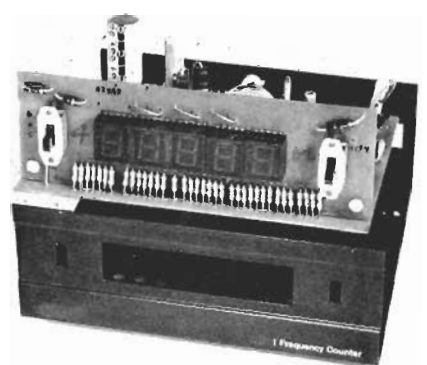
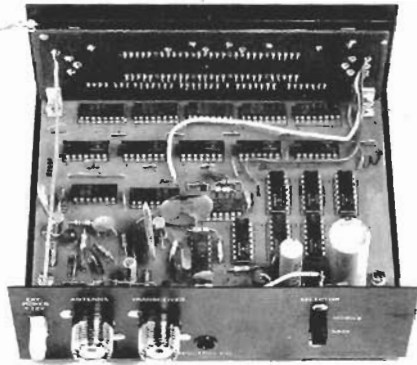


Build 30-MHz CB



FREQUENCY COUNTER

Two circuit boards make this an easy unit to assemble. An accessory power supply adds line voltage operation

GEORGE SANTI

THERE IS ONLY ONE WAY THAT A CB OPERATOR can be certain that his CB transmitter is always operating on frequency, and that's by monitoring its output with a frequency counter whenever he is on the air. The frequency counter described in this article makes it easy for the CB'er to do just that. It can be used in the car with a mobile unit or at home with a base station.

The counter reads frequencies over a range of 5 Hz to 30 MHz. The display

consists of five large (1½-inch high), bright LED readouts. A mode switch lets you select kHz or MHz readings. Once installed, the unit works automatically when you transmit. And while you're listening, only the decimal point of the display remains lit, reducing current drain to less than 70 mA.

For CB'ers, all 40 CB channels are

covered. The unit can be mounted in a car and the frequency counter connects between the CB transmitter and the antenna by using standard SO-239 in-line connectors.

To use the counter with a base station, an additional 117-volt AC supply is needed. A schematic for such a supply is shown and an assembled version is available as described in the parts list.

Amateur radio operators can also use the counter to check their transmissions on all bands through 10 meters. Obviously, this is particularly important if he is using a VFO.

For experimenters, this counter offers an inexpensive accurate (± 10 PPM) test instrument. It can be driven directly with 5-volt TTL signals.

SPECIFICATIONS

INPUT SENSITIVITY: 500 mV RMS-DC to 3MHz, 500 mV RMS linearly increasing to 5 VRMS-3 MHz to 27 MHz.

IMPEDANCE: 22,000 ohms at low frequencies, 200 ohms at 27 MHz.

FREQUENCY RANGE: 5 Hz to 30 MHz.

DISPLAYS: Five 0.5" high LED's

OVERLOAD: Diodeprotected input

ACCURACY: ± 1 digit \pm time base stability

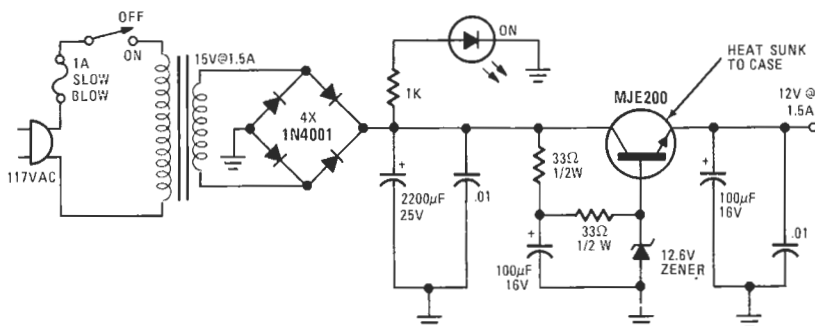
READOUT: kHz or MHz

TIMEBASE CRYSTAL FREQUENCY: 10 MHz, ± 10 PPM accuracy, ± 1 PPM stability

POWER REQUIREMENTS: 8-14 VDC at 1.2A. For base-station operation use 117 VAC regulated power supply (minimum 1.5A rating)

DIMENSIONS: 2½" H, 5½" W, 6¼" D

WEIGHT: 1.6 pounds



POWER SUPPLY provides 12 volts DC to operate the frequency counter off the 117-volt AC line.

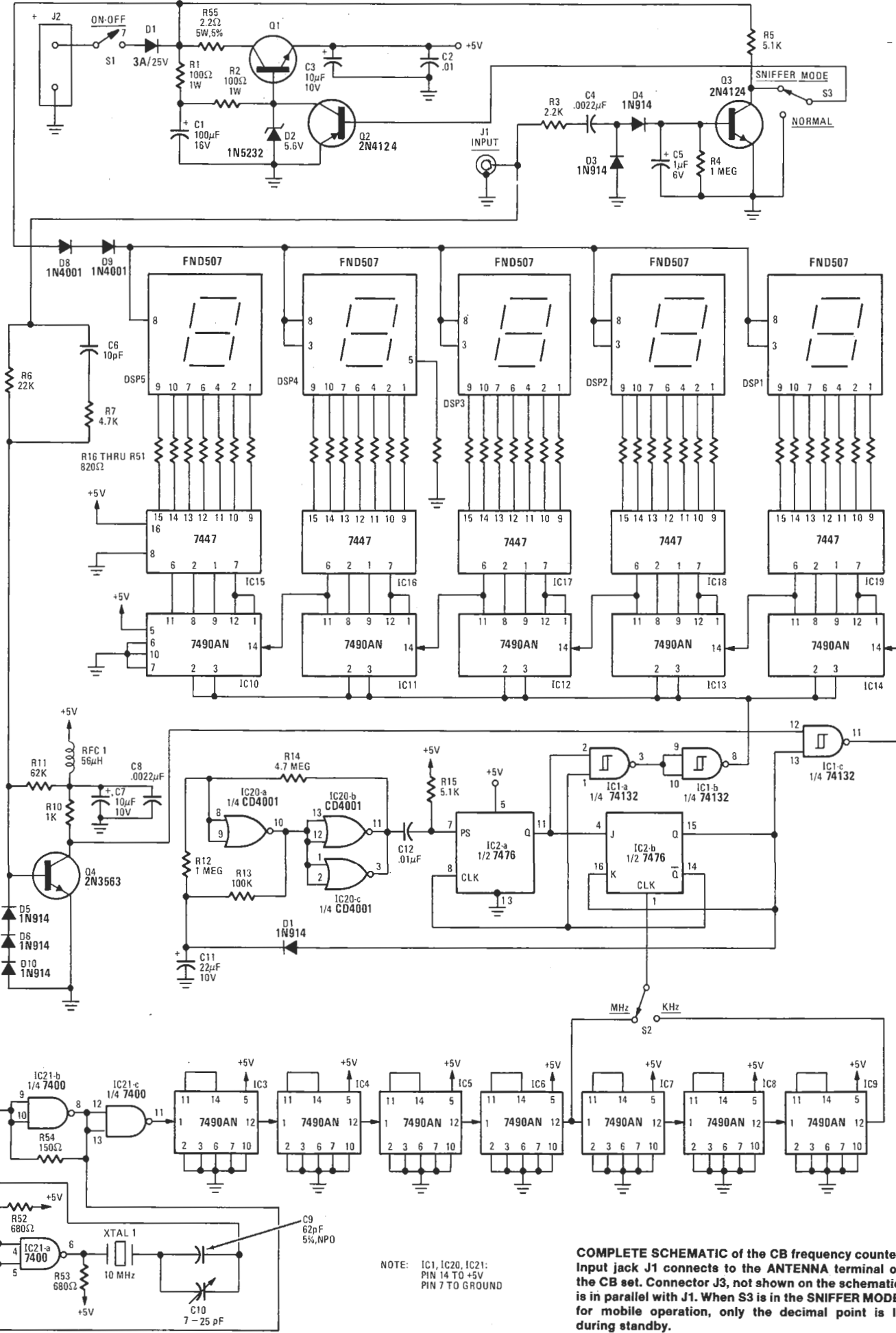
Building your counter

The unit is easy to build. All parts with the exception of front and rear panel switches and connectors mount on the two circuit boards. One board is the main circuitry, the other houses the display devices. Both boards are one-sided and the foil patterns printed here are actual size. Boards are also available from the supplier listed in the parts list.

The resistors mounted on the display board have only one lead connected to that board. The other end of these resistors mate with matching holes in the main circuit board and interconnect the two boards. Once soldered into place, the two boards sit at right angles to each other and are firmly fastened together.

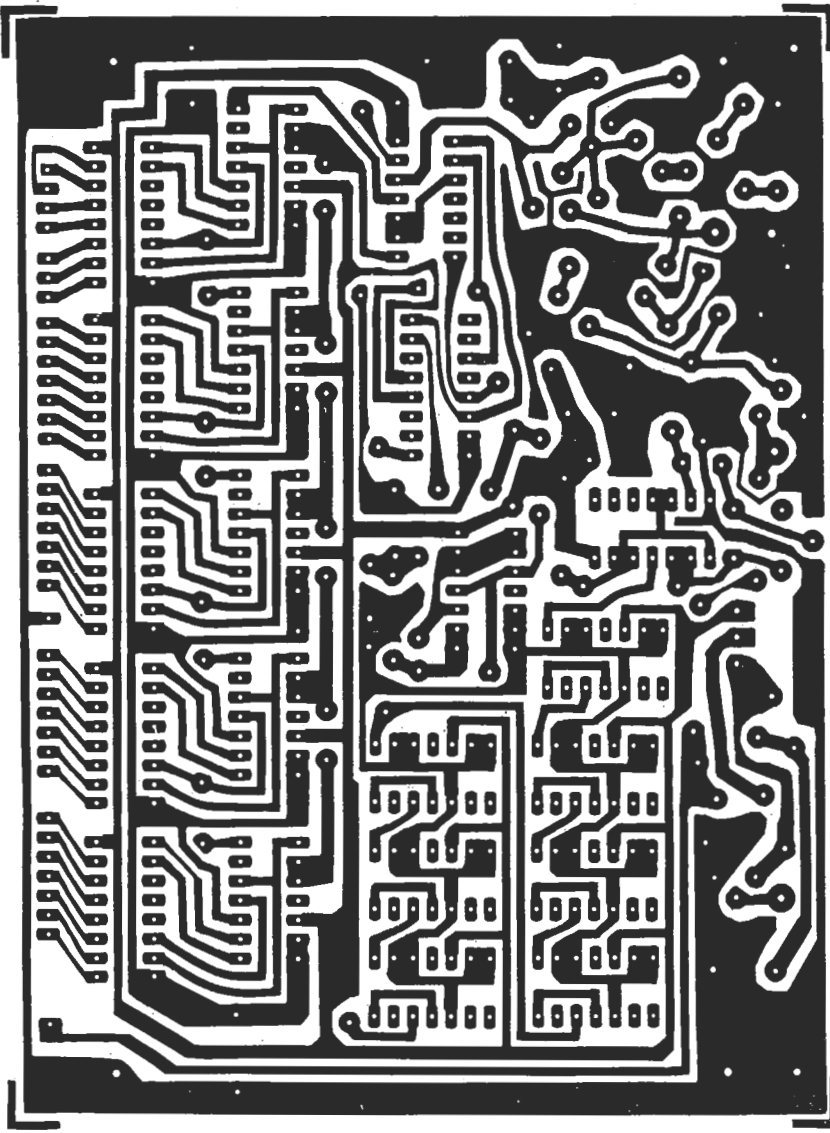
No special construction tips are needed. But do take care not to let solder blobs short foils, especially when soldering the IC pins into place.

One point; you might want to try

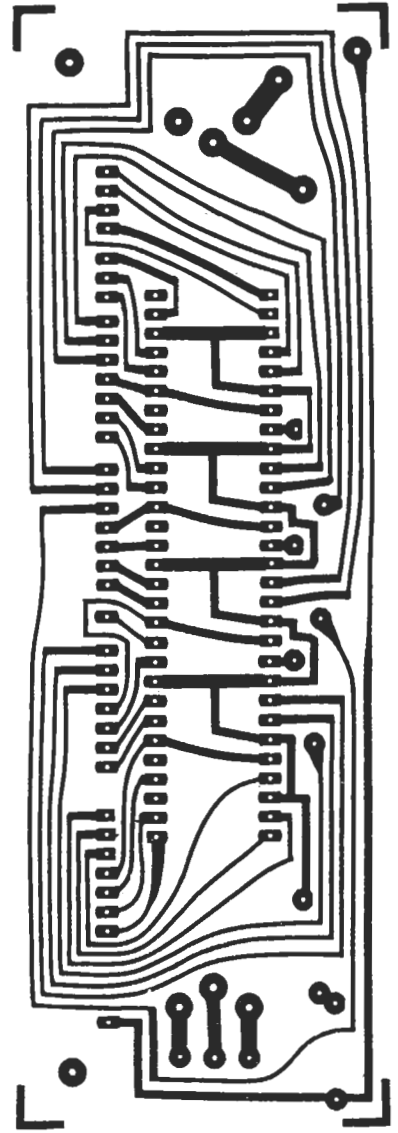


NOTE: IC1, IC20, IC21:
PIN 14 TO +5V
PIN 7 TO GROUND

COMPLETE SCHEMATIC of the CB frequency counter. Input jack J1 connects to the ANTENNA terminal on the CB set. Connector J3, not shown on the schematic, is in parallel with J1. When S3 is in the SNIFFER MODE, for mobile operation, only the decimal point is lit during standby.



FULL SIZE FOIL PATTERN for the main circuit board of the CB frequency counter. This one-sided board should be relatively easy to make.



FULL SIZE FOIL pattern for the display board makes it easy to duplicate.

PARTS LIST

All resistors 1/4-watt 5% unless noted

- R1, R2—100 ohms, 1W, 10%
- R3—2200 ohms
- R4, R12—1 megohm
- R5, R15—5100 ohms
- R6—22,000 ohms
- R7—4700 ohms
- R8, R9—not used
- R10—1,000 ohms
- R11—62,000 ohms
- R13—100,000 ohms
- R14—4.7 megohms
- R16 thru R51—820 ohms (35 resistors)
- R52, R53—680 ohms
- R54—150 ohms
- R55—2.2 ohms, 5W, 5%

Capacitors

- C1—1,000 μ F, 16V, electrolytic
- C2, C12—.01- μ F disc
- C3, C7—10 μ F, 10V, electrolytic
- C4, C8—.0022- μ F disc
- C5—1 μ F, 6V, electrolytic
- C6—10-pF disc
- C9—62-pF, 5% NPO, disc
- C10—7-25-pF trimmer (Erie)
- C11—22- μ F 10V, electrolytic

Diodes

- D1—3A, 25V or higher power rectifier
- D2—1N5232B, 5.6V Zener diode
- D3, D4, D5, D6, D7, D10—1N914
- D8, D9—1N4001
- DSP1, DSP2, DSP3, DSP4, DSP5—FND507 (0.5-inch high 7-segment LED display 15mA per segment)
- F1—3A 3AG
- J1—coax connector
- J2, J3—2 connector male power jack
- RFC1—56- μ H choke

Integrated circuits

- IC1—74132—Quad 2-input NAND Schmitt Trigger
- IC2—7476—Dual J-K Master-Slave flip-flop
- IC3 thru IC14—7490AN—Decade Counter
- IC15 thru IC19—7447 BCD-to-seven-segment decoder drive
- IC20—CD4001—Quad 2-input NOR gates
- IC21—7400—Quad 2-input NAND gate
- Q1—2N40631
- Q2, Q3—2N4124
- Q4—2N3563
- S1—SPST switch

- S2, 3—SPDT switch
- XTAL1—10 MHz \pm 10 PPM.
- Circuit Boards
- Case
- Hardware

The following parts are available from Guardsman Electronics, Box 215, Brooklyn, NY 11207.

Etched and drilled circuit boards (2); \$11.00 postage prepaid.
10-MHz crystal; \$3.50 postage paid.
Trimmer capacitor; \$6.50 postage paid.

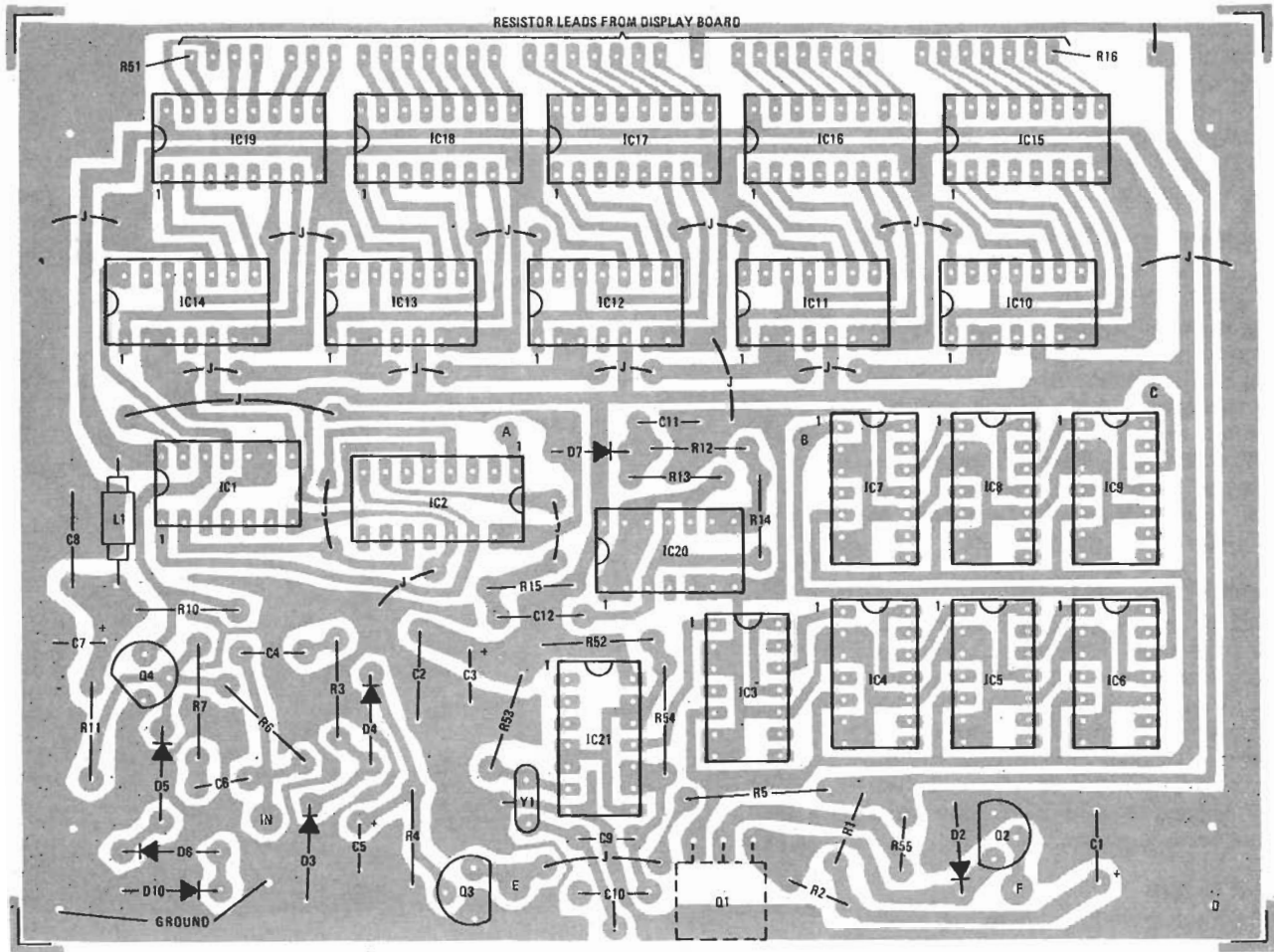
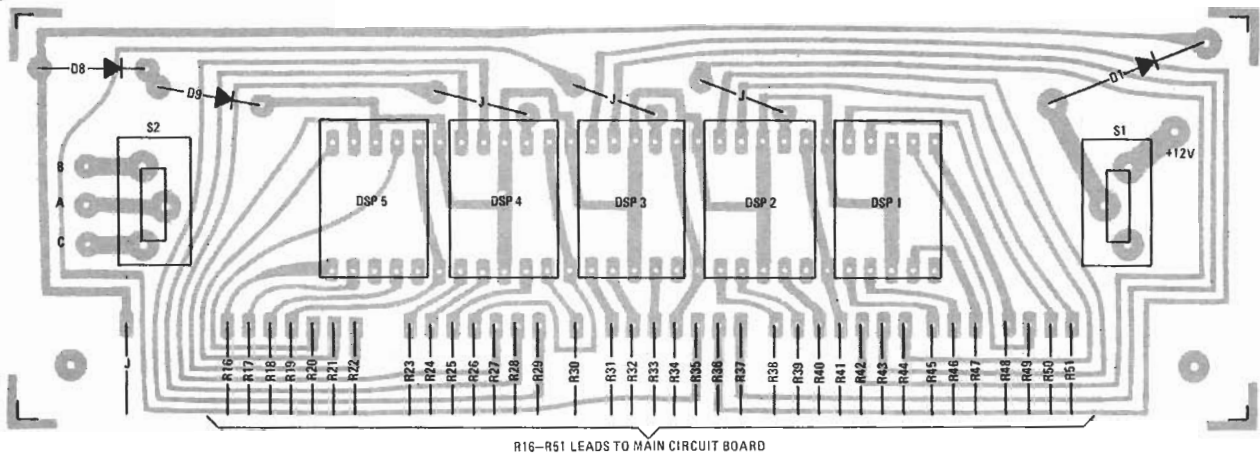
Set of 2 circuit boards, crystal and trimmer capacitor; \$19.00 postage paid.

Complete kit of all parts including custom cabinet; \$59.95 plus \$1.50 postage and handling.

Assembled unit; \$99.95 plus \$1.50 postage and handling.

Power supply (assembled) 13.6VDC, 2.5A, \$18.00 postage prepaid.

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PARTS PLACEMENT DIAGRAMS shows exact positions for parts mounting on both the main and display circuit boards.

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using IC sockets. Don't do it for this project if you intend to use the counter in a vehicle. Over a period of time the vibration will loosen the IC's and the counter will suffer from all kinds of strange problems. However, if you are using the counter with a base station, you can use IC sockets if you wish.

Installation

Installing the counter in a car is a relatively simple matter. It can be installed in

any convenient location using mounting brackets. The most convenient location is usually under-dash as close to your CB rig as possible.

After mounting, the next step is to connect the counter to the car's 12-volt electrical system. To do this, assuming a negative-ground electrical system, connect the negative lead from the counter to the metal frame of the car and the positive lead to a fuse in the fuse box. If you would like the counter to turn off with the ignition switch, tie into a fuse that handles a switched accessory. For posi-

tive-ground electrical systems, reverse the connections.

Connect the antenna to the coaxial connector marked ANTENNA on the back panel of the counter and the CB rig to the one marked TRANSCIVER. Finally, place the slide switch on the back panel in the MOBILE position and your all set.

A base installation is basically the same, minus the mounting headaches. Power is taken from the separate power supply.

We think you'll find this an interesting and useful project.