

## Going to the End of the Line Is Good?

Whoever said we do things differently in the security industry? In society, if someone does something wrong they are sent to the end of the line. In security, going to the end of the line — the end of the alarm circuit that is — means something is correct. Go figure.

### Superior Systems Are Supervised

Supervision is an important feature in an alarm systems be it a small residential or large integrated enterprise system.

On the surface, supervision lets the user know that a window or door has been physically left open and that a system cannot be armed. Underneath, electrical supervision of an alarm circuit can let us know that performance integrity has been lost due to an accidental short, such as a roofing nail or a rodent eating through a wire, or pur-

poseful compromise by a burglar.

The alarm installer must be prepared to cover all of these scenarios, thereby helping the customer maximize their security investment.

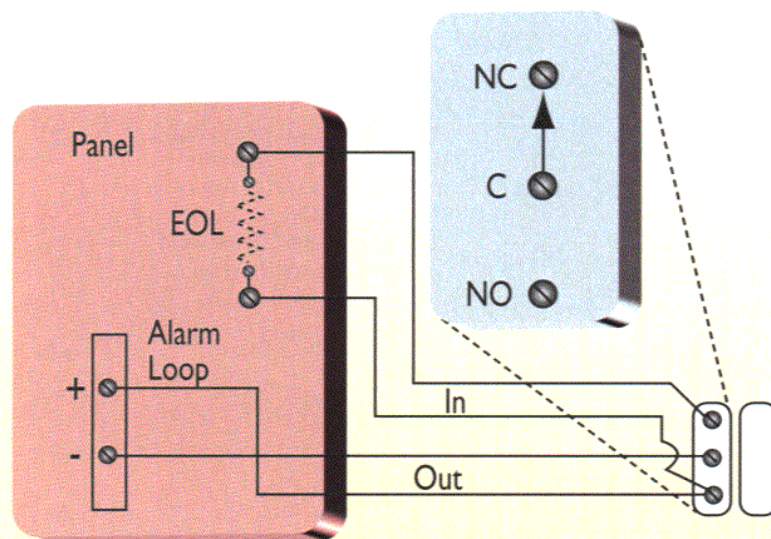
### The Importance of EOL Devices

End-of-line (EOL) alarm circuit supervision appears to be one of those controversial installation techniques. It is most often found in commercial installations and rarely in residential. Since the majority of panel manufacturers provide this technology as a standard feature, not installing the devices could be a liability issue for the dealer. Some installers faithfully install EOL devices on every job, while others seldom do it.

### Avoid Placing EOLRs Inside Panels

Basic EOL circuits use a single end-of-line resistor (IOLR) placed in series

Diagram 1: Cross n' Break Circuit



This depicts a suggested supervision configuration when an end-of-line resistor (EOLR) needs to be mounted in the alarm panel.



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### BOB'S TIPS

- The best location for an EOLR is at the end of the alarm circuit.
- Don't use a DEOLR configuration on a fire alarm circuit.
- Use only NC contacts on a DEOLR configuration.
- For multiple contacts on a single zone, use NO alarm contacts with EOLR parallel after last device.
- Document EOLR configurations and store info in panel.

next to the device at the end of the alarm circuit; not in the alarm panel, as is too often found. Placing the EOLR in the panel will not give you the designed supervision as an accidental or intentional short can compromise the alarm zone.

When using an EOLR device, only install one alarm sensor (door, PIR, etc.) per zone for optimal performance. If there is a need for multiple sensors on a zone with EOLR supervision, then a normally open contact should be used with the EOLR parallel across the last device.

### Cost Can Hinder Implementation

If alarm circuit supervision is such a good feature, then why is it not used more often? Installing these devices at the contact end of a circuit is labor-intensive and, therefore, costs more. One solution is to order contacts with the EOLR built into the contact. This provides for easy installation and high tamper resistance. Manufacturers such as George Risk Industries (GRI) have these available at a slightly additional charge. Take a look at Aleph as they make a contact series

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(DCxxx) with a built-in extra terminal for easy EOLR installation or looping contacts.

Make sure to indicate the presence of EOL devices on the inside of the alarm panel door. Consider labeling or color-coding the contacts too for future troubleshooting reference.

Another problem with using EOLR devices is the large variety of values used by manufacturers. This forces dealers to stock a large inventory of service configurations. Dealers should try to standardize as much as possible on their combinations. Hopefully, alarm panel manufacturers will soon begin designing panels with a programming option to cover this myriad of value combinations.

### An Alternative Can Go Inside Panel

While mounting an EOLR at the end of an alarm loop is considered the best approach, there is another configuration that can be used if an EOLR needs to be installed in an alarm panel for servicing convenience. This circuit (see *Diagram 1 on other page*) uses a single-pole, double-throw (SPDT) alarm contact and is sometimes referred to as a *cross break* configuration.

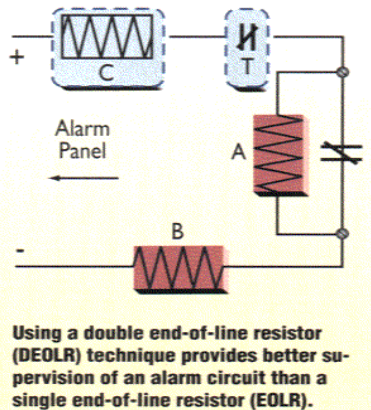
Notice that, when an alarm condition occurs, the common (C) switch arm opens the EOL alarm circuit; the twist is that **it** also shorts the return alarm circuit. This variation gives the circuit extra tamper resistance and supervision. Anyone trying to compromise a standard NC surface-mount contact will find the extra termination point confusing.

### Increase Supervision Via DEOLR's

Another form of alarm circuit supervision is the double EOLR, or DEOLR. In this case (see *Diagram 2 on this page*) two EOLR's are used in a series, parallel configuration. Resistor A is placed across the NC alarm con-

tact, while resistor B is in series. Notice that series EOLRs should be mounted on the negative, or common, side of the alarm loop for better ground short supervision.

Diagram 2: Double End-of-Line Resistor Supervision



Since resistor values can vary depending on the manufacturer. I have used letters to represent the EOLR values. It is recommended that only an NC contact be used with this configuration. This configuration provides an extra level of supervision over a single-series EOLR circuit.

In the case of a DEOLR, you get the following supervision:

- B value = Secured loop
- A + B value = Loop violation
- Short = Trouble/Fault
- Open = Open or Cut loop/Tamper

If the alarm circuit gets accidentally or intentionally shorted during the day, a customer would then have the option of calling for service before closing time. DEOLR supervision is not to be used on a fire loop. Also, only one sensor per zone is to be used with a DEOLR configuration.

There are two other items in Diagram 2. An NC tamper switch (T),

such as you would find on a PIR motion sensor, can be wired in series. There is also a resistor value (C) in the circuit that represents the resistance of the wire in the alarm loop. Normally, panel manufacturers allow enough voltage drop deviation to allow for alarm loops of more than 1,000 feet. However, in a very long circuit with very small gauge wire, the voltage drop of the circuit wire might have to be considered.

Additionally, allow for double cable resistance per length to the alarm contact for an alarm circuit that terminates back at the panel.

### Resistor Values Refresher Course

Eventually, an installer will end up with an assortment of EOLRs. Being able to identify the value of a resistor quickly can be very handy. Remembering the following information will help

A resistor's identifier band values are color identified as black = 0 brown = 1; red = 2; orange = 3; yellow = 4; green = 5; blue = 6; violet = 7; gray = 8; white = 9. Counting left to right, the first band is the first value number, the second band the second value and the third band is the multiplier. If there is a fourth band, it is the resistor's tolerance value, with gold being  $\pm 5$  percent, silver  $\pm 10$  percent, and nothing  $\pm 20$  percent.

For example, a 5,600-ohm (also known as 5.6K or 5k6) resistor would have green, blue and red color bands,

A saying, sometimes referred to as a mnemonic device, for remembering these color and tolerance values is, "Bad hooze rots our young guts, hut vodka goes well. Get some now!" Memorize this phrase and you will never forget your resistor values again!

### I Stand Corrected....

In the April "Tech Talk," the last paragraph should have referred to the "off-hook" phone voltage as 5VDC and the "on-hook" phone voltage as a -48VDC, instead of the other way around. Sorry for the mix-up.