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CB to 10. . . and Beyond

—getting excited at 432

Shortly before the January VHF contest, a commercial 432-MHz transverter was purchased as a last minute attempt to add another potential source of points to the station. However, the station's only HF transceiver was already providing the necessary 28-MHz drive for a pair of 6- and 2-meter transverters. In order to provide for independent operation and monitoring on 432, another 10-meter transceiver would be required (preferably solid state in keeping with the rest of the station).

After purchasing one tower, several transverters, a truck load of aluminum for antennas, and miscellaneous other items, to bring home another "radio" would have meant instant divorce court and possible damage to the operator! Enter—one solid-state, 23-channel, SSB, neglected CB rig, vintage 1973.

The unit available for conversion was the SBE Sidebander II (model SBE-12CB). Conversion is simple and inexpensive and requires only a VTVM and wattmeter (with a 10-Watt slug) as test equipment. The actual conversion consisted of:

1. Replacement of four crystals in the synthesizer.
2. Addition of one inductor in the clarifier circuit to provide for continuous coverage.
3. Retuning the rig for 28-MHz operation.

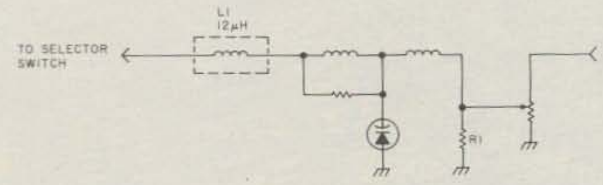

Fig. 1. SBE-12CB clarifier circuit. L1 is added to extend range to 15 kHz. R1 is 1-4k Ohms and controls linearity. All other components are existing.

The SBE-12CB uses three oscillators and a total of eleven crystals to synthesize its 23 channelized frequencies. A fixed 7.8-MHz oscillator is controlled by a single 7.8025 crystal. This oscillator remains unchanged. The other two oscillators, 7 MHz and 11 MHz, are controlled by four and six crystals respectively. The channel selector switch selects one (out of 4) crystals from the 7-MHz oscillators and one (out of 6) crystals from the 11-MHz oscillator.

For LSB and AM conversion, the selected outputs of the 11-MHz and 7-MHz oscillators are added to produce a signal around 19 MHz. Adding the fixed output of the 7.8-MHz oscillator produces the required frequency. For USB conversion, this same 19-MHz signal is added to the sec

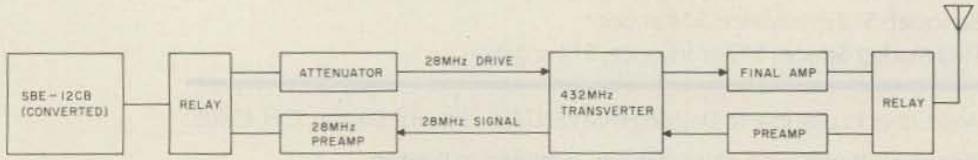

Fig. 2. CB to 432.

Channel	Center Freq. Before Conversion	11-MHz osc. Xtal Freq. (Unchanged)	7-MHz osc. Xtal Freq.[1,2] (Before Conversion)	Center Freq. After Conversion[1] 10 Meters, CW	Center Freq. After Conversion[2] 10 Meters, Phone
1	26.965	X6 = 11.700	X2 = 7.4625	28.0050	28.5050
2	.975		X3 = 7.4725	.0175	.5175
3	.985		X4 = 7.4825	.0300	.5300
4	27.005		X5 = 7.5025	.0425	.5425
5	27.015	X7 = 11.750	X2	.0550	.5500
6	.025		X3	.0675	.5675
7	.035		X4	.0800	.5800
8	.055		X5	.0925	.5925
9	.065	X8 = 11.800	X2	.1050	.6050
10	.075		X3	.1175	.6175
11	.085		X4	.1300	.6300
12	.105		X5	.1425	.6425
13	.115	X9 = 11.850	X2	.1550	.6550
14	.125		X3	.1675	.6675
15	.135		X4	.1800	.6800
16	.155		X5	.1925	.6925
17	.165	X10 = 11.900	X2	.2050	.7050
18	.175		X3	.2175	.7175
19	.185		X4	.2300	.7300
20	.205		X5	.2425	.7425
21	.215	X11 = 11.950	X2	.2550	.7550
22	.225		X3	.2675	.7675
23	.255		X5	.2925	.7925

Notes:

1. 7.8-MHz osc. xtal freq. = 7.8025 MHz (CB and 10 meters)
   11 MHz osc. xtal freq. = 11.700 MHz = X6 (CB and 10 meters)
   11.750 MHz = X7
   11.800 MHz = X8
   11.850 MHz = X9
   11.900 MHz = X10
   11.950 MHz = X11

2. 7-MHz osc. xtal freq.

CB	10 meters, CW	10 meters, phone	
7.4625 MHz	8.5025	9.0025	= X2
7.4725 MHz	8.5150	9.0150	= X3
7.4825 MHz	8.5275	9.0275	= X4
7.5025 MHz	8.5400	9.0400	= X5

Table 1. SBE-12CB synthesizer mixing scheme.

ond harmonic from the fixed 7.8-MHz oscillator (15 MHz) to produce a signal in the 34-MHz area. Subtracting the output of the 7.8-MHz oscillator from this sum yields the required USB frequency. Table 1 summarizes the synthesizer.

The first column of Table indicates the frequencies available from this rig for CB operation. All that is required to shift these frequencies into the 10-meter and is either to replace the six 11-MHz crystals or the four 7-MHz crystals. Since four is cheaper than six, the 7-MHz oscillator was attacked. The new crystal values are determined by taking the new center frequency, subtracting the existing center frequency, and adding this difference to the value of the existing 7-MHz crystals.

Example: The new desired channel 1 frequency is 28.005 MHz and the old frequency is 26.965; the difference is 1.040 MHz. The current 7-MHz crystal is 7.4625 MHz; add the difference (1.0400), and the new crystal required is 8.0025 MHz = X2.

Since there is a greater jump between channels 3 and 4 for CB operation, the last 7-MHz crystal (X5) is .02 MHz greater than X4. X4, X3, and X2 are each 0.01 MHz apart. In order to provide for continuous coverage and more linear coverage, the new crystals were placed .0125 MHz apart in frequency. This reduces the final frequency coverage only slightly (2.5 kHz) and allows for continuous tuning, which was deemed a reasonable sacrifice.

Table 1 indicates the new crystals required for operation at 28 to 28.3 MHz, and also those required to operate in the phone portion of the 10-meter band (28.5-28.8 MHz). The actual coverage in each case is about 300 kHz.

The varactor clarifier of the SBE-12CB tunes ± 700 Hz from the selected center frequency. In order to provide for continuous coverage, a spread of about 15 kHz is required. Fig.1 shows the existing clarifier circuit in the unit plus the additional 12-uH molded choke (L1) which was added to extend the range to the required 15 kHz. Adding the choke caused the tuning range of the clarifier to vary in a nonlinear fashion, and it was found that R1 could be changed to rectify this situation. The new value of R1 is determined best by experiment and seems to fall in the range of 1 to 4k, depending upon the spread finally selected.

This completes the conversion. Retuning this rig is simple if you have the SBE service manual or *Sams Photofacts®* #CB-50 (described 1973).

The rest of the setup for 432 is simple enough. An attenuator was built to hold down the 12-Watt output of the CB rig on sideband to that required by the transverter. No preamp was deemed necessary for the SBE-12CB, but a 432-MHz one was utilized (see Fig. 2).

There is nothing unique about the 432-MHz utilization of this rig, but the conversion is an interesting project which can yield a low-cost, 10-meter mobile rig. ■