

## How to Customize with Relays

Throughout the years, when I have conducted technical training programs on security, relays have proven to be one of the areas posing the greatest difficulty for technicians. However, once relay basics are understood, I have found them to be a valuable complement to an installer's technical skills arsenal. In fact, I have noticed many technical certification programs now require a certain level of expertise in relay applications.

What are relays? They are nothing more than an electrified switch. A relay can provide great flexibility by electrically isolating areas of different voltages within the same system. One of the most popular areas in security is controlling large current loads, such as exterior lighting, from the low current output of an alarm panel. These types

of relays are sometimes referred to as *contactors* of power relays.

I believe working with relays is fun. It has often given me the flexibility to slightly modify a system (remember, some call this customizing and charge a pretty penny!) for a customer or to improve the basic performance of a security system. This is also often done at a very small increase in cost, as relays are typically not very expensive.

Those who read my column regularly may remember I previously discussed the electrical performance specifications of relay applications (see "Taming Relays for Real World Applications" in the May issue). We will not go over that again but instead will look at a few of the interesting things we can do with relays.

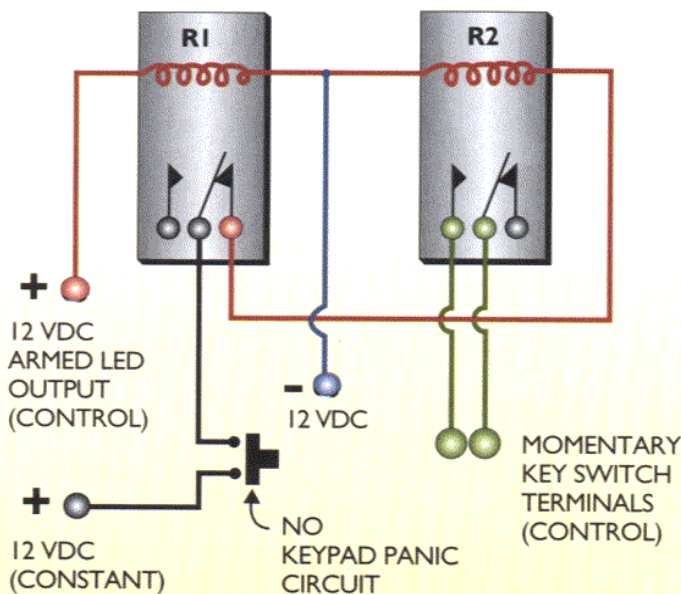


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### BOB'S TIPS

- Use relays to isolate and coordinate switching between circuits of different voltage and load requirements.
- The normal position (NO, NC) is identified during the relay's non-energized state.
- Avoid system jury-rigging as it is dangerous to you and your customer.
- Don't forget to look at the "backside action" of a Form C relay contact configuration for additional configuration options.

Diagram 1: Arm But Not Disarm Relay Configuration



A pair of NC-SPDT (normally closed, single-pull, double-throw) relays provide extra convenience for arming an alarm panel.

### Different Relay Types Explained

When specifying a relay, you will see acronyms like DPDT and SPDT. DPDT means double pole, double throw and SPDT means single pole, double throw. These mechanical actions happen when power is applied to the relay coil, thereby inducing a magnetic field, which in turn influences and switches the relay contacts.

A SPDT relay has the same action as a standard three-way light switch in that it has a common pole that makes contact with one of two poles (see Diagram 1, those relays are SPDT). I have often written about the "backside" of a relay action or the relay pole that is often not part of the primary action circuit. Depending on the voltage level being applied to the common pole, the backside pole can be used to switch an indicator light, which would let the customer know about a change of status in the system.

DPDT relays, on the other hand, are often used as safety interlocks for equipment power. This is due to the fact that it is physically impossible for the wiper contact in a SPDT configuration to be in both the NC and NO positions at the same time.

# Tech Talk

With Bob Dolph

Notice I mentioned the acronyms NO and NC. These stand for normally open and normally closed. In a “Form C” (another term for double throw) contact configuration, one pole and the common pole will be closed when the relay coil is not energized; this is the NC contact pole.

Note that the switching action in multiple pole relays happens to all contacts at the same time. This is how we get isolation in switching circuits since different sets of poles in the same relay can simultaneously be switching circuits of different voltage levels and current loads.

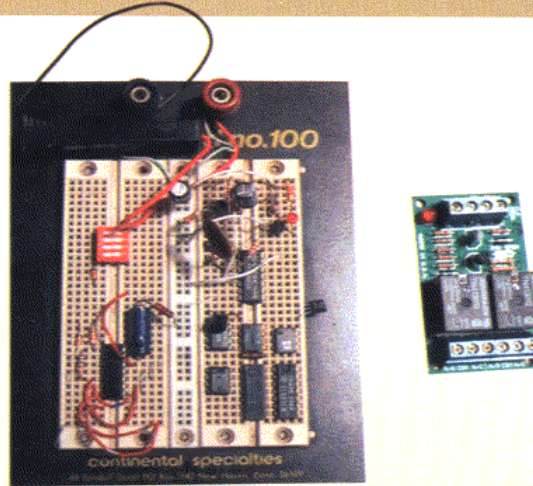
## A Look at How Relays Can Interact

The relay circuit in Diagram 1 was originally posted in John Sangers “More Kinks & Hints” (Butterworth Publishers). The circuit came from Ed Bullard of Guardian Alarm. I thought the application was a good example of how relays can be used to interact with other alarm equipment and offer a needed feature that might not have been available in the original equipment.

In Diagram 1, the purpose of the relays is to allow a person to arm an alarm panel from a momentary NO switch. This could also be the NO panic output of some standalone keypads. The alarm panel would then need to be disarmed at the main keypad. This feature might be provided for maintenance personnel who leave from a particular remote area after a regular closing time.

Now let’s follow the action of this circuit. When a person is ready to arm the system, they would push the momentary switch shown at the bottom of the diagram. This would energize both relays (R1, R2) to switch from their shown NC status. This would cause R2 to momentarily arm the panel,

## Prototype Breadboard Test Fixture and Dual-Relay Module



Here we see a breadboard fixture (left) with a circuit being tested. The dual-relay module (right) is suitable for high-current switching tests and applications.

thereby creating the 12VDC on switched panel output. This armed output voltage would keep R1 energized and the contacts open, thereby not allowing the system to be disarmed through the NO push-button. It would have to be disarmed at a control keypad with the correct code.

## Work Out Bugs Before Field Work

I will warn you, once you get started with some of the design options, you will be thinking, “What can I do next?” I have found it handy to put together a little design kit to help in experimenting with different combinations before going out in the field and applying your design. One of the handiest design tools I have used through the years is a prototype breadboard (see photo above).

These design boards are typically used for IC and analog design. Small relays, switches and lights (LED's) can be used to design circuits similar to the one in this article. A little tip: I have found that some pieces of old solid phone wire makes for a lifetime supply of breadboard testing wires.

In the photo above, you will also see a relay module from Elk Products ([www.elkproducts.com](http://www.elkproducts.com)) Relay modules like these would be needed for testing high

current loads in your final installation.

## WARNING: Use Care When Customizing

I would like to give one word of caution at this time. While it is fun and exciting to design different alarm application options with relays and other electronic components, installers should be careful to observe the fine line between customizing a system application and what is often referred to as “jury-rigging.” You will notice the relays in this example are used in the way they were designed and interface with the alarm panel in a manner that the panel was designed.

Installers should be careful not to physically or electrically

modify existing system components as it may void any equipment listings, warranties and liability coverage. An example of this would be directly soldering interface connections to a panel’s circuit board rather than through its specified input/output connections.

Additionally, many new panels have programming options that can closely simulate what is being accomplished in Diagram 1. The alarm panel’s options should always be given first priority if it fits the customer’s needs.