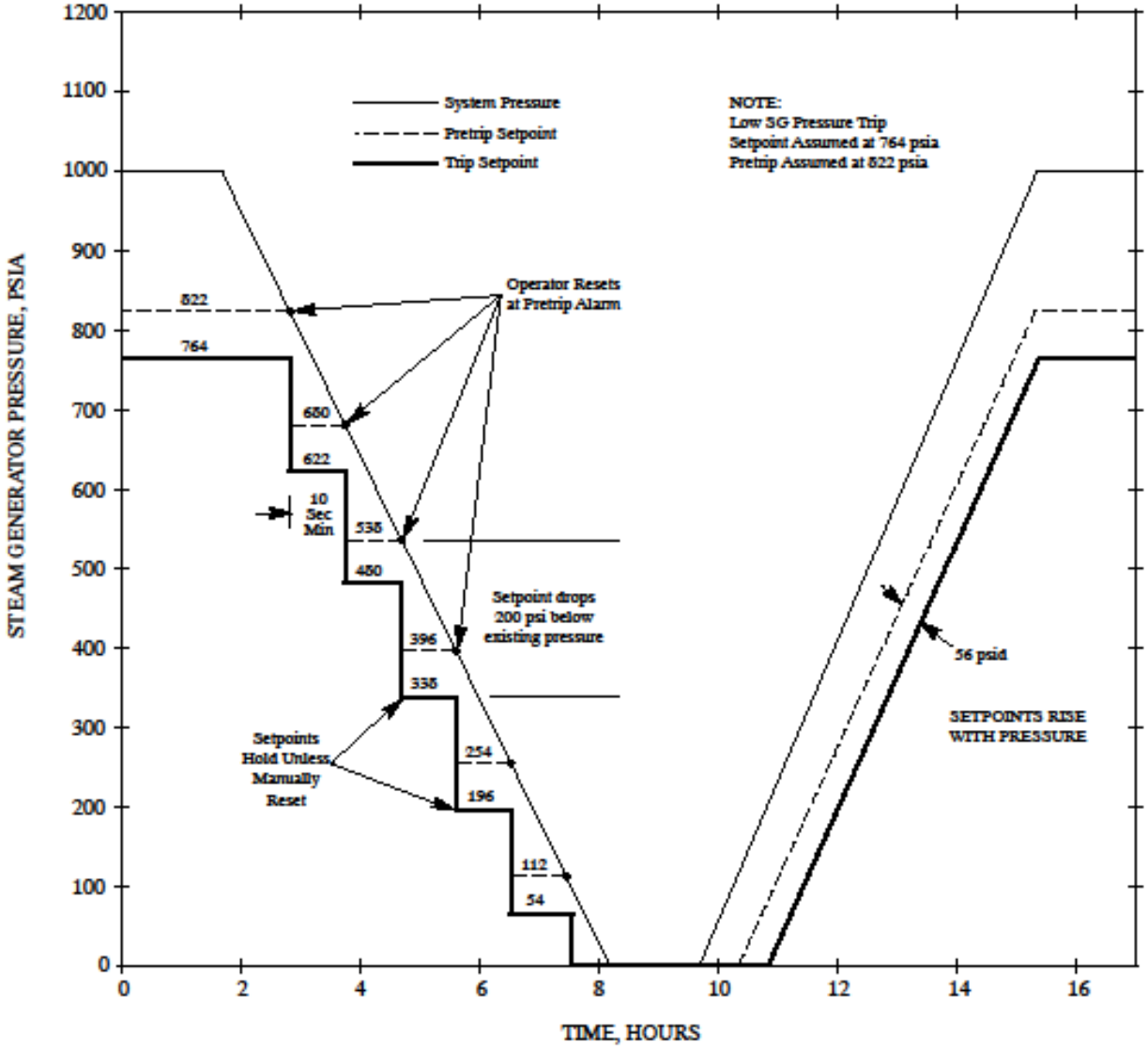

Figure 12.4-5 Low Steam Generator Pressure Variable Setpoint Operation

NOTES:

1. ALL WHITE AND RED LIGHTS NORMALLY ON FOR NON-TRIP CONDITION AT POWER CONDITION.

2. ITEMS IN PARENTHESIS SHOWN FOR INFORMATION BUT ARE NOT PHYSICALLY ON STATUS PANEL.

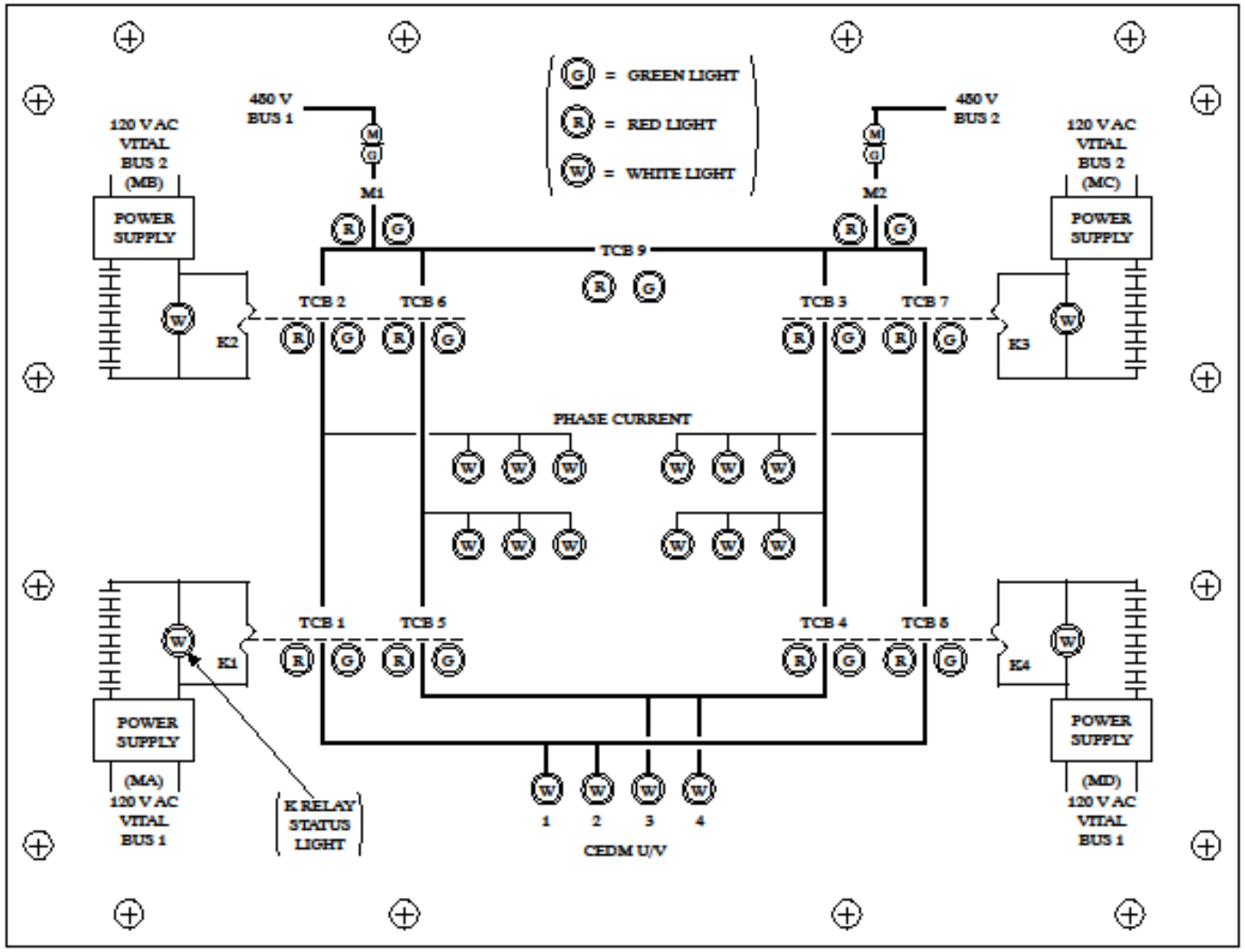

Figure 12.4-6 Reactor Trip Status Panel

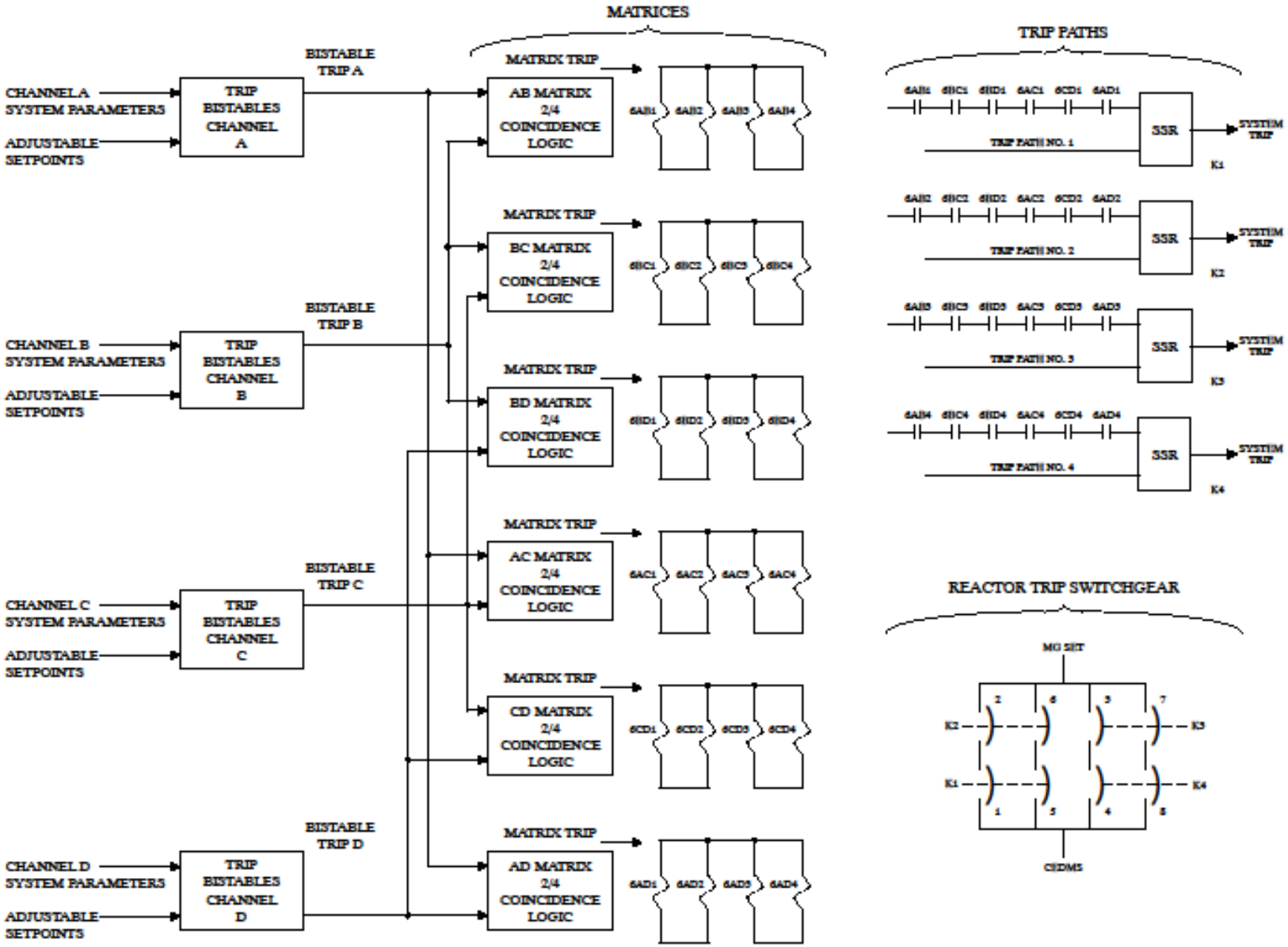

Figure 12.4-7 RPS Trip Signal Flowpath

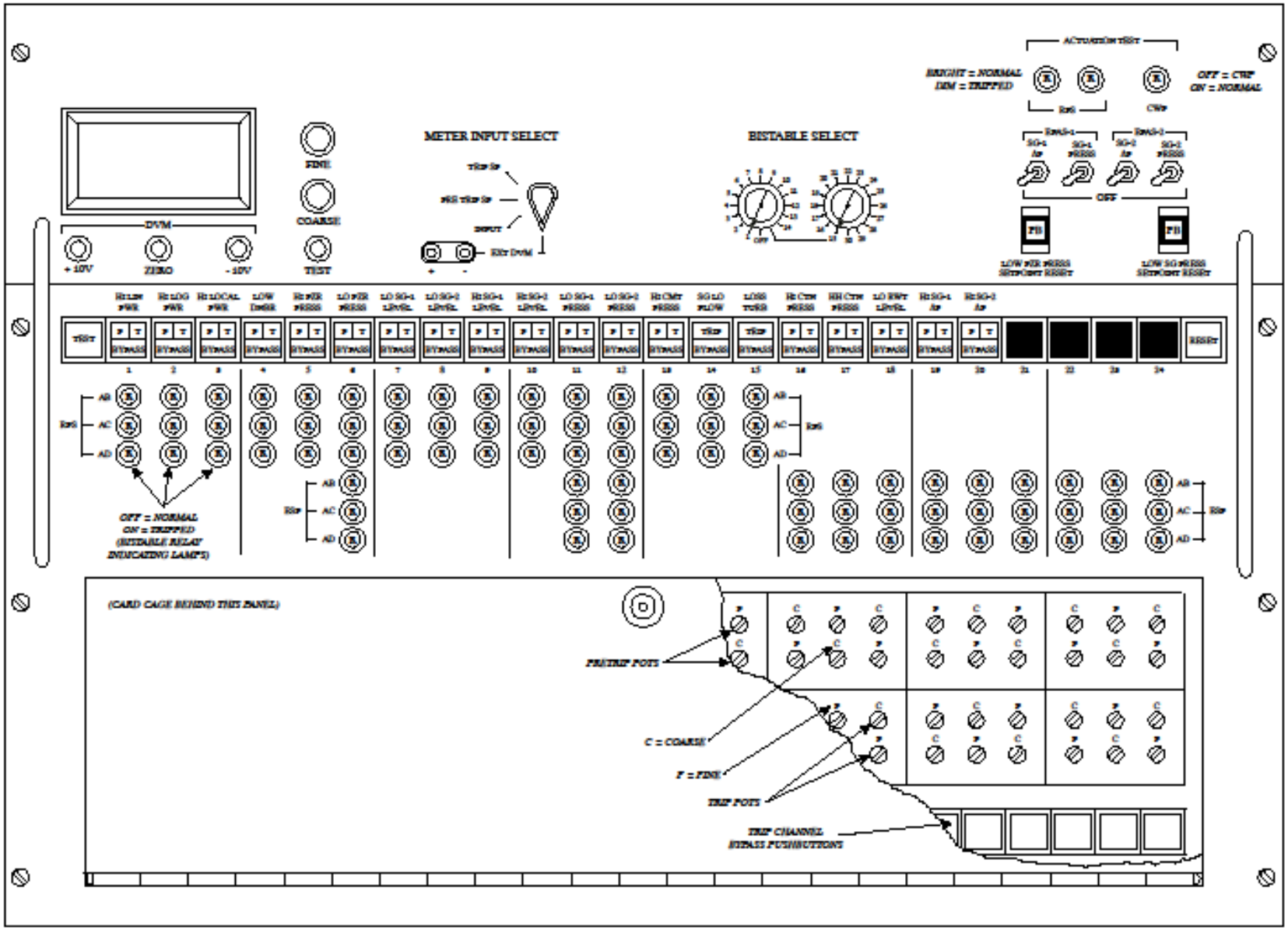

Figure 12.4-8 Bistable Control Panel Channel A

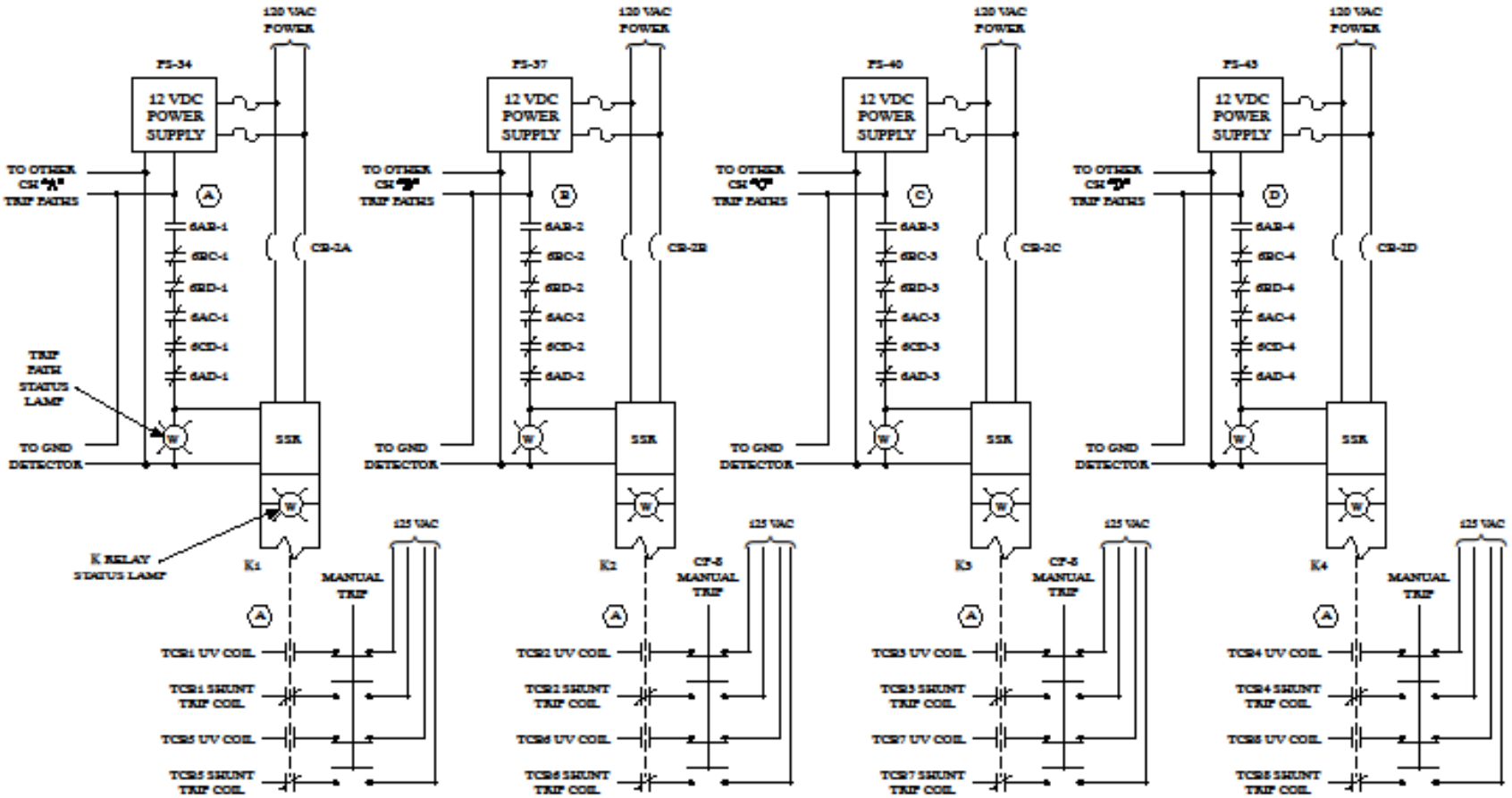

Figure 12.4-9 RPS Trip Path Status With Trip in the AB Matrix

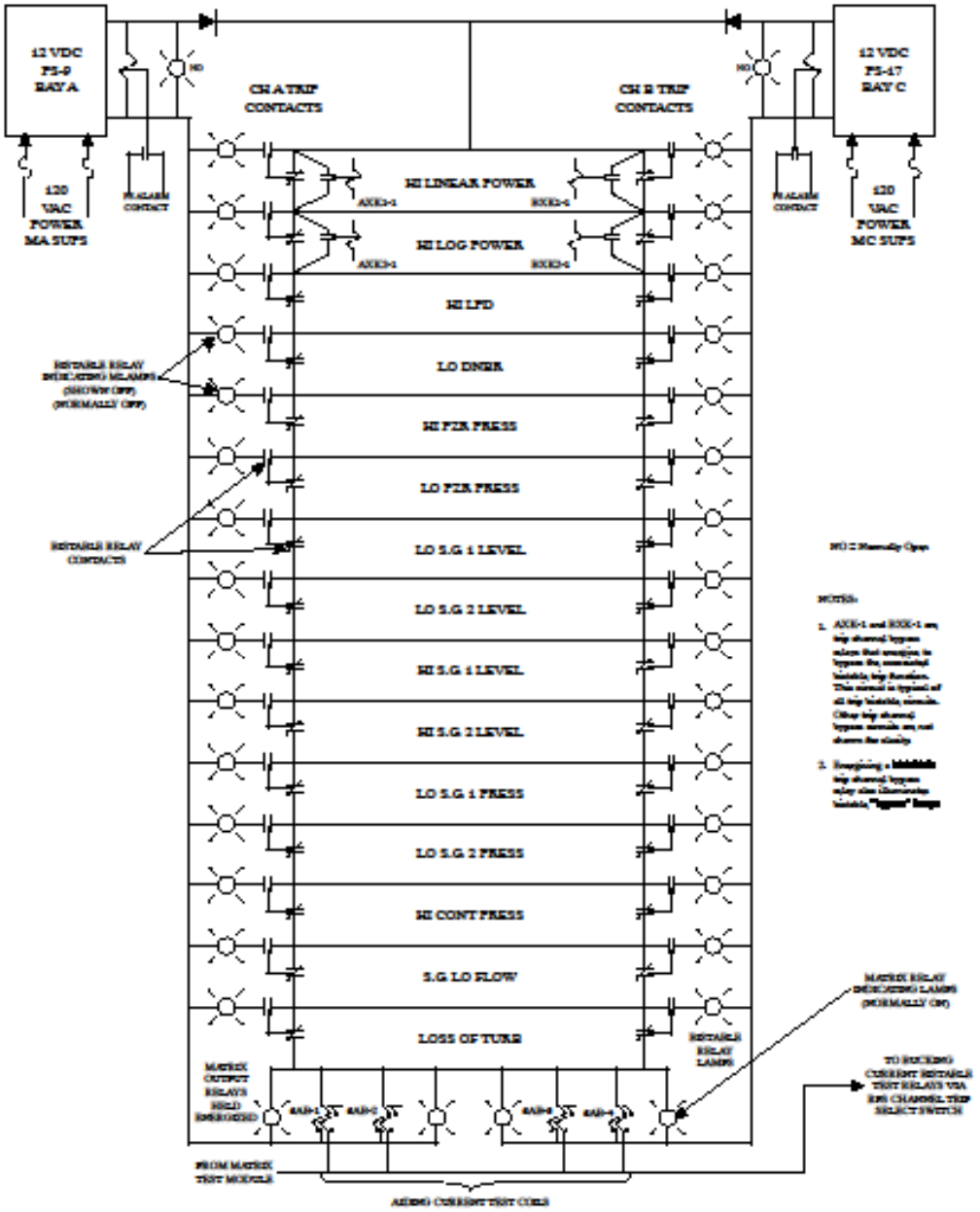

Figure 12.4-10 RPS AB Logic Matrix - Normal (untripped)

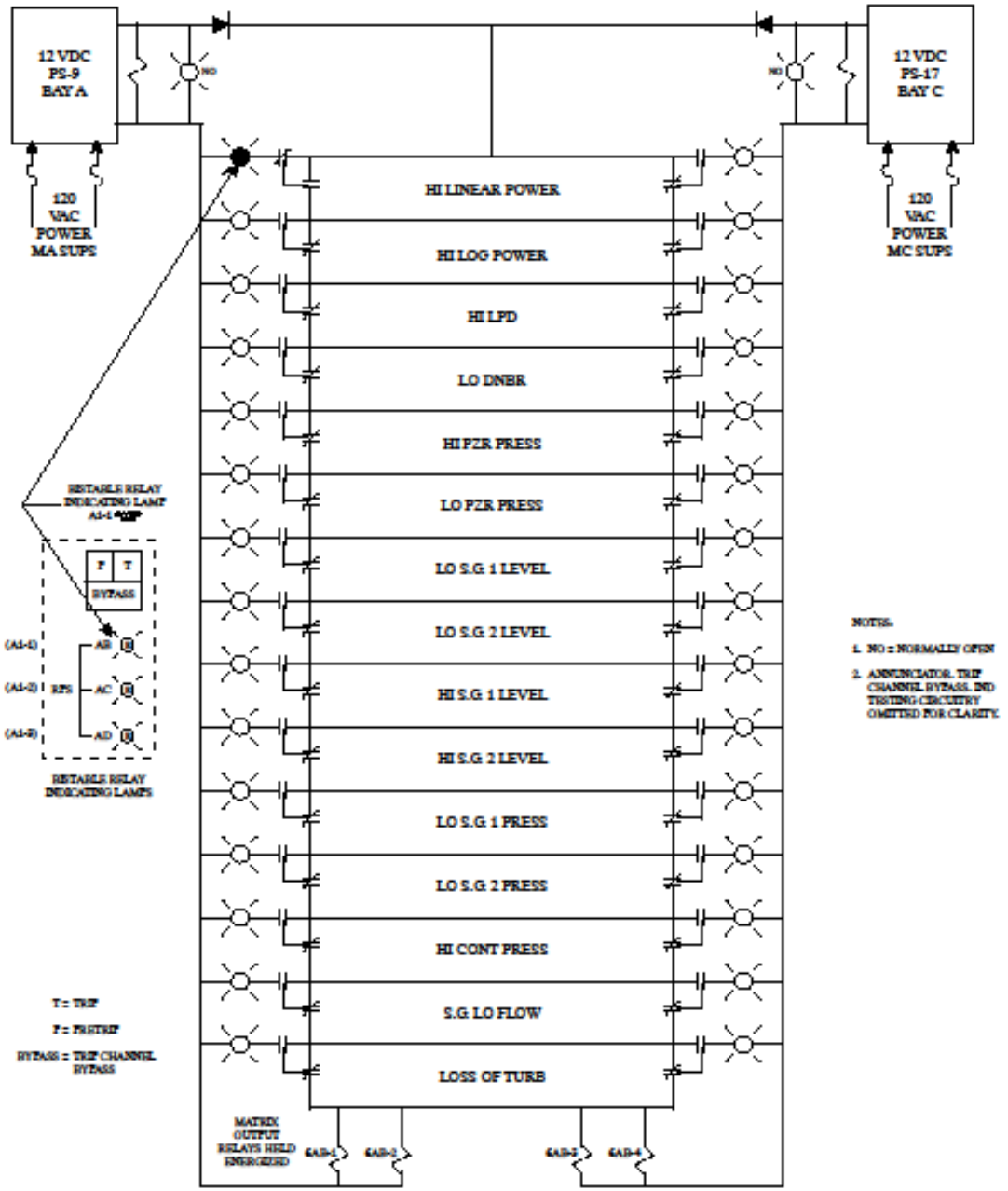

Figure 12.4-11 RPS Logic Matrix With High Linear Power Channel A Tripped

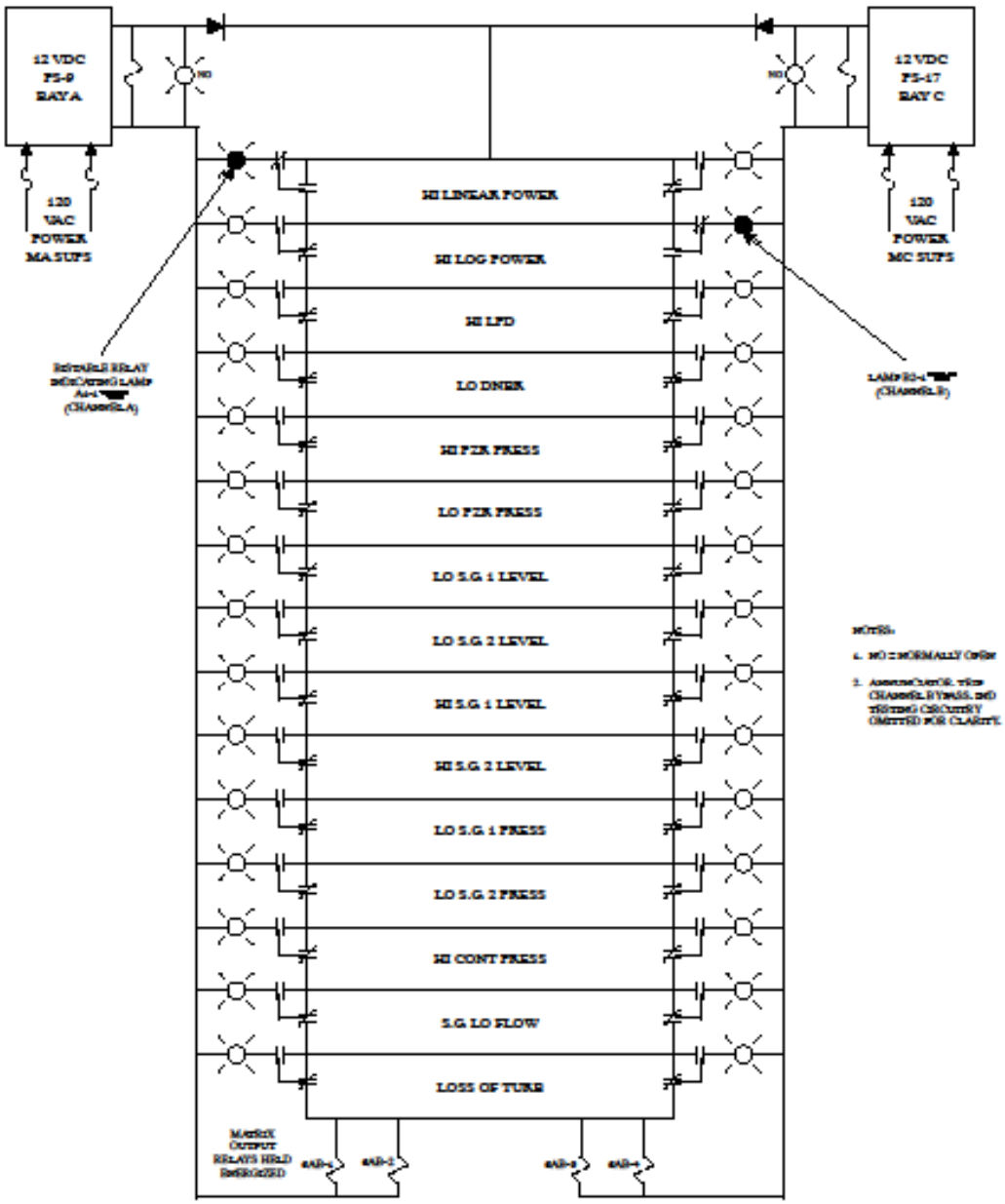

Figure 12.4-12 RPS Logic Matrix With Linear Power Channel A and High Log Power Channel B Tripped

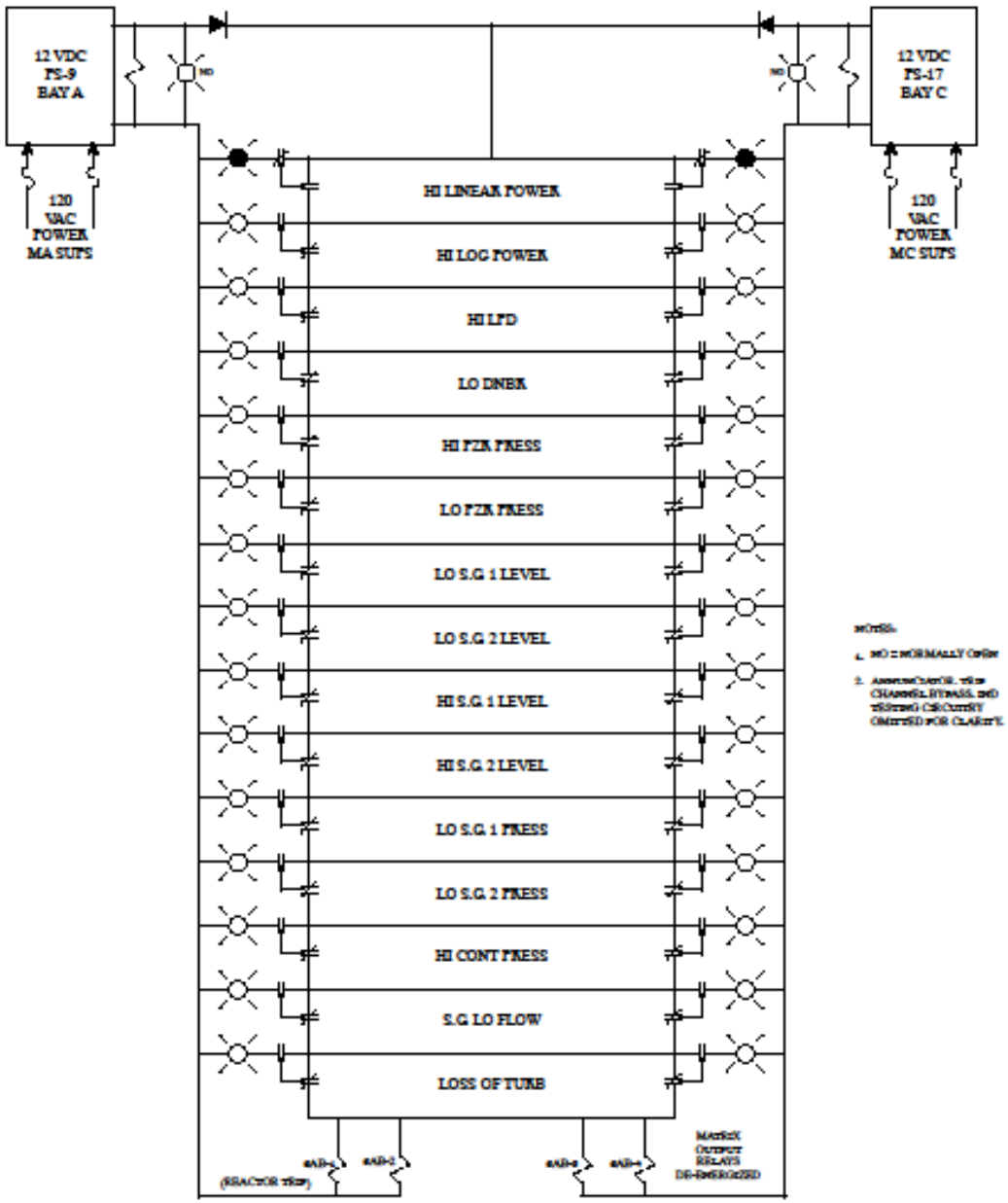

Figure 12.4-13 RPS AB Logic Matrix With High Linear Power Channel A and Channel B Tripped

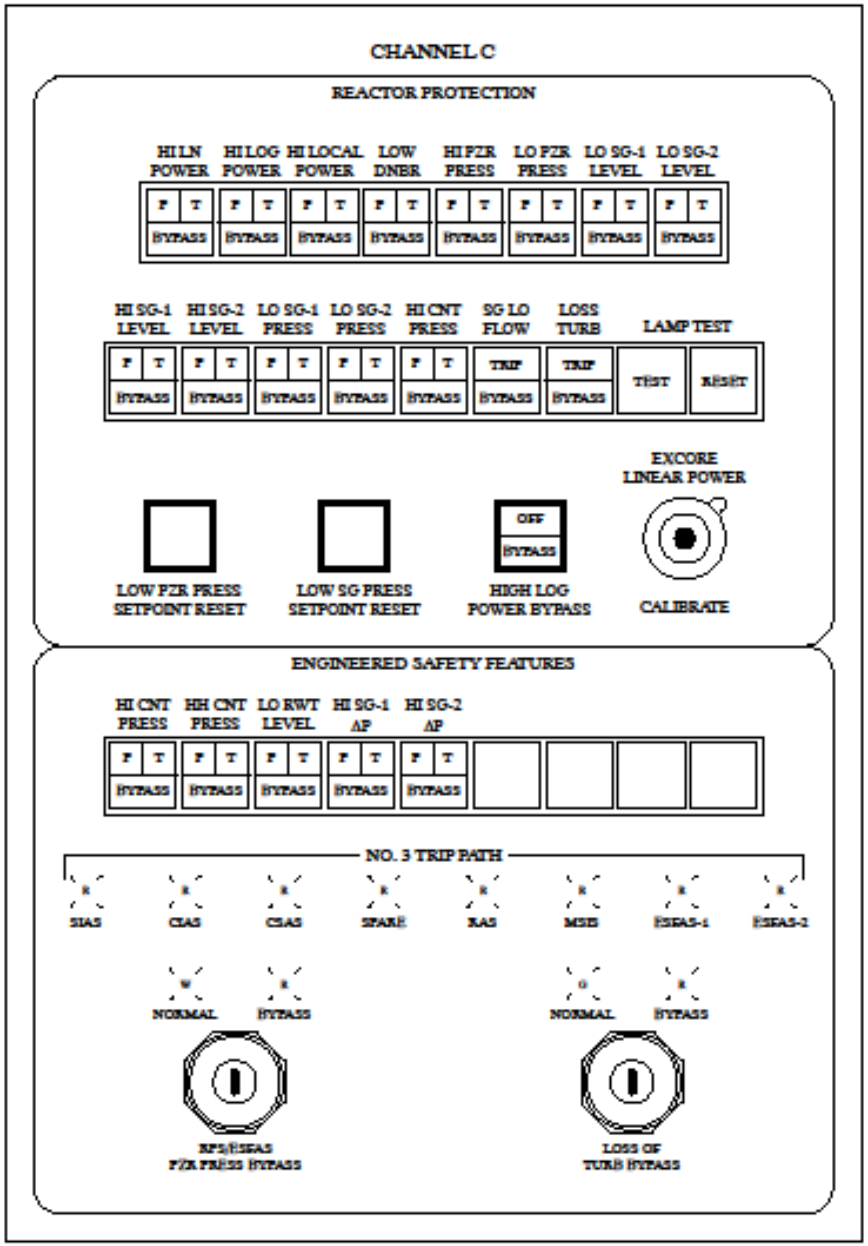

Figure 12.4-14 PPS **Remote Operator's Module**

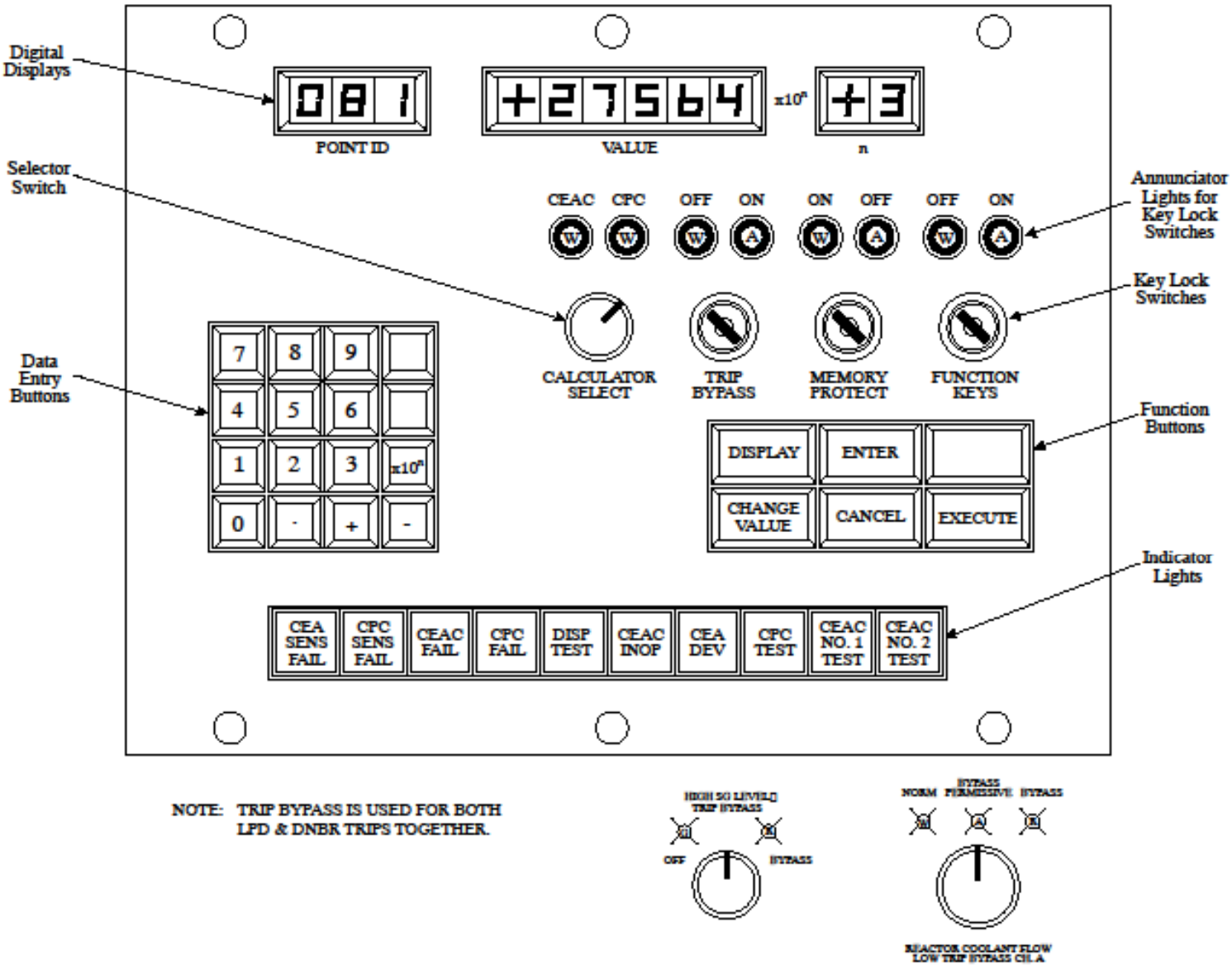

Figure 12.4-15 CPC **Remote Operator's Module**

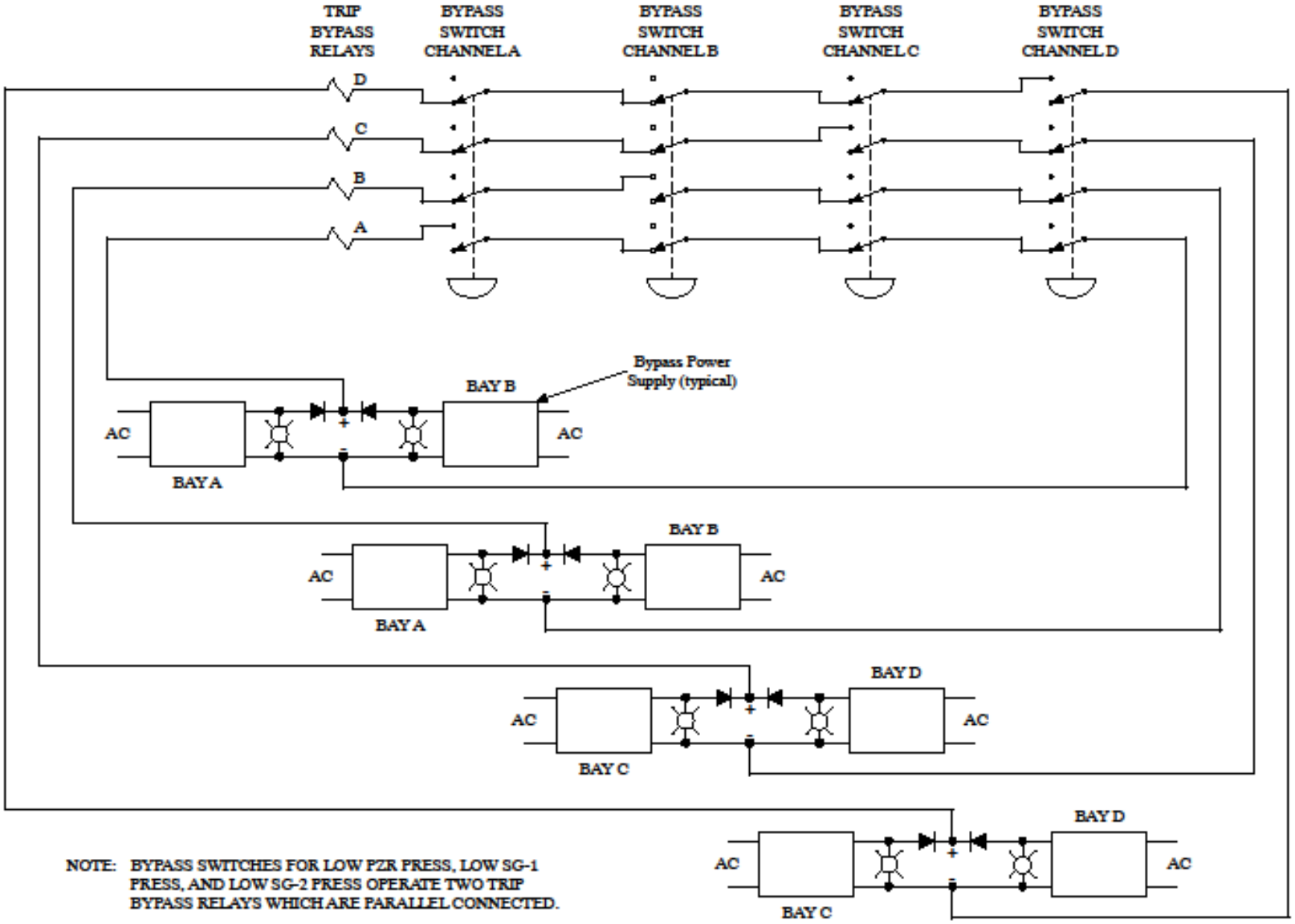

Figure 12.4-16 Trip Channel Bypass Electrical Interlock

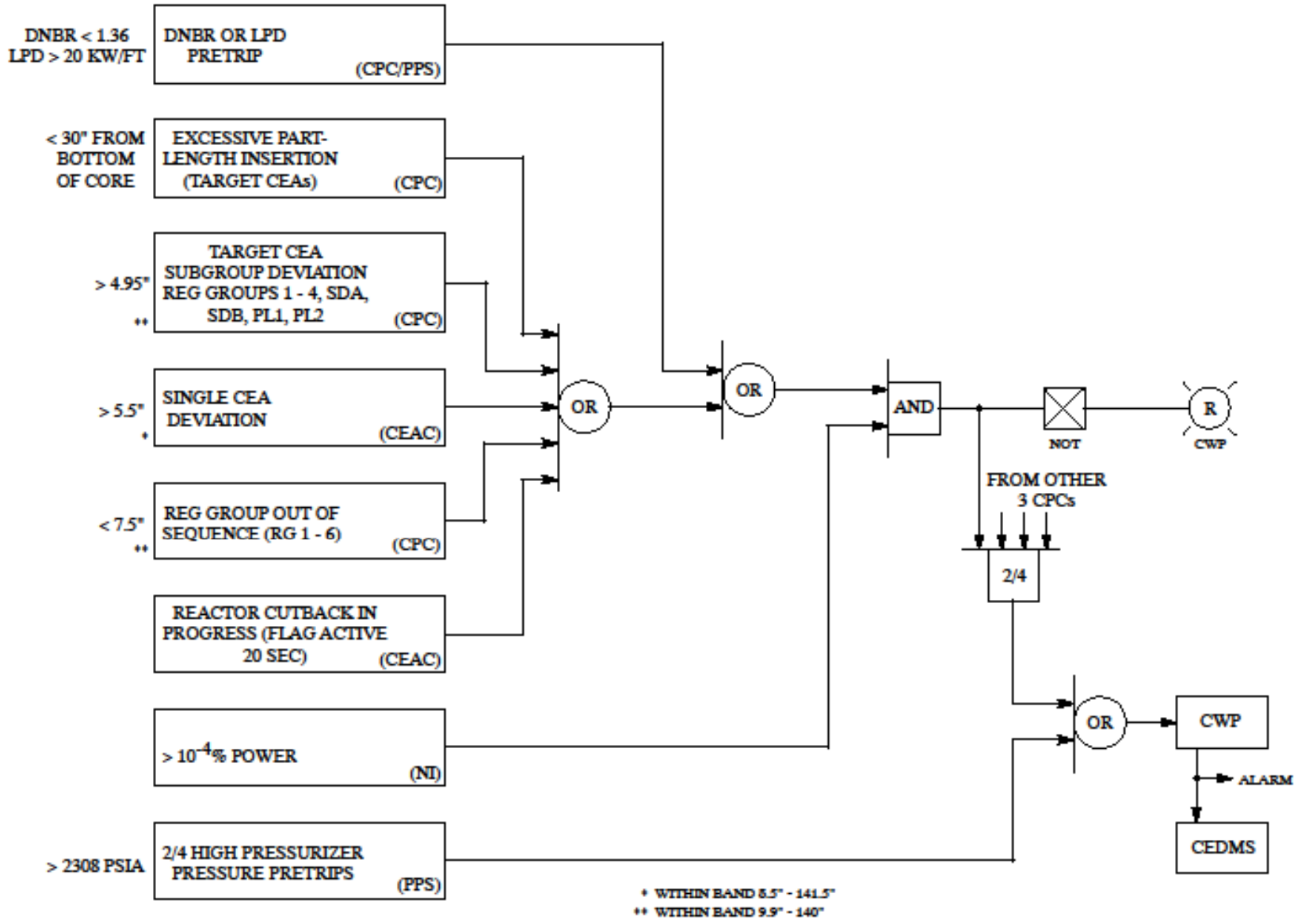

Figure 12.4-17 CEA Withdrawal Prohibit Logic Diagram

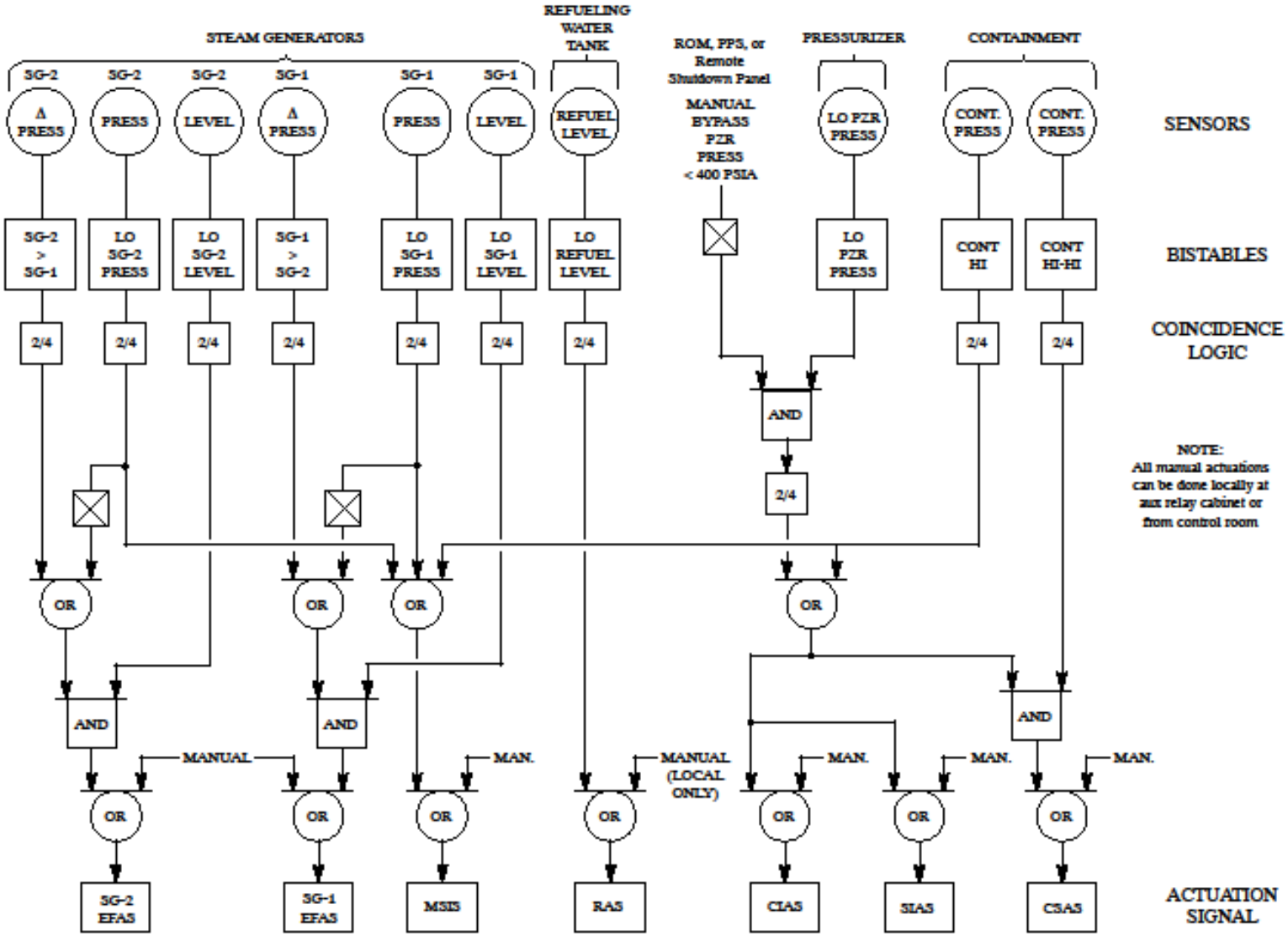

Figure 12.4-18 ESFAS Logic Diagram

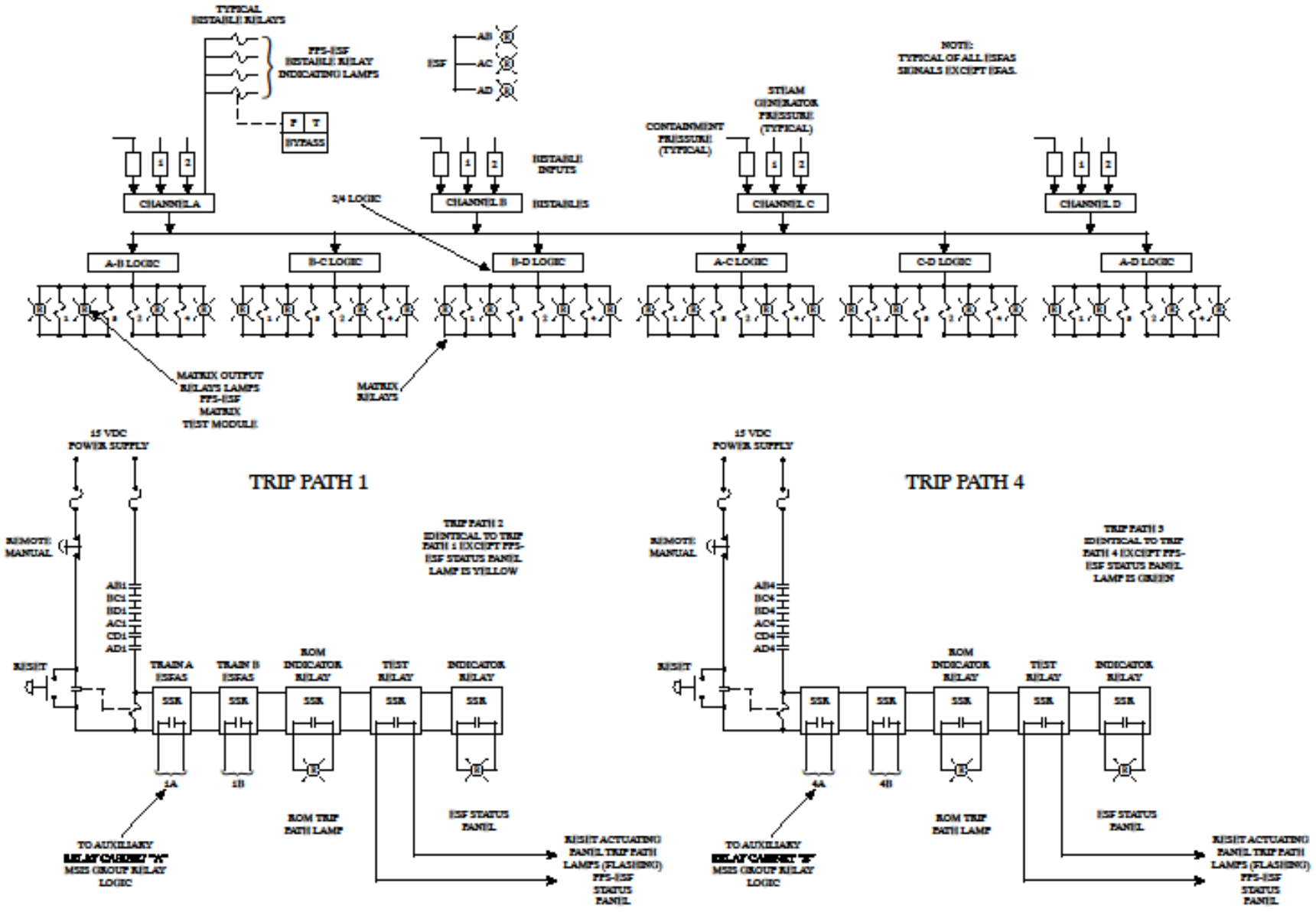

Figure 12.4-19 ESFAS Functional Diagram

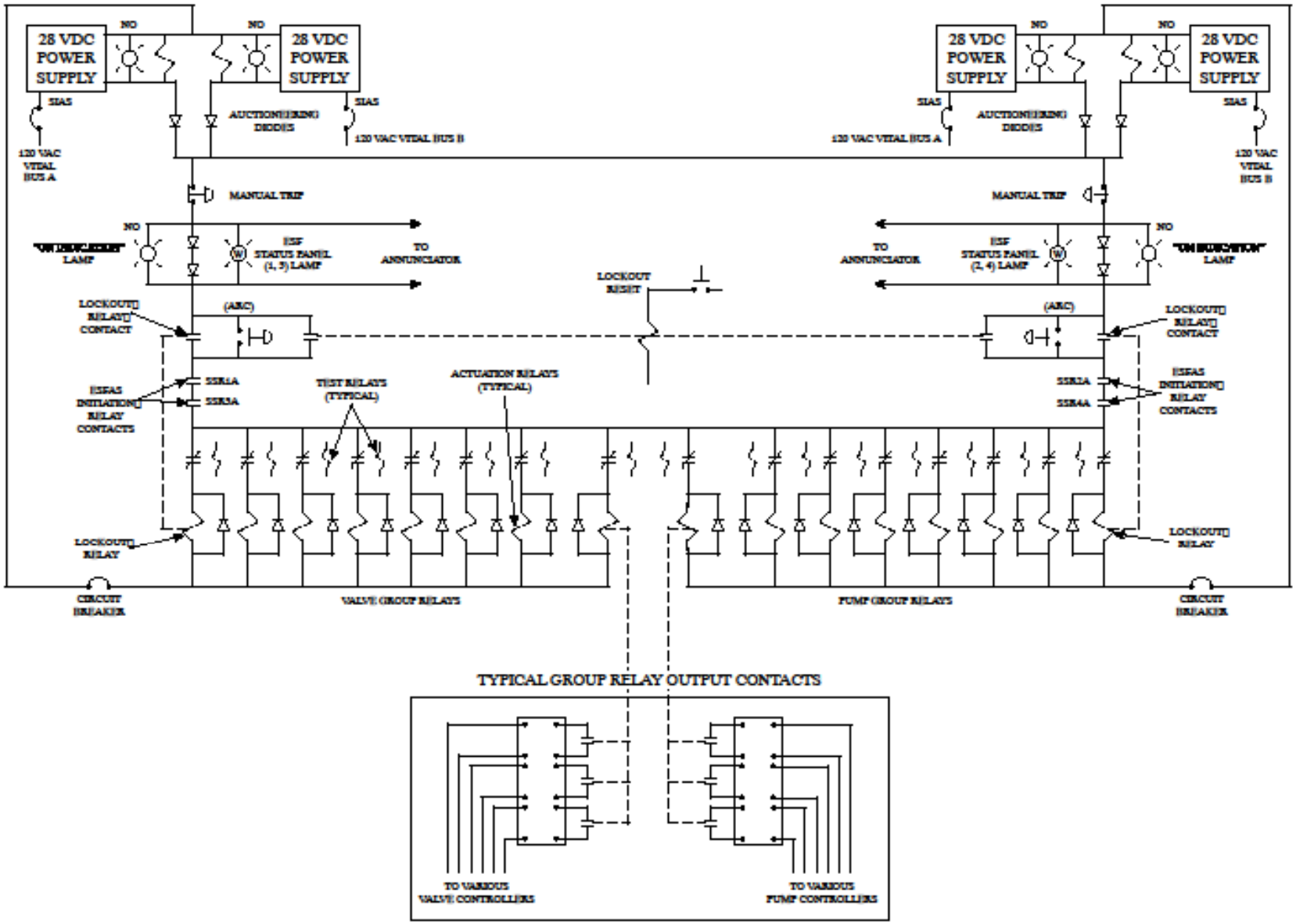

Figure 12.4-20 ESFAS Actuation Relay Cabinet Schematic - SIAS Circuit

The End