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Ham Window Dressing

If this nifty car frequency display doesn't draw gawks, nothing ever will.

Ever have the desire to let other hams who were sporting com antennas on their cars know a contact frequency? The following description of hardware for a rear window display will enable you to construct an easy-to-read suggested contact-frequency display system.

This system design and construction was developed by two of the Anne Arundel (Anne Arundel County, Maryland) Radio Club members upon request by another radio amateur. Some design criteria were: easy to read from a distance, low cost, simple construction, easy to change display, and easy to install.

Design considerations

LCDs of the size desired (several inches tall) are very expensive compared with LEDs. Also, LCDs require back-lighting during darkness. Instead of purchasing complete bar segment displays, separately mounted LEDs were used. The display selected was a 5 x 7 dot matrix of jumbo LEDs. Red LEDs were selected due to cost and brightness considerations. To minimize complexity and maximize display brightness, DC currents were used rather than strobing the display. To minimize the number of wires connecting the control panel at the dashboard to the display in the rear window, BCD switches and 7447 BCD-to-"N" of 7 drivers were used.

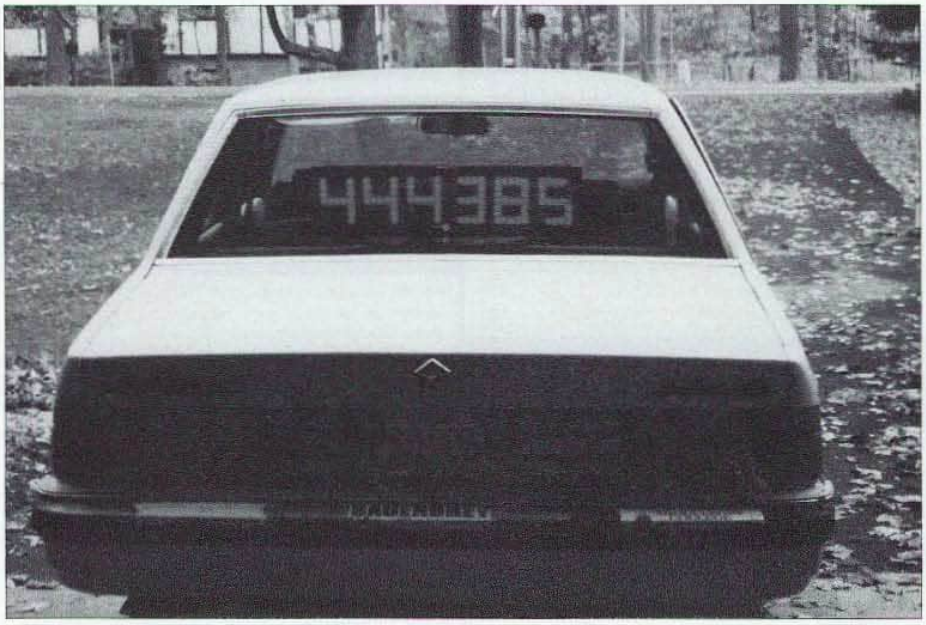

Photo A. *Rear window display during daylight hours. Regulations regarding the placement of signs on vehicles vary from state to state. They may also vary with the type of vehicle (e.g., car, van, or truck), the location of the sign on the vehicle (e.g., rear deck, trunk, or side window) and the size or type of display (illuminated or passive). Contact your local motor vehicle office.*

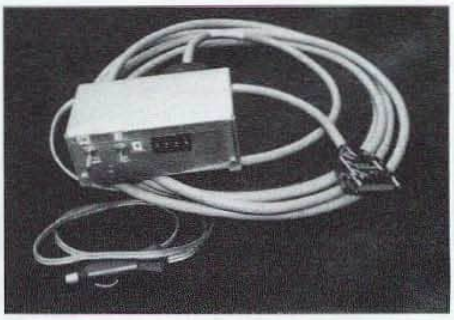

Photo B. *A view of the control box with an 8-ft.-long 25-wire data cable. The cable is terminated with a DB-25 female connector. A 3-ft. power cable is also shown connected to the control box. This cable is terminated with a cigarette lighter plug.*

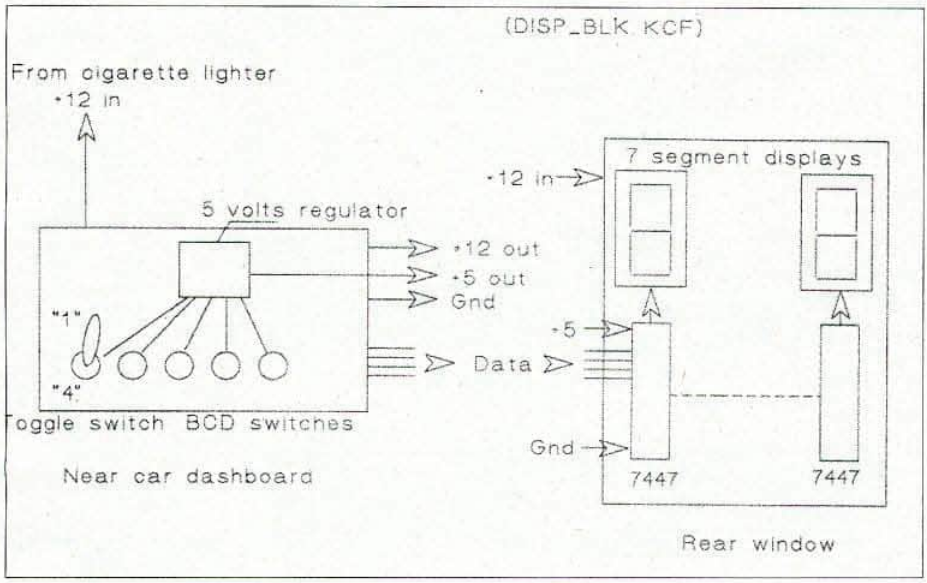

Fig. 1. System block diagram.

7447 drivers are ubiquitous and low-cost ($1.29 each by mail order). Segment drive currents of 20 mA at a car electrical voltage of 12 volts was decided upon. At 13.8 volts, the current for a bar segment consisting of 3 LEDs increased to 26 mA and the 4-LEDs-per-segment current increased to 28 mA. Since the jumbo LEDs were purchased from a surplus electronic parts supplier, data sheets were unavailable. There was concern about exceeding the maximum current rating of the LEDs; however, over 100 hours of "burn-in" have occurred with no failures. By employing BCD switches rather than 10-position rotary switches, the total number of wires between the control panel and display were reduced from 45 to 21. To minimize voltage drops, the +12, +5, and ground lines were "doubled up."

System block diagram

The control box consists of a 5 volt regulator (7805), four BCD switches, an SPDT toggle switch, an SPST toggle switch, a cigarette lighter plug with a built-in 2 amp fuse, a green LED assembly with built-in resistor, a female DB-25 connector, and an aluminum enclosure.

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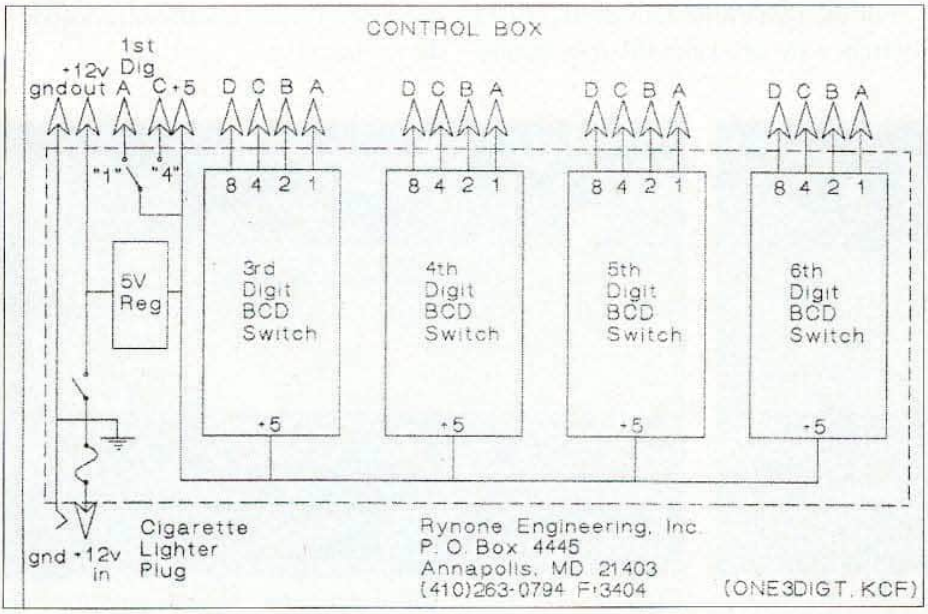

Fig. 2. Control box schematic.

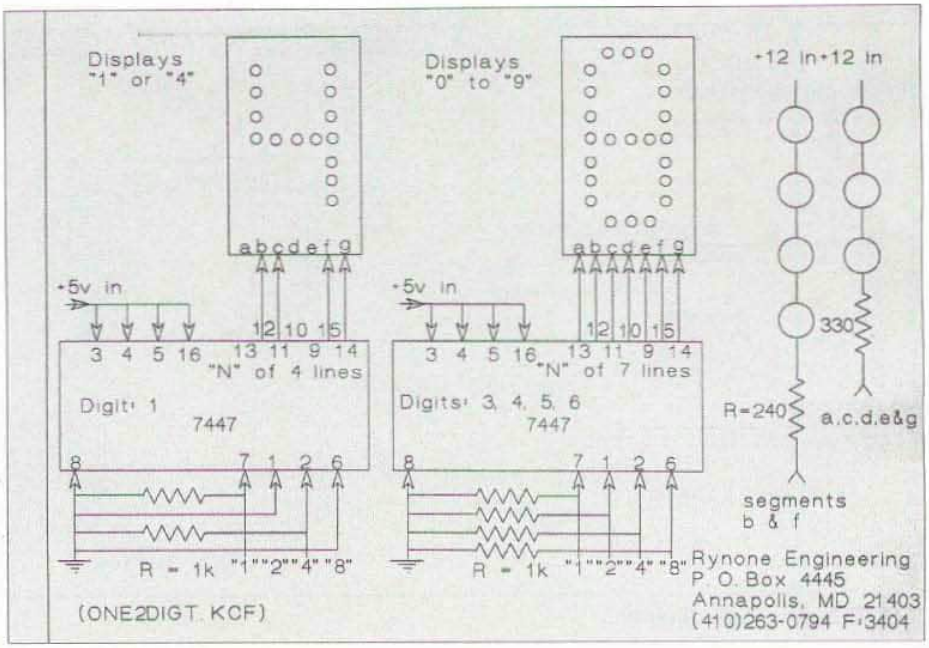

Fig. 3. Display schematic.

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Control box schematic

The display assembly consists of six decimal digits. Four of the digits are composed of seven-segment displays. The second digit is simply the decimal number "four." This digit is hard-wired as shown. The first digit of the system must display either decimal "1" or decimal "4" (for two meter or 440 MHz) — thus only four segments (b, c, f, and g) are required. Selection of either "1" or "4" is made via a single pole double throw toggle switch.

For the remaining four digits, BCD switches are used and the four output terminals are connected to wires that interconnect the control box switches to the 7447 decoder/drivers. The output of each 7447 consists of a LOW logic level for "N" of 7 segments. The second digit is always displayed as a "4." Consequently, segments b, c, f, and g are hard-wired to +12 volts with the appropriate current limiting resistors (330 ohms for c & g, 240 ohms for b & f). It is worth noting that should it be desired to construct a display where all six digits are selectable, all that is required is to replace the SPDT switch-selected first digit and hard-wired second digit with two additional decoder/driver boards.

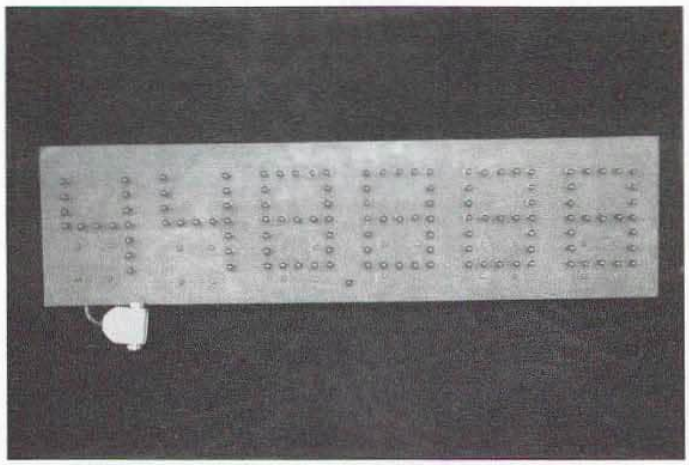

***Photo C.** Close-up front view of the display panel with a 6-in.-long, 25-wire data cable, and its terminating DB-25 male connector.*

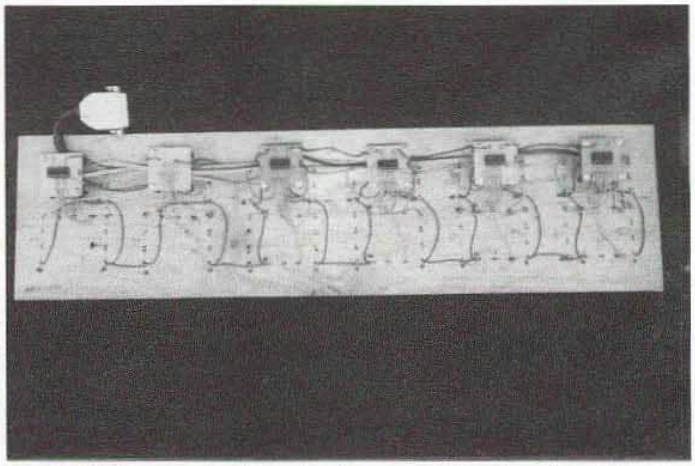

***Photo D.** Rear view of the display panel showing the wiring between the data cable and each of the display digits.*

Installation

By employing a cigarette lighter plug, the display system may be easily removed from the car. This feature may be desirable where auto theft is of concern. The data cable may be buried underneath the front seat and then under the rear carpet and finally under the rear seat. For ease of removal, it may be desirable to not locate the cable under the rear seat and instead locate the cable on the side of the rear seat up to the rear deck. Also, plugs and jacks may be included at the cable entrance to the control box and also at the rear display. This would enable easy removal of the display and control box and leave the cable assembly in place.

PCBs

Printed circuit boards are available for each digit of the 6-digit frequency display system at $6 per board, plus $1.50 S&H per 2 boards. You can purchase the set of all six boards for $30 plus $3 S&H. Inquiries should be addressed to FAR Circuits, 18 North 640 Field Court, Dundee IL 60118. Phone 847-836-9148, or E-mail [farcir@ais.net].

Acknowledgments

Mr. Oscar Ramsey did quality construction and testing. Dick Wilkinson used his Nikon to take professional-quality photos. Professors (ret.) Ralph Santoro and Steve Burns kindly provided technical assistance. 73

Qty.	Item	Part No.	Distributor
Control Box:			
4	BCD switches	136557	Jameco
1	Toggle switch, SPDT, miniature	275-613	Radio Shack
1	5 volt regulator, 7805	276-1770A	Radio Shack
1	Aluminum project box	270-238	Radio Shack
1	Cigarette lighter plug w/ fuse	274-335	Radio Shack
1	Green 12 V LED cartridge	276-085A	Radio Shack
1	Connector, DB-25, female	276-1548	Radio Shack
1	Power cable, 2-wire, #16 wire in plastic sheath		
1	Fuse, 2 A, 3 AG	270-1007	Radio Shack
Display Assembly:			
5	7447 decoder/drivers	50420	Jameco Electronics
121	LEDs, 8mm jumbo, red	LED-23	All Electronics
1	Plastic sheet, 4 in. x 21 in. x 1/8 in.		
10	Resistors, 240Ω, 1/2 W	N/A	Mark Electronics
22*	Resistors, 330Ω 1/2 W	271-1315	Radio Shack
18*	Resistors, 1kΩ, 1/2 W	271-1321	Radio Shack
6	Perfboards	276-148	Radio Shack
1	Connector, DB-25, male	276-1547	Radio Shack
Interconnect Cable:			
1	Cable, 20-wire, in a plastic sheath or ribbon, #22 wire		
1	Connector, DB-25, male	276-1547	Radio Shack
1	Connector, DB-25, female	276-1548	Radio Shack
Cable note: All the above for cable, OR			
1	Computer cable, 15 ft. long w/ DB-25 male and female connectors	177279	Jameco
*Note: These items sold in blister packs of more than one item per package.			

Table 1. Parts list.