forms the operator that a 10-minute transmission period has elapsed but it does not insert the Morse identification by itself.

The '3100 operator may transmit chosen portions of received text. The information is selectively switched from the receive buffer to the transmit buffer to prepare it for transmission. Editing, too, is easy. Not only may one correct "typos" as they happen, but the operator may return to any line, word or letter (prior to its transmission), and alter it to suit his taste. Half-duplex (normal) or full-duplex operation is possible with the system. Full-duplex operation allows *simultaneous* active receive and transmit functions to be operative. CONTinuous, LINE and WORD transmit modes refer to the manner in which transmitted text is handled. In the CONTinuous mode, characters are transmitted as they are released from the buffer without stopping until the end of the text is reached. LINE mode transmits one line at a time; information within a line not being transmitted until after a new line has been typed. WORD mode outputs one word at a time. A word will not be transmitted until the system recognizes the first character of a new word following a space between words.

There is an internal real-time, 24-hour clock within the '3100. This clock may be programmed with the time, zone and date, and the information may be transmitted at the touch of a button. The clock has to be reprogrammed each time the power is removed from the system.

Operating the '3100 proved to be the most fun I've experienced in a while. ASCII operation was not attempted since it hadn't been approved at the time of review, but Morse and Baudot RTTY proved delightful. I first tried the unit on cw. Having used a keyboard cw generator before, I felt somewhat secure. No matter which mode of operation is chosen, the secret to being an errorless emitter of information and rf is to set the speed of the HAL to somewhat less than your typing speed and prepare some transmit text during the receive period. (Now my secret's out!) The only transmitting "hang-up" I had was my inability to use the space bar effectively. I had never "sent spaces" on a key before! The cure for that turned out to be spending a couple of weeks at the keyboard running RTTY. When I went back to cw, the space-bar malady had disappeared.

Receiving cw with the '3100 was interesting. I never could quite break myself of the habit of copying along by ear; I also wouldn't recommend it be done. While the '3100 does a pretty good job of copying cw, it cannot equal the human brain when it comes to copying a really tough "swing" or copying under conditions of heavy QRM and/or QSB. Occasionally, the unit would get "stuck" (usually because of a station tuning up close to the frequency) but a depression of the CLR (CLeaR) key would get it going again. It's also surprising to watch the screen and see the print-out displayed one letter behind the received information. The system does lag to ensure that the transmitting operator is maintaining the same sending speed, and it will attempt to compensate for timing errors. If the received signal speed changes, the system copying speed changes automatically. It isn't necessary to set a received-speed control for cw; the unit clocks the incoming signal and figures this out all by itself.

Although I'd had some limited exposure to transmitting RTTY many years ago, I'd done nothing but copy RTTY in the recent past. I did quite a bit of practicing with the '3100 (while using a dummy load) to get the "feel" of the operation. My first QSO was a success, and from then on I was "hooked." Cw, my favorite mode of operation, fell by the wayside, and the '3100 (coupled with the ST-6000) kept me occupied for the next few weekends on RTTY. My "better half" was all in favor of such noiseless operation as was I. However, I did miss having an occasional "hard copy" for certain situations, such as RTTY picture reception. A mechanical printer can easily be accommodated by the '3100 for use in such circumstances.

Video-terminal RTTY and cw are quite commonplace today: ASCII is sure to follow soon. With the HAL DS3100 ASR, you'll have it all at your fingertips — silently. The HAL DS3100 ASR is available from HAL Communications Corp., Box 365, Urbana, IL 61801. Price class: $2000. — *Paul K. Pagel, N1FB*

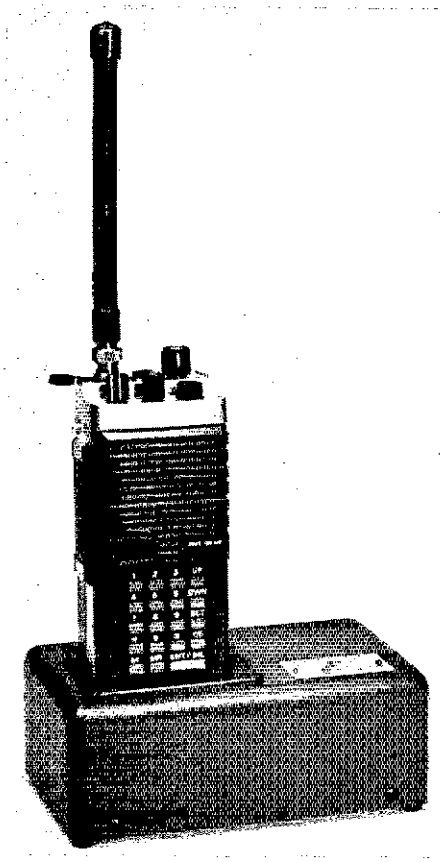
THE YAESU FT-207R HAND-HELD 2-METER FM TRANSCEIVER

Not long ago, having a synthesized 2-meter rig put you among the "elite" on this popular band. It was also convenient if the transceiver had a built-in Touch-Tone encoder so that one wouldn't have a length of wire and a surplus encoder dangling around the car or shack. A few months ago, the Tempo S-1 arrived (see *QST*, June 1979, page 37). Thanks to the wonders of miniaturization, this hand-held package contained its own built-in frequency synthesizer. The gang wondered where we'd go from there. Well, here's the first microprocessor-controlled hand-held — the Yaesu FT-207R!

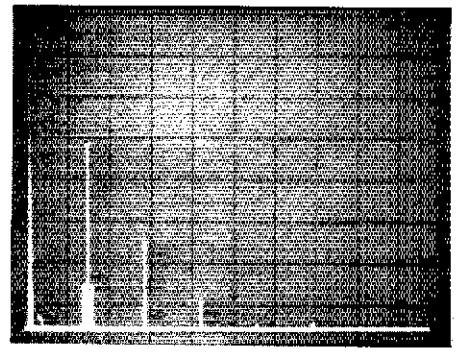
This rig has caused a real stir among radio amateurs, and for good reason. Its versatility is remarkable. The keyboard, shown in the accompanying photograph, is the "command center" for all the transceiver functions. While the intent is not to review the '207R's operating instructions, an example of how you put 'er on frequency is in order.

When the transceiver is first turned on, the LED display (yes, a digital display!) shows 7.00, representing 147.00 MHz. This readout will be displayed following any interruption of power to the memory, such as installation of a fresh set of batteries. For operation on 146.28/146.88 MHz, the keyboard entry is "688," then "ENT/DIL." This programs in the frequency. The −600-kHz repeater offset is available as one of the settings on the appropriate control knob on the top of the transceiver case. Simplex operation and ±600-kHz splits are built into the '207R for convenience. But there's more — splits of *any* amount, 10 kHz minimum, are programmable as long as they do not pass outside the 144- to 148-MHz limits of the transceiver. In a case of mistakenly (or deliberately — I tried!) programming a split resulting in possible out-of-band operation, an "E" on the display flashes to indicate that you goofed!

There are four memory channels in the FT-207R, and any of the splits may be used in conjunction with them. One of the more interesting features is the scanner. The band may be scanned in 10-kHz increments from 144 to 148 MHz (or vice-versa) by depressing the UP or DOWN button. The scan will continue for as long as either button is held down and may be set to stop at a clear or busy channel — a boon to locating repeaters in an unfamiliar area. The scan feature may be employed as well with the four memory channels. Touch-Tone operation is built in, too, as a keyboard function. A CTCSS subaudible tone feature will be available



The Yaesu FT-207R 2-meter synthesized hand-held transceiver is shown nestled inside its matching NC-2 charger.



ARRL lab spectral photograph of the output of the Yaesu FT-207R transceiver. In this photo, the rig was operating at 144.00 MHz with 2.5 watts output. Vertical divisions are 10 dB each; horizontal divisions, 100 MHz. The fundamental frequency has been attenuated approximately 30 dB by means of a two-cavity notch filter in order to prevent overload distortion in the spectrum analyzer. The most significant spurious signal, 10 MHz above and below the fundamental, is down approximately 65 dB; the second harmonic is down approximately 55 dB. This photograph represents the worst-case test; other tests within the band showed better attenuation of spurious products. The FT-207R, therefore, complies with current FCC specifications regarding spectral purity.

Yaesu FT-207R 2-Meter FM Hand-Held Transceiver

Claimed Specifications

Transmitter:

Power output: 2.5 W (min.)/200 mW high/low
Deviation: 5 kHz
Spurious radiation: −60 dB or better at 2.5 W output (see spectral photo for ARRL lab measurements)
Frequency coverage: 144.000-147.995 MHz
Transmitter offsets: 600 kHz or simplex built-in, others programmable, 10 kHz minimum.

Receiver:

Circuit type: Double-conversion superheterodyne
Sensitivity: 0.32 μV for 20 dB quieting
Selectivity: 7.5 kHz at −60dB
I-f: First, 10.7 MHz; second, 455 kHz
Audio output: 200 mW at 10% THD

General

Batteries: 450 mA NiCad pack
Current Consumption: Rx, 150 mA (35 mA squelched, display off) Tx, 800 mA (Hi); 250 mA (Low) Memory backup, approx. 4 mA
Voltage requirement: 10.8 V dc, nominal
Dimensions: 68 × 181 × 54 mm (HWD)
Weight: 680 g including batteries
Price class: FT-207R with wall charger, rubber duck antenna, earphone, belt clip and shoulder strap — $399.
Options: NiCad battery pack — $23; YM-24 speaker/microphone — $32; NC-2 desk quick-charger/ac supply — $86; TA-2 telescoping 1/4-wave antenna — $8.50.

soon as an aid to operation with repeaters in congested areas.

There are other conveniences, too: a LOCK switch for disabling the keyboard so that frequencies can't be accidentally changed; a 5 UP position for repeaters needing that extra 5 kHz (this digit doesn't appear on the display), and a DISP switch which is used to turn off the display to conserve battery power. This latter function may appear to be inconvenient, but it's not. Even with the display off, each time a frequency is changed the display momentarily comes on to show just what is happening. The 4-bit microprocessor chip inside the rig makes it all happen! the operator has a choice of 2.5 W or 200 mW of output power, switch selectable from the bottom of the transceiver case. For a hand-held, this certainly is a multitude of functions.

It takes some reading to cover the thorough instruction manual supplied with the '207R, but on-the-air contacts become easy to make once the operator has been "programmed." There is, for memory support, a constant drain on the NiCads in the transceiver. Consequently, if the rig is fully charged and unused for several days, the unit will have to be recharged. The memory draws 4 mA, so the 450 mA NiCads (fully charged) will run the transceiver for about four days with the unit at rest. By means of the offset switch, the memory backup may be disabled, thereby increasing the battery charge life.

One minor inconvenience I've noted during operation outdoors is that the LED display couldn't be read unless it was shaded with my hand. In the car, for ease of operation, I have been using a UG-255/V BNC-to-UHF adaptor to mate the '207R connector to my existing antenna lead in. The 2.5-watt power level is adequate for working repeaters in this area. Yaesu's optional speaker/microphone would be a welcome addition for extended mobile use. During all repeater contacts, I received excellent audio-quality reports.

When the FT-207R arrived here at Headquarters, it was supplied with the optional NC-2 desk charger/ac supply and two optional NiCad battery packs. The charger has a tapering charge rate, from an initial 450 mA to a pulsed 45 mA. Although the charge rate doesn't drop off completely, the LED indicator will show a slow pulsing as the batteries approach a fully charged condition, indicating that the '207R's ready to go. Yaesu does not recommend that the charger be left on indefinitely, as possible damage to the NiCads may occur from overcharging.

There's a lot in this small package, indeed, but it's well presented and housed in a rugged case. A belt clip and shoulder strap are provided. My overall operating impressions are very favorable. Once the operating instructions are mastered — not difficult at all — the FT 207R really shines in 2-meter versatility. — *Sandy Gerli, AC1Y*

MURCH UT-2000-B TRANSMATCH

"Slick and built to handle the power" were my thoughts as I peered into the exposed innards of the Murch UT-2000-B matching network. The fundamental circuit is pretty similar to that of most of today's commercial Transmatches, but the circuit of such a unit is not the only consideration. The matching resolution is just one function to contemplate. Another is whether or not the components can handle the full legal amateur power without arcing, overheating or melting. This Murch unit fills all of these requirements.

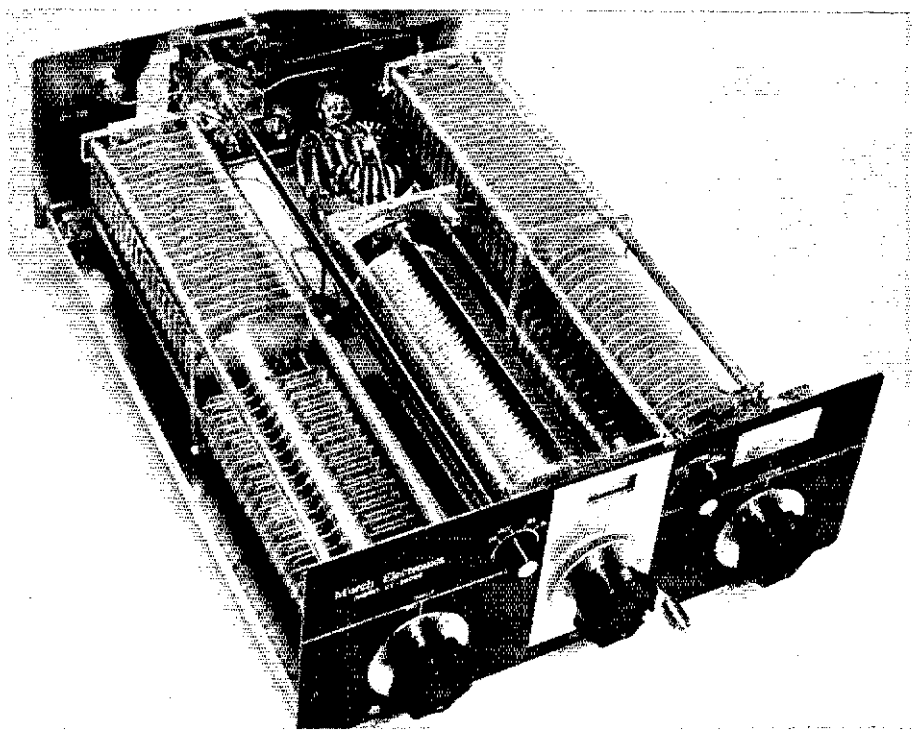
The circuit is essentially the popular T-network that evolved from the James Millen Co. 50-Ohmer matching network which was developed some years ago. Late in the 1960s, a homemade version — The Ultimate Transmatch — was described in *QST* by W1ICP. That innovation of the 50-Ohmer inspired numerous manufacturers to use the design for their marketed wares. Murch was the first to produce a commercial version of the so-called Ultimate Transmatch. The UT-2000-B is the newest model being sold by Murch, and one might well class it as their "super matcher."

Circuit Highlights

Fig. 1 shows the basic circuit of this type of Transmatch. The version at A is found in many commercial products. However, the technique at B (single-section input capacitor) provides equal results at reduced mass and cost. This was demonstrated a few years ago in the ARRL laboratory by Walt Maxwell, W2DU.

It can be seen that under certain load conditions the network functions as a high-pass circuit, and, hence, there is no harmonic attenuation. Under different load conditions, the circuit can perform as a bandpass network (desirable). Furthermore, a match can be obtained at a variety of settings for some load conditions. Minimum insertion loss will occur when the series output capacitor is at the maximum-capacitance setting that will provide an SWR of 1.

Matching resolution, mentioned earlier, is best achieved by using a roller inductor type of coil. The UT-2000-B contains one. Some commercial Transmatches utilize tapped inductors, which do not always permit a perfect match to a given load. The roller inductor, on the other hand, provides continuously variable inductance, right to a fraction of a coil turn. This becomes especially important at the upper part of the hf spectrum. I had occasion during my VP2MFW operation on Montserrat to use a "brand X" high-power Transmatch which did not have a roller inductor. Consequently, the match on 20, 15 and 10 meters was never 1:1. Admittedly, an acceptable match could be ob-



The Murch UT-2000-B Transmatch. The function switch (see text) is a welcomed operator convenience which eliminates cable switching.