



EQUIPMENT REVIEW

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THE DRAKE TR-5 HF SSB/CW TRANSCEIVER

Although not as well known as some of the Japanese brands, the Drake Company of Miamisburg, Ohio has been in the amateur radio business for close to thirty years. They produced one of the first all band SSB transceivers, the TR-4, in 1963. Their amateur band receivers were considered next in line to a Collins and if you were fortunate enough to own a 2B in the late fifties you were someone to look up to. The '2' series receivers gave way to the 4 series which concluded with the superb 'C' model. Drake have always concentrated on superior receiver performance particularly in the area of strong signal handling, cross modulation and sensitivity, but as receiver designers know, these desirable features don't go hand in hand. The TR-4 transceiver was developed and improved through to the 'CW' series of the mid-seventies. However by this time the writing was on the wall for tube type equipment. Transistors were here to stay and design techniques had changed. The Drake TR-7 emerged as the world's first general coverage transceiver, fully solid state, digital readout, band pass tuning, the lot. The Japanese of course soon found out they were behind the times, but then as I have pointed out before in these reviews, many of our new developments come from the USA first.

A year or so ago, it must have become apparent to the Drake Company that the TR-7 was a little out of reach of many amateurs and so the lower priced TR-5 appeared with amateur band coverage only and basic features required by the average operator.

THE TR-5 TECHNICAL FEATURES

At a distance, the TR-5 and the TR-7 look like twin brothers, however the looks are only skin deep and the TR-5 is a very different piece of electronic equipment.

In this day of increasing complexity in amateur equipment, it is nice to see a move away from this. While it could not be said that the TR-5 is simple in any way, it is nevertheless a transceiver with basic features packaged in a relatively large box with a 'get-at-ability' that is just not seen these days. If you have been complaining that the present crop of amateur gear is too complicated, too hard to operate and has more features than you would ever need, then the TR-5 might be just what you have been looking for. You might even have a chance of fixing it if anything goes wrong.

Frequency coverage is amateur band only from 160 to 10 metres including the three new WARC bands at 10, 18 and 24MHz, in 500kHz segments. As supplied in standard form, the heterodyne crystals for 160 metres, the 18 and 24MHz bands and 28-28.5, 29-29.5MHz are optional extras and were not included in our review transceiver.



TR5 with matching microphone

As mentioned earlier, the TR-5 is housed in the same cabinet as the more elaborate TR-7. It measures 31.75cm deep, 34.6cm wide and 11.7cm high. The weight at 6.35kg is a little less than the TR-7's 7.75kg.

The front panel has a similar layout to the TR-7 but has fewer control functions. The digital frequency readout is a six figure red LED display which indicates down to 100Hz. The analog dial has been simplified somewhat from the TR-7's twin rotating translucent scales showing the 100kHz and 5kHz segments with one kHz divisions on the tuning knob down to the calibrated skirt on the tuning knob only. Clearly the digital display is intended as the primary and only frequency indicator.

Receiver selectivity is taken care of with a 2.3kHz filter for SSB with several other filters offered as optional extras. However only one extra filter can be installed in the TR-5 at any one time and a front panel NORMAL/AUX BW switch allows selection of the optionally installed filter of your choice. There is no other band width or IF shift control included. The optional filters have 6dB band widths of .3, .5, 1.0, 1.8, 4.0 and 6.0kHz, the latter two being for AM, however no AM mode is provided for in the TR-5 transceiver.

The transmitter section of the TR-5 features a broad band final which requires no tuning. When a 50 ohm load is presented to the output, the transmitter will deliver its rated output. It is designed for continuous operation on SSB or CW or for continuous SSTV or RTTY operation provided the optional cooling fan is installed. Automatic high SWR protection is included.

The transceiver is designed to operate from a 12 to 16 volt supply such as a car battery for mobile operation or a 15/20 amp regulated supply for home station use. The optional Drake PS75 model 1570 regulated supply is recommended. If however you decide to use your own power supply, you will need to purchase the optional mobile mounting kit as no power supply connectors or cables are supplied with the transceiver.

The keen CW operator has been provided with full break in keying and of course the excellent selection of filters mentioned above.

The noise blanker for the TR-5 is another optional extra. Drake claim that it is useful in eliminating or reducing impulse noise and also over the horizon radar (woodpecker) interference. We will comment on the effectiveness of this later as the blanker was included in our review transceiver.

Drake engineers must be congratulated on finding yet another way of wiring up the standard Japanese four pin microphone connector. However the agents kindly supplied the delightful DRAKE/ASTATIC 7077 desk microphone which saved a rewiring job on one of my spare microphones. A microphone is not included with the TR-5 as standard.

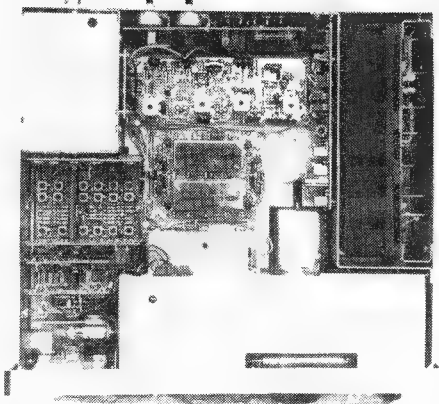
A multi pin connector on the rear panel provides connection for the optional external synthesized VFO. This is described as offering 10Hz resolution and automatic variable tuning rate.

Connecting a VHF transverter could prove difficult as no low level RF output is provided.

Where the TR-7 used an up convert system with a 48MHz first IF, the TR-5 has a conventional single conversion setup with an IF frequency of 5.6MHz. The PTO, or VFO if you prefer, operates from 10.6 to 11.1MHz and mixes with heterodyne crystal oscillator output to produce the required mixer injection to convert the incoming frequency to the 5.6MHz IF.

THE DRAKE TR-5 ON THE AIR

With its fully solid state broad band final, the TR-5 requires no tuning up for transmission or peaking for receive. As an external 13.8 volt regulated power supply is required, the Drake agents kindly supplied a heavy duty PS-7 for



TR5 with cover removed — note final amp. heatsink running from front to rear.

our use. They also supplied a model 7077 desk microphone which would have to be one of the most elegant microphones I have seen for some time.

First impressions are good, the meter is brightly illuminated and the digital display clear and spot on frequency but the tuning knob feels too small for comfortable handling and the finger recess is worse than useless. Tuning rate is 25kHz per turn. The built in speaker is in the bottom of the cabinet and has very poor quality unless the front of the transceiver is raised about 5cm higher than the optional extra feet allow. This extra height is also required to present the front panel at the right angle for easy operation. Perhaps Drake might consider fitting a tilt bale as is often seen on communications equipment these days. A few minutes use brought out another small problem. I had trouble tuning the transceiver in the desired direction. It was most infuriating. The TR-5 tunes higher in frequency with an anti-clockwise rotation of the tuning knob. All of the equipment that I currently use tunes in the opposite direction. No doubt familiarity would overcome the problem.

The next funny thing encountered was that the audio gain control would not reduce the audio level to zero. In fact, at times, it was annoyingly loud at minimum gain. However worse was to come. With headphones in use it was very much too loud and as a single circuit jack is fitted you will not be able to plug in your stereo headphones. Stereo type headphone jacks have been common on Japanese equipment for some years now.

Having dispensed with the problems, let's look at some of the better features.

With a good quality external speaker plugged in, the recovered quality was excellent. Three AGC decay times are selectable plus AGC off. The slow setting is really slow, just right for those strong SSB signals on 80 metres in the evening. If you are hunting weak DX signals on 20 metres then the medium AGC decay is just right, allowing the receiver to recover quickly after tuning through a strong local. For break in CW the fast position is fine with almost instantaneous recovery.

Control knobs are somewhat larger than is common these days and being well spread out are easy to use. Only one concentric pair is used, the audio and RF gains, and these are grouped on the right side of the front panel close to the tuning knob.

Reports on the transmitted audio were most complimentary, perhaps due to the microphone supplied. The instruction book suggested that the microphone gain be set to give an 'S' meter reading of 'S'2 to 4. Strangely there is no actual ALC scale on the meter. Anyhow the ALC certainly worked well and the setting of the micro-

phone gain seemed to be very non-critical. Rear panel facilities are reasonably good. Speaker and CW key connections are via standard 1/4-inch phone jacks, while phono connectors are used for phone patch in and out, external receiver antenna connection, a separate receive antenna input and an external mute to operate a linear amplifier. Two preset controls are situated on the rear panel, the anti VOX level and the sidetone level controls.

ACCESSORIES

Several of the optional accessories have already been mentioned. One other however will be the subject of a separate review in the near future. This is the MN-75 Antenna Matching Network. Drake have for many years produced excellent antenna tuners to match their equipment and this one is no exception.

THE TR-5 ON TEST

The following test equipment was used to produce the figures that are quoted. Drake W4 watt meter, Kenwood SM-220 monitor scope, Heath Cantenna dummy load, Daven audio power output meter, AWA F242A noise and distortion meter, AWA G230A low distortion audio oscillator.

FREQUENCY STABILITY

The VNG frequency standard on 7.5MHz was used. From a cold start at 20°C the transceiver drifted 200Hz over the first hour and then stayed to within 50Hz over the next two hours. This is a very acceptable result. It should be noted that as the TR-5 uses separate heterodyne crystals for each band, the drift results obtained above might not be exactly reproduced on each band. However spot checks on other bands suggested similar results would be obtained.

POWER OUTPUT

Firstly power output was measured with full drive under CW conditions. (As mentioned earlier, not all bands are operative.)

1.8MHz n.a.	18.0MHz n.a.
3.5MHz 90 watts	21.0MHz 60 watts
7.0MHz 85 watts	24.5MHz n.a.
10.1MHz 82 watts	28.0MHz 50 watts
14.0MHz 80 watts	

PEP output as checked on the monitor scope was about the same with a copy book pattern. Even when driving the ALC much higher than the recommended level the pattern remained clean with no sign of flat topping. On air tests also indicated that the transmitted signal was cleaner than usual. A test on ten metres with an 'S'9 signal, only produced 'S'1 distortion products (relative readings)

RECEIVER TESTS

Receiver residual audio noise level -67dBm. An excellent figure which perhaps shows the good design of the Drake PS-7 power supply. The receiver output was terminated in the recommended 4 ohms. Maximum audio output was 2 watts at a very low 1.6% distortion. Measured again at a normal listening level of .2 watts the distortion had dropped to 1%. The audio for this test was a 1kHz tone produced by feeding a crystal oscillator into the receiver antenna socket.

Receiver frequency response was checked by tuning across the same signal. The -6dB points were 400Hz and 2.9kHz with the -3dB points at 500Hz and 2.5kHz. Less than 1dB variation occurred over the rest of the curve. The narrow filter fitted to our review transceiver produced -6dB points at 900Hz and 1.8kHz.

The RIT control is usable on receive only and has a range of +3.6kHz and -2.6kHz.

Terminating the receiver input with a 50 ohm load and then tuning across the various bands produced a surprising number of spurious responses. Most would be lost in noise with the antenna connected but several were able to push the 'S' meter to 7 or 8. These were on 21.165, 21.064, 29.101 and 28.927MKz.

SPECIFICATIONS

GENERAL

Frequency Coverage: 1.8-2.0*, 3.5-4.0, 7.0-7.5, 10.0-10.5, 14.0-14.5, 18.0-18.5*, 21.0-21.5, 24.5-25.0*, 28.0-28.5*, 28.5-29.0, 29.0-29.7* MHz. (*With accessory range crystal.)

Modes of Operation: USB, LSB, CW

Frequency Stability: Less than 1kHz drift first hour. Less than 150Hz per hour drift after first hour. Less than 100Hz change for a $\pm 10\%$ line voltage change.

Readout Accuracy: $\pm 10\text{ppm} \pm 100\text{Hz}$

Power Requirements: 13.6 VDC regulated, 2 A. 12-16 VDC unregulated, 0.8 V rms maximum ripple, 15 A.

Dimensions — Depth: 12.5in (31.75cm), excluding knobs and connectors; Width: 13.6in. (34.6cm); Height: 4.6in (11.7cm), excluding feet.

Weight: 14 lb. (6.35kg).

RECEIVER

Sensitivity: Less than 0.5 μV for 10dB S+N/N except less than 1.0 μV , 1.8-2.0MHz.

Selectivity: 2.3kHz minimum at -6dB, 4.1kHz maximum at -60dB; (1.8:1 shape factor)

Ultimate Selectivity: Greater than 95dB.

AGC: Less than 5dB output variation for 100dB input signal change, referenced to AGC threshold.

Intermodulation (20kHz or greater spacing) — Intercept Point: Greater than 0dBm. Two-Tone Dynamic Range: Greater than 85dB.

IF Frequency: 5.645MHz.

IF Rejection: 50dB, minimum.

Image Rejection: 60dB, minimum below 14MHz; 50dB, minimum above 14MHz.

Audio Output: 2 watts, minimum @ less than 10% THD (4 ohm load).

Spurious Response: Greater than 60dB down.

TRANSMITTER

Power Input (Nominal): 150 watts, PEP or CW.

Load Impedance: 50 ohms.

Spurious and Harmonic Output: Greater than 40dB down.

Intermodulation Distortion: Greater than 30dB below PEP.

Carrier Suppression: Greater than 50dB.

Undesired Sideband Suppression: Greater than 60dB at 1kHz.

Duty Cycle — SSB, CW: 100%; Key Down (w/o FA7 Fan): 30%, 5 minutes maximum transmit; Key Down (w/FA7 Fan): 100%.

Microphone Input: High Impedance.

CW Keying: Instantaneous full break-in, adjustable delay.

Others on 21 and 28MHz could prove troublesome near very weak signals.

As I do not possess a signal generator of suitable quality, sensitivity checks must be subjective and comparative with my normal station equipment. Sensitivity appeared to be excellent and quite up with other current model equipment. Strong signal handling was excellent with no trace of overload even on transmitted signals in the same shack. No front end attenuator is provided.

AGC action was checked by measuring receiver audio output with the crystal calibrator coupled to the receiver to produce an 'S'4 signal and then connected to produce an 'S'9+30dB signal. There was no variation in audio output level for this change of input signal.

INSTRUCTION BOOK

Having looked at many Japanese instruction

books over the years it is certainly interesting to look at an American book with their rather different approach. First impression is the excellent quality of the printing and general production. Spiral binding is used so the book can be opened at any point and will then stay open.

Subjects covered include: power supply connections, microphone connections, front panel controls, rear panel controls, CW side tone adjustment, accessory filter installation, CW and SSB operation.

An excellent chapter describes the theory of operation while another has basic service information. A full circuit and block diagram are included.

CONCLUSION

As a basic transceiver, the TR-5 does a commendable job. It is however surprising that a firm with the experience of Drake would spoil the otherwise excellent performance with a few

blunders that in most cases could be put right at minimal cost. However I am sure that the TR-5 will appeal to many amateurs who prefer straightforward gear that will probably be operating satisfactorily years after some of its contemporaries have passed the point of economical repair.

The TR-5 used in this review was supplied by ELMEASCO Instruments Pty. Ltd. Offices are listed below:

SYDNEY

PO Box 30, Concord, NSW 2137. Phone (02) 736 2888.

MELBOURNE

PO Box 107, Mt Waverley, Vic. 3149 Phone (03) 233 4044.

Elmeasco also have offices in Brisbane, Adelaide and Perth — all enquiries regarding price and delivery should be directed to them at their nearest office.

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The Adventures of Bill Blitheringtwit

Ted Holmes VK3DEH
20 Edmond Street, Parkdale 3195



These adventures have been appearing each month in the Moorabbin and District Radio Club magazine "APC" under the pen name of "Segue". This is a musical expression meaning "press on" and could be said to be appropriate to most amateurs. Bill Blitheringtwit is entirely a figment of the imagination and is not intended to be representative of any particular person. If anyone reads himself into any of the stories, that is his own choice. . . .

BILL AND THE PCB

Bill Blitheringtwit signed heavily and reached for his Scope soldering iron. He realised that life wasn't meant to be easy, but this was going too far. He had spent nearly four hours trying to put this small circuit board together and this must be about the fifth time he'd tried to insert this idiotic transistor. Each time he'd tried, something happened. He had got it in the wrong way round at least three times and had had to desolder it and remove it from the board. The thin little legs of the device looked a bit wobbly by this time.

He tried again. One of the legs broke off and he reached for the solder sucker. It was blocked. He tried to clear it and the teflon nozzle broke off. Not deterred, he placed the board on end and gripped the remains of the transistor firmly, whilst pull-

ing, and applied the hot iron to the other side of the board.

There was a sizzling sound and a strong smell of something burning. The transistor grew very hot and Bill let go. The Scope then destroyed the copper track and the board was rendered useless.

Bill cursed and immediately set about trying to repair the remnants of the copper track. He threw the transistor away and then spent thirty minutes trying to find it, as he didn't have a note of the type number and wanted to buy a replacement.

Eventually he ran a stream of hot solder on to the blackened circuit board and was satisfied that he had created a track of sorts. Only he had blocked up some holes, so he needed a drill. After rummaging around, he found one buried under his

workbench. It was pretty ancient and the power cord was frayed. Bill plugged it in and switched on. There was a loud bang and the fuse in the power box blew. All the lights in the garage — and, in fact, the entire house — went out.

Bill tried to walk towards his car to fetch a torch but tripped over the power cord of the antique drill he was carrying. The implement flew out of his hand and went straight through the windscreen of his wife's car.

By the time Bill had finished sorting himself out and making explanations to his irate wife, who demanded to know what he was playing at, Bill had forgotten what it was he had been trying to make and the ruins of the circuit board joined many others in his capacious junk box.

EVALUATION AND ON AIR TEST OF THE DRAKE TR-5 TRANSCEIVER

Serial No. 001330

CATEGORY	RATING	COMMENTS
APPEARANCE		
Packaging	***	Transceiver plastic wrapped, foam inserts, strong carton.
Size	**	Larger than most competitors.
Weight	**	Fairly light for size.
External finish	**	Neat but very basic styling and finish.
Construction quality	***	Good quality circuit boards and neat internal wiring.
FRONT PANEL		
Location of controls	***	Controls are well spaced and easy to operate.
Size of knobs	***	Normally used controls are large.
Labelling	***	Very clearly labelled.
Meter	***	Brightly illuminated.
VFO knob action	**	No backlash. But knob too small. Finger hole too small. Knob turns anti-clockwise for increase in frequency.
Dial readout:		
Digital	***	Bright red LED readout to 100Hz.
Analogue	*	Might be better if it was removed altogether.
Status indicators	*	Only one provided (RIT).
REAR PANEL		
	**	Easy accessibility but limited facilities.
RECEIVER OPERATION		
VFO stability	***	See test section for results.
Digital dial	***	Within $\pm 50\text{Hz}$ at all times.
Analogue dial	*	One kHz division on knob skirt only tracked over a few kHz.
Memories	NA	
Sensitivity	***	In comparative tests very good.
RF attenuator	NA	
RF gain	***	Smooth and progressive action.
Selectivity	**	A good filter, no other aids.
Passband tuning	NA	
IF shift	NA	
Notch/peak filter	NA	
Optional filters	***	Several available.
Spurious responses	*	Many evident. See test section.
'S' meter	**	Smooth action.
AGC performance	***	Four positions (off, fast, medium & slow) also see test section.
Signal handling	****	No overloading found.
RIT operation	**	Receive only. Digital dial follows.
NOISE BLANKER		
Line noise	**	Some reduction in some types of noise.
Auto ignition	***	Quite effective.
Woodpecker	*	No effect at all.
Effect on signal	****	No noticeable effect on signal.
QUALITY OF RECEIVED SIGNAL		
Internal speaker	**	Only if front of receiver is lifted higher than optional feet allow.
External speaker	NA	Available as option.
Headphone output	*	Stereo phones only work on one side. Speaker has to be manually switched off. Audio gain cannot be reduced far enough.
Cooling fan noise	NA	Fan available as option, not provided on review transceiver.
TRANSMIT OPERATION		
CW and PEP output	**	See test section.
Audio response	****	Excellent quality reports.
Audio sensitivity	***	Plenty of mic gain.
ALC action	***	No flat topping even with high mic gain.
Speech processor	NA	Available as optional extra.
Metering	*	ALC and relative output, but no meter scale provided for either.
Relay noise	***	Very quiet.
VOX operation	***	Smooth operation combined with quiet relays.
QSK operation	***	Full break in CW operation.
Cooling	***	No overheating noted.
MANUAL (OWNER'S HANDBOOK)		
	***	See comments in text.
ACCESSIBILITY FOR SERVICING		
	****	Plenty of space to get to everything.
RATING CODE		
Poor *	Satisfactory **	Very Good ***
		Excellent ****