

# ALS-302 Contact Input Board

## Background

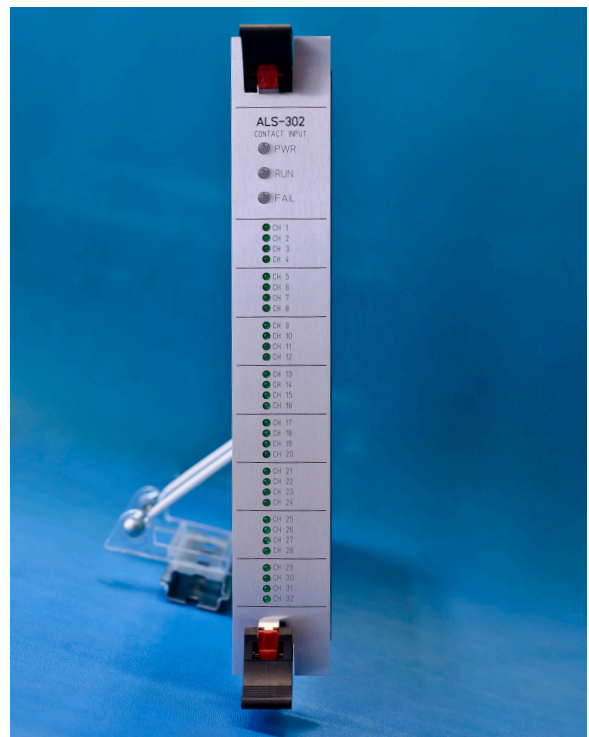
The ALS-302 contact input board is a member of the Advanced Logic System® (ALS®) platform, providing sensing of 32 independently isolated dry field contacts. The target application for the ALS-302 is remote contact sensing of discrete signals, i.e., digital on/off levels. Each input channel includes a configurable debounce filter, active contact state (normally open/normally closed), automatic self test and contact wetting supply.

## Description

All inputs are galvanically isolated from the ALS logic, and further divided into two galvanic isolation groups with high isolation between the groups. Input channels are optically isolated and capable of withstanding 1,500 Vrms between field and logic circuits. All contact input channels are surge protected to prevent permanent damage from momentary faults.

Each ALS-302 input channel includes a built-in self-test feature used to detect opens, shorts and stuck at faults. Self-test capabilities provide detection of single-point (and most multi-point) failures in the channel, the field programmable gate array logic circuits, the configuration of non-volatile memory and the power management logic. The integrity for each channel is indicated locally and reported to the core logic board.

The ALS-302 is designed by Westinghouse and is built and manufactured under Westinghouse control per an approved 10CFR50 Appendix B Quality Assurance program. The processes and procedures for the design and development have been reviewed and approved by the U.S. Nuclear Regulatory Commission for use in Class 1E systems.



ALS -302 contact input board

The ALS-302 incorporates a common implementation approach with all ALS platform boards. Component reuse and circuit design reuse is a key aspect of the ALS platform, providing long-term reliability and mitigation of obsolescence issues. Additionally, the common implementation provides a common look and feel to all ALS platform boards for ease of maintainability.

The ALS-302 was subjected to a board-level reliability analysis to achieve the highest level of reliability. Additionally, the ALS-302 was subjected to a failure modes and effects analysis (FMEA) at the individual component level.

### Benefits

The ALS provides a common platform solution for all Class 1E safety system applications in the nuclear power plant. The ALS is a hardware-based architecture that uses a minimal set of hardware to implement a system with high integrity and reliability. The platform is modular so that common individual boards can be mixed and matched to achieve an overall solution for a given application. The ALS is scalable so that replacements can be performed on a system-by-system basis.

The ALS-302 provides:

- 32 isolated contact input channels
- High reliability, optically isolated input channels
- Built-in 48V contact wetting voltage
- Configurable debounce filter
- Built-in automatic self test and fault detection
- Surge and over voltage protection
- Autonomous board operation
- Ability to be hot swapped

### Electrical Specifications

Number of input channels	32 channels	
Type of channels	Contact -sense	
Channel groups	2	
Wetting supply voltage	48 VDC (nominal)	
Contact wetting current	4 mA (nominal)	
Contact (OPEN)	> 20 kΩ	
Contact (CLOSED)	<2.5 kΩ	
Debounce filters	20 ms, 75 ms, 150 ms, and 500 ms	
Input over-voltage protection	120 VDC	
Isolation	Group to group	1,500 VRMS and 1,500 VDC
	Channel to logic	1,500 VRMS and 1,500 VDC
	Channel to earth	750 VRMS and 750 VDC

### Power Requirements

Power consumption	Less than 3 watts from ALS chassis power supply
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### Environmental

Standard operating temperature range	5 C to +60 C
Storage temperature range	-20 C to +70 C
Relative humidity range	10 to 95 percent, non-condensing

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