

**This article is a departure from our normal equipment reviews. Firstly it is not written by our usual reviewer. Secondly it is not a solicited article and we must accept that the author did not have available the sophisticated test equipment required to check the manufacturer's claimed technical performance. The article, nevertheless, does cover the apparent strengths and weaknesses of the TR7 quite well. Even if you are not about to buy a new rig this article makes interesting reading.**

The R.L. Drake Co. have recently released their latest HF transceiver, the TR7. This radio is to supersede their old TR4 series and possibly the T4, R4 series of separate transmitter and receiver (the "Twins"). The TR7 has taken off very well in the States where at the moment there is a six to eight month waiting period for delivery.

The TR7 with DR7 option (Digital Read-out), TR7/DR7, is the model most Australians will meet, so comments will be restricted to this model.

**FREQUENCY COVERAGE**

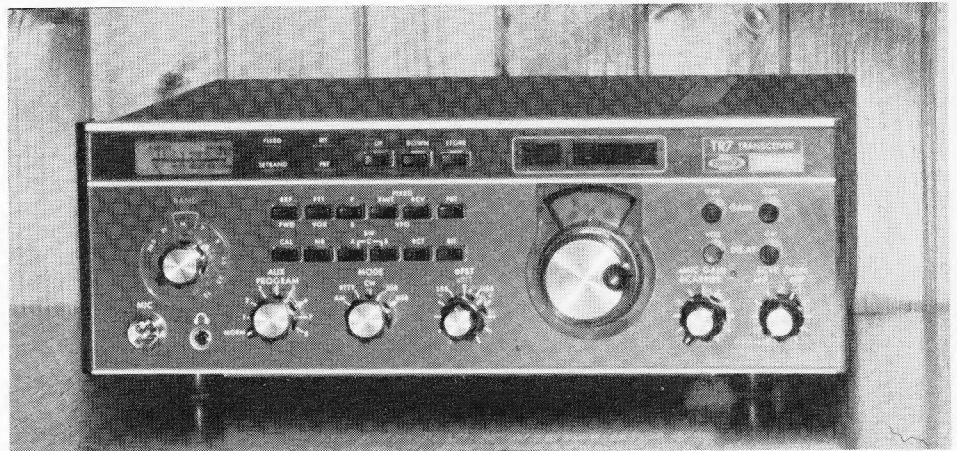
The frequency coverage of the TR7 is the first point of interest. On receive it is a 1.5 to 30 MHz receiver. On transmit it covers all the Ham bands 160 to 10 metres in 500 kHz sections. With the addition of the optional extra, AUX 7, the TR7 enjoys 0 to 30 MHz receive capability, and it can transmit in an extra 8500 kHz sections which may be placed anywhere from 1.5 to 30 MHz. Alternately the frequency can be crystal controlled, which is probably of some use in commercial applications. So the TR7 will easily handle any extra band allocations, unless WARC 79 gives amateurs more than an additional 4 MHz in the HF band.

The TR7 has a built-in frequency counter which gives a digital display of the operating frequency and can be accessed externally to provide an accurate counter for work around the shack. The unit will count up to 150 MHz which makes it useful for work on VHF as well as HF equipment.

**FRONT END DESIGN**

The TR7 achieves its frequency coverage capability by a radically new design approach. Most amateur HF transceivers use a single or double conversion technique to get to an IF of between 5 and 10 MHz, where a crystal filter provides the selectivity. The TR7 has broken away from this idea to a new method Drake term Up-Conversion. That is, the signal is converted up to a first IF of 48.05 MHz and then down to 5.645 MHz, where an 8 pole crystal filter provides the selectivity. By this method, Drake are able to provide a 0 to 30 MHz receiver, with no IF gaps, that has the performance of a good amateur transceiver.

As Drake point out in their advertising brochures, it is only with recent developments in solid state techniques that transistorised equipment has been able to



meet or exceed the performance shown by that using valves. The area where solid state equipment has failed in the past is in the ability to handle strong signals near to the desired frequency. So the specifications for Dynamic Range and more importantly Intermodulation Distortion (IMD) are rarely quoted by the manufacturers. Rather they are only too willing to tell of the excellent sensitivity of their equipment, an area where transistors excel.

In an effort to provide a "strong" front end, the first active element in the TR7 is a double-balanced mixer with a high level of local oscillator injection. This connects to a 4 pole crystal filter 8-10 kHz wide, then via a second diode ring double-balanced mixer to the information filter, which for voice is 2.3 kHz at 6 dB down and 4.1 kHz at 60 dB down. It is only here, after the selectivity, that Drake place the bulk of their gain.

As a result of this design Drake are able to quote figures for Dynamic Range and IMD of 95 dB and +20 dB respectively, two very impressive figures. None of the figures quoted have been verified by the author but one would hope that even in modern times manufacturers can be trusted to this degree. There is, however, a necessary trade-off between Dynamic Range, IMD and Sensitivity. Consequently Drake are only able to claim a sensitivity figure of 0.5 uV for SSB. This comparative lack of sensitivity would not normally be a problem as background noise is usually above this figure, but conceivably there could be circumstances where this lack of sensitivity would be a hindrance.

**ON AIR TESTING**

The TR7 was connected "back to back" with the Drake Twins and then to a TH6DXX at 90 feet. Unfortunately on the evening of this test the bands were not very crowded and neither set could be faulted under strong signal conditions.

On weak signals, the audio quality was superior on the Twins while the TR7 appeared to have less background noise. If there was a difference between the two, the TR7 appeared to have a slight edge in hanging on to the weak signals. The difference in audio quality was probably due to the fact that the Twins were used with their matching speaker and the TR7 has a narrower filter and more extensive audio filtering to cut out the "highs".

The results were repeated when the TR7 was run back to back with a Kenwood TS820S at VK2MB, the Manly Radio Club. Once again there were no strong signals on the bands. Under weak signal conditions, however, the TS820S was able to demonstrate its superior sensitivity, being better at pulling signals out of the mud. The audio quality of the TS820 from a hi-fi point of view was superior to the TR7. The narrower filter of the TR7 and audio characteristics definitely make it a communications transceiver rather than one for enjoying the individual's voice in local "rag-chews".

The big test came later when the TR7 was used during the CQ WPX contest. Conditions were good and the bands were crowded with S9+ signals. Here the TR7 really proved itself, and after 4 or 5 hours behind the VFO one could almost feel the crystal filter reaching out into the night.

Not once was there a trace of any signal outside the passband of the filter being received, no cross modulation or IMD.

The TR7 does have a problem with spurious responses. This is probably due to a number of factors; the set is synthesised, it is a continuous coverage receiver, it uses up-conversion and uses high levels of local oscillator injection (typically + 17 dBm). There are a large number of spurious signals throughout their receiver range, including the ham bands. However, there was only one spurious signal found that moved the "S" meter, and this at 5.645 MHz was S9. These are certainly a nuisance but it is doubtful if they would ever stop a contact being made. The most annoying feature is that they sound like a weak DX station tuning up on air, and one is constantly switching between antenna and dummy load to determine if they are DX or a spurious signal.

#### TRANSMITTER

The TR7 is solid state throughout, including the PA, which is rated at 250 watts input. The output power was measured and found to fall from 130 watts on 14 MHz to 100 watts on 28 MHz, which means the amplifier is fairly inefficient. This is probably true, because as it is broadbanded, Drake have used linear techniques throughout in order to keep the transmissions clean. The amplifier chain is all class A except the driver and final. The transmitter is supposedly capable of running "key down, flat out" for 5 minutes, unless

an auxiliary fan is fitted, when it is then capable of continuous use. In order to test this the CW key was shorted and the rig left to run for 5 minutes at 130 watts output. The TR7 was easily up to the task, the heatsink was just warm, which is more than could be said about the dummy load.

#### OPERATION

The operation of the TR7 is extremely simple. In fact the absence of knobs and dials to fiddle with is at first almost frustrating. There is absolutely no tune up on receive or transmit. Power output is continuously variable on both CW and phone.

In fact the rig is almost completely automatic. All that needs to be done is to select the frequency and push the button. Even the AGC decay times are changed when the modes are changed; this can then be further altered by a front panel control.

The transceiver is very flexible. It is possible to select any of 4 filters (2.3 kHz is standard, 300 Hz, 500 Hz, 1.8 kHz and 6 kHz are optional) independently of the mode in use, thus one can receive CW through a 300 Hz filter and transmit voice. By use of the Pass Band Tuning, PBT, it is possible to receive on a sideband and transmit on the other. All interesting features but probably of little practical value.

The PBT is a useful feature in the fight against QRM. It moves the received signal with respect to the information filter and then moves it back on frequency in the

product detector. Thus the received frequency remains unchanged while the QRM is attenuated by the crystal filter. In a test, two signals, 200 Hz apart and both S9+, were injected into the receiver. By use of the PBT one signal was reduced to an S1 while the wanted signal was unaffected.

#### CONCLUSION

A number of quick points in conclusion. The TR7 does not have a notch filter, which seems a pity. The hand book basically gives very little information apart from instructions on operating the rig and a basic overview of the theory of operation. It badly lacks a circuit diagram or any servicing details apart from advising that it should be taken back to the dealer should any problems arise.

The TR7 is an expensive rig, but for the amateur who wants the best and is prepared to pay for it, it is worth looking at. The TR7 is not for the ham who only wants to talk to the locals, other rigs available will do the job as well and cheaper. The TR7 comes into its own, however, in crashing dogpiles, in kilowatt alley on 20 metres, or on 40 metres where the IMD from 1/2 megawatt short wave broadcast stations near in frequency can render a receiver useless in certain QTHs.

The R.L. Drake Co. have certainly produced a technically interesting transceiver in the TR7. It will be interesting to see if other manufacturers of amateur equipment follow Drake's lead in up-conversion and strong front-end design. ■

# NO-BREAK CLOCK SUPPLY

Jim Jones VK8ZJJ

Having lived in areas where the mains are somewhat erratic, I found it necessary to construct a simple no-break supply. This circuit overcame the problem of having to reset the station digital clock every time a mains failure occurred.

#### INTRODUCTION

A no-break supply is a system in which the supply is normally taken from the 240 volt mains. In the event of a mains failure, the supply is automatically switched to a standby battery source. When the mains voltage is restored, the system automatically switches back.

The circuit is extremely simple and can be adapted for many other applications.

#### OPERATION

The operation of the circuit relies on the basic fact that a diode will conduct when the anode is positive with respect to the cathode and has the appropriate forward bias. A silicon diode requires approximately 0.6 volts.

Two diodes are used to isolate the supplies. The output to the clock timing

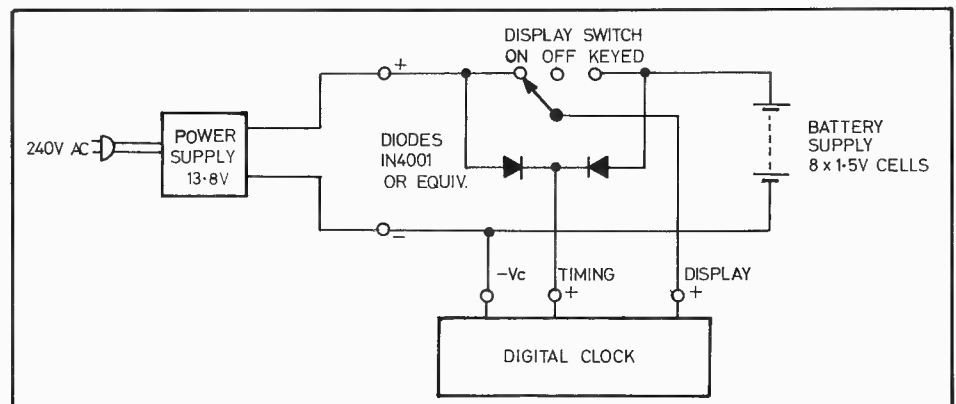


FIGURE 1: Circuit diagram.

circuit is always the higher of the two input voltages. To operate correctly, the voltage from the main supply must be higher than the battery source. If not, the batteries will become the main source for the clock timing circuit.

A key switch has been included in the clock display circuit.

This switch enables the display to be switched on continuously from the main

supply, switched off or keyed-on from the battery source. By utilising this facility, the battery life will be extended. In this circuit, the batteries are *not* charged by the main supply.

#### CONCLUSION

As many of the quartz clocks available have good long term stability, it is advantageous to have a clock supply which has long term voltage availability. ■