

# *Monitor Protective Relay Health to Improve Safety and Reliability*

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## INTRODUCTION

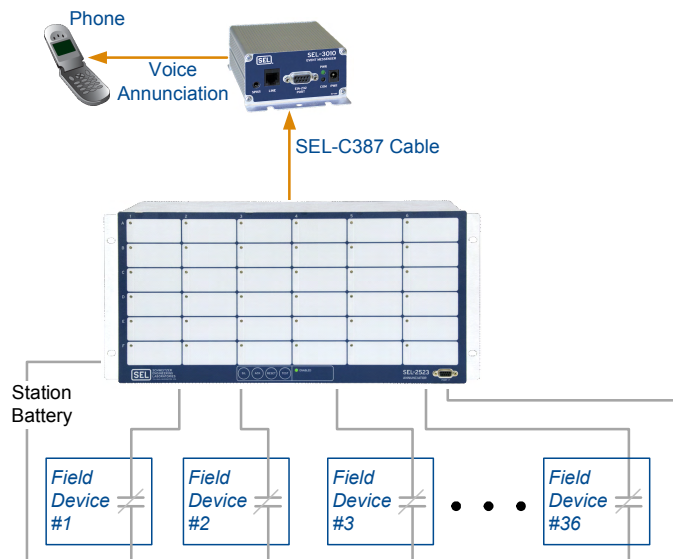
Protective relays sense electrical information and issue trip commands to protect electrical lines and apparatus. Microprocessor-based protective relays perform self-diagnostics. If power to the relay is lost, or if diagnostics fail, the alarm contact will close.

## PROBLEM

The diagnostic information is valuable and useful only if it is monitored and action is taken when a failure is reported. An information processor can determine the status of a relay by analyzing the information conveyed via a communications link and monitoring that the link is active. Alternatively, a device can monitor each alarm contact. A mechanism must be provided to convey an alarm when protection is lost, and work instructions and training are needed so that when an alarm is raised, a human responds to repair or replace the relay. All too often, this does not occur.

## LOCAL ANNUNCIATION AND CALLOUT

One economical solution is to connect the alarm contacts to the digital inputs of an SEL-2523 Annunciator Panel and report alarms with the SEL-3010 Event Messenger through the public telephone network, as shown in Figure 1.



**Figure 1 Local Annunciator With Voice Calling**

A constant alarm contact closure indicates loss of power or diagnostic-detected relay failure. Short pulses on the alarm contacts indicate password access commands and settings changes. The SEL-2523 can time-tag these events for retrieval through Sequential Events Recorder (SER)

reports, but generally you would not want them to cause alarms. Set timer logic in the SEL-2523 to prevent alarms for short duration alarm pulses. An SEL-C387 cable provides power for the SEL-3010 plus the EIA-232 serial communications between the SEL-3010 and the SEL-2523. The list price of an SEL-2523 and an SEL-3010 with an SEL-C387 cable is \$4,401.

## LOCAL ANNUNCIATION AND CALLOUT WITH UNINTERRUPTIBLE POWER SUPPLY

If the battery or other power source for the relays is de-energized or disconnected, the relays are unable to function or report. Furthermore, if the SEL-2523 is powered by the same source, then loss of this power source will disable protection and alarm reporting. Substation fires and explosions have occurred because relays were not protecting due to loss of the battery system. One easy way to prevent this potentially disastrous situation is to use an SEL-UPS Uninterruptible Power Source, as shown in Figure 2. The SEL-UPS includes a built-in 48 Vdc battery to power the SEL-2523 and, through the SEL-C387 cable, the Event Messenger. It provides alarm contacts to indicate loss of ac and low battery voltage so that personnel will be notified with ample time to correct these problems. The list price of an SEL-2523, SEL-3010, SEL-C387 cable, and SEL-UPS is \$5,086.

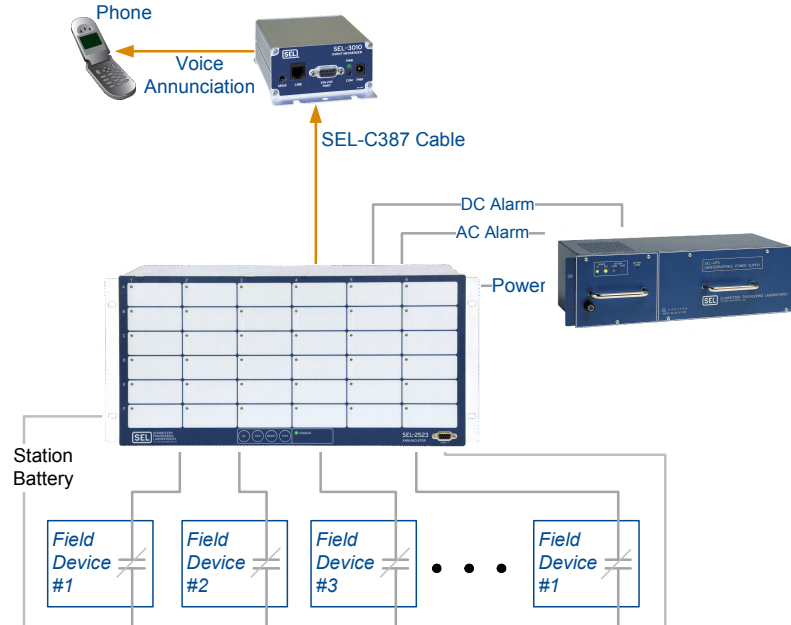


Figure 2 Local Annunciator With Voice Calling and UPS

## CONCLUSIONS

For under \$5,100 in equipment costs, you can monitor and notify personnel of relays that are not performing the required protection because of power source or relay failure. This solution includes the local indication, so personnel can quickly determine needed actions to restore the protection, and remote callout to notify the maintenance crew.