

# Global Instrumentation and Control

## Nuclear Instrumentation System

### Power Range Increased Sensitivity

#### Background

The Westinghouse original ex-core Nuclear Instrumentation System (NIS) has been protecting nuclear plants for over 50 years. Industry experience has proven the design to be robust, reliable and effective.

Low leakage fuel patterns reduce neutron flux to the power range detectors. This decreased flux results in lower power range detector currents. At some plants, the detector current levels approach the lower limit where the drawer gain adjustments cannot be turned up high enough for proper operation.

Westinghouse offers two solutions to prevent or resolve low detector current issues:

- Power range increased sensitivity kit
- Power range detector moderator

These two options can be implemented together or separately.

#### Description

##### Power Range Increased Sensitivity Kit

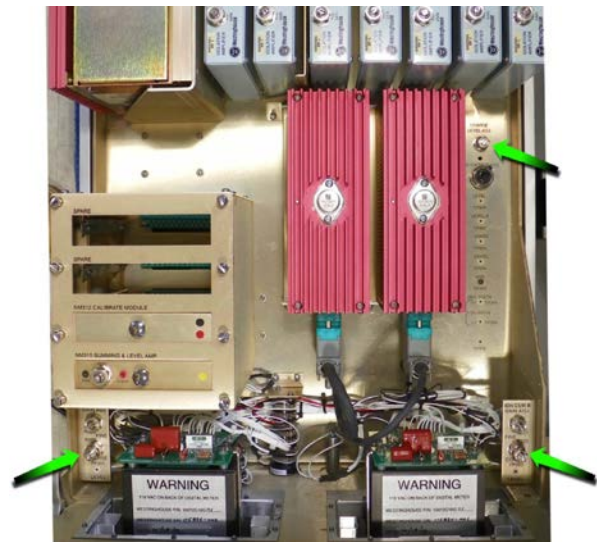
This kit increases the electrical gain of the power range B drawers. In the original configuration, the drawers cannot function with detector currents lower than 83.3 microamps per detector section at 100-percent power. With the increased sensitivity kit, the drawers can function with currents as low as 25 microamps.

The kit replaces three gain adjustment potentiometers and two fixed resistors.

The kit can be installed on-site or factory installed during new drawer builds or refurbishments.

The increased sensitivity kit is seismically and environmentally qualified as class 1E in accordance with the IEEE 323-1974 and 344-1975 requirements.

Westinghouse can provide licensing support, field change notices, drawing updates, technical manual updates and installation services.



*The increased sensitivity kit replaces three potentiometers and two fixed resistors (not shown) to increase signal gain in the power range B drawer.*

## Power Range Detector Moderator

Westinghouse can provide a seismically and environmentally qualified power range detector moderator. The moderator increases the capture and epithermal-to-thermal neutron conversion resulting in greater accuracy for core power monitoring.

The moderator system is designed for easy installation using the existing power range detectors and detector wells.

The moderator consists of a high-density polyethylene encapsulated in a dual-walled canister. The detector is installed inside this canister. Existing detector insulator rings are replaced with smaller rings to maintain electrical isolation of the detector from the canister.

The canister can be made of aluminum, stainless steel or titanium. The weight of an aluminum canister is approximately 110 pounds (50 kilograms). The canisters are approximately 127 inches (323 centimeters) long and 6.75 inches (17 centimeters) in diameter. The canister is supplied with lift cables for easy installation and removal from detector wells.

The moderator thickness is designed for optimal sensitivity. This modification can increase the power range detector currents by up to eight times.

## Benefits

### Power Range Increased Sensitivity Kit

- Enables power range drawers to function with currents as low as 25 microamps per detector section. Without the kit, the drawers cannot properly function with detector currents below 83.3 microamps at 100-percent power.
- No changes to drawer calibration procedures are needed.
- Simple installation involves replacing five components in each of the four power range B drawers.

### Power Range Detector Moderator

- Increases detector currents up to eight times
- Increases power measurement accuracy and resolution
- Greatly improves signal-to-noise ratio
- Resolves power range drawer calibration problems due to low detector currents
- Designed for easy installation with existing power range detectors and detector wells
- Includes lift cables

## Experience

- Over 20 reactor units have the increased sensitivity kit
- 10 reactor units have installed the power range detector moderator