ISCE

The Institute of Sound and Communications Engineers

Engineering Note 14.1

Fire alarm monitoring techniques

Andy Scott *MInstSCE*

DISCLAIMER

Care is taken to determine that 'Engineering Notes' do not refer to any copyrighted or patented circuit or technique, but ISCE can accept no responsibility in this connection. Users of the information in an 'Engineering Note' must satisfy themselves that they do not infringe any Intellectual Property Rights.

ISCE Engineering Note No. 14.1

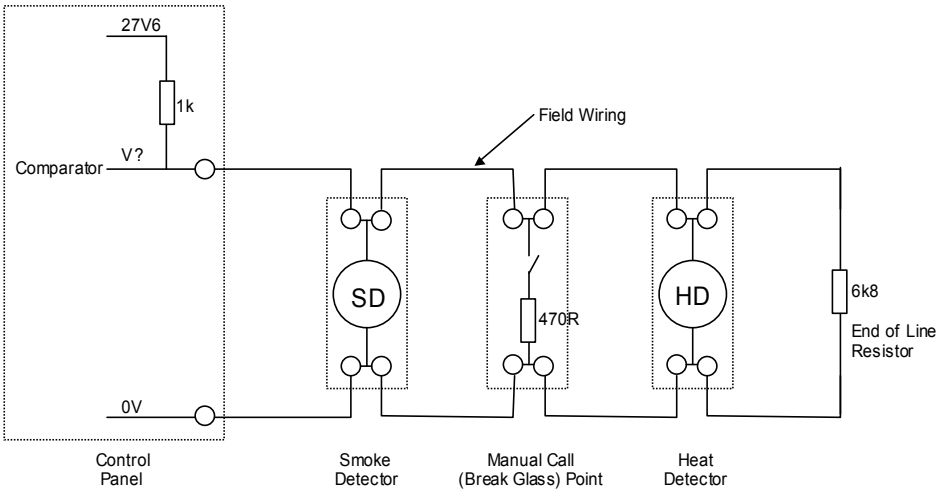
by Andy Scott MInstSCE

Fire alarm monitoring techniques

Fire alarm control panels generally operate from 27.6V d.c., as this is the float charge voltage for valve regulated lead acid batteries. So called ‘conventional’ control panels use simple techniques to monitor fire detection and alarm sounder circuits for faults. The devices themselves are not monitored.

A typical fire detection circuit

Several fire detection devices such as smoke and heat detectors and manual call (break glass) points are connected in parallel across the detection circuit wiring. The field wiring passes in and out of each device and an end of line resistor is connected across the last device.



The 1 kΩ and 6.8 kΩ resistors form a voltage divider and in the quiescent condition the voltage measured by the comparator at point V? is approximately 24 V. When a manual call point is operated, the switch latches mechanically and connects the 470 Ω resistor in parallel with the 1k ohm resistor. This equals about 440 ohms so the comparator measures about 8.4 Volts at V?, and causes the alarm to sound.

When a smoke detector triggers, its internal resistance is similar to that of the manual call point and so the result is the same. Once the alarm is sounding, it has to be manually reset and so it does not matter how many more devices operate. In the event of an open circuit fault, no current flows and so the voltage measured at V? is 27.6 volts, which is reported as an open circuit fault.

In the event of a closed circuit, the voltage measured at V? is 0 volts, which is reported as a short-circuit fault.

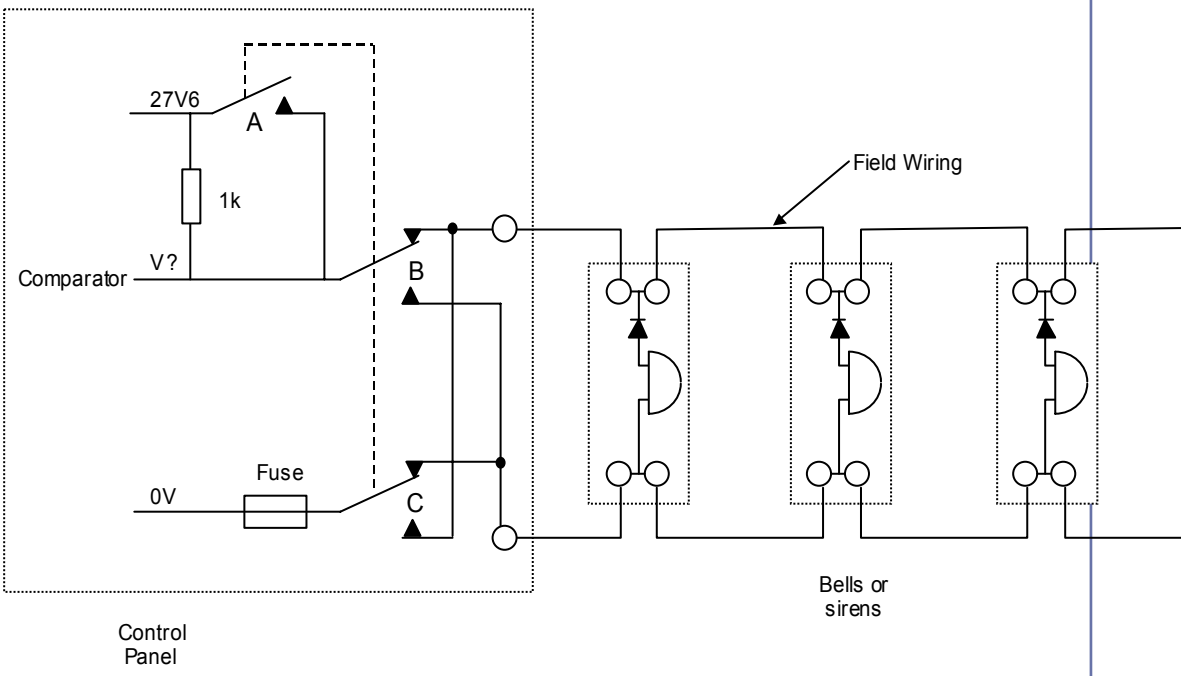
A typical sounder circuit

Sounder circuits use the same principle as detector circuits but are slightly more complicated due to the need to monitor devices that will sound when a voltage is applied to them.

In the quiescent condition, a comparator at V? monitors the sounder circuit for open or short circuit faults. The blocking diodes in each bell or siren ensure that current cannot flow through them and so they do not sound.

When the alarm is triggered, the three sets of relay contacts all operate. The contact at A connects the power directly to the sounder circuit and the contacts at B and C reverse the supply to the sounder circuit. Current can now flow through the blocking diodes and so the bells or sirens now sound.

Fault monitoring does not operate when the bells or sirens are sounding.



Variations on a theme

On modern control panels, the relay contacts shown above are usually replaced by solid state devices. One major concern for fire alarm control panels is to keep battery consumption as low as possible and so, instead of using the relay arrangement shown above, many panels generate a small negative voltage (say about 3 V) for the monitoring. Also, as faults do not have to be reported for up to 100 seconds, some control panels only apply this voltage intermittently, thus saving even more power.

Connecting to voice alarm systems

When connecting a voice alarm to a fire alarm control panel all that is necessary to comply with the requirements of BS 5839-8 is to provide one sounder circuit for each trigger and to arrange the wring so that the sounder circuit end of line devices are connected at the voice alarm interface. Depending on the method of reverse monitoring that is used, it may also be necessary to provide a separate sounder circuit that operates when the control panel is silenced. A general voice alarm fault can be signalled by open circuiting any of the sounder circuits.