operating frequency, or 37.660 to 37.950 MHz for operation on CB channels 1 to 23.

Output from the vco is also mixed with the third harmonic of the 11.80666 MHz crystal oscillator (Q105) at 35.420 MHz, to produce a difference frequency of 2.24 to 2.53 MHz, which is fed into pin 2 of the PLL chip. 10.240 MHz energy from the 10.240 MHz reference/second receiver mixer injection oscillator is fed into the IC at pin 3.

Inside the IC, the 10.240 MHz signal is divided by 1024 to produce a 10.00 kHz reference signal. The 2.24 to 2.53 MHz signal is divided by n, where n is a number determined by the binary coding from the channel switch to pins 7-15 of the IC. See Table 1.

For channel 1, n is 224, dividing the difference frequency at pin 2 by 224. This frequency is compared to that of the 10.00 kHz reference signal. If the output of the n divider is less than 10.00 kHz, the voltage at pin 5 of the PLL chip (the control voltage for the vco) is raised, causing the frequency of the vco to increase. If, on the other hand, the frequency of the n divider output is higher than 10.00 kHz, indicating that the vco is too high in frequency, the voltage at pin 5 drops, lowering the vco's frequency. This action, similar to that of a thermostat, regulates the frequency of the vco. By changing the value of n (the job of the channel switch) or the frequency of the 11.80666 MHz oscillator and adjusting the slug in the vco oscillator coil (to set its tuning range), the operating frequency of the vco, and thereby the operating frequency of the entire rig, can be changed, while maintaining stability approaching that of a crystal oscillator.

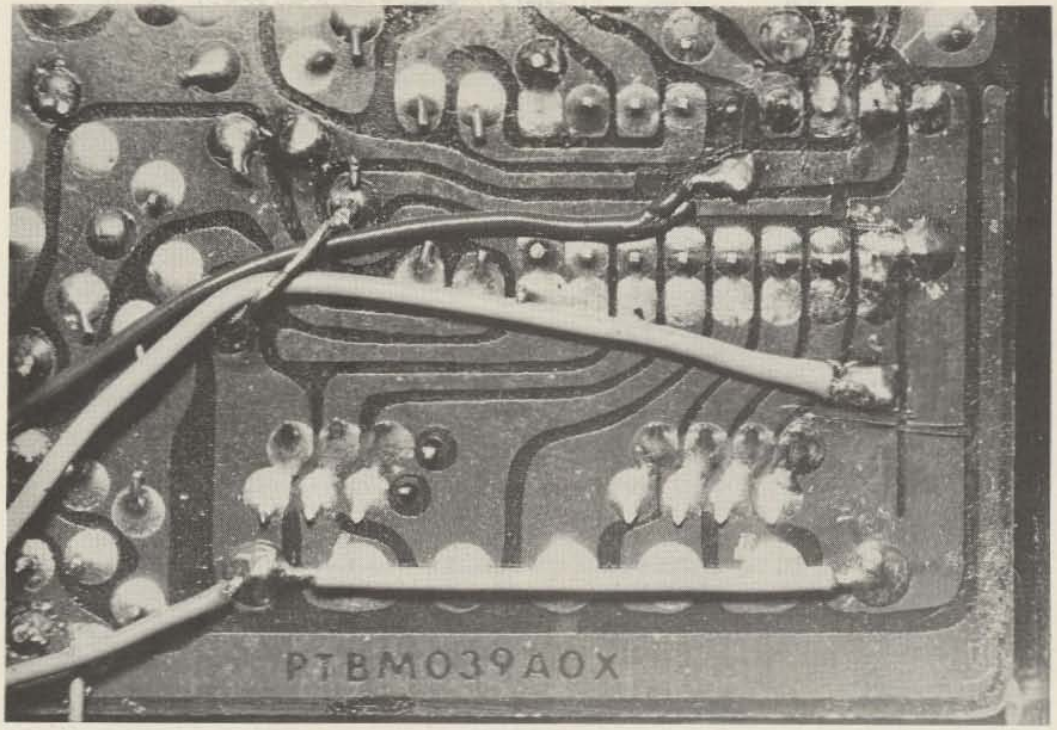

Photo B. Close-up of the channel-switch area of the circuit board, showing the modification to provide 23 additional channels 320 kHz above the "normal" 23 channels.

Conversion to 10 Meters

To convert the radio to 10 meters, the 11.80666 MHz oscillator must be changed. The frequency required to give channel 1 a frequency of "F" MHz is:

crystal frequency (MHz) = (F + 8.455)/3

or 12.405 MHz for channel 1 at 28.760 MHz, the channel 1 for many converted CBs now in use, especially in the Los Angeles, California, area. The crystal should be available from any of the major crystal manufacturers. When ordering, specify the frequency desired and the model of radio you are converting. The crystal manufacturers usually have information on holder type, load capacity, and other specifications for CB units on file. If not, send a copy of the oscillator schematic along with the order.

To get the rig up to ten meters, the vco must be moved to near 39 MHz and the transmitter must be completely realigned. The easiest way I have found to do this is to use a dummy load, wattmeter, or other output indicator, frequency counter, or receiver covering 27 to 29.5 MHz with some accuracy and a signal generator or steady on-the-air signal in the following procedure.

With the unit off, isolate pins 5 and 6 of the PLL from the circuit board foil (use solder wick to remove the solder). Pin 6 is a protection voltage which drops to 0 if the PLL fails to lock up (i.e., the PLL can't regulate the vco frequency for some reason) and disables the transmitter. Pin 5 is the control voltage to the vco. Temporarily connect a jumper wire from pin 1 (5-volt supply to the IC) to the foil at pins 5 and 6, without connecting to the pins themselves. It probably wouldn't hurt the IC if the pins did touch, but, at $12.00 or more for a replacement IC, I don't recommend taking chances. This temporary modification runs the vco at maximum frequency, unlocked from the PLL, and overrides the transmitter disable line, allowing the transmitter to function. Connect the wattmeter and dummy load to the transmitter. Connect the frequency counter according to its instructions to monitor transmitted frequency.

Turn the unit on and key the transmitter. The frequency counter should read somewhere above 27.4 MHz. Tune the slugs of T111, L103, L104, T102, T103, L106, L109, and L110 for maximum output (the numbers are next to the coils on the circuit board). Exercise extreme caution in tuning, as the slugs are very fragile. Tune the vco oscillator coil, T101, until the frequency is about 300 kHz higher and retune the above coils for maximum

Fig. 1.

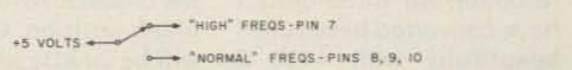

Fig. 2.

n	Ch.	Freq.	pin: 7	8	9	10	11	12	13	14	15
224	01	26.965 MHz	0	1	1	1	0	0	0	0	0
225	02	26.975 MHz	0	1	1	1	0	0	0	0	1
226	03	26.985 MHz	0	1	1	1	0	0	0	1	0
228	04	27.005 MHz	0	1	1	1	0	0	1	0	0
229	05	27.015 MHz	0	1	1	1	0	0	1	0	1
230	06	27.025 MHz	0	1	1	1	0	0	1	1	0
231	07	27.035 MHz	0	1	1	1	0	0	1	1	1
233	08	27.055 MHz	0	1	1	1	0	1	0	0	1
234	09	27.065 MHz	0	1	1	1	0	1	0	1	0
235	10	27.075 MHz	0	1	1	1	0	1	0	1	1
236	11	27.085 MHz	0	1	1	1	0	1	1	0	0
238	12	27.105 MHz	0	1	1	1	0	1	1	1	0
239	13	27.115 MHz	0	1	1	1	0	1	1	1	1
240	14	27.125 MHz	0	1	1	1	1	0	0	0	0
241	15	27.135 MHz	0	1	1	1	1	0	0	0	1
243	16	27.155 MHz	0	1	1	1	1	0	0	1	1
244	17	27.165 MHz	0	1	1	1	1	0	1	0	0
245	18	27.175 MHz	0	1	1	1	1	0	1	0	1
246	19	27.185 MHz	0	1	1	1	1	0	1	1	0
248	20	27.205 MHz	0	1	1	1	1	1	0	0	0
249	21	27.215 MHz	0	1	1	1	1	1	0	0	1
250	22	27.225 MHz	0	1	1	1	1	1	0	1	0
253	23	27.255 MHz	0	1	1	1	1	1	1	0	1
255	27	(see text)	0	1	1	1	1	1	1	1	1
Binary number:			256	128	64	32	16	8	4	2	1

A 1 indicates 5 volts at pin; 0 indicates no voltage.

Table 1.

output. Repeat the procedure, "walking" the transmitter up to about 200 kHz above your highest ten meter channel (about 29.35 MHz for channel 1 at 28.760 MHz). Turn the unit off.

Disconnect the 5-volt jumper wire which was temporarily installed from pins 5 and 6 to pin 1 and reconnect the pins to the foil. Turn the unit back on, and set the channel switch to channel 1. Adjust the trimmer capacitor next to the crystal for the proper output frequency. Turn the channel switch to channel 18. Adjust all of the coils mentioned except T101, the vco coil, for maximum power output. (This is done at a higher-than-center frequency because the power output drops off faster above the peak frequency than below. This is normal even on 11 meters and should not be the cause of any worries about changing capacitor values, trimming coils, etc., unless the coils just refuse to resonate. All three units I have converted have tuned beautifully with 4 to 5 Watts output without juggling any component values.)

Connect the transceiver to the signal generator or other signal source. Set the channel switch to channel 12 and adjust the generator for output on the same frequency. Adjust the rf stages in the receiver (T104 and L112) for maximum received signal strength on the S-meter. Alignment of the other receiver tuning adjustments should not be necessary, as the i-fs are on the same frequency as when the unit worked a couple of MHz lower.

Additional Channels

Channel 27 may be available in the blank position between channel 23 and channel 1 on the dial by installing an insulated jumper wire on the foil side of the circuit board between the terminal on the far left of the channel switch and the terminal on the far right of the switch. This modification will supply 5 volts to the vco and to IC pins 8 through 10 when the channel switch is in the blank position. Channel 27 will be 20 kHz above channel 23, or 29.070 MHz for channel 1 on 28.760 MHz. On some units, the blank will be another channel 1, but it's worth a try and, if it doesn't work on your rig, you can always take the jumper back out.

Each channel can be moved up or down 320 kHz by performing one of the following modifications. If one of these modifications is done, each channel will have two possible frequencies, one 320 kHz above the other. Thus, channel 1 in the higher position will be 30 kHz above the lower channel 23 and 10 kHz above the lower channel 27. In other words, the 320 kHz offset switch is selecting between two different bands of 23 channels (or 24 channels) each. The only component required for the modification is an SPDT switch, which may be installed in the front panel, or, to preserve the stock appearance of the radio, the function of an existing switch may be changed.

To be able to move the 23-channel band down 320 kHz, isolate pin 10 of the IC by cutting the foil on the circuit board around it. Then wire the switch as shown in Fig. 1.

To move up 320 kHz requires a little more work and is the modification I have shown in the photographs. Cut the foil on both sides of the connection to pin 7 to isolate it from ground. Then cut the foil to isolate pins 8, 9, and 10 as a group from the switch contact and from the thin strip of foil going to one end of R103, the series resistor in the B-plus lead to the vco. Install a jumper from this end of R103 to the 5-volt line at the left-most terminal of the channel switch or to the point shown in the photograph, which is just on the other side of a jumper from the terminal. If this jumper is forgotten, the vco won't oscillate. Connect the switch as shown in Fig. 2.

After the conversion has been completed, affix a label to it in an obvious place stating that the radio is not capable of operation on Citizens Band frequencies and that an amateur radio license is required to use it. The label could save a lot of embarrassment or a pink ticket from the FCC in the event a passenger riding in your car says something like "You have a CB just like mine!", picks up the microphone, and yells "Breaker 4" all over the world on 29.050 MHz.

My 13-882C on ten meters has provided quite a few contacts, mostly with stations on the west coast. My dad (Dale K9HIS) also has a 13-882C on ten, and my brother (Larry WB9BAQ) runs a 13-857B (an 882C without the noise blanker or antenna warning light) mobile with a trimmed-down CB magnet-mount antenna, working mostly stations on the west coast and southeastern U.S. What 4 or 5 Watts of AM phone will do on a clear frequency gave me quite a surprise. Who called it Ancient Mode, anyway? ■