False-alarming security system

Security systems that routinely false-alarm can be a real pain in the neck. Here's how G. C. of Tawa, NZ solved one particularly persistent false-alarm problem . . .

I look after an elderly but still serviceable security system protecting a museum site's workshop and vehicle storage areas. Over the years (and even prior to my involvement), this system generated so many false alarms that an alarm activation call in the middle of the night would usually be ignored until the next day – that is, until I took over.

This was not good. If there had been

a genuine break-in (and there was at least one attempt to my knowledge), then the alarm may have gone unanswered.

When I took over the system, I became the unfortunate person who was first on the call-out list. As a result, the security monitoring staff would telephone me at all hours of the night, advising that the alarm had gone off. This was a real problem in the early hours of the morning because my wife was woken as well. So my scarce "brownie points" were being used up fast!

This particular security system uses a number of motion detectors to protect areas inside "rough" buildings with unlined walls. All the zone detection circuits on the control unit are used, with multiple motion detectors wired to each one. As a result, it was difficult to determine which individual detector had activated to cause a false alarm, although it was possible to determine which zone had activated.

I tried all sorts of things to eliminate the false alarms, including a battery-backed regulated power supply to supply the motion detectors, as it was noticed that some false alarms occurred during mains power supply outages. However, that didn't stop the false alarms.

Next, I fitted wooden shades to keep the light from the roof skylights away from the detectors. This certainly helped reduce the false alarms as the light changed but they weren't eliminated altogether.

Two of the detectors connected to zones which were subject to false alarms were combined microwave/PIR types and I suspected that these were the main culprits. The microwave detection part was very sensitive to movement but the PIR detector was difficult to trigger except when a human was standing in direct view of the unit. So what could be causing these units to false trigger at night?

Eventually, I decided that the only way to solve the problem was to determine which individual detector of a multiple set had triggered. The wiring to these motion detectors was run using standard 6-core security cable, providing the power supply (two wires), the "end-of-line" resistor detection circuit back to the control panel (two wires) and a common "end-of-line" resistor "tamper" circuit (1-2 wires).

In the end, I determined that a

simple transistor latch circuit with a local indicating LED could easily be installed inside each motion detector's case and powered from the detector's 12V power supply circuit. When the NC (normally-closed) relay contact in the detector opened, this could trigger the LED indicator circuit and provided this circuit had a high enough impedance, the alarm system would function normally.

The real difficulty was figuring out how to stop these LED indicators from latching during the day when the building was occupied. I certainly didn't want to have to install any more cabling to do this, as the building runs were quite extensive.

The solution was to reset each latched LED circuit by using a connection to the tamper circuit. The idea was to detect the change in voltage when the tamper circuit was open-circuited at the control unit. Provided this reset connection was of high enough impedance, then all the installed LED indicators could be wired in parallel across the tamper circuit.

A wiring trial indicated that this arrangement would work well. All I had to do now was figure out how to disable this reset circuit late every afternoon, when the security control unit was armed for the night.

In the end, the solution was relatively simple. In this system, a security flap is used to hide the separately located keypad panel near the entrance from prying eyes. The site protocol was that this flap had to be locked "closed" after the control unit was disarmed at the start of each day. It was then opened at night to arm the unit.

As a result, I simply extended the tamper circuit to the keypad panel and used a microswitch to detect when the flap was closed. This scheme effectively prevented all the indicating LED circuits from latching on during normal building-occupied operation while allowing them to work at night when the flap was open. With that in place, I was set to determine which motion detector on a particular zone circuit had triggered a false alarm.

After a few late night-time trips to the site after false alarms, a pattern soon became evident in regard to the environmental conditions prevalent at these times. In particular, one PIR sensor that was prone to false triggering was located at the southern end of the building, which is exposed to very cold winds, especially during winter.

Finally, the reason for the false triggerings became clear – a PIR detector is sensitive to fast moving air with sharp temperature gradients in its area of surveillance. And when the cold wind blew strongly enough through the rather large cracks between the large entrance door and the door posts, the sudden temperature changes due to air movement were sufficient to trigger the detector.

The cure was simple – I blocked off the door cracks with timber and the false alarms ceased. It was much the same story for the other motion detectors that were causing false alarms.

So that solved the false alarm problems – at least during winter. Now all I have to do is figure out how to keep birds out of the building during the spring nesting period. If I can do that, there should be no more false alarms to disturb my sleep. SC