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Remote Scanner Monitoring

It's nice to have a spouse who supports my hobbies. My wife often brings home interesting electronics parts and gadgets she finds at flea markets and garage sales. A few years ago, she brought home three steel boxes, each being about the size of a microwave oven and filled with several 117 VAC electromechanical relays in plug-in sockets. The boxes appeared to be industrial controllers used for factory process control.

What could I do with a pile of relays in a steel box? I used them to build a controller so I could listen to my home scanner remotely via telephone. My home was already equipped with a second telephone line which I used primarily for making outgoing calls. This controller connected the phone line to the speaker leads of an old Electra Bearcat BC-300.

Whenever someone would call my home on this phone line, the controller seized the line, started an internal timer, and fed the audio output of the BC-300 out onto the phone line. The caller could hear whatever the BC-300 heard. After a few minutes, the controller would hang up the phone line and rearm itself.

How it Works

As shown in the schematic, when a telephone call is received, the ac ringing voltage on the phone line passes through the 4 □F capacitor and energizes relay RL1. RL1 momentarily energizes RL2, RL3, and time delay relay RL4. RL3 is wired as a latch and its contacts apply 117 Vac to its coil so it stays energized and keeps RL2 energized.

RL2 connects the scanner audio through an impedance matching transformer to the telephone line. A 600 ohm resistor placed across the phone line makes it appear to the central office that someone has picked up a telephone, i.e., it is "off hook."

Any audio present on the scanner's speaker leads is transmitted down the telephone line, so the caller can listen to the scanner from miles away. The varistor clamps any high voltage spikes which may be present on the phone line so they won't damage the scanner.

A few minutes later, time delay relay RL4 "times out," opening its contacts and disconnecting ac power from the other relays. The turn-on delay in the stock RL4 was controlled by an internal capacitor and an external resistor. Its 0.1 - 10 second delay was too short, so I swapped the internal capacitor with one of a larger value. For the timing resistor, I used a rheostat mounted through a hole in the cabinet so I could adjust the length of the timeout.

FIG 1

A handful of salvaged Potter & Brumfield plug-in relays were used to make a remote scanner controller.

Switch S1 is the main power switch used to arm the controller. Push-to-test switch S2 lets me connect the scanner to the phone line without an incoming call.

I used Potter & Brumfield KRP11AM for relays RL1, RL2, and RL3 and a Potter & Brumfield CLF-41-70010 for RL4. They are expensive DPDT (double pole double throw) plug-in relays, but the "price was right." I won't provide step-by-step construction details, but you can study the schematic and substitute less expensive relays from Radio Shack or another source. The abbreviation NC means "normally closed" and NO means "normally open" contacts.

There are more modern ways to perform the same task, like using an answering machine equipped with a room monitor feature. Older style electromechanical relays have been replaced by solid state devices in many applications. But, relays are less apt to be damaged or falsely triggered by nearby lightning storms, and my controller has worked reliably for years.

Longer MX-4000 / MX-4200 Battery Life

The old Regency MX-4000 and MX-4200 are battery-operated, 20-channel scanners manufactured in Japan by AOR. Both scanners contain a low battery warning circuit which disables the scanner when the battery voltage falls below a preset level.

A freshly charged battery pack should last at least 5 hours before needing a recharge. Ron Smithberg, of Joliet, Illinois, complained of getting only 2 hours use from a set of freshly charged NiCd batteries in his MX-4200. This note describes how we increased his usage to over 7 hours between charges.

Both MX models are powered by a pack of four AA-sized NiCd batteries. The battery pack is nominally 4.8 volts and has a rated capacity of about 500 mAH. The scanner draws about 100 mA when squelched. A good rule of thumb is that a NiCd should be recharged when its voltage falls below 1.0 volts per cell. Using this heuristic, the MX-4200 battery pack should be recharged when it falls

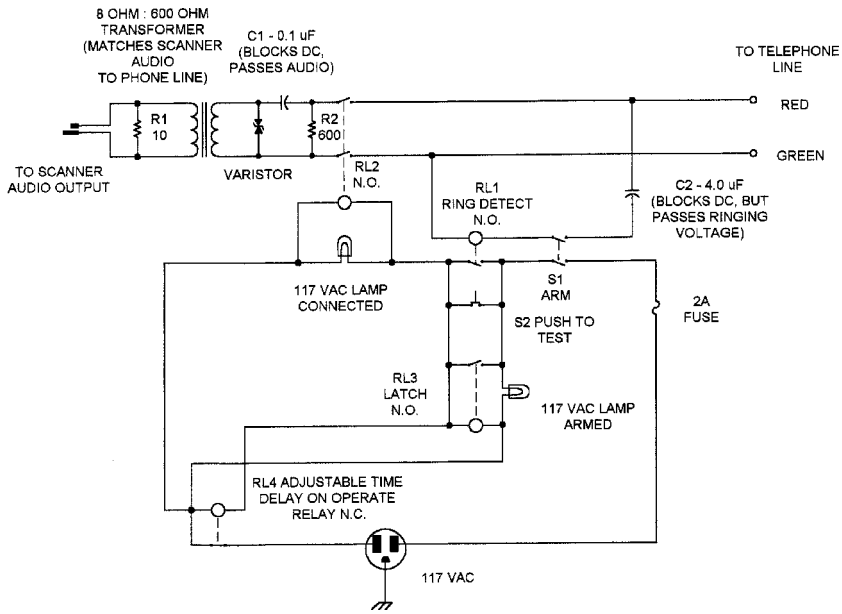

FIG 2 - *Controller answers calls on telephone line and connects scanner audio to line. Relay RL4 disconnects scanner and hangs up after a few minutes.*

below 4.0 volts under load.

The low battery circuit on Ron's MX-4200 was misadjusted to shut down the scanner prematurely when the battery voltage fell below 4.7 volts. I readjusted the low battery threshold to 4.0 volts.

You can use the same procedure, but you will need an adjustable, regulated DC power supply, capable of furnishing between 3 and 5 volts at 500 mA or more, and accurate means of measuring voltage from the power supply. A digital voltmeter with an accuracy of 5 percent or better is best. You will also need a #1 Phillips screwdriver and a small, slotted screwdriver or alignment tool.

The low battery sensor threshold is controlled by a potentiometer. Here's how to readjust the sensor to 4.0 volts:

1. Turn the scanner off.
2. Connect a digital voltmeter to a well-regulated DC power supply and adjust the supply to 5.0 volts.
3. Connect the power supply to the snap terminals on the scanner that would normally connect to the battery pack. Be sure to observe proper polarity. Connect the positive lead of the supply to the female snap, and the negative lead to the male snap.
4. Turn the scanner on.
5. As you watch the scanner's LCD display, gradually reduce the power supply voltage until the scanner's low voltage warning begins to flash.
6. Read the digital voltmeter. If it reads between 3.9 and 4.0 volts, no further adjustment is required, just disconnect the supply and reconnect the battery pack.
7. Otherwise, turn off and disconnect the power supply, and continue.
8. Turn the scanner upside down, and place it on a soft cloth so as not to scratch the case.
9. Remove the bottom tilt foot from the scanner.
10. Remove the battery pack.
11. Remove the four Phillips screws holding the case bottom, then remove the case bottom.
12. Reconnect the power supply to the scanner and set it to 4.0 volts.
13. Turn the scanner on.
14. Locate a small gray potentiometer on the printed circuit board. The potentiometer looks something like a gray plastic Phillips screw head. If the scanner front panel is facing you, the pot will be just behind the keyboard on the left side. (Don't confuse this pot with the three pots along the right edge of the board. The battery voltage sensor pot is not near any other pot.)
15. Slowly adjust the potentiometer to the threshold at which the low battery indicator begins to flash.

This procedure worked with great success on an MX-4200, and its battery life was increased from 2 to 7.5 hours. Thanks to Rick Meyer, WB9UFL, for finding the potentiometer in his MX-4000, and Ron Smithberg for letting me experiment with his MX-4200.

PRO-7A Repair

The Radio Shack PRO-7A is a 1970's vintage VHF-high band, eight-channel crystal model. A PRO-7A owner wrote that his scanner no longer worked on channels 5 to 8 and the lamps for those channels would not light.

The PRO-7A uses one 7408A (IC6) and two 7400A integrated circuits (IC4, IC5) to switch among the 8 channels. His scanner is now scanning all channels after replacing one of the 7400A ICs.