



EQUIPMENT REVIEW

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The YAESU FT-230R 2 METRE FM TRANSCEIVER

VHF transceivers have advanced to a remarkable extent over the last few years. The new YAESU FT-230R for instance has 25 watts output, full coverage of the whole two metre band in either five or ten kilohertz steps, plus a microprocessor control system that can do all sorts of remarkable things.

However I always like to go back to the beginning and trace the evolution of the various pieces of equipment that are reviewed. Back in 1971 when most two metre operators were using converted tube type car phones such as the MR-6 or MTR-13, Yaesu introduced the FT-2F. It was around a sixth of the size, weighed only a quarter of the old rigs and had the capability of switching twelve channels (who would ever need 12 channels!). Well that started it, those little transceivers were just irresistible. We all had to have one, and so the two metre boom began. Twelve channels soon gave way to twenty two or more and the cost of crystals could equal the cost of the transceiver. Synthesized transceivers appeared around 1976, the YAESU 200R had 200 channels between 146 and 148MHz. For some reason it met with only limited success, while the multi mode tunable transceivers really took on. The 800 channel FT-227 was probably the most popular YAESU two metre transceiver with the latter RA and RB models incorporating up/down scanning from the microphone. The new FT-230R could perhaps be considered an updated replacement for the 227. While the 227 was about the same overall size as the original FT-2F, the 230R is actually about half the volume of the 227. For good measure throw in twice the power output, ten memories, two VFOs, priority channel checking and full band scanning just to name a few of the features and you can begin to see just what this little rig has to offer. However enough of comparisons, let's look at the FT-230R in detail.

THE FT-230R DESIGN FEATURES.

Before we go on to look at the circuit details of the 230, let's see just what it has to offer. As mentioned above, it is extremely compact. The actual dimensions are 150mm wide, 50mm high and 174mm deep. It should fit somewhere even in the most diminutive compact car. The weight is only 1.3kg. The transceiver is supplied with a mobile mounting bracket and a chrome tilt bale for home use. Also supplied is a microphone with scanning buttons and a function lock switch. Perhaps the most appealing feature is the superb LCD frequency readout. It is both large and very readable even at an angle. Of course it is readable with direct sun light in direct contrast to LED displays that disappear under these conditions. At night the background is evenly and brightly illuminated.

The S/output meter is also brightly illuminated through the rear of the translucent



The FT 230 R with the scanning Microphone — note the clear LCD Frequency Readout.

scale. The frequency has five digits and is capable of reading to 100Hz, however as the synthesizer steps in either five or ten kHz steps, the last digit seems rather unnecessary. Probably the reason for its inclusion is that it appears that the whole control system has been taken from the popular FT-290R where of course the last digit is used in the SSB tuning mode. The 230 memory and scanning system is also closely related to the 290R. Ten memories can be programmed and then recalled either by the memory switch or by scanning. When the scanning method is selected, it will pause for five seconds when a busy channel is located, just long enough to decide if you want to hear more or not. If you do it only requires the push of either of the scan or PTT buttons on the microphone to halt the scanning. If you hap-

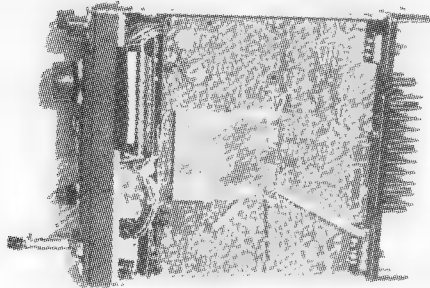
pen to be looking for a clear rather than a busy channel when scanning then a rear panel selector switch will give you this facility.

Any one of the memories can be programmed as a priority channel. If you are expecting a call from a friend on your private frequency, but you would like to listen to the chit chat on the local repeater then it is only necessary to tune the repeater on the main tuning, switch the memory selector to your private frequency, push the F button then the MR/PRI button and the priority channel will be quickly sampled every five seconds. If your friend calls the transceiver will lock onto the priority channel. With the priority checking going on, the first decimal point of the display will blink to indicate this mode of operation. The second decimal

point blinks when a halt occurs during either memory or full band scan operation. It should be noted that once the memories have been selected, they will be held even if the supply voltage is removed from the transceiver. This is due to the inclusion of a lithium cell which YAESU claim has a five year life. Current drain of the memory is rated at only one microamp.

Two separate VFOs are included, the second one being useful if split operation other than 600kHz is required. It can also provide an additional memory quickly selected with the VFO push button.

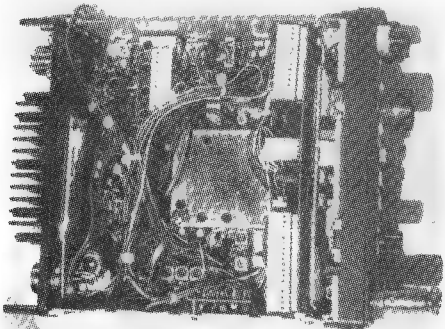
Tuning up and down the band can be done in two ways. The tuning knob has a soft stepping movement, much improved over the old "hack saw" feel of the old FT-227. Tuning as mentioned before is in either 5 or 10kHz steps and I found that the 10kHz steps were the ones most used. Up/Down tuning can be initiated automatically with the microphone scan buttons. A quick jab of one of the buttons will produce a single step while holding the button for two seconds will give a continuous tuning scan that will stop either on signals or clear channels depending on the setting of the rear mounted BUSY-MAN-CLEAR switch.



Inside view of the 230.

THE FT-230R CIRCUIT DESCRIPTION

The receiver is a double conversion set up of fairly conventional design. 10.7MHz and 455kHz are used with a 15kHz bandwidth filter at the first IF and a 15 kHz ceramic filter at the second IF frequency. Quite a bit of effort has been expended to produce a clean signal free from cross modulation. As we shall later see this has been quite successful. Relay antenna switching feeds a lowpass filter to a 3SK51-03 RF amplifier. A five section band pass filter which has a steep cut off just outside the band edge keeps unwanted out of band signals well in the background. Audio output of one watt is produced by an IC amplifier driven by a single transistor stage.



Underside view.

The transmitter line up starts at 10.7MHz and is heterodyned to the final transmit frequency via a balanced FET mixer stage. Audio from the microphone is amplified and limited by an IC stage before the 10.7MHz modulator stage. Two driver stages precede the final 25 watt power out-put stage. ALC is produced from a portion of the transmitter out-put and fed back

to a control stage between the transmitter mixer and the first driver.

Of course the heart of a transceiver of this type is the PLL section which provides the frequency control and selection. The operation of this section is of course quite complex and would require a rather lengthy description. If you are lucky enough to acquire an FT-230R, I would suggest you read the PLL circuit description in the instruction book.

The PLL is controlled by a low current drain (1 microamp) 4-bit micro processor. The ROM has been preprogrammed to do all the ingenious things mentioned earlier.

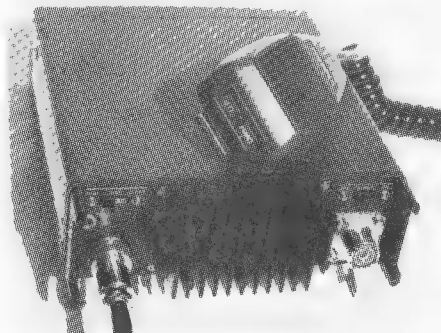
THE FT-230R ON THE AIR

We have already covered many of the operational points in the earlier description section. The first thing I discovered when I tried to put the transceiver on the air is that a solid power supply is needed. My five amp supply ran out of steam and I had to resort to a borrowed 10 amp supply. YAESU rate the current drain at 5 amps with 25 watts output but the test unit required 6 amps and delivered 28 watts out-put. If you are going to use the 230 mobile then of course the current drain will not worry you but you might need to watch your connection to the battery. A cigarette lighter plug connection may not be up to the task of supplying the required current.

As received the memory backup battery is switched off. Removal of a small rubber plug from the bottom of the transceiver case gives access to the switch.

The next thing I discovered is that when used as a home station transceiver with the tilt bale installed, the rear of the transceiver rests on the rather sharp ends of the heat sink. If you have a wooden or vinyl topped desk, watch out — they scratch. A couple of self stick rubber pads would fix the problem. Perhaps YAESU might include these in future. With the power supply problem sorted out, the FT-230R performed in a faultless way. Power out-put was 28 watts at 13.8 volts. I then checked out-put at lower voltages to simulate mobile or portable operation with the battery not on charge. At 12.5 volts output was 22 watts and at 11.5 volts out-put was down to 15 watts. Current drain at the lower voltages dropped to 5.4 amps.

Received audio quality was excellent and at no time was an external speaker considered necessary. Audio output was adequate and should be sufficient even in a fairly noisy car. Transmit audio was also good, but reports indicated that the quality became a little harsh when talking close to the microphone. With the mic about 5 to 7cm back, quality was fine. The microphone is well shaped and the scan buttons are easy to handle. With the transceiver used under mobile conditions, the best way to operate is to use the memories and scan from channel to channel either by stepping position to position or by just letting the transceiver find the channel you need.



Rear view shows connectors and adequate heat-sink of the 25-watt final.

The only point of criticism with the receive performance is the limiter action. While testing the transceiver one windy night, I noticed a good deal of intermittent noise on a weak signal. Switching to my normal transceiver, the noise was totally absent. Checking on an HF general coverage receiver identified the noise as a rather harsh power line noise obviously brought on by the windy weather.

I was not able to do any actual checks on sensitivity or quieting as a suitable signal generator was not available at the time. However sensitivity was comparable to other current model FM gear that I use in the shack.

SPECIFICATIONS

Frequency Coverage:	144.00—147.99 MHz
Synthesizer steps:	5/10 or 12.5/25 kHz
Power Output:	25 watts
Modulation Type:	Variable Reactance
Deviation: (max.):	± 5 kHz
Maximum Bandwidth:	16 kHz
Spurious Emissions:	—60 dB or better
Antenna Connector:	SO-239
Output Impedance:	50 ohms
Microphone Impedance:	500-600 ohms
Receiver Type:	Double Conversion Superheterodyne
First IF:	10.7 MHz
Second IF:	455 kHz
Sensitivity:	0.25 μ V for 12 dB SINAD
Selectivity:	± 6 kHz (—60 dB) ± 12 kHz (—60 dB)
Audio Output:	1.0 watts @ 8 ohms
Audio Output Impedance:	8 ohms
Power Requirements:	13.6 VDC (negative ground)
Current Consumption:	(approx) TX 5.0A, RX 0.3A (standby)
Case Size:	150(W) x 50(H) x 174(D) mm
Weight:	approx. 1.3 kg.

Options

YM-49	Speaker/Microphone
FTS-32	CTCSS Encoder/Decoder
FTS-32E	CTCSS Encoder

THE FT-230R INSTRUCTION BOOK

If you are used to the normal style of Yaesu instruction books, you will be surprised with this one. It is small, measuring only 15 by 21cm. However what it lacks in size, it more than makes up for in quality. Its 52 pages include specifications, front panel controls and switches, rear apron switches and jacks, installation, operation, circuit description, maintenance and alignment and a full parts list. The book is well illustrated with the major components labelled. Provided one has the required test equipment, checking of the alignment would be a straight forward procedure.

Operation of the FT-230R is covered in a complete and precise manner with no sign of Japanese English.

CONCLUSION

The FT-230R is a delightful little transceiver. The 25 watt output capability is a worthwhile increase over the more usual 10/12 watt transceiver. While doubling the power makes only a small difference in the received signal at the other end, it could make the difference of just getting into or not into a repeater. The FT-230R is highly recommended. Our test unit was supplied by Bail Electronic Services, 38 Faithful Street, Wangaratta, Victoria 3677. All enquiries regarding price and delivery should be addressed to them.