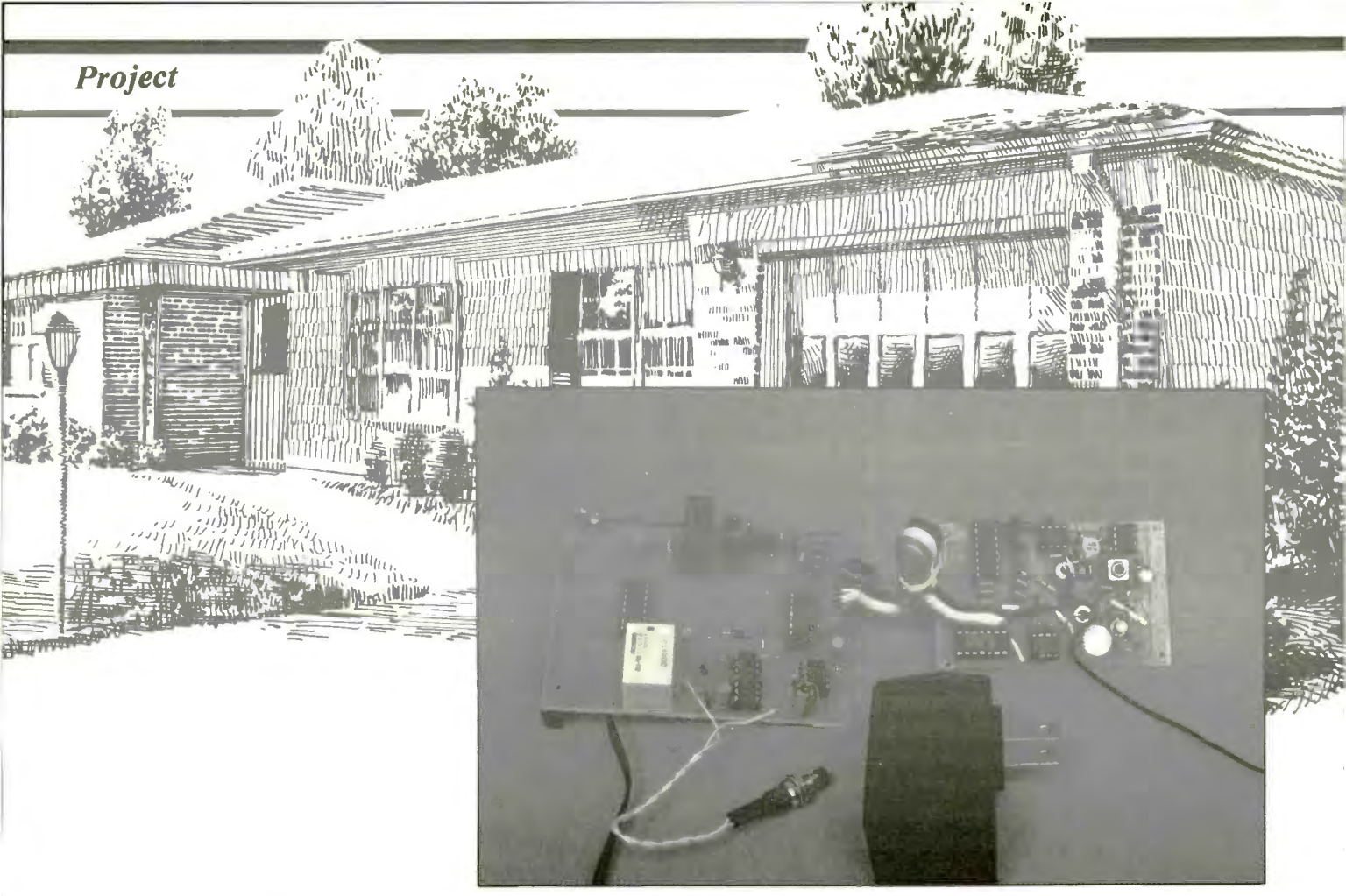


A 10-Channel Wireless Home Security System

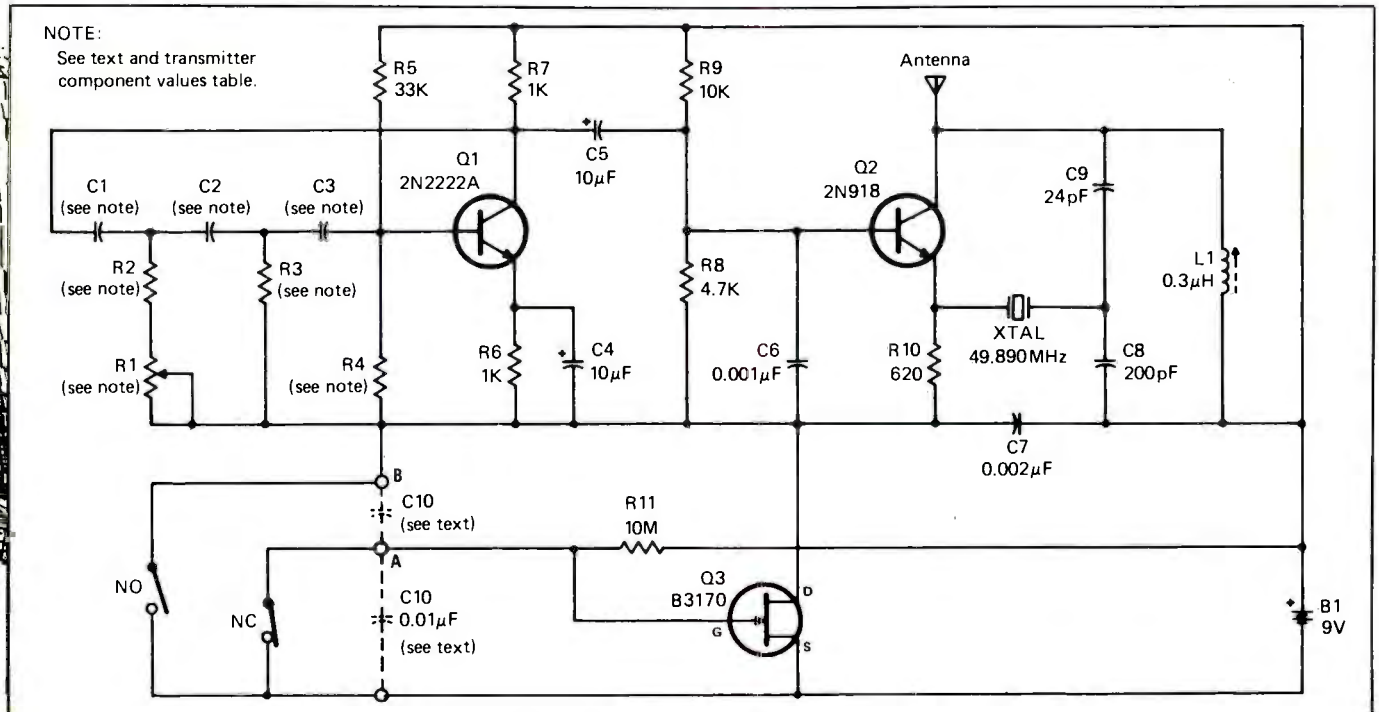
A flexible, highly effective wireless security system with the economy of hard-wired devices

By Dan Becker

A variety of security alarm systems are available to the home owner. The simplest and least expensive are little more than a relay with hard-wired sensor switches; the most elaborate—and very expensive—feature a microprocessor-controlled receiver and digitally encoded radio transmitters. Though the latter can be very elaborate, it isn't necessarily a better alarm. Because it eliminates unsightly wires and the time-consuming task of running them throughout a house, however, it's the system of choice for many home owners who can afford it.

Our 10-Channel Wireless Home Security System offers an inexpensive approach to the radio-type system used in the more costly setups. Though it doesn't employ microprocessor control, each of its 10 transmitters has its own unique "code." Hence, the system not only alerts you to an emergency condition, it even tells you its location.

Transmit/receive range is up to 150 feet, so you can use the system to monitor entrances, windows, your car, etc. Depending on the types of sensors you use to trip the transmitters, you can monitor for fire, smoke, frost, flood and any of a host of other physical conditions for which there are sensors available. The system can activate an audible



TRANSMITTER PARTS LIST

Semiconductors
Q1—2N2222A npn transistor
Q2—2N918 npn transistor
Q3—BS170 PMOS switch

Capacitors
C1,C2,C3—Low-voltage metalized film (see Table)
C4,C5—10-μF, 16-volt electrolytic
C6—0.001-μF ceramic disc
C7—0.002-μF ceramic disc
C8—200-pF high-Q ceramic disc
C9—24-pF high-Q ceramic disc
C10—0.01-μF ceramic disc

Resistors (¼-watt)
R2,R3,R4—1% tolerance (see Table)
R5—33,200 ohms, 1% tolerance
R6,R7—1,000 ohms, 5% tolerance
R8—4,700 ohms, 5% tolerance
R9—10,000 ohms, 5% tolerance
R10—620 ohms, 5% tolerance
R11—10 megohms, 5% tolerance
R1—Trimmer potentiometer (see Table)

Miscellaneous
B1—9-volt battery
L1—0.3-μH variable inductor (TOKO 10K Series)
XTAL—49.890-MHz series-resonant crystal
Printed-circuit board; snap connector for B1; stranded 22-gauge hookup wire; machine hardware; solder; etc.

Note: For components and kit availability, see Note at end of Power Supply/ Display Parts List

Fig. 1. All transmitters in the system are identical, varying in their tone coding by varying values of frequency determining parts in the Q1 audio oscillator.

alarm and can simultaneously turn on a lamp and/or siren.

When assembled as outlined here, the Wireless Home Security System complies with the FCC Rules and Regulations part 15, subpart D, for the "experimental" 49-MHz band. Though other devices share this band, including toy walkie-talkies, the narrow bandwidth, rapid scanning technique employed makes the decoder reasonably immune to voice-modulated transmissions.

The receiver/decoder sequentially monitors 10 channels in scanner-like fashion. When a transmitter is active, the decoding circuit locks on and sounds a buzzer and turns on an LED that corresponds to the location of the active transmitter. In addition, an ALARM LED turns on and a relay's contacts lock close to indicate that the system has been tripped. After a few seconds, the circuit returns to scanning.

You can use the relay to control a siren or/and a lamp or floodlights. Additionally, you can use channel 1 as a wireless remote reset switch that allows you to pass through a security zone without setting off the alarm.

The Transmitters

All transmitters in the system are identical, except that each is "tuned" to a different tone code that makes it unique and immediately identifiable. The transmitters (Fig. 1) operate on

Transmitter Component Values

Channel Number	Frequency (Hz)	C1, C2 & C3 (μF)	R1	R2	R3 (kilohms)	R4
1	4,300	0.01	1	1	1.2	33.2
2	670	0.047	1	1.2	2	15.8
3	460	0.047	1	3	3.6	15.8
4	3,300	0.01	1	1.5	1.8	33.2
5	2,340	0.022	1	0	0.75	20
6	950	0.022	5	2.2	3	20
7	830	0.022	5	2.2	3	20
8	540	0.047	1	2.2	2.8	15.8
9	340	0.1	1	1.2	2	15.8
10	240	0.1	1	1.5	2.2	15.8

49.890 MHz and are crystal controlled for stability. They are basically amplitude-modulated oscillators, with *Q2* dc biased by *R8*, *R9* and *R10*. Capacitor *C6* operates as a short circuit at 49 MHz, which places *Q2* in a common-base configuration, thus maximizing stability and preventing unwanted spurious oscillations.

Because the crystal is in series with the emitter of *Q2*, emitter current is very sinusoidal and free of a strong second harmonic. Capacitors *C8* and *C9* make up a voltage divider that feeds a small amount of the r-f output back into the emitter of *Q2*. Inductor *L1* and capacitors *C8* and *C9* tune the circuit to resonance. Capacitor *C7* bypasses *B1* at 49 MHz.

Audio oscillator *Q1* modulates r-f stage *Q2* and is dc biased by *R4* through *R7* so that *Q1* operates as a common-emitter amplifier. Capacitor *C4* connects the emitter to ground for ac signals to maximize gain. The *Q1* stage has an open-loop gain of 1 to maintain oscillation. Since *Q1*'s gain is directly proportional to the dc emitter current, the value of bias resistor *R4* must be chosen to provide unity gain at the selected frequency (see "Transmitter Component Values" table for the values of this resistor and other frequency-determining components).

To adjust the percentage of modulation, the value of *R4* can be varied by + or − 5,000 ohms. Trimmer *R1* permits fine tuning of the operating frequency. The audio output of *Q1* is coupled by *C5* to the base of *Q2* to modulate the dc bias level and r-f amplitude. This is readily accomplished because *Q2* operates as a common-emitter amplifier at audio frequencies.

Transistor *Q3* is a power MOSFET that provides connection to a normally closed security switch. This external security switch connects the gate to ground, thus biasing off *Q3*. Should this switch open, *R11* forward biases *Q3* and applies battery power to the transmitter.

When a normally open security switch is used, *Q3* and *R11* must be omitted, allowing the external security switch to turn on and off the transmitter directly.

The Receiver/Decoder

Shown in Fig. 2 is the complete schematic diagram of the receiver/decoder with *Q1* operating as a superregenerative detector. It serves as

RECEIVER/DECODER PARTS LIST

Semiconductors
IC1—LM358 op amp
IC2—LM567 tone decoder
IC3—CM7555 CMOS timer
IC4—74LS90 TTL counter
IC5—74LS42 TTL decoder
Q1—2N918 npn transistor

Capacitors
C1,C3—0.0033-μF ceramic disc
C2,C4—24-pF high-Q disc
C5—10-μF, 16-volt radial-lead electrolytic
C6—0.037-μF Mylar
C7—0.1-μF Mylar
C8—10-pF high-Q disc
C9—22-μF, 16-volt axial-lead electrolytic
C10,C11—1-μF, 50-volt axial-lead electrolytic
C12—0.0022-μF Mylar
C13—0.015-μF Mylar
C14—0.022-μF Mylar
C15—0.0027-μF Mylar
C16—0.0039-μF Mylar
C17—0.01-μF Mylar
C18—0.012-μF Mylar
C19—0.018-μF Mylar
C20—0.027-μF Mylar
C21—0.039-μF Mylar
C22—220-μF, 16-volt radial-lead electrolytic
C23—5-pF high-Q disc
C24—100-μF, 6.3-volt miniature radial-lead electrolytic

Resistors (¼-watt, 5% tolerance)
R1—2,200 ohms
R2,R12—10,000 ohms
R3—47 ohms
R4—2,000 ohms
R5,R6,R13—100,000 ohms
R7—470,000 ohms
R8—4,700 ohms
R9—6,200 ohms
R11—20,000 ohms
R14—56,000 ohms
R10—100,000 ohms, 1% tolerance

Miscellaneous
FB1,FB2—Vhf ferrite bead
RFC1,RFC2—R-f choke (14 turns 28-gauge magnet wire wound on No. FT-23-43 toroid core—see text)
T1—Receiver transformer (special order only—see Note below)
Printed-circuit board; sockets for ICs; 22-gauge stranded hookup wire; 8″ 7-conductor ribbon cable; machine hardware; solder; etc.

Note: For components and kit availability, see Note at end of Power Supply/Display Parts List

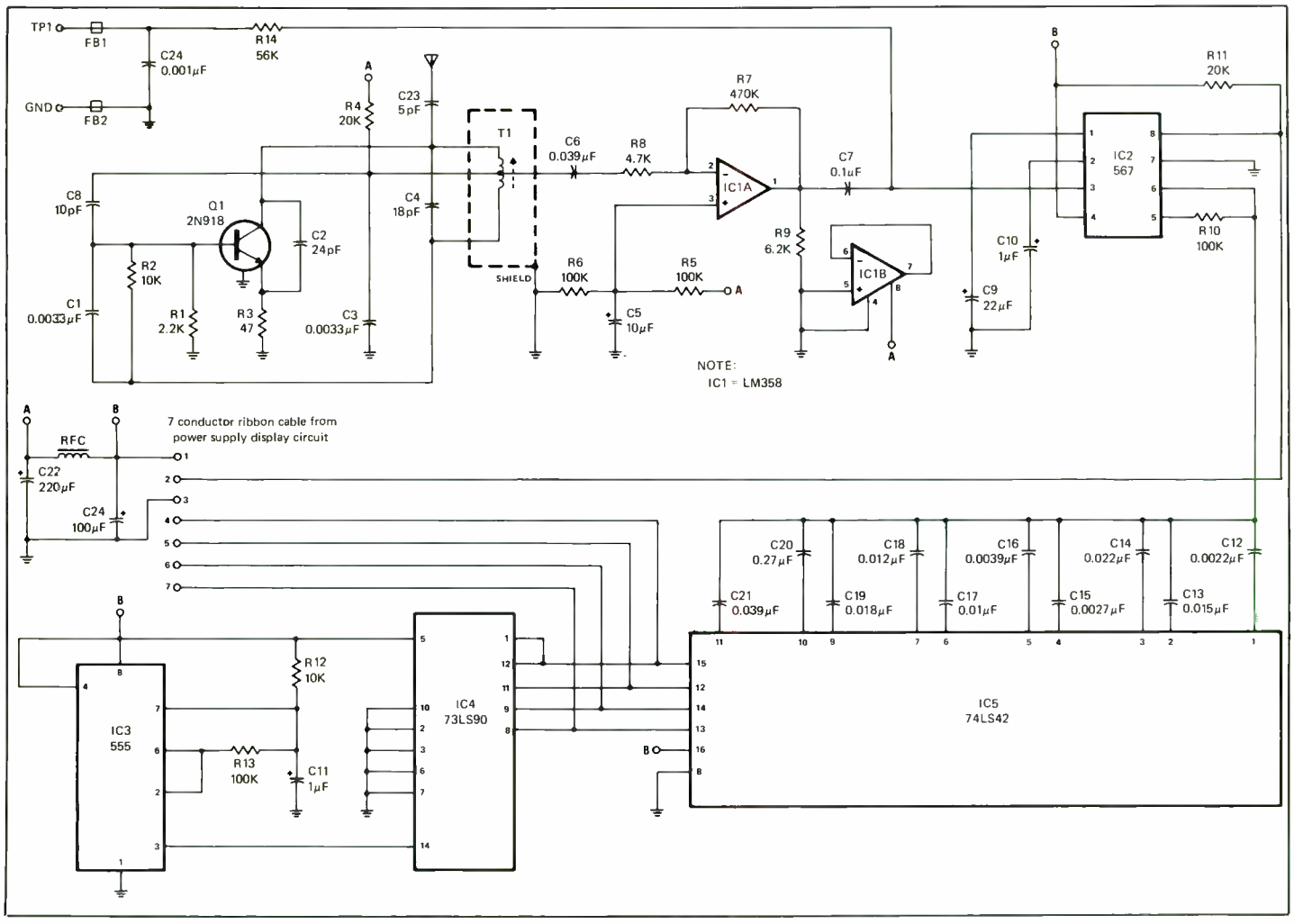


Fig. 2. Schematic diagram of receiver/tone decoder circuit.

both an r-f amplifier and an AM detector. Transformer *T1* is tuned to the 49.890-MHz carrier.

The incoming signal from the antenna goes into the *C4/L1* tank circuit and combines with the 49-MHz oscillator signal, causing the amplitude of the oscillations to increase. If the incoming signal is amplitude modulated, oscillation strength varies in accordance with the variations in amplitude of the received signal.

Any audio tone that amplitude-modulates the transmitter appears as amplitude variations across *Q1*'s base-emitter junction. Although it's tuned to oscillate at radio frequencies, *Q1* has considerable gain at audio frequencies and thus amplifies the audio modulation.

Capacitor *C6* couples the detected audio signal into op amp *IC1*, which provides about 10 dB of gain. Because a single-ended power supply is used (see Fig. 3), *IC1* is dc biased to 2.5 volts by *R5*, *R6* and *C5*. Otherwise, the input signal would be rectified. The amplified audio is fed to tone decoder *IC2*, which outputs a logic 0 when the audio tone for which it is tuned appears at the input.

Because each transmitter uses a different audio frequency to modulate its carrier, *IC2* must be tuned to each of the 10 possible different frequencies. To accomplish this, 10 different capacitors (*C12* through *C21*) are sequentially connected to ground. As each capacitor is grounded, it's placed in series with frequency-determining resistor *R10*.

A clock signal, generated by *IC3*, determines the rate at which *C12* through *C21* are scanned and goes to BCD counter *IC4*, whose outputs drive 1-of-10 BCD decoder *IC5*. Since *IC4* continuously counts up from 0 to 9, *IC5* continually grounds *C12* through *C21*, causing *IC2* to select each capacitor in succession.

The Power Supply/Display

The four BCD output lines from *IC4*, the output from *IC2* and the

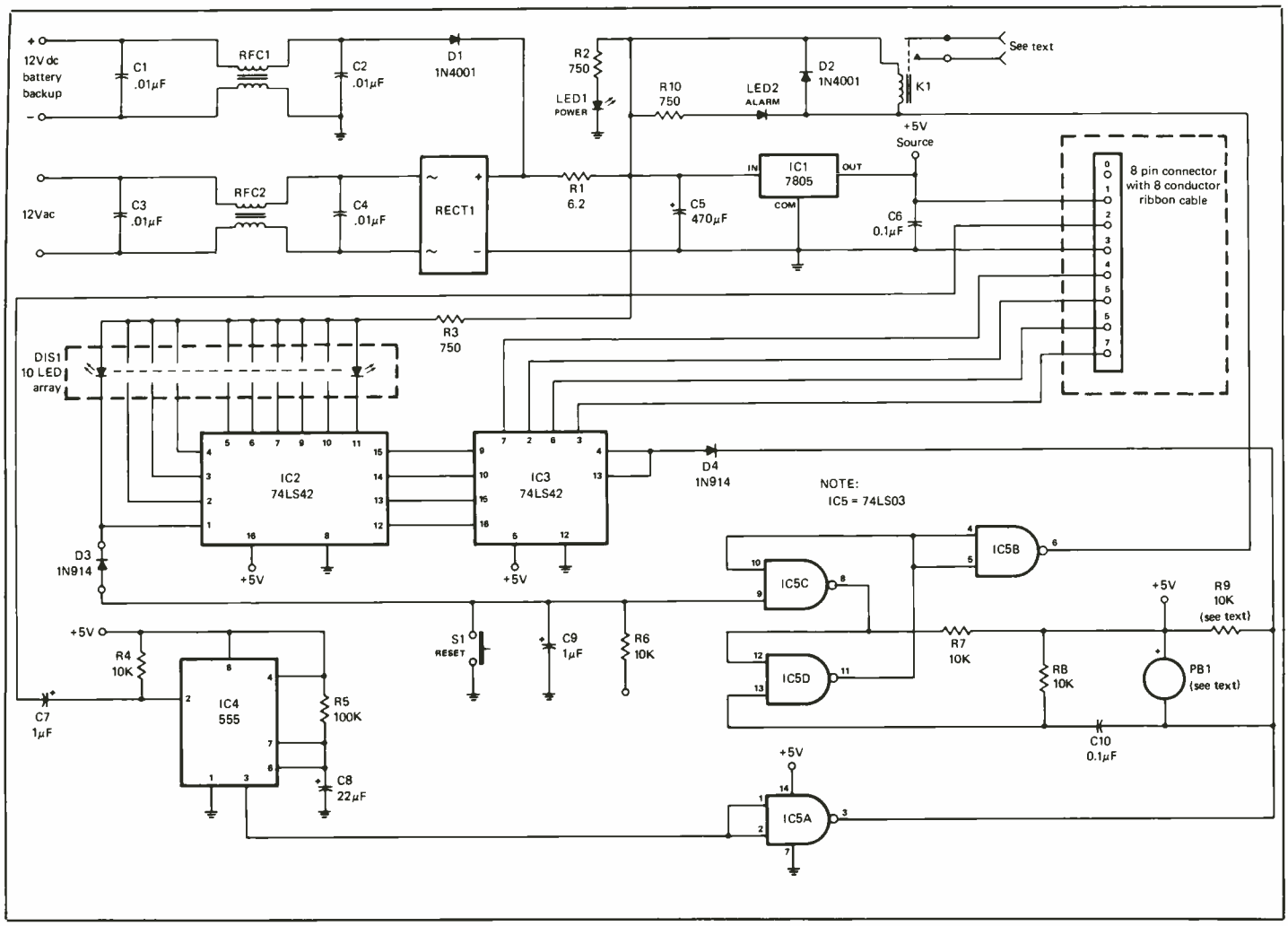


Fig. 3. Schematic diagram of power-supply/display circuit.

power buses go to the power-supply/display subsection shown in Fig. 3. Ac line power for this circuit is delivered through a 12-volt ac wall transformer via the "12 Vac" input connectors. An optional 12-volt backup battery can be wired across the connectors at the upper left.

Electrical noise is filtered out of the line by *RFC1* and *RFC2* (radio-frequency chokes) and *C1* through *C4*, and *D1* prevents current flow from the ac-driven supply into the battery supply.

A +5-volt power supply is made up of *RECT1*, *IC1*, *C5* and *C6*. Except for *K1* and the LEDs that make up the display and indicator systems, which operate from the pulsating 12 volts dc available at the + output from *RECT1*, all receiver/decoder/driver circuits are powered by the 5-volt supply.

When a tramsmitter is active, the logic-0 pulse generated by the tone decoder in the receiver is coupled into the Fig. 3 circuit via pin 2 of the miniconnector through *C7* into timer *IC4*'s trigger input at pin 2. The timer lengthens this pulse to a few seconds and passes it to *IC5A*. The low signal at pin 3 of *IC5A* is then used to arm piezoelectric buzzer *PB1* to tell you that a transmitter has been activated. The low output from *IC5A* also sets a flip-flop made up of *IC5C* and *IC5D*, causing its output to latch in a low state, *K1* to energize and ALARM *LED2* to light. The relay RESET switch *S1* is operated to reset the flip-flop.

If a piezoelectric buzzer isn't used, a 10,000-ohm resistor must be installed at *R9* in Fig. 3. You can have either *PB1* or *R9*—not both.

The four BCD lines from the receiver/decoder go to the Fig. 3 circuit via miniconnector pins 4 through 7. These lines carry a number between 1 and 9 that indicates which of the 10 channels the decoder is tuned to has been activated. These four lines go to quad storage latch *IC3* and then on to *IC2*.

POWER SUPPLY/DISPLAY PARTS LIST

Semiconductors
D1,D2—1N4001 rectifier diode
D3,D4—1N914 switching diode
DIS1—10-LED array (Panasonic No. LN10204P)
IC1—7805 + 5-volt regulator
IC2—74LS42 TTL decoder
IC3—74LS75 TTL quad latch
IC4—CM7555 timer
IC5—74LS03 quad NAND gate
LED1,LED2—Light-emitting diode
RECT1—DB101 or similar bridge rectifier

Capacitors
C1 thru C4—0.01-μF ceramic disc
C5—470-μF, 16-volt axial-lead electrolytic
C6—0.1-μF ceramic disc
C7—1-μF, 50-volt axial-lead electrolytic
C8—22-μF, 16-volt axial-lead electrolytic
C9—1-μF miniature radial-lead electrolytic
C10—0.1-μF Mylar

Resistors (5% tolerance)
R1—6.2 ohms, ½ watt
R2,R3,R10—750 ohms, ½ watt
R4,R6,R7,R8,R9—10,000 ohms, ¼ watt
R5—100,000 ohms, ¼ watt

Miscellaneous
K1—12-volt spst relay (Omron No. G2U-112P-US)
PB1—Piezoelectric buzzer (any 5-volt type)
RFC—R-f choke on No. FT-23-43 toroid core (see text)
S1—Normally open, momentary-action spst pushbutton switch
T1—12-volt ac wall transformer
Printed-circuit board; suitable enclosure to house both receiver/decoder and power supply/display boards; sockets for ICs; 4-40 machine hardware; hookup wire; solder; etc.

Note: The following items are available from Dan Becker, 101 Highland Dr., Chapel Hill, NC 27514: complete transmitter kit No. SS-10-TR, minus enclosure and external security switch(es) for $17.95 plus $2.00 P&H (specify channel desired); complete receiver kit No. SS-10-RC including all components in Receiver/Decoder and Power Supply/Display Parts Lists but not including piezoelectric buzzer and enclosure for $69.95 plus $4.50 P&H; inductor kit containing r-f transformer and three RFCs for $9.95 PPD.

Each of the 10 output lines from *IC2* is sequentially held low, causing one of the 10 LEDs in *DIS1* to light at a time. As long as the output from *IC5A* remains low, *IC3* will hold the last BCD number from the receiver. This means that each LED in the *DIS1* array corresponds to a unique transmitter location.

After pausing for a few seconds, *DIS1* returns to scanning. If a transmitter is still active, the display again pauses on the appropriate LED.

Construction

You build the Wireless Home Security System in stages, starting with the transmitter(s). Printed-circuit-board wiring is recommended for all circuits. The actual-size etching-and-drilling guides for the transmitter, receiver/decoder and power-supply/display pc boards are shown in Figs. 4, 5 and 6, respectively. You can fabricate your own pc boards using these guides or purchase ready-to-wire boards from the source given in the Note at the end of the Power Supply/Display Parts List.

Select a plastic enclosure (it can

COMPLIANCE WITH FCC RULES

The receiver in the Wireless Security System described in this article can be home built without you having to obtain special permission from the Federal Communications Commission and without violation of the FCC Rules and Regulations. You can build up to five transmitters without obtaining permission from the FCC, provided you comply with the requirements set forth in sections 15.133 and 15.119, which require the following:

To each transmitter you build, you must attach a signed and dated label that reads: "I have constructed this device for my own use. I have tested it and certify that it complies with the applicable regulations of FCC Rules Part 15. A copy of my measurements is in my possession and is available for inspection."

The measurements mentioned on the label are those required by section 15.118, which states:

"a) The r-f carrier and modulation products shall be maintained within the band 49.82-49.90 MHz.

"b) The power input to the device measured at the battery or the power line terminals shall not exceed 100 milliwatts under any condition of modulation.

"c) The antenna shall be a single element 1 meter or less in length permanently mounted on the enclosure containing the device.

"d) The device shall, with the exception of the microphone, be completely self-contained with the antenna permanently attached to the enclosure containing the device. The microphone may be external to the device, provided it is permanently attached to the enclosure with a cable not longer than 1.5 meters.

"e) Harmonic emissions shall be suppressed at least 20 dB below the level of the unmodulated carrier."

If you build and tune the transmitter as detailed in this article, it will comply with the FCC rules. If you should decide to build more than five transmitters, you must make the measurements detailed in section 15.118 and file an application for certification. Consult Volume II of the FCC Rules and Regulations, available at many libraries, for more information. As of September of this year, the FCC charges a fee for certification.

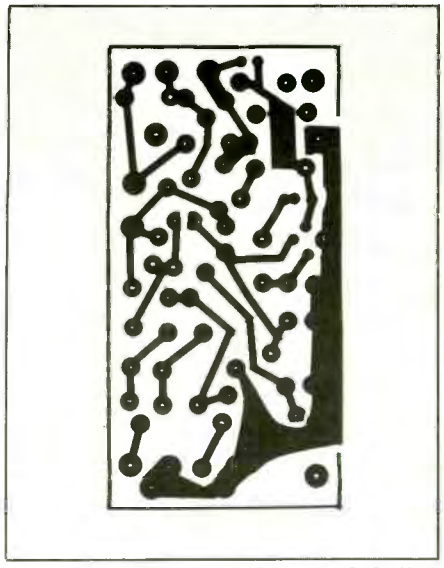


Fig. 4. Actual-size etching-and-drilling guide for transmitter pc board.

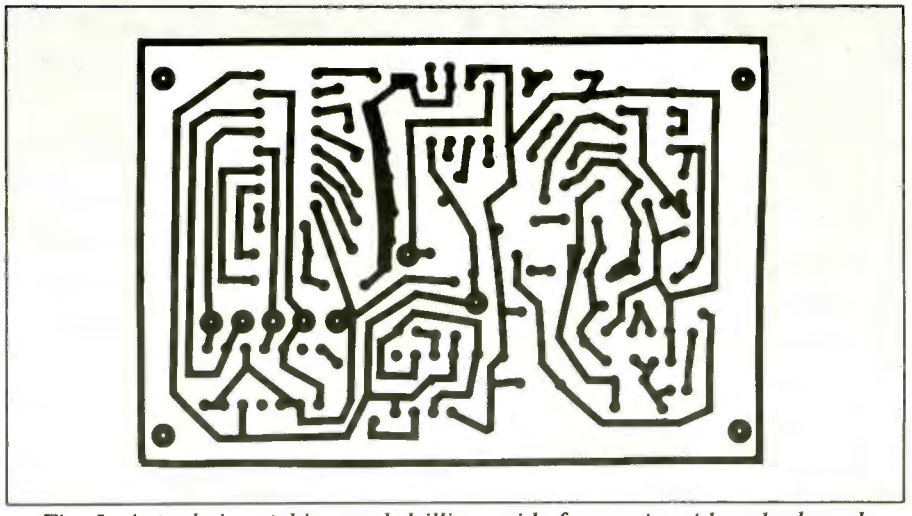


Fig. 5. Actual-size etching-and-drilling guide for receiver/decoder board.

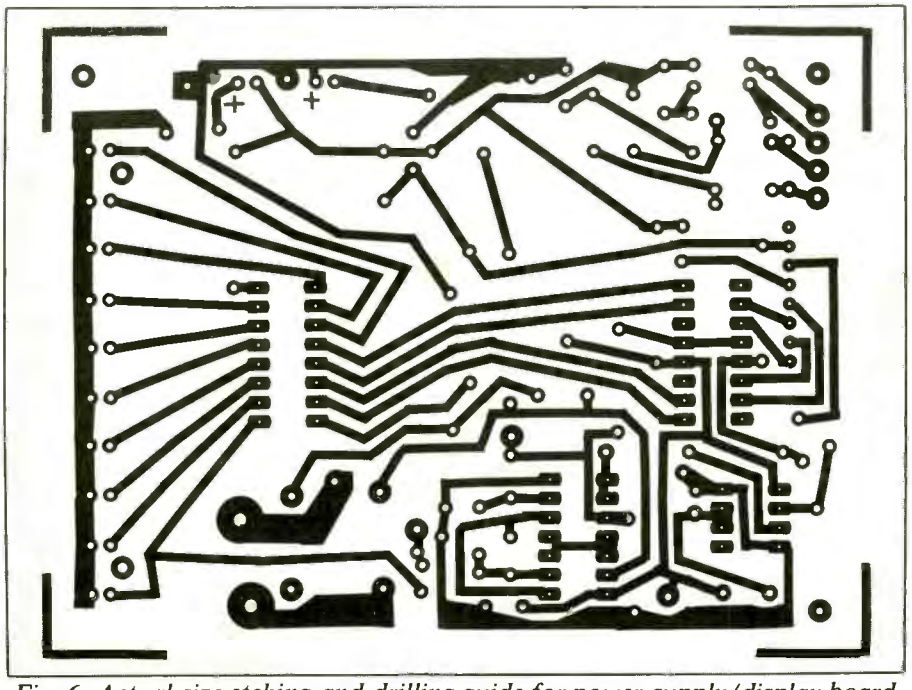


Fig. 6. Actual-size etching-and-drilling guide for power-supply/display board.

have a metal panel) that will accommodate the transmitter circuit board and 9-volt battery. Using the board as a template, position it inside the enclosure and mark the case for the two mounting holes. Then mark the hole locations for the antenna wire, sensor wires and access for *R1* and *L1*. Use a 3/32" bit to drill the antenna hole and a 1/8" bit for all other holes. Prepare as many enclosures as you will be using transmitters.

Decide how many transmitters you are going to have in your system and the audio tone frequencies you wish to use. then wire each board exactly as shown in Fig. 7, using the appropriate values for *R1* through *R4* and *C1* through *C3* from the transmitter Component Values table in each case. Wire only one transmitter board at a time to avoid confusion. Install all components (except the transistors, which mount 3/16" above the board's surface) flush with the board.

Note that most resistors on this board and many on the other two boards in the system mount vertically. Make sure the electrolytic capacitors are properly polarized and that basing is correct for the transistors before soldering them into place. If you plan to use a normally closed sensor, install *C10* between ground and point A. For a normally open sensor, omit *Q3* and solder a jumper wire between the drain (D) and source (S) pads and connect *C10* between ground and point B. Use heat jusiciously when soldering the transistors and crystal to the transmitter board and the diodes, LEDs, transistors and ICs on the other boards in the system to prevent heat damage to these delicate components. A photo of the wired board is shown in Fig. 8.

Trim 1/4" of insulation from both ends of three 36" lengths of 22-guage stranded hookup wire. Loosely twist together two of these wires and tie a knot 2" from the prepared end of the third wire. Pass one end of the twisted pair through the sensor-wire hole in the enclosure and connect and solder it to either the NC or NO (depending on the type of sensor you're using with the specific transmitter) pads on the board. Solder the

prepared end of the single wire to the ANTENNA pad on the board. Then solder the red and black wires from *B1*'s snap connector to the B+ and B– pads, respectively.

Label each board as it is wired with its channel number. Mount the board in the enclosure with the channel number of the board installed in it and the sensor type (NC or NO) for which the circuit is wired. Pass the free end of the antenna wire through its hole and plug a 9-volt battery into the snap connector. Assemble the enclosure.

Referring to Figs. 9 and 10, wire the transmitter/decoder and power-supply/display boards exactly as shown. It's a good idea to use sockets for all ICs, except *IC1* in the power supply. Again, note that many resistors mount vertically. Make certain that all components are properly oriented before soldering their leads or pins to the board. Also note that the test point and ground on the receiver/decoder board consist of insulated hookup wire with the tops looped over to retain ferrite beads *FB1* and *FB2*. Don't forget to install insulated jumper wires on the receiver/decoder and bare jumper wires on the power-supply/display boards at all indicated locations.

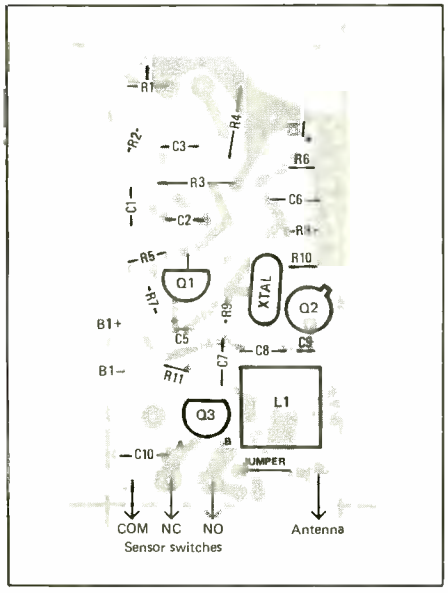


Fig. 7. Wiring guide for transmitter.

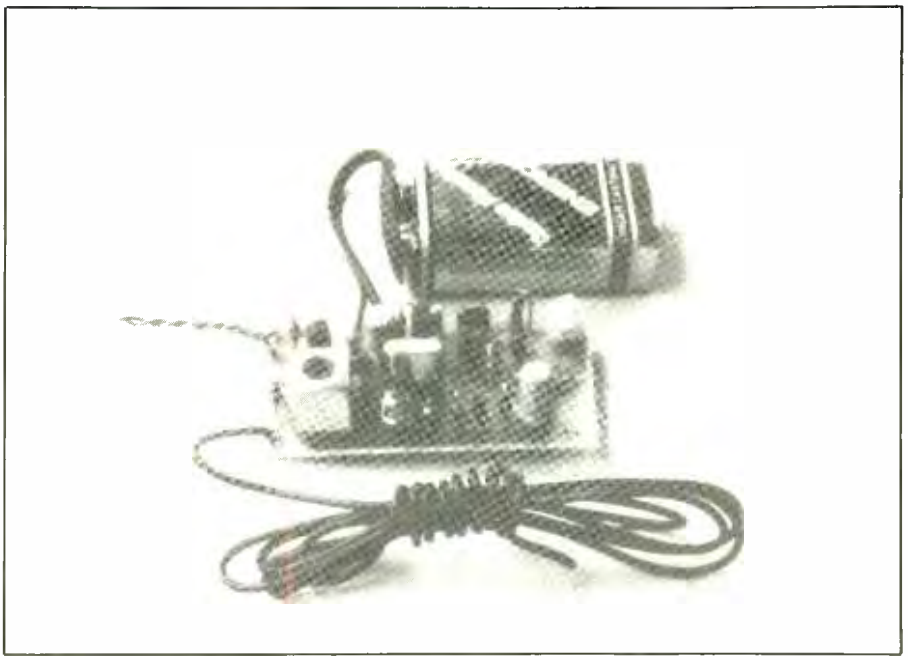


Fig. 8. The wired transmitter board.

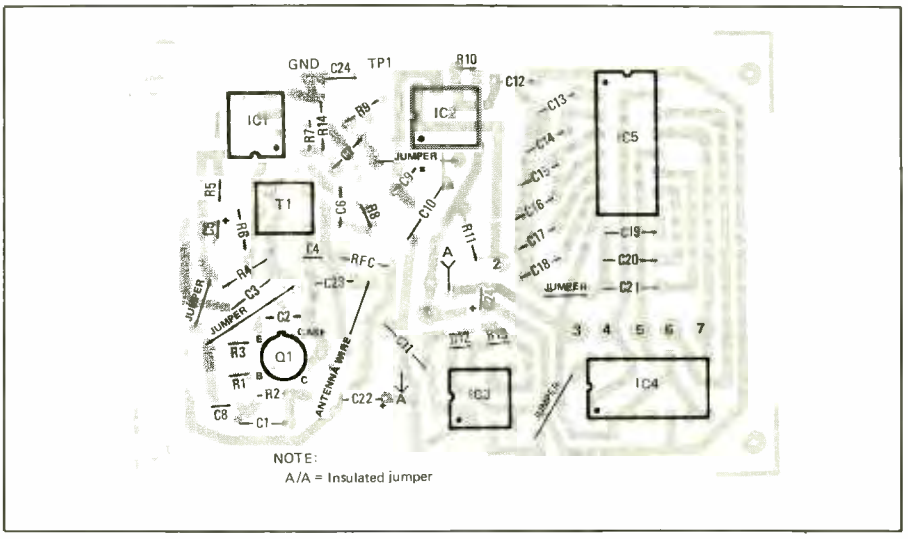


Fig. 9. Wiring guide for receiver/decoder board.

If you want the LEDs that make up *DIS1* on the power-supply/display board to protrude through the front panel of your enclosure, mount the display array, *LED1* and *LED2* on the *foil* side of the board, as in Fig. 11. Make sure the discrete LEDs are at the same height as the LED array and that they and *DIS2* are properly polarized.

Use a 7-conductor ribbon cable with an 8-pin connector at the power-supply end to link the receiver/decoder and power-supply/display boards. The power supply end can be terminated in a miniature 8-pin connector or be soldered directly to the board. (Install a mating connector on the board itself.) To prepare the receiver end, shorten lines 4 through 7 by ½", and solder the conductors in the appropriate holes in the board. Use a 24" length of stranded insulated hookup wire for the antenna

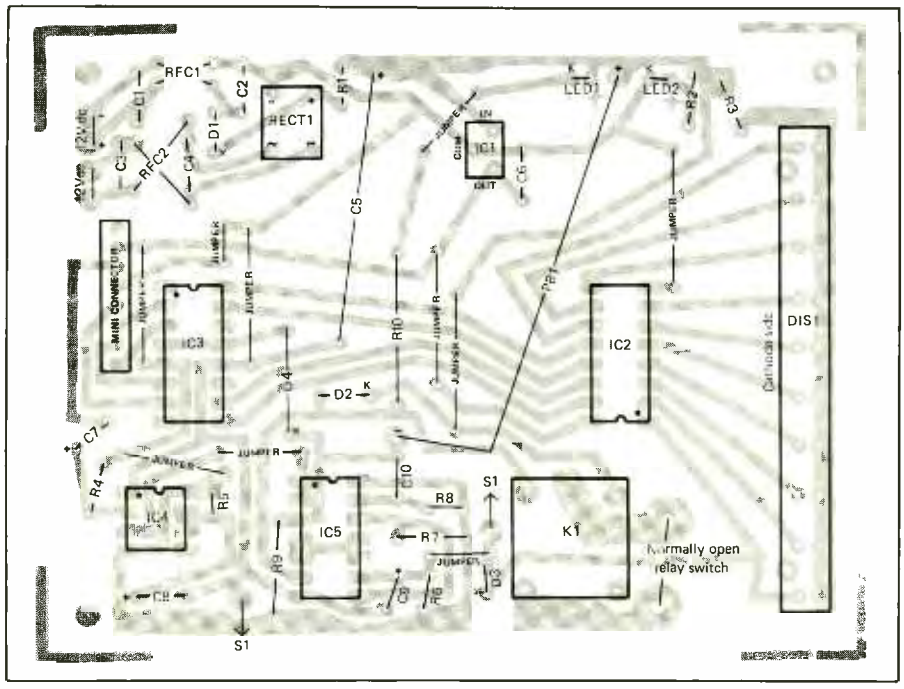


Fig. 10. Wiring guide for power-supply/display board.

and any type of hookup wire for the leads that go to *S1*, the piezoelectric buzzer if it is to be used, and the Normally Open Relay Switch pads.

For *RFC* on the receiver board, wind 14 turns of 28-gauge magnet wire on a No. FT-23-42 toroid core. Both *RFC1* and *RFC2* on the power-supply board are wound on the same No. FT-23-43 toroid core. To prepare this double RFC, twist together two 6″ lengths of 30-gauge magnet wire (about 30 twists) an wind five turns of the twisted pair on the toroid form. Be sure to start and end with the same conductor for each RFC, as shown in Fig. 2, when installing the assembly. Don't cross-connect the windings!

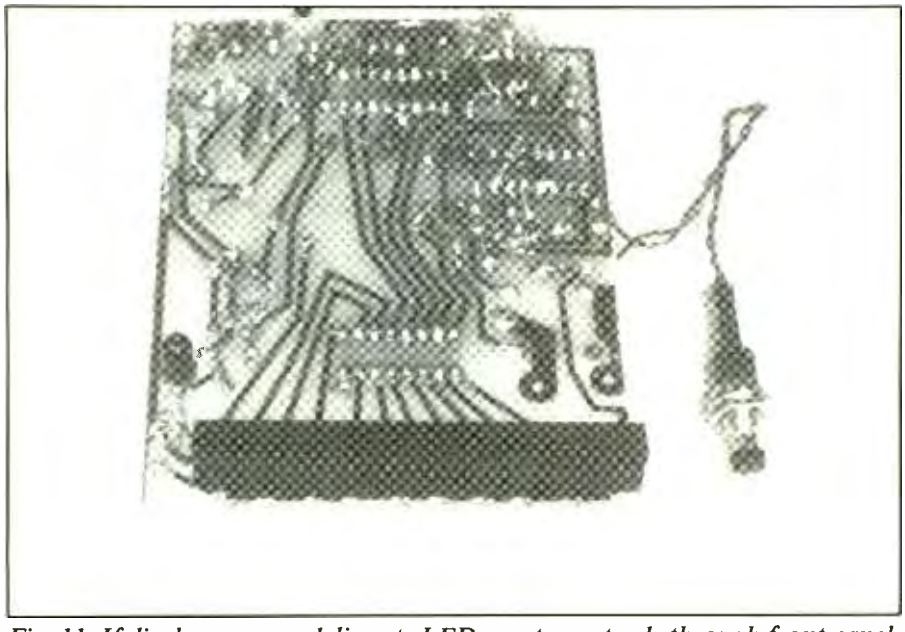


Fig. 11. If display array and discrete LEDs are to protrude through front panel, mount them on the rear of the board. Observe proper orientations.

If you wish to have the wireless pass-through option, install diode *D3* as shown in Fig. 3. Now *K1* will reset whenever the transmitter for channel 1 is activiated, allowing you to pass through a monitored entrance without tripping the alarm. The wired receiver/decoder and power-supply/display boards are shown in the lead photo.

Select an enclosure for the receiver system that is large enough to accommodate the receiver/decoder and power-supply/display boards without crowding, as well as the backup-battery option if you plan on using it and installing it internally. Drill holes for mounting the receiver/decoder and power-supply/display boards (receiver on the bottom panel, power-supply on the top panel); the antenna and transformer cable (in different sides); and the LEDs and the *S1* RESET switch. Line the hole through which the wall transformer cable is to enter the enclosure with a rubber grommet.

Cut a slot for viewing the LED display. Then drill mounting holes for a 2-contact screw-type terminal strip on the rear wall and for the piezoelectric buzzer (if you decide to use it) on the front or one of the side walls of the enclosure. The wires from the relay's contacts go to the terminal strip.

If your wall transformer has a connector on it, cut it off and prepare the cable for soldering. Pass the cable through the grommet and tie a knot in it about 6″ from the prepared end. Solder the conductors to the pads labeled 12 VAC. If you plan on using the battery backup option, solder 8″ lengths of hookup wire to the pads labeled 12 VDC.

Mount *S1* in its hole and the terminal strip on the enclosure. Then use ¼″ spacers and 4-40 × ½″ machine

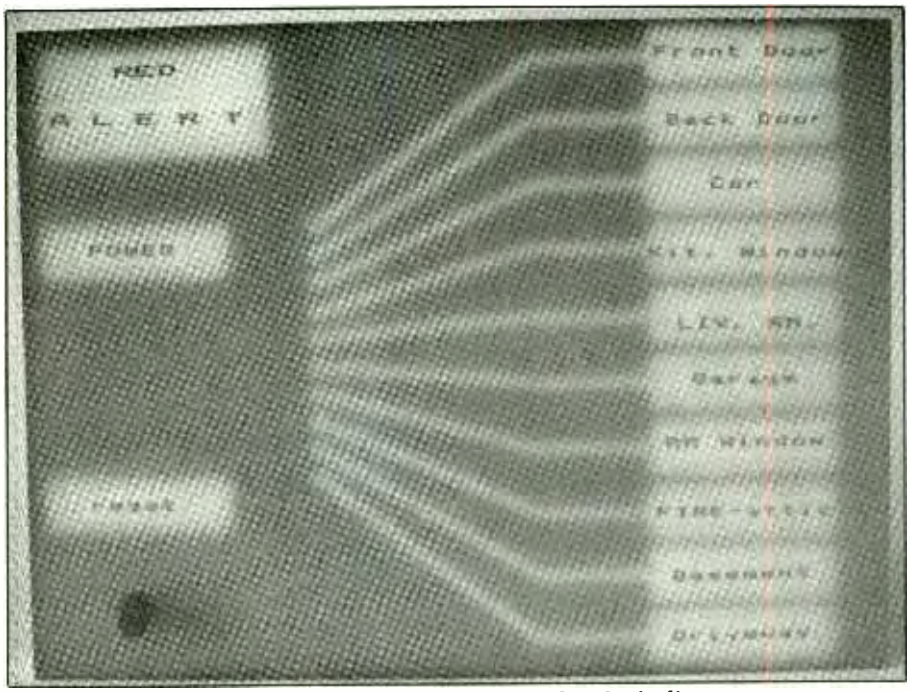


Fig. 12. A suggested front-panel layout for the indicator system.

hardware to mount the pc board assemblies. Plug the ribbon cable onto the connector on the power-supply board and route the antenna wire through its hole. Connect and solder the wires to *S1*, *PB1* and the terminal strip.

Label *LED1* POWER and *LED2* ALARM (or ALERT), the various LEDs of *DIS1* according to location (such as FRONT DOOR, KITCHEN WINDOW, GARAGE, etc. in Fig. 12) and *S1* RESET.

Calibration and Installation

Starting with the receiver system, place it within about 3 feet of a TV receiver turned on and tuned to channel 2. Plug the projects's wall transformer into an ac outlet and note that the POWER LED immediately comes on and that all 10 LEDs in *DIS1* light for a few seconds and then shut off. After this, the array's LEDs will turn on and off sequentially in scanner-like fashion.

Use a small screwdriver to adjust the tuning slug in *T1*. (*Caution*: the tuning slug is very fragile; so work carefully.) With the slug about halfway out, begin slowly turning it clockwise while monitoring the TV picture. Lines of interference should appear. Continue clockwise adjustment until most or all of the lines fade out and a light snow remains, indicating that the r-f detector is operating in the correct frequency range.

Connect an audio amplifier to testpoint TP1 and GND on the receiver/decoder board (see Fig. 7). Turn up the volume to about halfway and listen for the hissing noise that indicates correct receiver operation. If a TV station is broadcasting on channel 2, you can detect the video portion of the signal by backing *T1*'s slug about halfway out until you hear a harsh buzzing sound.

To calibrate the transmitter(s), start by setting trimmer control *R1* to mid-position and the slug in *L1* flush with the top of the coilform. Place the transmitter near the TV receiver, still turned on and tuned to channel 2. Drape the transmitter's antenna wire over the TV receiver's rabbit-ears antenna and turn on the transmitter. Adjust *L1*'s slug until interference lines appear on the TV screen (an audio tone might also be heard, but not clearly), indicating that the transmitter is working.

Use the 450-Hz transmitter to make the following adjustment. Place the transmitter about 15 feet from the receiver and adjust *T1*'s slug until you hear a tone coming from the amplifier's speaker. Adjust for best signal. Once tuned, check to make sure that each transmitter causes the receiver's relay to latch and the display to pause at the correct location.

Decide on the locations in which to mount the transmitters. If possible, orient the antennas vertically, off the floor and away from metal objects, including electrical wiring. Fasten the sensors so that they toggle when monitored doors and windows are opened. You can locate the receiving module in any convenient location within the protected premises where there's an ac outlet into which it can be plugged. Then when the system is fully installed, make several test runs to ascertain that the system is working properly. Orient the antenna vertically.

At this point, you can elect to have your system sound a siren or loud bell, activate a sump pump, turn on a sprinkler system, turn on flood lights, etc. via the relay in the receiver. Be aware, however, that this relay's contacts are rated for relatively light-duty loads. If you wish to have it control an item that draws a lot of power, such as floodlights, have the internal relay control an external power relay that, in turn, controls the load.

Parting Comment

The 10-Channel Wireless Home Security System described here provides the convenience of wireless operation with the basic economy of a hard-wired system. Its ability to inform you of the location of an attempted break-in or other emergency situation is a benefit that most hard-wired systems do not offer. **ME**