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QST Issue: Dec 1977
Title: Ten-Tec Century 21 Transceiver
Author: Jim Bartlett, WB9VAV

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listed are sources for the other components used in the various timing circuits.

The *IC Timer Cookbook* is written in a practical, easy-to-read style that makes it suitable for use by readers with a wide range of backgrounds. Every circuit example contains not only all component values, but also the design equations they were derived from.

An excellent introduction to IC timers and their applications for anyone with limited experience in this field, this book would make a valuable addition to any ham's reference library. It measures 5-1/2 by 8-1/2 inches and contains 287 pages. In our opinion, the $9.95 price is a little steep for a paperback. – *WB9VAV*

MICROWAVE MODULES MMv1296 VARACTOR TRIPLER AND MMc1296 RECEIVING CONVERTER

Activity on the 23-cm band is beginning to increase, according to reports from around the country. Part of this upsurge in interest is no doubt due to the availability of commercially produced equipment for this band. While building one's own equipment for this band is not all that difficult, the ham in a hurry may wish to consider using the store-bought approach.

Varactor Tripler

Using a "passive" frequency multiplier is the utmost in simplicity. In the case of the MMv1296, power applied at 432 MHz is retrieved at the output in the form of 1296-MHz power. Device efficiency is high, on the order of 60 percent. Maximum input is 20 watts, so power output on 23 cm will be 10-12 watts. Some form of output filtering is desirable, such as an interdigital filter or cavity. Undesired outputs will be suppressed at least 30 dB, but the potential for TVI exists. Because the varactor diode is a passive device, no power supply is required.

Receiving Converter

To reduce the effects of spurious responses, the local oscillator in a uhf converter should operate on the highest frequency possible. In the MMc1296, the LO operates on 105.67 MHz. Oscillator output is multiplied by 12 and mixed with the received signal. This provides an output on 28 MHz. An optional i-f output of 144 MHz is available. The converter uses a hot-carrier-diode single-balanced mixer. There is no rf preamplification. Image attenuation in such a system is not good. While the chance of image reception is slight, "double-sideband" reception can result in misleading noise-figure measurements. The converter cannot differentiate between noise at the signal frequency and noise at the image frequency, which would cause an indicated noise figure 3 dB better than actual to be obtained. Inserting a band-pass filter between the noise source and the converter may also yield inaccurate data. Unless the filter introduces absolutely no mismatch into the line, its reactance may affect the noise figure of the converter front end. A single-resonator filter, properly matched, is the most reasonable method. Mismatches caused by coupling between sections of a multiresonator filter will almost certainly defeat the purpose of using one, at least during measurement. Noise figure of the MMc1296 converter we tested was measured at 7.5 dB, with no filter used. This converter has a 28-MHz i-f output. When no front-end amplification is used, it becomes necessary to develop converter gain in an i-f amplifier. The MMc1296 uses a single MOSFET. Nominal gain is claimed to be 23 dB for this converter, although this parameter could not be ascertained.

Construction of both units is very professional. Double-sided, glass-epoxy board is used in the receiving converter. Tuned lines are used in the multiplier. Both units are enclosed in cast-aluminum boxes, 4.5 × 2.5 × 1.25 inches in size.

If the reader wishing to try 1296 does not have a source of power on 432 MHz, a varactor tripler such as that described in the ARRL *VHF Manual* may be used for tripling up from 144 MHz. Older commercial fm rigs may be purchased at low cost, and a surplus 450-MHz transmitter converted to operate at 432 MHz is another possible solution.

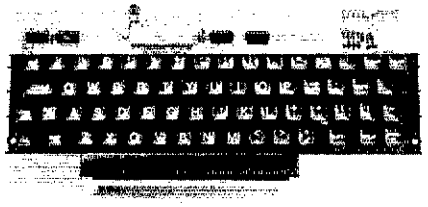
Microwave Modules equipment is distributed in the U.S. by Texas RF Communications, 4800 West 34th St., Suite D12A, Houston, TX 77092. Price class for the MMc1296 is $70, and for the MMv1296 $90. – *W1XZ*

POLY PAKS KEYBOARD AND ENCODER

Poly Paks recently announced a new keyboard and encoder kit (or wired unit). The keyboard utilizes 63 keys and, with the encoding circuitry, provides output of all 128 ASCII (American Standard Code for Information Interchange) characters. One feature of the unit is a display of seven LEDs that show each character of the ASCII code as the appropriate key is depressed. We really like this feature because with many keyboards, you cannot always be sure that what you expect is what you get when you press a key.

The kit consists of the keyboard, a two-sided plated-through circuit board, and the components that are mounted on the board. While the directions could be a little clearer, they do the job. It took us about two hours to wire the kit, and it worked the first time around. We gave the keyboard a thorough testing, trying it on two different computer systems.

The keyboard is encoded for both upper and lower case, shift lock if desired, and control-key operations that are necessary for so many types of computer and RTTY operations. Voltage requirements are plus 5 V dc and minus 12 V dc; total power drain is 200 mW. Either positive or negative strobe is available via a jumper connection. Size is 13 × 5 × 2 inches and the weight is 3 pounds. Price class: kit $60, wired $70. Manufacturer: Poly Paks, Box 942, South Lynnfield, MA 01940. – *W1ICP*



The Poly Paks keyboard and encoder.

TEN-TEC CENTURY 21

The first thing that impressed me about the new Ten-Tec Century 21 was its basic good looks. Pictures just don't do this new cw transceiver justice at all! Not that I get hung up on looks, but the Century is, in my personal opinion, the best-looking rig that Ten-Tec has put out! The cabinet is all metal – top, bottom, back, front and sides. The dial operates smoothly, having the spinner type of finger hole which makes fast frequency changes a snap. This is almost a necessity, because it takes about 30 revolutions of the tuning knob to sweep a 500-kHz band segment (lots of bandspread!).

The Century is a cw man's rig. Actually it's ideal for either the beginner or the QRP cw fan, because it offers a host of state-of-the-art features at a relatively low cost. The receiver section is capable of receiving cw or ssb signals, but the transmitter is strictly cw, with 70 watts input on 80 through 10 meters. Full coverage is included for all bands except 10 meters. The rig comes with crystals installed for 80, 40 and 20 meters. One crystal for 15 meters and two for the 28- to 29-MHz segment of 10 meters are available as plug-in options.

Instant band changes are possible with the Century because it has a pretuned front end. To change bands, just turn the bandswitch and adjust the drive level. Very simple! Full break-in is also included in the Century 21. This means that an incoming signal can be heard whenever the key is not down – even between dots in an H – if you're not sending too fast! These features, along with a built-in power supply, speaker and adjustable sidetone, make the transceiver a breeze to operate.

A common VFO is used to control the receiver and transmitter in the Century 21. In the receiver, an incoming signal is first mixed with the appropriate high-frequency oscillator. The product is between 5.0 and 5.5 MHz at this point. This signal is amplified and applied to the product detector where it is beat against the VFO output. The product of this last mixing is at audio frequency. This signal is fed through one of three selective bandwidth filters before going to the speaker. The 2.5-kHz filter is used for general listening and most ssb work. The 1-kHz filter is used for normal cw, and the 500-Hz filter is used to help eliminate interference while receiving cw signals.

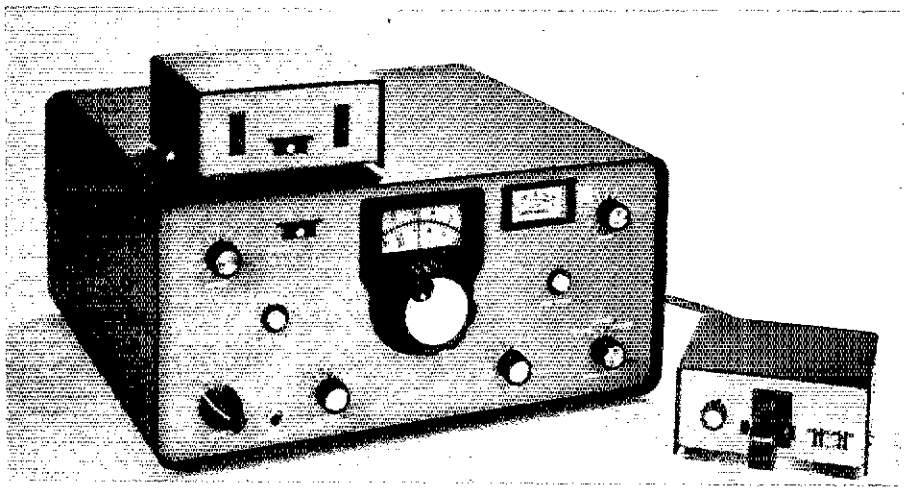
In the transmitter, the hf oscillator being used (there is one for each band) is mixed with the VFO output, and the product is fed to band-pass filters. From there, the signal is

amplified at a low level before going to the driver and power amp. Finally, the power amplifier output is run through low-pass filtering before being fed to the antenna. Individual low-pass filters are used for each band, and these are switched into the antenna line by the band switch. The cw signal from the Century is clean, chirpless, and without drift. The keying is click-free. The final amplifier in our Century 21 came to us biased for Class AB operation, but all new production models are factory-biased for Class C. After talking with the people at Ten-Tec, the final bias on our review sample was changed to Class C. The spectral analysis shown was taken after the modification was made.

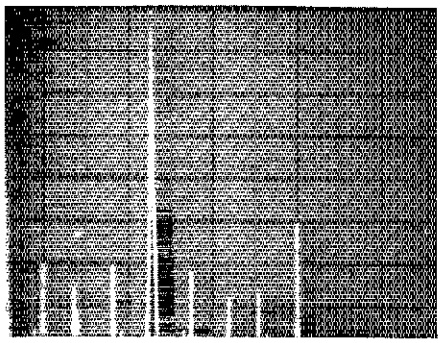
Another very handy feature is the spotting switch, which allows you to zero beat a cw station before calling him (or her). Pressing the zerobeat button disables the offset section of the VFO. Once the transmitter has been set to the same frequency as the incoming signal, the receiver can be adjusted using the offset or incremental-tuning control to receive the cw signal on either side of zerobeat. Front-panel layout is symmetrical, with the large tuning knob located in the exact center. Across the top are the receiver tuning offset, dial readout, input power meter, and drive control. The meter is monitored while setting the drive level. This allows the operator to select the input power, up to 70 watts. Another neat thing about the Century is its automatic-shutoff circuitry. If the input power is run up beyond about 70 watts, or if the antenna shorts or opens leaving the transmitter working into a high SWR, the rig senses the current rise and instantly shuts down the power supply. To reset the circuit breaker after the problem has been corrected, simply turn the main power switch off and then on again, and normal operation is restored.

I basically think of myself as a cw operator. But after having used only tube-type gear that required tune-up in the past, the Ten-Tec really took adjusting to. It's just plain hard to adapt yourself to a rig that only needs to be turned on! That's one of the benefits of solid-state finals . . . no warm-up, no preselector, no plate or load controls, just a drive-level adjustment when you switch bands (takes about one second) and you're on!

Along with the transceiver itself, we also received the optional crystal calibrator, model 276, and the matching keyer, model 670 for review. The calibrator has a neat feature in that it pulses the calibration signal to the receiver instead of sending out a continuous note. This helps the operator find the *real* calibration mark on the dial without disconnecting his antenna. With the standard type of "always on" calibrator, it can be difficult at times to distinguish the calibration pip from the numerous carriers on close-by frequencies.



The Ten-Tec Century 21 transceiver is an enjoyable rig that makes cw operation on ht as easy and uncomplicated as possible. An antenna and key are all that are necessary to put this solid-state jewel on the air! The Century 21 is shown here with its accessory keyer and crystal calibrator.



The spectrum analysis of the Century's output on 7 MHz. The pip at the left edge of the photo represents zero frequency. The horizontal scale is 2 MHz per division, and the vertical scale, 10 dB. The fundamental is the large pip in the center of the photo, and the second harmonic is the pip farthest to the right. The second harmonic is about 50 dB down from the full scale fundamental. All other pips are mixing products at least 60 dB down. This complies with FCC regulations.

The electronic keyer was designed specifically as a companion to the Century 21 transceiver. It contains no battery itself, but is plugged into the back of the transceiver from which it derives its operating power. The keyer speed can be adjusted from six to 50 words per minute. The keyer has self-completing dots and dashes and an automatic weighting circuit that increases the dot length about 10 percent at 20 wpm. The weighting circuit is designed to help increase the readability of the code being sent, especially at higher speeds.

The plastic paddle on the keyer performed pretty well once the springs were properly adjusted. The keyer itself is fairly light, containing only one IC and a handful of other parts. This made the case a little unstable on the operating surface when confronted with my "heavier than normal" keying fist. A small amount of rubber cement on the keyer feet was sufficient to stop the unit from walking away from me as I sent with it. One last note on the model 670 keyer: It should not be used to key transmitters with cathode or grid-block keying. It should only be used with the Century 21 transceiver. Ten-Tec equipment is manufactured by Ten-Tec, Inc., Sevierville, TN 27862. – *WB9VAV*

Ten-Tec Century 21 CW Transceiver

Dimensions (HWD) and weight: 5-3/4 × 12-3/8 × 11-1/2 inches; 15-1/2 lbs.*
Power requirements: 105-125 V ac, 50/60 Hz.
Frequency range: 80-10 meters (28-29 MHz on 10 meters).
Receiver sensitivity: 1 μV or less, 10 dB S + N/N.
Transmitter output: 40 watts.*
Price class: $290, model 670 keyer $30, model 276 calibrator $30.
*Measured in ARRL lab.

ICOM IC-22S

A brisk market often sets the stage for technological advancements, which sometimes seem to be outright revolution. About six or seven years ago there was a marked shift from converted surplus equipment to equipment specifically manufactured for the 2-meter fm band. It would appear that we are in the midst of another "revolution" – this time from crystal control to frequency synthesis. And, one rig seems to have caught the fancy of the amateur community, the IC-22S.

The simple straightforward design of the IC-22S lends itself to modification, as witness the number of modification articles in the amateur magazines. Therefore, the editors decided to review the IC-22S with one of the more versatile modification packages available, the Spectronics Speuscan-S scanner. During the period of review the products were used together, although it is perfectly easy to detach the scanner and use the IC-22S by itself.

The IC-22S uses a diode matrix to form a binary code. This code determines the frequency-dividing ratio needed to enable the transceiver to operate on a given, standard 2-meter fm, channel. In other words, instead of buying crystals at around $10 per pair, one merely plugs in from one to seven diodes which cost about 10 cents each at Radio Shack. If you move or if the local repeater switches to another operating frequency, it is a simple matter to pull the diodes out and plug them in the appropriate holes.

Before I acquired this unit for review, I overheard a conversation one day between the owner of an IC-22S and another ham. The