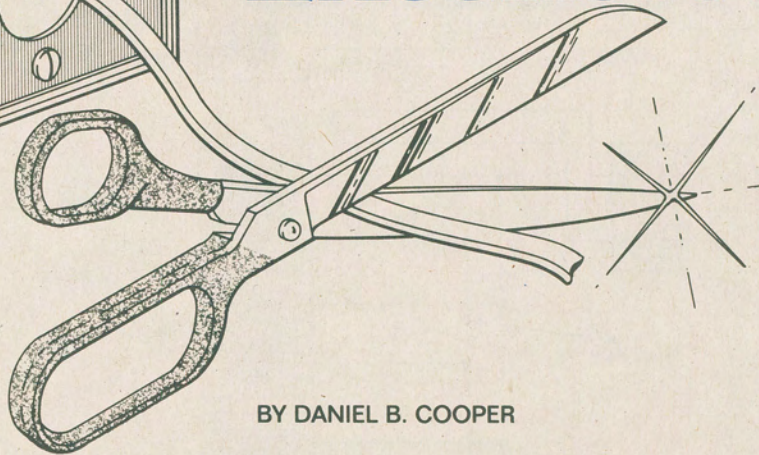
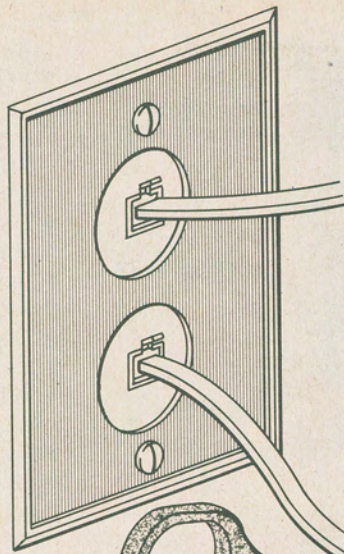


*A phone extension can be a nice convenience, but it can be turned into a tool for the nosy. This article shows you how to prevent snooping, and more.*

**T**here are a number of circumstances in which it would be convenient to be able to isolate one telephone extension from others on the same line. The simplest reason would be to ensure absolute privacy against snoopers surreptitiously listening at other extensions. Another reason, especially in homes with a single phone line, is to give a fax machine or a modem-equipped computer total control of the phone, either to prevent interruption during a data exchange, or to prevent the other phone(s) from ringing upon receiving an incoming data call.

All you need to isolate an extension is an extra pair of wires—which may already be present in your home's wiring—and a couple of support components. Many family dwellings built since the mid-1970's have bundles of telephone wiring running to wall boxes in almost every room. Some homes have eight wires (which form four pairs); others have sixteen wires (or eight pairs). Incorporating an extension-silencing feature into such a home is often particularly easy as it is likely to have an unused pair of wires that you can take advantage of. However, as it has become common practice to use such wiring for alarm systems, remote controls, and intercoms, as well as phones, it might be possible that even a new home has no wires to spare. In such circumstances, or if the house is wired for a single phone, you will have to run a pair of wires, but you can still install the feature using the technique we describe.

**Some Telephone Basics.** To isolate a



# Isolating Telephone Extensions

BY DANIEL B. COOPER

phone jack in the manner we'll describe, it's necessary to understand the fundamentals of home-telephone wiring. All phone circuits require two wires, called (for historical reasons) tip and ring. When the phone is not ringing, the wires carry a direct current with the ring wire at a negative potential with respect to the tip wire.

When no phone or other communications device is "off-hook" (using the phone line), the voltage will be about 48 volts. When a phone, modem, or fax machine goes off-hook, the line is pulled down to about 6 volts. Neither voltage has enough current behind it to be dangerous.

**However, the ring signal is a 90-volt peak-to-peak AC signal that is applied to the line, and it packs enough of a punch to give a painful shock.** For this reason, and to avoid shorting live phone wires and sending spurious noise and on-hook signals to the phone company equipment, it's best to disconnect the telephone wiring at the incoming terminal block before doing any rewiring.

The wiring from the phone company ends at the terminal block, which may be on an external wall or in the basement. The wiring that leads from the terminal block into the house is yours, both to maintain and to do with as you

please, provided that you don't have a service agreement with the phone company. If you have such an agreement, you can still play with the wiring, but the phone company can charge you if they have to clear up any errors you make. Certain restrictions must be met; primary among them is that all equipment attached to a live telephone line must be FCC registered. But the wiring is still yours to use and modify as you wish, without charge or permission from the phone company.

Phone wiring is color coded. The standard four colors used in single-line systems are black, yellow, red, and green. In most phones, the yellow and black wires are not used. The red and green wires are the ring and tip wires, respectively. Also, when connections are made to wall terminals and the like, the ring wire always goes to the right-hand terminal. You can keep all that straight by remembering the simple mnemonic "red-ring-right."

The multiple wiring pairs that run through homes use another color-coding system. One wire of each pair will be a solid color with white bands; the other will be white with bands of the matching color. The solid-color wire with the white bands is always the ring wire.

The usual colors for four-pair wiring



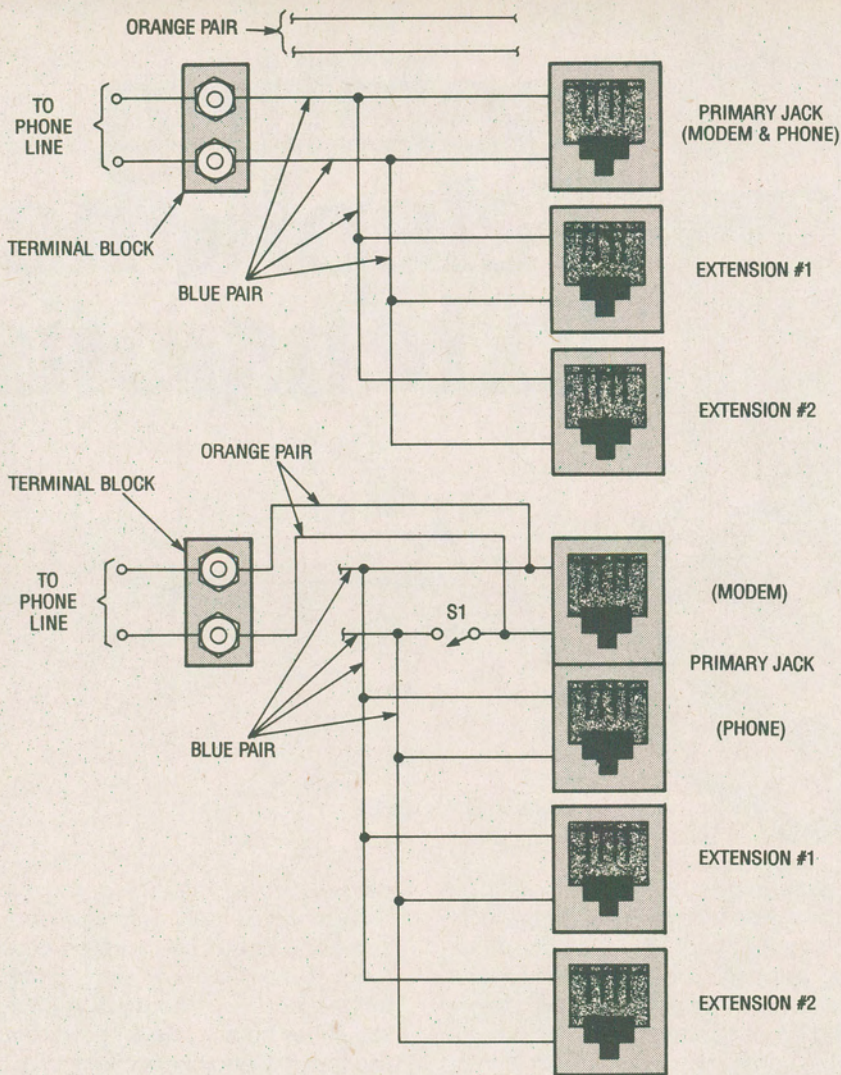


Fig. 1. This is the basic-isolation wiring. At top is the phone system before modification, with the orange pair unused. At bottom, the orange pair is used to connect the primary jack to the terminal block. Note that the old primary jack has been replaced by a dual jack and a switch has been added.

are red, green, orange, and blue (with white used as mentioned). Of course, more colors are used in eight-pair wiring, but the color-coding scheme is the same. Take note the blue pair is usually used for the first or only phone line.

The wiring pairs that run through the house to the various phone jacks or blank wall boxes are "continuous runs." What that means is that all wires go to every box and none are terminated till they reach the last box. Even if a wire is needed at a certain box it is not cut. Instead, a 1/4- to 3/8-inch piece of its insulation is removed, the bare section is formed into a loop, and the loop is wrapped around the desired screw terminal. That allows the wire to pass through the box uninterrupted. You should follow this practice any time you do your own home wiring. Further, if you

remove a jack or change the wiring pair, be sure to insulate the bare strips of the old wires with electrical tape.

**The Basic Technique.** The basic technique for isolating one phone extension can be summed up easily. For descriptive purposes, it is assumed that your current phone jacks are all connected to the blue pair, and you will be using the orange pair to perform the modification. After examining your home's phone wiring, you may substitute whatever colors you have available as long as you use the standard color-coding scheme. For those of you that must run a new wire pair, that pair will take the place of the orange pair we mention in our discussion.

Throughout our discussion the jack that is to be isolated (and in control) is

referred to as the "primary jack," and all others are "secondary jacks." The names "primary" and "secondary" have no bearing on where the jacks are located along the phone wiring.

The basic steps, diagrammed in Fig. 1, are as follows:

- Disconnect the blue wiring pair from the terminal block.
- Disconnect the blue wiring pair from the terminals of the primary jack.
- Connect the orange wiring pair to the primary jack's terminals.
- In the primary jack's wiring box, connect the blue pair to the orange pair via a switch.
- Connect the orange pair to the terminal block. When the switch is closed, all of the secondary jacks on the blue pair will be active. When this switch is open, the secondary jacks will be cut off, while the primary or isolated jack still functions.

This basic procedure can be used as the starting point for a number of variations. Let's look at what could be considered a basic installation, and then discuss some possible alternatives.

#### PARTS LIST FOR THE EXTENSION ISOLATER

- J1—Two-conductor jack
- PL1—Two-conductor plug
- S1—SPST switch
- A dual modular phone jack (if not present), twin-lead cable (see text), solder, etc.

**Basic Installation.** In this example installation, two things are assumed: that a simple manual switch will be used to isolate the jack, and that both an isolated and non-isolated jack are desired at the primary extension.

For security, the switch should be able to be removed from the primary jack without causing the phones on the blue pair to be cut off. That can be accomplished using an audio jack with terminals that short together when the plug is removed. The jack wiring for the basic installation is shown in Fig. 2.

A standard duplex telephone jack has two modular sockets, each with four screw terminals on the rear side. Short jumper wires connect the corresponding terminals on each jack. That is usually desired. However, in this case we want the two jacks to be separated. Cut or remove the green jumper wire, leaving the rest intact.

(Continued on page 96)



## ISOLATING EXTENSIONS

(Continued from page 42)

Between the two modular sockets, and to one side on the faceplate, drill a hole to mount the closed audio jack, J1. Mount the jack and wire it between the two separated green terminals as shown in Fig. 2. When correctly wired, the two green terminals should be connected together when no plug is in the audio jack, and should run to the switch when the plug is inserted.

Connect the orange wiring pair to the upper jack, with the solid-color wire going to the red or ring terminal. That jack will be the primary jack. Connect the blue pair to the lower jack, again ensuring that the solid-colored wire goes to the red terminal. Neatly stow the wiring into the jack's wiring box and screw the faceplate in place. All phone extensions in the house should operate normally. Insert an unused audio plug into the audio jack. The lower modular socket on the new duplex jack, and all other phone extensions, should now be disconnected while the upper socket on the duplex jack remains functional.

The plug and switch assembly can be built in any convenient fashion. The switch, S1, should be a toggle, slide, or rocker type instead of a locking push-button so that its position can be recognized at a glance. Mount it in a small, attractive box and connect it to the control plug, PL1, using an appropriate length of 22-24-gauge 2-conductor cable. When the plug is inserted into the audio jack, the switch will control whether the primary jack is isolated or not. With the switch open, the phone extension, modem, or fax machine connected to the primary jack will have exclusive use of the phone line.

If the primary jack is used by a modem or fax machine, you have two options for connecting a telephone at the same location. If you want to be able to isolate the phone for the sake of privacy, plug it into the modem or fax's "phone" jack. The phone will remain connected when the isolating switch is open. If you want that phone to be disconnected when using your fax or modem, plug it into the other (secondary) socket of the wall jack.

**Modifications.** The basic installation can be extended and modified in a variety of ways. For example, if the isolated jack is intended only to be used to guarantee privacy, you can use a single

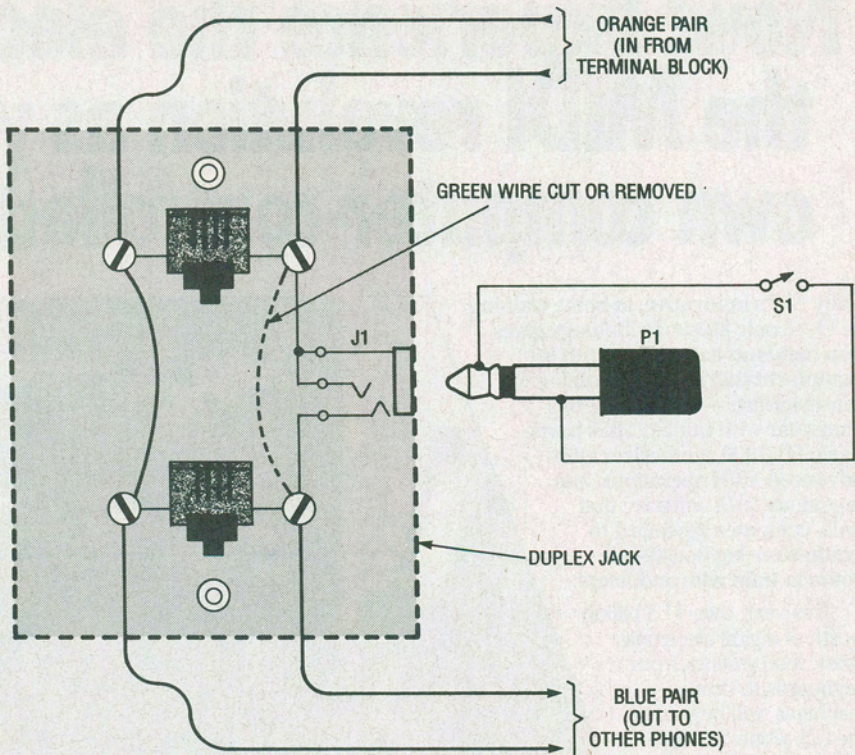


Fig. 2. This is the schematic for modifying the duplex jack. The red wire jumpering the two jacks should be left in place, while the green wire is cut or removed. The switch and its wiring may be modified as necessary for your particular needs.

modular jack instead of a duplex type. (However, the duplex jack is a bit easier to install, since it provides two sets of screw terminals for easy connection to the two wiring pairs.)

You could use a timed switching arrangement to isolate the primary jack at selected times. That is the arrangement I use to accommodate an electronic mail system that must be ready for incoming calls during one hour in the early morning. To prevent the telephones from ringing, the computer is connected to the primary jack, and a timer-controlled switch disconnects the other phones during "incoming-mail hour."

Or you could replace the manual switch with a fax machine or a modem's internal switching hardware to automatically shut down the extensions. In such a system there is no need for J1, but the green wire in the duplex jack should still be cut. The primary jack is connected to the modem or fax "line" jack, while the second (blue-pair) jack is connected to the modem or fax's "phone" jack. As long as the modem or fax machine is not in operation, the other phone extensions will be connected to the phone line. When the modem or fax connects to the line, the

others will be automatically disconnected.

That is appealingly simple, but it has two drawbacks: The machine will be able to rudely interrupt calls being made via the other phone extensions. Also, disconnecting either cable, or a fault anywhere in the loop formed by the machine and the cables, will disable the other phone extensions.

Whether to ensure privacy or to enhance the operation of a phone-line-using machine, the technique outlined here of isolating one phone jack from others on a single line can be easily adapted to your own needs. ■

