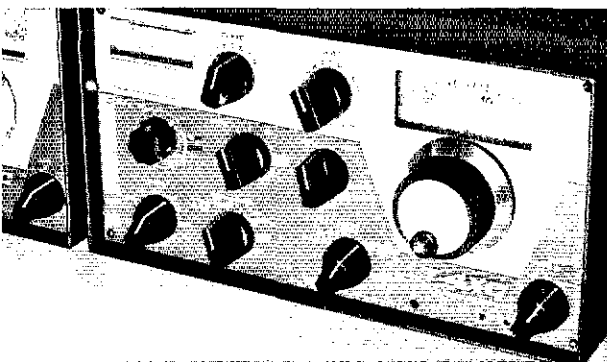




Recent Equipment



To acquaint you with the technical features of current amateur gear.



The Drake T-4XC Transmitter

THE DRAKE T-4XC transmitter bears considerably greater resemblance to its predecessors (T-4X and T-4XB) than was the case with the R-4C receiver reviewed by W1FBY last month. Several minor changes to increase operating convenience have been made, but basically the unit is very similar to the original T-4X which was introduced some nine years ago and reviewed in *QST* for May, 1966. Quarreling with success doesn't appear to number among the Drake Company's habits!

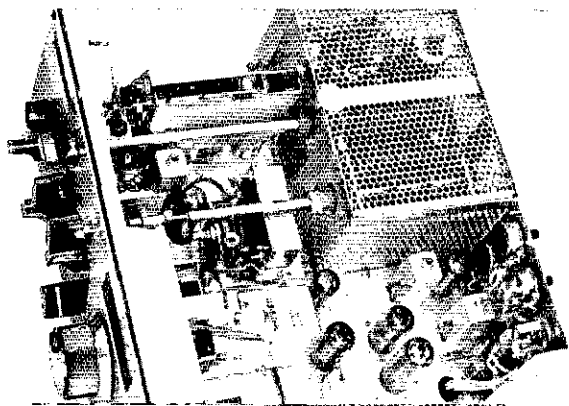
Because the Drake 4-line is so well known, here we will deal mainly with the changes which have been made in the current model. From the front panel, the most obvious difference is the VFO dial. Earlier Drake equipment used a calibrated skirt on the tuning knob to provide 1-kHz readout. With a tuning rate of 25 kHz per turn, this meant that it

was necessary to read the "rough" frequency from the main dial to the next lowest 25-kHz point, then to add the reading on the skirt. This was inconvenient at best, and with the advent of balkanized ham bands a few years ago it became a real chore for some operators to select a legal operating frequency. The new dial (which isn't really new, having been used on the programmable SPR-4 receiver for a number of years) eliminates this problem, but as a German amateur pointed out on 20 meters when the transmitter was being field tested, it adds a new one: parallax, that is, a change in apparent frequency according to the angle at which the panel is viewed. Most operators, though, will find that the new dial is a definite improvement over the old.

Other front-panel changes include a slight styling change (the elimination of the chrome-colored strip around the edges of the panel); movement of the on-off switching function from the gain control to the mode switch; and inclusion of a "fixed-frequency" crystal socket with screw-driver-adjusted trimmer capacitor. The usefulness of this last feature is rather limited, especially in view of the excellent VFO stability documented in last month's review of the R-4C.

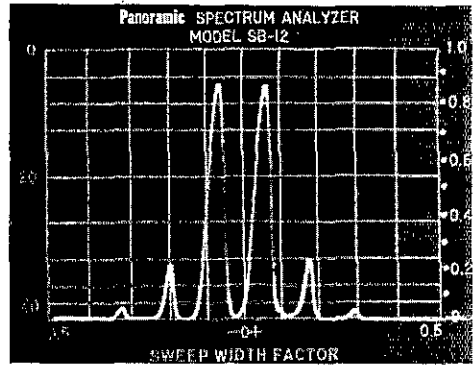
The rear panel won't even be recognizable to owners of earlier Drake transmitters. Whereas in previous models the rear wall of the chassis was the "panel," now there is the appearance (though, unfortunately, not the effect) of a completely shielded enclosure. The real purpose of the enlarged rear panel is to support the VOX controls, the microphone jack (moved from an inconvenient side location), and the key jack. Phono jacks are provided for cables to mate with any R-4 series (or other) receiver, and for shifting the carrier oscillator for fsk operation. Extra holes are provided for modifying the transmitter for use with a vhf transverter, but no description of the modification is provided with the instruction manual. Installation of a phono jack in another spare hole for connection of the transmitter to a phone patch is described. Such a modification, if performed correctly, would not void the 90-day warranty.

The most obvious difference in the circuitry of the T-4XC when compared with the earlier models is that the number of vacuum tubes has been



Top view of the T-4XC with cover removed. The transmitter uses separate filters for upper and lower sideband; the filters are mounted on a bracket just below the loading-control shaft. Crystals for coverage of four additional frequency ranges may be plugged into the sockets shown in the lower left corner of the picture. Most frequently added coverage is 160 meters and extra ten-meter ranges.

Fig. 1 — Spectrum-analyzer display of the output of the Drake T-4XC transmitter with a two-tone 200-W PEP input. The horizontal axis of the display represents frequency, and the vertical axis amplitude. Each "pip" represents a single-frequency component of the rf output. The display is adjusted so the amplitude of each component may be read from the scale at left, directly in decibels below the peak-envelope power (PEP) output. Each reticle division represents 5 dB. Responses other than the two individual tones near the center are distortion products; third-order products 30 dB down may be seen here. Individual tones of the two-tone signal are down by 6 dB from the PEP output. This is because the tones are displayed as two discrete frequencies. At the instant when voltages of the individual tones are in phase, they add to produce a peak in the envelope wave-form pattern which is twice the voltage amplitude of a single tone alone. The power at the peaks of the envelope (PEP) is therefore four times that of a single tone, a 4:1 power ratio being equivalent to 6 dB.



making it impossible to adjust the two controls independently. All VOX controls, including separate delay controls for phone and cw, are now on the rear panel and are of the set-and-forget variety, which facilitates adjustment of the transmitter output power. The gain control is ganged with a push-pull switch for changing from VOX to push-to-talk on phone. *A word of warning:* for cw operation, the switch must be pushed in. Otherwise, spurious signals only 40 dB below the desired one sprout up about one kHz away, creating possible interference to other stations near the frequency. The spurious signals might also warrant FCC attention if the transmitter is operated near a band edge, or if the FCC monitor decides that the output is really A2 instead of the intended A1. This condition is all too common in the cw bands these days.

All in-band spurious outputs were at least 50 dB down with two exceptions: the spurious signals on cw mentioned above and signals on 10 meters about 200 kHz from the operating frequency (both 40 dB down). These signals were measured with the transmitter running at its rated 200 watts input. Output increased if the transmitter was run at higher input, but spurious signals (especially in the vhf TV region) increased considerably. A word to the wise should be sufficient!

These days, nearly everyone in the market for commercially-manufactured hf amateur equipment uses the systems approach. That is, a manufacturer is not selling individual transmitters and receivers so much as a package of one, two, or three units performing the receive, transmit, and transmitter power supply functions. Transceivers are popular, but the "separates" approach still has a lot going

reduced from 11 to 10 with the replacement of the carrier oscillator tube with solid-state devices. The ramifications of this change were discussed in last month's review of the R-4C, and indeed it seems that the change was made in the process of making the transmitter compatible with the new receiver. No change in the operation of the transmitter alone results, though the necessity for aligning the companion units for transceive ssb operation has been eliminated. All oscillators (except in the fixed-frequency mode, where the 6EJ7 premixer functions as an oscillator) are now solid-state, and four of the remaining ten tubes are performing audio or dc functions.

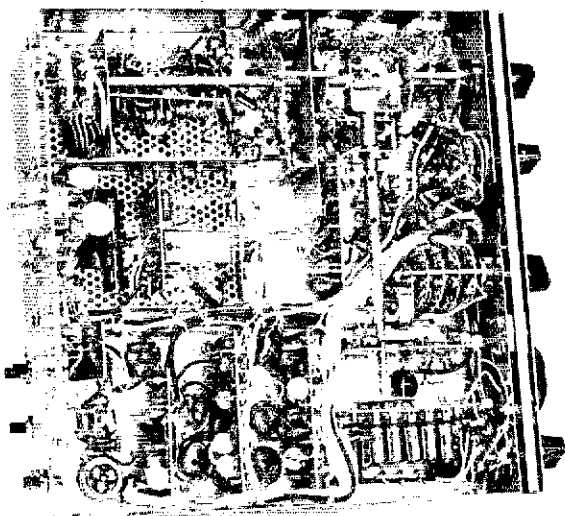
All operating voltages (see box) for home-station operation of the T-4XC may be obtained from the current-model AC-4 or the earlier AC-3 power supplies. These supplies may be wired for either 120 or 240 volt, 50 or 60-Hz lines. For 12-volt operation the DC-4 supplies not only the voltages for the T-4XC, but also 115 volts ac to run the receiver.

In operating convenience the T-4XC represents an improvement over earlier models, though how much of an improvement is perceived depends on the individual operator. The VOX gain control on the earlier transmitters was ganged with the combination microphone gain/carrier level control,

Table 1 — Power Output and Spurious Response Chart for the Drake T-4XC

Freq. (MHz)	Power Output (Watts)*	Second Harmonic Level	Third Harmonic Level	Other Spurious Levels
1.8	100	-32	-48	-42
3.5	115	-32	-44	-45
7.0	110	-36	-44	-40
14.0	118	-35	-42	-48
21.0	98	-42	-55	-32
28.5	105	-38	-48	-40

* Measurements made at 200 watts input, cw conditions. Rf power output measurements were taken into a 50-ohm noninductive load while using a Bird Thru-line meter. Spurious and harmonic figures were obtained while using a Hewlett-Packard spectrum analyzer.



Bottom view of the T-4XC. In this picture the final amplifier is at the top left, with the driver stage at the top right.

for it. For example, in working with Oscar 6 it's necessary to be able to hear the satellite output on ten meters at the same time you're transmitting on two meters. This is mighty hard to do if your station consists of an hf transceiver with transmitting converter!

If you decide on a separate transmitter and receiver you'll almost certainly obtain both from the same manufacturer, and your choice of equipment will probably depend more upon the receiver than the transmitter. If your requirements include 160-meter coverage and provision for coverage of accessory ranges with both the receiver and the transmitter, chances are that your station will have been built and engineered in Miamisburg, Ohio. — K1ZND

Drake T-4XC Transmitter

Frequency coverage: 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.5-29.0 MHz standard; provision for 4 additional 500-kHz ranges between 1.8 and 30.0 MHz, excluding 2.3-3.0, 5.0-6.0, 10.5-12.0 MHz.*

Power input: 200 watts PEP, ssb and a-m; 200 watts cw.*

Carrier suppression on ssb: Rated 60 dB or better, measured over 70 dB.*

Unwanted sideband suppression: 60 dB or better.*

Frequency response, ssb: 325 to 2725 Hz at 6 dB down.

Dial calibration: to 1 kHz.*

Calibration accuracy: Better than 1 kHz when calibrated to nearest 100-kHz point.*

Spurious outputs: Better than 50 dB down except as noted in text.*

Power amplifier tubes: Two parallel 6JB6As.

Meter functions: Power amplifier cathode current, relative rf power output.

Dimensions (HWD) and Weight: 5-1/2 x 10-3/4 x 11-5/8 inches, 14 pounds, 10 ounces.*

Power requirements: 650 V dc at 200 mA average, 330 mA maximum; 250 V dc at 120 mA; -45 to -65 V dc adjustable bias; 12.6 volts ac or dc at 3 A. Requirements supplied by AC-4 (\$100) or by DC-4 (\$125) external power supply.

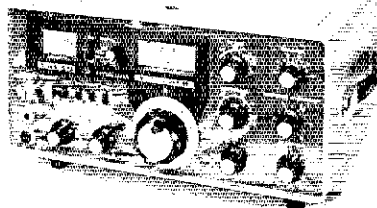
Price class: \$530.

Manufacturer: R. L. Drake Company, Miamisburg, Ohio 45342.

* Measurements made in the ARRL lab.

QST ——— QST ——— QST

Yaesu Musen FT-101B Transceiver



PACK IT UP and take it with you, the man said, so we took the 13-1/2 x 6 x 11-1/2-inch gray box to the West Indies for a two-week shakedown test. Hand carrying some 30 pounds of phone/cw transceiver (power supply built in) can

be convenient when one travels, and the FT-101B qualifies. It is small enough to fit under the seats of most jet airliners, and is not too heavy to carry by hand through air terminals. As the writer learned, having a multiband rig (160 through 10 meters) with you on vacation can provide many hours of pleasure, assuming that the XYL is willing to share her "prime time" with ham-band denizens to whom you address your CQs and replies. This writer was fortunate in that regard, for the XYL