

Nuclear Automation

Nuclear Instrumentation System

Bypass Test Panel

Background

The Westinghouse original ex-core Nuclear Instrumentation System (NIS) has been protecting nuclear plants for more than 50 years. Westinghouse continues to support the NIS with obsolescence replacements and upgrades such as the bypass test panel.

With the current design, an NIS power range channel is placed in the tripped state for testing or if it is not restored to operable status within the specified Completion Time. Due to the 2-out-of-4 coincidence logic for the NIS power range reactor trip functions, this reduces the coincidence logic to a 1-out-of-3, and results in a trip state vulnerability. A single human error, spurious transient or channel failure could result in an inadvertent reactor trip.

The bypass test panel allows testing and maintenance of the NIS power range channels in a bypassed state, eliminating the potential for an inadvertent reactor trip.



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 potential for inadvertent reactor trips.
- Allows routine testing and maintenance of NIS power range channels in a bypassed condition instead of a tripped condition.

- Bypassed drawers can be removed or powered down for maintenance without interrupting the bypass signals.

Experience

NIS power range bypass test panels are installed in at least 15 Westinghouse Nuclear Steam Supply System units.



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