Background

The Westinghouse original ex-core Nuclear Instrumentation System (NIS) has been protecting nuclear plants for over 40 years. Westinghouse continues to support the NIS with obsolescence replacements and upgrades such as the bypass test panel.

Normally, an NIS channel is placed in the tripped state for testing or if inoperable. Considering the 2-out-of-4 coincidence logic for NIS power range reactor trips, this creates a single channel operational vulnerability. A single human error, spurious transient or channel failure could trigger an inadvertent reactor trip.

The bypass test panel allows testing and maintenance of NIS channels in a bypassed mode with no increased risk of an inadvertent reactor trip. Licensing changes associated with the bypass test panel extend the time a channel can be bypassed for testing up to 12 hours. The time a channel can be bypassed for maintenance is extended up to 72 hours.

Source, intermediate and power range bistable signals can be bypassed for no-risk testing and maintenance.

Pull-to-toggle switches and a key lock switch protect against unintentional operation.
**Description**

A bypass test panel is installed in the rear of each of the four NIS cabinet bays. Each bistable that produces a reactor trip, permissive or rod stop signal has a bypass toggle switch and indicator on the panel. A master key lock switch must be turned for any of the bypass switches to be active.

When a bistable is bypassed, the bypass test panel provides the 120 Vac signal to the reactor trip system and then disconnects the bistable output. A make-before-break system is used to prevent signal interruption.

Because the bypass signal to the reactor trip system is provided by the bypass test panel and not the drawer, an entire drawer can be removed without creating a partial trip condition.

The bypass test panel is designed to minimize wiring changes by using existing cables and connectors as much as possible. A contact output is provided for a bypass annunciator in the control room.

Bypass test panels for only the power range (without the source and intermediate ranges) are available. A similar bypass test modification is available for the 7300 process protection system.

The bypass test panel is a qualified class 1E system that conforms to applicable General Design Criteria, U.S. Nuclear Regulatory Commission Regulatory Guides and Institute of Electrical and Electronics Engineers standards.

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

**Benefits**

- Reduces the chance of inadvertent reactor trips.
- Allows routine testing and maintenance of NIS channels in a bypassed condition instead of a tripped condition.
- Extends to 12 hours the time an NIS channel can be bypassed for testing.
- Extends to 72 hours the time an NIS channel can be bypassed for maintenance.
- Bypassed drawers can be removed or powered down for maintenance without interrupting bypass signals.

**Experience**

Seven plants have the bypass test panels installed, and four plants are preparing for installation.

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*Bypassing power range signals during testing and maintenance avoids risky single-channel plant trip conditions.*