

Excure Core Neutron Monitoring System

Chapter 9.1



Objectives

1. List the purposes of the excore nuclear instrumentation system.
2. Explain the basic operation of the following excore neutron detectors and state the detector type used in each range of the excore neutron monitoring system:
 - a. B10 proportional counter
 - b. Fission chamber
 - c. Uncompensated Ion chamber

Objectives (Continued)

3. Describe the following excore nuclear instrumentation system interfaces and interlocks:
 - a. Wide range logarithmic channel high voltage interlock
 - b. Wide range logarithmic channel and linear power range safety channel overlap.
 - c. Wide range channel and linear power range safety channel reactor protection system (RPS) inputs.
 - d. Non-safety related linear power range safety channel interfaces.

Objectives (Continued)

4. Explain how the excore nuclear instrumentation is capable of detecting both radial and axial power distributions.
5. Explain how the linear power range safety channel is calibrated to indicate reactor thermal power.
6. List the power range linear control channel outputs.

Purposes

1. To monitor neutron flux from the source level to 200% of full power.
2. To provide indication in the control room of neutron power and the rate of change of neutron power.
3. To provide power level signals to the reactor regulating system (RRS).
4. To provide power level signals and the rate of change of power signals to the reactor protection system (RPS).
5. To provide information on axial power distribution to the control room and the RPS.

Figure 9.1-1 Typical Channel Flux Coverage With Detectors

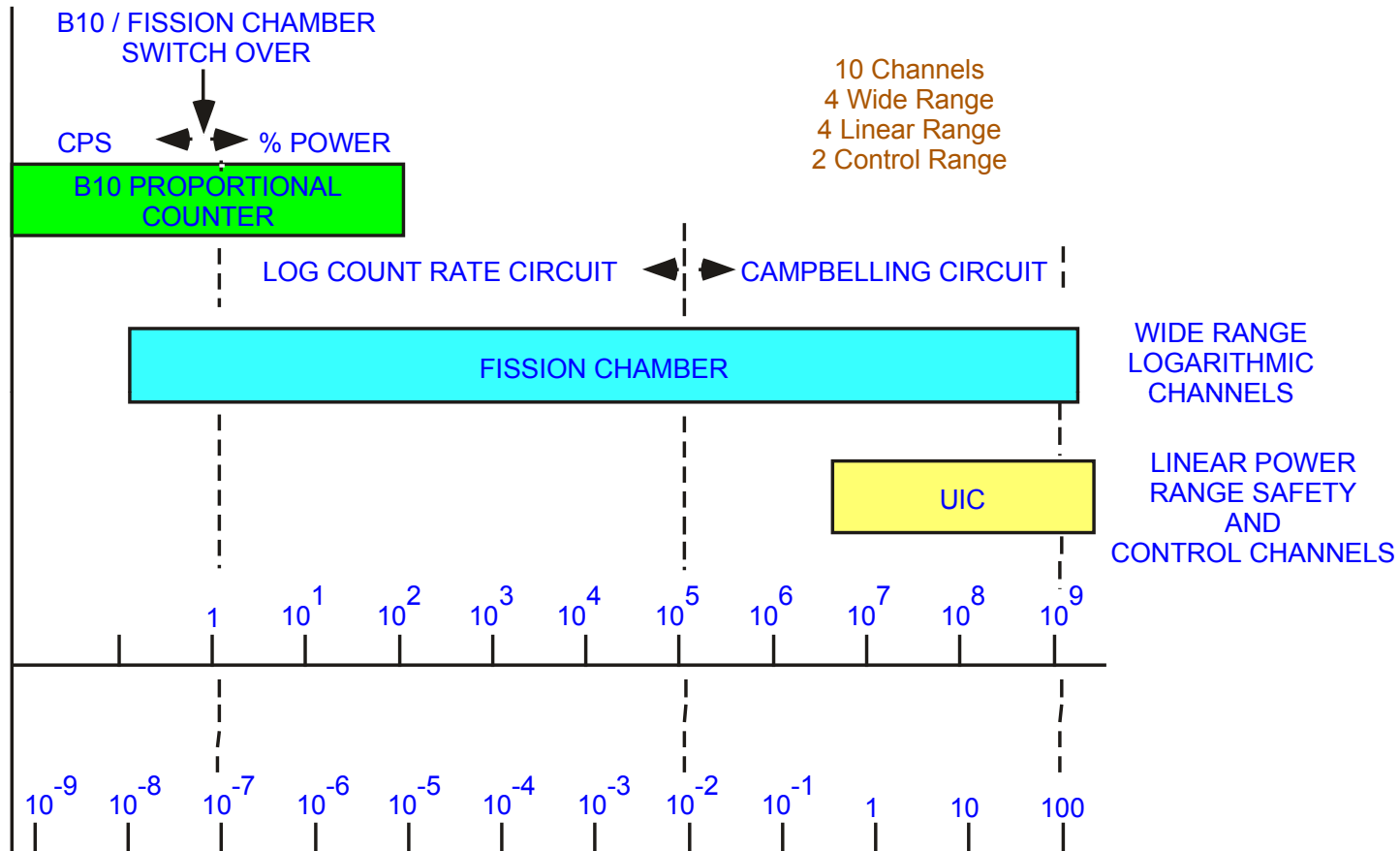


Figure 9.1-2 Ion Pairs Versus Applied Voltage

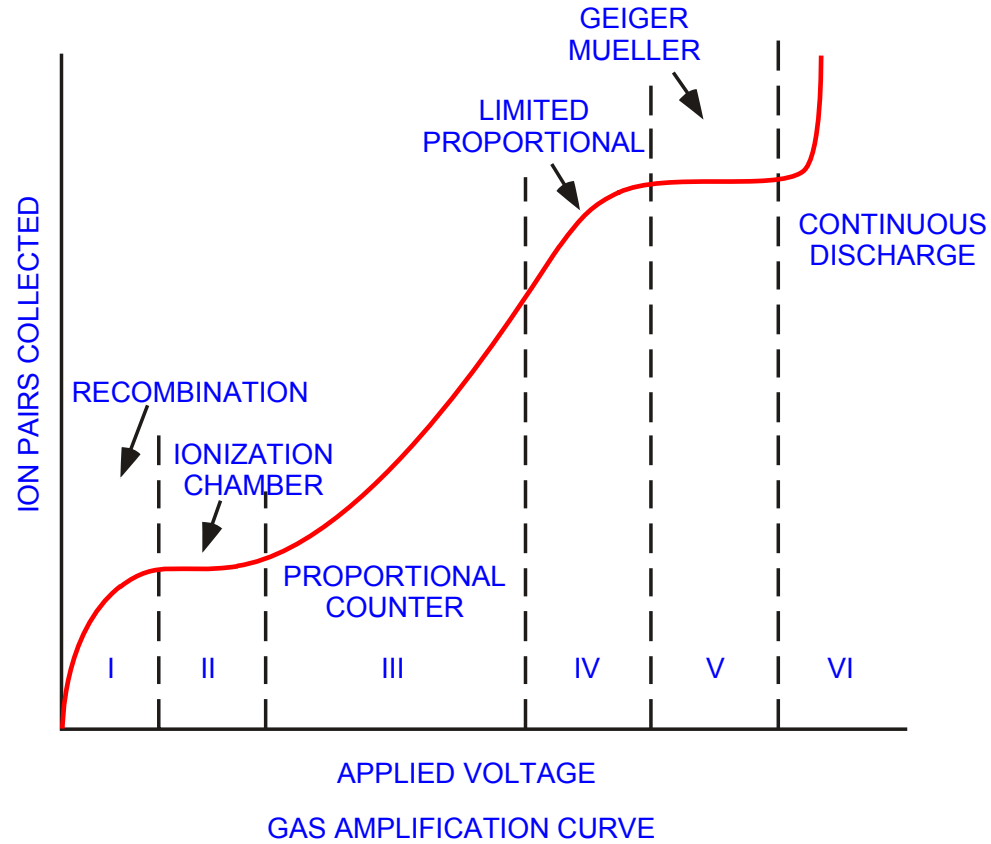
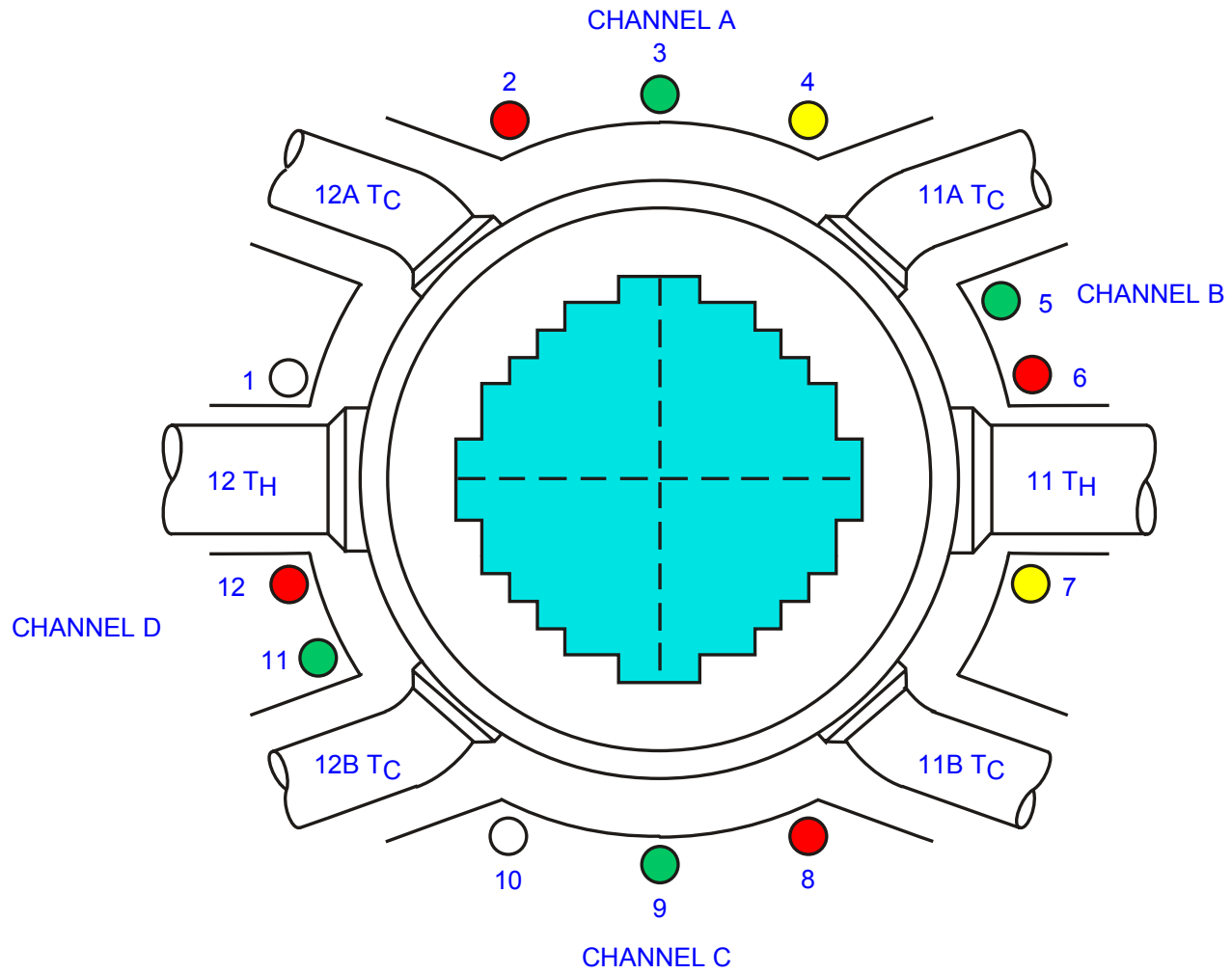


Figure 9.1-3 Excore Detector Location



WIDE RANGE LOG CHANNELS 3,5,9,11
LINEAR POWER RANGE SAFETY CHANNELS 2,6,8,12
LINEAR POWER RANGE CONTROL CHANNELS 4,7
SPARE LOCATIONS 1,10

Figure 9.1-4 Typical B10 Proportional Counter

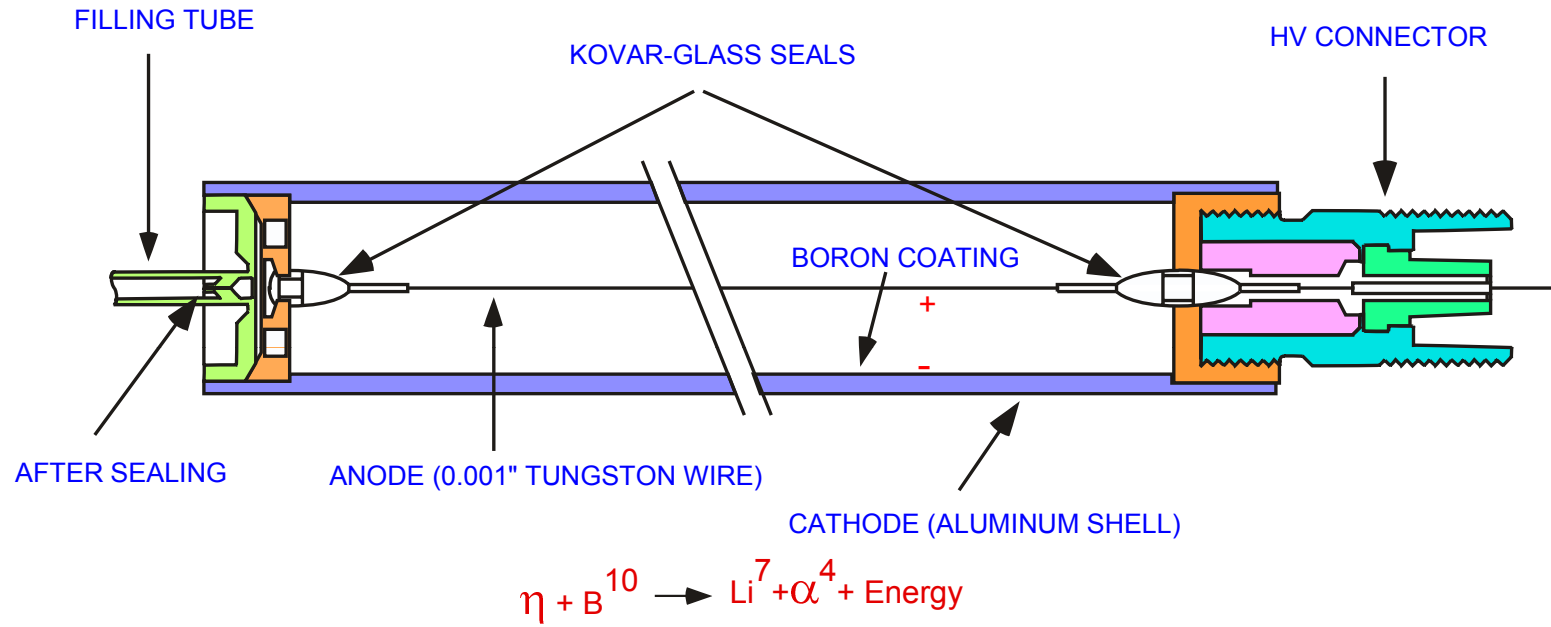


Figure 9.1-5 Fission Chamber (Neutron Sensitivity 0.7 Counts/NV)

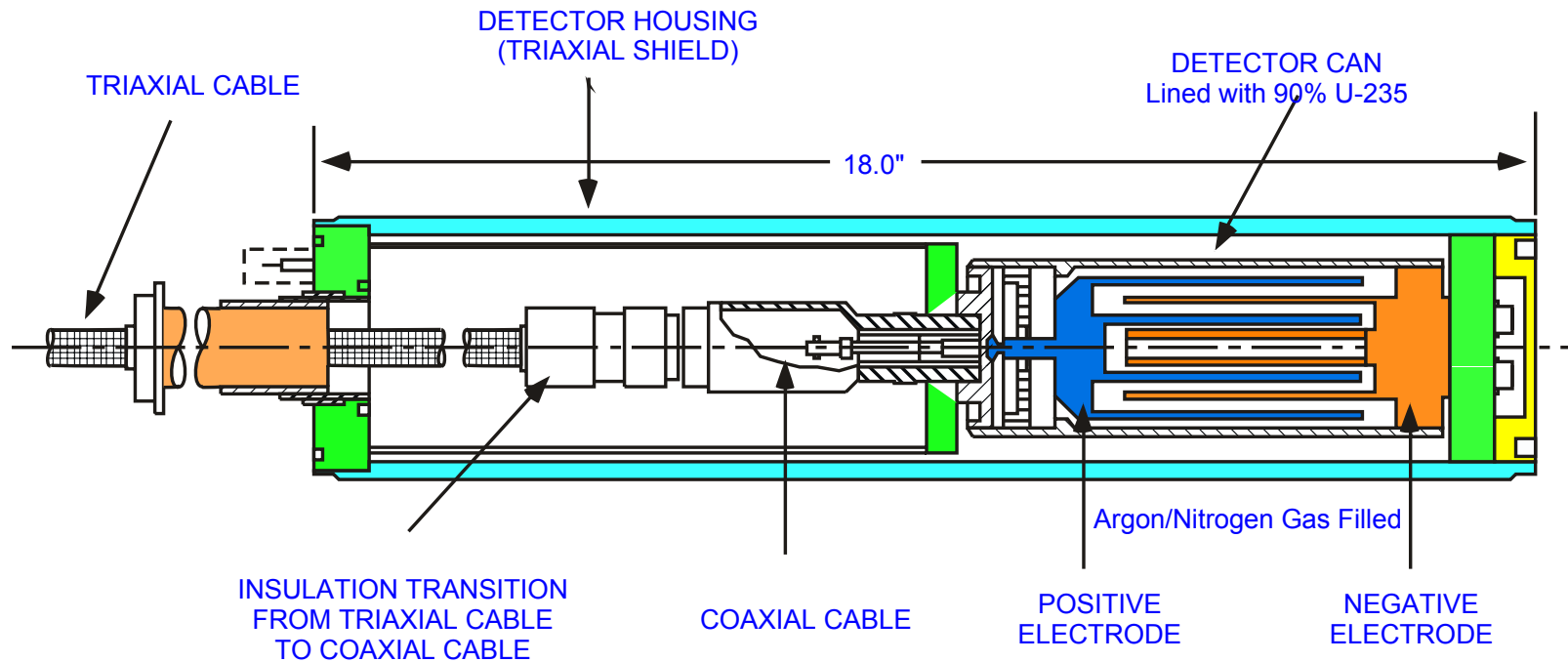
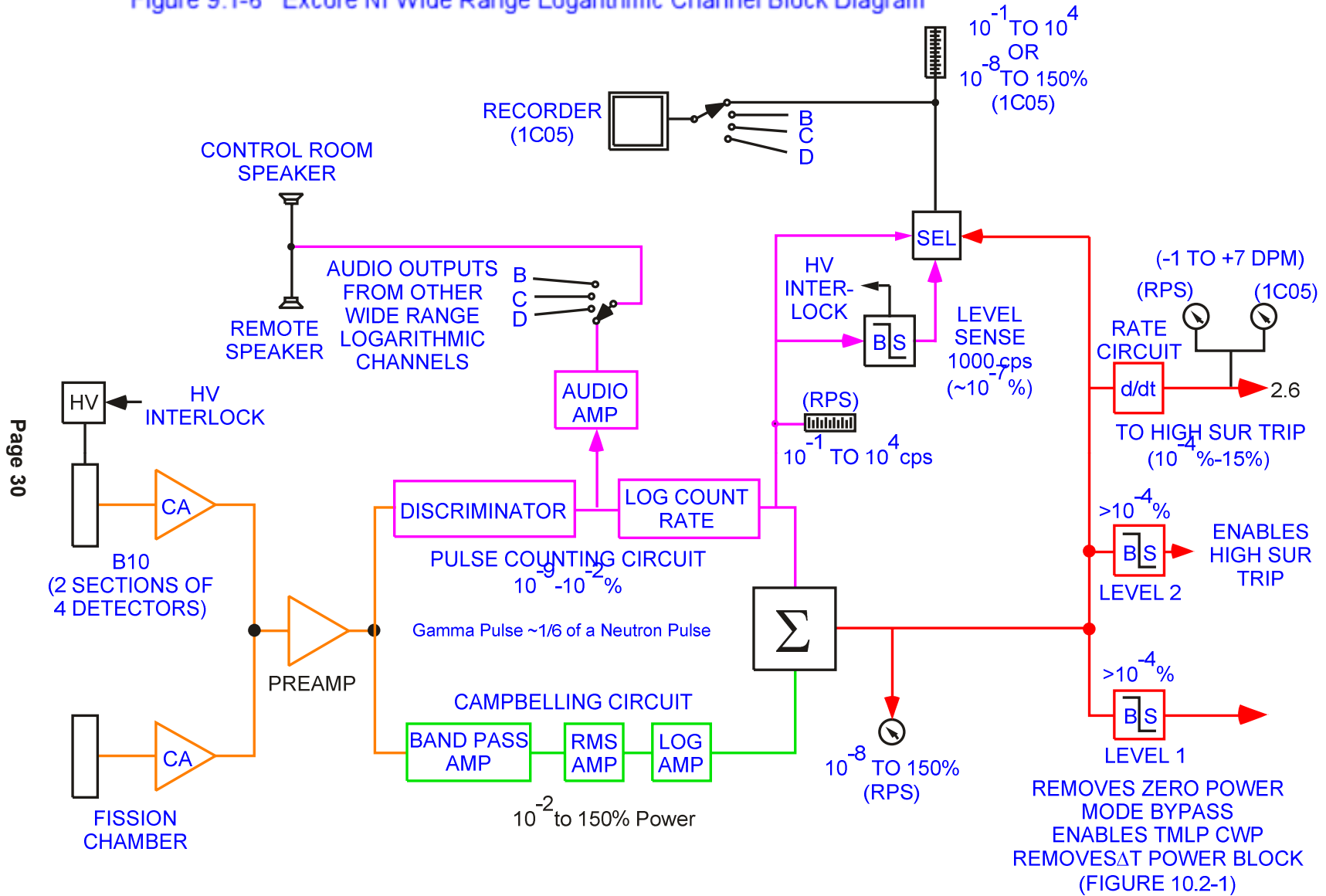


Figure 9.1-6 Excore NI Wide Range Logarithmic Channel Block Diagram



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Figure 9.1-7 Uncompensated Ionization Chamber
Neutron Sensitivity $3.5E-13$ A/NV
Gamma Sensitivity $1.2E-10$ A/NV

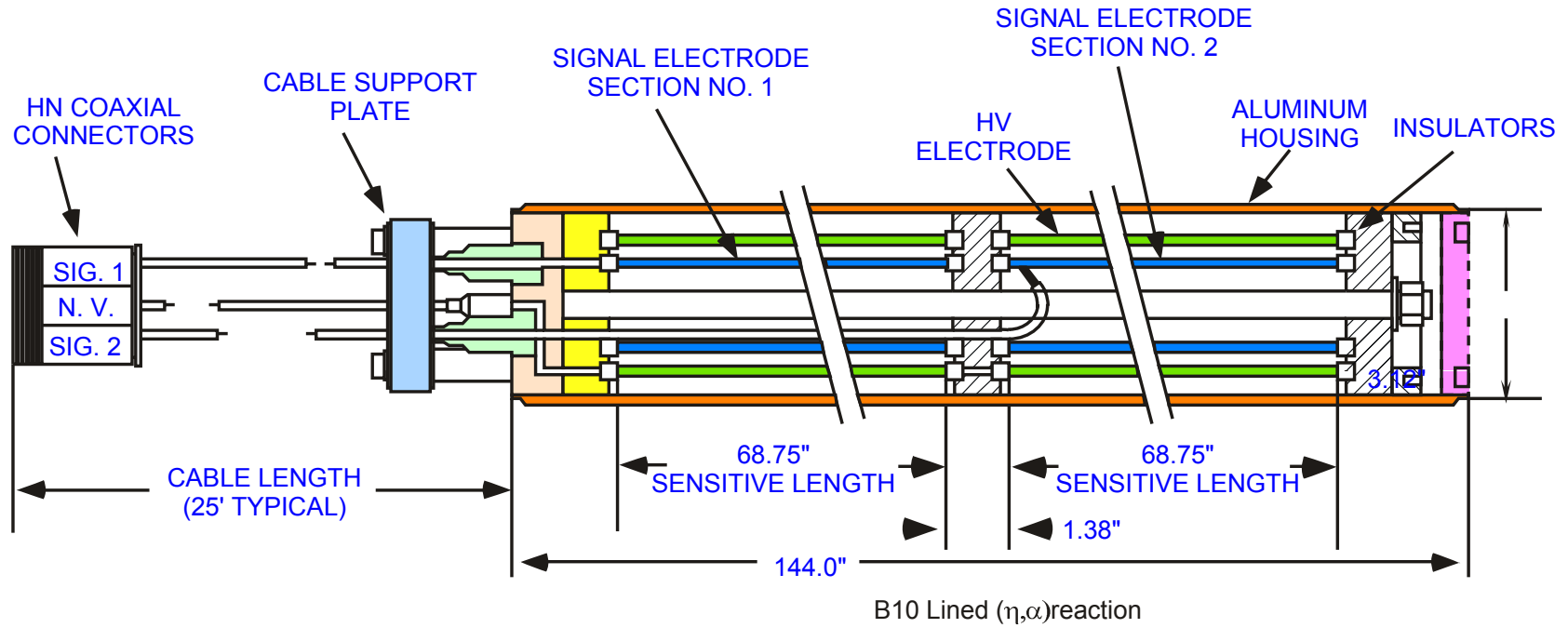


Figure 9.1-8 Excore NI Narrow Range Linear Channel Block Diagram

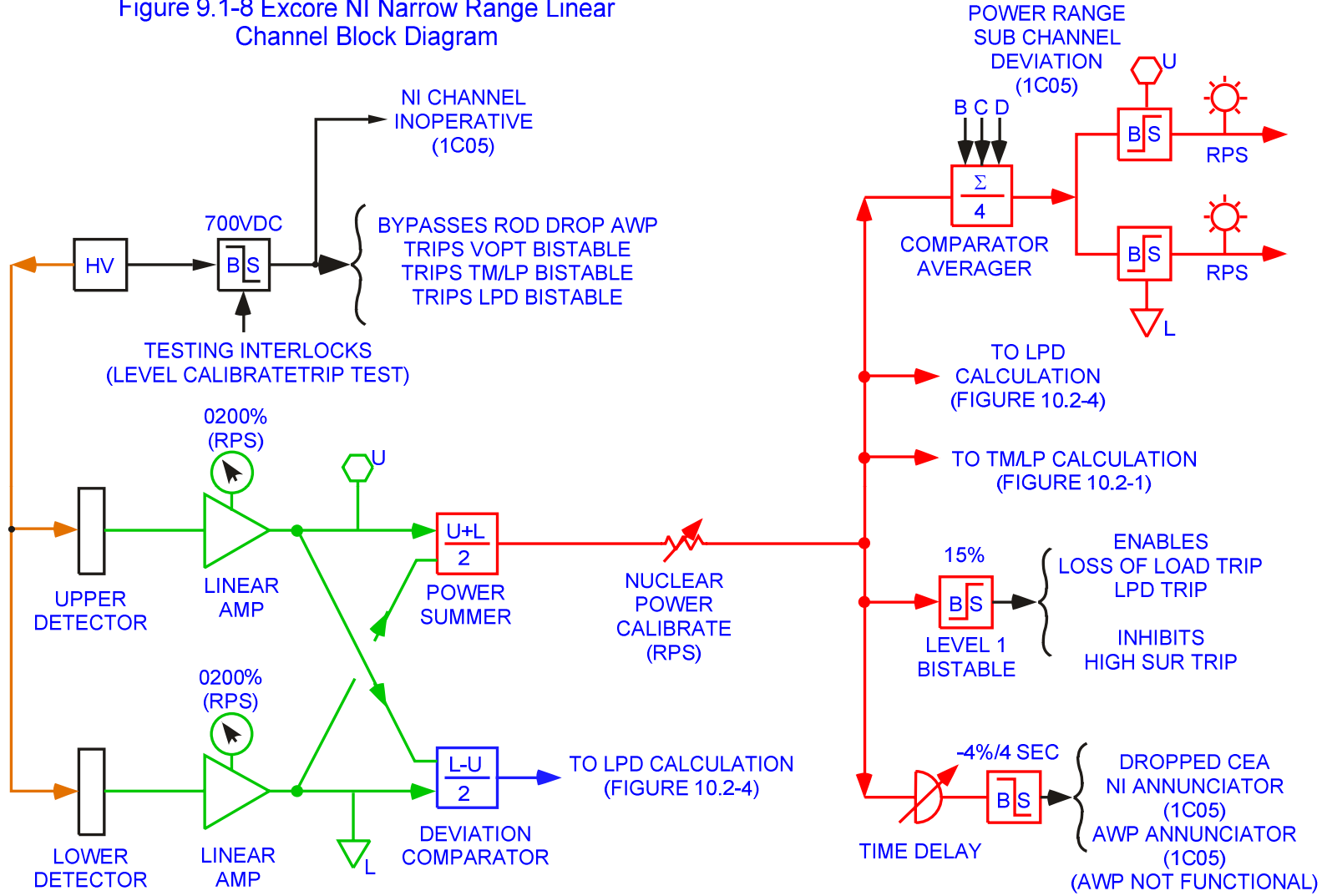
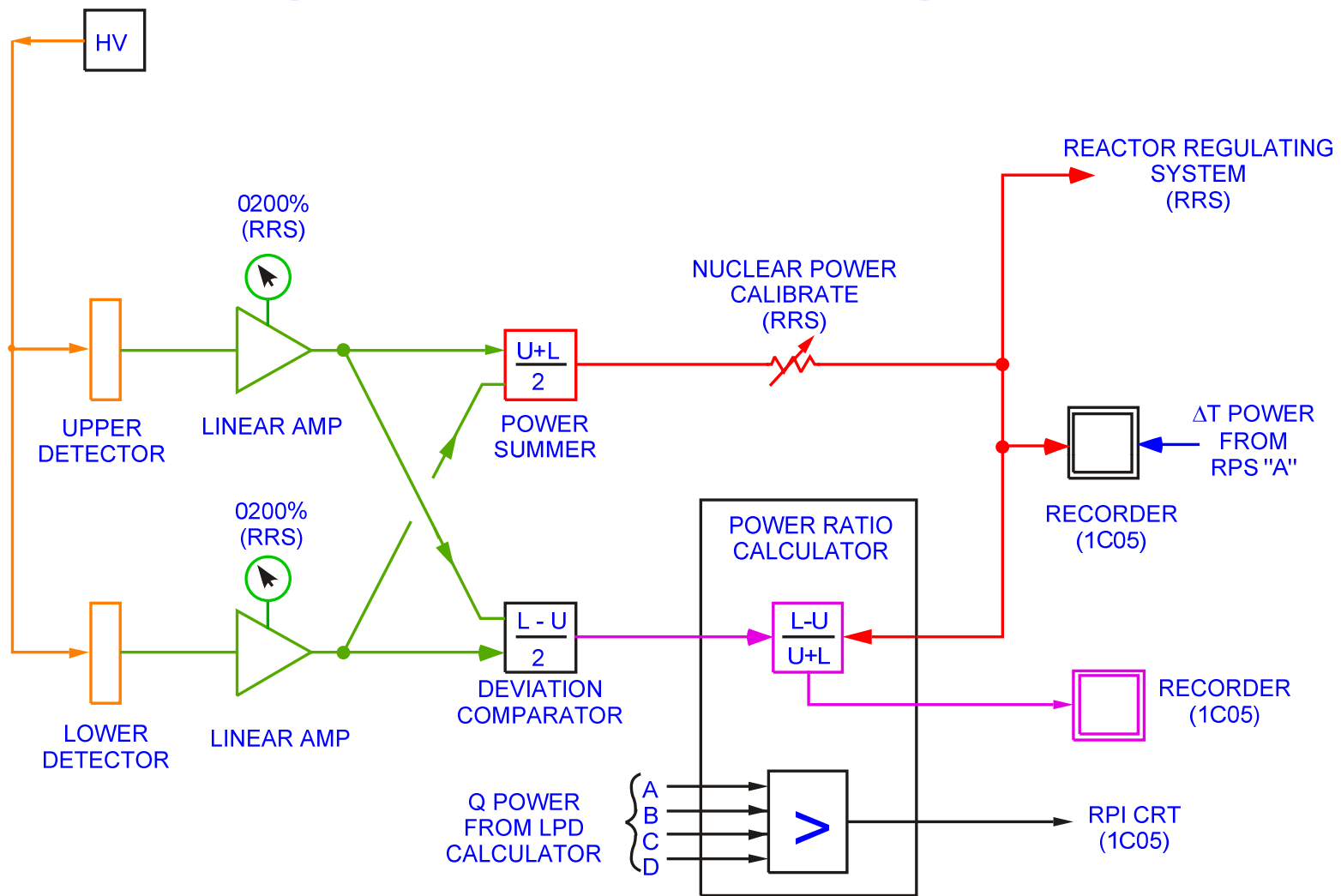


Figure 9.1-9 Linear Power Control Channel Block Diagram



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