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The SHORT WAVE Magazine

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THE 'DIREX'

AN AMATEUR BANDS DIRECT CONVERSION RECEIVER

G. C. DOBBS, G3RJV

IN the April 1977 issue of *Short Wave Magazine*, the author described a "Simple Receive Adaptor" which used the principle of direct conversion to produce receive facilities from an existing VFO. The circuit was the basis for any direct conversion receiver, with the addition of a variable frequency oscillator and audio stages. This article takes the 'bones' provided by that circuit and adds a little 'flesh' to give a complete receiver.

A direct conversion receiver mixes the incoming signal with a local oscillator in a similar manner to the superhet. However in this type of receiver, the difference between the two signals is the required audio frequency, so direct conversion from RF signal to audio signal occurs. The action is like that of a product detector in a single sideband receiver. The resulting beat note between the two signals makes the system only really suitable for CW or SSB signals, but these are the two most common amateur band modes.

In a direct conversion receiver there are very few tuned circuits, which makes the technique very suitable for amateur home construction; most of the gain and selectivity has to take place at the audio frequencies. It is usual to provide audio filtering for selectivity and high audio gain for sensitivity. The stability of the receiver depends upon the local oscillator, so a carefully constructed reliable VFO is required.

The circuit for the complete "Direx" receiver is shown in Fig. 1—the circuitry around TR1 and TR2 is that of the article mentioned above; TR3 is a simple, but surprisingly stable VFO. A single stage of audio filtering is provided by the operational amplifier IC1, and another op. amp. IC2 is used as a high gain headphone amplifier.

The prototype "Direx" was built to operate on the 7 MHz and 14 MHz amateur bands, though it is quite simple to use the circuit for any or all of the HF bands; L1 and L2 are identical coils and a pair of suitable coils would put the receiver on any required band. The circuitry from TR1 to IC2 could form the basis of a receiver with oscillator input taken to TR1 from a transmitter VFO—a very adaptable circuit.

TR1 is a dual-gate Mosfet mixer, and though Type 40673 is given in the table of values, the inexpensive substitute type sold by *J. Birkett* of Lincoln works well in the circuit; L1 and VC1 provide the front-end tuning for both bands. The 100pF value is enough to enable 7 and 14 MHz to be peaked for incoming signals, and this is coupled *via* C1 into one of the gates of the dual-gate Mosfet.

The oscillator is a simple single-stage Colpitts circuit: this was found to be sufficiently stable for two-band use (it would be possible for the constructor to use his own favourite HF oscillator circuit). L2 and VC2 allow a fair degree of bandspread tuning for both bands by the switching-in of two trimmers CT1 and CT2; with S3 open the 14 MHz band is tuned and with S3 closed the 7 MHz band may be tuned. The oscillator output is

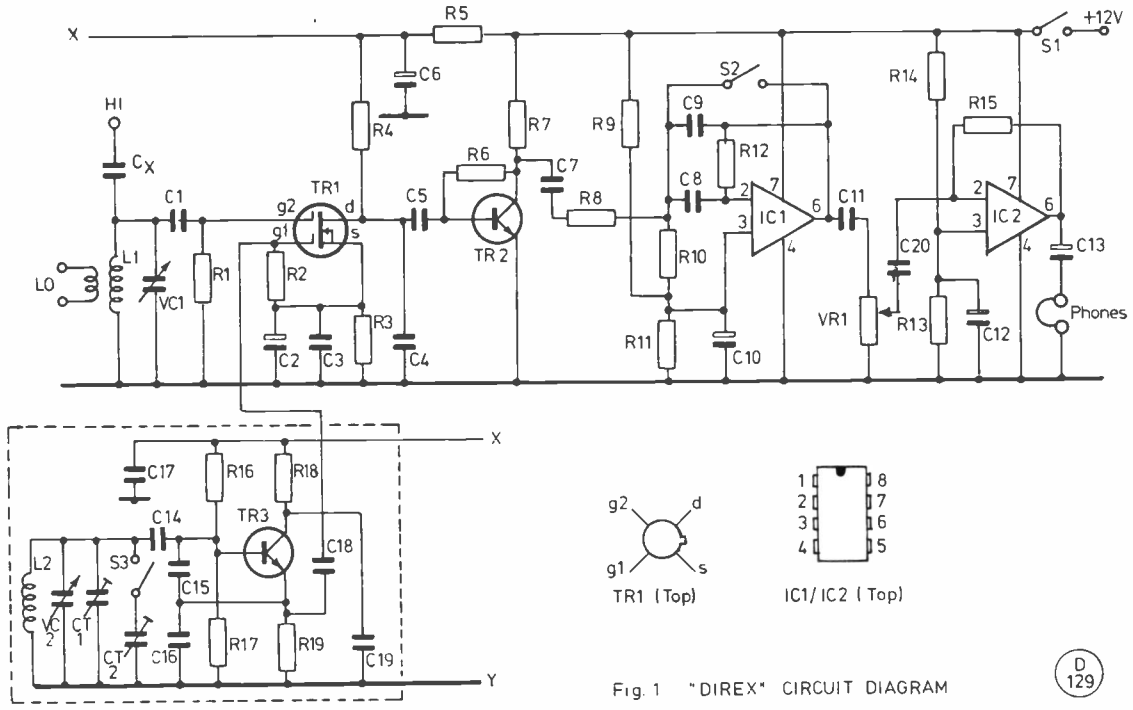

Fig. 1 "DIREX" CIRCUIT DIAGRAM

D 129

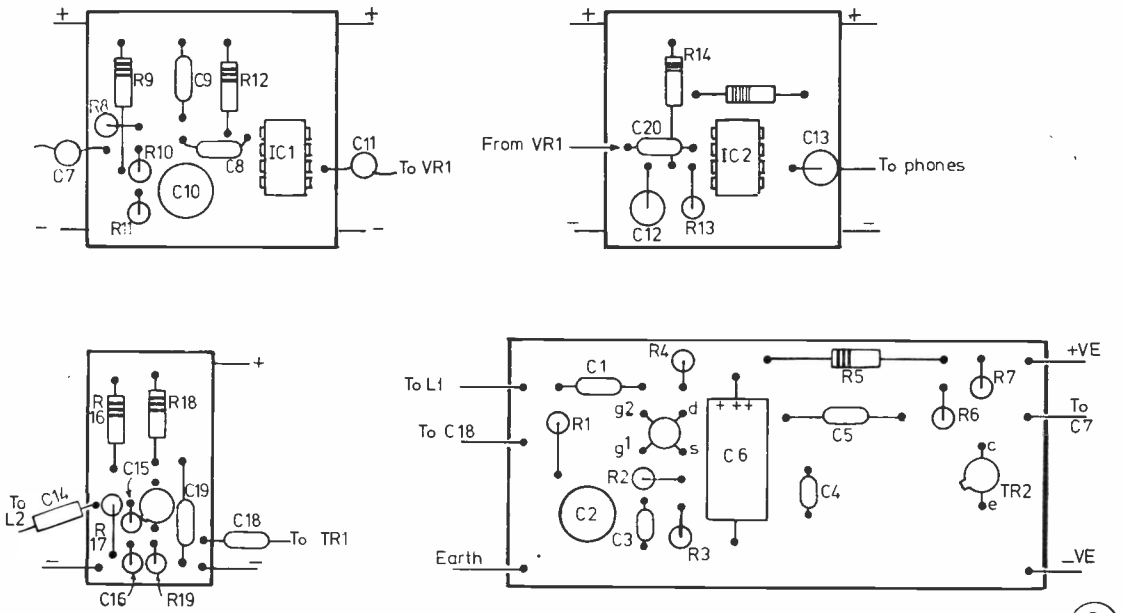

Fig. 2 BOARD LAYOUTS

taken from the emitter of TR3, *via* C18, to the other gate of TR1.

L1 and L2 are identically wound coils of 11 turns of 26 *s.w.g.* enamelled wire on a ¼in. (7mm.) 'Alladin' former; L1 has an additional winding to provide a suitable input for a low impedance aerial, marked LO on the circuit. A high impedance aerial, for example an unmatched length of wire, can be coupled directly to the top of L1 *via* C_x; C_x is an aerial coupling capacitor of sufficient value for RF transfer without undue damping of the tuned circuit. A value of some 100-200 pF will serve the purpose, or a trimmer with a maximum value of 250pF could be used. 7 MHz will be tuned with VC1 vanes almost closed and 14 MHz will be tuned with the vanes almost open.

Arranging for TR3 to tune the two bands is a question of adjusting the trimmers and the dust core of L2; this can be done with a GDO with the components in circuit. However, an easier method is to get TR3 to oscillate and find the output on an existing receiver. The simplest procedure is to get VC2 to tune the whole 14 MHz band with CT1 by adjusting the trimmer CT1 and the dust core—attempt to obtain this with CT1 unscrewed no more than about a third of its travel. If CT1 is unscrewed too far on the 14 MHz band, CT2 will not reach the 7 MHz band; when the 14 MHz band has been found, switch in CT2 and adjust only CT2 to the 7 MHz band. If CT2 will not enable the VFO to reach the low end of the 7 MHz, additional capacitance can be added in parallel.

The output from the mixer, TR1, is RF decoupled by C4 and the audio is coupled *via* C5 into a single stage audio preamplifier TR2. This stage provides audio amplification to drive the audio filter. It would be possible to simplify the receiver by omitting this stage, but since most of the receiver gain is achieved at audio, it is advisable to retain TR2.

A simple single stage audio filter is provided by IC1: this is based upon the popular MFJ circuit. It provides a bandwidth of some 110 Hz with a centre frequency of about 800 Hz, and gives most of the receiver selectivity. The resistor network R9 and R11 enables a single rail power supply to be used with the op. amp;

Table of Values—Fig. 1

R1	= 47K	C15	= 470 pF poly.
R2	= 33K	C16	= 250 pF poly
R3	= 1K	C17	= 0·001 μF
R4	= 4·7K	C18	= 1,000 pF
R5	= 220 ohms	C19	= 0·01 μF
R6	= 1·2M	C20	= 0·1 μF
R7	= 4·7K	VR1	= 10K Log. Pot.
R8	= 33K	VC1	= 100 pF variable
R9	= 27K	VC2	= 10 pF variable
R10	= 24K	CT1	= 3-30 Beehive Trimmer
R11	= 27K	CT2	= as CT1
R12	= 1·8M	TR1	= 40673 (*see text*)
R13	= 5·6K	TR2	= BC109
R14	= 5·6K	TR3	= BC109
R15	= 1M	IC1	= 741
R16	= 10K	IC2	= 741
R17	= 10K	PH	= 2,000 ohms Impedance Headphones
R18	= 470 ohms		
R19	= 470 ohms	S1, S2 and S3	= single-pole, single-throw Slide Switch
C1	= 100 pF		
C2	= 25 μF Elec.	L1	= 11 turns 26 *s.w.g.* enamelled wire on ¼in. (7mm.) 'Alladin' former with dust core; 3-turn link winding over the main winding.
C3	= 0·02 μF		
C4	= 0·01 μF		
C5	= 0·22 μF		
C6	= 100 μF Elec.	L2	= as L1
C7	= 0·22 μF		
C8	= 0·001 μF, 2%		
C9	= 0·001 μF, 2%		
C10	= 10 μF Elec.		
C11	= 0·01 μF		
C12	= 25 μF Elec.		
C13	= 50 μF Elec.		
C14	= 100 pF		

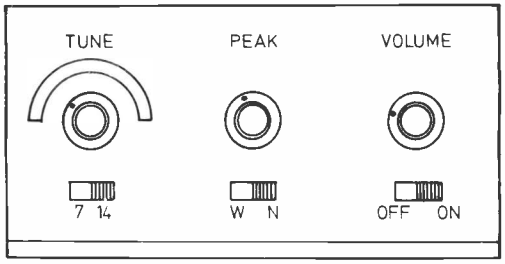

Fig. 3 "DIREX" FRONT PANEL

D 131

C8 and C9 should be close tolerance components. S2 shorts out this filter, and provides a wide/narrow bandwidth facility. C11 couples the audio signal to VR1, a simple audio volume control.

The final audio gain is provided by another 741 op. amp. The feedback loop is controlled by R15 giving a high gain, but retaining stability; R14 and R13 allow for a single rail power supply for this amplifier. The output is coupled *via* C13 into a pair of high impedance headphones (this IC provides adequate headphone output).

The receiver was built in an aluminium box 5in. x 2½in. x 3½in., with the VFO built in a screened portion of it; the usual RF oscillator constructional practices should be followed. All the wiring should be direct and solid, and L1 mounted not too close to the side of the case to allow access to the dust core for tuning up.

The front panel layout (Fig. 3) allows a reasonable amount of space for construction. The VFO has a simple epicyclic 8 : 1 slow motion drive which is mounted onto the front of the box, and a pointer made from a length of stout copper wire is soldered to the reduced drive flange; this shows the frequency on a simple paper scale pasted on the front panel.

The circuits are built on *Veroboard* of the plain variety, without the copper strips; the interconnections are made beneath the board using the spare lead lengths of the components. There are four boards: VFO, Mixer/Preamp, Filter and Audio stages—the layout of components on these boards is shown in Fig. 2.

The VFO board is placed inside the screened compartment and the Mixer/Preamp board is mounted in the centre of the box, close to the VC1 control. The Filter and Audio boards are placed behind the VR1 control; these two are mounted in a vertical position to allow adequate spacing. The boards may be attached to the box by using *Blutack* 'putty' which is ideal for holding small circuit boards in place.

This receiver could be built by a beginner without too much difficulty, and could also provide a portable or stand-by receiver for the more experienced amateur. It may also be seen as the basis for further experimentation, with it's inherent lack of tuned circuit problems.

ANTENNAS—THE WEAK LINK PART II: WAVE ANGLE, DIRECTIVITY AND GAIN

A. P. ASHTON, G3XAP

IT is convenient to discuss antenna properties under the three loose headings of angle of *radiation*, *directivity* and *gain*; it should be realised, however, that these three factors are related to one another and a change in one property will almost certainly affect one or both of the other properties. An understanding of the way in which these properties can be achieved or removed will enable an antenna system to be designed for a particular purpose; it should also be recognised *at the design stage* that an antenna will not give of its best in a role for which it was not intended.

Wave Angle

When talking of 'wave angle' (or angle of radiation), we mean the angle between the ground and the radiated wave from the antenna, *see* Fig. 1a. However, a lobe of radiation is not sharp like the beam of a car's headlights and the angle usually referred to is the angle at which the field strength is a maximum—Fig. 1 will help to clarify this point. An antenna may have more than one lobe and we may, therefore, have an antenna which radiates well at various angles, *see* Fig. 1b.

As stated in *Part I*, the lower the angle of radiation, the further the distance travelled by a sky wave before returning to Earth. So, when designing an antenna system we must decide whether we are interested in DX working—in which case we will need low wave angles—or local working in which case a high angle is normally required. In practice most antennas built with low angle radiation in mind will also radiate appreciable amounts of energy at high angles—especially at frequencies below 14 MHz where antennas will need to be mounted very high in order to completely suppress these higher angles. Generally speaking the actual wave angles achieved will be somewhat higher than the theoretical figures quoted in the handbooks, because these figures have usually been arrived at by assuming that the antenna is mounted over perfectly conducting ground: unfortunately ground tends more towards perfect insulation than perfect conduction. However, the theories applied to attaining low angles still hold good—its just that bit more difficult to attain them.

The angle of radiation for DX working can be *too* low (this will be explained later) but it is beyond the resources and ambition of most of us to get down to angles of this order.

Radiation Patterns

Before discussing directivity, let us see what is meant by the 'radiation pattern' of an antenna.

When we talk of *wave angle* we are interested in the angle between the lobes of radiation and the Earth's surface (the diagrams illustrating this are known as Vertical Plane Radiation Patterns). Now consider the pattern in a different plane—looking down directly onto the antenna with the Earth beneath it: the pattern in this case is known as the Directive Pattern, or more correctly the Horizontal Plane Radiation Pattern. In this plane we must state the wave angle for which the pattern is

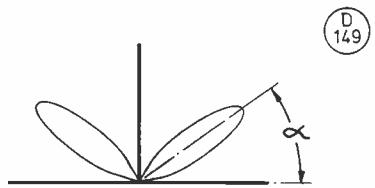

Fig. 1a

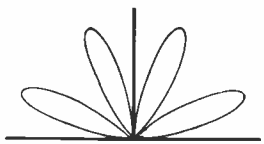

Fig. 1b

Fig. 1. Vertical-plane Radiation Patterns : (*a*) Single lobe, angle *a* = angle of radiation ; (*b*) Antenna with two lobes of radiation.

drawn—with the vertical pattern we assume that the major radiation lobe is parallel to the paper on which the pattern is drawn.

Fig. 2a shows the directive pattern for a half-wave horizontal antenna at a height of one half-wavelength, whilst Fig. 2b shows the pattern for a 3-element Yagi antenna at the same height.

Directivity

Practically all antennas show some directivity, even verticals, although some are obviously more directive than others. For local working directivity is not usually required—a high angle omnidirectional radiation pattern on, say, 3·5 MHz would give good, all-round local coverage. For DX working, however, directivity can be of considerable advantage not only by concentrating the signal into the area into which we want it to go, but also by reducing QRM from unwanted directions whilst receiving.

We have not mentioned "reciprocity" before, so it may be well to discuss it at this point. Simply stated, reciprocity means that the properties displayed by an antenna whilst transmitting will also apply when the same antenna is used for receiving. This, though, will only be apparent from the operating position if the receiver is matched to the antenna system in the same way as the transmitter, *i.e.* the input impedance of the receiver (plus matching unit if any) is the same as the output impedance of the transmitter (plus matching unit).

Many newcomers to radio find it difficult to think of an antenna displaying gain and directivity in the reception mode, but half an hour spent trying to watch a UHF television with a long wire antenna should dispel any doubts on this score! In fact, directivity is possibly even more important for reception than it is for transmission (except that being closely allied to gain it does help to ensure that we do not waste power by radiating it into areas in which we are not interested).

Like wave angle, the actual directivity pattern achieved in practice may differ quite considerably from the theoretical pattern—mainly due to the influence of nearby objects which absorb or reflect power from the antenna, one of these objects being the feeder! As with wave angle, we must decide from the outset whether or not we need directivity, and if so, whether the direction of the major lobe is to be fixed or if we need a rotatable system.

This is one of the major differences between Amateur and Commercial installations: a commercial station is often interested in transmitting to a specific area or even a specific station, whereas the amateur almost always wishes to direct his signal into *any* area as the need arises. The commercial station is therefore often in a simpler situation as it is usually more easy to devise and install a system for fixed directivity than it is to set up a rotatable array. However, many amateurs do use fixed directive arrays—especially on the lower frequency bands—and this is a possibility that should not be ruled out when planning an antenna system.

Gain

'Gain' is probably the least well understood of the three properties under consideration and most confusion seems to arise from not fully understanding what is meant by the term itself.

There are two types of 'gain' to consider and a failure to recognise the distinction between the two will make it difficult to grasp the overall concept of antenna design. Firstly, there is Free Space Gain: this is the gain displayed by the antenna when compared with another antenna (usually a half-wave dipole) as measured by the reception of a direct wave from it *i.e.* one that has not undergone reflection from the ionised layers), and is usually measured at distances of about 5 to 50 wavelengths from the antenna. Secondly, there is what is usually called the 'DX gain', this being the gain displayed by the antenna (again usually compared with a half-wave dipole) when its radiated field strength is measured at a very large distance (*i.e.* after one or more ionospheric reflection).

In general, free space gain figures for HF antennas

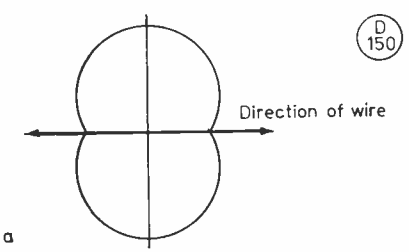

Fig. 2a

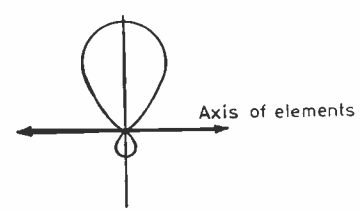

Fig. 2b

Fig. 2. (*a*) Horizontal-plane radiation pattern for half-wave horizontal antenna mounted one half-wavelength above ground ; pattern refers to wave angle of 30°. (*b*) Horizontal-plane radiation pattern for 3-element Yagi antenna mounted one half-wavelength above ground ; pattern refers to a wave angle of 30°.

tend to be grossly over-estimated—especially by manufacturers and retailers! For some reason, however, the same people appear to quote DX gains somewhat lower than the sort of results that one finds in practice.

Although not always true, it is a good general rule that while Free Space Gain is the result of introducing directivity into the radiation pattern (after all, gain results simply from radiating in a favoured direction at the expense of radiation in an unwanted one), DX gain is more the result of a low angle of radiation. This is demonstrated by the fact that a low-angle vertical antenna showing practically no directivity can show a DX gain which will put many directive arrays to shame.

Closely allied to gain is Front-to-Back ratio, this being a comparison of the radiated field strengths in the favoured and the opposite directions. Again, this ratio when measured at long distances may be different to that attained in the 'free space' mode—the difference being due to the fact that the wanted and unwanted lobes from directive arrays do not always have the same angle of radiation.

Multi-band Systems

In general, multi-band antenna systems are a compromise, and it must be accepted that the wave angle, directivity and gain (if any) will not be the same for all the bands that the antenna covers; this is more noticeable on the lower frequency bands, but even tri-band beams on 14, 21 and 28 MHz may give a better performance on one band than on the others. Generally speaking, the higher the system is mounted above ground, the less this effect will be felt, but on the LF bands the sort of heights required can rarely be achieved. It is one thing to erect a 14 MHz antenna at a height of one wavelength above ground, but on 3·5 MHz this would represent a height of about 275ft.!

Feed impedance will also vary from band to band as a result of the different ground effects which are felt on different frequencies (this will be discussed in a later article). How often one hears on the air comments such as "my antenna is great on 15, but it just doesn't get out on 20 or 10." This sort of remark is almost never heard from the operator with separate antennas for each band, yet the attraction of "all-band" operation from one antenna seems to be very strong indeed.

Although not completely decrying multi-banders, the author does feel that unless space is at a premium, or that the operator does not want an optimum system, then well planned, single band antennas should always be used.

Local *versus* DX

It should be apparent from what has been said so far that the properties which we require from our antenna will fall into several categories:—

(1) *High Angle Omnidirectional.* This is for local 'net' working, and in practice the high angle is simple to achieve, but true omnidirectional properties are not quite so simple—especially below the 7 MHz band. As mentioned above, nearby objects distort the radiation pattern, and even simple verticals are rarely equal in all directions; however, these effects are not so apparent at short distances, and verticals are good examples of antennas for this category—especially verticals with inefficient earth systems.

(2) *High Angle Directional.* These antennas are not often required, but may be of value in some Contest working where it may be desired to put a strong signal into a local or semi-local area. This type of antenna would also have a definite advantage in maintaining regular 'skeds' (for example, with a station in Sweden, a fairly high angle of radiation and some directivity towards the North-East would be of great value). A fairly long wire mounted about a quarter-wave from the ground would come into this category, as would a low 2-element beam.

(3) *Low Angle Omnidirectional.* Antennas of this type are often used on the lower frequency bands for DX working and usually take the form of verticals of some type or other; the sheer physical size of rotatable arrays for these frequencies makes them somewhat impracticable, however. Omnidirectional DX antennas do possess one great disadvantage in that when weak signals are being received, Murphy's Law sees to it that an S9 plus signal always comes up from a different direction and blots out the DX!

(4) *Low Angle Directional.* These are common on the HF bands in the form of rotatable arrays, but if used on the lower frequencies they tend to be in a fixed rather than rotatable configuration. An example of an electrically rather than mechanically 'steered' low angle directional system is the practice of "phasing" two vertical antennas, by placing them at predetermined distances apart and feeding them with appropriate lengths of feeder. This excellent method is somewhat neglected by Amateurs and will be discussed at some length in a later article. A type of fixed-direction low-angle radiator for the LF bands is the "G3XAP Directional Antenna", and this has been described elsewhere [1].

In practice since the theoretical radiation patterns are rarely achieved, and since most low angle radiators also radiate at high angles also, an antenna may not fall exclusively into one of the above groups, and one often hears the comment that "the theory is not always right." On the contrary, the theory is invariably correct, and if the antenna does not comply with theory, then the design considerations have not been fully met—blaming theory is the easy way out. Remember that antenna design and angles of radiation etc. are based on the assumption that the antenna will be perfect—*i.e.* it will be located several wavelengths from any other object that might absorb or reflect radiation and it will be erected over perfectly conducting earth. Obviously these two conditions are very rarely achieved in practice, so the antenna never performs quite as well as we would like it to!

Although perfection can never be achieved, this does not mean that a study of theory is a waste of time: what we should realise is that the efficient operation of an antenna is achieved far more rarely than most of us would care to admit, and as a result we must work that much harder in order to achieve success.

Summary

Be aware of the "Law of Common Sense" and realise that theoretical capabilities of antennas are seldom realised in practice. Do not accept exaggerated claims for any antenna—especially commercial ones. Think carefully before putting up any antenna—is it really

suitable for the job in hand? Finally, accept the fact that there is no wonder 'antenna to end all antennas'—some types are more suited for certain jobs, but they all have their limitations, even the mighty Rhombic.

In *Part III* we'll have a closer look at wave angles and consider some methods of obtaining that elusive low angle of radiation.

[1] "The G3XAP Directional Antenna for the Lower Frequencies", *Radio Communication*, November 1977.

to be continued

REVERSE REPEATER ON THE TRIO TS-700

C. WEARING, GM8GIQ

AFTER some time of faithful service it was decided to try and bring the GM8GIQ TS-700 up to TS-700G standard. One basic difference between the two rigs is that the 700G has reverse repeater facilities.

On examination of the 700 manual it can be seen that if the bandswitch is in the RPT position the Rx frequency is as shown on the dial, but the Tx frequency is dropped by 600 kHz by a contact on the changeover relay grounding a pin on the HET unit board, as shown in Fig. 1.

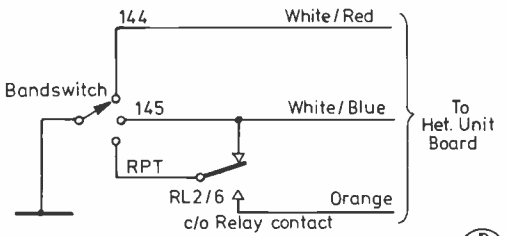

Fig. 1 WIRING COLOUR CODE

D 146

The HET unit board can be found by removing the top cover; it is on the front right of the rig and has the holders for the fixed channel xtals. The colour coded wires are easily located as they are wirewrapped to pins.

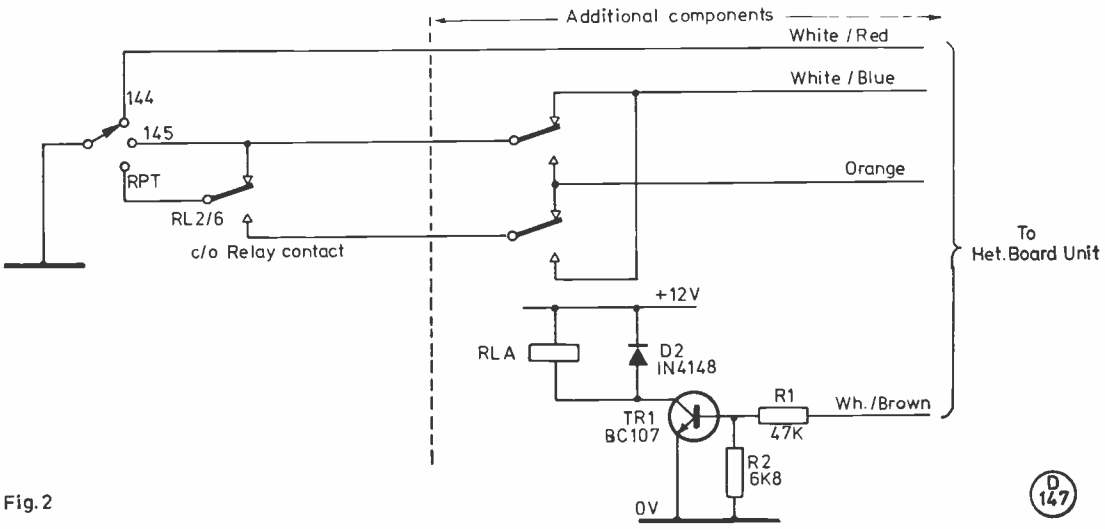

Fig. 2

D 147

For reverse repeater operation this process has to be reversed, and fortunately this is easily done by adding a miniature 2-pole changeover relay. This relay is switched by a transistor which itself is switched by placing the fixed channel switch in position '11.' However, if the fixed channel switch is in this position the VFO is normally switched off; to enable the VFO to operate in this position a diode is wired between the contacts of the fixed channel switch as shown in Fig. 3.

With the circuit wired, as in Fig. 2, and the diode added to the channel switch—if the rig is in RPT mode on switching from VFO to position '11' on the fixed channel switch, the rig receives 600 kHz as indicated, and transmits on the dial frequency, *i.e.* reverse repeater.

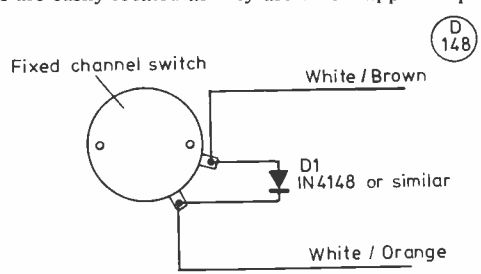

Fig. 3

D 148

VHF BANDS

NORMAN FITCH, G3FPK

Oscar 8 is Up!

SUNDAY, March 5 saw the successful launch of *A-O-D* at 1754 GMT. It was ejected into orbit at 1919 GMT, was immediately powered up, becoming *OSCAR 8*. Laurie Hunton, G3ILD (Co. Durham) heard the telemetry beacon on 435·095 MHz at 1919·24 for about half a minute from which the battery voltage was found to be 17·35, the baseplate temperature 8½°C. and the battery temperature just under 13°C.

In spite of AMSAT's repeated requests not to use the satellite for communication, many Italian and German amateurs were bashing away on Mode "J" on the second orbit. The first genuine user day was later fixed as March 19. On 2m. many stations participated in the UK-AMSAT net on 144·280 MHz from 1730 on launch day passing the vital TLM readings on orbits 1-3 to the Surrey Telecommand Station at the University of Surrey in Guildford. Surrey was in contact with AMSAT-USA throughout, passing over the information when *0-8* was out of range of the U.S.A.

As we go to press, it seems that the period is slightly greater than planned, probably about 103·23 minutes, giving an increment of 25·8° but for the latest information, readers should listen to the AMSAT nets on Sundays on 144·280 MHz at 1800 local time in South Wales (GW3NJW), the London net at 1930 (G8CSI) and the Northeast net on Wednesdays at 2100 local (G3ILD). There is a nationwide net on Sunday mornings from 1000 local on 3780 kHz with G3IOR/G3RWL, etc., as well as several international ones on the HF bands.

Oscar 7 is still suffering from a hot battery so has been switched to Mode "B" until further notice as was advised in the "Codestore" transmission on March 9. AMSAT-UK is holding its AGM on April 8 at London House, Meckleborough Square, London, W.C.1 at 1400 local *sharp*. (Opposite the RSGB). The AGM will be followed by various discussions, talks on A-0-6, 7 and 8 and Phase 3, possibly with slide shows and/or films. A "QSY" to the "Blue Boar" in Grays Inn Road at 1730 has been suggested by AMSAT Secretary Ron Broadbent, G3AAJ.

VHFCC Progress

Two readers have been elected to the VHF Century Club this month, both for 2m. operation. No. 293 goes to Ray Elliott, G4ERX, from Hutton, Essex, who was first licensed as G8KKG in July, 1975. Ray's first Tx was a QRP 40 mW AM job feeding a loft dipole, the best DX being 8 miles. The Class "A" licence was obtained in January, 1976 during which year a variety of modified commercial sets were used. Ray's current station has AM, FM, CW, SSB and RTTY capability covering the 4m., 2m., 70 cm. and 23 cm. bands, the "prime mover" being the popular *Yaesu* FT-101E transceiver.

Ken Osborne, G8KSS, from Filton, Bristol wins VHFCC certificate no. 294 for all AM operation using all home built gear. His 10 watts of AM and FM, VFO controlled, brought in 18 countries. Ken's location is 220ft. *a.s.l.* and his present 10-el. *Skybeam* is 33ft. *a.g.l.* G8KSS has since succumbed to SSB and his new *Icom* IC-202 is doing fine.

VHF Convention

VHF/UHF enthusiasts descended upon The Winning Post Hotel in Whitton on Saturday, Feb. 25, in considerable numbers. As usual, the area where the trade exhibits were was far too small and one had to push and shove to get near many of the stands. Even so, there seemed to be something for everyone, apart from those seeking complete "black boxes." There were 17 trade stands, plus a BARTG exhibit, RSGB Bookstall and a Bring-and-Buy stall.

The three lecture streams took place in the nearby Whitton School, following an opening address by RSGB President, Dr. Dain Evans, G3RPE. Your scribe attended the "Operational" stream chaired by VHF Manager Ian White, G3SEK. The first lecture given by Chris Bartram, G4DGU, was subtitled, "Meteor Scatter: Reaches the Parts other Modes cannot reach!" The talk was concerned with the basic requirements for embarking on the MS trial covering recommended receiver and transmitter performance, time and frequency measurement accuracy, accessories such as keyers and how to arrange schedules. The notes handed out at the lecture included an MS QSO Flow Chart, the reporting system, speed variation circuit for a *Philips* cassette recorder, simple audio keyer and the G4DGU Memory Keyer. Copies of these notes and diagrams can be obtained free of charge by sending a large stamped, addressed envelope to:— Bryn Llewellyn, G4DEZ, at 32 Foxhall Road, Didcot, Oxon. No *s.a.e.*, no data!

The second MS lecture was presented by G3SEK and Clive Penna, G3POI, and was devoted to advanced procedures and included their proposals for a more effective use of the 144·150-144·200 MHz sub-band for SSB schedules. These proposals will be tabled at the Miskolc-Tapolca Conference in Hungary on April 24. Your scribe would guess an attendance of 200-300 at these two talks and it is most gratifying that there are so many VHF-ers interested in MS work.

It was a pleasure to meet many readers, often literally by bumping into them, and to have "eye-ball QSO's" with many others hitherto just voices from loudspeakers. The RSGB's VHF Committee has got the mixture about right and the rather early date did not seem to be criticised. However, in fairness to traders and visitors, some consideration should be given to holding the exhibition part in the main hall of the school in future.

Beaconry

In the 6m. band a beacon has been established in Jamaica. Its callsign is 6Y5RC in Kingston and its QRG is 50·025 MHz. *E.r.p.* is stated as 40 watts, omni-directional and the keying cycle is 15 secs., F1. Reception reports either to WA1UAT/6Y5 of *via* G3PYB (*QTHR*). The Lannion beacon

THREE BAND ANNUAL VHF TABLE
January to December 1978

Station	FOUR METRES Counties	FOUR METRES Countries	TWO METRES Counties	TWO METRES Countries	70 CENTIMETRES Counties	70 CENTIMETRES Countries	TOTAL Points
G2AXI	9	3	35	8	16	4	75
G3FPK	—	—	59	14	—	—	73
G8HHI	—	—	31	9	23	6	69
G4DEZ	—	—	53	14	—	—	67
G4BWG	16	3	31	8	1	3	62
G4ERX	13	1	33	8	4	3	62
G8APZ	—	—	44	10	2	1	57
G3FIJ	10	1	30	5	8	2	56
G8BJC	—	—	45	7	—	—	52
GM4CXP	—	—	36	11	1	1	49
G8LHT	—	—	36	10	—	—	46
G8KSS	—	—	40	6	—	—	46
G8NYS	—	—	39	6	—	—	45
G8ITS	—	—	22	6	10	3	41
G8BKR	—	—	26	7	3	3	39
G8MKW	—	—	34	4	—	—	38
G8LYH	—	—	25	6	—	—	31
GJ8AAZ	—	—	10	4	5	4	23

frequency is now 50·104 MHz but it has been QRT due to aerial damage and PA stage problems. When the *E's* season starts in earnest, the aerial will be re-pointed across the Atlantic again.

In the 2m. band, The Trondheim beacon LA2VHF (FX42c) is now QRV on A1, and should be useful during periods of auroral propagation. It is on 144·870 MHz.

In the 70 cm. band, a memorial beacon to the late G2UJ has been established at Crowborough, E. Sussex on 432·81 MHz with the call GB3WHA. The Tx is a 10 watts solid state job feeding an 8-over-8 slot beam bearing NNW. Reception reports to G4BOO (*QTHR*).

New World Records

Mention was made in the Janaury feature of the exceptional distances being covered on 2m. by stations in the western hemisphere. The record has now increased to no less than 6341 kms, achieved by LU8DIN and KP4EOR on Feb. 12. On the same day LU3AAJ also worked the KP4 (6156 kms.) and on Feb. 8, YV5ZZ and LU5DJZ made it over a 5486 kms. path. There are reports that KP4EOR has been heard in Uruguay and that KV4AD's signals have been copied in Argentina. But the most incredible report is that YV5ZZ heard LU3AAT on 432·1 MHz! The foregoing information originated from *Ham Radio* Report and was broadcast over GB2RS.

In the Far East, the same sources report a QSO on Feb. 10 between VK8WJ and JH8TEM at 1105 GMT over a 5055 kms. path. Both the Australian and Japanese stations were using 10/30 watts and "modest" aerials in this 2m. "first."

Afro-European tests have started between several stations in southern Europe and ZE2JV in Rhodesia. On Feb. 25, SV1AB (Athens) positively identified the ZE2JV beacon on 144·118 MHz at 1806 and 1835 GMT. European Band 1 TV has been received in ZE and ZS, and ZE TV has been copied in Greece. Also involved in these TEP tests are Bulgarian amateurs, including LZ1AB, SV1DH, 5B4WR, and 9H1CD and it is only a matter of time before the first two-way, 2m. QSO's take place between southern Europe and southern Africa. (*Tnx* G3USF for this.)

Sporadic E

From one of the recent *DUBUS* nets on 20m., it seems that on Feb. 18 at 1040 GMT, DJ9CZ (DL71a) heard UK5IBM in Donetsk, Karl maintaining this to have been *via E's*. On the same day, IØSNY (GD72) heard an LA and a bit of detective work concerning times and frequencies suggests this was LA3WU (CU47d). IWØAKA heard a DK station. There were very large solar flares on Feb. 11 and 13 and the solar flux levels were up to 163 by the 10th according to G3USF.

With the 10m. band open frequently world wide at this early stage of the sunspot cycle, it is obvious that F layer ionization is quite intense at times. Therefore, from now on it would be wise to check the 4m. band for east European broadcast stations and Band 2 for southern European FM stations as a pointer to possible *E's* propagation on 2m.

Shiela Williams, G8KPL (Cumbria), would like all readers to send any reports of *E's* last year to her at:— 30 Skelgate, Dalton-in-Furness, Cumbria, LA15 8BD for transmission to a group of Hungarian amateurs who are engaged in an *E's* scientific study programme. Please list your QTH locator as well as stations heard/worked and their QRA's.

Contest News

Results: According to GB2RS, the winner of the 144 MHz Fixed Contest last Dec. 4 was the Norfolk VHF Contest Group with the University of Kent ARS in second place. Winner of the Grafton Radio Society's contest last Nov. 20 was Bryn Llewellyn, G4DEZ (Oxon.) with 200 points, the runner up being G3FPK with just 76! In third spot was G3AFT. The Verulam ARC's contest a week later was won by Ian Offer, G4FDX (Beds.) with 4408 pts., runner up being Peter Tucker, G4DWZ (London), with 3024 pts., just 4 pts. ahead of the University of Manchester's station, G3CXX. 11 partticipants sent in entries.

Coming events: The 144 MHz CW Contest is scheduled for April 23 from 0900-1700 GMT, entries going to G3FZL. The weekend May 6/7 is an IARU Region 1 UHF Contest on 432, 1296 and 2304 MHz bands from 1600-1600 GMT. W.A.B. addicts should note that the only VHF session is a 'phone one on July 23 from 0900-2100 GMT.

Full rules from the Contest Manager, "Woody" Woodhouse, G3TWX, 13 Gannet Close, Haverhill, Suffolk. (*S.a.e.* please).

Who Needs SSB Repeaters?

Full proposals for a system of SSB repeaters in the 2m. band have just been published (*Radio Communication*, March) along with a scheme for "channelizing" the entire lower half of the band. Author of this fiendish plot is one Tony Whitaker, G3RKL, who proposes output frequencies between 144·15 and 144·195 MHz, with inputs 600 kHz higher. All serious SSB and CW operators to whom your conductor has mentioned the idea have greeted it with a mixture of derision and horror, as the brain child of one having no idea of how *real* operators wish to use the band.

Such ideas must not be allowed to go unchallenged so it is suggested that readers who agree that we have had enough of this repeater and "channel" nonsense write immediately to GM8FFX, P.O. Box 49, Aberdeen, AB9 8JA setting out their reasoned opposition to this plan. Some points to bear in mind are that:— (1) It is in complete contravention of the IARU Region 1 2m. Band Plan; (2) It would ruin the re-planning of the 144·15-144·20 MHz sub-band for MS SSB operation in Europe as proposed at the VHF Convention; (3) As SSB is the most effective form of telephony under weak signal conditions, artificial aids like repeaters are unnecessary, and (4) It would disrupt services now using the proposed input band; *e.g.* the ATV talkback frequency and the satellite command band.

Many amateurs feel that repeaters are a discouragement to people to improve their stations to cover a greater range and that they are akin to a crutch.

The 144/432 MHz Contest

As far as can be ascertained from comments on the air, a majority of participants did not altogether welcome the new rules applying to the March 4/5 contest. In the absence of any firm guidance in the rules, some thought it quite in order to transmit on one band whilst monitoring the other, whereas others took the view it was quite wrong even to have the other receiver switched on.

Conditions were certainly only average or below for much of the time. Mike Pharoah, G3LCH, operated portable from near Leek (Staffs.) and thought the rules were, " . . . a pleasant change . . ." He got the impression that 70 cm. propagation was about to fold up at any time, but managed 95 QSO's. On 2m. he found things, "horribly flat" but had 245 QSO's. Paul Balaam, G8EFS, went out portable on the Woldingham Ridge in north Kent and worked 61 stations in 2½ hours, best DX being F1EZP/P in CH15d.

The Crystal Palace club operated portable from a site 10 kms. west of Faversham, Kent. One of the operators, Steve Marsh, G4BWG, found 70 cm. conditions disappointing with only 40-50 QSO's including a number of continentals. On 2m., they scored 3421 pts. from around 410 contacts. The GW8BHH team, operating portable from Beacon Hill, Powys, made 110 QSO's on 70 cm. worth 4080 pts. and 410 on 2m. for 3650. At G3FPK, little time was spent listening. On 2m., conditions to the north through west seemed down at the start but improved at the end of the event. G4CRC/P (XK64b) was a particularly consistent signal throughout the Sunday.

G4ERX (Essex) also mentions the Cornish station in his 145 QSO's in 7 countries which included a GD, 7 GW's, 4 ON's, 4 PA's, 6 F's and 2 DL's. Ray is "General Factotum" for the Vange Contest Group (G3YCW) and, to stimulate activity, they ran a contest-within-a-contest wherein G8GKA had 199 QSO's, G8NPM 113, G8OIV 100-plus, with 7 others taking part. John Pilags, G8HHI (Hants.), was on part time and had 53 QSO's on 70 cm. and 75 on 2m. G8KSS (Bristol) found conditions *E/W* average, above average to the *S* and *SW* and down to the *NW/N*. His best DX on 2m. with the *IC-202* was ON6UG/A in BK18f. Glen Sweeney, G8NYS (Notts.), suffered from bad local splatter but completed 75 QSO's, best DX being F1KBF/P (AK09d) and F1KAR/P (AJ06h), all with 3 watts to an 8-ele. Yagi.

DX-Peditions

The Cambridge University Wireless Society team is aiming for an EI expedition from July 23 until Aug. 6 but some difficulty is being experienced in getting licences due to there being no G8 equivalent in the Republic. Roger Thorn, G3CHN (Devon), reports that EI9V plans to operate from UM square from May 18, " . . . for a few days . . ." on 2m. and 70 cm. *Via* G3POI, news that the G8MME/PE1AVU Shetlands raid mentioned last month will have 100 watts available on 23 cm. They will be QRV for tropo. contacts between 1900 and 0100 GMT on 144·225 MHz SSB and 432·220 MHz SSB/CW.

Twenty-three Centimetres

"Monday night is activity night" is the message for 23 cm. enthusiasts, according to G3JXN and G4DGU. There is a steady increase in interest in this band. Ian Harwood, G8LHT (S. Yorks.), aims to be QRV soon and Syd Harden, G2AXI (Hants.), hopes to have SSB available this year. He finds he can have plenty of CW QSO's on Mondays without prior setting up on other bands. G3JXN mentioned a beacon on 1296·925 MHz near Rotterdam which has been heard in East Anglia.

Seventy Centimetres

Jack Hum, G5UM, has suggested an SSB Activity Night on 70 cm., possibly Wednesday, with calls on the hour and half hour. This is an excellent idea. A new station in Jersey is Geoff Brown, GJ8ORH, who uses a *Belcom* Liner-430 to a 12XY Yagi. Mainly portable operation from the north coast and skeds can be arranged by 'phoning 0534 26788.

The best news of the month is the appearance of EA1CR (XD32d) who uses a *Microwave Modules* transverter and a "modest" aerial. In the tropo. lift of March 10/11, many southern British stations were worked including G3MCS, G3RQZ, G3JXN and G4GLN in the southeast on the Friday night. Ruben also worked a GU, GW8JLY/P, G8AGU (Devon) and others. Alan Scott, G4BYP (Liverpool), has an *MMT* transverter and is looking for QSO's towards the London area.

Two Metres

Apart from the lift on March

10/11 tropo. propagation on 2m. has been very disappointing for far too long. A new correspondent is Bob Mackean, G8LYH (Liverpool), who is just 16 and currently embroiled in studying for 11 "O-Levels." Using a *Liner 2* and 8-ele. Yagi he has had some auroral QSO's. GJ8ORH has a *Trio* TS-700 with 4CX250B amplifier to an 8-over-8 beam from the home QTH, but uses a 50 watts linear and 14-ele. *Parabeam* for portable operation.

Auroral events are covered in Clive Morton's, G4CMV, letter from W. Yorks. He mentions a 10 minute one on Feb. 6 with only GB3LER heard. On Feb. 27 an *Ar* was in progress when he got home from work and QSO's were concluded with GM4CXP, LA3WU and GM3UKG, all RST 55A between 1655 and 1715 GMT. Clive nominates as "Lids of the Month" a group of FM-ers using 144·975 MHz thus blotting out the Angus and Lerwick beacons. (*N.B.* Weak FM-type heterodynes are often heard in London when searching for GB3ANG.)

Jon Dougherty, G4FUT (Tyne & Wear), also notes the Feb. 27 *Ar* when he discovered G4JJ's auroral signals with a 10 kHz *Doppler* shift downwards on the *Oscar 7* Mode "B" downlink, just as it was about to disappear north. Jon records that two G stations were still giving *Ar* reports to SM's and LA's that were no longer auroral with him even though the G's were. Selective *Ar* skip, he asks? GB3LER was *Ar* in Sunderland on Feb. 28 and March 1 but no activity heard. At G3FPK, a 10 minute event was discovered at 1900 on March 1 with only a very weak signal from GM3JFG.

Derrick Dance, GM4CXP (Borders), was up to 30+ counties and 11 countries in the first four days of the year thanks to MS, tropo. and *Ar* QSO's. However, things have been rather less hectic since even though he has caught 7 events up to Feb. 21.

From G4CMV, G8KSS and many others, a plea that 2m. operators should stick to the band plan, particularly concerning beacon frequencies, MS calling and *E-M-E* frequencies and SSTV and RTTY channels. All these appear in the *RSGB Call Book* and elsewhere. The latest nuisance in the London area is FM QSO's on 144·900, 144·925 MHz which render reception of FXØTHF, FX3THF, GB3CTC, DLØPR, etc. impossible. It would appear that either these folk are oblivious of the band plan or that they are just plain selfish.

G3CHN found propagation *via* tropo. to the south good during the week of March 6-11. Roger worked EA1CR, EA1MZ and EA1QY on SSB although it was hard going with MZ and QY who only speak Spanish. EA1TA (VD59j) in La Coruña was a good catch on CW, and G3CHN is sure he could have worked into CT1—if only there had been activity from there. Finally a plea from G5UM for FM operators to be brave and consider using *other* "channels" than S20-S25 to avoid so much QRM. Jack also asks that those newly-licensed G4's and G8's, not in the 1978 *Call Book* say where they are when calling CQ.

Deadlines

All your contributions for the May column by April 6 please and for the June issue by May 4—earlier if possible—to:—"VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts., AL6 9EQ. *73 de G3FPK.*

QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2 m.	Total
G8FUF	2	84	207	293
I4EAT	—	25	196	221
G3POI	—	—	213	213
G3JXN	26	65	83	174
GM4CXP	—	25	127	152
G3SEK	—	—	152	152
G3COJ	17	61	72	150
G3CHN	—	—	148	148
G8GML	8	50	89	147
G8HVY	—	48	96	144
G3FPK	—	—	140	140
9H1CD	—	13	126	139
G4BWG	—	25	110	135
G8LEF	4	43	87	134
G3OHC	4	31	98	133
G3XCS	—	21	110	131
G2AXI	1	47	80	128
G4BAH	—	32	92	124
G8KR	1	19	93	113
G4CMV	—	3	109	112
G4FCD	—	22	89	111
G8HHI	—	28	82	110
G8IWA	—	29	77	106
G4DKX	5	30	68	103
G4DEZ	—	—	103	103
GD2HDZ	10	32	59	101
9H1BT	—	—	94	94
GJ8AAZ	1	22	66	89
G3FIJ	—	27	62	89
G8GII	—	22	63	85
G6UW	—	—	85	85
9H1C	—	—	83	83
G8EOP	8	36	38	82
G4AEZ	2	22	57	81
G4AWU	—	—	80	80
G8JJR	—	—	79	79
G4FBK	—	5	72	77
G4ERX	1	21	54	76
G8IFT	7	18	49	74
G8JHX	—	—	74	74
G8LHT	—	1	71	72
G3BW	1	21	47	69
G4GET	—	—	69	69
G8KUC	—	7	60	67
GD3YEO	—	8	59	67
G4GEE	—	23	41	64
G8KPL	—	—	64	64
GM8NCM	—	4	59	63
G8KLN	—	1	62	63
G8JAG	—	—	63	63
G4CIK	—	—	62	62
G8KGF	—	—	62	62
G8ITS	—	11	51	62
G4GCQ	—	—	61	61
G3KPU	—	—	60	60
G8KSP	—	—	60	60
G8JEF	—	—	58	58
G8KSS	—	—	58	58
GW4FJK	—	—	57	57
OZ9IY	—	—	53	53
G4EYL	—	—	41	41
G8LLG	—	1	38	39
G8JAH	—	1	35	36
G8JGK	—	—	34	34
G8JAJ	—	—	24	24
G8JKA	—	—	21	21

Starting Date January 1, 1975. No satellite or repeater QSO's.

THE MONTH WITH THE CLUBS

BY *'Club Secretary"*

Nationals

Amateur Radio News Service is actually an *inter*-national set-up which exists for the prime purpose of helping those who edit club newsletters to do their job as well as possible; in particular it is a mine of useful material for no more cost than an acknowledgement of the source. Additionally, those who join also receive for the princely sum of one dollar extra in the first year's dues, a copy of the "Club Bulletin" in which has been put together all the accumulated knowledge of the best way to start and run a club newsletter. For the U.K., our own G3FPK is the man to get in touch with—*see* Panel for his address.

Our next one also involves G3FPK—this time as Hon. Sec. and editor of *Mobile News*, which is the newsletter of the **Amateur Radio Mobile Society,** and again an international affair. Anyone interested in mobile operation, either licensed or as an SWL, should become a member. We note the new printing method—the fifth in the history of this *Newsletter*—and have to say that we think it is the best yet; and since it has also reduced the cost of printing, that can't be bad! Details are available from the Hon. Sec.—*see* Panel.

The **Royal Navy** group are still very much in business, despite the continued financial stringency in the Services: the current issue of the *Newsletter* has, as it's centre page spread, a reprint of the article on the recovery of the *Dolly* from the mud of Ullswater where she had lain for some 67 years; her engines must have been pretty well made as they are still in use, with the *original* piston-rings! Again, details from the Hon. Sec.—*see* Panel.

Our next customer is **I.R.T.S.,** the Eire national society; they print some 400 copies of their monthly *Newsletter*, and in the current issue there is an account of the processes involved—those who have never produced a club newsletter could well read this before proposing to start a newsletter at *their* local club! Again, details from the Hon. Sec.—*see* Panel for his name and address.

Westerly

We've just been west to Eire, so we may as well stay on the wetter side of our boundary! So—**City of Bristol (RSGB)** will be getting together on April 24 to hear G5XB talking of that vital work done by the Intruder Watch, at Queens Building, University Walk, Clifton, starting at 7 p.m. On a different note, the club scribe hand-wrote his letter this time, instead of the usual typewritten screed: "No typist, no typewriter—must be something to do with the weather!"

Just as we were about to pass over the bottom of the *Newsletter* of the last-mentioned club, our eye lit on a line from which we understand that there is a **North Bristol** group, who seem to have at least the second Friday—more details from G2BSU at the address given in the Panel.

Well and truly west now, to **Cornish,** where it is always the first Thursday in the month, with the venue being the *SWEE* Clubroom, Pool, Camborne. The current *Newsletter* issue is of course almost entirely devoted to the Poldhu celebration station, and the obituary to G3NKE; one wonders whether any other club in the country (and your scribe has visited many over the years) could have suffered so grievous a loss at such a critical time, and yet make such a magnificent job of an event like this. April 6 will be the next date, and will be the Annual General Meeting.

Hq. for **Salisbury** is at the Activity Centre, Wilton Road, each Tuesday; G2FIX has all the details of the forthcoming events, the gang being very much orientated towards the setting-up of special-activity stations—last year the score was eight such fêtes, plus a D/F qualifying event for RSGB!

Yet another of the **Torbay** founder-members has become a Silent Key, Mr. W. Launder of Torquay, who had the call G3FHI. The group have a normal weekly session, plus the "main" effort which this time is on April 1 (being the March 'do' postponed because of the Easter break). Details from the Hon. Sec.—*see* panel.

Deadlines for "Clubs" for the next three months—
(For May issue—March 31st)
For June issue—April 28th
For July issue—May 26th
For August issue—June 30th
Please be sure to note these dates!

Up North

We seem to be doing a circular tour this month. Our first stop is **York** where they have an *amazing* number of things happening, all approached with the confidence that comes from having done them successfully before! They are to be found at the United Services Club, 61 Micklegate, York on every Friday *except* the third one in each month; contact the Hon. Sec. for full details.

Bolton are to be found in session at the Recreation Club, Kensington Place, Bolton where, on April 5, they will welcome G3SMM, who will speak about and answer questions on RSGB affairs. Then, on April 19, a couple of the SWL members combine forces in order to present an exposé of PCB production as it is done in the factory and at home.

An intriguing title for a meeting programme appears in the **Grimsby** letter—"What do they mean?" on April 6; to fill the April 20 evening they have an open Forum. Both are scheduled for the New Alexandra Social Club Cleethorpes.

Midlands

Our first here is **Cheltenham,** who are to be found at the Old Bakery, Chester Walk, which is at the rear of the Library in Clarence Street; the first Thursday gives April 6, and the April 21 Friday date follows, although at the time of writing we do not have any details on these fixtures. For this, we suggest you contact the Hon. Sec. —*see* Panel.

A nice new cover appears on the **Stourbridge** *Newsletter*, and the inside says that they have the first Monday and the following day as informal or constructional, and then on the third Monday of the month comes the main 'do.' However we can't take matters any further, as the last March meeting will have been the AGM and because the *Newsletter* omits the venue. So—the contact is the

Hon. Sec., at the address in the Panel.

At the next stop, **Derby,** we have always wondered why they have just given 119 Green Lane, Derby as the venue, when other references in the *Newsletter* indicate that it must be quite a large and well-known place. Now we know at last—they have a room above the Oddfellows Hall. How appropriate! Anyway, find them there on any Wednesday, from 7.30—April 5 for a Junk Sale, 12th for a Social Natter Night, 19th for a lecture on a subject to be announced, and finally on April 26, a film show.

The 'other' Derby group is **Nunsfield House,** based on the community association of that name. They are in business every Friday evening which gives us April 7 for a talk on the Derby repeater, while on 14th G3WFU will be talking about "Line Transmission Systems" and 21st sees a technical Film Show. Finally, April 28 sees members and guests testing their skill in a general-knowledge and technical quiz.

Although the renovations to the meeting room of the **Hereford** chaps seem to be taking an eternity—your scribe seems to recall some shuffling-around as long ago as years!—it hasn't had any ill-effect on attendance, indeed they are going from strength to strength. They are based at County Control, Civil Defence Hq., Gaol Street in Hereford, and have the first and third Fridays booked; April 7 being down for G3BA to discuss radio in Japanese P.o.W. camps.

UK FM Group (Western) is the organisation which was known previously as the Western FM Repeater Group. The current *Newsletter* contains a long article on the concept of a 'provisional licence' for radio operation; the case made is at least partly valid in that the argument is logical—but a logical argument from false premises still falls! Their argument is that repeater jamming is a new problem, which completely overlooks the fact that in the days when Top Band was the national natter-band we had pirates, who jammed even when they had to build the gear (although many of the Top Band jammers used things like AT5's). However, G3LEQ's arguments should be more widely heard and we suggest that the Hon. Sec. of clubs in repeater-infested country should write to him and ask for a copy to read to their members, who could then debate the issues raised; many will agree, and those who don't will have had a chance to pit their wits at toppling the argument! The details, both of the group, and of the article, can be obtained from G3LEQ, at the address in the Panel.

Still in that corner of the world we have **Wirral,** and their Hq. is in the Sports Centre, Grange Road West, Birkenhead. The dates are the first and third Wednesdays in each month, April 5 being down for a Sale of surplus equipment. We could add that the current issue of their *Newsletter* seems to say they now have a gem of an editor—it bears much evidence of his own extra efforts to make it more interesting and readable. Congratulations.

Bury are based on the Mosses Community Centre, Cecil Street, Bury, where the booking is for every Tuesday; of these it is normal to regard the second Tuesday as the meeting, while the other Tuesdays are devoted to such games as operating, nattering, Morse tuition, and so on. For April, we see April 11 as being down to Mr. M. Leese of Plessey, his subject being Basic Facsimile. In addition, on April 28, they have an outside visit to Ringway Air Traffic Control.

South & East

The Red Cross building is situated near the station in **Stowmarket,** and the local gang have a booking on the first Monday in each month. For more details of the goings-on, we suggest you get in touch with the Hon. Sec.—*see* Panel.

UK FM Group (London) have a *Newsletter* which does not mention the dates or venues for forthcoming meetings, so for this we have to refer you to the Hon. Sec.—*see* Panel. On the other hand, we have to say that their's is one of the best *Newsletters* to come across this old scribe's desk—well printed and generally some interesting articles to read.

The editor of the **Silverthorn** *Newsletter* was a little upset over our comments back in February, although he admits they are true. In essence, we said that to skip a Newsletter issue for want of contributions is a good way of killing the newsletter altogether; however, in this particular case, there was a further problem in that they have a 'pot' for the contributor of the best article during the year, and the appeal for 'last entries' would have left the problem of writing the article and getting it produced all in the space of one week, which would have been all but impossible; the editor was really bewailing the fact that he hadn't an adequacy of material to fall back on in such a situation, so the preliminary pages already set up were in the event wasted. However, *Spurious* is very much alive and kicking, as indeed is the club. Good news, this, because the club and its newsletter cover a wide area to the North-East of London very effectively indeed, and have done so for many years. All the details from the Hon. Sec.—*see* Panel.

A new Hon. Sec. has taken over the duties at **Colchester,** and he writes to say they are to be found at the Technical College, Sheepen Street, on alternate Thursday evenings from 7.30. More details can be obtained from the Hon. Sec. at the address in the Panel.

Now to Bournemouth and **Wessex.** At the time when this was being written, we were hearing about the fearful

'Clipper is now most of the way in'

weather they were having, and we wonder how much this affected attendances, as for some time now the club has been almost too big for its Hq. size. They will be at the Dolphin Hotel, Holdenhurst Road, on April 7 and April 21; the former is given over to G8MCQ, who will talk about 3cm. operations, and it is hoped that some others may be available to add the 23cm. band to the picture. As for 21st, that is given over to G3PLX who will be talking about and demonstrating his RTTY VDU, and talking about microprocessors, with some considerable assistance from G4ERV. On April 14, at the same venue, we understand there will also be a meeting, at which representatives of the local groups are to consider setting-up a local repeater group.

At **Stevenage**, they have Hq. at the Hawker Siddeley Dynamics company's staff canteen, which is in Gunnels Wood Road in the Industrial area of the town. They are booked in for April 6, when G4ENS will be talking about the proposed Luton ATV repeater, and April 20 when they have persuaded G6LL to come over and talk to them—reminiscing about his long years in amateur radio, many of which Jimmy spent very much at the centre of things.

We are always well supplied with information as to their activities by the **Verulam** crowd, and it is clear that they are one of the best clubs in the country and, which is more to the point, they have remained so for more years than your scribe can remember. For April 27, they have a Mr. Curant from *Tektronix* who will give a "Beginners Guide to the Oscilloscope." The place for this one is the Market Hall, St. Albans. In addition, on the second Thursday of the month they have an informal session at the R.A.F.A. Hq. in Victoria Street, St. Albans.

It's AGM-time for **West Kent**, at their Hq. at the Adult Education Centre, Monson Road, Tunbridge Wells; this is on April 14, while on Tuesday April 18 they have the judging of their "Loudest Crystal Set" competition. On April 28, the evening will be split up, part being the Construction Contest, and the rest being addressed to the matter of the HF and VHF NFD events. Incidentally the Tuesday dates are at the Drill Hall, Victoria Road, and are always the Tuesdays after the regular Friday dates.

Cray Valley are now installed in their new place at Christchurch Centre, High Street, Eltham, London S.E.9, where they have the formal on the first Thursday in the month, and an informal on the third Thursday. However, we are not quite up to date with their activities, so for the April 'gen' we must refer you to the Hon. Sec. at the address in the Panel.

TS Terra Nova is Hq. to the **Surrey** group, and they are to be found there on the first and third Wednesdays of each month; they always have something going on, but if you want the very latest situation we must refer you to the Hon. Sec. at the address in the Panel.

It is April 6 and 18 for **Maidenhead**, and on both dates they will be entertaining other clubs. On 6th, the guests are Chiltern, invited to listen to Alan, G3MME, of *Lowe Electronics*, talking about "Current Techniques." On 18th it is the Bracknell crowd who are visiting, and this time the object of the exercise is a Quiz between the two clubs.

There are two venues for the **Sutton & Cheam** crowd; the AGM is on April 20, at Sutton College of Liberal Arts, in Cheam Road, Sutton. However we do not have details of any other foregathering during April, so if you wish to check we must refer you to the Hon. Sec.—*see* Panel.

Over to **Crawley** who have an Informal on April 12, and a Component Sale on April 26, both being at the

Names and addresses of Club Secretaries reporting in this issue:

A.R.M.S.: N. A. S. Fitch, G3FPK, 40 Eskdale Gardens, Purley, Surrey CR2 1EZ.
A.R.N.S.: N. A. S. Fitch, G3FPK, 40 Eskdale Gardens, Purley, Surrey.
BOLTON: E. Walton, G4FSN, 4 Oakfield Close, Horwich, Bolton BL6 6JR.
BOURNEMOUTH (Wessex): G. D. Cole, G4EMN, 6 St. Anthony's Road, Bournemouth (*20027*) BH2 6PD.
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CORNISH: H. F. Adcock, 1 Bowglas Close, Castle Road, Ludgvan, Penzance TR20 8HD. (*Cockwells 562.*)
CRAWLEY: A. V. H. Davis, G3MGL, 41 Gainsborough Road, Crawley (*20986*), West Sussex RH10 5LD.
CRAY VALLEY: P. J. Clark, G4FUG, 42 Shooters Hill Road, London S.E.3.
CRYSTAL PALACE: G. M. C. Stone, G3FZL, 11 Liphook Crescent, London SE23 3BN. (*01-699 6940.*)
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WEST KENT: B. P. Castle, G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent TN14 5AF.
YORK: K. R. Cass, G3WVO, 4 Heworth Village, York.

United Reformed Church Hall, Ifield. Incidentally, a Component Sale is something we have not seen done before, and in times like these when it is often a long march to the nearest place that sells components, such an interchange could well be a very useful event.

Up the road from Crawley are **Reigate,** who have their AGM on April 18; the only snag is that the venue is not given, so for that we have to refer you to the Hon. Sec. at the address in the Panel. However you could pay them a visit on April 4, when they have a Natter Night at the Marquis of Granby, Redhill.

Finally, we have **Crystal Palace;** it's the 22nd for them, at Emmanuel Church Hall, Barry Road, S.E.22, for a 23cm. evening which is in the joint care of G3SBV, G4GLN and G3FZL.

Finale

That is the lot for another month; the deadlines will be found in a 'box' as usual; and may we at the same time remind you that your letter should carry—as well as activity dates and details—the Hq. address, and a note of any changes of Hon. Sec. details for our card-index so that we can't give enquirers wrong information! Send it, in time for the deadline, to "Club Secretary," SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts AL6 9EQ.

WATCHING SUNSPOTS

G. P. ANDERSON, G2QY

IT is apparent from discussion on the air that amateurs are very often unaware of the ease with which spots may be observed on the face of the sun, so providing an added interest to Amateur Radio activities.

But first of all a warning that cannot be repeated too often: never, repeat *never*, attempt to look at the sun directly through a telescope or field glasses. This rule applies even if a smoked glass or other optical filter is used, as such a device can easily slip and expose the eye to the concentrated full power of the sun, resulting in damage and possibly destruction of the sight.

Having said that, the method to be described is perfectly safe, and calls for little equipment. The principle item is a telescope, which can be quite a simple terrestrial model; in the writer's case it is of unknown specification and is at least 100 years old, having been used by his grandfather during service as a ship's engineer in the Far East in the 1860's.

The telescope is set up on a convenient stand, constructed so that the telescope may be moved both vertically and horizontally in order to line it up on the sun (an old camera tripod with a simple mount made to fit to the top is conveneint). It is also beneficial to fit a simple mask around the barrel of the telescope—a piece of cardboard about 12in. square is suitable, in order to minimise the direct sunlight falling on the screen.

Having set up the telescope on its stand (obviously choosing a day when the sun is clearly visible!) point the end with the larger lens—the Objective—at the sun, and holding a piece of white card or plastic near to the eye-

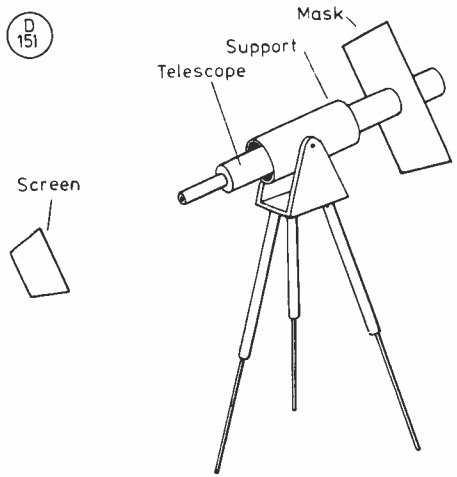

Fig. 1 GENERAL ARRANGEMENT

piece, move the telescope until an image of the sun appears on the 'screen'; with the telescope so aligned move the card away from it until the desired size of image is achieved. During this procedure it will be necessary to adjust the telescope in order to focus a sharp image on the screen.

It any sunspots of reasonable size are present they should be readily seen, and their position can be marked on the card; it will be found advantageous to prepare a circle of suitable size, say 2in. diameter, on the card before making the observation, so that the locations of the spots may be marked with reasonable accuracy. It is important to keep the card upright—that is, the sides vertical to the ground, so that later observations may be compared, and the progress of spots across the face of the sun followed. When weather conditions permit, daily inspection of the sun is worth while, and co-ordination with observations on radio conditions, particularly at the higher frequencies of 21 and 28 MHz will show interesting results.

A note about the screen may be useful. Good quality clean white card or paper is satisfactory, but some experiments with white plastic may be worthwhile, to find a better reflecting surface; the lid of a plastic margarine box has proved very suitable.

One further point: although obviously a true picture of what is happening on the face of the sun is required, and consequently the screen should be set up perpendicular to the axis of the telescope, it has been found to be helpful to move the screen away from this position while inspecting the image, as shown in Fig. 2, especially when projecting on to a plastic surface. The resulting image is of course distorted, but spots stand out much more clearly, as they are enlarged by the distortion.

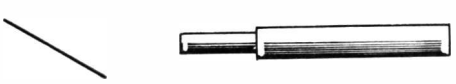

Fig. 2

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Selling: TR-7500, £180. Two-metre PA, 150w., 12v. DC, switched FM/SSB, £55. Lowe Monitor Rx, R6 and S.20, AC/DC PSU, £20. 2m. 10XY, £13. ASP 2m. ½-wave, mag. mount, £8. ASP 70cm. colinear, £10. 12XY, 70cm., £15.—Ring Cragg, Dunstable 600358.

Wanted: B.40D receiver in good working condition. Details and price please. (S. Yorks.)—Box No. 5631, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

For sale: Icom IC-22A, 12 channels, crystal controlled toneburst, mobile mount and accessories, £135. Trio TR-2200GX, 8 channels, with ni-cads and accessories, £125. FT-75 with AC and DC PSU's, 15 crystals, spare 10m. and 15m. crystals, mobile mount and accessories, £150. Vibroplex el-bug keying paddle, £9.—Ring Allen, 01-684 2515 after 6 p.m.

Sale: Westower, 42ft. telescopic wall mounting model, as new, never been erected, with all fittings and winch etc., £100. (Essex).—Box No. 5632, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

For sale: Collins equipment: KWM-2A transceiver, fitted with noise blanker, notch filter and DX Engineering RF clipper; 312B-5 VFO/wattmeter/station-control; 351D2 mobile mount with MP-1 12v. PSU; PM-2 PSU; 516F heavy duty PSU; 51S-2 general coverage receiver;

KWM-2 carrying case; mobile mic. and headset. Offers around one-third current cost, but will haggle.—Ring Cheesley, G4CHP, Swainsthorpe 470365.

Wanted: Telford TC-7 Mk. II, with tunable IF 28-30 MHz, in good condition. Details and price please.—Ring Elliott, G3ZOG, Sunderland (0783) 280080, 6-8 p.m.

Wanted: Wireless sets Nos. 8, 18, 21, 22, 28, 46, 48, 58 and 68 (incomplete O.K.); also R.109, WS19 wood mounting plate, and WS19 high-power variable inductor; also Manuals for the above. Can be collected during holiday in 1st week of June. Details and prices please. —Meulstee, PAØPCR, 28 Smetanalaan, Schiedam, Holland. (Tel: 010-704230).

Selling: R.216 receiver, complete with PSU, built-in 1 and 5 MHz frequency standards, variable selectivity, 9-167 MHz in 5 switched band ranges, 12ft. film-scale vernier calibration dial, die-cast chassis, B7A valves and spares. Best offer near £75 secures.—Ring Wetherill, ex-G2TK, Scarborough (0723) 71213 daytime.

Sale: Racal RA-17 Mk. II receiver, good condition, in case, £225. Murphy marine Tx/Rx (AC mains), 60 kHz to 30 MHz, AM/CW, complete with power supply and leads, £50. Solartron Type CO-546 signal generator, 50 Hz to 500 kHz, AC mains, £10. Eddystone 840C, £60.—Ring Cusworth, Leeds 496048.

Wanted: Drake DSR-1, Racal RA-1772, G.E.C. RC-410R, or similar digital communications receiver. Details and price please.—Hemingway, 9 Hitherwood, Cranleigh, Surrey.

For sale: Large numbers of "Radio Communication" and "Wireless World". s.a.e. please. (Devon).—Box No. 5633, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Selling: FT-75 with AC/DC PSU and extra xtals, £160. Yaesu FV-101B external VFO, £40. Osker power meter, £15.—Ring Thurlow, 01-654 2761.

For sale: Hy-Gain AVT/WB vertical antenna, good clean condition, £35.—Ring Taylor, Ipswich 622942.

Sale: AR88 receiver, with S-meter, p.v.c., £85. Army receiver, £10. Tele-typewriter, £30. VHF receiver, £65. —Ring Wright, Wigan 55948.

Selling: Marconi marine receivers: 60-420 kHz, 500 kHz-30 MHz, £45; 15-550 kHz, £25; Panadaptor, ±100 kHz, £45. (Manchester).—Box No. 5634, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Sale: Magnum-Four 4-metre transverter, perfect working order, £75 or near offer.—Jesson, 181 Kings Acre Road, Hereford. (Tel: 0432-3237.)

Wanted: Datong FL-1 filter; 18AVT; 10-metre receiver; bound vols. of "Rad Com."—O'Reilly, EIØCY, 96 Boulevard North, Dublin 13.

Wanted: AR88D receiver, or similar. Details and price please. Will collect reasonable distance.—Scarth, 1 Beechwood Avenue, Whitley Bay (526777), Tyne & Wear.

Sale: R.107 10v. Rx, with S-meter and handbook, one owner, £20 cash and carry.—Thompson, 16 Goniston Road, Reddish, Stockport.

Wanted: Manual or any information on U.S. Navy receiver Type AN.SLR-2; also 3 kHz mechanical filter suitable for Collins 51J-4.—Ring Wroxham 3153 (Norfolk).

Selling: TS-700, very good condition, £260. Pye 'Compact' on 433.2 MHz, £30.—Ring Wright, G8KDP, Heathfield 2571 (Sussex).

For sale: TR-2200GX, fitted 12 channels, with two antennas, ni-cads, VFO-30G, 15w. PA, switchable pre-amp., £200. FR-101D, mint condition, £320.—Ring Godden, 01-464 1216 evenings.

Wanted: Eddystone 990R. Will buy or exchange HF gear, transceiver, FL-2100B etc., with cash adjustment as necessary. (N. Ireland).—Box No. 5635, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Wanted: SSB Tx for 20 metres, with mains PSU, and 20-40 watts or so (home-brew O.K. if neat).—Hurst, G3JJU, 31 Avondale Road, Fleet (5831), Hants.

Sale: Eddystone 770R, 19-165 MHz, recent overhaul, silver hammer finish, manual, £120. AR88D with product detector, very good, £50. Yaesu world clock, new £13.50. Pifco 24-hr. digital clock, £6. Hamgear PM-IIDX preselector tuner, £6. UHF pre-amp., 500 MHz, mains input, £3. Buyers collect large items, others carriage extra.—Ring Duke, Folkestone 76063.

Wanted: Eddystone EC-10 Mk. II, or 1001, must be in perfect working order and condition.—Ring Leighton, Guildford 66543 evenings.

Wanted: Bandspread coils for HRO MX receiver, also HF preselector.—Ryan, 91 Ard-Na-Greine, Clonmel, Co. Tipperary, Eire.

For sale: Trio TR-7010 SSB mobile transceiver, with 2m. ⅝-whip, £115 the lot.—Ring Butler, Bristol (0272) 616636.

For sale: Property of the late G3SKQ: Atlas 180 Tx/Rx, mint condition (Tx hardly used), complete with **Osker** SWR bridge, **Shure** 201 microphone and heavy-duty power supply. First £265 secures.—Ring Fakenham 2923.

Wanted: Eddystone EC-10 Mk. II, must be in perfect condition.—Ring Leighton, Guildford 66543 evenings.

Sale: FDK Quartz 16 2m. transceiver, fitted S20-S24, RO and R3-R7, three months old, new condition, £150 inc. carriage.—Tibbert, 16 Nicola Gardens, Littleover, Derby.

Wanted: Good KW-2000A, with speaker, AC/PSU, leads, operators handbook etc. Details and price please.—Mahmud, G4GKA, 34 Queens Avenue, Muswell Hill, London N.10.

Wanted: Mint condition 'Round Emblem' Collins 30L-1 and 312B-4. **Sell** Datong FL-1, £35; Drake R-4C, boxed, used less than one hour. (Worcs.).—Box No. 5636, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

For Sale: KW-204/KW-202, immaculate condition, £395.

FT-227R, absolutely as new, £179. **National DR-22** Rx, LW to 30 MHz in 8 bands, fast/slow tuning, with BFO, S-meter and calibrator, first £75 secures. **SMC-73** Rx, bandspread, £77.50. **DX-160** Rx, as brand new, £52.50.

FRG-7 Mk. II, mint condition, £135.—Ring Batham, Dunstable (0582) 65114.

Selling: Telford TC-9 Tx and TC-7 Rx, plus converter, £75 or near offer (inc. carriage).—Ring Hall, G4GSB, Dudley 54119 (West Midlands).

May issue: Due to appear April 28th. Single copies at 50p post paid will be sent by first class mail for orders received by Wednesday, April 26th, as available.—Circulation Dept., Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

For sale: Two Liner-2's, complete with manuals and leads; Heathkit RA-1 Rx. The lot, £210 (or will separate).—Ring Middleton, 0522-28968.

Sale: KW-2000B with AC/PSU, £210.—Fennell, Eastview, Gedney Duke, Nr. Spalding, Lincs. (Tel: 0406-362501).

Sale: Eddystone EC-10 Mk. II with mains PSU, mint, £110. Heathkit 'Mohican' Rx- £30. Codar PR-40 preselector, £10. (Callers weekends only).—Taylor, 26 Hertford Road, Yeovil, Somerset.

Selling: Drake T-R4 transceiver, 80-10m., with R-V4 remote VFO, AC-4 mains supply and handbook, good condition, recently serviced.—Ring Stone, 01-357 3232 office hours.

Sale: Eddystone Model 940 with plinth speaker and manual, mint condition, £95.—Ring Hereford 65222.

For sale: TS-700G, fitted T. & T. pre-amp. and vox unit, as new, £325 or near offer. Hustler SF-22 $\frac{5}{8}$-whip and HLM boot mount, as new (cost £22), £15. S.M.C. monitor 'scope, mint, unused, £60.—Ring Moscrop, G4EMG, 01-534 3460.

For sale: Yaesu FRG-7, 4 months old, guaranteed, £140 or offer. Exchange Grundig 'Satellit', or similar.—Ring Parkin, 01-659 1106.

Sale: Ken Products KP-12A RF speech processor, audio-to-audio via 10.7 MHz, £36. Trio MC-50 dual impedance desk mic., £16. SP-400, £11. All post free.—Ring Stewart, GM4DHJ, 041-889 9010.

Selling: Hammarlund HQ-110 receiver, 160-6m., with IF Q-multiplier, £80.—52 Bunkers Hill Lane, Bilston, West Midlands.

Selling: Rare Canadian wartime W/S No. 29, working, £25. Wanted: Avo VCM Mk. IV; working Redifon GR-410 Tx/Rx. Exchange with No. 29 Set considered. —Ring Taylor, G3UCT, Fleet 6998.

Wanted: Transceiver for 2-metres side band, up to £150 offered.—Ring Brindley, G3DYZ, Sheffield (0742) 373850.

Sale: Creed 7E teleprinter, excellent condition, £25.—Ring Bensley, G3PTZ, Lincoln 33141.

For sale: FT-200, mint condition, fully crystalled on 10m., with speaker, mic., fan and power supply, £220 or near offer.—Ring Nutt, GM3YDN, Crosshill 338 (Ayrshire).

Selling: Liner-2, with PSU and mobile mount, excellent condition, £125. Seiwa MS-2 FM Rx, with case, crystals, Nicad pack, excellent, £55. Lowe REC-1420C monitor Rx, 6 crystals, mobile mount, £20. T.W. 'Communicator', 2-metres, working, £20.—Morrison, 14 Woodcote Road, Tettenhall, Wolverhampton. (Tel: 0902-755634.)

Selling: SSR-1 general coverage receiver, £95. Microwave Modules 2m. converter, IF 28 MHz, £12. Partridge VFA and aerial tuner, £5. S.T.E. 455 kHz FM discriminator, £2.—Ring Collett, 021-747 7925.

Sale: QC1246AX filter with sideband crystals, £22. Datong RF clipper board, £13. Flexible 'gooseneck', 21in., £2. All used, good condition.—Lemay, 108 Slewins Lane, Hornchurch, Essex.

For Sale: Racal RA-17L communications receiver in cabinet, with handbook, excellent condition, £29.—Hanson, 6 Woodhall Place, Parksite Estate, Newcastle-under-Lyme, Staffs.

Sale: FT-200/FP-200, £170. Electroniques QP-166 RF unit, £10. Eddystone 898 dial, £5. Kokusai Type MF455-15CK mechanical filter, with crystal, £17. Codar AT-5, £15.—Ring Silvester, G4DAQ, Luton 34053.

Wanted: Canadian No. 52 Tx/Rx, complete and working, and individual items (connectors etc.) for spares; also R.209 Mk. II. Details and price please.—Ring Taylor, G3UCT, Fleet 6998.

Wanted: Trio 9R-59DS or JR-500SE, in good condition. Details and price please.—Strike, The Green, Millom, Cumbria. (Tel: Millom 2528).

Wanted: Receiver Type R.1155, any model, for Aircraft Museum. Details and price please.—Smith, G8EGU, 60 Orchard Way, Balderton, Newark, Notts.

Selling: Yaesu FR-101 digital receiver, with matching speaker, mint condition (cost £540 new), first offer over £400 secures.—Ring Benton, 021-706 3371 ext. 34, office hours.

Wanted: Manual for 'Am' Type 11 oscilloscope (Ref. 10S/562); buy, or borrow for copying.—Fraser, 3 Rimbleton Avenue, Glenrothes, Fife.

For sale: Eddystone EC-10 Mk. II, battery/mains, £90. EB-34 with tuning meter, BFO, battery/mains, £90.—Holder, South Furzehill, Lynton, Devon.

Wanted: K.W. Vanguard, DX-100, or similar AM/CW Tx. Details and price please.—Aldridge, 1 Balmoral Avenue, Leyland, Lancs.

Selling: Lafayette HA-600A general coverage Rx, immaculate condition, £38.—Travers, 157 Wales Road, Kiveton Park, Sheffield. (Tel. 0909-771831).

Wanted: Geloso 80-10m. transmitter, VFO or CW, plus SB-10 sideband adaptor. Condition and price please.—Ledger, G3UBL, 51 Lancaster Close, Albrington, Wolverhampton WV7 3NH.

Sale: Pye 'Pocketfones' working on 433·2 MHz, also xtals for RB4, with Rx helical, two sets of batteries and Pye Base charger, all in good condition, £40.—Berry, 99 Keighley Road, Colne (864877), Lancs.

Selling: Yaesu FR-101D and FL-101RF, £520 (not available separately, seen working). Buyer inspects and collects.—Hall, G4FRN, QTHR. (Tel: Cobham 3197).

Wanted: Handbook and circuit for Hallicrafters Model S.36 UHF Rx. Buy or borrow.—Bracey, 11 Seymour Road, West Clacton, Essex.

Exchange: KW-500 Linear amp. for KW-109 ATU.—Fennell, Eastview, Gedney Dyke, Spalding, Lincs. (Tel: Long Sutton (0406) 362501).

Wanted: Any condition Type 3 Mk. II Set, or parts; command receivers, transmitters, racks; SCR-522 receiver, transmitter, rack; Wireless Sets 21, TR9, 1133, 1196, leads, power unit; Remote control unit for TCS-12; Any German equipment or parts; Leads for No. 29 Set; Indicators 62 and 184.—Warner, 45 Eastry Close, Stanhope Estate, Ashford, Kent.

Sale: Atlas 210X with noise blanker, virtually new, £100 under list price.—Robinson, G2KF, QTHR. (Tel: 072-681 2337).

Wanted: Eddystone S.750 Rx, must be in first class (near mint) electrical and mechanical condition throughout; round die-cast speaker and 'beehive' S-meter would be added bonus. Details and price please.—Davies, 16 East Parade, Rhyl, N. Wales.

Sell or exchange: R.1155 with PSU and audio stage, £30. Or exchange for 'scope.—Ring Nicholson, 0244-531000.

Wanted by SWL newcomer: Amateur or general coverage receiver, valve or transistor, plus any interesting bits for SWL.—Altree, Winsford House, Halwill, Beaworthy, Devon.

Sale: Yaesu FT-101 and SP-101, mint, £225.—Ring Hewitt, Newmarket 741337.

For sale: Twin-meter SWR bridge, as new, boxed, 77.—Edwards, G3RJB, 41 Winston Road, Hereford.

Selling: KP-202 hand-held transceiver, fitted 6 channels, with leather case and base charger, scarcely used, mint, £105. **R.A.E.** home study course, used by Distinction candidate, £25.—Ring Jones, 046-02 376 (South Chard).

Sale: Drake R-4C receiver, excellent condition, offered at £290 for quick sale.—Jesson, G4CNY, 181 Kings Acre Road, Hereford. (Tel: 0432-3237.)

For sale: Eddystone EC-10 Mk. II receiver, good condition, with twin external speakers and telescopic aerial, £100.—Beynon, 137 Hobmoor Road, Small Heath, Birmingham B10 9BS.

For sale: Liner-2 with mains PSU and fitted pre-amp., £110 or near offer.—Ring Black, G8HPD, Wheathampstead 3307 after 7 p.m.

For sale: Europa 2 and 4 (brand new), Ham-M h/d rotor and box, two antennas, 2in. dia. pole, £200.—Francis, Keeill Voirrey, Walpole Drive, Ramsey, Isle of Man.

For sale: FT-2F, with three repeaters and nine simplex above 145 MHz, excellent condition, in daily use, £95 or near offer. PF-70 UHF handie-talkie, fitted SU8, SU20 and RB10, with tone burst, Antec 'rubber duck' and new leather case, in first class condition, £80 or near offer.—Ring Shipton, South Benfleet 53997.

Selling: Trio 9R-59DS receiver, £45. Buyer collects. (London S.W.19).—Box No. 5637, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Wanted: Grundig 'Satellit', will exchange J.V.C. Model 9475LS stereo radio cassette recorder.—Hardy, 17 Green Lane, Fordingbridge, Hants. SP6 1HT. (Tel: Fordingbridge 52093 after 6 p.m.).

Wanted: Heathkit 'Mohican' receiver, beam rotator, BC-221 and Eddystone mounting blocks.—Newton, 20 Ormesby Bank, Middlesbrough TS7 9EB.

Sale: BC-221M mains power pack, as new, £25. BC-221Q mains power pack, £20. TF-1041A VTVM, £20. TS-69A/AP absorption frequency meter, 341-1000 MHz, with charts, £25. TF-1267 transmission test set, £10. T/R power pack, 480v. at 175 mA. twice, 350v. at 225 mA., 6·5v. at 5A. twice, £5. CV power pack, 25v. at 8A., £12. Miniature 'scope unit with pre-amp., £10. Azimuth beam indicator, with rotation control, £15. TF-987/1 noise generator, £5. Timing signal generator, £5. R4/ARR2 VHF command receiver, £8.—Barnes, 14 Laurel Drive, Eccleston, St. Helens (53018), Merseyside.

Sale: Creed 7 teleprinter spares. Far too many items to list, send Creed Part/No. with s.a.e. for quotation.—Cooper, 9 Cavendish Drive, Kidderminster, Worcs.

For sale: Labgear LG-300 150-watt transmitter, together with Labgear PSU and modulator for LG-300. T.W. 'Communicator' 2m. 12v. portable. Offers?—Goudime, G2DCV, Cedar House, Windlesham, Surrey.

Offering: Racal RA-17L, MA-168B diversity switch, MA-150G synthesiser, S-[illegible] adaptor, EA-52 diodes, instrument cases, components, etc. Offers?—Ring Betts, West Drayton 43694 after 6 p.m.

For sale: Pye Cambridge AM-10B, hi-band 12·5 kHz, with cradle, control cable and mic., £35. Three G.E.C. 'Courier' hand-held portables, AM hi-band 12·5 kHz, complete with mics., leather cases and batteries, £30 each. Storno 'Viscount' control box and cable, £4.—Axford, G4AQZ, QTHR. (Tel: 025-584 632 after 6 p.m.).

Sale: FR-DX400, 10-160m., mint, £140.—Hartwell, Town Mills, Wiveliscombe (23762), Taunton TA4 2LY.

Selling: Racal RA-17 receiver, excellent condition, £200. MA-168B diversity switch, £30.—Ring Betts, G4EAK, West Drayton 43694 evenings.

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WB6	11 × 7½ × 3½	£2·50
WB7	12 × 6½ × 5½	£2·85
WB853	8 × 5½ × 3½	£2·25

PLUGS & SOCKETS

BNC PLUGS (ex-equip.), 5 for £1·50.

PL259 PLUGS (PTFE). Brand new, Packed with reducers, 75p each.

SO239 SOCKETS (PTFE). Brand new (4 hole fixing type), 60p each.

N-TYPE PLUGS, 50 ohm, 60p each.

GREENPAR (GE30015). Chassis Lead Terminations. (These are the units which bolt on to the chassis, the lead is secured by screw cap, and the inner of the coax passes through the chassis), 30p each, 4 for £1·00.

MULTICORE SOLDER. Size CISAV18 Savit, 18 SWG, 56p; ¼ Kg. (1·1 lb.) 60/40, 20 SWG on plastic reel, £3·00.

ALU-SOL ALUMINIUM SOLDER

(Made by Multicore) Solders Aluminium to itself or Copper, Brass, Steel, Nickel or Tinplate, 16SWG with multicore flux with instructions, approx. 1 Metre coil 40p pack. Large Reel £2·75.

SOLDER SUCKERS (Plunger type). Standard model, £5·50, Skirted model, £6·00. Spare nozzles, 60p each.

ALL BELOW — ADD 8% VAT

UR41 ATTENUATOR CABLE. Nominal 72 ohm, overall dia. approx. ¼", Att. per 100ft. 100MHz 21dB, 200 MHz 316dB, 600 MHz 449dB, 3000 MHz 625dB. Ideal for Rx or Low power Tx fixed attenuators. Supplied with attenuation graph. 4 metres for £1·00.

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A NEW RANGE OF SPEAKERS AND CABINETS. BRAND NEW AND BOXED AT BARGAIN PRICES

TELEFUNKEN HIGH QUALITY SPEAKERS. 3 ohm, 8 watt RMS, 9¼" dia. Full range type, £6·00 each (or 2 for £11·00) + 12½% VAT.

TYPE L2 TRIANGULAR CORNER CABINETS. Smart woodgrain Formica type finish with nylon grille. Overall height 23" × 12" wide. Contain Three 15 ohm 6½" × 4". Full range speakers in parallel + 100V line transformer (easily disconnected for 5 ohm operation). £7·50 each (or 2 for £14·00) + 12½% VAT.

TYPE M704 CEILING SPEAKERS. White plastic fascia 10" square, for recess mounting into ceiling, with 8" dia. 15 ohm full range speaker, £4·00 each + 12½% VAT.

TYPE L4 PORTABLE SPEAKER CABINET. Smart woodgrain Formica type finish with nylon grille, 15" high × 14" wide × 7" deep (tapering). Containing 10" round, 15 ohm full range speaker + 100V line transformer £7·00 each + 12½% VAT.

TYPE HT4 HOTEL SPEAKER CABINET. Wood veneered, 12¾" wide x 5¼" high x 3¼" deep, with aluminium grille + volume control and 4 way + off switch panels on front. Very smart. Contains 3 ohm 5" × 3" eliptical speaker + 100V line transformer, £5·00 + 12½% VAT.

AND SPIRALUX. Tools for the Electronics enthusiast. S.A.E. for list.

AEI CS10B/R MICROWAVE MIXER DIODES, up to X-Band, max. noise figure 8·5dB at 9·375 GHz, 80p each.

SUB-MINIATURE ROTARY SWITCHES, 4 × 5 way make contacts, Size approx. ¾" dia. 1" deep, 3/16" spindle, 50p each.

DIECAST BOXES. Please ring, or write (with SAE), for latest mail-order prices.

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TYPE NB2 approx. 3¾" × 2¼" × 1¼", 55p each.
TYPE NB3 approx. 4½" × 3¼" × 1¼", 65p each.

SMITH'S CLOCK MOTORS. 200—250V 50 Hz 2 watts, 1 Rev. every 2 mins., 3 hole fixing, ¼" spindle, £1·00 each.

SLOW MOTION MOTORS, 120V 50 Hz 1 RPM, Size approx. 2" dia., 1½" deep, with ¼" spindle. 60p each or 2 for £1·00.

NEW PCBs FOR PYE LYNX TV-CAMERA STABILISER PANEL (AT26352), £3·00.
VIDEO PC B (AG58314), £5·00.
LIMITED SUPPLY ONLY . . . ORDER NOW!

CERAMIC TAG STRIPS (4 on 1 mount), 10 mounts for 50p.

TUNED COILS, 2 section coils, around 1 MHz, with a black smart tuning knob, which moves an internal core to vary the inductance, many uses, easily rewound, 3 for 50p.

2-6pf, 10mm. circular, ceramic trimmers (for VHF/UHF work), 3 pin mounting, 5 for 50p.

ON/OFF/RX STANDBY SWITCHES for AM10B Cambridge and Vanguard control boxes, 40p each, 3 for £1.

OSMOR REED RELAY COILS (for reed relays up to ¼" dia., not supplied), 12v., 500 ohm coil, 2 for 50p.

THIS MONTH'S SCOOP PURCHASE, PYE CAMBRIDGE AM AUDIO PCB. Brand new, 60p each, or 4 for £2·00.

VIDICON SCAN COILS (Transistor type, but no data) complete with vidicon base, £6·50 each. Brand New.

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GERMANIUM DIODES, approx. 30 for 30p.

IN4148 (1N914) DIODES, 10 for 25p.

741CG RCA OP AMPS, 4 for £1·00.

VALVES

QQVO3/20A (ex equipment), £3·00.

QQVO3/10 (ex equipment), 75p or 2 for £1·20.

6BH6 (ex equipment), 2 for 50p.

All the above valves are untested, except for heaters, and no guarantee of percentage of emission is given. Sorry, no returns.

6BW6 VALVES (BRAND NEW), 85p each or 2 for £1·50.

MULLARD 85A2 85v. STABILISER VALVES (Brand New), 70p each or 2 for £1·20.

ALL BELOW — ADD 12½% VAT

BARGAIN PACK OF LOW VOLTAGE ELECTROLYTIC CAPACITORS. Up to 50v. working. Seatronic manufacture. Approx. 100, £1·50 per pack.

A large range of capacitors available at bargain prices, S.A.E. for list.

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ITT ELECTROLYTICS, 6,800 mfd at 25v., high grade, screw terminals, with mounting clip, 50p each.
MULLARD ELC1043/05 VARICAP TV TUNERS. Brand New, £5·00 each.

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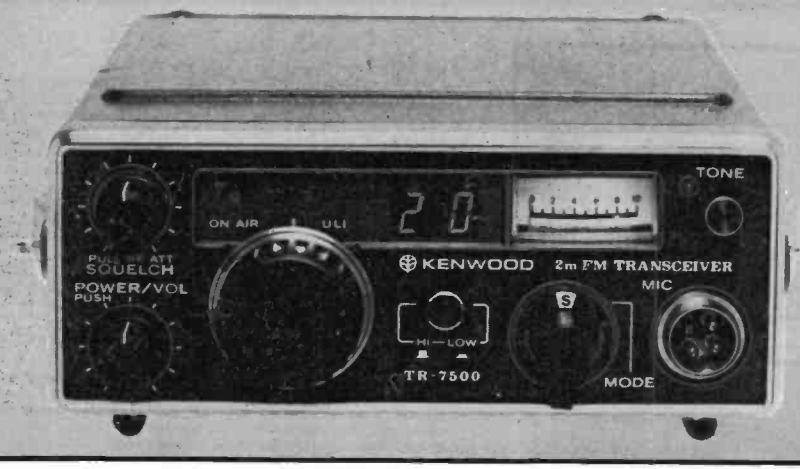
TR-7500

Why settle for anything less ?



TR7500

The TR7500 is the very latest 2 metre FM mobile to be introduced by TRIO and will delight the owner with its combination of performance, reliability and unique design. It represents another step forward in the TRIO product line and is designed to give you the very best FM transceiver available in its class.

Whatever you now own, or may have been thinking of buying, you would be foolish to settle for anything less than the TR7500.

PLL Synthesiser, no crystals to buy, ever, with the TR7500 since the operating frequencies are generated by a TRIO designed LSI phase locked synthesiser. This provides 80 FM channels at 25 kHz spacing from 144–146 MHz, all 10 repeater and reverse repeater channels. The channels are selected by a single knob and no *programming is required from the user*—just unpack the rig, connect 12 volt dc and you are on the air.

Unique display

TRIO attention to detail at its very best is shown in the method used to display the channel number. TRIO believe that ease of use is the priority consideration, and have arranged the large LED display to show the correct channel number at all times. If you want to operate on S24, turn the channel knob until the display shows 24—simple isn't it? Need R7? Turn the knob until the display shows 7. There's no need to wonder "did I programme S24 into channel 15 or channel 9?".

Repeater operation

Available at the touch of a front panel switch. Turn this to "N" (normal) and you operate normal repeater with 600 kHz receiver upshift. If you wish to listen on the input, turn the switch to "S" (Simplex), and you are there—and can operate simplex on the input frequency. Need reverse repeater? Turn the switch to "R" (reverse) and you operate with transmitter up-shift of 600 kHz. This facility is most useful when you hear several stations calling into a repeater with only one (of course) appearing at the output. Using reverse repeater operation, you can call into the pack to invite anyone to a simplex channel for direct QSO.

Automatic tone burst is provided, with a front panel LED to remind you that you have the tone burst on. Needless to say, the 1750Hz is generated by TRIO's unique tuning fork oscillator which guarantees spot on frequency at all times and in all temperatures.

Performance plus

A combination of multi section helical filtering at signal frequency, monolithic crystal filters at 10·7 MHz, and sharp multi pole filters at 455 kHz allows the TR7500 to keep on working under strong adjacent signal conditions when other rigs give up.

The receiver performance for sensitivity is excellent. On the samples checked so far, we obtain 12dB SINAD for a startling 0·18 microvolts and under mobile conditions, we copy repeaters in terrain which previously presented real signal problems.

The transmitter generates a true FM signal at 10·7 MHz which is translated directly to two metres in a fully balanced mixer system. This guarantees a superbly clean signal with no unwanted multiplier products, and an all new PA system with specially developed transistors, gives rugged reliable power in excess of 10 watts.

As a final test for freedom from unwanted in band signals, we ran the TR7500 at full output with a TS700G coupled to it on the bench. Tuning from 144–146 MHz on the TS700G, we found just one signal—the wanted one. It was impossible to find a single unwanted signal coming out of the TR7500 under these extremely severe conditions. Wideband checks using the analyser revealed no spurious outputs detectable above noise level. At this point we retired happy!

Attention to detail

As is well known, TRIO introduced the since copied variable power SWR protection system, and it is of course fitted to the TR7500 with an improved high gain dc amplifier for tighter and faster control.

High/low band change is by push button, with S-meter illumination colour change to remind you of the band in use.

Another simple but typically TRIO thoughtful provision is the special channel knob with a deep moulded indent at S0. You can set this vertical by touch alone and can then count up the channels without even seeing the channel display. Great when mobile and you need your eyes on the road.

Finally the TR7500 with all its potent performance is packaged in a case not much bigger than a TR2200GX!

Accessories

The TR7500 is supplied complete and ready to use with the TRIO, quick release mobile, microphone, power leads, comprehensive manual etc., etc. Nothing more to buy to own the best mobile/fixed station FM rig on the market.

DON'T SETTLE FOR ANYTHING LESS THAN THE TR7500

£225 inc. VAT

TR2200GX

TR2200GX, £139 (3 ch.) **£169** (12 ch.) inc. VAT

This is the definitive 2 metre FM portable rig which has won praise from all over the world. Over 2W transmitter output with switched reduction to 400mW for local contacts. High gain receiver with double IF filtering at 10·7 MHz and 455 kHz for razor sharp selectivity.

The TR2200GX is supplied with all accessories including the battery charger for the optional Nicad battery pack, the removable telescopic antenna, the carrying case, the shoulder strap, external power lead, microphone and handbook. Fitted with 12 channels, the price is only **£169** inc. VAT. If you wish to start out at a lower price, we can supply the rig fitted 3 channels for only **£139.** With all its performance, the TR2200GX is a must for the portable operator. At the price, it has to be the best around. Just look around at the next rally and see how many operators are carrying them.

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FT221R 2m., "All mode" ... £339·00

FT227 10W, 400ch. mobile, digital ... ... £169·00

FT223T/RX 2m. FM 23 ch. 12v. ... ... £139·50

FR101 DeLuxe "S" BC FM £480·00

FR101DD Digital Readout "D" ... ... £480·00

FT101E Transceiver ... £429·00

FL101 T.X. 1·8-30 MHz 230v. £325·00

FL2100B Linear 1·2kW PIP £269·00

YC500 500 MHz Counter 10 PPM ... ... £210·00

YC601 Dig. Display 101 and 401 ... ... £110·00

YC301 Monitor scope ... £123·50

ALL + VAT 12½% except Monitor Scope, Clock, Counter, Wattmeter + 8%

YAESU FT227R + LEE ELECTRONICS AUTO-SCAN

YES WE CAN NOW SUPPLY THE FT227R WITH AUTO-SCAN FACILITIES, DESIGNED AND MANUFACTURED EXCLUSIVELY FOR US—NOTE THESE STAR-FEATURES :

- ★ Scans 40 channels
- ★ 2 speed scan rate
- ★ Locks out unwanted channels
- ★ Automatic tone burst for repeater operation
- ★ Reverse repeater facility
- ★ Scans between 145–146 MHz in 25 kc/s. steps
- ★ Scanning facility

Controlled by switch fitted to microphone (*not illustrated*)

AVAILABLE END OF APRIL

PRICE : £218 + VAT

ICOM RANGE

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ALL + post 25p + 12½% VAT

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SUPER-SCAN

Manufactured for us, and designed exclusively for use with the IC240. Note these star features ★ Scans 40 channels in 25Kc/s. steps. ★ Locks out unwanted occupied channels. ★ Adjustable scan rate ★ Adjustable phase period ★ Manual mode feature ★ Automatic ± 600 kHz shift of TX frequency when repeater mode is selected ★ Large six digit display shows frequency to 5 kc/s ★ Display always shows frequency in use including TX frequency when PTT is operated ★ Call for demonstration.

Price £69·00 + 12½% VAT post free.

SPECIAL NOTICE!! The above Super-scan unit is terminated with 14-pin plug to plug into rear of IC–240, but customers' IC–240's have to be wired with socket to accept the above unit. We can carry out the above modification if required—price £6 inc. VAT and return postage.

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The FT221R. The multimode USB, LSB, AM, FM, CW (with semi-break in and side tone), 2m. transceiver offering the choice of phase locked VFO or 44 crystal channels, simplex or repeater (600Hz up and down shifts), with unique "double push" auto tone burst, mains or 12v. (3A) operation, excellent selectivity SSB 2·4 kHz (1·7 : S.F.) or FM 12 kHz. Front panel adjustable VOX and mic gain, a calibrator (1 MHz ÷ 10), 1 kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes F.S.K. easy), switchable "S" and centre zero tuning meter, noise blanker, serviceable plug in boards all contained in 11½" (14") x 5" x 11½", 22 lb. rigid package 600 kHz and 1·6 MHz shifts over 4 MHz.

FT221R £357 + 12½% **YC221 £72·50** + 8% **MANUAL £9·00**

SCANNING DIGITAL II from KYOKUTO

The Digital II offers complete 5 kHz step coverage across 2 metres and now with the Scanner 33, 25 kHz channels from 145 MHz upwards covered in around 10 seconds. It offers full lock and lockout on all channels. The scanner stops on a required channel for 10 seconds, then unless locked moves on. The brighr digita readout comes from 6 seven segment LEDS.
Selectable 10 or 1 watt output for simplex or duplex (up and down shifts), across 144–146 (rx to 149 MHz) from a tiny 6½" x 2" x 7½". Easily underdash mounted with the supplied mounting bracket, or slipped in place of the broadcast wireless.
For strong handling, and low noise the R.F. mixer, first I.F. (16·9 MHz) second mixer (and LO) are all FET's. The front end is tuned by varicaps by the DC output of the P.L.L. with superb selectivity provided by a 15 pole (±8 kHz at —5dB ±15 kHz at —70dB). Ceramic filter. LED lamps indicate if the P.L.L. in unlocked or the squelch open. The V.C.O. is directly modulated, for exceedingly linear deviation). Unitary 6 circuit block construction (for serviceability and screening). Selective calling socket.

DIGITAL II £235 SCANNER £49·50 (+VAT 12½%)

FOR VHF MOBILE THE FT227R FROM YAESU EX STOCK

The new FT227R uses a "single knob" tuned digital synthesizer employing a photoelectric sensor or an optical coupled system which eliminates both noisy, unreliable rotary switches, and crystal banks.
Full coverage of 2 metres in 5 kHz divisions with a ±600 kHz shift plus a memory feature which permits recall of any entered frequency or particular offset.
Bright large, digital readout gives unequivicable readout of the frequency in use. The receiver offers 0·3μV (for 20dB S + N/N) sensitivity into a ±6 kHz (at 6dB) bandwidth whilst maintaining a remarkable immunity to overload and image problems. The 20W. DC input transmitter features Hi/low power outputs, AFP tone burst o.i repeaters and an out of band inhibition trip, etc.

FT227R

KYOKUTO DENSHI SCANNING FM2015R

The 2015 transceives across 144–146 (Rx to 149) MHz in 5 kHz steps tuned by coaxial switch stopped at 0 and 9.
A major feature is the 4 channel RAM memory (with an internal Ni Cad back up) which may be programmed direct from the front panel by simply dialling in a frequency, no screw drivers, no soldering irons, no fuss. Frequencies can be recalled from the memory instantly or they may be scanned in either of two modes :—searching for a vacant or an occupied channel. 5 split (including + and — 600 kHz) for repeater or transvertor (even triplevertor) use. Multipurpose tone burst, RIT (centre off with "click"), modular constructions, centre zero meter, accessory socket, mounting bracket, microphone etc., are all provided. The sensitive receiver is varicap tuned by the DC level of the P.L.L. IF's of 16·9 MHz and 455 kHz provide high image rejection and good shape factor 2 : 1 at 70dB (12 kHz BW). In the transmitter, modulation is applied directly to the V.C.O. (for the ultimate in fidelity), auto power control and varicap tuning keeps power output constant at band edges and spurii way down. **EX-STOCK. £245** + VAT (12½%).

WATTMETER REMOTE RF HEAD

50–150 MHz ideal for mobile use.
Separate directional coupler 3" x 2½" x 1¼" and illuminated indicator 5" x 2¾" x 1¼" c/w brackets, etc. Power 20 and 200W FSD (±10%) SWR to 3 : 1 (±3%).
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Flat 50–150 MHz SWR ±3% (to 3½ : 1) 20 & 200W FSD (±10%) 6¾" x 2¾" x (4¼")
FS302M P & P 85p + 8% VAT **£22·50**

30W peak 15W cont. 50 ohms PL259 VSWR 1·2 : 1 at 150 MHz.
DL20 P & P 25p + 8% VAT **£4·75**

VHF HANDHELD

KEN KP202 TRANSCEIVER (+ VAT Price) 144 MHz, FM, 2W of RF and ½W of audio. Immunity to image and IF breakthrough and performance to rival all walkie-talkies and many a mobile set.

C/w F plug, leather handle/whip case and telescopic whip.

Fitted 6 channels S20 & S21 + choice of S (21, 23, 24, 0) R (3, 4, 5, 6, 7) ...

R channel only crystal tone burst	...		£10·00
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VHF Monitor Receiver

SEIWA MR2 AND MS2 (+ VAT prices) Ideal for the SWL, the YL or even the XYL as the monitor receiver to keep you in touch. Tiny (2¼" x 1¼" x 4¼") and light (8 ozs.) slip into your pocket or onto your belt with the optional case. Sensitive double conversion superhet with 12 kHz band width, auto squelch, and generous audio output c/w Nicads, Mains Charger, Earpiece, Antenna.

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DCC	DC Cable	£8·45
MBK	Mobile Bracket Kit	£4·38
MT–1	Mobile Antenna Match Transformer	£18·00
PC–120	Plug-in Noise Blanker	£40·50
10X	Crystal Oscillator	£42·75
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VX–5	VOX accessory	£36·00
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TRIO EQUIPMENT

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R–599D	160–10m. RECEIVER CW/SSB/AM/FM	£403·00
T–599S	80–10m. TRANSMITTER CW/SSB/AM/FM	£383·00
S–599	Matching Speaker 8 ohms	£18·00
CC–29A	2m. Converter for R–599D	£20·00
TS–700G	2m. TRANSCEIVER CW/SSB/FM/AM	£426·00
VOX–3	Matching VOX unit (free with TS700G)	£19·00
SP–70	New Matching Speaker	£18·00
TS–700S	De luxe 2m. DIGITAL TRANSCEIVER	£542·00
VFO–700S	External VFO (split-freq. facilities)	£83·00
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PS–5	Matching AC psu/digital clock	£58·00
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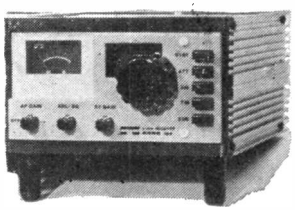
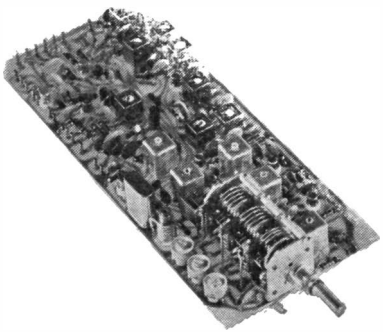


ARAC 102 receiver, 28–30 MHz. 144–146 MHz. AM–SSB–FM–CW Price £100·00



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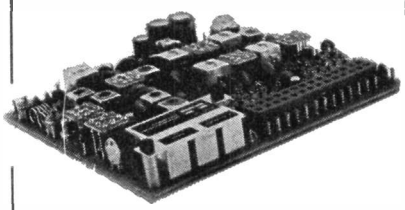
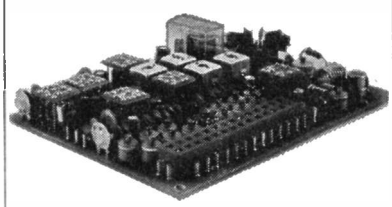


AR20. 12 channel FM receiver 144-146 MHz. Input impedance 50–75 ohm. AM-FM modes. Sensitivity 0·2uV AF output 3 watts. 12v. DC operation.



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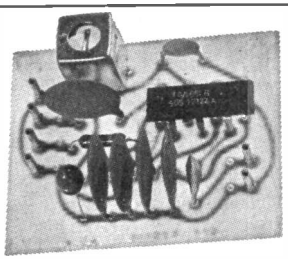

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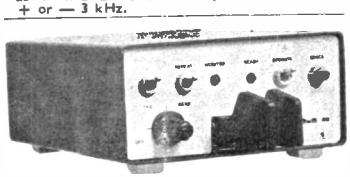

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CONTENTS

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT-WAVE Magazine

EDITORIAL

Twelvemonths

This issue marks the end of the writer's first year 'in office'—a position which seemed at first so awesome, but is now beginning to feel a little more comfortable. You have continued to support *Short Wave Magazine*, and indeed circulation has risen; for that, our thanks.

Clearly this first year has been used for something of a re-assessment: we hope in the coming issues to put into practice the plans which have been laid during this period, although essentially we can only publish what contributors offer (and it is to their 'feel' for what *we* sense to be *your* liking that we have addressed ourselves). There should be something for (almost) everyone—not that we shall be attempting 'to please all the people all the time' as the only result of such efforts is to please no-one.

As a first step, this is something of a 'bumper issue', with eight extra pages; and we hope you will enjoy them all.

G3KFE.

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

Top Band

This of course just has to mean W1BB, as indeed it does. His crack about "hope springing eternally" more or less sums it up; this last season has been rather like the curate's egg. Stew last snagged a new country as long ago as May last year (that one being C31), although he agrees that he missed a couple of possibilities—who cares when you have 140 countries already in the bag on the band, and you can look forward most years to taking some 45-55 countries. W1BB reckons the highlight of the year for him was listening to K1PBW acting as MC on 1810 kHz (mainly SSB), while in one direction was ZL2BT and the other way the Europeans, and *W's* from East to West coast; some of the *W's* worked both *ZL* and *EU's*, and some *G's* connected with *ZL*, all in the 'Insomnia Net'—which included at least one (KØZVE), signing /M. All this activity was around December 28-31.

On the international front, we note that the *YU* chaps are pressing hard for other European countries to join them on Top Band. Russian noises gave the impression they would soon be giving permission to their people, once some aeronautical activities are moved. Poland apparently granted Top Band from January 1, 1978, while Hungary had the band but lost it for some reason unexplained; and the YO chaps are hopeful of Top Band in 1979. *ZS* stations now have the whole band, except for 3 kHz above/below 1800, 1820, 1830, 1887, 1936, 1981 and 1982 kHz, with 150 watts. Perhaps the earliest QSO on the band was at 1740z when VO1KE worked GD4BEG. We have it that TF3ST is quite interested in Top Band, and might be 1807·5 kHz from the former *Loran* station, using lower sideband.

Since January 1, G3ILO (Dursley) has been knocking off the counties for the CCA Award, and his takings so far include some 46 counties, a couple of *LA's*, *OH*, *OE*, about fifty assorted *OK/OL* chaps, GU3HFN, YU3TJA, EI9ONE, GU4EON, all on CW, plus SSB to GU3HFN and G3VXI.

Another one *en route* to the award is G4FJU (Walsall) who finds EDX a bit of an anticlimax after K1PBW on January 1; Ben now has a plot to make a loop to see if some of the noise can be disposed of.

G2HKU (Sheppey) still has his mast on the floor, after the recent weather; this means his 'G5RV' aerial is at 30 feet at one end, and only seven feet up at t'other—but he still had SSB to PAOPN, plus CW QSO's with DJKWA, LA8UU, LA5HE, DL1BU, YU1OCV, GM3PFQ, DJ6TK and GM3LWS.

Comments

Well before deadline-time we had a note from G3CED (which included a copy of the multi-coloured log from F9UO) with the indication that QRT still reigned supreme for George. However, with the last of the mail came his second note saying that he was carrying out prototype checks at the bottom of Broadstairs High Street with 250 milliwatts and an indoor Joystick—"when you've only got 250 milliwatts and a stupid location it's like skating *up* Everest: a sort of smug exhilaration and somewhat taxing!" At the head of his letter, a phrase which will bring back many memories to older readers who recall the first radio comedy show that really used speed as an adjunct to humour and wit: the porno postcard seller in *ITMA* "I go—I come back!"

Nice to hear again from G2HLU (Reading) who took advantage of the old adage about the 'ill wind'—can't garden, so play in the ARRL DX CW and Phone contests.

G3KPO—he of the Antique Wireless Museum—writes to mention the Alverstoke Manor Tea-party on September 17; last year's event was quite a success and for this year something rather exotic will be on show, if all goes well. On a different tack, Douglas knows that many an amateur is keen on electronic organs and such, so an 'organ-grinder's net' has been established every Wednesday afternoon between 3 and 4. That would surely have pleased old Tommy, G6QB, who wrote this column for so many years, and in his 'other hat' used to modulate the BBC QSO rig from the BBC cinema organ at regular intervals (sometimes with G6FO tuning the pages), plus almost daily stints at the Hammond organs at Hastings—which indeed was where your scribe first got to know Tommy. It's an interesting point that G3KPO wonders whether he would be breaking his licence conditions if he used his antique Hammond to play a simple tune over the air just to check modulation! Interesting all the more when one recalls how all the frequencies generated by the original Hammonds were in effect mains-locked in frequency. Eighty-eight 'wheels,' all on a common shaft, driven by a synchronous motor and a coil close to each, sensing the change in field as the toothed wheels rotated—we've come along a bit since then!

'CDXN' deadlines for the next three months—

May issue—April 6th
June issue—May 4th
July issue—June 1st

Please be sure to note these dates.

A letter from G3RJV indicates that he is now once again settling into a new QTH, and reckons to have a long-wire out ere long, having spotted a most opportune tree some 200 feet away to the rear of the QTH; so, one quiet Sunday morning there will be some tree-climbing—one has a vision of canonical clothing disappearing up a tree with a piece of string to the amazement of the locals!

By the time this reaches you, if all has gone according to plan, the first Clipperton activity since 1958 will have racked up some 25,000 QSO's between the ten operators, which ought to mop up some of the demand for this, the top of the DX rarity tree.

We have a note from G3TWX

of the WAB Phone and CW LF Contests, respectively on May 7 and June 18, both being 160-08-40 affairs, 0900z to 2100z; score 5 points per station per band with a multiplier to consist of one for each WAB area plus, for U.K. competitors, one for each DXCC country worked; overseas entrants to count the WAB areas only. Full rules from G3TWX at 13 Gannet Close, Haverhill, Suffolk CB9 0JL. We understand there will be no WAB HF contests this year but they will be back next year all being well.

The fine station of *Magazine* reader Bob Berge, ON4QX.

Eighty

First reporter is F9UO (Verrieres-le-Buisson) who had a play in the FOC Marathon for 48 hours, using his TS-520 and Joystick from a tower-block. As far as Eighty went there were two sessions, and in the first, GD4BEG, JG2LU, DJ, PAØ and lots of *G* stations were hooked early in the morning (0730-0900) while a second session in the evening yielded a few *G's* and a far slower QSO rate.

G6TC (Wednesfield) reckons the band is beginning to quieten down after the winter, but nonetheless his CW got out to all *W* call areas other than 6 and 7, *VE1-3*.

Not a lot of DX about, complains G4DMN (Wirral), and even less in the way of time—when he wrote he was right in the middle of examinations, so night-owling was out. SSB QSO's were however made with CO2JA, EA8JP, EP2TY, FP8DX, FP8DX, PY1WDC, 9H1EL, 9L1CA, 9N1NFO, 9Y4RR and NØBG/6Y5.

A long and rambling letter from G2BJY (Walsall) was put together over several days, and concerned many things (*ships and shoes and sealing-wax, and whether pigs have wings?*) but he did find the time to get on the air and to make sporadic forays into the garden to keep himself amused. Geoff had a basinful in the REF contest and seems to have done quite well, so much so that an application for the DDFM award has gone in. On a different tack, a friend of Geoff's has been taking R.A.E. and the instructor, a G8-plus-three, apparently has made a categoric statement to his class that home-brew gear is *out*—sounds a bit like a lack of confidence on the part of the instructor, or maybe he just doesn't want to spend too much of his own time sorting out student projects which have gone awry!

Forty

Is a good place to test the performance of a receiver, at least in U.K., and it is quite surprising if one sits down and combs through the mess carefully just how much DX is there for the asking; and while we have often said how the acid test of a receiver is its behaviour in the presence of strong nearby signals—a condition which sets most of the current crop aside instantly!—it never ceases to amaze one just how much can be done with a receiver of known poor front-end performance by a skilled operator.

G3ILO appears at the top of the pile; Steve played in the ARRL CW contest and managed a string of *W1-4* types before the change was made to the higher frequencies.

G2HKU, with his mast down still (as always, when a disaster like that strikes the weather continues to hamper the restoration work) and so he stuck to CW, which on Forty accounted for UD6DFK and UD6DHH.

Another letter from G3ZGC/MM which indicates he is back aboard the *Esso Scotia*, which has had commercial RTTY fitted—so CW is becoming a bit of a rarity in the radio-room (it is generally reckoned that the present 90 per cent CW from ships generally will drop to 10 per cent within the next five years). DX was a bit of a rarity, too, and at the start of the trip while the ship was still near U.K. there was some considerable difficulty in getting even a nibble to CQ calls on the key.

On now to G4EDG (Newton Abbot) who boasts a box of relays at the bottom of the 7 MHz dipole feeder, which are energised from the shack and enable operation on Top Band and Eighty. Back to Forty, and the stations noted include VK3MR, KV4CI, KØRF (Colorado), *W5's*, VK2HK, VK3QQ, *EA8's*, W6XX, WB5QWX/C6A, PY6AUC, VE8RR, PZ1AP, 4X4GD, N6FU, VE7CC, VE7WJ, N6AX, *W6's* and *W7's*.

G4CQK (Walton-on-Thames) has a QRP rig and a long-wire of 35 metres; this on Forty yielded just one QSO, namely with PA3ADU—but attention was most definitely riveted on other bands as conditions perked up!

Spring is on the way, avers G6TC, who bases his comment on the reappearance of Snow—no, not the white stuff, but VK3MR, worked on three mornings around 0730. Other contacts on the band included all *W* call areas save *W7*, *VE1-3* and a *JA*. Ted mentions that he has been keeping skeds regularly with VK3VJ since 1947, and KV4AA has also been worked regularly since 1949; he wonders who can beat that for long-running skeds.

On now to F9UO, who seems to have combed the 7 MHz band pretty thoroughly; the Joystick aerial found him some 47 stations to QSO between 0700 and lunch-time on Forty, the crop being mainly European of course but a brace of *W's* are noted.

Twenty

As with last month, largely neglected by the troops while things are going so well on Ten metres and Fifteen; but that is not to say the band hasn't been pretty fair in its own right and, at that, at civilised times when folk like G3KFE can operate or listen. Let G3ILO take

up the tale; he managed all *W* call areas, including three new states —N5CG for Oklahoma, KØRF Colorado and KØDI in Nebraska. In addition there were UAOQAV in N.E. Siberia, LU9CV, *VE1-3*, *VE6* and *VE7*.

For G2HKU there are two ways of tackling Twenty, namely with the HW-8 or the KW-2000; the little 'un made it to HA1KSQ, EA5ACA, IT9DYP, while the QRO machine keyed to UG6GOM, ZL1AXM SM5GXW/LU2KAK — what a key-bender of a call!—ZP5AO, HI8MOG, VK6WT and 9H1CH, while with the mic. plugged in the usual ZL1VN, ZL3RS and ZL3SE skeds were kept going.

Twenty has been the best of the bunch as far as G3ZGC/MM is concerned, with a good path to *G* from both North and South Atlantic around 1800z. Also, the later evenings in *ZS* have been very good to *W/VE* with 59 reports being swapped both by Richard and others.

Down West again, to G4EDG; after 80, 160 and 40, went straight down to 28 MHz to sample the action—as have done so many others, and why not indeed.

F9UO, his Joystick and the TS-520 had a little scratch round in the FOC Marathon, and came out from there rather pleased with themselves—and if we have any other readers who live in tower blocks and can't put up outside skywires, they could take heart from this: a steady average of five QSO's an hour right through the 48 hours, including rest periods (the rate would have been a lot higher had we taken them into the calculation!), not to mention *VE7*, *9H1* and *EP2* all in the space of 15 minutes, and a couple of *VK's* as chasers some 30 minutes later. 14 MHz gave a brace of *ZS* and *W's*, KV4AA and a *VE2* on the first spell, and a return later netted some more DX, SMØKY, ZL3GQ, our old friend GM3KLA, IT9AGA, VE7CXE, 9H1CH, EP2IA, LA7Y/EA8, W7FU and a pair of *VK's;* all this last lot in about 80 minutes!

A mildly unhappy note from G2HLU (Earley), who was smitten by conscience when he read last month's piece; and one detects a certain 'something' in his comment that when he worked PY7AAI/O "it wasn't exactly a ragchew!" Which is another way of saying that he ended up with a mite of doubt as to whether he actually worked the chap or not! But never mind, Harold had great fun on all the HF bands in the ARRL Contests, both the Phone ones and one of the CW legs; WA7NIN (Nevada), W5JW (New Mexico), and W7HYW (Wyoming) were three QSO's that gave much pleasure.

G4EAN (Nottingham) has a job where *Flexitime* has been introduced and so he now reckons on getting on the air at saner times; but as a result he usually manages to find 21 or 28 MHz more interesting, so his only 14 MHz activity was to work *W1*, *W2* and *W3* stations. However, it gave him the opportunity to refer to his log as a twig!

G3RJV (Nottingham) slung up a 14 MHz dipole as a stop-gap, a matter of 15 feet up, and in the Erewash valley. A first attempt was with 5 watts of CW, which raised W2PU, and improved George's morale quite a bit as he had been thinking he had moved into a poor spot from the radio point of view. His next effort was when he had a couple of youngsters visiting, and so 5 watts of SSB were let loose to work EA1QH, IT9KG, OH6UJ and C31FO; and that last one interested G3RJV as well as the lads, the more so as he was hooked first call! It rather looks that the QTH is a little better than first thoughts suggested. On another theme, G3RJV tells us the G-QRP Club is now up to some 380-odd members and still rising.

Contests

April 22/23 sees the Bermuda Contest, the rules being as before except that SSB QSO's between stations in Regions 1 and 2 are no longer permitted. Logs to be received by June 30, addressed to the Radio Society of Bermuda, Contest Committee, P.O. Box 275, Hamilton 5, Bermuda. As remarked in previous years, the winner is to collect his trophy at the Society Annual Dinner in October with round-trip transportation and hotel costs provided by the VP9's—which makes this one of the best contests to enter!

21 MHz

Seems to have been left in an odd sort of position by most people; the ten-metre enthusiasts coming down to it when Ten is dead, and the 14 MHz chaps using it when the QRM there is a bit heavy—and neither side thinking of it except as a diversion to the main activity.

G3NOF (Yeovil) says conditions were well up—and if Don says that, they must have been superb! However, there were the two solar flares of February 6 and 27 which put a stop to things for a few days. On Fifteen, Don worked a goodly number, including CM2RX, CT2BB, EA9FD, EP2TW, FG7BA, HC2TM, J3AAG, H5FXT, JA2XKM, JA4DZR, JA4JSV, JA4MCS, JA4YNQ, JA6AA, JE30YE, JF1HSH, JH1NZM/MM, JH4EHB, JR1KYC, JR2XOM, K5FP, K7CE (Arizona), K7WWP, KØJD (South Dakota), LA4YU/MM, N5JH, PY1ZBX, PY2MB, VE7IG, VK2NAQ, VK5FA, VK8DA/P, VP2MDA, VP2VEH, VU2LQA, W5MJQ, W5VBX, W6BH, W6OCU, W6KXZ, W6YX, W7QS (Arizona), WA6IXZ, WB5FGD, WB6FDR, WB7NPN/5, WD5FXF, ZB2DV, 7P8BE, ZL3JW; and that lot must be the biggest list from G3NOF for a long time!

G2DHV (Sidcup) remarks on the odd effects when weak signals on one side of the Atlantic and strong ones on the other alternate with each other; but at least the CW end is not as overpopulated as the SSB section. George mentions CW QSO's with *HV3J*, *KZ5*, *ZE*, J28AY, *VK6*, JR6SJC, SU1MI, *5H4*, *PY*, plus the usual *W/VE* and Europeans, and a squiggle which looks like '727'. That's one thing we need in this column—a crystal ball! It would be handy for pre-dating all those DX snippets that are rumoured and which have come and gone again between the time this piece is typed and the time you see the copy —not to mention the handwriting problem!

21 MHz for G3ILO showed all *W* call areas, KP4AIT, FHØBKZ (Mayotte) on CW plus SSB to *W1-4*, *W8* and *W9*.

G2HKU used his HW-8 on Fifteen metres to work UA3DBC; and on a different topic Ted remarks that the station so many have reported as

LA7Y/EA8 is now signing EA8QO.

G4CQK and his HW-8 had a ball on 21 MHz, with WB2SJG, WB9ZKK, WD9GPC, WA9SIW, AA4GA, WB9VJU, K2GJC, all falling to a mere 2·5 watts input power.

G2BJY tried the band out as much as anything to see if his new crystal-mixer VFO was giving any trouble, and proved it as being OK; in the process he worked C6ABA who is G3AMR at home, JHØCAZ, UAØAAK, and had a long QSO with W5MJQ, who is ex-G5BEX and knows Walsall well.

Green in the F9UO log means 21 MHz; there are two bits so coloured, the first of which shows ZS60C, lots of *W's* (the vast majority the two-letter call merchants), *VE* and LA7Y/EA8, while the second, shorter, spell gave QSO's with ZL1AH, 9J2BO, IT9AGA and *W's*.

Ten Metres

Quite apart from the rising sun-spot count (the 90-day mean had been over 100 for the solar flux by mid-February, and *KH6's* have been picking-up *VK* TV stations), things are definitely on the up-trend!

GI4FUM (Lisburn) opens the batting here: Dave stuck entirely to the band, and it brought him in JY9VK, KV4CI, EA9FD (Mellila, but speaks Spanish only), EA8OZ, KV4AQ, A6XB, 4X4ZE, UH8HCE, YBØACH, LZ1ØORF, VE3WW, J28AO, YBØACM, EP2LY, 9K2DR and 9H1DW.

We have a long report from SWL D. Whitaker; David has already heard some 86 countries this year, even though the Sporadic-E season has not yet begun, and well over 110 countries reported in to him by transmitting stations. The times mentioned seem to be all the way from 0700z—at which time OE6DK/YK was logged—right through to 1800z, when *W6*, *W7*, *VE6*, *VE7* and FY7BC appeared in the list.

G3NOF extends the active time to as late as 2030z, when the *W's* have at last faded out on some good days; South Africans in the afternoons, and mid-morning there have been short-path openings to *VK/ZL*/S.E. Asia. SSB QSO's were made with FY7BC, K5GA, K5WH, KØZZ (South Dakota), KG400, N7NA (Arizona), N7NN (Arizona), WB7AEB, WB7EMA (Wyoming), WA6UOR, YBØACH, ZS6BNH, and lots of the run-of-the-mill *W/VE* stations.

January for G4EAN was a matter of UA6ZBL, UK3DDK, and hearing a *KP4* working a *VE3;* however, for February the picture improved as the mornings gave *UA3*, *UA9*, *UB5*, plus a Gotaway VU2LQA, SV1AC, VK6EB who came up to over S9, and in the afternoons most of the *W* call areas and a *VW3*.

Ten-metre CW is G2ADZ's forte, summed up as "Lots DX, Lots QRM!"—although Bill certainly seems to reckon it would be the ideal place for the QRP lads he swapped reports with W5SUR, and they got down to 549 at ten watts and 529 at five watts. Among the DX worked, Bill notes all *W* call areas, *UA9*, *UAØ*, TA1TS, CM2AF, ZP5AO, KV4CI, HC4JL, 9K2DR, VU2BK, EP2LA, lots of *JA's*, *PY's*, *LU's*, and *VK's*—the one of most interest was with VK2NGB, whose uncle is G2ARW.

The G3ILO lot includes both CW and SSB; the former added 9K2DR to the collection of *W* call areas taken on both modes, RH8HBM, and an AM two-way QSO with K2UTC.

G3ZGC/MM found Ten a rather poor thing, with a few weak openings to Europe; but it yielded a bit of humour when a *ZD8* called QRZ QRP, and was promptly called by lots of *W's* using 'exciters' like FT-101's barefoot, and the *ZD8* was amazed at their signal strength!

On to G4EDG, who found the band quite good at times, and raised K7CS, W6DC, FG7AM, VE5UA, VE5BAV, WB7DRO, KØVKH, W7RA, K5OGX, W7WE, A9XBC, VK2NGB (a QRP type), *UL7*, UJ8XCI, *9H1*, UD6BW, VP9BO and PJ7VL, but did not work any of the *JA's* even though his ground-plane was hearing them OK.

G2BJY finally managed to time it right on Ten, and is using mainly CW to a pair of 807's as a push-push doubler PA, but still he isn't working them—*VK*, *W6*, *W7*, *ZS*, *PY*, are all not even heard; but on the other hand East coast *W's* have been very good, as have Eastern Europeans, and Asian Russians. From the very great length of the list of *UD6*, *UI8*, *UA9*, *UAØ*, as many as eight *UL7's*, and 9K2DR, it becomes clear that Geoff's aerial is quite definitely directional and so piling lots of RF into a relatively small segment of the globe—which is rather what one would expect of the longwire arrangements used of necessity by G2BJY.

One session of 'yellow' appears in F9UO's log: Réne spent an hour on the band for some dozen QSO's with *W's* and a *VE*.

G4DMN comes back on to the stage now, having been forced to stick to his ten-metre 'last' by the failure of traps in his aerial; time has also been short due to examinations, but Richard still found time to talk to A6XB, A9XBJ, AP2KS, CE5CN, CE8CH, CT2CB, FG7AN, FY7BC, HK4CUR, JA6EKU, JE2CGR, J28AY, JY4MB, KV4CI, HZ1HZ, KH6IAA, OA4MZ, OK2BFP/D2A, JA1PIG/PZ, RJ8XCQ, UJ8XCV, UI8ZAC, UAØAFJ, UH8HCE, UAOSGL, VE5QI, VE6CC, VE6DF, VE7CML, VE7CMN, VK6NAY, VP2MDA, VS6FE, all *W* call areas, XE2ABN, YB2HO, YBØACH, ZD7PV, ZP5B, *VK6*, 3B8CV and 9K2FO.

Finis

So there it is for another month. It remains before signing off to answer for all a question put by one contributor which is "how do we like it set out." Just as you like, save that it helps if you mark the start of a particular band report with some clear indication of the why and wherefore, and so also with the Gotaways. But heaven forbid that all should adopt a stereotyped approach—half the fun of this task is in the reading of the letters before the start, and enjoying the various different styles and approaches.

The coming month *should* see a peak the like of which we haven't seen for years; and some of the newer licensees may never have heard of such conditions, let alone experienced them—now watch for Murphy's Law! Find the deadlines in the 'box' in the body of the piece, and address all the letters to your scribe, 'CDXN,' SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

AMATEUR RADIO— COMMUNICATION OR TECHNOLOGY, OR BOTH? PART III

MAKING YOUR OWN RF COILS

N. H. SEDGWICK, G8WV

IN *Part II* some contribution was promised towards removing the empirics from designing and making RF coils in the shack. The 'making' bit will be restricted to single layer coils, since multi-layer coils require a specialised wave-winding machine (adjustable to winding length, wire size, and waves per revolution) which is a precision and therefore expensive tool. However, the general design factors are much the same for single or multi-layer coils, taking average coil diameter for the diameter factor in the latter case. An amateur-made wave-winding machine was once seen which was very ingenious, but which limited coil making to a winding of fixed length, single wave per revolution, and allowed no adjustment for wire size, so that there was a maximum size of wire which could be used, and which just laid each turn nicely against its neighbours; smaller wire left space between neighbouring turns, but was usable only over a limited range.

Since most multi-layer coils required by amatersu will be RF chokes or IF coils, there is little point in home-making such readily obtainable coils, although one may well need to do inductance or resonance measurements on them. Quite a large proportion of the coils required by an amateur will be single-wound coils, as in pi-couplings, transmitter output low-pass filters, etc.

Basics

Coupled coils in the HF spectrum generally have a main tuned winding and a smaller untuned winding wound on the same former and loosely coupled to the main winding. The coupling becomes critical if one wants to achieve a specified frequency band-pass coupling effect, but this is seldom essential in the RF sections of an HF receiver because the IF couplings take care of such matters. In transmitters a multi-section ganged condenser is much easier to ensure tuning of the stages up to the actual PA drive than to use band-pass couplings, each designed to pass one amateur band. The amateur who intends to make his own HF coils is therefore advised to avoid making up circuits requiring band-pass couplings, and to stay with simple non-critical coupling arrangements.

When designing a piece of equipment covering a wide range of the HF spectrum one must decide how best to arrange the tuning. If continuous frequency covering is required one must divide the spectrum up into a number of wavebands, each requiring its own coil, tuned by a condenser whose capacity ratio from minimum to maximum, including circuit capacities, will provide the correct frequency tuning ratio. Since resonance is proportional to the square root of the product of the inductance and capacity in a tuned circuit, and normally the inductance is fixed so that variation is due to capacity change only, the frequency ratio of the tuning is equal to the square root of the capacity change ratio. Thus for example, if the capacity change from minimum to maximum is 4 : 1 ratio, the frequency change will be 2 : 1 ratio. Again, if one wishes to tune a coil of 14 microhenrys from 2 to 6 MHz with a minimum capacity of 50 pF, the maximum capacity needed is $(6/2)^2 \times 50 = 9 \times 50 = 450$ pF, and this includes the minimum capacity.

Perforce we must start our design with the minimum capacity which will consist of:

(*a*) Minimum capacity of the tuning condenser (C_{min}),
(*b*) Circuit capacity (wiring, inter-electrode etc.),
(*c*) Trimming deliberately connected across the circuit for band-edge setting, tracking, or tuning ratio adjustment.

All these three are in parallel as far as resonant frequency is concerned, and (*b*) and (*c*) must be added to the rated maximum of the tuning condenser when calculating the low frequency end of the band. If then we have a tuning condenser with C_{min} quoted as 10 pF and its maximum C_{max} as 160 pF there is a capacity swing of 16 : 1 ratio which would give a frequency range, $\triangle f$, of 4 : 1. Assume stray capacity (*b*) is likely to be around 20 pF, bringing the minimum possible to 30 pF and the maximum to 180 pF, giving a frequency range of $\sqrt{6}$ or 2·45 : 1. It will be noted that tuning range is very responsive to minimum capacity change.

Suppose we wanted to give each tuning range a 2 : 1 frequency band:—Let y be the external capacity (*b*) + (*c*) which must be added to achieve this,

Then: $C_{max} + y = (\triangle f)^2 \times (C_{min} + y)$, (i)
therefore $160 + y = 4(10 + y) = 40 + 4y$,
thus $y = 40$.

We have assumed (*b*) to be 20 pF, so further capacity must be added to bring y up to 40 pF and this can conveniently be provided by a 3-30 pF trimmer, so allowing correction for any error in the assumption that stray capacity (*b*) is 20 pF.

In *Part II*, Fig. 3, we showed a tuned circuit associated with TR3 using a split-stator condenser; this will not affect the tuning ratio but it will affect the resonant frequency by halving the capacity across the inductance. In the case of this oscillator five ranges were used to cover a required spectrum from 1·6 to 30 MHz, which allows a small overlap between ranges at each end if the tuning ratio is 2 : 1. They can be set as follows :—

Range 1: 1·5—3 MHz Range 4: 9·0—18·0 MHz
Range 2: 2·75—5·5 MHz Range 5: 16·0—32·0 MHz
Range 3: 5·0—10·0 MHz

With such overlap, individual calibration and care in coil design and manufacture, two fixed condensers can be selected to provide (*c*) and will reasonably serve on all ranges without necessity to switch them.

We now have to calculate the inductance of each coil for the above ranges, and shall opt for the lower frequency of each range in the formula, substituting maximum capacity of 100 pF in the formula, which is derived from the standard formula for resonance:—

$$f_o = \frac{1}{2\pi\sqrt{LC}},$$

where f_o = resonant frequency, L = inductance, and C = capacity.

These are all in main units, Hz, Henrys, and Farads, and very inconvenient for our RF application, so let us put them into MHz, microHenrys, and picoFarads. The formula then becomes:—

$$f_o \times 10^6 = \frac{1}{2\pi\sqrt{L \times 10^{-6} \times C \times 10^{-12}}} = \frac{1}{2\pi\sqrt{LC \times 10^{-18}}}$$

$$\text{Squaring, } f_o^2 \times 10^{12} = \frac{1}{(2\pi)^2 LC \times 10^{-18}}$$

$$\therefore f_o^2 = \frac{10^6}{39{\cdot}478602LC} = \frac{25330{\cdot}177}{LC} \qquad (ii)$$

$$\text{and} \quad L = \frac{25330{\cdot}177}{f_o^2 C} \qquad (iii)$$

$$\text{and} \quad C = \frac{25330{\cdot}177}{f_o^2 L} \qquad (iv)$$

In these days of cheap pocket electronic calculators one does not need early approximation by crossing out small decimal fractions during calculations.

Using formula (*iii*) we calculate L for each range as follows:—

Range 1: 112·578 microHenrys
Range 2: 33·494 microHenrys
Range 3: 10·132 microHenrys
Range 4: 3·127 microHenrys
Range 5: 0·989 microHenrys

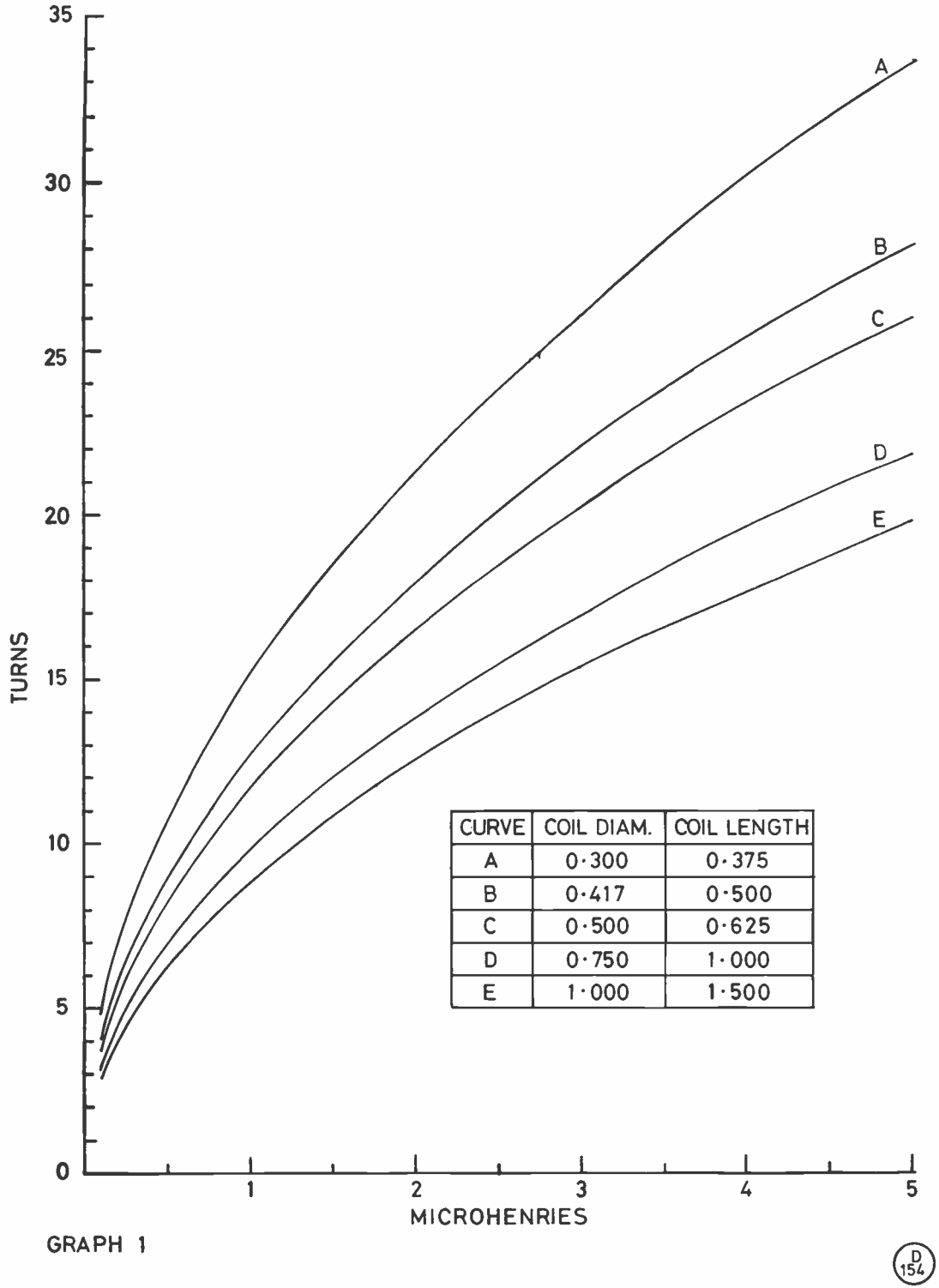
In an air-cored coil having a circular winding there are three parameters which together determine its inductance; these are length of winding, diameter of winding, and number of turns. Introduction of a ferrite dust core into the coil will increase its inductance, but introduce some frequency limitation into its characteristics (manufacturers produce different grades of ferrite material for use at different frequencies); cores threaded to run in moulded coil formers are usually coloured at one end to identify the material and the maximum frequency for which it should be used. If one wishes to make a coil adjustable by means of a ferrite core it is generally sufficient to design the coil as for an air-cored one having 25-30% less inductance than intended when ferrite-cored. If a coupling coil is wound on the same former adjacent to the main winding the degree of coupling will be greatly affected by whether the core is physical positioned away from the middle of the main winding towards or away from the coupling winding. When screwing a core into a coil inductance will increase until the core is right in the middle of the winding; screwing it further in the same direction will cause inductance to fall again as the core emerges on the other side of the middle. When adjusting a coil by peaking the core position for maximum signal one can be misled if the inductance is too small to achieve resonance, for a peak will be found as the coil inductance passes through a maximum with the core in the middle which is often mistaken for resonance. In fact, if resonance falls within the adjustment range, two peaks should be found, *i.e.* resonance as the core approaches the middle and again on the way out past the middle at the other end of the coil.

At least one of the amateur handbooks gives empiric formulae for design of air-cored circular winding coils, and these work out well in practice, apart from being somewhat cumbersome; the graphs in Figs. 1 and 2 show turns plotted against inductance for a variety of coil proportions adaptable to comply available formers. The maximum inductance catered for by these graphs is 50 microHenrys as coils above that value are more conveniently wave-wound. The coil for *Range 1* of the group shown above is therefore out of our manufacturing capability at 112·578 microHenrys, but a standard 1·6 MHz IF coil which resonates with 100 pF capacity is easily obtainable, and one of the windings with the condenser across it removed can be used in this position; the core will enable it to be adjusted up to 1·5 MHz in the oscillator. However, we can design and make the other coils.

Coil Formers

Fig. 3 shows a collection of commercial coil formers of three general types. The three lower ones shown have internal threads which enable threaded ferrite cores to be screwed into them, and they all fix to the equipment chassis by two small screws. The two immediately above them are moulded bakelite formers with a threaded protrusion at the tops. To mount them a clearance hole is drilled in the chassis through which the protrusion is pushed and a spring clip (seen in place on the right-hand one) is pushed over it to hold the former firmly to the chassis. The ferrite cores for these two formers have a length of brass threaded stemming projecting from one end with a screwdriver slot at its tip; this runs in the thread in the former protrusion, and can be seen in the right-hand example. The left-hand example has a thread along its entire winding length in which the coil wire seats, thus automatically fixing the coil length for a given number of turns, irrespective of wire size, and in fact gives an accurate spaced-turn winding up to a maximum of 35 turns. The top coil is a plain *Paxolin* tube with two *Paxolin* rings which slide tightly over the tube and secure the ends of the winding; it is mounted to the chassis by pushing tightly onto a knurled bush riveted into the chassis, and a tapped hole through the bush accommodates a ferrite core with threaded brass extension for adjustment. In the case of coils having threaded brass extension cores they are fixed after adjustment by a lock nut, which can be frustrating because tightening the nut will often pull the coil slightly off tune.

The threaded ferrite cores have screwdriver slots in their ends which will crumble easily if any firm resistance to their rotation is encountered when screwing them in: they are therefore manufactured to run quite loosely in the former threads, and need a method of locking them to prevent movement due to vibration etc., after adjustment. Various pastes and high viscocity lubricants are available to smear on the cores and dampen movement without causing seizure during adjustment. Snags are that the paste generally hardens with time and eventually locks the core solidly into the former, and the lubricant oozes out with heat from the electronics and makes



CURVE	COIL DIAM.	COIL LENGTH
A	0·300	0·375
B	0·417	0·500
C	0·500	0·625
D	0·750	1·000
E	1·000	1·500

Fig. 1. Graph showing coil turns against inductance for a variety of coil proportions, 0.1 to 5 microHenrys.

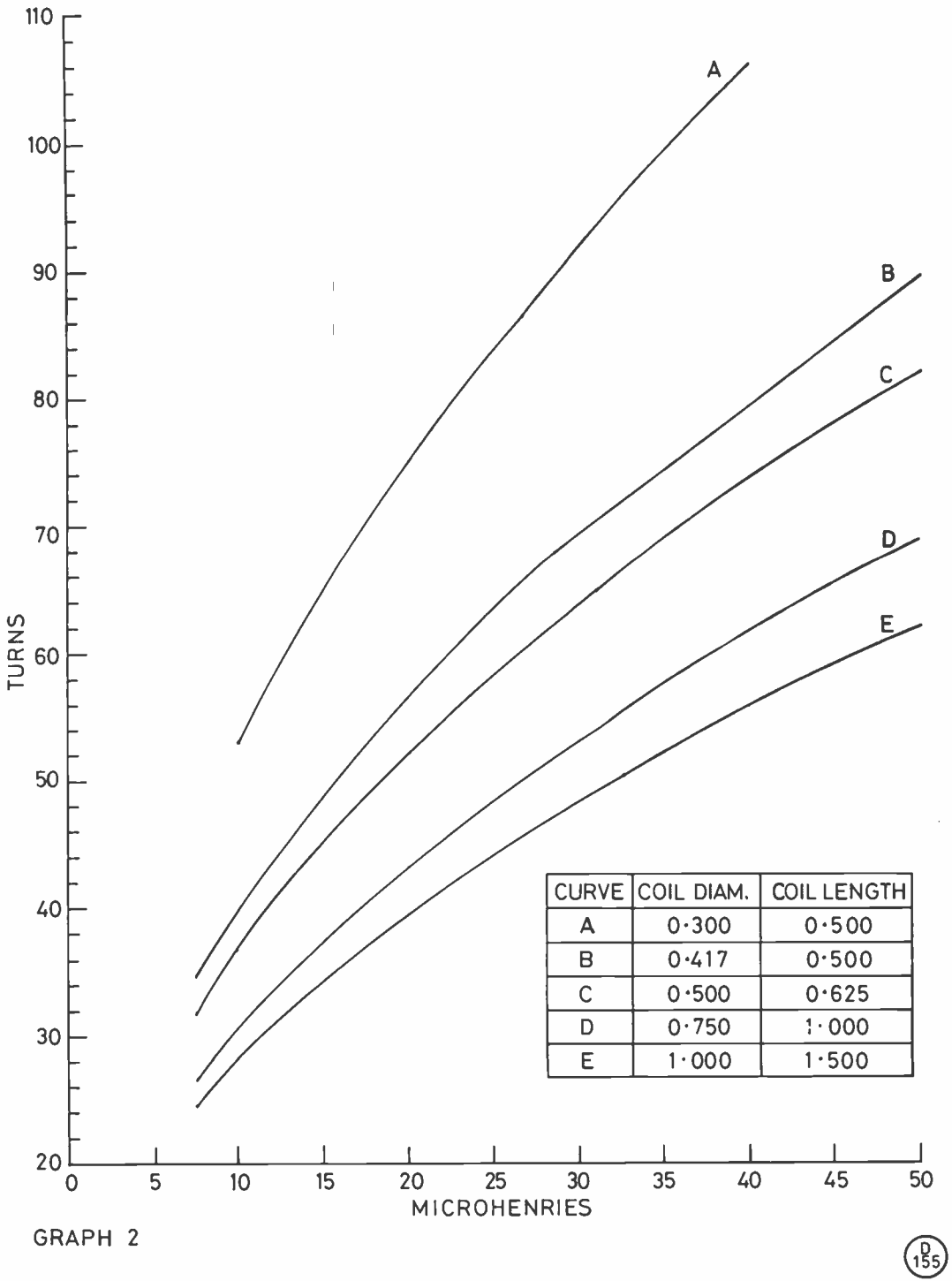


Fig. 2. Graph showing coil turns against inductance for a variety of coil proportions, 7.5 to 50 microHenrys.

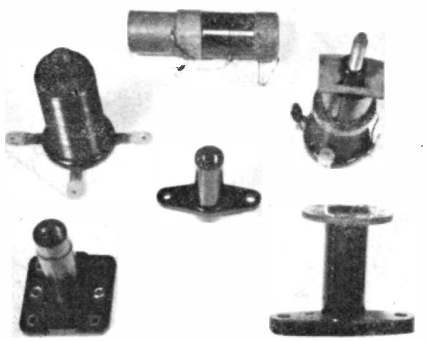


Fig. 3. Some types of commercial coil formers.

a mess. The writer has found that the best thing with which to lock the cores is a thin rubber string produced for the purpose; failing that, a piece of thin rubber band is a good substitute. A short length of the string is laid in the former along its length and the core screwed in, compressing the string as it travels; when eventually the rubber perishes it continues to lock the core against vibration, but breaks into dust if the core is turned by a screwdriver, so that it may be removed without breaking.

In general the two most common formers found in surplus equipment of the pre-solid-state era are the lower pair shown in Fig. 3. The left-hand one comes in various heights with matching screening cans; six eyelet rivets in its square base will pass short lengths of 18 *s.w.g.* copper wire which can be soldered to the rivets and used to make off the winding ends and serve as connectors protruding through the chassis on which the coils are mounted. The former diameter is 0·295in. and thus well-suited to a curves 'A' on the graphs in Figs. 1 and 2. The thread of the core is standard 'O' BA, so that an 'O' BA screw or length of stemming can be screwed into the former to support it during winding operations.

The right-hand former, with or without its bakelite tag-bearing ring shown pushed over the tip and stuck with *Araldite*, has a diameter of 0·415in. and so suits curves 'B' in Figs. 1 and 2; it has a $\frac{5}{16}$in. thread which appears to be BSF in pitch. It is possible to screw a $\frac{5}{16}$in. BSW bolt a couple of threads into the former before it tightens up, and this is adequate to support the former during winding operations.

Coil Winding

Winding a coil held in the hand is a troublesome business, especially if the turns are many and the wire fine. On these plain formers with internal threads it is possible to start the winding by securing the wire to a tag on the former or fixing it with a tiny piece of sticky tape, but at the end of the winding if it is held in the hand one has to keep the wire taut whilst fixing it to the former, and one finds a shortage of hands for the job!

With pieces taken entirely from the junk box a simple winding machine was made, *see* Fig. 4. The chuck is from a burnt-out pistol drill and is fitted to a length of $\frac{3}{8}$in. dia. silver steel on which the winding handle (sawn and filed from a piece of $\frac{3}{4}$in. x $\frac{1}{8}$in. bright mild steel strip screwed to a $\frac{3}{4}$in. brass boss fitted with a grub screw) slides. Between the chuck and the L-bracket is a large washer on which a piece of soft rubber (motor tyre inner tube!) is stuck with *Evostik*, and this is compressed by pushing the spindle into the handle boss before tightening up its grub screw, so that the handle will turn readily enough but the rubber will stop it slipping back and slackening the wire when one removes one's hand from the handle.

The wire reel stand is made from a length of electrician's steel conduit screwed into a flange fitting. At the top a $\frac{5}{32}$in. hole is drilled right through the tube and the hole on one side then opened to $\frac{3}{8}$in. The $\frac{3}{8}$in. silver steel spindle is drilled and tapped 4 BA at one end, and this end is then pushed through the $\frac{3}{8}$in. hole at the top of the tube and secured by a 4 BA screw through the $\frac{5}{32}$in. hole; the wire reel is held against a compression spring by another boss with a grub screw seen on the right of the reel. The compression spring and the two moulded bakelite pieces between which it mounts were in fact taken from the cap of a very old valve screening can from the days when low power trides stood four inches high! Tension on the wire is adjusted according to its size and strength by positioning the boss on the right along the spindle and tightening the grub screw. The aim is that the reel, wire and chuck stay put when the hand is removed from the handle so that the coil winding does not slacken. The author found he could wind down to 42 *s.w.g.* enamelled wire with this device handled carefully, guiding the wire with the right hand and winding with the left; 42 *s.w.g.* wire has a diameter of just four thousandths of an inch, and is about the smallest wire any amateur is likely to need to wind on an RF coil. For the type of former discussed here it is suggested that 26 *s.w.g.* at 0·018in. diameter is probably the thickest wire likely to be used; it is recommended that a small stock of 30, 34, 38 and 40 *s.w.g.* enamelled copper wire be held also. The wire is quite expensive to buy in small quantities, yet HF coils use such a small quantity for a winding that the amateur would never benefit by buying his wire in what a professional would regard as economic quantities; therefore only a limited range of sizes need be held, and fancy insulation coatings are to be avoided.

Adhesives

Whilst professional coil winders dabble in masses of adhesive tapes of all kinds, one needs to know just what one is using; some of the adhesives are quite acidic and attack the copper. *Durofix* adhesive has been found excellent for sticking down fine wire windings, and applied from the tube and smoothed round with a finger tip, it quickly sets; it should be applied with the former still held in the winding machine with the wire

under tension. When set, the wire can be snipped and terminated on its tag. Thicker wire, say from 30 *s.w.g.* down, really requires something stronger, and it is satisfactory to tie the wire to the former with a clove hitch plus half-hitch of waxed thread before applying the *Durofix;* Beeswax may be obtained from old-fashioned style ironmongery shops, and a spool of stout sewing thread can be boiled in it in a small tin. The plastic bobbins now used for the thread dislike this treatment and turn into a sort of chewing gum, so wind some thread off onto a piece of dowel stick before hot waxing it.

To clean the enamel off copper wire for terminating and soldering it use a small piece of fine glass paper; very thin wire and certainly *Litz* wire (composed of a number of individually enamelled strands and the whole lapped in silk) will need the enamel burning off. Take a small metal bottle cap, or something similar, which can be filled to at least a $\frac{3}{8}$in. depth with methylated spirit and clamp it 'orifice-up' in a vice, put in the spirit and light it. Put the end of the wire in the flame until it glows red hot and then plunge it through the flame into the spirit below and withdraw quickly; this strips the enamel off beautifully, but have something handy to extinguish the flame. A small asbestos oven plate (same ironmonger!) laid on top will do fine.

Selecting the Wire

Our graphs require winding length to be known as well as diameter of the coil. For coils with a lot of turns one can select a wire gauge to give the right length when close-wound once the number of turns is known. For example, suppose we require a coil of 15 microHenrys wound to the proportions of curve 'B' on Fig. 2. We see from the graph that 49 turns are required and the winding length should be 0·5in. This means we need a wire thickness which gives 49 x 2 = 98 turns per inch; look this up in a copper wire table, which tells us that 34 *s.w.g.* enamelled wire winds exactly 98 turns to the inch. Sheer luck, and seldom as easy as that!

Generally some adjustment has to be made, like slightly spacing turns of a smaller wire because we do not have the best size of wire; if the coil is to have a core it does not matter, for the core will allow adjustment. Spaced winding can be made very accurate by selecting two wire sizes which, wound together side by side, give the correct length, and then removing one winding after the adhesive has set. The remaining winding will then be neatly spaced between turns by the diameter of the wire removed.

Working to Fig. 1, suppose we want a coil to curve 'A' proportions having one microHenry inductance. The number of turns will be 15 for a winding length of 0·375in., giving a winding pitch of 40 turns per inch; the nearest one gets to that is 24 *s.w.g.* at 42 turns per inch, but this is rather a heavy gauge to wind on such a small former, yet too light to be wound self-supporting. However, 32 *s.w.g.* enamelled wire winds at 83 turns to the inch, so two strands of 32 *s.w.g.*, with one serving as a spacer, wound for 15 turns will produce a winding length of 0·36in. instead of the 0·375in. required, an error of 4 per cent. If we need to be more accurate one of the strands could be made 31 *s.w.g.*, which winds at 77·8 turns per inch and which, side by side with 32 *s.w.g.*, winds at 40·158 turns to the inch; 15 turns will then be 0·3735in. long or one and a half thousandths of an inch too short.

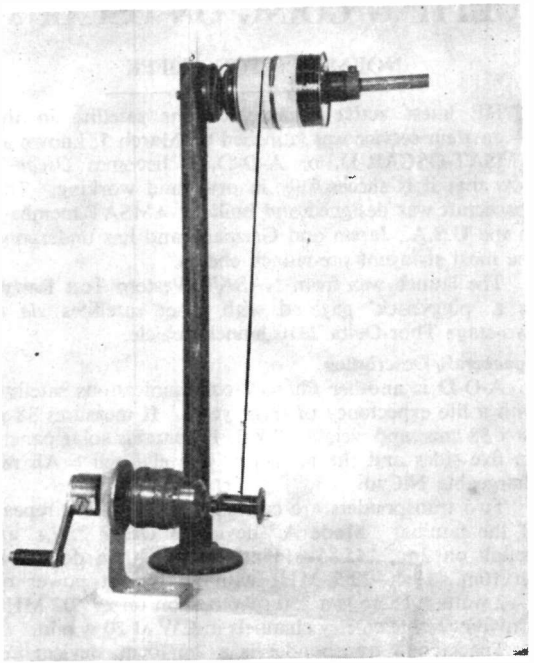


Fig. 4. A coil winding machine straight from the junk box.

We could not measure that error with our little steel ruler!

Actually we have been splitting hairs regarding accuracy, for the tolerance on the wire diameter and our capability of accurate measurement make it impossible for us to work so closely, but since resonant frequency varies as the square root of any change in the inductance of the tuned circuit we can stand some error without worry.

Self-supporting coils wound with thick wire will need to be wound on a former of some kind, such as a piece of dowel rod, and then slid off. The wire should be cut to a little more length than actually required and then stretched slightly by clamping one end in a vice and pulling the other end with a big pair of pliers; this takes out all kinks and hardens the copper a little. The coil can be wound with two strands side by side to fix the turn spacing. When the winding operation is complete and the coil released by the hands the coil will spring a little and the diameter increase: it will be necessary to experiment to determine the best former diameter to use so that the coil will be at the correct diameter after the springing has taken place. Always overwind the number of turns a little, because the increase in diameter must reduce the number of turns fractionally.

Checking

When coils are completed the inductance can be checked by resonating them with a close tolerance condenser, say 100 pF, and finding the resonant frequency with the test instrument described in *Part II*, or some other dip meter. Formula (*iii*) above can then be applied to find the inductance in microHenrys.

to be continued

GETTING GOING ON OSCAR 8

NORMAN FITCH, G3FPK

THE latest active communications satellite in the amateur service was launched on March 5; known as AMSAT-OSCAR-D, or A-O-D, it becomes *Oscar 8* now that it is successfully in orbit and working. The spacecraft was designed and built by AMSAT members in the U.S.A., Japan and Germany and has undergone the most stringent pre-launch checks.

The launch was from NASA's Western Test Range as a 'piggyback' payload with other satellites *via* a two-stage Thor-Delta 2910 launch vehicle.

Spacecraft Description

A-O-D is another Phase 2 communications satellite with a life expectancy of three years. It measures 38 x 38 x 33 cms. and weighs 27 kg. It contains solar panels on five sides and the battery is a twelve-cell 6 Ah re-chargeable NiCad.

Two transponders are carried. The first is a repeat of the familiar "Mode A" device in *Oscar 7; i.e.* an uplink on 2m., 145·85—145·95 MHz with a downlink on 10m., 29·4—29·5 MHz with an output power of 1—2 watts. There is a 250 mW beacon on 29·402 MHz providing six telemetry channels in CW at 20 w.p.m.

The second transponder is a 2m/70cm. device; *i.e.* an uplink of 145·9—146·0 MHz with a down link of 435·2—435·1 MHz. This is known as "Mode J" as it was constructed by members of the Japanese AMSAT Association. Its power output is 1—2 watts p.e.p. and the passband is *inverted; i.e.* USB signals come down as LSB. There is a 100 mW telemetry beacon on 435·095 MHz. Details of the transponders are given in Table 1 and formulae for telemetry decoding in Table 2.

The spacecraft's 2m. receiving aerial is a canted turnstile of four 48cm. lengths of 12mm. carpenter's rule connected to develop circular polarisation. The 10m. transmitting aerial is a dipole at right angles to the spacecraft's stabilisation magnets. The 70cm. transmitting aerial is a linearly polarised monopole.

The relationships between uplink and downlink frequencies for both modes are given by the following formulae:—

Mode A: $F_d = F_u - 116{\cdot}458 \pm$ Doppler shift
Mode J: $F_d = 581{\cdot}1 - F_u \pm$ Doppler shift
where F_d and F_u are in MHz.

Orbit Parameters

A-O-D will be in a lower orbit than *0-7* with an apogee of 929 kms. and a perigee of 884 kms. The period is 103·23 minutes giving fourteen orbits per day. The orbit is planned to be sun-synchronous with passes repeating at the same time every day making tracking that much simpler. The inclination is 98·99°.

A graphical presentation of AOS, TNA, LOS and azimuths is given in Fig. 1 from which it can be seen

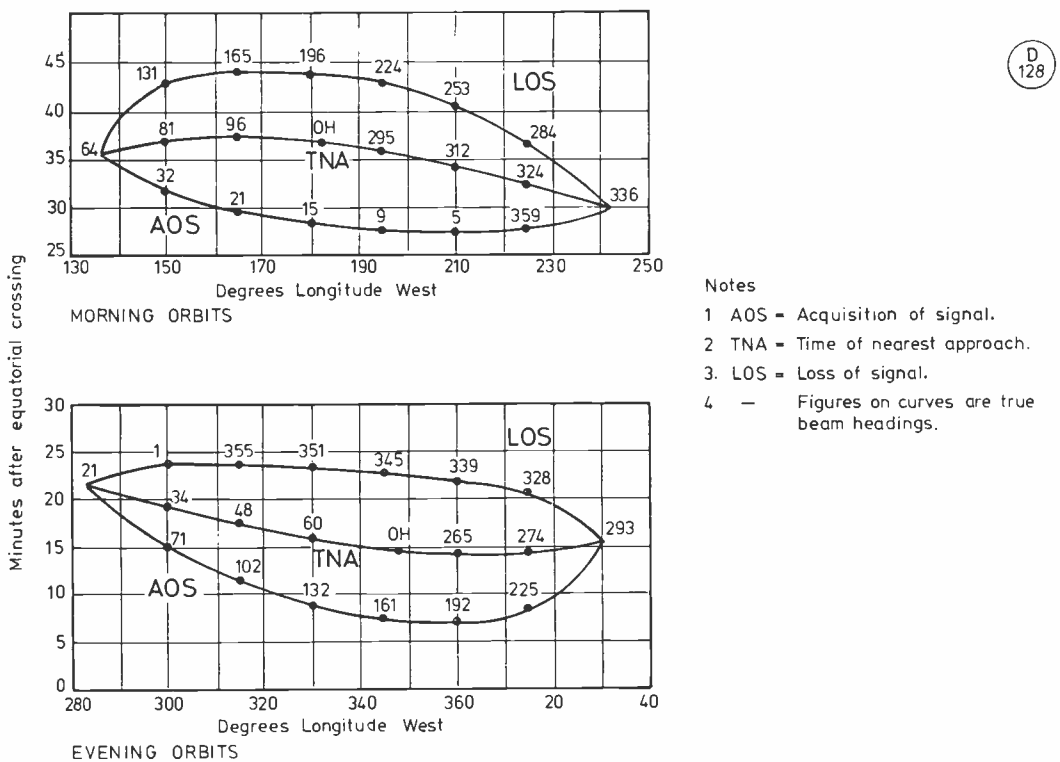


Fig. 1 OSCAR 8 SATELLITE PREDICTION CHART (Compiled for London)

MODE	TLM MHz	UPLINK MHz	DOWNLINK MHz	REMARKS
A	29·402	145·85-145·95	29·40- 29·50	Inverted
J	435·095	145·90-146·00	435·20-435·10	

Table 1. Transponder details.

that A-O-D will be available for two separate periods each day. Orbit information will be available on the various AMSAT nets such as the Western European one on 3780 kHz on Sundays at 10·00 a.m. local time, the London area VHF net on 144·28 MHz from 7.30 p.m. local time on Sundays, or the international nets on Sundays at 1800 GMT and 1900 GMT on 14·28 and 21·28 MHz respectively. Once a reference orbit is known, others can be calculated by adding or substracting 102·79 minutes to the time and 25·7° to the longitude.

The maximum horizon range should be about 3500 kms. giving a maximum station-to-station ground range of about 6400 km. On overhead passes, the satellite should be in range for about 15½ minutes. From London the following areas would be within range:—the eastern half of Canada, northeast U.S.A. to about Detroit, Bermuda, equatorial Africa, Arabia, West Pakistan and mid-Asiatic Russia. The Caribbean and South America are well out of range.

Ground Station Requirements

For Mode A approximately —95 dBm. is required at the transponder's receiver input terminals to produce one watt output. Assuming a 3 dB polarisation mismatch, at a range of about 2000 kms., an e.r.p. of 80 watts would produce this one watt output.

For Mode J *much less power is required; e.g.* 8 watts e.r.p. at 2000 kms. This means that the amateur using a small SSB transceiver with a simple aerial like an *HB9CV*, should have no trouble accessing the satellite. However, under certain conditions, up to 80 watts e.r.p. *might* be required for the same 2000 kms. range.

Band Plan

The latest G3ZCZ band plan will apply to A-O-D and this is shown in Fig. 2. This plan is for the *downlink* bands. Remember that because Mode J downlink is inverted, you will have to transmit CW at the *top* third of the uplink passband and SSB in the bottom third.

Operating Schedule

At the time of writing, the precise operating schedules have not been published. As the prime purpose of A-O-D is educational in the U.S.A. it is likely that it will be in Mode A on weekdays over the U.S.A. and on Mode J at weekends. Further information can be gleaned from the aforementioned nets.

CHANNEL	PARAMETER		FORMULA	UNITS
1	I_T	Total solar array current	7·15 (101-N)	mA
2	I_{Bat}	Battery charge/ discharge current	57 (N-50)	mA
3	V_B	Battery voltage	0·1N+8·25	Volts
4	T_{bp}	Baseplate temperature	95·8-1·48N	°C
5	T_{Bat}	Battery temperature	95·8-1·48N	°C
6	P_{JT}	RF power out mode J	23N	milliwatts

Table 2. Telemetry decoding formulae. *Note:* **A typical 'frame' would be 120 255 380 451 551 620 HI. The 'N' is the last two figures in each group.**

Conclusions

Unlike *0-7*, A-O-D requires one to have a transmitter only for the two-metre band with receiving facilities for ten metres and/or seventy centimetres. Because its orbital velocity is about 4% greater than that of *O-7*, the Doppler shift will be a little more. This latest satellite should tide us over until the first of the Phase 3 satellites is put into orbit, presently planned for December next year. If the Russian OSKARS are successfully launched, 1978 might be the first year when three amateur satellites were functioning.

Acknowledgements:

This article is based upon information abstracted from "The AMSAT-OSCAR-D Spacecraft" by Perry Klein, W3PK, and Joe Kasser, G3ZCZ, published in the "AMSAT Newsletter" for December 1977 by AMSAT, P.O. Box 27, Washington D.C., 20044, U.S.A.

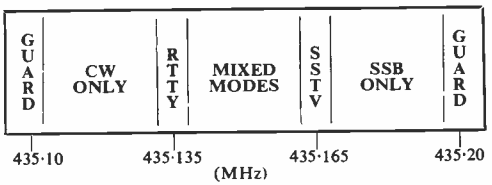


Fig. 2. A-O-D Bandplan. *Note:* **Guard channels 5 kHz wide.**

CHANGES IN THE R.A.E.

From 1979 the Radio Amateur's Examination will be in the form of objective tests containing multiple-choice questions, and anyone preparing alone for his or her amateur licence and living in the London area, may be able to assist the City and Guilds of London Institute.

In preparation for this change the Institute is to pretest objective questions, trying them out on candidates who have reached examination standard. Pretests are intended to test the performance of individual questions and syllabus coverage. Information is obtained which assists the Institute's reviewing panels in judging whether each individual question should be included in the question bank for use in future examinations.

In order to obtain reliable information, pretests must be administered to a sample of students which is as representative as possible of those who will take the examination. Many would-be licensed amateurs prepare for examinations without following a college course, and the Institute invites such candidates who live around the London area to assist in the pretests. As well as helping the City and Guilds, the tests may help would-be examinees to revise their work and gain some examination experience (volunteers who participated last year found the morning helpful and interesting).

The pretests are to be held at City and Guilds of London Institute, 76 Portland Place, W1 on Tuesday May 2 1978 from 10 a.m. Anyone willing to assist please contact Miss Jackie Clifford (01-278 2468 Ext 485). Invitations will be issued to elegible candidates.