Industrial Smart Fuse
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SE STARK ENGINEERING

Software Design

Fuse Monitoring Module

- FreeRTOS
  - Real Time Operating System
- ADC
  - Method used to measure voltage on both sides of the fuse
- Discovery Protocol
  - CAN bus and discrete I/O protocol used to identify and index connected nodes
- CAN Communication
  - Protocol used to relay statuses to the ethernet module

Ethernet Control Module

- FreeRTOS
  - Real Time Operating System
- FreeRTOS+TCP Stack
  - TCP and UDP stack used for ethernet communication
- Discovery Protocol
  - CAN bus and discrete I/O protocol used to identify and index connected nodes
- CAN Communication
  - Protocol used to relay messages to fuse modules

Hardware Design

Fuse Monitoring Module

- STM32F0 MCU
- Isolation Circuitry
  - Optical Isolator
- CAN Transceiver

Ethernet Control Module

- STM32F7 MCU
- 10M/100M Ethernet Communication
  - RJ-45 Port
  - Ethernet Transceiver
- CAN Transceiver

Abstract

Due to the high cost of downtime, modern industrial facilities have increasing pressure to reduce the time it takes to identify and recover from the issue. Almost half of downtime is related to hardware failures.

The Industrial Smart Fuse is a device that can be used to detect and locate blown electrical fuses. The Industrial Smart Fuse is a collection of interconnected fuse nodes that have ethernet capabilities and will be able to communicate with a control system via standards such as Modbus TCP/IP or Ethernet/IP.

Results

The Industrial Smart Fuse can monitor and detect blown fuses. The fuse monitoring circuit is isolated from the fuse circuit by optical isolation. The fuse statuses can be sent to the ethernet module via a CAN bus.

The ethernet module implements a TCP/UDP stack used for communication to the control system. The fuse module and ethernet module also implement the discovery protocol for index identification so the fuse index can be sent back to the control system.