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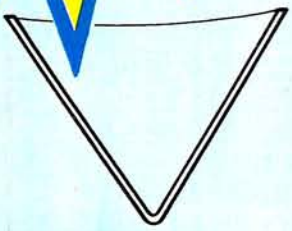
Practical Wireless

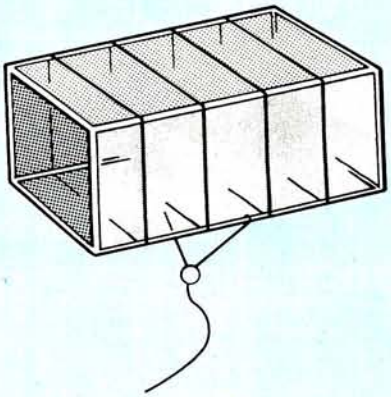
THE RADIO MAGAZINE

HF ANTENNA SPECIAL

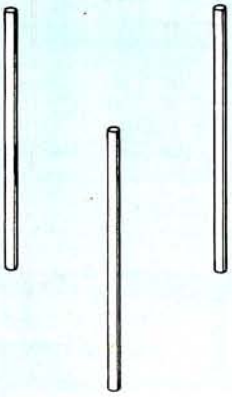
Two Band Mini-X Beam



The Vertical V Antenna



Kite Antennas For Top Band



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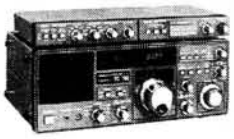

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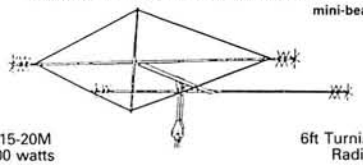
mini-beam



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MMC144/28	2M Converter to HF Rig	29.90	(—)
MMC432/28S	70cm Converter to HF Rig	37.90	(—)
MMC432/144S	70cm Converter to 2M Rig	37.90	(—)
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FOR THE Radio ENTHUSIAST ...

Practical Wireless

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Westover House
West Quay Road
Poole, Dorset BH15 1JG
℡ Poole 671191

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for the HF man, the **TS 430S**

£736.00 inc vat carriage £6.00

A new HF transceiver, taking into account the outstanding performance of the previous Trio rigs you could be forgiven for thinking that it would be impossible for them to improve on existing models and specifications. Alternatively of course, you might be of the opinion that engineers with the talents as displayed by the designers of such rigs as the TS830S, TS130V and TR2500 etc. would have no trouble in pushing forward the frontiers of transceiver technology s we know it today.

The new HF transceiver from Trio is the TS430S. Those who have seen it and the fortunate ones who have used it on the air are all agreed that here we have a major advance for the enthusiastic operator on todays busy bands. Not only does the transceiver have full amateur band coverage from 160 to 10 metres (including the three new bands) but it also incorporates a general coverage receiver (150 kHz to 30 MHz). The new transceivers features are many; USB, LSB, CW, and AM with FM available (optional FM430 board), compact size 270mm wide/96mm high/275mm deep, continuous tuning over the entire frequency range, two separate VFO's and an up/down scan mode using the optional MC42S microphone. Eight memories, each of which can be used as a separate VFO are provided and frequency scan is programable between the two frequencies held in memory channels six and seven. Not only does the memory remember frequency but also the mode of operation, thus short wave DX and Broadcast stations can be stored alongside a SSB net channel and complete sense made as the frequencies are scanned. The by now normal Trio features are all included, IF shift, notch filter, speech processor and narrow/wide filter selection on CW, SSB and AM modes.

The TS430S, Trio's rig for todays operator.

and now **RTTY, ASCII** and **CW** using **TELEREADER** equipment.

I must confess that I was extremely sceptical regarding RTTY and the equipment already on the market. To realise that we were to market the Telereader range did not fill me with enthusiasm. That was the situation before Saturday 22nd October. Being the devoted company man that you all know, I decided to upset my tidy shack, remove TRIO TS700S and put in its place a TELEREADER CWR 685E complete with matching keyboard. The rig was taken home and connected to my shack power supply. After much study of the most comprehensive manual that I have seen, I made the necessary connections to the TS780. I must quickly point out that to connect any of the TELEREADER equipment to either a reciever or transceiver is simple. In the case of the top of the range CWR685E, three connections are required. These are, audio in from the external speaker socket of the TS780, transmit signal from the TELEREADER to the TS780 front panel microphone socket and finally a PTT line which again uses the front panel microphone socket. Simple!

Having previously studied the two metre band plan I tuned the transceiver to 145.300, the RTTY afsk calling frequency (audio frequency shift keying) and waited. At this point I must confess I thought about half an hour would be enough, and then I could restore the TS700S to its rightful position. However, before 5 minutes had elapsed the TS780 burst into life but there was nothing on the screen. I quickly changed the baud rate, no success. Getting technical now! The information was arriving but I was still getting nowhere.

To speed up matters I decided to throw caution to the wind and transmit, pressed control key + A and began to type. Result: nothing! the TELEREADER appeared to work but not properly, when I stopped typing no idle tone could be heard, just a continuous carrier.

I must now mention G8FCQ who was the operator I was trying to copy. A more helpful chap I have yet to meet and quickly he put me right. Soon the CWR685E was idling away to itself and typing began. My problem was simple. TELEREADER have designed a beautiful machine, the 33 control commands put the keyboard in control of all functions and make operating a pleasure, but you have to know the commands. Not all of them but the basic ones. For example control key + key A pressed together change the rig from receive to transmit, control key + key Y + key establishes the idle mode and control key + key W sets the page on the monitor so that the five memories can be prewritten.

Why have memories and what is meant by "page"? Until you have experienced RTTY you will have no concept of the different and refreshing style of operating. By splitting the screen into two, you can receive at the top of the screen and at the same time be typing your reply at the bottom. When the other station has concluded his over and sends you "DE G8FCQ KKK" then you can quickly go to transmit (control key + A as you have already instructed the equipment to be in idle mode). The CWR685E begins transmitting what you have already typed at full speed. Soon you are caught up and from then on progress is at your typing speed which in my case is slow, hence the thoughtful inclusion by TELEREADER of memory. The memories are written prior to going on the air or loaded from tape storage and can be up to 5 blocks of information. For example; a CQ call complete with callsign, a response to someone else's call, a description of the station and in the final memory "73 DE G8GIY, THANKS FOR A FINE CONTACT BI BI". Having mastered the memories then you can prepare a sequence transmission. Again for example; memory 0 three times, station identification followed by a DE G8GIY KKK and, now for the sophistication, you can pre-instruct the TELEREADER to return to receive. Real armchair operation, key in control + key A and sit back to await a call. All the normal test transmissions are included and, don't forget, the rig also has ASCII and CW.

I must confess that I have used neither the CW or ASCII modes. My attention has been held by the number of contacts I have had on RTTY. Having said that, one RTTY contact has requested that I stand by with ASCII whilst he moves his terminal into the shack. I await his call.

It is most important that I convey the TELEREADER'S ability to receive under the most difficult conditions, the "fine" control on the front panel adjusts the tuning frequency of the space filter relative to a fixed mark frequency. So if the station you are trying to copy is not perfectly set up re. mark and space then you can make the necessary corrections yourself. This attention to detail is applied to all aspects of TELEREADER equipment and one doesn't have to use the equipment for long before concluding that a skilled electronic design team has been this way before.

You may have discerned my enthusiasm, I've thrown my microphone away!, after all, on that first weekend I worked on the TELEREADER, ON7XT, perhaps not the best DX but good enough for a beginner.

CWR685E RX/TX Unit	**£730.99 inc vat**
CWR670E RX Only	**£335.00 inc vat**
CWR610E RX Only	**£175.00 inc vat**

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for the VHF operator, the **TR7930** mobile transceiver

£305.21 inc vat carriage £6.00

Any amateur who has used or owns a Trio TR7800 has had the finest piece of 2 metre mobile technology at his fingertips. The TR7800 had simply everything that the keen mobile operator could ever want. Of course, there were a few points which customers said could be improved on and, I must admit, we, in the majority of cases, agreed. Trio, with the introduction of the new TR7930, have taken note of this feedback of information and the result, I am sure you will agree, is as close to perfection as you will find in a rig.

The improvements are, a green floodlit LCD readout which does not disappear in strong sunlight, additional memory channels, both timed and carrier scan hold on occupied channels, selectable memory channel for the priority frequency and automatically corrected mode selection (simplex or repeater) without having to instruct the rig. The most significant change is the liquid crystal frequency readout on a green illuminated background, but closely following this must be the ability to omit specific memory channels when scanning, and the programmable scan between user designated frequencies. This gives the rig the ability to scan simplex channels only, without holding on repeaters.

The Trio TR7930. The mobile 2 metre FM rig designed with ease of operation coupled to outstanding performance.

for the serious UHF and VHF operator, a DXing transceiver, the **TS780**.

With the arrival of the TS780, the dual bander rig has come of age, giving the two band multimode facilities of the original concept, plus a wealth of additional operating facilities. Taking a trip across the front panel of the rig we have the repeater facilities, a non-locking tone switch, ideal now that most repeaters are tone accessed and carrier maintained. The tone, of course, only works whilst the rig is in the FM mode. Below the tone switch is the TX offset switch giving plus or minus 600 KHz or 1.6 MHz, depending on whether 2 metres or 70 cm is selected and last, but certainly not least, reverse repeater – to my way of thinking proof that the TS780 was designed for amateurs by amateurs.

The meter functions on receive as S. meter, ALC meter or as a centre meter, the functions being controlled from a panel switch. On transmit the meter reads relative RF output. Immediately above the digital frequency and memory/VFO indicator are indicating leds: "a busy" led indicating in FM mode whether the squelch is open thereby, assuming the squelch level is correctly set, that the other station is transmitting. A "frequency lock" led tells that the F lock switch is pressed and the VFO knob inoperative. The "on air" led indicates the rig is transmitting and the "offset" led reminds you that the TX offset switch is set to repeater.

The memory operation has been updated: instead of having to progressively move through the memory content in sequence, by means of a rotary switch any of the ten memories (two more than the TS770's) can be selected at will. Entering frequencies into the memory is easier, as anyone who has a TS770 series will explain. Two priority frequencies are included: 9 and 10. Push buttons to the left of the VFO knob allow either of the two programmed frequencies to be quickly selected, immediately cancelling the previous instructions given to the rig. Just the thing for local net frequencies. SSB mic gain needs no explanation, as does the AF/RF gain control.

On the same control knob as the squelch level is a switch enabling the frequency width of scan to be determined. Briefly, when the rig is set to scan either in FM, FM step or SSB mode you can determine the amount of band to be covered.

The ranges are 0.5, 1, 3, 5 and 10 MHz, thus you can limit the rig to scan just the section of the band used by the mode you have selected.

Example: scan width 0.5 MHz, VFO set at 144,000, coverage – 144.000 to 144.5 mode side band – result: free scanning of the SSB portion of the band. On FM the scan locks if a signal is present. On SSB the scan does not stop but you are made aware that there is activity on the band.

Another new control on the TS780 is the IF shift. Available for some time on HF equipment to cope with crowded band conditions, obviously the Trio design engineers have recognised that the 2 metre SSB end of the band can become crowded during contests or when there is "a bit of a lift on". At these times a rig that has the "IF shift" facility will certainly "score points".

The send/receive Vox/Man, meter function, NB, low/high power switches are all well known and have been found on previous generations of Trio base station equipment and again require no explanation. I could say the same thing about the mode switch but here you will notice alongside the standard FM position another marked FM CH. Put the mode switch in this position and instead of a free-running VFO you have a mechanical "click" step feel, the frequency now moving in either 12.5 KHz or 5 KHz steps. Of course the rig will also scan in these steps, controlled either by the scan switch or the up/down shift microphone. Again the Trio amateurs who design the equipment have here a major triumph.

By now you may be seeing why I am so enthusiastic about the TS780 but there is still more to come. How about a memory scan system that will scan either the 2 metre frequencies stored in the memory or the 70 cm ones or, if you wish, both. Well that's another feature of the TS780. Add to this list variable VFO steps of either 20 Hz or 200 Hz, a selectable braked feel to the VFO knob, rapid up and down MHz switching and you have the most comprehensive rig ever seen.

Too complicated some may say. Rubbish say I. Trio thrive on rigs designed to be simple to operate. Do you remember what John wrote in Radcom about the TR7500 and its competitors? And, finally, how about a rig that without resorting to a MHz switch will, by use of the VFO knob, tune from 144 to 146 MHz and from 430 to 440 MHz – only one rig –

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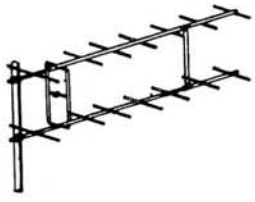

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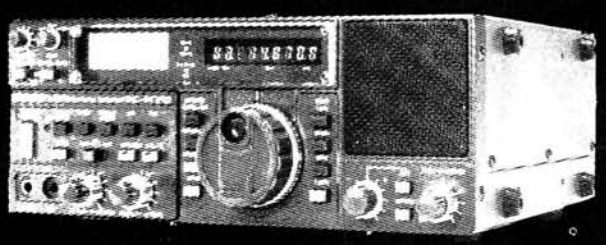

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IC-751, £969. HF Transceiver

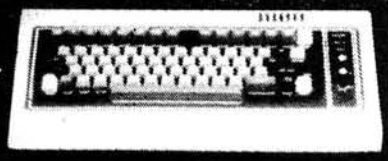
Think about the IC-740.
One of the most popular amateur bands transceivers, make a few improvements such as adding 36 memory channels, doing away with mechanical bandswitching and then add full HF receive capabillity (0.1-30 MHz) which is even an improvement on the famous R70 and you get a pretty good idea of what the IC-751 is like. It is fully compatible with Icom Auto units such as the AT-500 and IC-2KL and a further option for computer control can be added. There is also a digital speech synthesizer option which will be ideal for blind operators For power supplies you have the option of the IC-PS740 (which fits inside) or the PS-15/PS20 range for external use.

RTTY, Morse & ASCII

Shortwave listeners and amateurs are able to take more interest in other modes of transmission than speech with the latest range of decoders and senders available. As well as amateur transmissions, there is an abundance of news and other interesting broadcasts which can be read using these space-age devices.

Some models in our range are the Tono 550, 9000E and the Telereader CWR-670, CWR-685E and CWR-610E. There is now available a professional version of the Tono 9000E, the PRO-1, which has a built-in scrambler. The Telereader CWR-670 is also available with a built-in VDU which can include a 40 column printer.

TONO 9000E Sender/Decoder £669.



CWR-610E, Decoder £189.

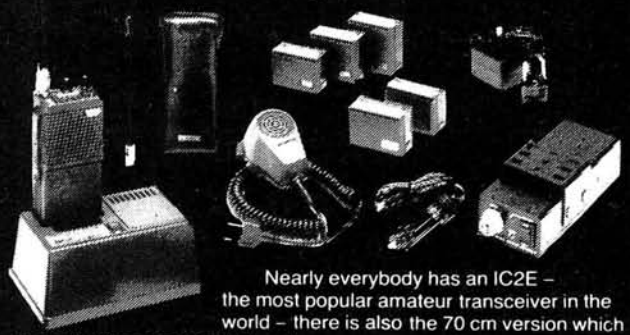
As U.K. importers of the renowned TONO and TELEREADER products, we can offer you a wide range, from a simple morse and RTTY reader which can be plugged into your TV., to a complete send and receive system with memories and built-in displays, or outputs for high-definition VDU.

As well as stocking the complete ICOM range of equipment suitable for European use, we also sell Yaesu, Jaybeam, Datong, Welz, G-Whip, Western, TAL, Bearcat, Versatower and RSGB publications from our shop and showroom at the address below.

IC-290D, VHF, £433. Multimode Mobile

The recently introduced IC-290H has proved so popular that we have decided to concentrate on this (25W) model 2m multimode. With its bright green display, 5 memories, scan facilities on either memories or the whole band, tone-call button on the microphone and instant listen input for repeaters, this little box really is a beauty The 70cm version, the IC-490E has similar features (although the output is only 10W in this case).

IC-2E, VHF/FM, £179. IC-4E UHF, £199.



Nearly everybody has an IC2E – the most popular amateur transceiver in the world – there is also the 70 cm version which is every bit as good and takes the same accessories.

IC-25H/25E, £329/£369. VHF, FM Mobiles

The FM mobile choice has to be the Icom IC-25E. It is so small yet boasts a powerful 25 Watt voice and a sensitive receiver. The new 25H now available has a green display and 45 Watts output. There are five easily programmable memories, and facilities for changing the repeater shift from the default value of 600kHz.

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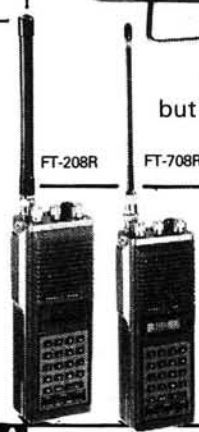

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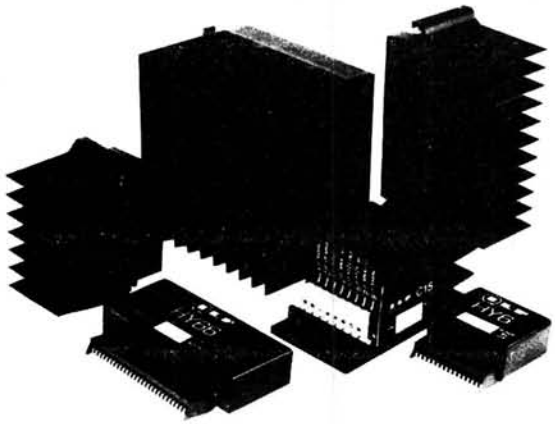

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Module Number	Output Power Watts rms	Load Impedance Ω	DISTORTION T.H.D. Typ at 1KHz	DISTORTION I.M.D. 60Hz/ 7KHz 4:1	Supply Voltage Typ	Size mm	WT gms	Price inc. VAT
HY30	15	4-8	0.015%	<0.006%	± 18	76 x 68 x 40	240	£8.40
HY60	30	4-8	0.015%	<0.006%	± 25	76 x 68 x 40	240	£9.55
HY6060	30 + 30	4-8	0.015%	<0.006%	± 25	120 x 78 x 40	420	£18.69
HY124	60	4	0.01%	<0.006%	± 26	120 x 78 x 40	410	£20.75
HY128	60	8	0.01%	<0.006%	± 35	120 x 78 x 40	410	£20.75
HY244	120	4	0.01%	<0.006%	± 35	120 x 78 x 50	520	£25.47
HY248	120	8	0.01%	<0.006%	± 50	120 x 78 x 50	520	£25.47
HY364	180	4	0.01%	<0.006%	± 45	120 x 78 x 100	1030	£38.41
HY368	180	8	0.01%	<0.006%	± 60	120 x 78 x 100	1030	£38.41

Protection: Full load line. Slew Rate: 15v/µs. Risetime: 5µs. S/N ratio: 100db.
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Input Impedance: 100KΩ. Damping factor: 100Hz>400.

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Module Number	Module	Functions	Current Required	Price inc. VAT
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HY66	Stereo pre amp	Mic/Mag. Cartridge/Tuner/Tape/ Aux + Vol/Bass/Treble/Balance	20mA	£14.32
HY73	Guitar pre amp	Two Guitar (Bass Lead) and Mic + separate Volume Bass Treble + Mix	20mA	£15.36
HY78	Stereo pre amp	As HY66 less tone controls	20mA	£14.20

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MOS 128	60	4-8	<0.005%	<0.006%	± 45	120 x 78 x 40	420	£30.41
MOS 248	120	4-8	<0.005%	<0.006%	± 55	120 x 78 x 80	850	£39.86
MOS 364	180	4	<0.005%	<0.006%	± 55	120 x 78 x 100	1025	£45.54

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Slew rate: 20v/µs. Rise time: 3µs. S/N ratio: 100db
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PSU 43X	1 x MOS128	£16.70
PSU 51X	2 x HY128, 1 x HY244	£17.07
PSU 52X	2 x HY124	£17.07
PSU 53X	2 x MOS128	£17.86
PSU 54X	1 x HY248	£17.86
PSU 55X	1 x MOS248	£19.52
PSU 71X	2 x HY244	£21.75
PSU 72X	2 x HY248	£22.54
PSU 73X	1 x HY364	£22.54
PSU 74X	1 x HY368	£24.20
PSU 75X	2 x MOS248, 1 x MOS368	£24.20

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FT480R (2m Multimode mobile)
FT780R (70cm Multimode mobile)
FT208R (2m handheld)
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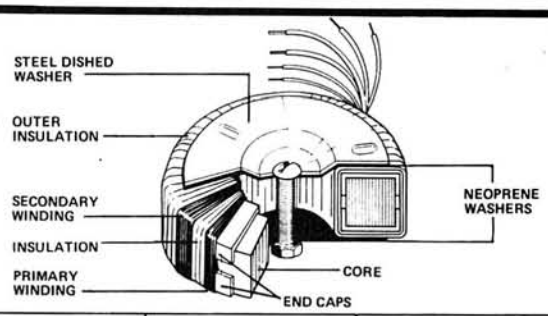

15 VA 62 x 34mm 0.35Kg Regulation 19%

SERIES No	SECONDARY Volts	RMS Current
0x010	6+6	1 25
0x011	9+9	0 83
0x012	12+12	0 63
0x013	15+15	0 50
0x014	18+18	0 42
0x015	22+22	0 34
0x016	25+25	0 30
0x017	30+30	0 25

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30 VA 70 x 30mm 0.45Kg Regulation 18%

1x010	6+6	2.50
1x011	9+9	1 66
1x012	12+12	1 25
1x013	15+15	1 00
1x014	18+18	0.83
1x015	22+22	0.68
1x016	25+25	0.60
1x017	30+30	0.50

50 VA 80 x 35mm 0.9Kg Regulation 13%

2x010	6+6	4 16
2x011	9+9	2 77
2x012	12+12	2 08
2x013	15+15	1 66
2x014	18+18	1 38
2x015	22+22	1 13
2x016	25+25	1 00
2x017	30+30	0 83
2x028	110	0 45
2x029	220	0 22
2x030	240	0 20

80 VA 90 x 30mm 1Kg Regulation 12%

3x010	6+6	6 64
3x011	9+9	4 44
3x012	12+12	3 33
3x013	15+15	2 66
3x014	18+18	2 22
3x015	22+22	1 81
3x016	25+25	1 60
3x017	30+30	1 33
3x028	110	0 72
3x029	220	0 36
3x030	240	0 33

120 VA 90 x 40mm 1.2Kg Regulation 11%

4x010	6+6	10 00
4x011	9+9	6 66
4x012	12+12	5 00
4x013	15+15	4 00
4x014	18+18	3 33
4x015	22+22	2 72
4x016	25+25	2 40
4x017	30+30	2 00
4x018	35+35	1 71
4x028	110	1 09
4x029	220	0 54
4x030	240	0 50

160 VA 110 x 40mm 1.8Kg Regulation 8%

5x011	9+9	8 89
5x012	12+12	6 66
5x013	15+15	5 33
5x014	18+18	4 44
5x015	22+22	3 63
5x016	25+25	3 20
5x017	30+30	2 66
5x018	35+35	2 28
5x026	40+40	2 00
5x028	110	1 45
5x029	220	0 72
5x030	240	0 66

225 VA 110 x 45mm 2.2Kg Regulation 7%

6x012	12+12	9 38
6x013	15+15	7 50
6x014	18+18	6 25
6x015	22+22	5 11
6x016	25+25	4 50
6x017	30+30	3 75
6x018	35+35	3 21
6x026	40+40	2 81
6x025	45+45	2 50
6x033	50+50	2 25
6x028	110	2 04
6x029	220	1 02
6x030	240	0 93

300 VA 110 x 50mm 2.6Kg Regulation 6%

7x013	15+15	10 00
7x014	18+18	8 33
7x015	22+22	6 82
7x016	25+25	6 00
7x017	30+30	5 00
7x018	35+35	4 28
7x026	40+40	3 75
7x025	45+45	3 33
7x033	50+50	3 00
7x028	110	2 72
7x029	220	1 36
7x030	240	1 25

500 VA 140 x 60mm 4Kg Regulation 4%

8x016	25+25	10 00
8x017	30+30	8 33
8x018	35+35	7 14
8x026	40+40	6 25
8x025	45+45	5 55
8x033	50+50	5 00
8x042	55+55	4 54
8x028	110	4 54
8x029	220	2 27
8x030	240	2 08

625 VA 140 x 75mm 5Kg Regulation 4%

9x017	30+30	10 41
9x018	35+35	8 92
9x026	40+40	7 81
9x025	45+45	6 94
9x033	50+50	6 25
9x042	55+55	5 68
9x028	110	5 68
9x029	220	2 84
9x030	240	2 60

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50	2	10.10	300	7	18.55
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120	4	11.73	625	9	31.63

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SENTINEL 2M LINEAR POWER/PRE-AMPLIFIERS
Now feature either POWER AMP alone or PRE-AMP alone or both POWER AND PRE-AMP or STRAIGHT THROU when OFF. Plus a gain control on the PRE-AMP from 0 to 20dB. N.F. around 1dB with a neutralised strip line DUAL GATE MOSFET (BF981).

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Already a great success. If you want an 80 metre (3.5-3.8MHz) Rx. Only 2½" × 6" × 3". 12 volt operation. I.W. o/p. This is for you. **£45.**

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PW/1/84

AMATEUR RADIO EXCHANGE

SEX BEFORE MARRIAGE

Even in this modern age where nearly anything goes, the vast majority of people still have doubts about the possible implications and complications that may result from such a relationship.

There are many who will argue that before they commit themselves to a lifelong union, they want to know whether or not they are compatible. Such arguments when applied to human relationships have little substance. However, when an amateur commits himself to a new rig, which he hopes to live with for years to come, to have and to cherish, the implications are quite different.

Of course you want to know all about it – to listen to it, to talk to it, to feel how the controls operate, check the specifications on the air against those which have been quoted – and that is exactly what we at Amateur Radio Exchange invite you to do. Both branches now have excellent demonstration facilities where all the popular models can be air tested, and that includes the rig which *you* may decide to buy.

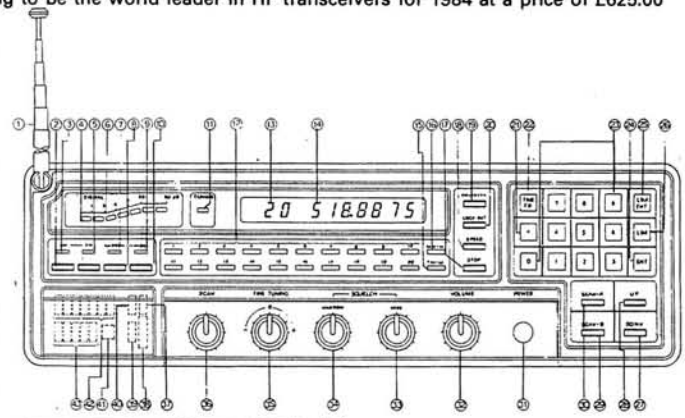
By the time this magazine goes to press the long awaited FT 757GX should be available from stock, but at this moment in time very few people have seen this model let alone tested it. However, we did have an opportunity to operate the receive side at the Friedrichhaven exhibition last June, and undoubtedly the FT 757GX is going to be the world leader in HF transceivers for 1984 at a price of £625.00 including VAT.

For the many people who are interested in Scanning Receivers, there are three new models recently announced.

These are:-

the SX400 made by J.I.L. Japan who are, of course, well known for the very successful and popular SX200N.

The new model will cover from 26 to 520 MHz with no gaps and will receive in FM and AM. Priced at over £500.00 this receiver is destined for the professional market.



FUNCTIONS (FRONT VIEW)

1. Telescopic Antenna; 2. AM Switch; 3. AM Indicator Lamp; 4. FM Switch; 5. FM Indicator Lamp; 6. Signal Meter; 7. Narrow Indicator Lamp; 8. Narrow Switch; 9. Wide Indicator Lamp; 10. Wide Switch; 11. Tuning Meter; 12. 20 channel Memory Keys; 13. Memory Channel Display; 14. Frequency Display; 15. Scan Write, Minute Adjustment Key; 16. Memory Write, Hour Adjustment Key; 17. Stop Button; 18. Speed Change Key; 19. Priority Button; 20. Lock out Button; 21. Decimal Point Button; 22. Time & Frequency Selection Key; 23. Keyboard Frequency Selection Keys; 24. Frequency Entry Button; 25. Limit Entry Key; 26. Limit Key (ON/ OFF); 27. Down Seek Key; 28. Up Seek Key; 29. Scan B Button; 30. Scan A Button; 31. Power Switch; 32. Volume Control; 33. Squelch Control of WIDE; 34. Squelch Control of NARROW; 35. Fine Tuning Control; 36. Scan Delay Control; 37. Auto Noise Limiter Switch; 38. Change Switch of Squelch Mode; 39. Carrier ON/ OFF Switch; 40. Dimmer Control Switch; 41. Set Switch of Channel Space; 42. Change Switch of Channel Space (5 KHz/ 6.25 KHz); 43. Change Switch of Channel Space (10 KHz/ 12.5 KHz).

* * *

Then there is the new AOR2001. Information on this model has been available for some time – again general coverage between 25 and 555MHz and considered excellent for the amateur market at approximately £300.00.

* * *

Last but not least – a briliant HF receiver from SONY. Most people will know of the SONY ICF2001 – but now they have excelled themselves with this new model, the ICF 7600D.

Size: Only 6" × 4" × 1" approximately.

Frequency coverage: 153KHz - 30MHz + FM, 87.6 - 108 MHz.

Double conversion.

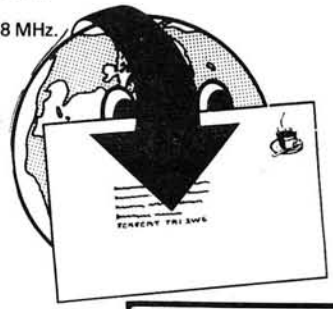
Keyboard entry of frequencies and memories.

SSB/CW/AM modes.

Internal batteries and external antenna connections.

* * *

We notice with some satisfaction a comment by another advertiser which refers to our mention of a well known quotation which we attributed to Winston Churchill. We have been corrected by several readers that this quotation was originally made by Phineas T. Barnum, and we have since proved this to be correct from reference books.



Our thanks to Lowe Electronics for pointing out our error too – but Abe Lincoln never said it at all – *BUT* what is more important, however, is that *LOWE ELECTRONICS* read our advertisements.

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Icom	**Alinco**
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Closed Wednesday at Acton and Monday at Earlestown, but use our 24-hour Ansafone service at either shop.

Getting WISE

IT SEEMS THE FASHION that each new year is adopted by various organisations as a means of promoting some aspect of their operations or interests. You may already have noticed announcements about "Women into Science and Engineering" (WISE) year, a joint promotion by the Equal Opportunities Commission (EOC) and the Engineering Council which is to be launched in January and run throughout 1984.

Local education authorities and schools will already have received information packages about WISE, which will consist of a series of co-ordinated projects in schools and colleges throughout the UK, together with initiatives by employers, professional institutions and associations and public bodies. Both the EOC and the Engineering Council are concerned that so few women are employed as scientists and technologists, technicians or in craft occupations in the engineering industry. Currently 94% of all women who work in the industry are employed as operators, clerical staff and in unskilled grades.

The shift in emphasis from heavy to light engineering, much of it radio or electronics based, has undoubtedly helped to arouse a little more interest in engineering as a career for girls, but there is a long way to go. Many schools retain the attitude that it's not quite the done thing for girls to get involved in such things, and many men in the industry look on it as a threat to their future employment. The latter is an understandable reaction, but nevertheless times are changing, the structure of society is no longer what it was. Without wishing to be caught in the crossfire between "male chauvinist pigs" and "militant feminists", my own feeling is that anyone, male or female, should have an equal opportunity to pursue their chosen interests.

The influx of YLs and XYLs into amateur radio in the last couple of years, though still very small in percentage terms, is evidence of increasing interest in "things technical" on the part of the ladies. Some old hands complain that meetings down at the radio club aren't the same any more, now that the YLs are there all the year round, rather than just for a Christmas social or a summer picnic. Again it's an understandable reaction—those of us who are getting a little longer in the tooth all have things we look back on with thoughts of "It was better in those days". But things change, and we must move with the times or disappear like the prehistoric animals.

Geoff Arnold

QUERIES

While we will always try to assist readers in difficulties with a *Practical Wireless* project, we cannot offer advice on modifications to our designs, nor on commercial radio, TV or electronic equipment. Please address your letters to the **Editor, "Practical Wireless", Westover House, West Quay Road, Poole, Dorset BH15 1JG,** giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the "Buying Guide" box included in each constructional article.

PROJECT COST

The approximate cost quoted in each constructional article includes the box or case used for the prototype. For some projects the type of case may be critical; if so this will be mentioned in the Buying Guide.

INSURANCE

Turn to the following page for details of the PW Radio Users Insurance Scheme, exclusive to our readers.

CONSTRUCTION RATING

Each constructional project will in future be given a rating, to guide readers as to its complexity:

Beginner

A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently. Generally this category will be used for simple projects, but sometimes for more complicated ones of wide appeal. In this case, construction and wiring will be dealt with in some detail.

Intermediate

A project likely to appeal to a wide range of constructors, and requiring only basic test equipment to complete any tests and adjustments. A fair degree of experience in building electronic or radio projects is assumed.

Advanced

A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Constructional information will generally be limited to the more critical aspects of the project. Definitely not recommended for a beginner to tackle on his own.

SUBSCRIPTIONS

Subscriptions are available at £13 per annum to UK addresses and £14 overseas, from **"Practical Wireless" Subscription Department, Room 2816, King's Reach Tower, Stamford Street, London SE1 9LS.** Airmail rates for overseas subscriptions can be quoted on request.

BACK NUMBERS AND BINDERS

Limited stocks of some recent issues of *PW* are available at £1 each, including post and packing to addresses at home and overseas.

Binders are available (Price £5.50 to UK addresses, £5.75 overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

Send your orders to **Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.** All prices include VAT where appropriate.

Please make cheques, postal orders, etc., payable to IPC Magazines Limited.

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Practical Wireless Radio Users Insurance Scheme was devised by Registered Insurance Brokers B. A. LAYMOND & PARTNERS LIMITED following consultation with PRACTICAL WIRELESS to formulate an exclusive scheme designed to meet the needs and requirements of: Amateur Radio Enthusiasts ● CB Radio Users ● Taxi Companies and Fleet Users with Radio Telephones. A copy of the Policy can be inspected at the offices of B. A. Laymond & Partners Ltd., or of Practical Wireless in Poole.

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†Write directly to B. A. LAYMOND & PARTNERS LTD, for a special application form and full details enclosing the coupon below.

B. A. Laymond & Partners Ltd., Practical Wireless and the Underwriters wish to make it clear that it is an offence to instal or use a radio transmitter in the UK except under the authority of a licence granted by the Secretary of State and it is not their intention to provide cover for or to encourage or condone the illegal use of CB and/or other communications equipment.

Cover for property contained in vehicles is subject to a Limit of Liability of £250, increased to £750 where the vehicle is protected by a reputable audible alarm, correctly set and operational.

When the vehicle is unattended, mobile equipment secured so that tools or a key are required to remove it must be disguised or concealed from view. Portable and mobile equipment not so secured must be removed and placed in a locked boot or otherwise concealed from view, or removed from the vehicle entirely. Equipment not in a secure building or vehicle must not be left unattended.

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Sum to Insure	£1000	£3000	£5000
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Claims will be settled after deduction of an excess in the following manner:

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From saloon cars and hatchbacks with fully concealed luggage compartments		15% of claim (minimum £25)
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All others:	Sums insured up to £3000	£25
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How To Insure

Complete the application form below to obtain immediate insurance cover. Photocopies will not be accepted

APPLICATION FOR PRACTICAL WIRELESS RADIO USERS INSURANCE SCHEME **PW1/84**

Name in full (State Mr, Mrs, Miss or Title)

Address

Post Code

Occupation Age Phone No. (Home) (Work)

I/We hereby apply to insure the equipment detailed below

BLOCK LETTERS

	Manufacturer's Name	Model	Serial No.	Description of equipment to be insured e.g. Base station; Mobile; CB; etc.	VALUE £
1					
2					
3	Antennas (Aerials), s.w.r. meters, etc.				

Please continue list of equipment on a separate sheet if necessary

TOTAL SUM TO INSURE £

DECLARATION: I/We hereby declare that: 1. The sums insured represent the full replacement value of the equipment. 2. I/We have not* had insurance cancelled, declined, restricted, or other terms imposed in any way other than the normal Policy terms. 3. This proposal shall be the basis of the contract and that the contract will be on the Underwriters normal terms and conditions for All Risks and Legal Costs/Expenses cover unless otherwise agreed. 4. I/We have not* sustained any loss or damage to any radio communications equipment or been involved in litigation relating to use of radio equipment during the past three years, whether insured or not. 5. All the above statements made in connection with this proposal are true and no material information has been withheld. 6. I/We understand no liability shall attach until this proposal shall have been accepted by Laymond's and the premium paid in full and a Certificate issued.

* If you have, please give details on a separate sheet.

Date Signed

Rush us details of PW Club Insurance ☐
PW Company Insurance ☐

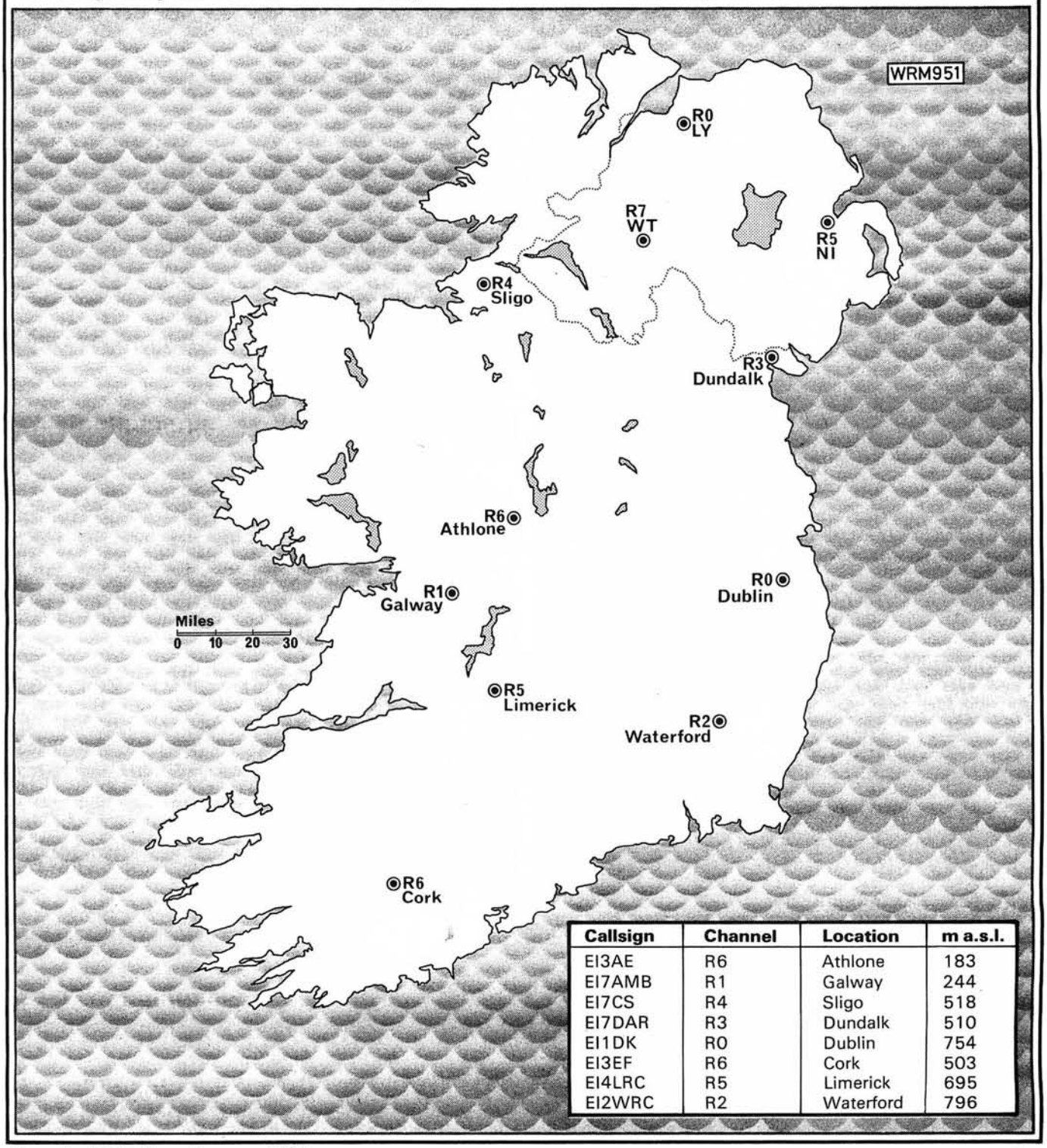
DELAY IN ARRANGING COVER COULD COST YOU A GREAT DEAL OF MONEY. COMPLETE THIS APPLICATION AND POST WITH YOUR PREMIUM MADE PAYABLE TO "LAYMOND'S" NOW. ADDRESS TO: PRACTICAL WIRELESS (INSURANCE), B. A. LAYMOND & PARTNERS LTD., 562 NORTH CIRCULAR ROAD, LONDON NW2 7QZ. TELEPHONE: 01-452 6611.

144 MHz (2m) REPEATERS IN IRELAND

During the preparation of the 2m Datacard, which was published in the March 1983 edition of *PW*, it became apparent that significant v.h.f. repeater developments were under way in the Irish Republic. As the channel allocations were known to be under review full details were not published.

However, at a meeting of the EI Repeater Co-Ordinating Group held on 2nd October 1983, revisions were agreed to permit maximum coverage for mobile units from the relatively few experimental devices, at the same time minimising potential co-channel interference problems. The map produced here contains all known details and *should* represent the situation as of November 1983, both in EI and GI.

Our thanks for the supply of this information go to Dr. T. S. Rea MRCGP, EI7AMB.



Callsign	Channel	Location	m a.s.l.
EI3AE	R6	Athlone	183
EI7AMB	R1	Galway	244
EI7CS	R4	Sligo	518
EI7DAR	R3	Dundalk	510
EI1DK	R0	Dublin	754
EI3EF	R6	Cork	503
EI4LRC	R5	Limerick	695
EI2WRC	R2	Waterford	796

HF ANTENNA SPECIAL

Steerable HF Antenna

F. E. WYER G8RY

The antenna system to be described in this article could well be the solution for those unable to erect a steerable h.f. beam antenna and who, like the author, prefer working at ground level!

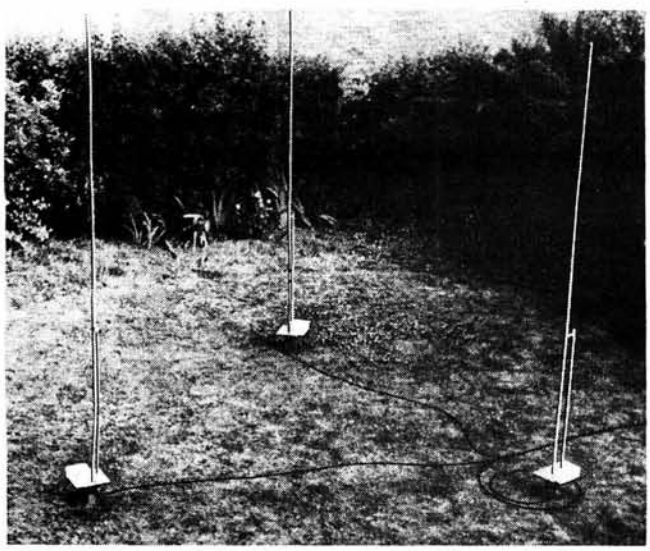
The basic principle of operation relies upon the phase effect obtained by the insertion of a λ/4 delay section between two radiating elements. By using three separate elements pitched in a triangle and arranging for the phase shifting element location to be varied from the operating position a six-way "end fire" directional beam effect is obtained.

In practice the antenna array consists of three identical λ/4 ground plane elements, which are individually gamma matched, feeding back via identical lengths of cable to a multi-pole wafer switch. The phasing section consists of an electrical λ/4 of feeder that is introduced between the appropriate selected pair of elements.

The cardinal lobe is approximately 60 degrees wide at the −3dB points therefore with three elements available it is possible to cover a full 360 degree sweep without the need for an expensive rotator system. Experimental measurements indicate a forward gain of 4·5dB over a single free space vertical. High attenuation of side and rear lobes is also evident.

To improve the system efficiency a network of buried wire radial elements are employed. This has the added incidental advantage of providing an excellent earthing arrangement. Because the bases of the λ/4 radiating elements are directly grounded this allows a substantial mechanical anchorage to be achieved together with ground level access for adjustments.

The schematic and constructional details provided in Figs. 1-3 indicate the general dimensions used by the author for operation on 21·3MHz (15m), however scaling of the λ/4 sections will allow systems to be developed for other h.f. bands such as 14MHz (20m).



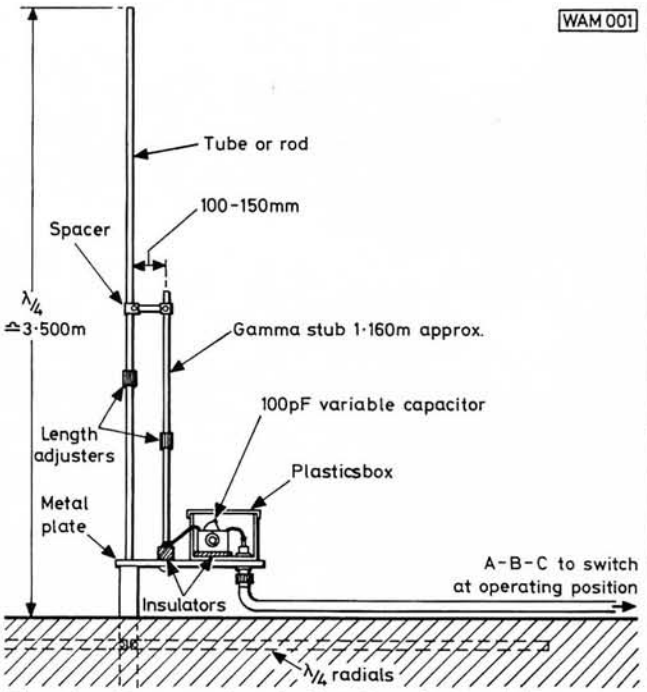


Fig. 1: Constructional details of the λ/4 gamma matched 21MHz radiating elements. The plastics box used by the author was a 2 litre ice cream container

When constructed the setting-up procedure consists of applying low power, at the frequency of interest, via an s.w.r. bridge to each individual radiating element. In the author's case 21·3MHz was selected and a long twin

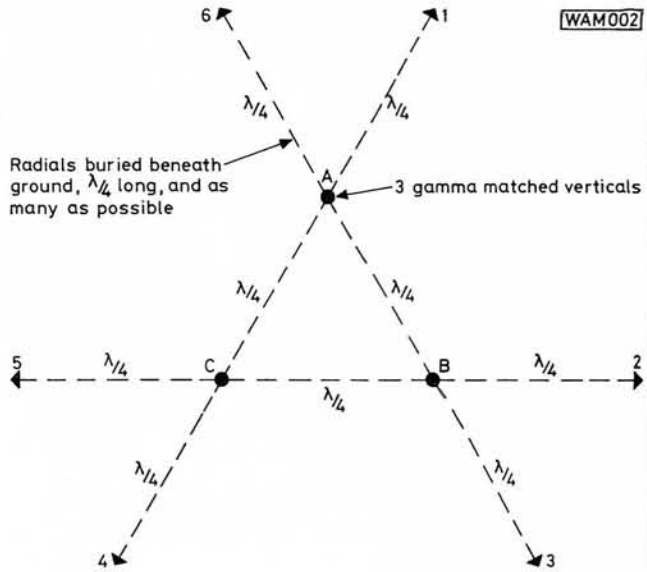


Fig. 2: Plan view of the system. The vertical elements are spaced λ/4 apart at the operating frequency

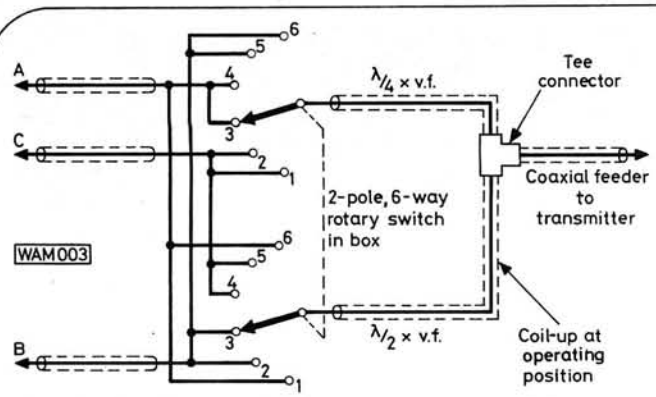


Fig. 3: Direction switching arrangements. Allowance must be made for cable velocity factor (v.f.)

feeder provided to connect a Morse key to the shack mounted transceiver. The s.w.r. bridge was located at the base of the λ/4 element and resonance achieved by adjustments to the length of the gamma rod and capacitor element. Using this remotely keyed arrangement allows rapid tune up. Having set all three radiating elements a second check of matching should be made as there are some slight interaction effects.

The three feeders must be of equal length and ideally composed of an even number of λ/4 lengths, although this is not critical. At the shack end of the feeder runs a six-way wafer switch is used to select the desired beam heading. This switch can also be fitted with a further wafer section to provide a visual display indication of heading adjacent to the transceiver position. The transceiver should also be earthed (independently of the house mains supply earth) to a suitable earth stake, following normal practice. ●

The Vertical V Antenna

E. J. PESTELL G3BPB

Most amateurs are familiar with the properties of the inverted Vee h.f. antenna. The inverted Vee is simple and inexpensive to construct, provides a good match to 50 ohm coaxial cable and produces a quasi-omni directional horizontally polarised radiation pattern when used at its fundamental frequency. An introductory chapter on antennas by Kraus[1] points out in a generic sense that a cylindrical vertical Vee can be expected to yield a broader

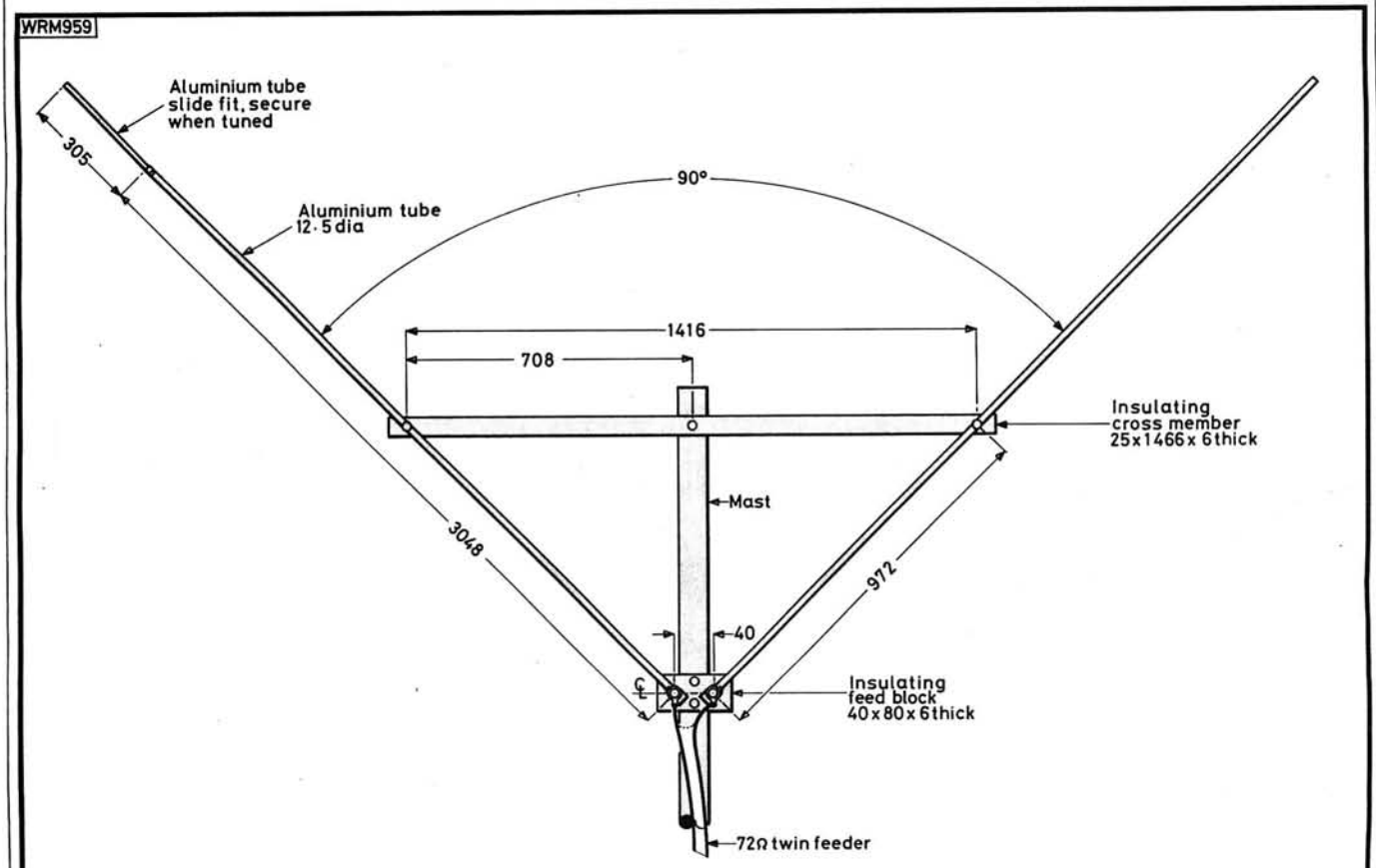


Fig. 1: Constructional details of the Vertical V antenna for 21MHz. Both radiating elements are provided with length adjustment and for best results a 1:1 balun should be fitted at the feedpoint when using 50 ohm coaxial cable. Note that this drawing is not to scale

usable bandwidth than the corresponding dipole. So it appears that a vertical Vee offers the potential for significantly improved performance over the common types of antennas. It is surprising that this type of radiator has not been described in the antenna manuals currently on sale.

The inverted Vee whilst providing excellent performance does suffer from deficiencies, such as ground effect and influence of feed point impedance if supported by a metal mast. Since the antenna is centre-fed the balanced currents may be induced on the transmission line even if a balun is used at the feed point. Finally, sloping the elements downwards to make the inverted Vee increases the likelihood of parasitic losses in nearby grounded objects. A vertical Vee would be much less affected by the above factors.

In addition a vertical Vee provides the further advantage of increased antenna height and simple construction as only one central support is required when self-supporting aluminium elements are used. It also has the capability of being rotated. Equipped with the above facts and informative constructional data supplied by VE3QE, the author decided to "have a go" at constructing such an antenna.

Time taken for construction was about 4 hours and the approximate cost was £8–£9. Tests were then arranged with VE3QE with the initial contact being made on 21MHz using a dipole orientated NW–SE. After communication was established the vertical Vee was substituted for the dipole and an identical report was received from Canada.

It should be noted that for this test the inverted Vee was at **ground level**. Half an hour later, after dismantling the dipole from a 4·5m mast and substituting the inverted Vee, putting it about 5m above ground, a further contact was made with the surprising report of two full "S" points increase in signal strength. Contacts were later established with RSARS members in Hong Kong, Sydney, Brisbane, Adelaide, Alice Springs, Norway, PA0, New York, Alberta, New Brunswick, plus other contacts with VE9, VK7, 8P6 and PY. Later tests, rotating the Vee, proved the antenna to have a fair degree of directional properties. Tests have now been carried out over a period of over 12 months with consistent reports. It is hoped that this short article will help readers to construct a cheap and reliable antenna. Tests have shown that feeding the antenna with 72 ohm twin feeder is better than using coaxial cable.

The author would like to thank VE3QE for the help and perseverance given during these tests. It is further hoped that our next project will be a trapped vertical Vee for the 28, 21 and 14MHz bands. ●

[1] *Antennas*. J.D. Kraus. McGraw-Hill USA

News

ARRA at Doncaster

The twelfth annual National Amateur Radio and Electronics Exhibition organised by the Amateur Radio Retailers Association (ARRA) was held in the Exhibition Centre at Doncaster Racecourse, from 6–8 October.

This is a new venue for the show, traditionally held at the Granby Halls in Leicester, and it proved to be very pleasant for visitors and exhibitors, with plenty of room to move about and good catering facilities. It was our pleasure on the *PW* stand (our first time at an ARRA event) to chat to many of our readers, and to show off some recent projects.

It is perhaps a sign of the times that attendance on the two weekdays, and particularly the Friday, was quite well

down. People with jobs can often get to exhibitions only at weekends; people who are unemployed probably can't afford to travel any great distance. So the organisers are in a dilemma as to the best days to hold the show. Let's hope next year will see an improvement in the economic situation for us all.

Lowe's Expanding

Lowe Electronics, the Matlock based Trio main agents, are soon to open yet another branch in Cardiff, Gwent.

The new shop will join their existing branches in London, Glasgow and Darlington.

For further information contact: *Lowe Electronics, Chesterfield Road, Matlock, Derbyshire DE4 5LE. Tel: (0629) 2817/2430/4057 and 4995.*

Armon Multimeters

Readers should note that prices quoted in Armon Electronics advertisements in recent issues of *PW* did not include VAT. Prices in this issue are VAT-inclusive.

Scopex Instruments

Since a Receiver has been appointed for Scopex Instruments Ltd., readers who own one of their instruments may be interested to learn of a company offering to repair these products.

The company, Mendascope Ltd., have specialist knowledge of Scopex instruments and can provide a unique service which includes collection and a free estimate.

Further details from: *Mendascope Ltd., Otter House, Weston Underwood, Olney, Bucks MK46 5JS. Tel: Bedford (0234) 712445.*

More on pages 63 & 64

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FC102	Tuner	200.00	(2.00)
FV102DM	VFO	230.00	(2.00)
SP102	Speaker	49.05	(2.00)
AM/FM	Unit	46.00	(1.00)
FT77	Mobile HF Transceiver	459.00	(—)
FP700	PSU	110.00	(5.00)
FC700	Tuner	85.00	(2.00)
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FL2010	Linear Amplifier	59.00	(1.00)
FT790	70cm M/Mode Port/Transceiver	299.00	(—)
FL7010	Linear Amplifier	91.00	(1.00)
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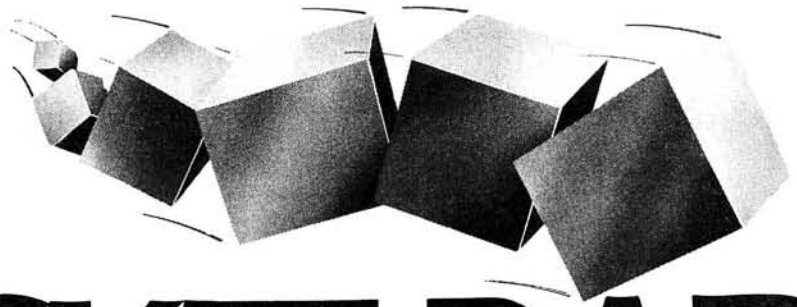

Part 2

PACKET RADIO

by Margaret Morrison KV7D, Dan Morrison KV7B and Lyle Johnson WA7GXD

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This article describes the inner workings of a terminal node controller (TNC), with emphasis on those aspects which are novel and useful to others interested in implementing digital radio systems. The discussion is based on the TNC designed by the Tucson Amateur Packet Radio Corporation (TAPR).[1]

Understanding the TNC

As shown in Fig. 2.1, the TNC is essentially a special-purpose microcomputer. In many ways it is very much the same as any small computer system in that it contains a central processor, memory, and input/output (I/O) sections. The TNC differs from the average home computer in its I/O design, however, and we shall focus on these features.

The TAPR TNC uses a 6809 microprocessor, with 24K bytes of read-only memory (ROM) for program storage, and 6K bytes of read-write memory (RAM), for message buffers and other temporary data. The serial I/O port conforms to the EIA RS-232-C specification and is used to communicate through a terminal or with a computer. A dual 8-bit parallel I/O port is available for auxiliary use. A crystal-controlled clock provides system timing for various parts of the TNC.

The components of the TNC that make it a packet radio controller, and that could be added to a personal computer for a home-brew system, are the HDLC controller and the modulator/demodulator (MODEM). The HDLC controller is an l.s.i. circuit which provides a convenient means for implementing much of the level 1 and level 2 protocol discussed in part one of this series. It acts as a bidirectional digital port between the computer and the MODEM.

Equivalent to an RTTY terminal unit, the modem is a key part of the TNC, and contains the interface circuit that ties the computer to the station radio. It generates tones whose level can be adjusted for compatibility with the radio used, and its audio can be keyed to generate a Morse code station identification. The circuitry provides transmitter p.t.t. line keying and a fail-safe timer to prevent excessively long key-down. The demodulator can be easily configured to accept audio from different radios, and includes l.e.d. level indicators for adjusting the receiver volume.

The versatile-interface adapter (VIA) block includes two 8-bit parallel I/O ports which communicate with the nonvolatile (RAM) semi-permanent storage, read user-settable switches, and control the modem. It also includes two counter-timers which provide interrupts for software timing and a programmable clock signal for the HDLC controller. The non-volatile RAM, a Xicor NOVRAM which stores 32 bytes of information without battery or other standby power, represents a new technological achievement that should have wide application in Amateur Radio.[2]

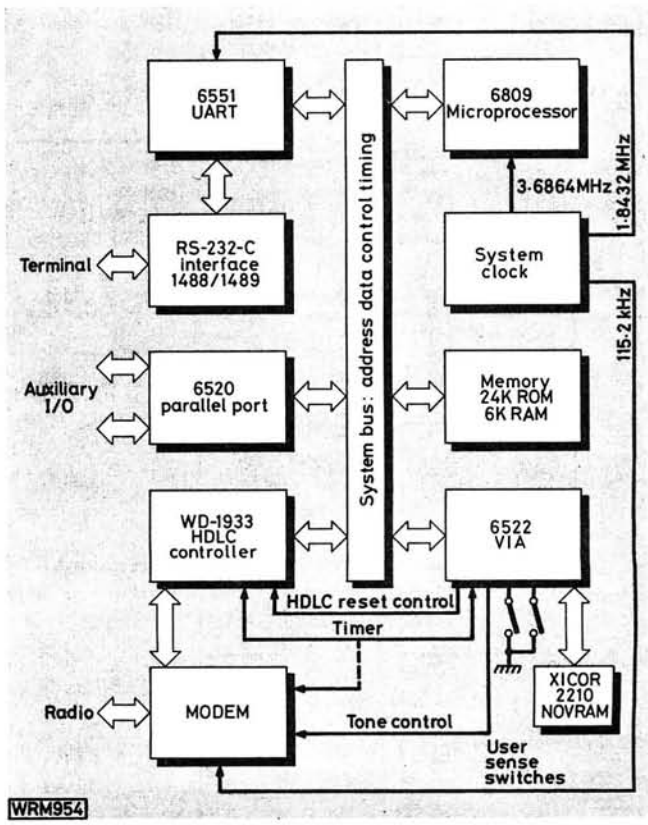

Fig. 2.1: Block diagram of the TAPR Beta TNC, showing system architecture

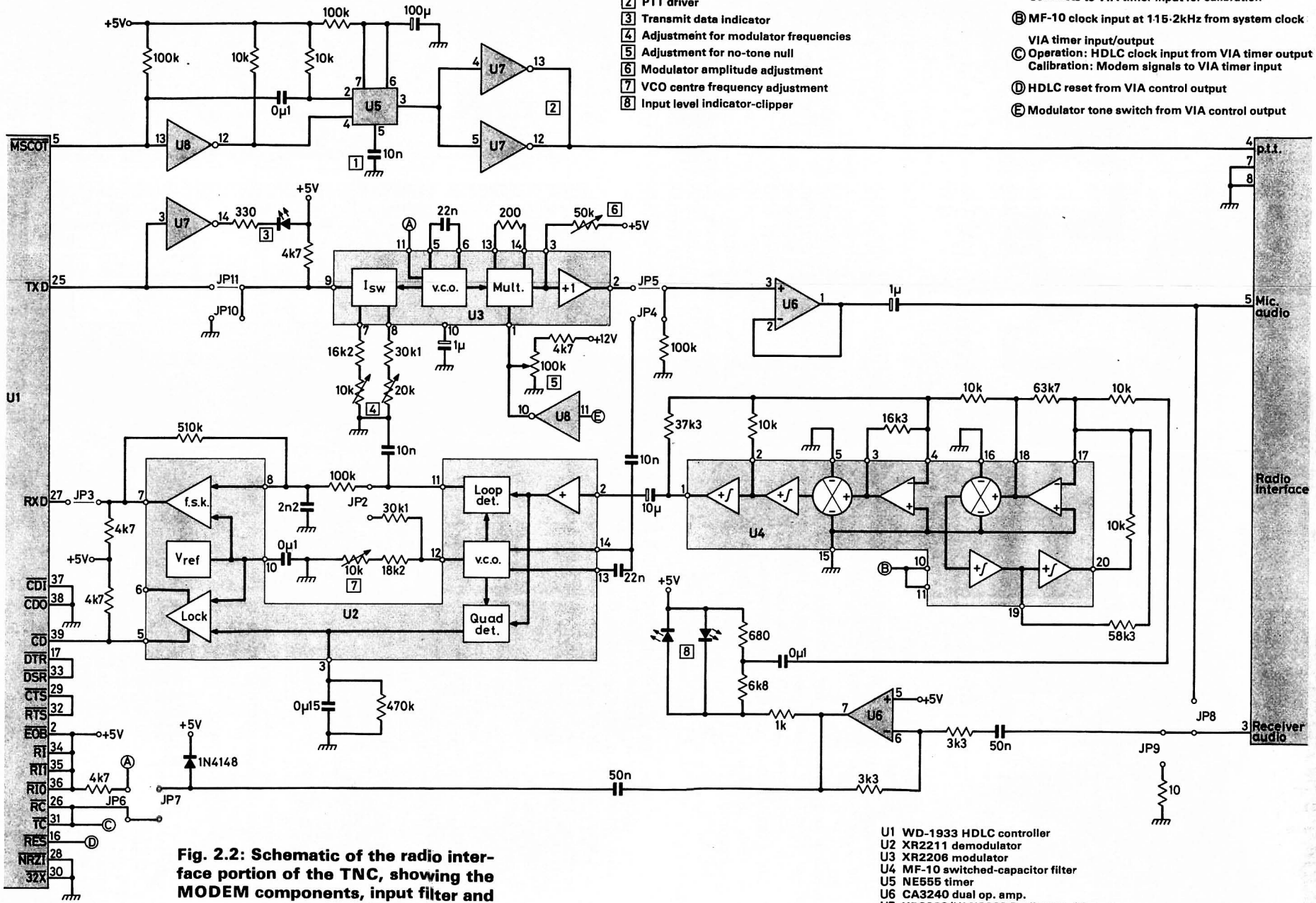

Fig. 2.2: Schematic of the radio interface portion of the TNC, showing the MODEM components, input filter and p.t.t. circuits

MODEM and Radio Interface

The radio and audio interface circuitry is shown in Fig. 2.2. Receiver audio output is buffered by one-half of U6 dual op. amp. Provision is made at jumper JP9 for attaching a load resistor in place of the speaker. The audio passes through an l.e.d. limiter/level-indicator to the MF-10 dual switched-capacitor audio input filter, which is configured as a high-pass section followed by a low-pass section. Both sections operate in Mode 3, as described by the manufacturer,[3] with a clock input of 115·2kHz produced by the TNC system clock. The response of the filter is optimised for typical transceiver combinations using a computer-aided design procedure.[4]

The necessity for this filter is dictated by the audio spectrum of 1200Hz and 2200Hz NRZI data at 1200 baud. This spectrum, shown in Fig. 2.3, suggests that ideally the system should exhibit flat response from below 500Hz to above 2900Hz. In fact, the typical overall response measured using a pair of 144MHz f.m. transceivers is shown in Fig. 2.4 (a). Without proper filtering the roll-off shown prevents data from being demodulated much above 600 baud. The filter, U4 in Fig. 2.2, with the eight programming resistors shown (slightly different from those on the TAPR Beta TNC) restores the response to that shown in Fig. 2.4 (b), and seems a good compromise for a wide variety of f.m. rigs.

The filtered audio is demodulated by the XR2211, which is configured as recommended by Exar[5] for demodulating 1200Hz and 2200Hz 1200 baud data, except for the lock-detect filter at pin 3. For better immunity to false lock indications this filter's time constant was increased. In addition to digital data from pin 7, the lock detect signal at pin 5 is required by the software to monitor channel activity.

The MF-10/XR2211 demodulator combination works well with a wide variety of f.m. transceivers. However, the lowest bit error rates for a given degree of receiver quieting will be achieved only by custom tailoring the input filter to produce the proper response for a specific transceiver pair. Normal experience is that data will be received perfectly under "full quieting" conditions, but deteriorates rapidly as the noise level goes up.

Data originating on the TNC at the TXD output of the WD-1933 generates phase-continuous a.f.s.k. via the XR2206 modulator. As in the case of the demodulator, Exar's recommended values were used for loop components.[5] A control signal generated by the TNC's VIA under software control is used at point E to key the a.f.s.k. signal on and off. This permits the software to generate the c.w. identification and to eliminate modulator output except when actually sending packets. The modulator output is buffered by the second section of U6 before going to the microphone input of the transmitter.

The remaining circuitry of Fig. 2.2 grounds the radio's p.t.t. line to key the transmitter whenever the WD-1933 MSCOT output is brought low. To prevent channel lockup a NE555 one-shot "watchdog" times out after approximately 14 seconds, and MSCOT must be toggled high to restore p.t.t. operation. This simple circuit has proved invaluable.

Special Digital Hardware

The TAPR TNC includes digital circuitry that sets it apart from ordinary personal computers. Some details of these circuits will now be discussed; if you have a TNC, this information will help clarify some of its design considerations. Should you choose to home-brew a packet adapter for your computer, the discussion will serve as an example.

The most important special chip on the TNC is the HDLC controller. There are several HDLC controller chips on the market today, and more are being introduced regularly. This is fortunate for the would-be TNC designer, because the HDLC chip relieves him of a fairly complex hardware design (typical 19 s.s.i. and m.s.i. i.c.s) or an equivalently complex software program (in assembly

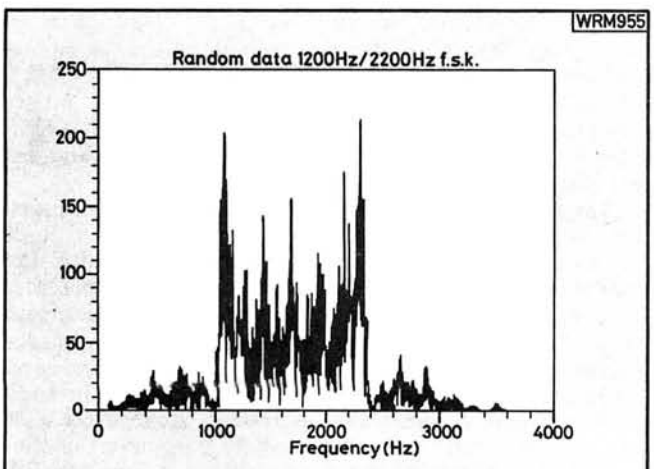

Fig. 2.3: Sound spectrum of a one-second burst of 1200Hz/2200Hz 1200 baud random NRZI data generated and analysed by computer

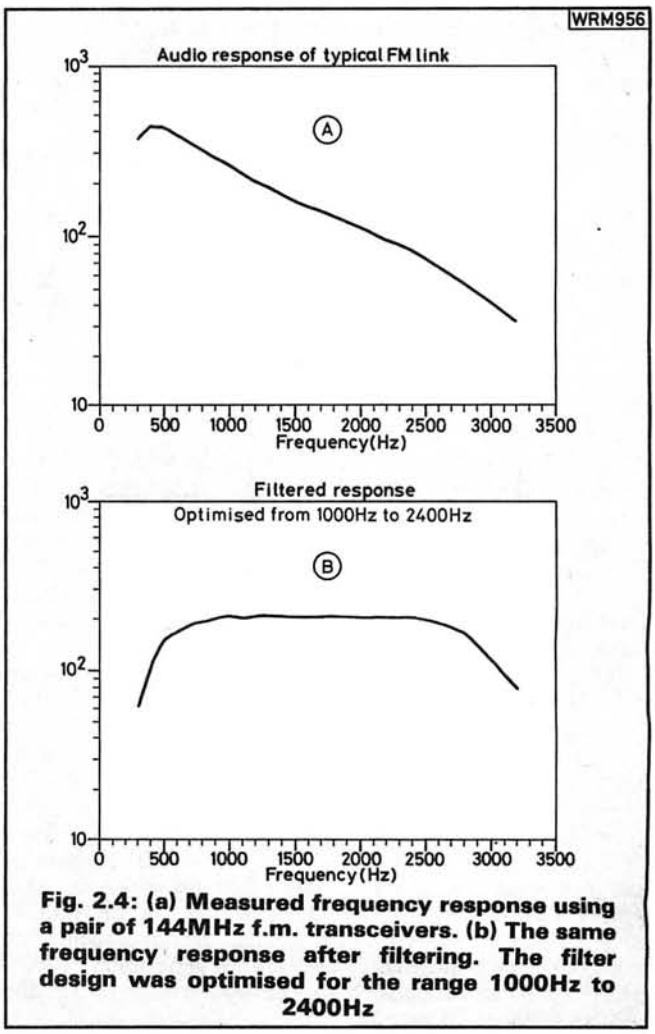

Fig. 2.4: (a) Measured frequency response using a pair of 144MHz f.m. transceivers. (b) The same frequency response after filtering. The filter design was optimised for the range 1000Hz to 2400Hz

language) to implement those parts of the HDLC protocol standard adopted by the overwhelming majority of packeteers.

As mentioned in the previous article, the most frequently used digital signalling technique employs Non-Return to Zero, Inverted (NRZI) encoding. This means that a digital *0* is encoded as a transition from a high to a low or vice-versa, while a *1* is passed as the absence of a transition. The result is this, along with "bit-stuffing" (in which a *0* is inserted by the sending station after five consecutive *1*s and stripped out at the receiving end), is that the clock signal can be recovered from the data stream. A phase-locked clock is necessary to ensure proper recovery of the data in this synchronous data mode, since the data must be latched in the middle of a bit and not, for example, just as a transition occurs.

Clock recovery is fairly straightforward using a phase-locked loop (p.l.l.). Fortunately, the NRZI scheme is also widely used in the commercial world, so a few manufacturers have included a digital p.l.l. (d.p.l.l.) on their HDLC controller chips. In order to minimise the number of chips used in the TNC, both the VADCG and the TAPR designs incorporate these HDLC controllers.

Among single-channel devices, only the Intel 8273 and the Western Digital 193X series incorporate the d.p.l.l., and the TAPR TNC uses the WD-1933, as it is generally about half the price of the Intel device. Of course, nothing is free, and some special considerations apply when interfacing this chip to a microcomputer. The software must take account of the inverted data bus of the WD-1933 which treats *0*s as *1*s and vice-versa. In addition, the interrupt lines must be buffered and inverted prior to connection to the control bus. Furthermore, this chip requires a baud rate clock 32 times the data rate (for 1200 baud this means a 38·4kHz clock) to drive the d.p.l.l. when using the NRZI mode, and also requires a special reset signal to be applied after the baud rate clock has been applied.

In exchange for these interfacing considerations, the HDLC controller provides automatic generation of pre-frame and post-frame flag bytes for synchronisation, transparent bit-stuffing on transmit and unstuffing on receive, recovery of the clock signal from the incoming data stream, calculation of the Frame Check Sequence (FCS) used to validate data integrity on both transmit and receive, and automatic detection and reporting of errors in sending or receiving a frame. All in all, the usefulness of these l.s.i. devices more than compensates for any interface difficulties.

In order to supply the HDLC controller with the needed reset and clock signals, and to provide other services, the TAPR TNC incorporates a 6522 Versatile Interface Adapter (VIA). This unit contains a pair of 8-bit parallel ports, which can be set on a bit-by-bit basis for input or output. Two of the four handshaking lines provided are used as single-bit control outputs. A pair of 16-bit counter-timers are also provided.

One of the control lines is used to provide a software controlled reset to the HDLC chip, while the other is used to effect a tone on-off command to the MODEM. This allows generation of an easily-copied c.w. station identification, as well as enabling an operator to insert a voice signal over the channel without disconnecting the TNC from the radio.

Two lines of one of the 8-bit ports (port B) connect to the internal 16-bit counter-timers. One timer is used as a software-controllable baud rate generator for the HDLC chip. This not only allows the operator a simple means for control of the baud rate, it also allows generation of non-standard baud rates, such as the 400 baud used in the AMSAT Phase III satellite.

The other timer is used for calibrating the MODEM frequencies and for primary system timing. From this clock are derived all the various clocks that must be updated for proper operation of the packet station of which the TNC is an integral part.

Two lines on the VIA are used to test the settings of a pair of switches on the board. These switches may thus be read by the software and are presently being used to tell the TNC whether to use the default parameter settings found in the system EPROM or whether to take these parameters from NOVRAM.

The remaining lines from the VIA parallel port are used for the NOVRAM interface. This helps prevent accidental alteration of NOVRAM parameters, as well as easing system bus timing constraints. The NOVRAM is a nibble-oriented device, meaning that its data bus is only 4 bits wide, rather than the 8-bit bus width of the host microprocessor. It also has six address lines and four control inputs. The control lines allow for device selection, read/write control of data between the RAM portion of the chip and the data bus, recall of the contents of the Electrically Erasable Programmable Read Only Memory (EEPROM), and storing of data from RAM into EEPROM.[2]

The presence of the NOVRAM permits long-term storage of parameters peculiar to the station, such as the callsign and terminal characteristics. In addition, infrequently adjusted parameters, such as those associated with the timing of data retries and other link activity, may be stored. Without such a long-term storage function there are only two choices. Either the operator must enter all necessary information every time the unit is powered up (which is not too practical), or the various parameters must be "burned-in" at assembly time, meaning that the operator must have his EPROMs erased and re-programmed every time he wants to change baud rates, callsign, station ID, and so forth.

Controller Software

The software present on the TAPR TNC is organised on two levels. The High Level Routines (HLRs) implement the machine-independent logical processes associated with protocol decisions and response to user commands. These routines know nothing of the hardware details of the TNC and, in fact, are written in a transportable *high level* language (PASCAL). As the HLRs require data transfers or status information they call subroutines contained in the Low Level Routines package (LLRs), and leave the nitty-gritty details of interrupt service, terminal editing features, and timer maintenance to the LLRs. The LLRs, naturally, are written in 6809 assembly language, and are definitely not transportable. However, the logical organisation of the LLRs is universal and should serve as a model for other implementations of packet radio.

The HLRs can be divided roughly into two major parts. One implements the command protocol, allowing the user to request connect and disconnect packets, control the digital-relay function of the station, and perform other tasks as necessary. For the TAPR TNC, this section consists of a command parser which compares a string of characters from the terminal with a list of commands and takes appropriate action when a match is found. In addition to issuing connect and disconnect packets, the user can alter program parameters, save the parameters in non-volatile RAM, display current parameter values, identify in Morse code, change input mode, or enter a special service routine. For maximum flexibility in a test environment, the parser controls some sixty parameters, including

the operator's callsign, terminal attributes, input editing features, radio interface characteristics, packet baud rate, and timing parameters.[6]

The other part of the HLRs is a procedure which implements the packet radio protocol. This section assembles and disassembles packets, maintains information about the link status (for example, to whom you are connected), keeps track of unacknowledged outbound packets, acknowledges inbound packets, and sends supervisory packets as required by whatever protocol is implemented. This routine watches a clock to time retransmissions of unacknowledged packets, formulates input from the terminal into packets, and passes the contents of received packets to the terminal.

Both sections of the HLRs depend on the LLRs to maintain buffers and perform I/O under interrupt control. The LLRs also update clocks on receipt of timer interrupts and service the non-volatile RAM. When the program is required to transmit a message to the terminal or to send a packet, the information is actually loaded into a buffer to be sent when the peripheral component is ready. Similarly, the program reads incoming information not directly from the peripheral, but from a buffer. The presence of complete messages to be read is signalled by flags set by the low-level input routines. This makes it relatively easy to implement the protocol in a high-level programming language without direct access to the peripheral devices.[7]

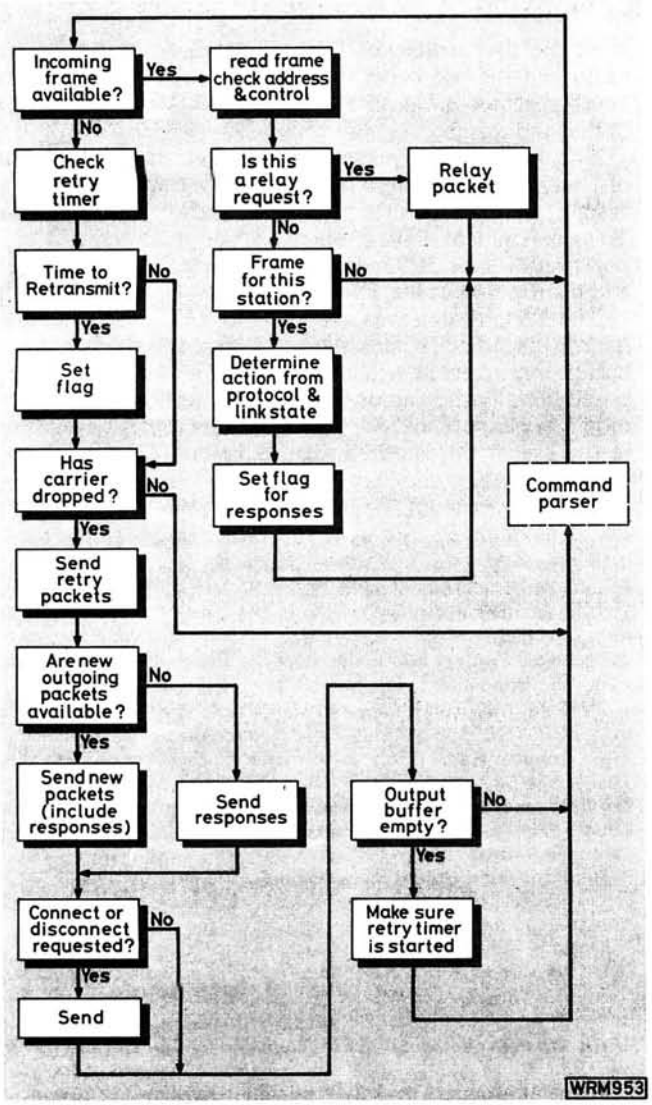

Fig. 2.5: Flowchart for operation of the packet protocol HLR routine

The utility of the HLR/LLR separation cannot be overemphasised. It allowed, for example, the two sections of the HLRs (command parser and packet protocol generator) as well as the LLRs to be developed independently by three people, in two different cities, on three different computers, prior to the final integration onto the TNC.

Program Structure

The structure of the packet protocol section of the HLR is shown in Fig. 2.5. This procedure is part of an infinite loop in which all routines alternately check for tasks to be done.

The first half of the procedure is concerned with reading incoming packets and determining the appropriate action to take. The action taken on receipt of a packet addressed to this station is determined by the protocol.[1,8] Several possible link states are defined, which are stages in the communication sequence starting with a connect request and ending with a disconnect request. For each type of packet received (specified by the CONTROL field) there is a prescribed action depending on the link state. If the action involves sending a packet—say, an acknowledgment—a flag is set for the second half of the procedure. When all incoming packets have been read, the clock is checked to see if packets have been sent which should have been acknowledged by now.

The second half of the packet protocol procedure, which sends outgoing packets, is entered only if the frequency is clear, indicating that all packets of a group have been received. This is determined by monitoring the demodulator carrier detect signal. Outgoing packets are formulated with header information and moved to the outgoing packet buffer following any packets being retried. Acknowledgments are sent as part of the control information with these packets if possible; otherwise, a special acknowledgment packet is sent. Finally, any special supervisory packets requested either in the first section of the procedure or by the user are sent. When transmission is complete, the clock is started for packets which should be acknowledged.

I/O Management

The interrupt-driven I/O routines contained in the LLRs basically form a simple operating system for supporting the HLRs.[9] In order to isolate the main program from the details of the hardware, all input and output is done through buffers. Since the HLRs do not examine incoming data until an entire line or packet has been received, terminal support such as character echoing, linefeed insertion, and response to character, line, and packet delete instructions (implemented by single editing characters) are managed by the low-level interrupt routines.

The structure of a typical buffer is shown in Fig. 2.6. There are four buffers, input and output buffers for terminal and radio data, each of which is accessed by an insertion pointer and a removal pointer. An input buffer, for example, has an insertion pointer which is advanced by an LLR interrupt routine as data is read from a peripheral device, and a removal pointer which is advanced by the HLR as it reads the data. All buffers are circular, meaning that when a pointer reaches the top of the buffer space it is moved back to the bottom. Input buffers require additional pointers to mark the beginning of a string which may be deleted by an editing command from the terminal, or in the case of a packet input buffer, by an error occurring during

receipt of a packet. Since a data string can be any length, the end of a packet or command line must be marked, either by a special character in the buffer or by a byte count at the beginning of the string.

Interrupt Handling

Only one hardware interrupt-request input of the 6809 microprocessor is used in the TAPR design—all interrupt lines are wire-ORed together. This means that when an interrupt occurs, each peripheral which could have generated it must be queried in turn, and an appropriate routine selected from a dispatch table when the cause of the interrupt is identified. Since more than one device could be in need of service at once, the order in which the devices are queried determines the interrupt priorities, which are as follows:

1. UART (terminal) input
2. UART output
3. VIA timer interrupt
4. HDLC (radio interface)
5. Parallel port input
6. Parallel port output

The serial input port is given highest priority, since if a character is not read before a new one is received, it is lost. The radio I/O interrupts are placed relatively low, since servicing the WD-1933 chip is complex and potentially time-consuming. Data lost in either direction due to slow service of this chip will be detected as an error, and the packet will be retransmitted. If the parallel port is used for user I/O, it should be serviced last, since full "handshaking" is used, and a sending device will not send new data until the old data has been read.

The timer interrupt is generated as the timer counts down past zero. By examining the count, the service routine can determine the actual elapsed time and compensate for any delay caused by conflict with other interrupts. For this reason, the priority for servicing the timer interrupt is arbitrary. Compensation must be made for the fact that the two count bytes are read at different times.

The timer interrupt service routine has a special function. After the software counters have been updated, a general housekeeping routine is entered. Time elapsed since a carrier drop is monitored and a packet transmission may be started from this routine. The c.w. station identification is also sent at appropriate intervals, and the timer routine toggles the audio signal on and off to produce dits and dahs.

The WD-1933 HDLC controller generates interrupts for the following seven conditions:

Receive Interrupts (by priority)
- Data received
- Received message without errors
- Received message with errors
- Change in carrier detect state

Transmit Interrupts (no priority)
- Data requested
- Transmitted message without errors
- Transmitted message with errors
  (Abort signal sent automatically)

Since they may potentially be present in any combination, and querying the chip resets most conditions, all conditions must be checked on each interrupt. The only difficulty results when logically inconsistent or out-of-place interrupts occur. For example, the presence of both "Received message without errors" and "Received message with errors," or a carrier-detect change while the transmitter is keyed, may occur. This is solved by ordering the receive interrupt priority as shown. Carrier detect can be ignored during transmission.

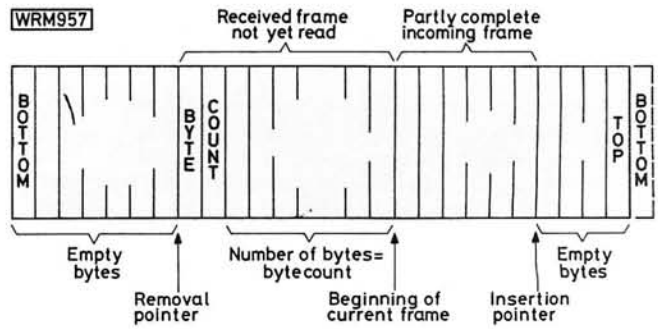

Fig. 2.6: A typical data buffer, *showing* pointers, and order of placement data. The buffer shown is the packet input buffer, and is similar to the other buffers

Transmit interrupts present a different sort of problem. The WD-1933 transmits HDLC frames automatically, but it must be commanded to send each section of the frame: flags, data and frame-check sequence. While the transmit function is active, it generates regular interrupts. These are "Data request" if the data function is commanded, and otherwise "Transmit end of message". These interrupts are treated as equivalent, and the interrupt service function is determined by the progress of the packet being transmitted.

Conclusion

In the first article of this series we described packet radio and the protocols in general use. In this article we have presented some details of the actual implementation of these concepts.

The TNC design presented represents the culmination of nearly two years of intensive effort by several Amateurs. These efforts resulted in both the formation of Tucson Amateur Packet Radio, a nonprofit R & D corporation of over 300 members worldwide, and the design and distribution of the TAPR TNC.

The TNC design was subjected to a Beta test with 172 boards placed at 19 sites. This test served to provide many useful improvements. Perhaps most importantly, it exposed literally thousands of Amateurs to this exciting new mode. We expect that soon there will be a rapid expansion in the use of this mode among Amateurs, and hope that you will join it.

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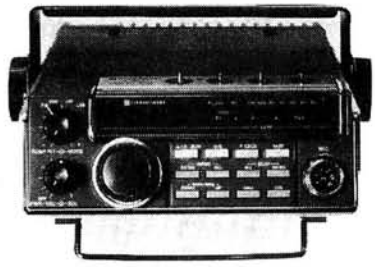

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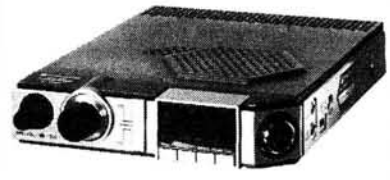

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Letters

RAE—May 1983

Sir: I would be grateful if you will allow me a few lines in which to reply to the letter of Mr Rumbelow, published in your August issue, and the letters from other readers which supported his criticism.

It may be useful to some of your readers if I start with a brief outline of how multiple choice question papers are constructed. Every paper follows a standard specification which allocates a certain number of questions to each section of the syllabus. The present specification is given on Page 13 of the syllabus pamphlet and will only be changed to give more "weighting" to a particular section when the syllabus itself is revised.

Each paper is designed by a working party which selects items from a "bank" of questions, all of which have been validated in pre-test and many of which have been used in previous examinations. This bank is being continually reviewed and augmented. The validating procedures which include pre-testing give us a clear idea of how the particular item will "perform" (i.e. among other factors, how many candidates will get it right) and your readers may be surprised to learn that most items perform in the same way each time they are used. The "facility value" of an item (i.e. how easy or difficult it is) is therefore a known quantity but, obviously, varies from item to item. However, in constructing a paper, we can balance difficult items with easier ones and can predict accurately the "mean score" (average mark) for all candidates.

There was no departure from this system in the development of the May 1983 papers and certainly no change of policy. All items were taken from the bank and a number had already been used in earlier examinations. The syllabus was covered according to the specification. The overall results do not suggest that candidates found Paper 2 more difficult than in previous years: 19·2% failed Paper 2, compared with 24·9% last year and in the examination as a whole the pass rate of 70% (5305 out of 7533 candidates) compares favourably with 66·9% last year. I have been able to trace the results of 10 of the 16 candidates who wrote criticising Paper 2, and of these 3 obtained credits, 4 passed and 3 failed, two of the three also failing in Paper 1. It would seem that some of your readers have a very modest view of their own knowledge and ability.

I hope that this summary has been of interest and I should again point out that the ultimate objective of the RAE is to establish that the candidate is capable of operating an amateur station within the terms of the licence. The achievement of this objective can only be of benefit to all operators.

S. D. Allison
City and Guilds of London Institute

Sir: After reading the Letters in the October issue of *PW* I felt that as a Tutor I should reply.

Fifteen of my class took the May exam; 13 passed, 2 failed the second part and 1 failed the first part.

None of them complained about the questions and said that everything that I had taught them had come up. The two that failed the second part had not attended all the classes.

The RAE Manual does not cover everything and too many students rely on this book to pass the exam. Like Mr. E. W. Stannard, I have spent over £200 on books, most of this on the Heathkit Continuing Education Series. I don't expect my students to spend this much, but they get the benefit of them through my teachings. There are articles in your own publication *Passport to Amateur Radio* which are not in the RAE Manual. I have produced my own book which students can obtain at my classes to try and cover the "gaps".

Complaints of the phrasing of questions I find come from those who don't read the questions properly (it's happened in my classes). A lot of students accept the example questions as the ones they will get in the exam, what they should do is change the questions round as many times as they can and form new questions, for some of those wrong answers are right if a word or two is changed in the question, change "Input" to "Output", a $\frac{1}{4}\lambda$ or $\frac{1}{2}\lambda$ shorted line has a different impedance when it's an open line, etc.

Mr. R. W. Lannon complains of lack of mathematical problems, he was obviously expecting a lot. The syllabus states "Electrical Theory" 11 questions (Page 31, *How to Become a Radio Amateur).* There were 12 questions in the May exam. For those who complained about the syllabus take a look at pages 21–30 of the above publication. The exam covered all aspects of the syllabus. I have received complaints from students about the exam, from other teaching centres. Their main complaint was they were not taught the questions that came up, and they were bogged down with maths. This aspect lies squarely on the shoulders of the Tutors.

D. F. Jones GW3SSY
Blaenavon

Sir: With regard to the May RAE. I sat the examination and was successful; a credit on both papers. I first tried a correspondence course; although many people probably find this adequate I felt I needed more personal direction so I enrolled at the local Radio and Electronics Society. This proved, in my case, the correct move.

We were taught strictly to the syllabus by an excellent instructor who drilled us, I believe, to above pass-mark requirement.

Over 90 per cent of the class passed, many with credits, and at least two distinctions.

Until I received the result I was far from confident about passing Paper II. The questions seemed to call for wider concepts of radio than the sample questions in the *RAE Manual.* The examiners seemed to have moved in a maze-like fashion to arrive at some of the questions. So parrot learning of formulae would not have been enough to pass. A good grasp of English was also needed to arrive at some answers.

Maybe the powers that be, on monitoring 144MHz (as they must surely do), have decided that standards need to rise. My own impressions on listening on that band in the London area are that there is definitely room for improvement. Perhaps some people did obtain their licences too easily in the early years of the multiple-choice paper. It is indeed sad that the antics of the idiot few make it harder for the rest of us. It was ever thus.

The major criticism I would level at the RAE is the lack of a practical test. Radio and electronics societies and clubs could be entrusted with a short practical test dealing with operating procedures and interference at a practical level.

Thank you for the years of entertaining and instructive enjoyment your magazine has given me. Also my thanks to Alan Sammons and the Barking Radio & Electronics Society for their excellent course.

J. F. Page
Dagenham

Letters

Sir: Re. Comment RAE October copy.

It seems to me that all budding Radio Amateurs want "it on a plate". When I took my RAE in 1961 there was no RAE Manual, etc., and we all had to rely on our instructors' notes.

The comment by one writer, "as it bore no relation to previous papers", seems odd to me. Does he want all the papers with the same questions on them?

It is no good going into the exam "half cocked" and in my area there was I think nearly 100 per cent pass rate. I do not think that our question papers were different to other parts of the country.

I may be old fashioned in my comment so I would like to hear from other amateurs within my own callsign area.

R. W. Howe G3PLB
Basildon

Sir: I note in October 1983 the poor and blatant cries of how hard the RAE is in its multi-choice answers. I took this type exam and passed first go without current trends in education, but hastily add that I am not brilliant as I had a gap from the ham radio scene for 15 years. I put my name down at the local tech. and sat the exam without tuition. I also add that I took the RAE of the 1960s and failed; in those "good old" days one had to explain how things worked. I would like to see this type of exam reappear and bring ham radio back to ham radio, fully into the meaning of it and not CB amateur radio. A hard earned thing would then not be abused and used with care and consideration for others. This would then sort out the genuine ham operators from the time wasters who take the exam and pass then operate, only to disappear after a few months.

E. F. Powell G6RGH
Cannock

Sir: I pen these words in an "off-operating" period during s.s.b. h.f. Field Day having just read the letters in October *PW*.

All your correspondents speak with one voice but are, I suspect, equally guilty of not studying the information, such as it is, put out from C & G concerning the detailed syllabus, which contains much important detail. It should be realised that to always set a question on a particular topic, or topics, would defeat the purpose of any examination.

As an RAE instructor and having written the paper in question for a blind candidate I can state that while there were some tortuous and poorly-worded questions there were enough questions on the basics to obtain pass grades at least.

Much has been written, and spoken, about the RAE over a good number of years and there are three points which rarely, if ever, seem to be raised.

First, the quality of the instructors. Just what experience of teaching, syllabus analysis, topic preparation and inter-relation does the average instructor have? From what I hear many are keen amateurs doing their best to give a service in providing instruction for a difficult form of examination. Do they give help on examination technique? Do they spend, as some do, many hours on practical work, which while interesting is really irrelevant as far as this examination goes. Some courses turn out almost skilled electronics engineers instead of concentrating on the object of the examination—to ensure a very basic knowledge of the fundamentals.

Secondly, that *RAE Manual*. As a professional lecturer in Technical Education (but in a non-technical subject) I can state that in 30 years of experience I have never seen such an atrocious, ill-written and disorganised collection of pages purporting to be a text book. A perusal of who wrote it reveals a bunch of experienced experts and as such in difficulty in writing anything for the many students who start the RAE with no knowledge. Like the curate's egg the manual has its better parts. It should be bought and put away in a drawer until the final fortnight before the examination—i.e. use it for revision and not learning.

The suggested reading list published in the *Manual* and in the Home Office booklet are about the worst things for today's average student to learn from. If these leave much to be desired then what can be used in their place?

There are now available on the market a whole range of texts published for the Technician Education Council (TEC) in Electronics and Radio Systems which cover in a much more readable and understandable manner much of the RAE syllabus (other than the licensing conditions of course).

I would suggest intending students would find the Electronics (Level I and Level II) and Radio Systems (Level II and Level III) of much greater use than the *Manual*—though this will be needed to cover some topics towards the end of the course. A number of authors have written books for the above levels and enquiries at the local technical bookshop or library would produce authors, publishers etc. My particular favourites are those by D. C. Green published by Pitman. Another useful publication is the ARRL book *Understanding Amateur Radio.*

Finally, despite the criticism heaped on every new style RAE exam, with questions cancelled, questions withdrawn, questions without correct answers, questions with two correct answers, three questions on the same topic, the answer to one question given in the next question, etc., etc., I would suggest people save their breath, for C & G are notorious in many subjects for messing things up. They have done this for many years and leopards don't change their spots. By the way, what does the RSGB Education Committee do? What do the RSGB members of the moderation board of C & G think about the exam?

As a final final, let intending students be prepared in their examination for about half a dozen "odd" questions. Don't be put off by them and remember the questions you did do and not the ones you couldn't do.

R. G. Wilson G4NZU
Nottingham

Sir: I was somewhat perplexed to read the comments in the letters section of *PW* regarding the May '83 RAE. May I suggest with respect that these individuals turn their attentions to the May '83 RAE results!! May I also say that buying an RAE Manual, etc., does not automatically constitute an RAE Pass, nor does it infer one. Whilst on the subject of the RAE, why is it that so many wives of licensed amateurs are sitting the RAE? Are they subscribing to the philosophy if you can't beat them join them? Or is it so their husbands can more easily justify the expenditure of large amounts of money on the acquisition of the latest all-singing, all-dancing Far East "wonder box"?

R. J. Howes
Weymouth

Sir: Having read your letters on the recent RAE exam, I am writing to say my husband took this exam in May. He did not take the course, nor have an electronics background, only reading *Radio Exam Manual* and a *Guide to Amateur Radio.* He managed to pass with credit on both papers. Reading some of your letters prompted me to write mine.

Mrs. E. A. McLachlan
Glasgow

Letters

Sir: In reply to the letter published in August *PW* regarding the RAE exam, I would like to make the following comments. I agree with your reader that there was a virtual absence of many major items, most noticeable of which was the main reactance and resonance formulae. Surprisingly there seemed very little requirement for the use of a calculator and the ability to remember and use important formulae.

In defence of the RAE, however, I do feel that there really are *far too* few questions in the second paper to enable full coverage in the exam. There is, as I found myself, a tendency when studying with the limited number of sample papers to become conditioned to expect that the exam paper will be a convenient blend of the two sample papers in the RAE manual. In fact there are major items absent from the sample papers as well. As with most exams, the biggest disappointment is always the absence of questions on the parts you know well.

At the time of writing this letter, I have not yet got my result, but I think there is scope for making the exam more comprehensive. If it has to be multiple choice then the second paper should be longer.

A final word to your reader: If they don't ask you what the formulae are you can't get them wrong!

J. S. Hind
Nottingham

Sir: I was interested in the letters about the RAE. A friend of mine, a G3, was asked if he would take an RAE class at the local school. In the first two exams he had 100 per cent pass rate and in the last RAE 4 failed. In the May RAE 70·5 per cent passed, some 5307. The letter writers are not yet to the standard to become radio amateurs.

We are always in danger of losing our frequency bands, and unskilled operators would add to this. When I took the RAE in 1968 I was able to draw a circuit diagram of a transmitter, receiver and Xtal type wavemeter with component values as you would be asked to draw part of all three.

I don't wish this to return, but amateurs have more freedom of the airways than any other services. I would like to keep it that way.

John Tye G4BYV
Norfolk

Sir: It is rare for me to write to any magazine readers' letters page. However, the deluge of complaint letters you published has stung me into action on this occasion!

It is obvious to me that all published writers were not only suffering from the post-examination blues but had failed to appreciate the full City & Guilds syllabus. G. L. Benbow's *Radio Amateurs Examination Manual* clearly and explicitly indicates the range of subjects that the aspiring candidate must cover.

I cannot help thinking that your writers' misgivings are misdirected! Instead of griping about the "City & Guilds having changed the rules", I think they should be challenging their Technical Colleges and Correspondence Courses for failing to enlighten them fully. I feel qualified to make such statements to you because last winter I too went through the pain and anguish of evening classes, trying to absorb the requisite information. However, the difference is that we were schooled correctly and briefed fully about the possible pitfalls of ambiguity in the questions and the necessity to cover the full syllabus including fringe questions. Result?—Ten of us enrolled for this May's exam and ten of us now have City & Guilds pass certificates, many with credits, and incidentally none of us had any previous electronics experience.

So writers, there is nothing wrong with the system, it is how you have been taught that is your real bone of contention. How many of you were taught by an electronics lecturer and how many of you had a Radio Amateur who had himself sat the current multi-choice paper? How many of you, I wonder, spent the time between exam and results worrying and moaning about the so-called "unfairness" of Paper II, now find themselves not having to resit Paper II this December but Paper I!

Tim Cattley G6YUW
Oswestry

PW Mast Review

Sir: As a result of the *PW* March 1983 review of the Altron SM30 mast, several customers have queried the method of operating the winch when lowering the mast. I hope the following may clarify the situation.

As an added safety measure, the standard ratchet winch normally supplied with the Altron SM30 slimline mast is modified by Allweld in a unique way to enable the ratchet to function as a failsafe stop in the event of an accidental runaway, such as can occur if the handle of the winch is let go under certain load conditions. This can happen on any standard type of ratchet winch that is not auto-braked. As far as we know, Allweld are the only firm currently doing this simple but effective modification, which involves fitting a stop-screw to prevent the ratchet pawl latching in the "off" position.

As the modified ratchet must be held off during winch-down operations, a little inconvenience can be experienced during the first part of the tilt-over on a post-mounted SM30, when the mast has to be started moving. A simple solution, as mentioned in the review, is to wedge a short piece of wood between the post and the mast to form a kick-bar, leaving both hands safely free to operate the winch. We feel this small inconvenience is not a high price to pay for the additional safety in operation resulting from this Allweld idea. We could of course weld on a kick-bar, but this could result in more barked shins than it would be worth. However, we are working on the idea and hope we may come up with another Allweld innovation.

As an extra-cost option, we can supply auto-brake winches if required.

A. Barraclough
Allweld Engineering

Advice Wanted

Sir: I would like to hear from any reader who has purchased and operated scanner sets. All letters will be answered.

Anthony Chaffe,
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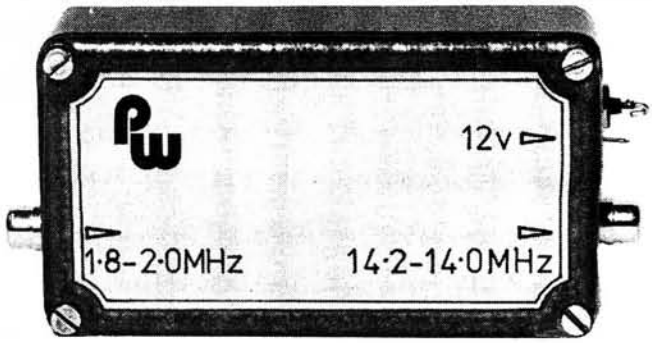
Halton Brow,
Runcorn,
Cheshire.



PW DART TOP BAND CONVERTER

by Rev G.C. Dobbs G3RJV & Colin Turner G3VTT

The *PW* Dart d.s.b.s.c./c.w. transmitter described in the November and December 1983 issues provides an ideal way to get onto the 1·81–2·0MHz amateur band at little cost. The circuit is perhaps most appealing to those who do not have facilities for that band. Many recent transceivers have omitted "Top Band" so the *PW* Dart, in conjunction with a suitable receiver, can fill in that gap.

It may be that if Top Band is missing from a station transceiver the station could have no receiving facilities for the band. An obvious way to overcome this problem is to build a receive converter to enable the band to be received on one of the more common amateur bands. What follows in this article is a simple up-converter design which can be bolted onto the back of the *PW* Dart transmitter to enable it to be used in conjunction with a transceiver or receiver which can tune 14MHz, to provide full transceiver facilities for the complete 1·8 to 2·0MHz band. The converter could be built as a small project in its own right to enable Top Band coverage to be added to any station receiver that tunes 14MHz.

Choice of IF

There are a few obvious problems in converting a signal from Top Band to another amateur band. For a start 1·8MHz is uncomfortably near to the medium wave a.m. broadcast band, with a variety of strong stations all waiting to break through on the input. Then there is the problem of breakthrough from existing signals on the amateur band selected as the conversion frequency.

On a dusty back shelf in my shack I have a converter from some years ago built to give me Top Band capability using the 7MHz band as the conversion band. A friendly little unit because if things are quiet on Top Band I can always listen to the local medium wave commercial station or to one of the broadcast stations encroaching into the 7MHz band in the evenings. Plainly a circuit to be avoided!

Another problem is finding a suitable crystal to form the local oscillator (l.o.) frequency for the conversion. Crystals can be etched to order on any suitable frequency but the cost is considerable and rather detracts from the inexpensive approach used in the *PW* Dart transmitter. A prototype was attempted using 27MHz radio control crystals, converting the band up to 29MHz. This works quite well but many receivers can be insensitive at these higher frequencies. The final conversion frequency was decided after noticing an advertisement in the back of *PW* from P. R. Golledge Electronics for "off the shelf" 16MHz fundamental crystals at £3.35 including VAT and postage.

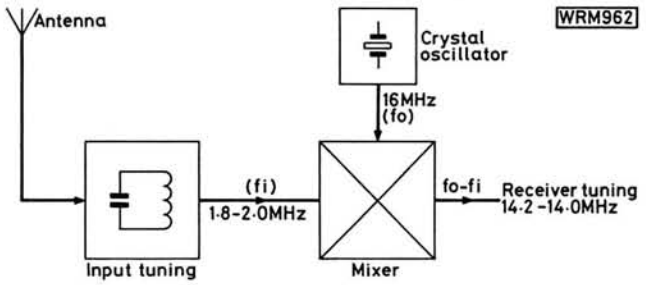


Fig. 1: Block schematic of the *PW* Dart 1·8MHz receive converter

Circuit Design

The approach adopted is shown in block form in Fig. 1. This is the classical simple receive conversion circuit. The required band (1·81 to 2·0MHz in Region 1) is tuned at the input and fed into a mixer stage. A 16MHz crystal provides the frequency for the local oscillator, which is also fed into the mixer. The frequency required at the output is the input frequency (fi) minus the oscillator frequency (fo). This produces the conversion from 1·8 to 2·0MHz as 14·2 to 14·0MHz—reverse tuned on the 14MHz amateur band. The s.s.b. stations on Top Band would normally use the opposite sideband to those on the 14MHz band so the reverse tuning is quite useful in that the sideband switch can be used in its "normal" (u.s.b.) position.

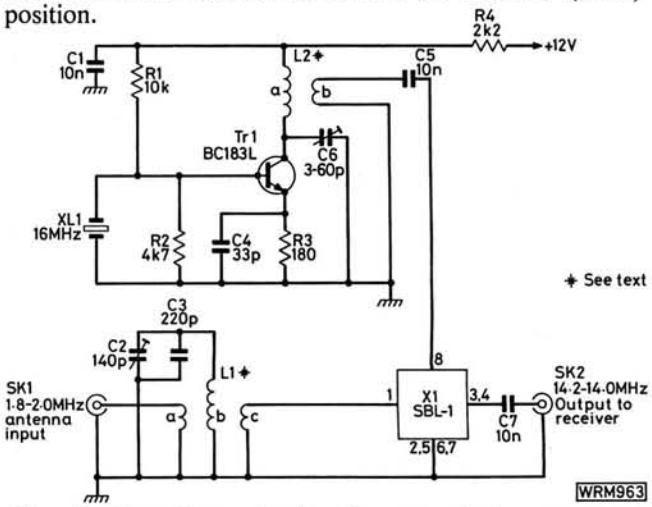


Fig. 2: Complete circuit diagram of the converter which will provide 1·8MHz band coverage when used in conjunction with a 14MHz receiver

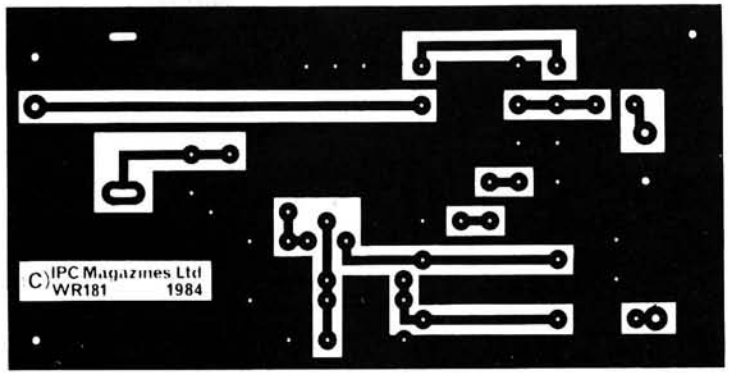
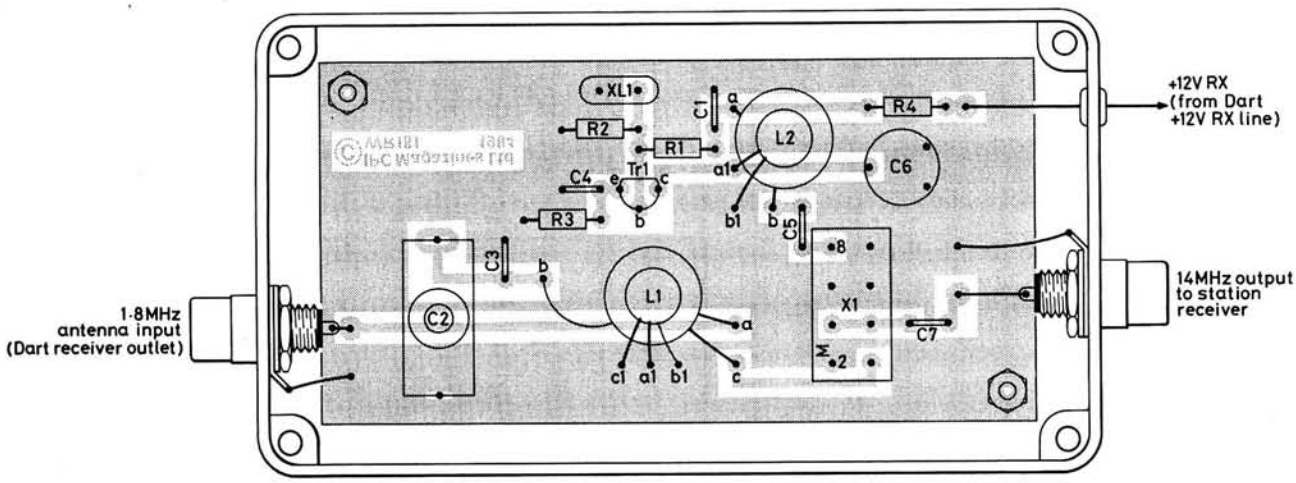


Fig. 3: Full size p.c.b. and component placement details. Pin 2 of the mixer X1 is located beneath the letter M of the part identification



★ components

Resistors

Carbon film ¼W 5%

180Ω	1	R3
2·2kΩ	1	R4
4·7kΩ	1	R2
10kΩ	1	R1

Capacitors

Miniature Plate Ceramic

33pF	1	C4
220pF	1	C3
10nF	1	C5

Miniature Ceramic

10nF	2	C1,C7

Compression Trimmer

140pF	1	C2

Miniature Film Trimmer

3–60pF	1	C6

Semiconductors

Transistors

BC183L	1	Tr1

Miscellaneous

SBL-1, double balanced mixer (1); 16MHz crystal HC18/U; phono sockets (2); feedthrough capacitor (see text); diecast aluminium box 110 x 60 x 30mm (see buying box); p.c.b.; T-50-2 toroid (1); T-50-6 toroid (1)

The full circuit diagram is shown in Fig. 2. Like the *PW* Dart, the circuitry is very simple. The mixing is done using a double balanced mixer type SBL-1. This is not a cheap device but it offers obvious advantages in this simple circuit. Being a high level mixer problems with cross modulation and adjacent channel interference are minimised. So much so that one preset tuned circuit ahead of the mixer was found to be sufficient against the ravages of the evening a.m. stations close to 1·8MHz. The balancing within the device is very "tight" and if adequate screening is used

BUYING GUIDE

Components for this project are readily available. An alternative housing is the Minfford A8 box. The prototype used a 16MHz HC18/U crystal from P.R. Golledge Electronics.

Approximate Cost £15

Construction Rating INTERMEDIATE

between the input and output ports and the l.o. the susceptibility to spurious signals is very low. Originally a tuned circuit or filter for the output was considered but in practice this made no difference. The output port is a well matched 50 ohms which can be fed directly, via C7, into the input of a receiver on 14MHz. The SBL-1 is a passive mixer so there is no conversion gain but on Top Band front end gain is of little importance. Who wants to amplify a lot of noise!

The input tuned circuit around L1 was found to be sufficient for the needs of the circuit. A two stage filter was considered, as was an externally adjustable input filter but this simple arrangement works well without problems of adjacent channel breakthrough. Setting C2 to peak signals in the centre of the band serves well for the whole band without need for retrimming. However, the fastidious could make C2 into a variable panel control if they so wish. The winding for L1b, which consists of 63 turns of 32 s.w.g. enamelled copper wire, occupies the whole of the T-50-2 toroid core. Inductors L1a and L1c, both comprising 5 turns of 26 s.w.g., are wound onto the grounded end of L1b. In practice the easiest way to do this is to take two lengths of wire and wind both L1a and L1c side by side onto the core in one action.

The oscillator circuit around Tr1 is very simple and should fire-up first time without problems. A whole range of transistors might be used for Tr1 but the BC183L is as cheap as most commonly available types. Inductor L2a tunes the 16MHz l.o. signal, in conjunction with C6, and L2b provides a low impedance output for the mixer. The two windings are mounted on a T-50-6 toroid, L2a being 16 turns and L2b 3 turns, both of 26 s.w.g. wire. When the oscillator stage is built it is best tested on its own before connection is made through capacitor C5 to the SBL-1.

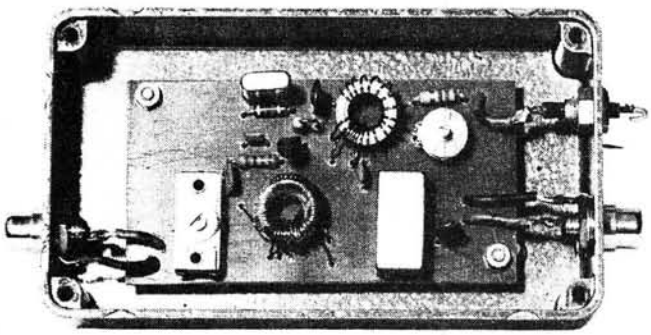


Fig. 4: A photograph of the author's prototype converter

A simple r.f. diode probe may be connected onto the output from L2a and a reading taken on a voltmeter. Passive mixers require quite a bit of drive—over half a volt is advised—so the output from L2a should read in the order of 1 to 1·5 volts (peak r.f.). This will be somewhat less when the output is loaded into the SBL-1. Crystal oscillators are perky little things and capable of much higher outputs than required here. If the output is too high, or under 0·5 volts, adjustment can be made to the value of R4.

A single printed circuit board accommodates the complete converter, as shown in Fig. 3. The board retains a large amount of copper to act as a screen mat which helps the isolation between the ports of the SBL-1. All components are standard types and easy to obtain. The assembled board was mounted into a diecast box measuring 110 × 60 × 30mm. This box happened to be to hand but a much cheaper alternative is the Minffordd A8 Box. Either will bolt directly onto the back of the *PW* Dart transmitter case. The input and output terminations are inexpensive phono sockets and a 1nF leadthrough capacitor takes the 12 volt d.c. supply into the box.

System Connection

The converter is a useful little unit to put ahead of any receiver that lacks Top Band but has 14MHz coverage. If it is to be used with the *PW* Dart, the method of connection is shown in Fig. 3. The Dart changeover board provides for a "receiver" output and a 12 volt d.c. *line on* receive (12VRX). The receiver line already comes out of the back of the case and can be fed into the converter input. The converter output goes to an existing station receiver on 14MHz. A leadthrough added to the back of the Dart case is probably the best way of getting the 12 volt line to the converter. The converter can now be used with the *PW* Dart and a receiver. Antenna changeover functions are provided within the Dart circuitry so once the converter has been peaked up using C2 it is merely left in place on the back of the transmitter case.

Armed with the *PW* Dart transmitter and this converter it is possible to get onto Top Band at little cost and with the added pleasure of making worthwhile contacts with homebuilt equipment. ●

Swap Spot

Have Harrier CBX radio, s.w.r./power meter, Sigma II antenna, halfbreed antennas. Would exchange for linear for Standard C-58 or w.h.y. Jeff Brown. Tel: 01-637 6270 *T574*

Have BSA Bantam D14 motorcycle (non-runner). Would exchange for any 144MHz or 28/29MHz gear, w.h.y. Tel: Basil G6VAN 0642 66869 (Cleveland). *T577*

Have 3½in screw cutting lathe with motor, some change wheels and accessories. Would exchange for 144MHz/432MHz hand held or base equipment, v.h.f. scanner or h.f. w.h.y. Tel: 051-645 5383 after 6.30pm (Birkenhead). *T591*

Have S registration Vee twin 350cc Morini motorcycle. Would exchange for h.f. receiver, FRG-7700, R1000 or w.h.y. Tony G3YSQ. Tel: West Hanney 386. *T592*

Have FT-290R mint condition. Would exchange for TS700G. Tel: G4TBM Lewes (Sussex) 6099. *T598*

Have FT-200 h.f. transceiver, 28MHz–3·5MHz with matching p.s.u.. Would exchange for TS700G. Tel: G8JDF Lewes (Sussex) 78080. *T599*

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Have amusement arcade Space Invaders machine would exchange for h.f. receiver or FC-902 a.t.u. Karl. Tel: 01-575 0090 (Greenford, Middx.). *T639*

Have Quad f.m. 188MHz Tuner plus 3-waveband tuner all valve sets. Would exchange for w.h.y. J. F. Riley, 51 Leeswood, Ashurst, Skelmersdale. Tel: 33304. *T637*

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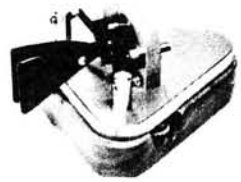

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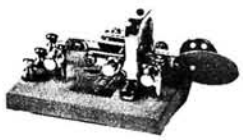

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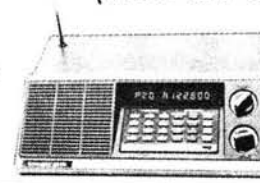

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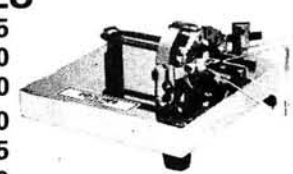

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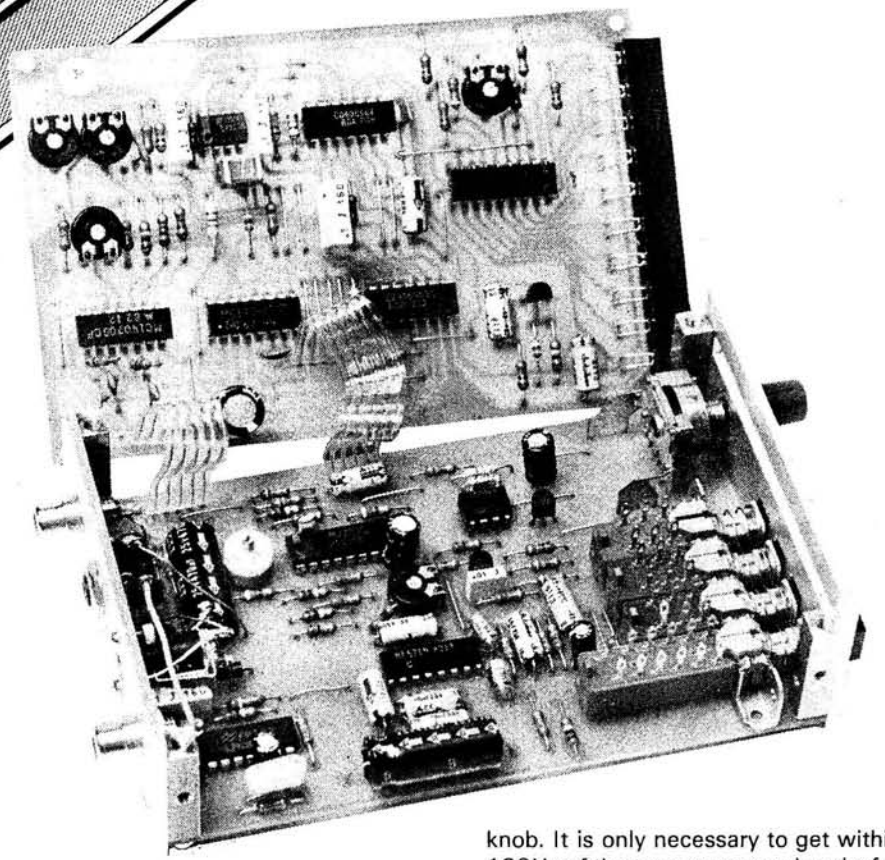
PW REVIEW

Datong Model ANF Auto-notch Filter



The Datong Model ANF is a compact, light-weight unit (150 x 90 x 42mm and 400g) which provides automatic or manual notching of interfering whistles and heterodynes, or manual peak filtering of c.w. signals.

It is simply connected to the external loudspeaker or headphone socket of a receiver using the lead provided, and has output sockets for a loudspeaker of 3Ω impedance or greater (a 2 watt audio amplifier is incorporated) or headphones.

The unit is controlled by four push-buttons and a manual tuning knob, and there is an l.e.d. indicator showing that the automatic notch filter is locked onto an interfering heterodyne, plus a bargraph l.e.d. display of notch or peak tuned frequency.

Operating the Model ANF is simplicity itself. The User Instruction sheets recommend that the unit is left permanently connected and operating in the auto-notch mode. In the absence of a steady interference note, the notch will sweep up and down the range 270-3500Hz, but will be quite inaudible because it is so narrow. As soon as a whistle or heterodyne appears, from an anti-social "tuner-upper" or whatever, the notch will lock onto the offending signal, typically within one second, effectively removing it from the output of the unit.

The effectiveness of the unit can be checked by pressing NOTCH and PEAK buttons together, putting the filter into the "bypass" mode. The notch depth on the review unit was measured at better than 34dB across the whole range.

If more than one interfering tone is present at the same time, the filter will lock onto the first one it encounters in its sweep, and this may not be the most annoying one. In such cases, it is better to select the MANUAL mode and tune the notch using the manual tuning knob. It is only necessary to get within 100Hz of the tone, a narrow-band a.f.c. system then takes over and fine-tunes the notch for maximum depth. This feature makes operation very easy.

For Morse code reception, the MANUAL PEAK mode turns the Model ANF into a high-quality c.w. filter, tunable to your favourite beat-note by means of the manual tuning knob, with operating frequency indicated by the bargraph l.e.d. display. The peak bandwidth on the review unit was measured at around 56Hz at −3dB points and 500Hz at −30dB points, with an ultimate rejection of better than 50dB.

Power requirements for the Model ANF are 11-18V d.c. with a measured consumption of 60mA at 13·2V. The supply need not be stabilised. The 4-page User Instructions give comprehensive operating advice, plus adjustment details for internal presets for Lock Threshold, Tuning Limits and Notch Depth. The unit is built on two p.c.b.s joined by ribbon-cable links, and constructed to the usual high Datong standard.

The Model ANF is priced at £67.85 including post, packing and VAT from **Datong Electronics Limited, Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE, telephone 0532-552461,** to whom go our thanks for the loan of the review model, or from Datong dealers.

Geoff Arnold

HF ANTENNA SPECIAL

Two Band Mini-X Beam

F. C. Smith GW2DDX

The mini "X" beam for 10 metres published in the March 1982 issue of *Practical Wireless* gave the author excellent results on the 28MHz band, even when used indoors.

It was to be regretted that good though this little beam was, it only covered the single band. Further thought was given as to how to make the excellent features of the "X" configuration into a more versatile dual-band antenna covering both 28 and 21MHz (15m), while still retaining its space saving utility. Accordingly, it was decided to make the "X" with 1·8m bamboo cane spreaders, thus making the external dimensions 2·438m × 2·438m, which still allows the antenna to be used indoors as well as outside. With the other simple modifications to the original design shown in Fig. 1, dual band operation is achieved.

Construction

As with the single band version, 300 ohm ribbon feeder is used for the elements, as this provides a broader bandwidth with the electrically shortened elements used on 21MHz (it will be noted that on 28MHz the elements are not shortened). Each section of the antenna is formed from 1·676m of ribbon feeder which is run along each cane and then taped. The remaining outer section lengths of ribbon for both the driven element and reflector are folded over and held together with non-conductive cord.

The driven element is resonated at 28·2MHz with a grid dip oscillator (g.d.o.) and the reflector at five per cent lower in frequency, following conventional Yagi practice. That takes care of the 28MHz band requirements. The next procedure is to get the beam on to 21MHz.

After some thought it was decided that the best way to proceed would be to coil load the driven and reflector elements in a similar manner to the original "X" beam and insert λ/4 stubs to provide band switching.

Appropriate size coils are fitted to the centre of the elements and once again adjusted in conjunction with a g.d.o. to 21·3MHz, with the reflector a further five per cent lower in frequency. Care should be taken with these adjustments to ensure the best performance of the assembled beam. Two additional λ/4 pieces of 300 ohm ribbon feeder are then brought to resonance at 28·5MHz (these worked out at 1·625m in length on the author's prototype) and are then fitted across the coil sections. As these sections of cable are not part of the radiating system proper they can then be rolled up and secured to the centre board.

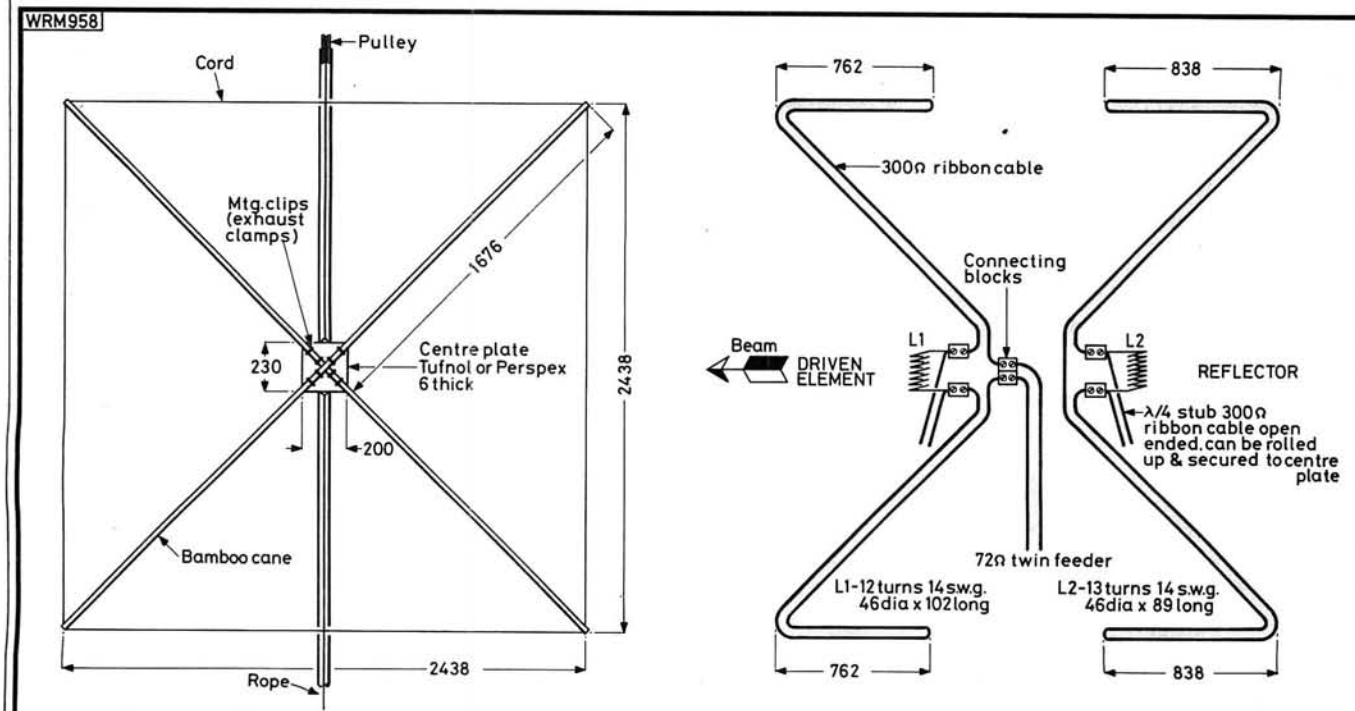


Fig. 1: Constructional details. The mechanical supporting structure is shown (above left) together with the associated *element details*. The folded-back ends of the 300Ω ribbon can be drilled and held in alignment using non-conductive nylon cord. A 10m high mast is used by the author with the centre plate of the antenna retained by sliding rings. Beam heading can be changed from ground level by the addition of a rope tied off to the driven element. If used outdoors the loading coils and feeder connections must be weather proofed

The antenna now covers the two bands. When operating on 28MHz the λ/4 stubs short out the 21MHz coils, allowing the beam to be resonant on that band. This method is a quite effective and efficient means of automatically switching bands.

Since its construction the performance of the beam has given the author every satisfaction, on both 21 and 28MHz, and can be recommended to those who have little space for a full size beam. The total weight of the mini "X" beam is just over 1·5kg and it can be used in both the horizontal or vertical modes. Do not forget to treat the canes with a coat of paint or varnish to prevent weathering effects. The estimated gain of the antenna should be approximately 5dB.

The 72 ohm twin feed line from the antenna driven element is connected to the transceiver via an a.t.u. having balanced input terminals and an output arrangement which is either balanced or coaxial as appropriate. In the author's case the a.t.u. is constructed from two 140pF variable capacitors, in series with the feeder conductors, connecting to each end of a six turn, 75mm diameter and 32mm long coil. The transceiver is coupled to this coil via a centrally placed two turn, 75mm diameter link coil which is 10mm long. ●

Kite Antennas For Top Band

P. Painting G3OUC

Of all the frequencies allocated to Radio Amateurs 1·8MHz (160m) is without doubt the best for the ease of construction of home built equipment. It is however unfortunately the case that for good results on "Top Band" considerable space is required on which an effective antenna system can be erected.

My garden is very small so I have constructed a 14m high centre loaded vertical antenna for this band. I have found that compared with a 40m long quarter wavelength antenna my own installation is inferior to some degree. Because of this situation, and having a fondness for 1·8MHz and the operators thereon, I frequently use the mobile or portable modes of operation using home constructed equipment, mostly amplitude modulated and simple in concept. Since my schooldays I have also had a keen interest in making and flying kites of all types so when I obtained my Amateur Radio licence in 1969 it was logical to combine the two hobbies and to use a kite as an antenna support on 1·8MHz.

Today with solid state equipment I am still getting a great deal of enjoyment, fresh air and plenty of interesting contacts whilst using the 20-year-old box kite to support a suitable length of wire. I have often been asked "over the air" to describe the equipment and antenna system; it is to those who wish to try this interesting and often effective method of stirring up activity on 1·8MHz that this article is dedicated.

Kite and Antenna Construction

You could say that I had a distinct advantage by using the ex-RAF air sea rescue type box kite and its associated antenna wire. It is possible that these excellent kites are still obtainable, however, I know of no source of supply.

This particular kite is perfect for portable use being both sturdy in construction and stable in a range of windspeeds from 30–70km per hour. Its design enables it to be dismantled and folded into a very small space. The struts are of duralumin and the sail material cotton. The antenna wire originally used with this kite was either stainless steel or phosphor bronze tinsel plaited with silk or nylon for strength and light weight. However, any stable kite capable of supporting the antenna wire will be suitable for the purpose, providing it falls within the specification laid out in the Air Traffic Control Regulations (see end of article for kite flying regulations). The major consideration is that of lifting the antenna wire plus a suitable safety line, therefore the larger the kite the better, providing the weight does not exceed the legal limit of 2kg.

At this juncture may I point out that kites of the "stunter" or aerobatic type are useless for antenna support. What is required is a steady stable system capable of flying whilst anchored down for as long as the operator wishes or whilst the wind blows favourably. Having to keep maintaining an eye on the kite or to rush about attending to things will not make you very popular whilst holding a QSO with a distant station—calling CQ only to have the kite descend as you receive a reply is no fun either! To ensure that all will be well when the great day comes it is important to get to know your kite and have a number of test flights in varying weather conditions so that the pitfalls previously mentioned do not occur.

The length of antenna wire I use is approximately 60m. This can be of 24 or 26 s.w.g. enamelled copper wire stripped from an old transformer, choke or solenoid. Aluminium alloy type wire sold by garden centres or horticultural stores is also very good. A further source suitable for large kites is electric fencing nylon/copper twisted cord obtainable from agricultural merchants;

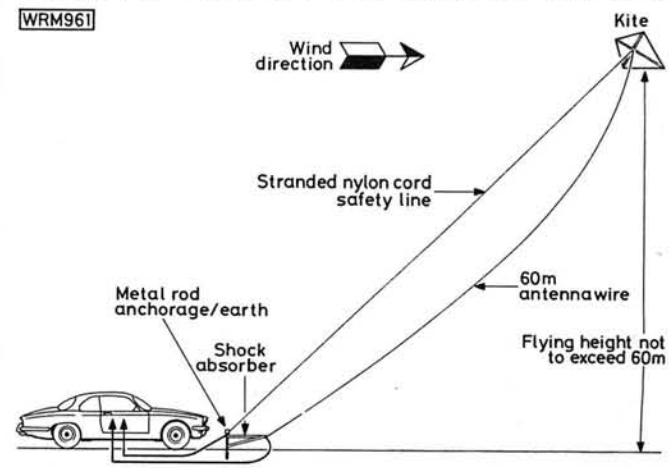


Fig. 1: The basic layout of the Kite supported antenna system discussed in the text

however, this cord is not cheap and for the one off portable foray the single strand enamelled wire will suffice. If more than a few flights a year are planned it is useful to have a winding reel to prevent the antenna wire being kinked or becoming a "bird's nest". If single strand wire is kinked or knotted it will eventually break so discard such damaged wire.

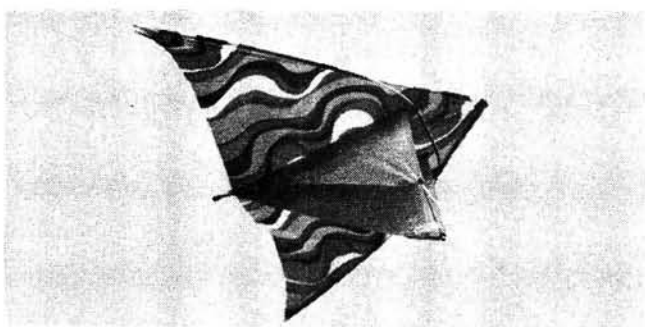
The antenna wire does not take the main pull of the kite. This can amount to several times the normal breaking strain of 26 s.w.g. copper wire. Even if the wire seems strong enough initially any slight kinks will eventually result in the wire snapping and/or prolonged use will stretch the wire to eventual failure. To prevent the antenna wire being broken, I use a safety line of nylon cord to take the strain. This should be capable of holding the kite in any "normal" wind. Further to this, if the antenna wire breaks the whole system can be brought down to terra firma safely on the main line. Although I use nylon stranded cord, any other strong rot-proof line will do provided it is not monofilament fishing line. The elasticity of such line precludes its use for this purpose.

At the ground end termination of the antenna and main support line it is wise to incorporate a rubber or elastic shock absorber to take up sudden stress due to wind variations etc. This shock absorber can be obtained from motor cycle shops where it is sold for holding equipment or panniers onto motor cycles, consisting of a length of rubber covered with fibre with two hooks, one at each end. Once the kite is flying at the required height it may be anchored by the hook end of the shock absorber to a secure point as close to the radio equipment as possible. A metal rod can be used for this support and it may also be used as an earth rod if required. Other anchor points may be convenient: trees, bushes, fence posts or large rocks, provided they are substantial enough to take the strain. Care should be taken not to cause damage when using such "natural" anchoring points.

Safety & Site Considerations

It may be opportune to raise a few points about safety at this juncture. Although my portable activities usually take place well away from built up areas, in fact the nearest buildings are about 5km away, there are always people, horses and sometimes vehicles in the vicinity, all of which can be a problem and should at all times be treated with due consideration.

It would be both foolhardy and extremely dangerous to set up a portable radio station using a kite supported antenna adjacent to power transmission lines or other types of overhead cables. If the kite broke free it could be carried by the wind across live conductors thereby energising the broken antenna wire.



The Twin Keeled Delta kite which is suitable for antenna support is available from Cochranes of Oxford Ltd., Leafield, Oxford OX8 5NT, Tel. 099 387 641

Other situations to avoid are damage to property and crops by using an ill-chosen site. Remember that the higher a kite flies, the further it will have to travel before it comes down. If the lines break, ensure that there is plenty of room for a safe descent, and that the kite can be retrieved without encroaching on private property.

During the summer months thunderstorms can build up quite rapidly. **On no account should the kite be used during such conditions.** Fortunately there are several indications of electrical storms long before they are *within* the area. As well as the daily weather forecast it is possible to obtain quite a good idea of suitable thunder-free conditions by listening on a medium wave broadcast band receiver. If electrical discharge interference can be heard this can indicate the presence of thunderstorms within 160km of the receiver. The 1·8MHz station receiver itself is also useful for this check; as the receiver frequency is raised towards 30MHz, the distance over which lightning discharge interference can be detected decreases. At 28MHz it seems to be approximately 30km on the author's mobile transceiver.

Visual indications of unsafe conditions are large dark clouds, flat at the base and towering to high altitudes, sometimes changing shape rapidly (cumulonimbus) together with hail or heavy rain squalls. Clouds such as these tinged with yellow are particularly good indications of bad conditions. On observing such approaching storm clouds or hearing static discharge interference (QRN) on the receiver it is prudent to discontinue operating and close down the portable station. It should be noted that thunderstorms can occur at any time of the year given the right conditions.

When vacating a portable site make sure that all rubbish, especially bits of wire or string, are removed as such things can be harmful to wildlife or livestock.

At this stage you may wonder if it is worthwhile proceeding further. I will just say that the previous information is a guide to proper portable field operating using a kite supported antenna. Provided care is taken there is no reason why you should not achieve success with safety.

Selection of Suitable Sites

At first site selection may seem a major problem; however, an Ordnance Survey map of the locality will often reveal open spaces where it is possbile to set up a portable amateur radio station without causing annoyance to others. Most radio societies have known portable sites where field day operation takes place or where farmers/landowners are personal friends. Ridgeways and downland, wherever such places are open to the public, are also suitable. In fact in the South of England much v.h.f. portable work is carried out from such locations.

Common land which at first sight may seem ideal requires careful checking because under certain circumstances bylaws prohibit the use of vehicles thereon. Also such places attract large numbers of people when the weather is fine and this is not conducive to success or safety. Of course, if you live on a barren sea coast or are holidaying in Scotland or Wales where there is open country in abundance the problem is minimal; such sites would seem ideal.

High open country is particularly good for flying the kite because the winds are more reliable at such locations. I have found that at my home, which is about 90m above sea level, the wind can be barely noticeable. However, on Walbury Camp, a hill 297m above sea level where most of my portable work takes place, it can be strong enough to require very secure attachment of the line. A light breeze

early in the morning can by midday be blowing strongly enough for the equipment to be used for several hours.

A point which is not generally understood is that the wind does not blow at a continuous rate but in a series of gusts of varying intensity and time. Similarly the wind's direction may vary over the period of operating using the kite antenna. Light rain or drizzle though affording discomfort when operating need not prevent 1·8MHz portable operation, providing the wind is strong enough to keep the kite flying. Sometimes better results are obtained because of reduced atmospherics in wet weather.

Antenna Length and Matching

As with all fixed station equipment, portable transmitting and receiving apparatus must be matched electrically to the antenna, for then and only then can the best results be obtained and of course possible damage to r.f. output transistors of solid state rigs be avoided. Modern transceivers have low impedance outputs in the 50 to 75 ohm range. To permit a random length of wire, which may be anything from 30 to 75m long, to be used as an antenna for such radio apparatus using coaxial input sockets, two important pieces of equipment are required. These are an antenna tuning unit (a.t.u.) and s.w.r. meter.

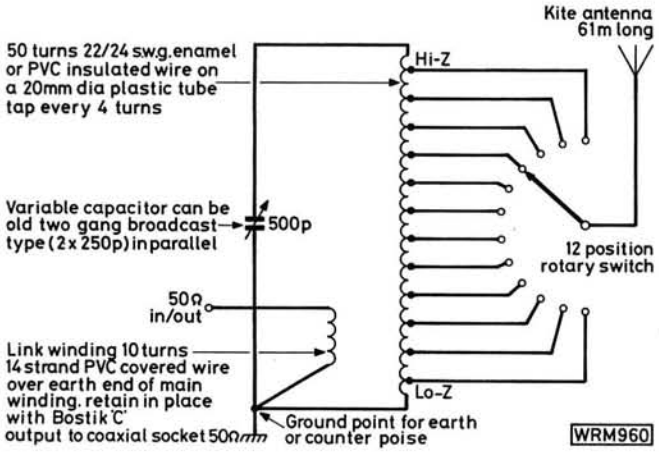


Fig. 2: Circuit details of the a.t.u. used by the author for operation on the 1·8MHz band

The a.t.u. matches the kite-borne antenna of unknown impedance to 50 or 75 ohms for connection via coaxial cable to the portable equipment. Several suitable designs of a.t.u. have been described in various radio magazines over the years. However, some of these can be complex and require careful adjustment, or will not adjust correctly with certain wire lengths.

Simplicity being the name of the game, I use a parallel tuned circuit with a 10 turn link coupling for 1·8MHz output (50 ohms) to the equipment, Fig. 2. The kite antenna is then tapped down the a.t.u. tuned circuit until a reasonable match between antenna and transmitter is obtained. The tuning capacitor of the a.t.u. is then carefully adjusted for final minimum reflected r.f. energy. By this method an extremely good transfer of r.f. energy to and from the transmitter/receiver is possible. Coupling of the a.t.u. to the rig is via coaxial cable of the correct impedance in series with an s.w.r. meter.

All initial adjustment of the a.t.u. should be done with reduced power and without delay, especially with solid state equipment, to avoid possible damage to unprotected r.f. output transistors under mismatch conditions. An indication of a near matched antenna is a rise in strength of incoming signals when the a.t.u. tuning capacitor is adjusted whilst the equipment is on receive.

It is also unwise to operate solid state portable equipment whilst the kite is on or near ground level, which may occur if the wind abates. With transmitting equipment using valves, no p.a. damage of this nature will be possible (assuming 10 watts on 1·8MHz). During normal use moderate variation in height of the kite supported antenna does not have a serious effect on the s.w.r. In some locations the use of an earth rod may improve the matching of the equipment to the antenna. An improvement in noise reduction can also sometimes be obtained with a good earth or ground connection; failing this a counterpoise wire of the same length as the main kite antenna can be laid out on the ground to improve the effectiveness of the system. One end of the counterpoise is connected to the a.t.u. earth connection point or the transceiver chassis.

The terrain over which I use a kite antenna system is of chalk and flint which is much inferior to either clay or peaty acid soils, especially in dry weather conditions. Consequently I have never employed an earth or ground connection whilst using portable equipment in my locality.

The only other apparatus required is an s.w.r. meter which will show you how the system is working. Because of licence power restrictions on the 1·8MHz band and its low frequency, some commercial s.w.r. meters are somewhat insensitive. If frequent l.f. portable operation is contemplated it is wise to construct a more sensitive instrument. The use of low power or QRP transmitting apparatus will also require an s.w.r. meter of extra sensitivity.

Operating

All that is required now is a transceiver for a.m., c.w. or s.s.b. to complete the station, a suitable kite, oh and do not forget to park your car on a down gradient if you like to use the vehicle battery to power the rig!

One advantage of portable operation is that away from the built-up areas man-made interference from electrical equipment is very much less of a problem, so it is possible to work very weak stations which from the home station would be unreadable. With the equipment described, big signals are the order of the day. Due to the strength of the radiated signal it is diplomatic to avoid the frequencies shared by the maritime radio services. Listen on frequency before transmitting and be sure to maintain normal standards of operation at all times. Going portable is no excuse for sloppy operating.

This article is not meant to be a treatise on kite flying but a guide to a mode which has given the author enjoyment and fun for many years. May you go and do likewise.

Regulations for Use of Kites

Currently, Civil Aviation Legislation applicable to kite flying is contained in the Air Navigation Order 1980.

For kites of not more than 2kg in weight Articles 67 and 46 apply. Flying height is not to exceed 60m or be flown within 5km of an aerodrome at any height. Written permission from the Civil Aviation Authority for special circumstances can be obtained.

Article 46 of the Order requires that a person shall not recklessly or negligently cause or permit an aircraft to endanger any person or property (kites are classified as aircraft). It should also be noted that aerial advertising may not take place from kites.

For further information contact: General Aviation Section, Civil Aviation Authority, Aviation House, 129 Kingsway, London WC2B 6NN. ●

Mods

No.27 Roger Hall G4TNT(Sam)

IMPORTANT—The ideas presented here are suggestions only, and as they are untried by this magazine, we cannot accept responsibility for any resultant damage, however caused. Before alterations are attempted, care should be taken to ensure that any guarantee is not invalidated, and it should also be borne in mind that modifications usually have an adverse effect on resale prices. In cases where specialist skills or equipment are needed, most dealers will undertake the work for a reasonable fee.

This month I have two mods for the Yaesu FT-480R 144MHz (2m) multimode. They were both sent in from Clapham by Robin, G8PVI, although the first one originated from Clive, G4PEB.

Low Power on Sideband

Robin enjoys QRP operation and although his FT-480R can be switched to low power on f.m. and c.w., he found that s.s.b. can only be used at full power. The following describes the mod he has built into his set to make the HI/LOW power switch work on s.s.b. as well.

First remove the bottom cover and locate the three coloured tags shown in Fig. 1. They are on the main board just to the right of Q61. To carry out the mod, just solder two 1N914 diodes across these tags as shown in the diagram. The circuit diagram Fig. 2 shows how they are incorporated into the circuit and when they are in place, the HI/LOW switch will be effective in all modes. All in all a very simple mod that should prove very useful for the QRP enthusiast.

Listen Input

Robin's second mod is also useful because it allows the user to check on the input of a repeater by pushing a button on the microphone.

The FT-480R has two pushbuttons for generating a toneburst, one on the front panel and one on the microphone. Robin has modified his set so that the button on the microphone now switches the receiver to the input of the repeater being used. The rear of the Satellite switch is shown in Fig. 3. There is a link between the two rear-most pins of the switch and this should be removed. When this is done, solder a 10kΩ resistor from the pin that has the blue wire soldered to it to the middle pin that has a violet wire running from it.

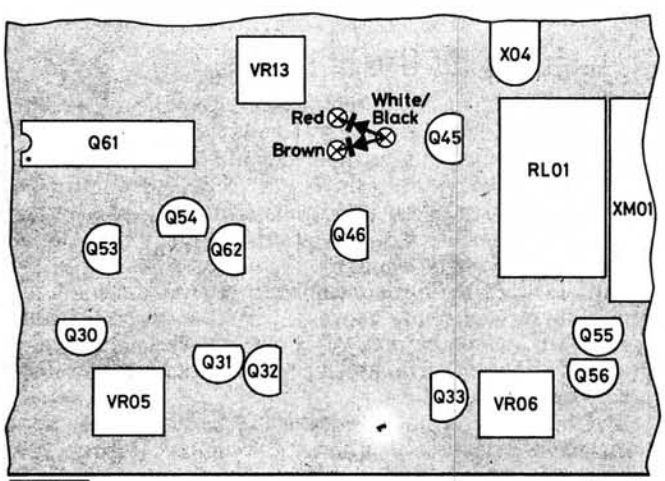


Fig. 1

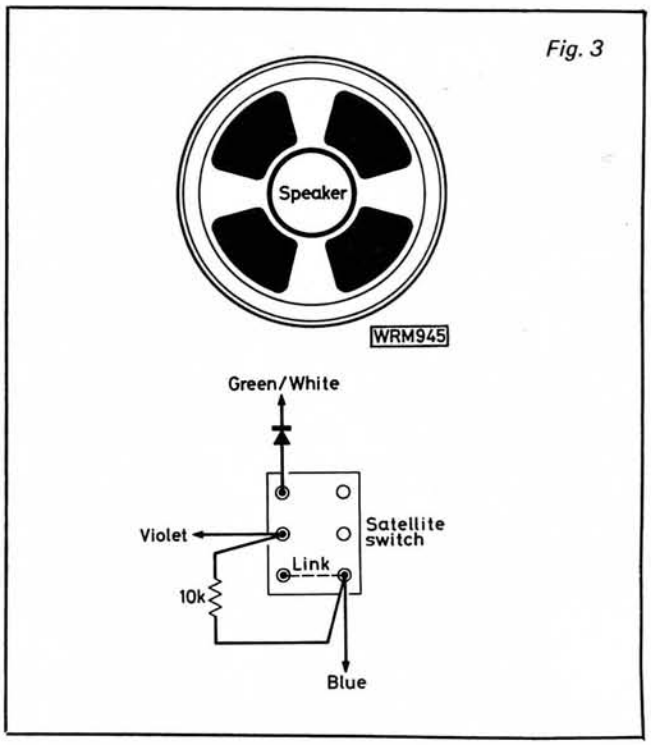


Fig. 3

Next, unsolder the green/white wire from the topmost pin and solder a diode (1N914) to that pin. Then solder the green/white wire to the other end of this new diode. Now, whenever you are listening to a repeater, pushing the toneburst button on the microphone will cause the receiver to switch to the input.

Thanks for two useful and easy mods Robin (and Clive).

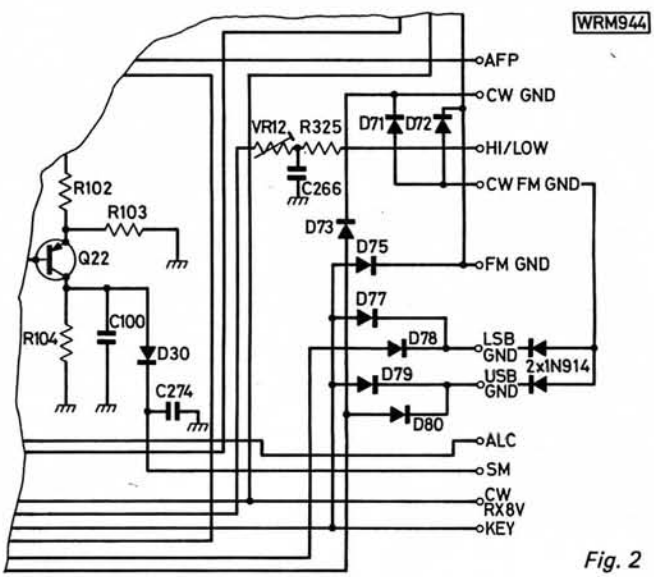


Fig. 2

Wanted

People are still writing in asking about extending the frequency range of the SX-200 scanner. As far as I know, this is not possible but I would be very pleased to hear from anyone who has had any success with this.

I have also received several requests from readers who are interested in joining a scanner club. Unfortunately I do not know of one in Britain, although there are several in America. Perhaps that is because these clubs are usually formed to allow members to swap frequencies and the legality of such a club in this country would be questionable. Of course there are lots of interesting transmissions that can be overheard with a scanner but that is illegal, so forming a British club to pass on the frequencies of these signals would certainly be frowned upon. Similarly, I cannot reply to those of you who have written to me asking for these frequencies, nor can I publish them as the legal position is not entirely clear. If there is a British scanner club that does not promote illegal listening, I would certainly like to know about it and I will publish the address(es) of any that care to contact me.

Pass it on...

If you have a mod that you would like to pass on or if you have a request for a mod that you would like to carry out, please write to me at this address: R. S. Hall, Practical Wireless, Room 204B, Hatfield House, Stamford Street, London SE1 9LS.

Did You Know...

That two famous professors demonstrated successful wireless apparatus before Marconi did, but were not interested in commercialising their systems?

In 1894, the English professor, Oliver Lodge demonstrated a complete wireless telegraphy installation comprising Hertz's generator with a Morse key for transmitting, and a combination of Hertz's resonator and an improved version of Branly's coherer for receiving. In addition, he connected the receiver to a Morse recorder, so that the dots and dashes were recorded as marks inked on paper. It worked well, but Lodge was a physicist and not interested in its practical application. The following year, a Russian, Professor Popov, used a somewhat similar receiving apparatus to record lightning flashes in thunderstorms, and increased its sensitivity by attaching it to an earth plate and a lightning conductor. He was thus the first to use an antenna but, like Lodge, was not concerned with the commercial use of his discovery.

Eric Westman

ADJUSTABLE AUDIO FILTER

by Tony Smith G4FAI

The device to be described in this article is a unit suitable for the aspiring radio amateur/s.w.l. beginning to listen to c.w. (Morse), or for the recently licensed operator anxious to use his newly mastered code, on the crowded amateur bands. At times conditions are such that it is quite difficult for an inexperienced operator to read the wanted signal in the midst of the cacophony of sound reaching his ears, and in these circumstances even a quite simple filter can be surprisingly effective.

The unit, which can be used for c.w. or speech, has adjustable bandwidth and centre frequencies; clipping, to reduce the audio level of powerful adjacent stations when used for telephony reception, and a headphone or built-in speaker output. An alternative, passive, filter for less demanding conditions together with a "straight-through" facility for connecting the 'phones or speaker directly to the receiver is provided and "finally" it can also be used as a Morse practice oscillator!

The Circuit

The heart of the circuit is Tr1. A twin "T" filter comprising R6/7, C6 and C4/5, R8/9, gives a narrow rejection notch at a frequency controlled by the setting of R9.

Connecting the filter between the output and input of Tr1 results in negative feedback reducing the gain of the transistor to a low level. At the notch frequency, however, there is little feedback so at this frequency Tr1 exhibits practically full gain thus reversing the action of the notch filter. Any signal at the selected audio frequency is then boosted at the expense of all others making it very much easier to copy the wanted signal.

The centre of the range of R9 provides the frequency most usually required, about 750Hz, and adjustment of this front panel control enables this to be varied as desired.

Adjustment of R5 controls the overall gain of Tr1 and also the width of the passband of the audio signal. This gives, in effect, a variable *Q* control enabling the passband to be made sharper or broader as required. More sophisticated circuits would specify the range of centre and passband frequencies obtainable. This information is not available here but what can be said is that the filter can be adjusted by ear over a reasonable range of frequencies either side of 750Hz (which can be identified—see later), and the bandwidth can be varied from totally broad to a sharpness which results in the signal "ringing".

The two diodes D1, D2, provide clipping of the audio signal when receiving telephony signals. Any signal above 0.6V is conducted to earth by the back-to-back diodes whilst all lower voltage signals are unaffected. If the wanted signal is increased by the input control R1, until it is just below clipping level, any stronger signals or peaks will be clipped to the same level, effecting a considerable improvement in the readability of the wanted signal.

Transistors Tr2 and Tr3 form a two stage direct-

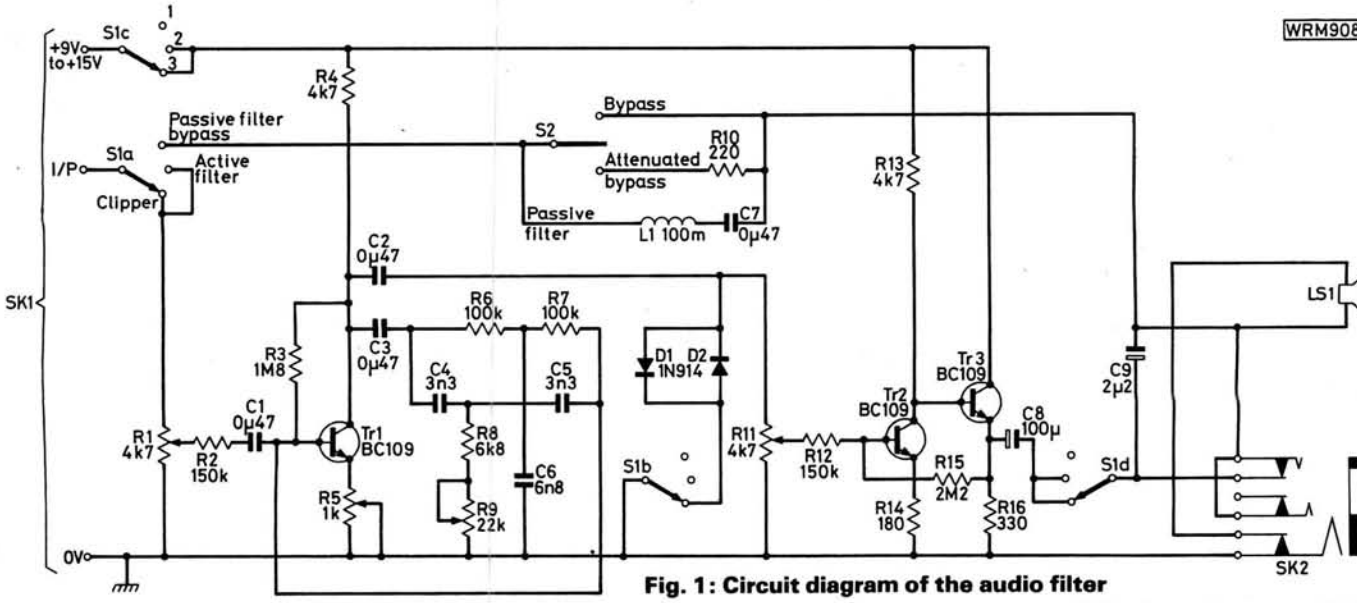


Fig. 1: Circuit diagram of the audio filter

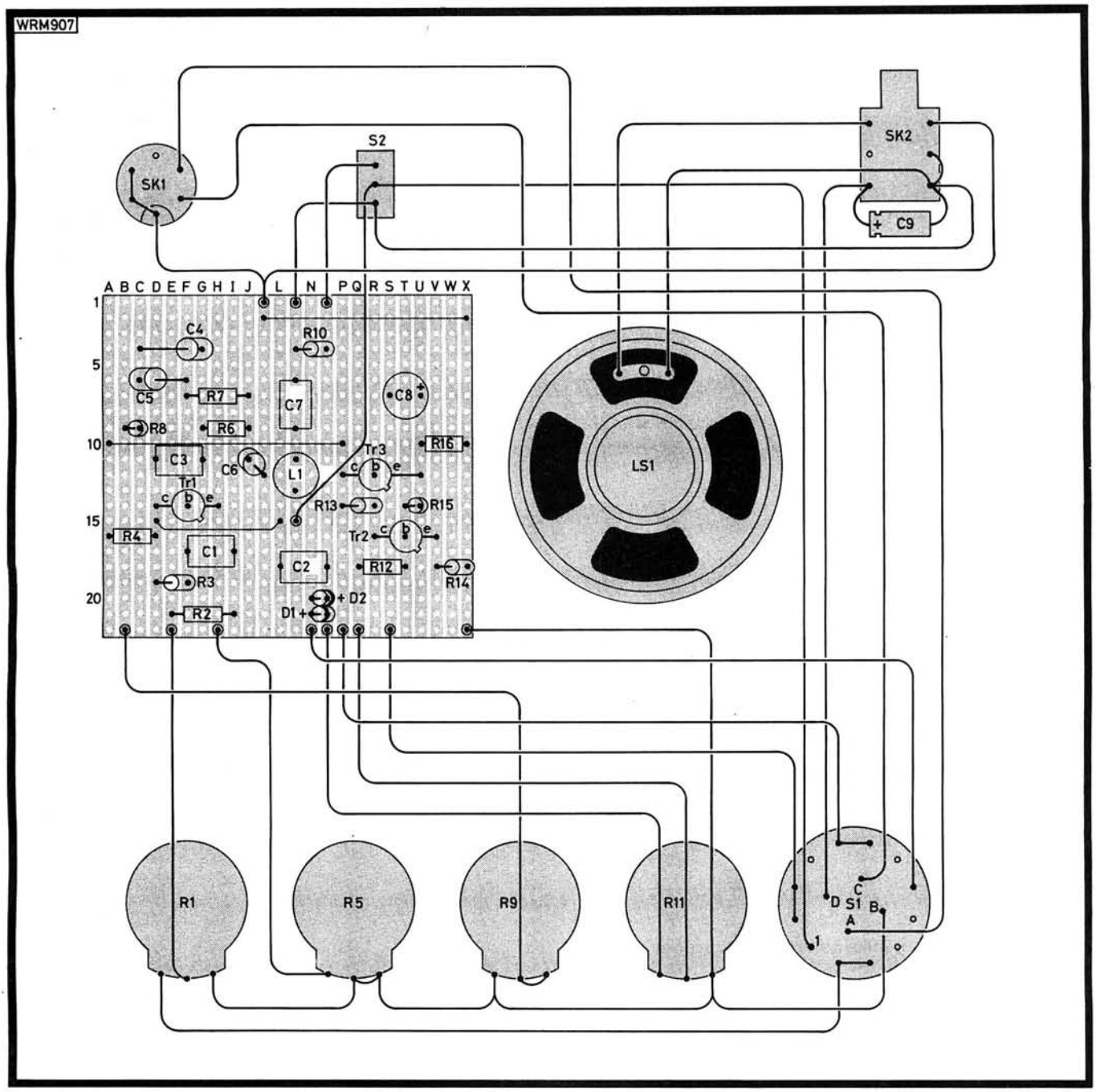


Fig. 2: Component placement and interconnection details. Veroboard track breaks occur at M7, M12, O12, E19 and N18

coupled amplifier with Tr2 in common emitter mode and its output matched by Tr3, an emitter follower, thus providing low impedance audio output.

With the speaker in use C8 is the output capacitor. Alternatively, when the 'phone jack is inserted in its socket C9 is automatically placed in series with C8, reducing the output capacitance to just over 2μF. This attenuates the bass response whilst still giving adequate audio for headphone recep[illegible]apful in cleaning up the signal when the filter is used with a wider passband.

Reasonable loudspeaker reception is obtained from stronger signals processed through the unit but the main purpose of the speaker is to provide "straight-through" reception when monitoring or tuning through the band. Serious operating should always be via headphones when the full effect of the filter can be realised. The 'phones used are unmodified standard 8Ω stereo types. High impedance 'phones (4kΩ) can be fed directly from the filter in place of the output control R11 and the audio amplifier would not then be required.

The inclusion of a passive filter, L1, C7, is an interesting feature which can be used on its own independently of the main unit. Traditionally, this type of filter has utilised heavy 88mH toroidal inductors and physically large capacitors. Here, modern miniature components have been used to provide, in the the first instance, a simple filter quite suitable for dealing with modest interference to c.w. signals without requiring a power supply and secondly, a standard centre frequency against which the active filter can be set. With the values given a nominal frequency of 734Hz is obtained, which is as near as necessary to 750Hz. Other values can be used for other frequencies to suit particular receivers or the listening preference of the operator.

Switch S1, position one, disconnects the power supply and brings S2 into operation. The second position brings

in the active filter and the third position adds the clipping facility. Switch S2 offers three listening options—BYPASS, PASSIVE FILTER or ATTENUATED BYPASS via R10.

The circuit will also function as a Morse practice oscillator, with variable frequency and audio output, by simply breaking the connection between R9 and R8 and inserting a Morse key at that point.

Passive Filter Design Notes

The PASSIVE FILTER included in the circuit is a modest but useful c.w. filter in its own right which can cope reasonably well with all but the most difficult conditions. The inductor used is available in different values permitting a range of centre frequencies to be obtained with various capacitor values. It should be borne in mind that too great a variation from the receiver's normal beat frequency will necessitate use of a transceiver's r.i.t. or offset control since the transmit and receive frequencies will no longer coincide when the filter is in use.

The basic formula for the filter is:

$$f = \frac{1}{2\pi\sqrt{LC}}$$

where L = inductance in henries
f = frequency in hertz
C = capacitance in farads

The values used can be inserted directly into:

$$f = \frac{10^5}{6{\cdot}32\pi\sqrt{LC}}$$

where L = inductance in mH
C = capacitance in μF
f = frequency in Hz

The result in either case is a nominal frequency because of the tolerance in the values of the components which need to be of 5 per cent tolerance or better.

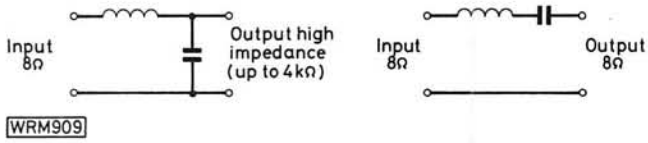


Fig. 3: Passive filter basic configurations

Construction

This is quite straightforward. The Veroboard has only five breaks in its copper strips and is mounted as shown on three insulated pillars, which must be high enough to clear the board from any cover fixing screws. All drilling and wiring details are given in the diagrams. The loudspeaker can be fixed with "Super-glue". The combined audio input/power supply DIN socket is optional and different arrangements can be made to suit individual requirements. If the Morse practice facility is required an additional socket, with break contacts, can be fitted to the rear panel (see Fig. 4).

Cabinet feet should be fitted at the front to provide clearance for the speaker sound output. Smaller feet at the rear will result in the sound being projected forward.

Setting up

Connect the input lead of the filter to a low impedance output from the receiver. Connect the power lead to a d.c. supply of between 9 and 15V. A good arrangement is to take the power directly from the receiver or transceiver if this can be done, providing it is negative earth. Make sure

★ components

Resistors
Carbon film ¼W 5%

180Ω	1	R14
220Ω	1	R10
330Ω	1	R16
4·7kΩ	2	R4,13
6·8kΩ	1	R8
100kΩ	2	R6,7
150kΩ	2	R2,12
1·8MΩ	1	R3
2·2MΩ	1	R15

Potentiometers
¼ inch spindle

1kΩ (lin)	1	R5
4·7kΩ (lin)	1	R1
4·7kΩ (log)	1	R11
22kΩ (lin)	1	R9

Capacitors
Polyester, 5%

0·47μF	4	C1–3,7

Polystyrene

3·3nF	2	C4,5
6·8nF	1	C6

Electrolytic p.c.b. type

100μF 25V	1	C8

Electrolytic double-ended

2·2μF 50V	1	C9

Semiconductors
Diodes

1N914	2	D1,2

Transistors

BC109	3	Tr1–3

Miscellaneous
TOKO 10RB, 100mH inductor (Ambit); 4 pole, 3 way rotary switch (S1); s.p.d.t. centre-off miniature toggle switch (S2); stereo jack socket; 5 pin DIN socket (see text); speaker 75mm, 8Ω; pointer knobs (5); Veroboard 0·1 inch matrix; Verobox 202-21038, 180 x 120 x 65mm; insulated pillars 6BA x 10mm; self-adhesive feet (4).

BUYING GUIDE

All components required for this project are readily available from normal sources

Approximate Cost £20

Construction Rating INTERMEDIATE

the earth side of the output from the receiver is connected to earth in the filter. Plug the headphones into the filter.

Next, set the input and output controls of the filter to approximately half-way and set the *Q* and Frequency controls at mimimum. Switch the unit to BYPASS and select BYPASS also on S2 at the rear of the unit. Switch on the receiver and signals should be heard as if the 'phones were connected directly to the receiver. Now tune the receiver to a crystal marker tone, if this is available, otherwise find a steady heterodyne signal somewhere in an amateur band.

Select the PASSIVE FILTER with S2 and tune the receiver until the signal is peaked by the filter. It may be necessary to advance the audio output of the receiver to obtain the best peak as the filter attenuates the signal passing through it.

The receiver is now delivering an audio signal of approximately 734Hz, or whatever other frequency the filter has been designed for. If the ACTIVE FILTER is now switched in by S1 on the front panel, R9, the FREQUENCY control can be adjusted to peak the signal at the same frequency. A mark can then be made on the front panel to enable the frequency to be returned to whenever desired. Alternatively, the position of the knob on the shaft of the potentiometer can be adjusted so that the pointer coincides with the centre marking on the front panel.

During this operation it will be necessary to advance the *Q* control to a point just short of oscillation to obtain the best peak. At the same time it may be necessary to reduce the input to the unit by adjusting R1. The filter is now ready for use.

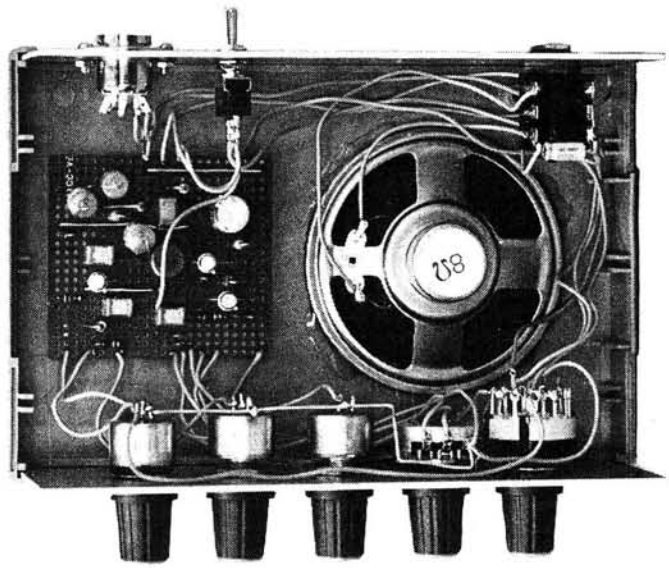
Operation

There is no need for the filter to be used at all if good clear c.w. signals are being received via the bypass line. A modest improvement can be obtained by listening via the attenuated bypass, which simply reduces the sensitivity of the 'phones, and a surprising improvement by using the passive filter. In this case a somewhat aggressive approach to the receiver's audio gain is sometimes necessary to get best results and the gain may have to be increased to just short of the point where distortion occurs on the wanted signal.

Remember not to switch back from passive filtering directly to ordinary by-pass as the result on the eardrums could be disastrous! The attenuated bypass is intended to match the two audio levels so that they can be switched from one to the other at about the same level.

If there is more interference than the passive circuit can cope with the active filter can be switched in by S1. If this is still set at the same frequency as before it should be possible to advance the *Q* control until much of the interference has been attenuated. Taking it to a point just short of oscillation will produce the sharpest filter effect. Backing off from this point will "open up" the filter and the widest possible passband should be used consistent with good readability of the signal. The input level should be kept reasonably low to obtain best results and the optimum settings will become apparent with practice. If a high *Q* is used it may not always be possible to hear the transmitter side-tone satisfactorily and in this case the filter should be switched to ATTENUATED BYPASS when keying.

Because this is an oscillatory circuit the adjustment of R5 between narrow and broad bandwidths is quite small. This does not cause any great difficulty in practice but a small improvement could be obtained by using a 500Ω potentiometer instead of the 1kΩ specified.



One of the difficulties with using any sharp audio filter is the fact that not all transmitters, or receivers, are stable enough to permit the wanted signal to remain within the passband of the filter. If this problem is experienced with a transceiver there are three possible solutions depending on the band conditions and the amount of frequency shift involved. These are:

1) following the signal with the receiver incremental tuning;
2) adjusting the frequency of the filter;
3) reducing the *Q* to open up the passband.

If a separate receiver is used it is simply retuned to follow the frequency shift.

For use with telephony signals S1 should select the clipping circuit. The *Q* should be advanced until the wanted signal is readable when accurately tuned but distorted on either side if the tuning is shifted. For maximum effect the input to the filter (R1) should now be increased until the wanted signal falls just short of distortion by clipping. If necessary the receiver audio output can be increased to assist this. The output control (R11) should be reduced to provide a comfortable listening level.

If the optional Morse practice function is used R5 should be fully advanced to put the circuit into oscillation, R9 adjusted to provide the required frequency and R11 for output level.

This versatile little unit has a quite surprising performance. Expensive commercial units provide similar features with greater elegance and sophistication, but the question arises—how much sophistication is really needed? In the true amateur tradition here is a modest piece of home-built equipment which will give of its best in response to the acquired skill and enthusiasm of the operator using it. ●

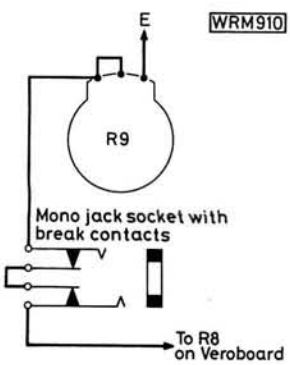


Fig. 4: The modification needed to provide a Morse practice facility. The jack socket which should be a mono type, can be located on the rear panel of the filter housing

Products

VHF Band II Antenna

South West Aerial Systems, the Poole based antenna specialists, can supply a new antenna intended for the f.m. DX enthusiast and features a curved folded dipole, not unlike the familiar "Halo" commonly used in amateur circles.

Called the Triax Omni 1, it is tuned for use in the 88 to 104MHz portion of the spectrum (Band II v.h.f. broadcast band) and provides full 360° omni-directional coverage, when mounted horizontally, without the need for a rotator.

Gain is claimed to be between −2 and −4dBd and the folded element is constructed of $\frac{3}{8}$in diameter seamless aluminium tube.

The quality of construction is to the usual high standard of Triax products, and within the connection box is a small ferrite balun converting the 300Ω balanced antenna element down to match standard 75Ω coaxial cable.

Priced at £10.90, which includes VAT and p&p, the Triax Omni 1 is obtainable from: *South West Aerial Systems, 11 Kent Road, Parkstone, Poole, Dorset BH12 2EH. Tel: (0202) 738232.*

Amateur Station Log Book

Ant Products, the Yorkshire based antenna manufacturers, now include in their product range an amateur radio station log book.

The A4 size log book is spiral bound and provides for over 2500 entries laid out to conform with UK licence requirements, also a European QRA locator map is printed on the inside front cover.

Priced at £3.50, which includes p&p, the log book also contains a voucher worth £2.00, redeemable against the purchase of one of their antennas (excepting the Super Slim Jim), and is obtainable direct from: *Ant Products, All Saints Industrial Estate, Baghill Lane, Pontefract, West Yorkshire. Tel: (0977) 700949.*

Latest on the SX-400 Scanner

We hear from Garex Electronics that the long-awaited SX-400 v.h.f./u.h.f. scanning receiver should be available early in the new year.

Based on the outstandingly successful SX-200, the SX-400 embodies many more features to appeal to the professional user.

Major features of the receiver include full coverage from 26MHz to 520MHz over 12 bands, programmable a.m. and f.m. throughout the range, switchable i.f. bandwidth, switchable channel spacing, 10·7MHz and 455kHz i.f. outputs, S-meter, computer handshaking for data recording and limitless memory capacity. An optional scaler (r.f. converter) enables the range to be extended down to 150kHz and up to 3·7GHz.

Priced in the region of £600, further details are available from: *Garex Electronics, 7 Norvic Road, Marsworth, Tring, Herts. HP23 4LS. Tel: Cheddington (0296) 668684.*

Hot News from Icom

Latest information from Icom reveals the launch of a new hand-held 144MHz transceiver onto the UK market early in 1984.

Entitled the IC-02E, it is intended to follow-on from the incredibly popular IC-2E and is housed in an almost identical case.

The IC-02E is microprocessor controlled and frequency selection is via a 16-button keyboard. A large digital l.c.d. readout displays frequency, relative signal strength, r.f. power and also identifies which of the 10 memory channels is being used.

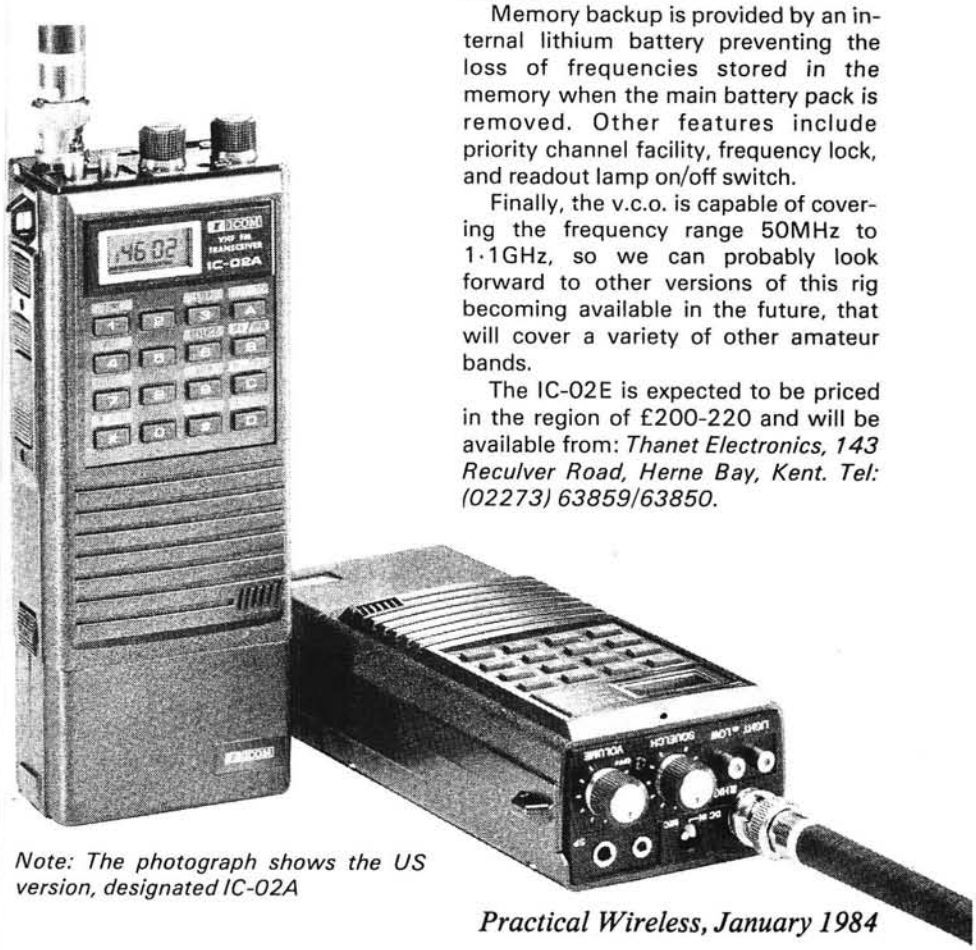
Other main features include full band scan, memory scan and scan between preset limits, plus a diecast aluminium back is incorporated to improve heat-sinking and the unit is fully compatible with all IC-2E accessories.

Nominally r.f. power out is 3W Hi with switchable 1W Lo but by using one of the two new battery packs the Hi figure can be lifted to 5W. Both new battery packs are fitted with a new locking arrangement to prevent accidental dislodging and also may be recharged direct from a separate 12V d.c. supply or car battery. Provision has also been made to power the transceiver direct from a 13·8V d.c. supply, such as the cigar lighter socket in a car.

Memory backup is provided by an internal lithium battery preventing the loss of frequencies stored in the memory when the main battery pack is removed. Other features include priority channel facility, frequency lock, and readout lamp on/off switch.

Finally, the v.c.o. is capable of covering the frequency range 50MHz to 1·1GHz, so we can probably look forward to other versions of this rig becoming available in the future, that will cover a variety of other amateur bands.

The IC-02E is expected to be priced in the region of £200-220 and will be available from: *Thanet Electronics, 143 Reculver Road, Herne Bay, Kent. Tel: (02273) 63859/63850.*



Note: The photograph shows the US version, designated IC-02A

Products

Mobile Generators

An essential component in the running of an efficient portable station at contests or field days is a reliable and constant power source for the equipment. Unless the operator is prepared to manhandle a number of lead-acid batteries to the site, the obvious answer is a lightweight portable engine generator.

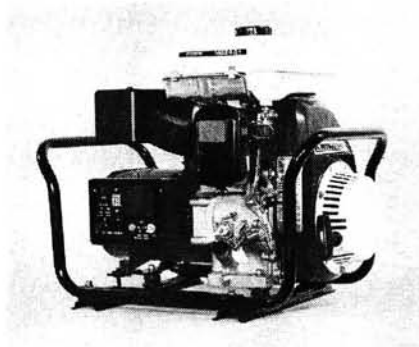
However, hiring a generator, for a number of events, can prove a most costly exercise, so, the special discount that Ray-Lift Ltd. are prepared to offer to *PW* readers could make the possession of a personal or club owned generator a reality.

The generators on offer are the MG series manufactured by Mitsubishi. Both models, the MG1801-D and MG2401-D, are compact and light in weight (40 and 49kg respectively), voltage stability is controlled by an automatic regulator which limits fluctuation to about five percent. Three output voltages may be selected: 110V a.c., 220V a.c. and 12V d.c. at 8·3 amps. Maximum power output on a.c. is 1·5kVA for the MG1801-D and 2·0kVA for the MG2401-D.

Control devices such as control box, speed control lever and recoil starter are installed on one side for easy operation. Also a frequency meter and circuit breaker are supplied as standard.

Fuel tank capacities are four litres for the MG1801-D and five litres for the MG2401-D.

List price for the MG1801-D is £390 plus VAT and £460 plus VAT for the MG2401-D. However, as mentioned previously, Ray-Lift Ltd. are prepared to offer a 30% discount to *PW* readers on orders received before the end of January 1984. Therefore, £283 plus VAT will buy the MG1801-D and £322 plus VAT will obtain the MG2401-D.



A Calor gas conversion kit is being produced, which will cost around £45 and will offer the advantages of cleaner burning, less dangerous exhaust fumes, quieter running, plus a 26lb bottle of gas will run the generator for approximately 26 hours.

Orders and further enquiries should be sent to: *Ray-Lift Ltd., 114 Kingston Avenue, Bilford Road, Worcester WR3 8PP. Tel: (0905) 56671.*

Another Winner for Sinclair and the UK

Following hard on the heels of the enormous success of the ZX series of home computers, comes the Sinclair 2in flat-screen TV, the first TV with a single i.c. chip for circuitry, which was introduced recently after a six year £4 million development programme.

About the size of an average paperback book this totally portable TV measures only 140 x 90 x 30mm, weighs 280g and will be priced at £79.95, which includes VAT and is approximately one third the cost of its nearest competitor.

Major features include, automatic standard switching for reception of most u.h.f. transmissions around the world (except France), high-quality video reception and extremely low power consumption with a special polaroid flat-battery providing 15 hours of reception time. Also the set is easy to operate having only two controls, on-off/volume and tune.

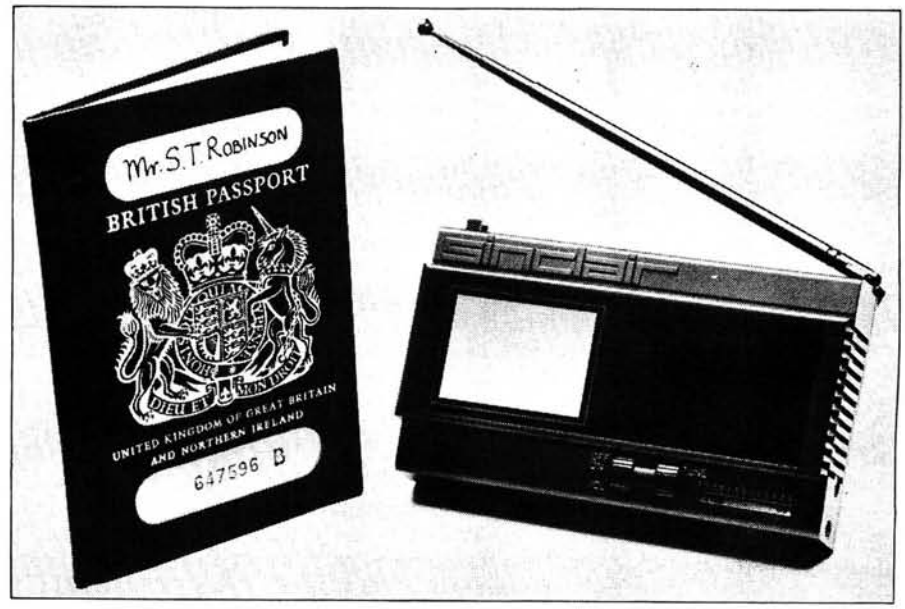
Key design elements in the new TV are Sinclair's revolutionary flat-screen c.r.t., and the single l.s.i. (integrated circuit) which performs the majority of signal processing functions within the set.

Simply described, the c.r.t. is assembled from just two sheets of glass, a flat front plate and a vacuum-formed backing plate. The phosphor screen is coated on the interior of the backing plate and is viewed through the front face from the same side that the electrons strike, resulting in up to three times the brightness of a conventional c.r.t. with the same beam energy. The electron gun is set to one side of the screen with its axis parallel to the screen. Two sets of electrostatic deflection plates in the gun assembly provide horizontal and vertical scanning, and a third set between the phosphor screen and front face bends the electron beam toward the screen.

Regarding the single l.s.i., its special features include integrated sound selectivity, video innovations to eliminate image problems in the u.h.f. channel and an advanced synthesised scan generator to control the complex waveforms needed to scan the flat c.r.t. It runs a check 50 times per second to ensure picture "hold".

UK retail and export sales are planned for the first half of 1984, and Sinclair is confident of selling up to one million sets per year worldwide, leading to the creation of hundreds of new UK jobs in component production and final assembly.

Orders for the first available sets will be supplied strictly on a first-come, first-served basis and can be placed by contacting: *Sinclair Research Ltd. Stanhope Road, Camberley, Surrey GU15 3PS. Tel: (0276) 6211.*



Domestic Aerials

in the GOOD OLD DAYS

by 'Old Timer'

To those of us fortunate enough to have lived through the "Golden Age" of wireless, the 1920s and 1930s, the most abiding memory must surely be the forests of aerials that bristled over the towns and villages of Britain. Practically every home boasted one: the multiwire array that stretched from a centuries-old tree over spacious lawns to the roof of a stately home; the ubiquitous single wire strung from a bent pole at the bottom of the council house garden to a bedroom window; the cylindrical "birdcage" perched on a broom-handle above the top-floor flat. In those days there was a wonderment and excitement about the new miracle of communication; sadly the magic of wireless has now become commonplace, and the wonderment—like the aerials—is no more.

For the starry-eyed "listener-in" of the early 1920s, with his crystal set and headphones, the longer and higher he could make his aerial, the better. In fact, with a really lofty and lengthy array, the proud owner of a bright-emitter valve set could stand his headphones in a pudding basin to amplify the sound whilst admiring relations and neighbours thrilled at the resultant audible squeals and crackles. But since these primitive valve receivers often emitted oscillations and so became transmitters of interference, the length of aerials was limited by law to 30 metres, although there was no limit to the number of wires that could be connected in parallel. Incidentally, the correct form when assailed by oscillations from a neighbour's valve set was to turn your own reaction (feedback) knob as far as it would go and so return the compliment in the form of a multi-decibels blast—particularly effective if the offender was wearing headphones!

In the days before broadcasting began, a single strand of, say, 16 s.w.g. bare copper wire was used for an aerial. But by the mid-1920s the preference was for a multi-strand, insulated copper-wire aerial. Two configurations were popular: the "inverted L" in which the lead-in ran from the end nearer the house; and the "T" in which the lead-in descended from the centre of the aerial.

The aerial wire was insulated at both ends from its attachment to the pole and house by a porcelain "egg" insulator. To get the aerial into the house a "lead-in tube" was used. This was an ebonite tube 304mm long by 16mm diameter with a 2BA threaded brass rod running through it, the whole fitted through the wooden windowframe nearest the wireless receiver. The lead-in was attached to the exterior end by a knurled brass nut, while the receiver was similarly connected to the interior end.

If possible, the aerial was erected in alignment with the

transmitter it was most wanted to receive, which was often the only one that could be received. Sometimes it was erected broadside-on to the transmitter you didn't want to receive, usually a nearer or more powerful one that blotted-out the required station, or even a persistent offender's oscillating valve set.

Since it was popularly believed that several aerial wires connected in parallel increased the strength of the signal fed to the receiver, multiwire aerials became popular. A favourite arrangement was the "twin" comprising two horizontal wires hung parallel and up to six feet apart. They were often attached via egg insulators to a broom-handle "spreader" at each end. Another favourite was the "sausage" or "cage" aerial made up of six or more wires hung parallel to one another in a tubular configuration. The wires were attached at either end via the ubiquitous egg insulators to a wooden hoop about 610mm in diameter—ladies' embroidery hoops often served.

For people with no gardens, such as flat-dwellers, a popular type of aerial was the "birdcage". Mounted atop a pole fixed to a chimney, it consisted of two wooden hoops set horizontally one above the other about 610mm apart with a length of insulated wire zig-zagged up and down between them all the way round. This effectivley concentrated a long aerial into a small space, and it was non-directional.

Those who could not manage any form of external aerial had to make-do with a "picture-rail" aerial, a length of flex strung along the wooden picture-rail all round the room. An aerial of this type was screened by the brick or stone walls surrounding it, and thus the strength of the signal reaching it was reduced.

Yet another collector of wireless waves for confined folk was the "loop" or "frame" aerial consisting of a circular, square or diamond-shaped wooden frame at least 610mm across, often 1·2 metres and in some cases 1·8m, when it would be mounted on the floor. Around the frame was wound wire, usually double-cotton covered and often of 20 s.w.g. The number of turns depended on the wavelength to be received and the size of the frame itself: the larger the frame, the fewer the turns. Although the signal it picked up was weaker than that from an outdoor aerial, it had two advantages: it could easily be aligned with any station it was wanted to receive, thus maximising the strength of the signal; and it could be turned broadside-on to an interfering station in order to minimise the interference.

The frame aerial usually took the place of the tuning coil in the receiver and was tuned, like the coil, by a variable condenser across the two ends of the winding. No earth was needed but reception could be badly affected by people moving about close to the frame. Indeed, some people became so adept at manipulating this property of the frame aerial that by setting their receiver at oscillating point and waving their hands to and fro near the frame they produced in their loudspeaker (and in other people's loudspeakers) mellifluous renditions of popular tunes of the moment. Music-hall performers used this principle to mystify their audiences with "magic music".

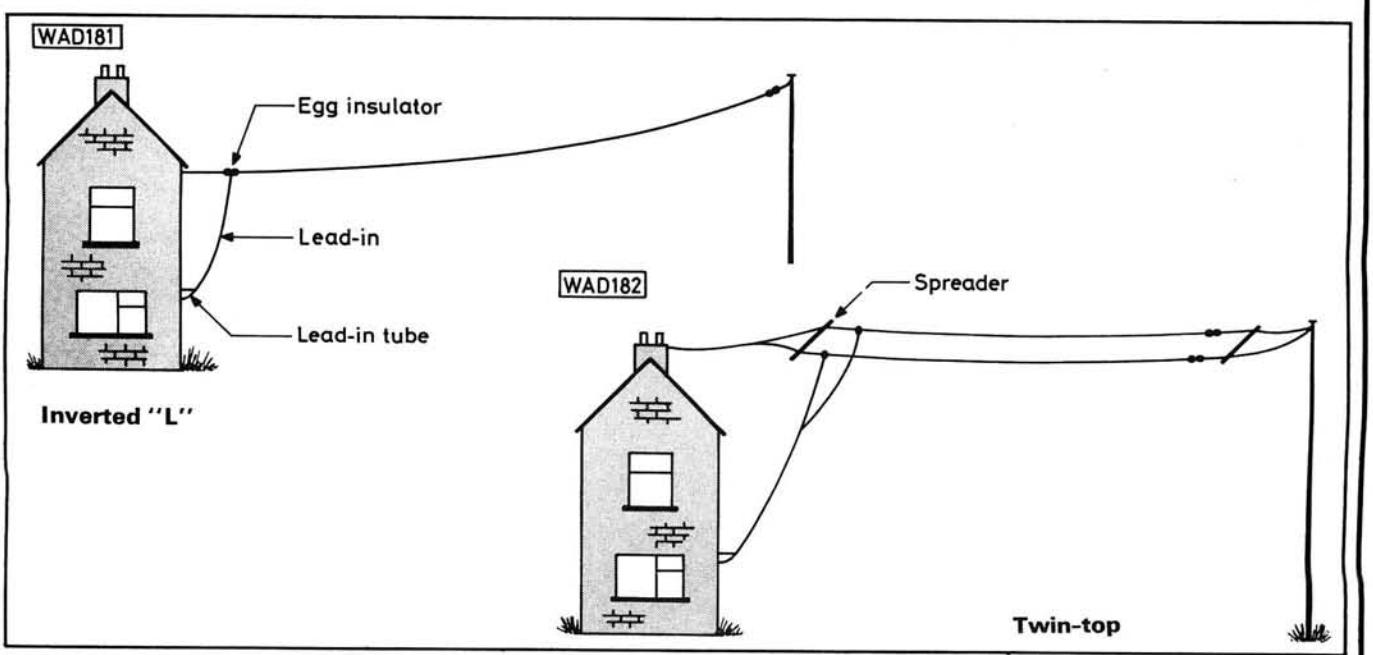
Still on the subject of frame aerials, a wireless magazine of the mid-1920s reported the case of a man living near the giant aerials of the new Daventry transmitting station who set up a large frame aerial, aligned it with Daventry, and obtained enough power to light a bulb in his shed. He was fined!

As wireless became more popular, all kinds of "monstrosities" were pressed into service as aerials. Sometimes the receiver was connected to a metal clothes-line running the length of the garden. With a height of only 2 metres compared with the normal 10 metres it was not very efficient; and not being insulated at each end, much of the signal would leak to earth. But the author remembers tuning-in Rome on a one-valve shortwaver in 1940, using a clothes-line aerial, and hearing Mussolini declare war on Britain.

Many people even swore that a tree would serve as an aerial if a nail were hammered into the trunk about two metres up and a lead-in connected to it, but most likely the length and the height of the lead-in caused the latter to function as an aerial on its own account. All the same, the United States army made a serious investigation of tree aerials in the First World War. It would be interesting to know how their 100 metres high Redwoods performed.

A good outdoor aerial system would have a 410mm bracket mounted on the outside wall near the lead-in tube, to hold the lead-in away from the wall and so prevent the signal from being damped. Without this bracket, the lead-in could be blown nearer or away from the wall thus varying the strength of the signal received and possibly upsetting all the painstaking adjustments of the receiver.

Fear of lightning striking the aerial was very great, particularly in the 1920s. Cautious people disconnected the aerial wire from the receiver and stood the end in a jug of



water every night when going to bed, fondly believing that they had thereby earthed the aerial! One British manufacturer of insulated, stranded aerial wire profited by this fear and boosted sales when he gave a free £500 lightning insurance policy with every roll of his wire. This was enough to buy a new house, but the aerial manufacturer ran no risk—I never heard of a claim being made.

Many lead-ins incorporated a "lightning arrester" consisting of a brass spark gap with one of its electrodes connected to the aerial and the other to the earth. In the event of lightning striking the aerial, the charge would jump the spark gap and pass harmlessly to earth instead of damaging the receiver. A home-made version could be made from two short pieces of hacksaw blade mounted teeth to teeth with a 0·8mm gap between them. An even simpler method employed an old sparkplug connected between aerial and earth.

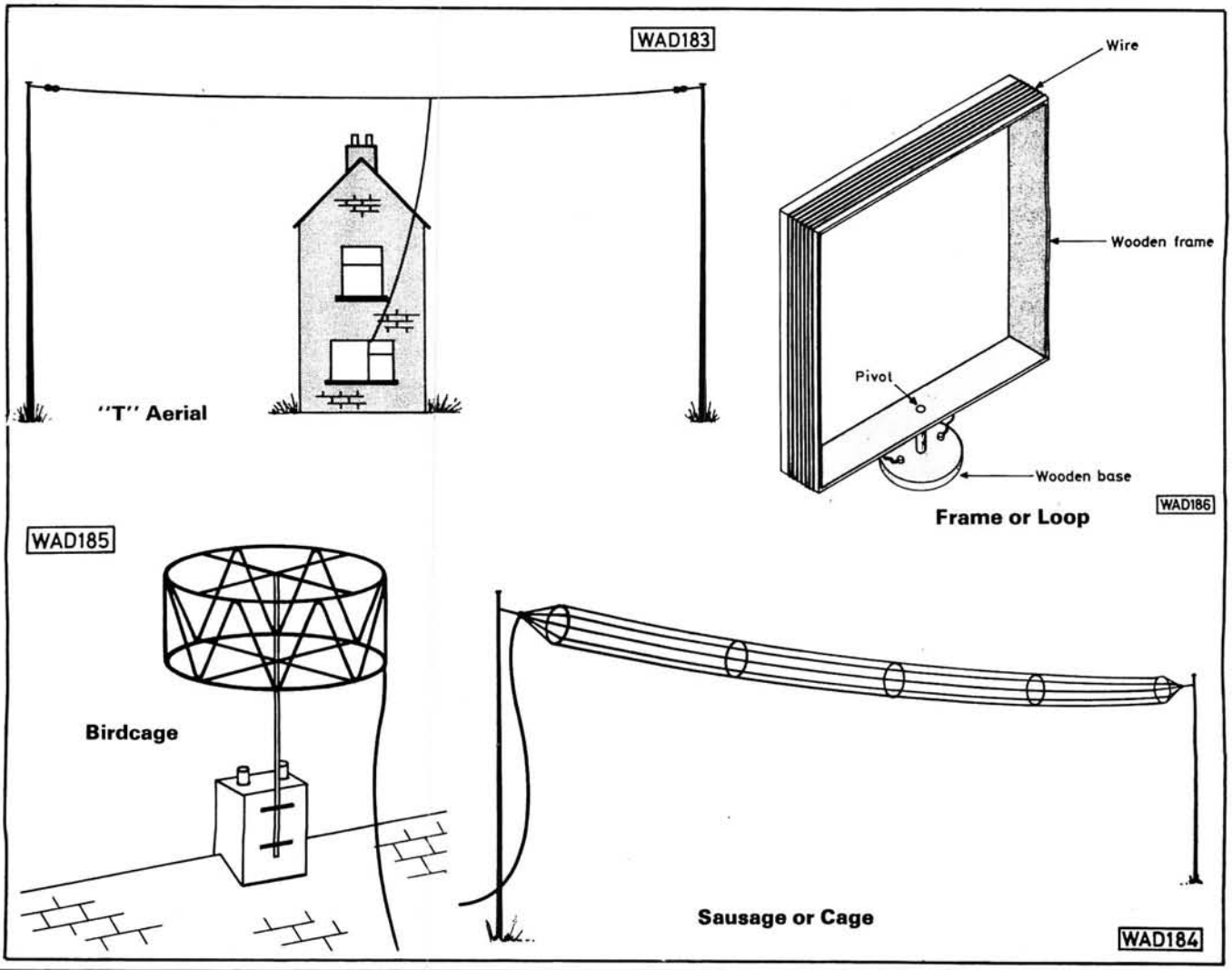
An alternative device was a knife-switch mounted on the outside wall to connect the aerial to earth in thundery weather. The author's late father—a village "wireless wizard" of the 1920s—used such a switch until the end of World War II and earthed his aerial every night before going to bed.

A cunning dodge employed by listeners-in who owned a telephone was to unscrew the lid of the telephone junction box and to connect the wireless set via a fixed capacitor to the external telephone wire which, with a length of many miles, made an excellent aerial. The author did this with an early crystal set and it operated a horn loudspeaker at fine volume. Some people believed that by tapping the appropriate terminals in the junction box they could obtain a free 24-volt d.c. electricity supply with which to augment the expensive high-tension battery.

Whilst on the subject of telephone wires, an old countryman known to the author erected a long aerial running parallel with the telephone wires leading to a farm further down the lane. This aerial picked up by induction the currents in the telephone wires, and the old fellow enjoyed listening on his wireless set to conversations between the farmer's daughter and her boyfriends. This inductive effect was common and could be cured by re-erecting the aerial at right-angles to the telephone wires.

Many strange myths circulated during the 1920s and 1930s concerning the supposed properties of aerials, and each enthusiast had his pet beliefs. A Somerset villager recalls a widely held local belief that the static could be eliminated by wrapping cottonwool around the lead-in! And that a longer and higher aerial "took power" from a neighbour's inferior aerial, so that when his father installed his first Kolster-Brandes valve set, he also installed the highest and longest aerial in the neighbourhood.

Sadly, all the weird and wonderful contraptions that passed as aerials have gone; so, indeed, has the very name, for nowadays we speak of "antennas". A phenomenon that was an essential feature of British life for over a quarter of a century is now no more than a curiosity remembered by the older generation. And if anyone should today be imprudent enough to construct one in his garden—assuming his modern property to be big enough—he would almost certainly be charged with contravening some local planning regulation! ●



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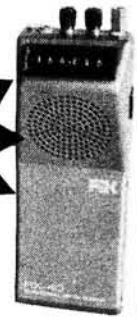

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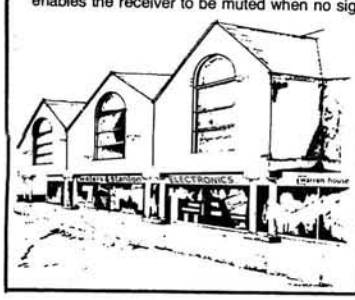

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TW4000	FM dual band mobile trans. 2m/70cm	469.00	2.50
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AT930	Aut. ATU 80–10m ham bands	141.75	2.50
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PS430	Mains PSU. built-in cooling fan	112.75	5.00
SP430	Matching speaker for TS430S	29.50	1.50
MB430	Mobile Mount bracket for TS430S	11.25	1.50
FM430	FM option unit for TS430S	34.50	1.00
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YK88CN	270Hz CW filter for TS430S	37.25	0.75
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MC60A	Deluxe desk mic. with built in pre-amp	55.25	2.00
MC35S	Fist mic. 50K impedance	14.75	1.25
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MC40S	Up/down mic. for TR900/7800 etc.	14.75	1.25
MC42S	Up/down hand mic. for TS930S	15.25	1.25
LF30A	HF low pass filter, 1kw rating	21.25	1.25
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TR7800	2m FM syn. mobile/fixed station 25w	257.50	2.50
TR7930	2m FM trans. with large LCD display	305.25	2.50
TR2300	2m FM syn. portable trans.	152.00	2.50
VB2300	10w amplifier for TR2300	65.75	1.50
TR2500	2m FM syn. handheld	232.50	2.50
VB2530	30w amplifier for TR2300	69.75	2.00
SMC25	Speaker/microphone	16.00	1.00
TR3500	70cm handheld trans. to match 2500	250.75	2.50
TR9500	70cm syn. mulitmode mobile fixed.	395.00	5.00
R600	Syn. Gen. Cov. receiver 150kHz–30mHz	257.00	5.00
R1000	Syn. 200kHz–30mHz receiver	297.00	5.00
R2000	Gen. Cov. Receiver	398.75	5.00
VC10	VHF unit for R2000. 118mHz–174mH	113.00	1.50
HC10	Digital station world time clock	67.50	1.50
YAESU			
FT757GX	Gen. Cov. HF transc.	625.00	5.00
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FT101ZDFM	9 band HF transc. SSB-CW-FM	665.00	5.00
FT480R	2M Multimode	395.00	
FT102	9 band HF transceiver	685.00	5.00
FC102	9 band matching atu	200.00	5.00
SP102	External speaker plus AF filtering	49.05	2.00
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FT77	SSB/CW 8 band 100w transceiver	459.00	5.00
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FT708	70cm FM synthesised handheld 2½ watts	209.00	2.00
NC9C	slow charger	8.05	1.00
PA3	Battery eliminator/charger 12v DC	14.20	0.75
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FT730R	70cms 10 watt FM mobile transciever	259.00	2.50
FT726R	3 band all mode base station	699.00	5.00
430T726	70cms module	230.00	2.50
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FRT7700	Antenna tuner unit for above	42.55	1.50
FRA7700	Active Antenna	38.70	2.00
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Swap Spot

Have Philips N1700 long play video 8 hours of tapes—scratched, also Suzuki GT250 used daily up to last year. Would exchange either or both for h.f. transceiver plus cash if necessary, portable TV or w.h.y. Derek. Tel: 0621 828807 (Chelmsford). *T658*

Have 5m Fish Boat clinker hull/motor 6 h.p. L/S Johnson Oars etc., value £500. Would exchange for radio gear like SS105, KW Tentec FT-101 etc. Also have KW 2000 for motoret would split for acquisition of h.f. gear RX etc. G6RGH. Cannock, Staffordshire. Tel: Stafford 46306 (not QTHR). *T667*

Have £200 worth of Crest Hotel voucher valid to 1984. Would exchange for 144MHz (2m) transceiver. Tel: 0365 22014. *T646*

Have Cossor dual-beam blue screen 'scope, Heathkit AO-IU signal generator, Practical Electronics digital multimeter, Commodore programmable calculator, Realistic transistor tester. Would exchange for good airband/144MHz scanner, 144MHz handheld transceiver, good s.w. s.s.b. receiver. Andy. Tel: Macclesfield (0625) 614510. *T647*

Have Vic 20 Computer Cassette unit, joystick, four ROM cartridges. Under 6 months old, v.g.c. Would exchange for 144MHz handheld TX/RX. D. Gallagher. Tel: (0524) 811715. *T693*

Have Sony ICF 2001 s.w. scanner radio and manual. Also Realistic PRO-22 scanner with crystals, both as new. Would exchange for any good quality 144MHz multimode transceiver. A. Cocking, 31 Dryden Crescent, Stafford, ST17 9YH. *T674*

Have Datong Morse tutor, Morse cassettes and Homebru practice key. All v.g.c. Would exchange for good power/s.w.r. meter or ZX81 Computer. Alan. Tel: 0279 504728 evenings and weekends (Bishop's Stortford). *T677*

Have 40 ch f.m. hand held CB 4 watt Harvard 410T with NiCads and charger, also magmount antenna, rubber duck antenna. Want h.f. RX Drake 2B or similar or marine v.h.f. RX. W. H. Cross, 45 Rhiwlas Street, Liverpool L83 UA. *T684*

Have an Olympus Trip 35 camera, leather case, new. Plus a mobile 2 metre FDK multi-11 23 channel with 4 channel scan good condition. Wanted IC-2E or similar hand set. Phone Jim G6MJS. Tel: 01-556 4050 (Leyton, London). *T686*

Have Varicap v.h.f./u.h.f. RX, tunes 50MHz–470MHz, no gaps a.m./f.m. internal 240V p.s.u. very sensitive. Would exchange for any 6ch 144MHz handportable, pair of Pocketfones, PF5 etc., or w.h.y. similar. Tel: 02074 4342 evenings/weekends (Rowlands Gill). *T700*

Have Yaesu FR-50B amateur RX. Mint condition, 100kHz c.c. 1·8MHz–28MHz. (Mods: By Importer). Would exchange for synthesiser type, keyboard. Must have rhythm unit. Vic Stimpson G3SLU. 67 Alliance Avenue, Hull. Tel: 0482 55906. *T713*

Have Braun T1000CD communications receiver, 13 wavebands. Also have Audioline f.m. CB 40 channel, new in box. Would exchange for computer—Sharp MZ80K or w.h.y. Can deliver. Findley, 27 Keytes Lane, Barford, Warwick. *T729*

Have Midland 2001 CB new and boxed with crystal filter fitted. Would exchange for 144MHz pre-amplifier or w.h.y. for 144MHz. Tel: Cambridge 834263. *T730*

Have Cossor twin-beam 'scope, model 1049 MkIV. Would exchange for a 144MHz transceiver—any type considered. 35 Mill Road, Gillingham, Kent. Tel: 0634 54049. *T731*

Have Heathkit Mohican in excellent condition—modified to accept f.m., s.s.b., n.b.f.m. Would exchange for a four-track reel-to-reel or small synthesiser. M. Duddridge, 127 Rhode Lane, Bridgwater, Somerset. *T733*

Have following test equipment with manuals: Marconi *Q*-meter TF329G, Component Bridge B521, Capacitance Bridge Marconi TF1342, Inductance Bridge with Capacitance Attachment Sullivan AC100, Boonton *Q*-meter 100-A, Audio Tester Marconi TF894A. **FREE** to anyone who collects the lot. Tel: Ruislip 75769. *T732*

Have boxed 16K Video Genie computer with built-in cassette. Complete with much software and books, approximate value £200. Would exchange for 144MHz multimode portable such as FT-290R or similar. Steve. Tel: 0777 818427 (Retford, Notts). *T735*

Have ZX Spectrum + two cassettes (Planetoids and Space Raiders), Atari console + three cartridges (Space Invaders, Asteroids and Tank Battle), Yashica 8T2 standard 8mm movie camera (clockwork) and a Eumig standard 8mm projector. Would exchange for a 144MHz multimode mobile/fixed station. Will pay postage from me to you. J. D. Bolton, 10 Bownes Road, Coniston Park Estate, Timperley, Cheshire. *T745*

Have Katsumi EK121 electronic keyer plus EKM-12 monitor. Would exchange for ZX81 (16K RAM) with manual, 144MHz s.s.b. transceiver (non-working repairable accepted) or w.h.y. C. Ansell G6NBD. Tel: 0474 59929 (Gravesend). *T746*

Have Polaroid Instant Movie outfit, including zoom lens, viewer, filters and indoor lights. Value £70. Would exchange for 144MHz linear amplifier, beam or any 144MHz equipment considered. Bob Griggs G6ZGL. 8 Paradise Street, Accrington. Tel: 31081. *T747*

Have Realistic TRC1001 legal CB handheld with p.s.u., mic, rubber duck and mag-mount antennas. Would exchange for a good 144MHz transceiver. T. Jones, 53 Central Drive, Shotton, Deeside, Clwyd. *T750*

Have Microwave Modules MMS1 Morse Talker v.g.c. Would exchange for 432MHz f.m., 144MHz s.s.b., h.f. mini beam + rotator, printer for RTTY, anything considered. Richard G4SHD. Dudley, West Midlands. Tel: 235931. *T762*

Have 6m tower in two 3m sections, ideal for amateur, lack of planning permission forces swap. Would exchange for Realistic DX160 or 100 receiver or CB rig with base antenna. O. Haigh, 3 Brora Close, Lakes Estate, Bletchley, Milton Keynes, Bucks. *T763*

Have NEC CQ-P-2200E 12-channel 1/3W 144MHz f.m. portable/mobile transceiver. Would exchange for SX200N scanning receiver or similar. Also have Binatone five star 40 channel f.m. CB rig. Would exchange for air-band monitor CD-6000. J. L. Perez, Trent House, 24 Ormonde Gate, Chelsea, London SW3. Tel: 01-352 7847. *T764*

Have Yaesu FRG-7700M with 500kHz filter, immaculate condition. Would exchange for Trio R2000 in same condition. No cash, no offers, no deals, just a straight swap. Eddie. Tel: 01-624 2546 (evenings) or 01-257 5032 (office hours). *T765*

Have Yamaha A55 Electone organ, 12 auto rhythms, also Binatone 40 channel CB rig and power unit (both new). Would exchange for h.f. transceiver or w.h.y. Tel: 0753 653945 (Iver). *T766*

Have Olympus OM1, 50mm and 200mm lens, motorwinder, 2X converter, set of extension tubes, National flash with adjustable and zoom head and aluminium case. Would exchange for Icom R70. Tel: Nottingham 278912. *T767*

Have Yashicamat t.l.r. camera with leather case and tripod, both absolutely mint condition. Would exchange for decent a.t.u. e.g. KW Supermatch or SEM Tranzmatch 1·8-28MHz. F. S. Richards, 9 Dales Grove, Worsley, Manchester M28 5JW. Tel: 061 790 0866. *T768*

Curing TVI to MF/HF Reception

by A. J. Cawthorne T.Eng(CEI) FSERT G3TDJ

This article describes work done by the author to overcome annoying r.f.i. caused by line timebase radiation from the home television receiver. The work was prompted simply by the fact that, with the television on, many frequencies, particularly m.f., were unusable. Additionally severe r.f.i. caused by fluorescent lighting was cleared at the same time.

Essentially practically orientated there is no attempt at theoretical reconciliation. From the outset the writer was determined to solve or improve the r.f.i. problem on the communications receiver, a much modified FRG-7, without being "bogged down" or swayed by worries of correct impedance matching etc. In the writer's experience most modern communications receivers have more than adequate sensitivity and one need not be too concerned with receiver-antenna impedances, indeed how much input attenuation seems to be the order of the day rather than the use of antenna tuners, pre-amplifiers and other expensive and often unnecessary "bolt-on goodies".

First thoughts on improving the r.f.i. problems were by use of an active antenna installed some distance from the "noisy" home environment, using the wide band matching to low impedance facility inherent in these devices and feeding the output signal via screened cable to the shack. It was difficult to justify the relatively high purchase cost of these admirable devices especially since it might not have cured the problem. A cheaper approach would have been to build an active array, but this faces the constructor with a tricky design problem if one is to avoid the pit-falls of low noise wideband amplification with suitable strong signal handling characteristics.

The writer had previously experienced considerable success with m.f. loop antenna fed to the receiver via a balanced screened transmission line and balun[1]. It was decided therefore to extend this idea to the ubiquitous general purpose receiving antenna, in this case an 18·2m "T", and attempt to transfer the collected energy via wideband transformers and screened balanced transmission line through the "noisy" area to the shack.

Practical Applications

No originality is claimed for the principles involved. This article describes a cheap and simple practical application of ideas gleaned from books and articles[2,3,4] which the writer would recommend as excellent further reading. Reference 2 provided the basic idea of an anti-interference antenna system, seemingly no longer available commercially. References 3 and 4 provide the details one requires to wind wideband transformers for amateur applications.

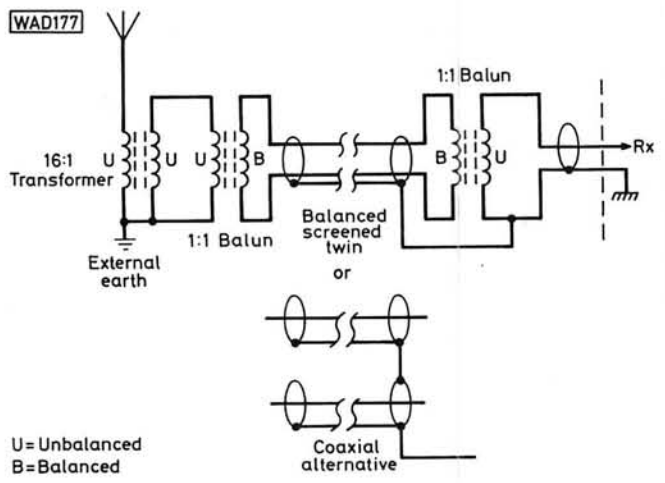

Fig. 1

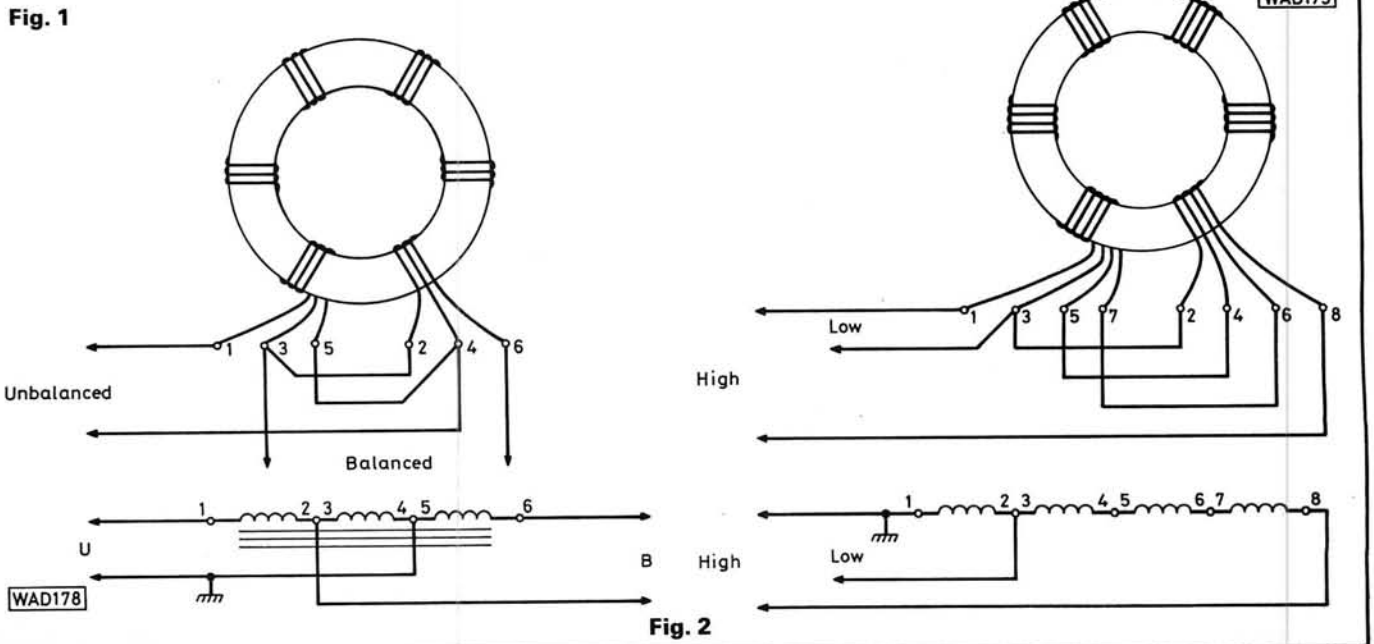

Fig. 2

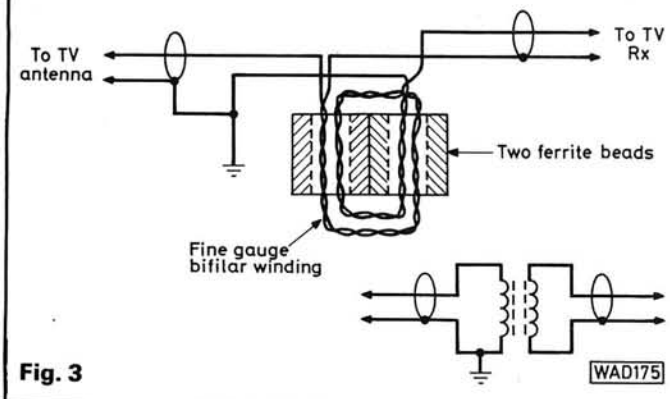

Fig. 3

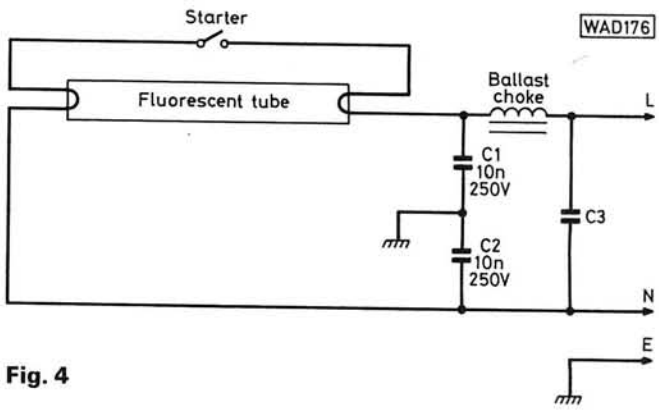

Fig. 4

Baluns

Fig. 1 shows the overall set up which is basically a balanced screened transmission line with 1 : 1 balun transformers at either end, at the receiver end the balun allows connection to the unbalanced receiver input, at the antenna end the balun allows connection to the unbalanced antenna system. A second, impedance step-up, wideband transformer is used at the antenna end to connect the antenna. Two transformers are used here simply to separate transformer functions and thus greatly simplify design. Reference 4 details several unbalanced to unbalanced step-up designs and the 16 : 1 version was chosen for this application.

Ideally the transmission line should be an r.f., screened, balanced twin feed. However, a most suitable alternative of course is two lengths of coaxial cable used "in parallel" the screens being joined together at the receiver end and grounded. In this application the FRG-7 receiver was converted to a single antenna input. Note that the ground connection to the antenna winding of the first transformer must be separate and not connected to the transmission line screen. As shown the transmission line outer screen must be left unterminated at the antenna end. This avoids a ground loop which will most certainly compromise the overall noise reduction available.

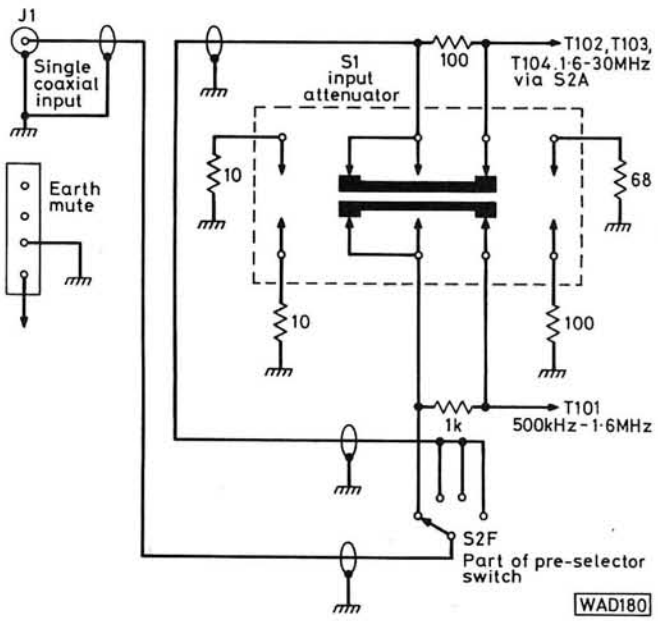

Fig. 5

Wideband Transformers

Considering now the construction of the wideband transformers. At first this was thought to be a complex task but in fact can be done easily. Tests were carried out on various toroidal cores. Ferrite material was finally chosen to minimise the number of turns required. Several of the very cheap 38mm ferrite rings were to hand. These are currently widely advertised as interference aids against TVI. Initial tests to determine certain core characteristics were a little disappointing. The cores seemed far happier at hundreds of kilohertz rather than the megahertz required. However sufficient faith to "press on" was placed in Reference 4 which mentions that "it is common to find low frequency ferrite cores in h.f. applications since at high frequencies the core material tends to vanish electrically".

Two standard 1 : 1 baluns were wound for each end of the transmission line. These are trifilar wound, i.e. three wires wound on together. After a little experimentation a 12 turn design was adopted. The three windings are connected in series and the connections for balanced and unbalanced identified as in Fig. 2. The 16 : 1 unbalanced to unbalanced step-up transformer is wound on an identical core, 12 turns are again used but in quadrifilar fashion. Again the four windings are connected in series and the low impedance winding and high impedance antenna winding identified as in Fig. 2.

It does help to use wire with different coloured insulation for each winding. Single core insulated cable is used of about 20 s.w.g., but this is not critical.

In the writer's installation the antenna is fed into the loft through the eaves together with an external earth. This allows the two transformers at the antenna end to be inside. For external use suitable watertight housings should be used for the transformers.

Braid Breakers

One additional precaution was taken at this time, this was to install a simple braid breaker in the television receiver antenna feeder. Again no originality is claimed for this work, the writer using a braid breaker described in reference 5.

The braid breaker is shown in Fig. 3. It is constructed using two ferrite beads and bifilar winding two fine gauge wires as shown. Reference 5 recommends that the braid breaker be fitted 1 metre from the television set. In the writer's installation this was conveniently installed inside the wall mounted coaxial socket box. It was found very beneficial to ground the television antenna cable outer screen at the aerial side of the braid breaker. Note this grounding must be done at the antenna side of the braid breaker to avoid grounding the television receiver.

Considering now the results. To put the r.f.i. problem

into perspective at m.f. and low h.f. timebase interference registered a disgusting "S9 + 15dB" (whatever that might actually represent). Whilst as already stated the objective was to remove or reduce this interference level an overriding concern was that the transformers and transmission line would function as an unacceptably high value attenuator.

It would be a brave man indeed to claim that there was no degradation of incoming wanted signals, but over several months of intensive testing no noticeable reduction could be determined—much more to the point was the effect on interference levels. With the receiver tuned to 1·8MHz, normally a particularly noisy part of the spectrum, interference was reduced from the "S9 + 15dB" to not registering on the meter. Timebase noise was still audible above band noise but was sufficiently low to cause little or no hindrance.

As a further test, to clearly establish where the remaining interference pick-up was occurring, the antenna was disconnected from the first transformer and replaced by a 1000 ohm resistor. With this configuration no signals were audible but much more importantly no interference was audible either. Clearly then the system was now limited by timebase radiation directly into the antenna proper, this has proven to be relatively inconsequential and the television receiver now presents little barrier to m.f./h.f. reception.

Fluorescent Lights

As mentioned earlier fluorescent lighting within the house caused considerable r.f.i. This was much reduced with the system described in use but the writer was somewhat disappointed with the result. The suppression circuit detailed in Reference 2 was fitted with complete success. This is reproduced here as Fig. 4 for those who suffer from similar problems. Capacitors used were 10nF 250V IS types from Maplin Electronics. The power factor correction capacitor is C3 and is left in circuit.

FRG-7 Modifications

Like so many receivers of its ilk the FRG-7 has separate antenna inputs for m.f. and h.f. This was considered to be a nuisance with the single low impedance antenna feed described. A simple modification shown in Fig. 5 allows single coaxial input to the FRG-7. This modification is easily implemented and easily reversible should the need arise.

A useful "spin-off" from the antenna system described has been the removal of the effect of a natural phenomenon. The writer was "plagued" with periodic rain static with conventional antenna systems. The d.c. path to ground provided by the first wideband transformer prevents any build up of static on the antenna.

The system described can of course be used with other types of antenna such as long wires and whips. The further the actual antenna from the source of the noise the better, within reason one need not be too concerned with losses on the transmission line. ●

References

1 *Practical Wireless* December 1981 page 70.
2 *The Practical Aerial Handbook.* Gordon King.
3 *Toroids in H.F. Applications.* N.W. Sedgwick G8WV. *Short Wave Magazine,* March 1979.
4 *The ARRL Handbook 1982.* Chapters 2 and 6.
5 *I.V.T. and Braid Breakers.* E. Margetts, GM4BOA. *Technical Topics. Radio Communication.* March 1976.

AR Station with a Difference

Probably the only amateur radio station established in a girls' school and run by licensed pupils is currently operating from Harrogate College, an independent girls' school with approximately 450 pupils, the majority of whom are boarders, whose ages range from 10½ to 18 years.

Amateur radio was first introduced to the school six years ago when David Andrews G4CWB joined the staff as Director of Music, and a year later was joined by Richard Horton G3XWH, appointed Head of Physics.

Shortly afterwards these two gentlemen ran a 24-hour exhibition station as part of the school's sports/open day. As a result, several girls expressed an interest in obtaining licenses and setting-up a school station. And that's how the bug, which most radio amateurs are so familiar with, was introduced into the "dorms" of Harrogate College.

Subsequently, David and Richard ran an RAE course, to be rewarded with five passes in the following May examination. During the course of the year a temporary "shack" was established off the Physics Lab and with the loan of David's FT-101B the school station came on the air. Three more RAE successes were obtained the following year, and the 24-hour station became an annual open day event.

For the 1982 open day they were able to move into a purpose-built shack located in a section of their new Hobbies Centre, equipped with among other gear, their own TH3 Mk3 h.f. beam, 2m colinear and FT-208R transceiver.

During 1983 the school celebrated its 90th anniversary and the 5th year of operating GB2HC, the 24-hour special event station. Additionally, they were most fortunate in marking this event with the delivery of a new h.f. rig, the Trio TS-430S.

The photograph shows three of the four licensed girls present in the school this year who are, left to right, Dione G4OOV (Richard's daughter), Sarah G6GGK and Danielle G6RHN (Head Girl), the fourth girl being Nora G6RHO.

Harrogate College's station, G4LYZ, is now very firmly established as one of the hobby activities within the school and the RAE course continues to attract a keen group of girls each year.

Amateurs in Space

To commemorate the operation of an amateur radio station from space by W5LFL aboard Space Shuttle "Columbia" STS9, a special philatelic cover (envelope) is to be issued in conjunction with the Solomon Islands Radio Society H44SI.

The cover will state "First Amateur Radio Operation from Earth Orbit" within the AMSAT logo.

A 45c Solomon Islands postage stamp featuring orbiter Columbia will be affixed to the cover and cancelled on the first day of operation.

The cover will be available from: *PO Box 81, Honiara, Solomon Islands,* at a cost US $1.00 or equivalent (US $1.00 or five IRCs) for direct mailing by air.

Covers can be supplied in mint condition within a sealed envelope, by air for an additional US $1.00 for up to 10 covers, i.e. one cover addressed and mailed US $1.00, one cover, mint, within envelope US $2.00, five covers, mint, within envelope (5 + 1) US $6.00.

At the time of going to press the final launch date and programme had not been confirmed.

RAF Halton Award

The RAF Halton Award is available to all licensed amateurs and listeners for contacts or confirmed reception reports with stations connected with RAF Halton Amateur Radio & Electronics Club, between 10 June 1983 and 30 June 1984 on all bands and modes.

A total of 25 points is required to qualify, and points will be awarded on the following basis: 10 points per QSO with Club Stations (G4SQC, G6WCR, GB2HAS and GB2HAR), and 5 points per QSO with Club Members.

Further information (sae please) or claims (£1 or 5 IRCs) to: *G8BVJ, 6 Mansion Hill, Halton, Aylesbury, Bucks HP22 5NL.*

PW QRP Contest Winners

Continuing with our policy of meeting as many of our readers as possible during the year Practical Wireless attended the Welsh Amateur Radio Convention held at Blackwood, Gwent. The event was a great success and well attended.

By coincidence the PW QRP 144MHz contest was won by a group of newly licensed amateurs all members of the Blackwood & District ARS so the opportunity to present them with their trophy was not missed. The convention was opened by Don Baptiste, President of the RSGB, and he very kindly agreed to present the cup to the winning team.

Our photograph shows (left to right) GW8UCQ, GW6NEO, Don Baptiste, GW6TGW and GW6RPZ. The club callsign used by the winners is GW6GW.

Repeater News

GB3SF, the Sheffield University experimental s.s.b. unit, has now been licensed for a one-year period. It is expected to be some time before the unit becomes operational.

The RWG is now called the Repeater Management Group and as such is a new independent committee of the RSGB. We have been asked to emphasise that the primary function of the committee will remain that of a **working** group.

Following discussions between the RSGB and the DTI, an agreement has been reached allowing the RSGB to submit proposals for up to 12 repeaters (v.h.f./u.h.f.) in total, per annum. It is expected that this policy will be in force for the foreseeable future and will commence 1 January 1984. In practice, proposals will be sent every six months. These proposals will not apply to beacons or microwave repeaters.

Anyone wishing to propose a repeater installation should contact RSGB HQ prior to submitting details, whereupon a copy of the DTI specifications will be provided.

A 29MHz repeater may be licensed to provide information on the viability of such units within IARU Region 1. Details and observations will then be correlated and passed for discussion at a future conference.

The 1984 IARU Conference will, amongst other items, receive two papers from RMG chairman, Mike Dennison G3XDV, on the subject of u.h.f. repeater planning. A proposal to formally adopt the UK RB system for Region 1 will be introduced. If this occurs, future bandplanning could allow the use of all 16 RB repeater channels.

Latest u.h.f. repeaters to become operational are GB3OH—Sterling on RB4 (reports please to GM4OMT, QTHR) and GB3TD—Swindon.

The v.h.f. repeater GB3WD—West Devon on R4 came on-air on 8 September. Reports suggest initial QRP operation. However, at the QTH of Technical Editor G8MCP, approximately 160km away, signals have been received just above noise, via a low-gain omni-directional vertical antenna, which confirms the effectiveness of the repeater's 630m a.s.l. site. Further reports please to G6IEP, QTHR.

The RSGB has agreed a site change for GB3LD on R3, the Lakeland v.h.f. repeater, to a local TV mast.

During the summer Mike Dennison G3XDV delivered a lecture to the second IEEE Conference of Radio Spectrum Conservation Techniques, based on the extensive UK 432MHz amateur repeater network. Reactions from the professional body were very encouraging with many delegates declaring their joint "amateur" status.

Information received from the Cambridgeshire Repeater Group, builders of the UK's first v.h.f. repeater GB3PI on R6, reveals that moves are under way to add relaying facilities, with message store and forward, to form an "electronic post-box", to the RTTY repeater GB3PT on R12 at Barkway. Should the proposals be accepted by the DTI/RSGB RMG, the standard CCITT telephone modem frequencies, at 300 baud, will be used. The explosion of home computer usage could make this a busy repeater soon. There is no truth in the rumour that successful access will only be obtained after zapping ten Klingons!

Also, GB3PS, the 1·3GHz f.m. voice repeater to be on RM3 at Barkway, is currently on soak test in Cambridge. In operation, following a successful access with toneburst, the device will switch from beacon to repeat mode, superimposing a 100Hz sub-audible tone onto the through audio. When the input carrier is dropped, it replies with a "K" unless the input signal is off-frequency or overdeviated, whereupon a National Semiconductor Digitalker takes over and gives the user a report to aid rig alignment. When installed at its final site the device will operate via a pair of slot antennas, fed with LDF 550 Heliax to give omni-directional coverage with horizontal polarisation.

After a period of nearly two years, the Central Kent 432MHz repeater, GB3CK on RB0 has been completely rebuilt and restored to service.

Following many frustrating hours trying to obtain the necessary isolation between transmitter and receiver, with minimum insertion loss, the repeater group decided to seek expert advice.

Via the good offices of Mike Dennison G3XDV, RMG Secretary, the group were put in touch with Mike Senior G4EFO, an expert in this field, who spent a great deal of time setting up the cavity resonators.

The GB3CK repeater group through their Manager, Jeff Clark G3TIS, offer grateful thanks to all concerned.

Stolen Rig

A Yaesu FT-290R 144MHz multimode transceiver was stolen from a hotel room in Shaftesbury on Friday 7 October 1983.

The serial number is 3C26038 and the owner is offering cash rewards for its recovery.

If you have any information concerning this rig please contact the owner: *D. M. Cranvey G6XPV, tel: (0703) 613948 (home), (079 47) 382 (work) or Shaftesbury Police, tel: (0747) 2231.*

CB "Burners" at Petrol Filling Stations: A Warning

Following reports in the press and on radio recently about the use of high-powered amplifiers known as "burners" to disrupt the operation of petrol pumps at filling stations, Mr. Alex Fletcher, Minister for corporate and consumer affairs in the Department of Trade and Industry, issued the following warning:

"All use of radio transmitters in petrol stations is potentially hazardous. The Code of Practice for Citizens' Band radio (available free at Post Offices) specifically draws attention to this. The use of high power transmitters such as a CB set coupled to an illegal 'burner' adds considerably to the risk of causing an electric spark close to the filling nozzle. An explosion could occur in some circumstances.

"The public are warned always to switch off transmitting equipment when entering a filling station forecourt and never to use CB 'burners' in a vehicle which is being filled with petrol.

"The use of a CB set with a burner is in any case illegal because of the interference it causes to domestic radio and TV reception and to the emergency services; offenders may be imprisoned for up to three months and fined up to £1 000. The sale and possession of 'burners' may be made illegal following the passage of the Telecommunications Bill at present before Parliament."

RAE Short Course

It is proposed to hold an RAE Course at the Barr Beacon Community Centre, Old Hall Lane, Pheasey, Walsall commencing on 19 January 1984 at 7.30pm.

The course will run for 10 weeks and the fee will be £7.50, however, school pupils and unemployed enthusiasts may join the course free of charge.

For further details contact the lecturer: *Frank Fear, 185 Longwood Road, Aldridge, Walsall, West Midlands WS9 0TB. Tel: (0922) 52706.*

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AT230 ATU	£135.00
PS430 PSU	£110.00
R600 Receiver. AM/SSB	£220.00
TR3500 70cm portable	£245.00
SMC 25 speaker mic	
PB 25 battery pack	
MSI Strand mobile	
R2000 Receiver	£380.00
VC10 – Converter	£110.00
R600 Receiver	£220.00
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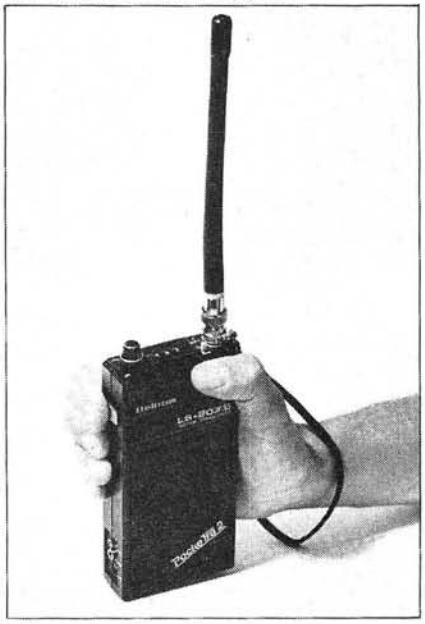
PW REVIEW

144MHz Handheld Belcom LS20-XE

As handheld rigs go the Belcom LS20-XE must certainly rate as one of the smallest. Covering the full 144MHz amateur band in 5kHz steps it measures a mere 140 x 69 x 26mm and weighs in at only 260g complete. "Pocket radio" is the correct term as it slides easily into a coat pocket—or handbag!

Where a rig has been designed to fit into a pocket such controls as tone burst, repeater shift and power are concealed behind a cover on one side. The four AAA size cells are also in a neat compartment at the base of the transceiver behind another cover. Therefore the rig can be moved without fear of disturbing any of the settings and accidentally setting off the tone burst or losing your repeater shift.

The transmitter output is switchable (1W, 500mW and 100mW), giving the operator maximum efficiency from the batteries. A very useful optional extra is the CP615 battery carrying pack, which will take four C size cells. This allowed the rig to be used for much longer before the batteries needed replacing. Reports on the transmitted audio were good using the built-in electret microphone, and only a slight difference noted when a speaker-microphone was used. Provision on the side of the rig is made for the connection of an external speaker-microphone and an external battery pack.



The 50Ω flexible antenna plugs into a BNC socket on the top panel where the volume/off switch, squelch and frequency selector switches are also located. Frequency selection is achieved with "thumb-wheel" switches and depending on the size of your fingers can be easy or difficult to operate.

As well as the electret microphone, the internal speaker is mounted behind the front panel. The audio from the speaker was very good—considering the size of the speaker, just 50mm. However a significant improvement came when the external speaker-mic was used.

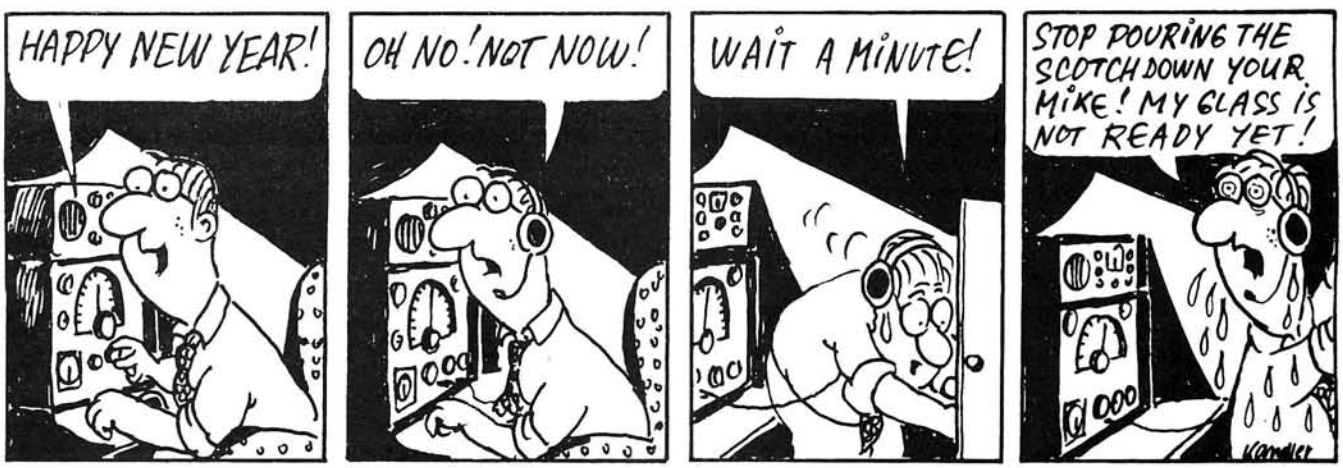
The receiver section was found to be very sensitive and compared well with other handheld and portable 144MHz rigs. Its lack of size does not denote a lack of receiver performance. It has a 3SK114Y dual-gate MOSFET r.f. stage which provides excellent performance in such a small rig.

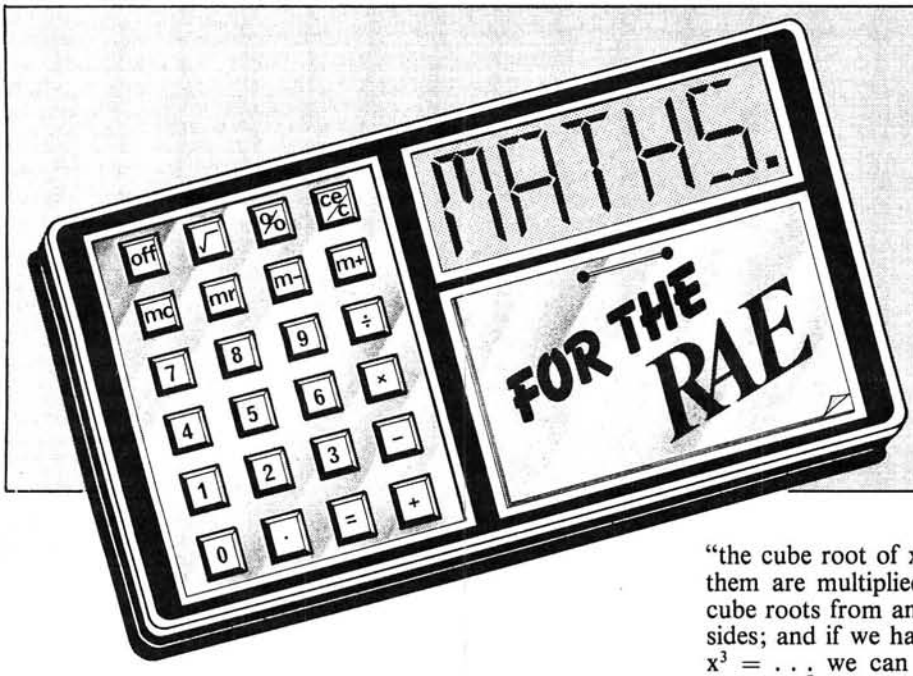
There are many optional extras available with the LS20-XE, the only ones tested during the review period being the battery pack and speaker-mic, both of which seem very useful extras. They enabled the user to get the best from the transceiver.

The LS20-XE costs £128 including VAT with a speaker-mic at £13.80 and the battery carrying pack £10.25. I would like to thank **Lowe Electronics, Chesterfield Road, Matlock, Derbyshire DE4 5LE, Tel. 0629 2817** for the loan of the review model.

Elaine Howard G4LFM

Benny





Part 2 by Roger Lancaster

Last month we dealt with the basic principles of changing the subject of a formula, so now we can look at the more complex forms of equation which might crop up in the examination.

It is sometimes necessary to **square** both sides of an equation. Suppose we want to express x in terms of a, b and c in the formula

$3a = 4bc\sqrt{x}$

We can cross-multiply to get

$$\sqrt{x} = \frac{3a}{4bc}$$

but we want x as the subject, not $\sqrt{x}$.

Multiplying a number by itself is called "squaring" and the reverse operation is "taking the square root". The term x^2 is read as "x squared" and is equal to x times x. The symbol $\sqrt{x}$ is read as "the square root of x". Thus, the square of the square root of a number is the number itself, i.e.

$(\sqrt{x})^2 = \sqrt{x}$ times $\sqrt{x} = x$

So, getting back to the example, we can get rid of all square root signs by squaring (the whole of both sides of the equation, of course) to produce

$$x = \left(\frac{3a}{4bc}\right)^2 \text{ or } \frac{9a^2}{16b^2c^2}$$

It is often easier to do the squaring before other operations, such as cross-multiplying. For example, if we want to make x the subject of

$b = 4c\sqrt{xa}$

This would become

$b^2 = 16c^2xa$ and then, cross-multiplying

$$x = \frac{b^2}{16c^2a}$$

The reverse operation may have to be used. To make x the subject of

$3ax^2 = 4bc$ we first cross-multiply the 3a to give

$$x^2 = \frac{4bc}{3a}$$ then take the square root of both sides i.e.

$$x = \sqrt{\frac{4bc}{3a}} \text{ or } = 2.\sqrt{\frac{bc}{3a}}$$

since the square root of 4 is 2. Be sure again that the operation is always performed on the whole of both sides of the equation.

The same principles can be applied to powers and roots other than 2, of course. For example, x^3, read as "x cubed", is equal to x times x times x, and $\sqrt[3]{x}$, read as "the cube root of x", is the number which, when **three** of them are multiplied together, will equal x. To get rid of cube roots from an equation, therefore, we can **cube** both sides; and if we have an equation whose left-hand side is $x^3 = \ldots$ we can **take the cube root** of both sides. In general, x^n is "x to the power n" and $\sqrt[n]{x}$ is the "nth root of x" and we can take the nth root of both sides of an equation or raise both sides to the power n.

Here are some worked examples to clarify the foregoing. In each case, x is to be made the subject:

No. 1: $a(\sqrt[3]{x}) = 3bc$ becomes

$a^3x = 27b^3c^3$ and then

$$x = \frac{27b^3c^3}{a^3}$$

No. 2: $2ax^5 = 64bc$ becomes

$$x^5 = \frac{64bc}{2a}$$

$$= \frac{32bc}{a}$$ and then

$$x = \sqrt[5]{\frac{32bc}{a}}$$

$$= 2\sqrt[5]{\frac{bc}{a}} \text{ (since } \sqrt[5]{32} = 2)$$

No. 3: $a = \frac{1}{2\pi\sqrt{xb}}$ becomes

$$a^2 = \frac{1}{4\pi^2xb}$$ and then

$$x = \frac{1}{4\pi^2a^2b}$$

(see question No. 1 of the self-test in Part 1 of the series)

Now suppose the variable we wish to make the subject of the formula is itself a power, as in

$a = bc^x$ where we want to make x the subject.

The right-hand side is the awkward one, so let us look at it more closely. Suppose b, c and x were real numbers, e.g.

(4·2) times $(7{\cdot}48)^6$.

How could we evaluate this without a calculator? We could multiply six lots of 7·48 together and multiply the result by 4·2—but this would be a laborious business. There is another way and that is to use logarithm (log) tables, which were popular before calculators made us even more lazy.

To multiply numbers together using log tables, you look up the log of each number and add these all together. This part is called "taking logs" and gives you the **log of** the answer to the original problem. You then look up the antilogarithm (antilog) of this in the antilog tables to find the answer itself. (The idea behind log tables is that it is easier to add large numbers than to multiply them).

Thus, to evaluate $(7{\cdot}48)^6$ for a start, we could look up the log of 7·48 (which is 0·8739), then add six of these together to get 5·2434, which is the log of the answer. The antilog of 5·2434 is 175 146, which is the result of multiplying six lots of 7·48 together. Of course, adding six lots of 0·8739 together is the same as multiplying 0·8739 by six, which is probably easier. To evaluate the (4·2) times $(7{\cdot}48)^6$ we would add the log of 4·2 (which is 0·6232) to the 5·2434 prior to taking the antilog.

So what is all this leading up to? Well, if we write out the process of taking logs, we get

6. log (7·48) + log (4·2)

and we can see that the 6 is no longer a power. We can therefore use this process of taking logs (of the whole of both sides, of course) on the original formula ($a = bc^x$) to get

$\log a = \log b + x.\log c$

Thence,

$x.\log c = \log a - \log b$ and

$$x = \frac{\log a - \log b}{\log c}$$

To divide using logs, we take the log of the numerator and **subtract** the log of the denominator from it before taking the antilog. Thus to evaluate 7·48/4·2, the **log** of the answer is log 7·48 − log 4·2 and the answer itself is the antilog of this result. The "taking logs" part is done prior to taking the antilog.

Therefore, if we have to make x the subject of

$\frac{a}{b} = c^x$ taking logs gives us

$\log a - \log b = x.\log c$ thence

$$x = \frac{\log a - \log b}{\log c}$$

You will see that this example is merely a different form of the previous one and so yields the same answer for x.

Here is a worked example relating to the charging of a capacitor through a resistor: to make t the subject of the formula

$v = Ve^{(-t/CR)}$

Taking logs, we get

$$\log v = \log V + \left(\frac{-t}{CR}\right) \log e \text{ thence}$$

$$\frac{-t.\log e}{CR} = \log v - \log V \text{ and then}$$

$$-t = \frac{CR(\log v - \log V)}{\log e} \text{ and finally}$$

$$t = \frac{-CR(\log v - \log V)}{\log e}$$

If we can take logs of an equation we can also take antilogs, and this is sometimes necessary in examples where decibels (dB) are involved. Suppose we have to make x the subject of the formula

$a = 10.\log x$

in order to turn log x into x we simply take the antilog of log x. So, if we cross-multiply the 10 first we get

$\log x = \frac{a}{10}$ and then taking antilogs

$x = \text{antilog } \frac{a}{10}$

Proportion

It is often useful to know what will happen to one variable in a formula if we change the value of another variable in the same formula. It is not always necessary to apply the formula in calculations in order to discover this. Often, with an understanding of **proportion** we can see straight away what the outcome will be.

Take the simple Ohm's Law relationship

$I = \frac{E}{R}$

What will happen to I if we **double** E? The right-hand side will become 2E/R and, to maintain the balance of the equation, the left-hand side must become 2I. In other words, doubling E results in the doubling of I. In fact we could multiply E by any number and the result would be that I would be multipled by the same number. We say that I and E vary in **direct proportion,** or that they are directly proportional (to each other).

But what will happen to I if we double R? The right-hand side will become E/2R and, to maintain the truth of the equation, the left-hand side must become I/2. So, doubling R results in the **halving** of I. If we multiply R by any number this will result in I being divided by the same number. We say that I and R vary in **inverse proportion,** or that they are inversely proportional (to each other).

There are forms of proportion more complex than direct and inverse proportion. Take the formula

$P = I^2R$

We cannot say that P and I are in direct proportion because doubling I will not **double** P, although any increase in I will certainly increase P. Doubling I will make the right-hand side $(2I)^2R$ and (since $2^2 = 4$) this is equal to $4I^2R$. So P is **quadrupled** when I is doubled. In this case, P is directly proportional to I^2.

Another example is

$$f = \frac{1}{2\pi\sqrt{LC}}$$

Here f is not strictly inversely proportional to L, since doubling L will not **halve** f, although an increase in L will certainly decrease f. Doubling L makes the right-hand side

$$\frac{1}{2\pi\sqrt{2LC}}$$

i.e. it has been divided by $\sqrt{2}$ (which is equal to 1·414), so this will result in f being divided by 1·414. In this case, f is inversely proportional to $\sqrt{L}$.

Let us look at the formula

$R_t = R_1 + R_2$.

The term R_t is not directly proportional to R_1 because only in exceptional circumstances would the doubling of R_1 cause a doubling of R_t (i.e. when $R_2 = 0$). The doubling of R_1 would certainly cause an **increase** in R_t but by how much would depend upon the relative values of R_1 and R_2. In short, simple proportional relationships only exist between **factors** of each side of an equation. In the right-hand side of our example R_1 is not a factor (see Part 1 of this series).

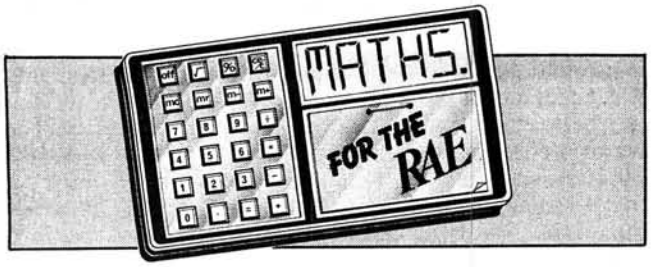
Unless direct or inverse proportion is obvious, as in the I = E/R examples, great care must be taken to determine exactly how a change in one variable will affect another variable. The general procedure is to establish what the given change in a variable has on its own side of the equation, then it follows that the same modification must be made to the other side of the equation.

Graphs

A graph is a pictorial method of showing the relationship between two variables.

Such a relationship between I and E in the purely resistive circuit is shown in Fig. 2.1. Previously we have seen this indicated by the formula I = E/R and we saw that I and E were directly proportional to each other.

Every graph has two axes, each representing various possible values of a variable. In this case the vertical axis represents I in milliamps (mA) and the horizontal axis represents E in volts (V). **The axes should always be clearly labelled to show the variable represented and the units used.** The line of the graph shows the connection between the two variables.



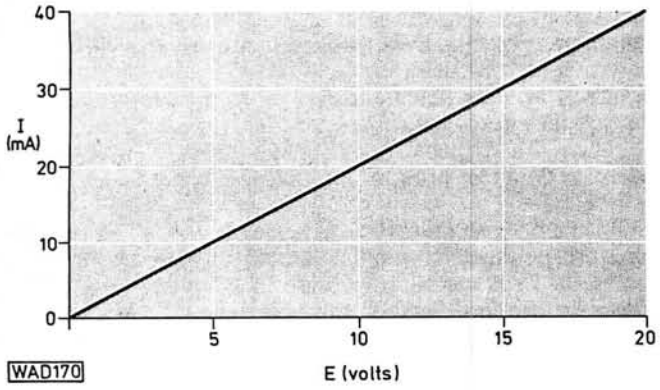


Fig. 2.1

If we want to see the effect of a certain value of E (say 15V) on I, we look vertically upwards from that value to the line of the graph, then from there horizontally across to the other axis to find the corresponding value of I (in this case 30mA). We could do the opposite, starting with a value of I (say 20mA) and ending with a corresponding value for E (10V). The graph shows at a glance all the values of I resulting from any value of E we care to choose, and vice versa, provided these values are not off the scale of the axes. All graphs can be used in this way.

It will be seen that doubling the voltage E (from 10V to 20V, for example) results in a doubling of the current I (from 20mA to 40mA). This shows direct proportion in the form of a straight line passing through the point where both variables are simultaneously zero.

The slope, or gradient, of the line shows the **rate of change** of one variable with respect to the other. In this case the slope is constant, i.e. the rate of change of I with respect to V does not vary, no matter which part of the graph (which range of values) is taken.

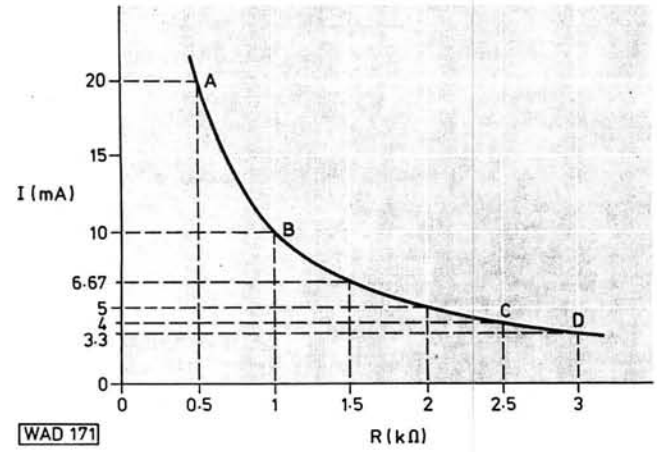


Fig. 2.2

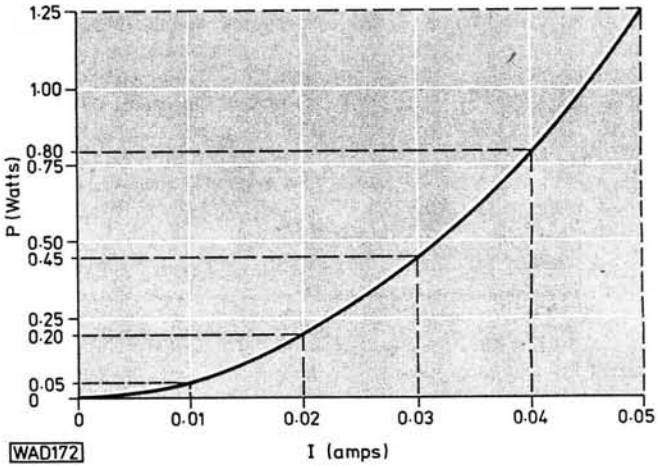


Fig. 2.3

If we keep E constant but vary R, we can see the effect on I for different values of R. This is shown in the graph of inverse proportion of Fig. 2.2. In this case, the graph is not a straight line but does follow a mathematical form governed by the formula. The slope varies, the rate of change of current with respect to resistance being high for low values of R (the steep slope between A and B) and low for higher values of R (the gradual slope between C and D).

The relationship between P and I in the resistive circuit ($P = I^2R$) when R is held constant is shown in Fig. 2.3.

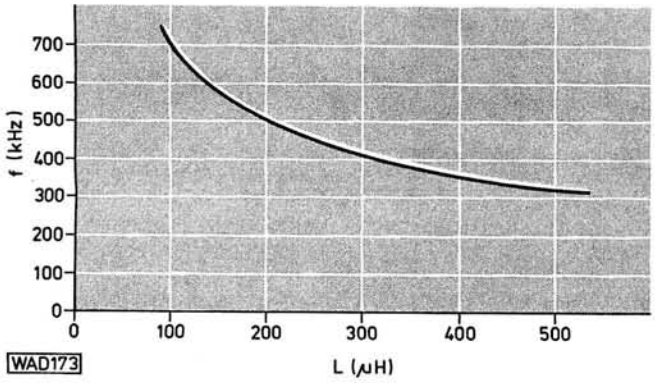


Fig. 2.4

The Fig. 2.4 shows the relationship between f and L in the tuned circuit.

$f = \frac{1}{2\pi\sqrt{LC}}$ when C is held constant.

The relationship between I and E when a voltage E is applied to a certain non-linear component (one which does not obey Ohm's Law all the time) is shown in Fig. 2.5. This is just one example of a component's "characteristic", other components will be represented by quite different graphs of E and I. In this case, the graph is not linear and neither does it follow a simple mathematical law (formula) but it is just as easy to use as the others, reading from one axis to the other via the line of the graph.

Some of the peculiarities to be seen from this graph are:
(i) I changes rapidly as E increases between points A and B (steep slope)
(ii) around points C and F, I changes only very slightly as E changes and at these points the slope is zero
(iii) between C and F, I **decreases** as E increases and between F and G, I increases again, but the slope is less than between A and B
(iv) the same value of I (40mA) can be achieved by applying any one of three values of E, namely 0·92V, 3·5V or 7·1V, although a value of 10mA is only achieved when E is 0·25V.
(v) the maximum value of I (66mA) is achieved when E is 2·2V (at C).

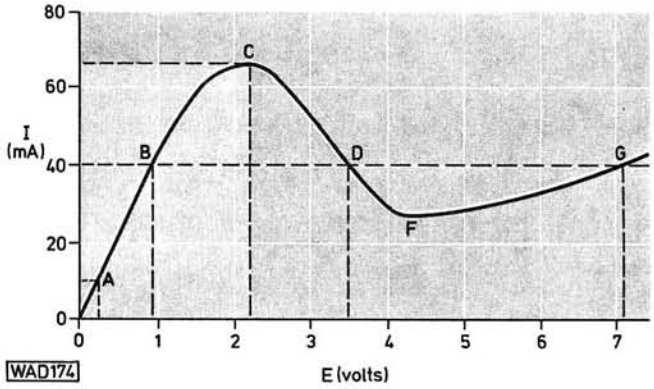


Fig. 2.5

Next month we will look at the graphs of the sine and cosine functions and also at vectors and phasors.

Swap Spot

Have Sinclair ZX81, full size keyboard, numeric pad built-in, p.s.u., 16K RAM, mother board, recorder, books, tapes plus Maxcom 4E CB rig (cost £190). Would exchange for Yaesu FT-290R or similar plus cash adjustment. G. Harris, 136 Centurion Way, Purfleet, Essex. *T528*

Have Quad II/202 with a.m. and f.m. tuners and decoder, plus Goldring Lenco with transcription arm. Would exchange for test equipment e.g. a.f. generator, lab. p.s.u., dual-beam 'scope, Avo 8 Mk 5. G. L. Mechan, 19 Alderson Crescent, Formby, Liverpool L37 3LY. *T530*

Have Kenpro KR-400RC antenna rotator, never used. Would exchange for MV5BH or any good multiband h.f. vertical. Tel: Folkestone 51259. *T532*

Have Amstrad radio receiver, battery or mains (l.w., m.w., s.w., f.m., air, marine, CB) also a Harrier CBX (new) mobile CB transceiver plus cash adjustment where necessary. Would exchange for Yaesu FC-902 a.t.u. or PDL II antenna. David Harrower, 39 Ravenswood, Forth, Lanark, Scotland ML11 8DW. *T533*

Have Icom IC-255E 144MHz transceiver plus 5-element XY Jay beam. Would exchange for h.f. transceiver, KW2000 w.h.y. Letters only to Jim GM6UHU, 30 Newlands Drive, Kilmarnock, Scotland KA3 2DW. *T535*

Have Sony ICF2001 a.m./f.m./s.s.b./c.w. receiver 150kHz–30MHz (worth £120). Would exchange for 144MHz or 432MHz mobile/portable. Tel: 01-521 9473 after 6pm G6YDY. *T546*

Have Sony 630 reel/reel, own amp, speakers and echo sound on sound. Would exchange for multi mode 144MHz rig. H. G. White, 5 Sandrock, June Lane, Midhurst, Sussex. Tel: 4427. *T565*

Have Oscilloscope—dual beam, 88 x 100 mm display, 4kV tube, timebase to 0·1μs per cm—good quality reliable instrument. Would exchange for 144MHz rig. Tel: Nottingham 819549 (evenings) *T550*

Have Scuba gear; two bottles, back-packs, fins, mask, weight belt, depth gauge and compass. Would exchange for h.f. equipment w.h.y. Tel: Kilmarnock 21997. *T573*

PW "SWAP SPOT"

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A FEW SIMPLE RULES: Your ad. should follow the format of those appearing above; it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale—and one of the items MUST be radio related. Adverts for ILLEGAL CB equipment will not be accepted.

on the air

AMATEUR BANDS by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR, c/o 60 Blakes Lane, New Malden, Surrey KT3 6NX.
Logs by bands in alphabetical order.

The s.w. listener has a wonderful opportunity to experiment with antennas for the h.f. bands before an amateur transmitting licence is obtained, getting to know their characteristics and capabilities at various frequencies. Antennas used solely for receiving purposes do not need to have that care in construction paid to them which is essential when they are used to handle the r.f. power from a transmitter where proper insulation and fairly heavy copper wire or rigid elements are a necessity.

The s.w.l. can use odd pieces of plastic tube such as are obtainable from ball- or felt-tipped pens for insulators at the ends of wire elements, or as centre spacers supporting coaxial or open feeders, or as spacers for open wire feeders themselves. Ball-points are generally around 130mm long and can be cut in half to provide two spacers in the last application.

The actual gauge of wire used can be quite thin before it will stretch and break and need not be copper. Plastic covered iron wire as used in gardening is quite suitable and there are reels of aluminium wire sold for the same purpose which will do, although since it cannot be soldered, should be one continuous length when used as a long wire, without any breaks or joins.

Depending upon the layout of the space available for antennas it is a good idea to fix up pulleys and ropes at the highest points that can be reached so that various antennas can be strung up very quickly with a minimum of bother each time. Where fixing points are in trees it is essential that a counterweight be fitted, either at the tree end or at the shack end, so that movement of the tree in the wind is taken up by the counterweight rather than the antenna wire itself.

It also saves a lot of time to have small marker pegs in the grass alongside the edge of a path, for instance, at 3m intervals so that lengths of wire can be measured off without having to drag out the tape measure each time. Don't forget to allow a few inches to the length of the wire for tying to insulators etc. After a while you will accumulate a number of wire elements that can be connected in all sorts of configurations and tried out quickly.

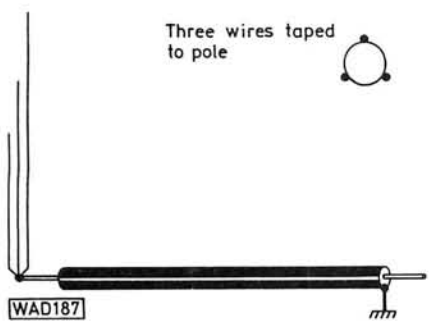


Fig. 1: Three pvc-insulated wires, 2·6m, 3·6m and 5·3m long respectively, are taped at intervals to a vertical wooden pole or bamboo cane. The bottom ends of the wires are soldered together to the inner conductor of the coaxial cable. The cable end should be sealed against the ingress of moisture. This antenna will cover the 28, 21 and 14MHz bands

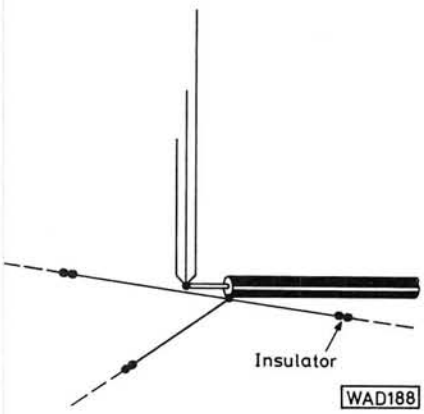


Fig. 2: If at all possible horizontal wires should be added as shown here, all soldered together and to the outer shield of the coaxial cable. The wires are the same length as those in the vertical elements, one for each band, but two or more per band are highly desirable

"Tried out quickly" is not quite the idea however because a new antenna needs to be used over a long period in order to evaluate it properly. Work out or look in the books for the likely polar diagram of a new antenna and see how the lobes apply to your particular location using a pocket compass in conjunction with a great circle map of the world.

Just because the signals from, say, North America, are down on a new antenna compared to a previous one it doesn't mean that it is any worse because it is probably much better in a quite different direction. If you are interested in receiving stations from a particular part of the world then one lobe of the polar diagram can be aimed in that direction.

Even single quad loops of around 5m a side can work very well on several bands, giving worthwhile gain on the higher frequencies. They can be suspended from the centre of a horizontal bamboo cane at the top and rotated from ground level with thin rope from the lower corners to anchor the loop in any direction. Such a loop should be fed with open or 300 ohm flat feeder, via an a.t.u., for all-band operation.

Where space is really restricted and only a vertical antenna can be accommodated then a modified ground plane design can give excellent results. In this, three wires, a quarter wave each for 14, 21 and 28MHz, are taped round a bamboo or other wooden pole, which only needs to be about 5m high, and the bottom ends soldered together and to the inner conductor of the coaxial feeder, the outer of which is earthed at the receiver. The cable may be 50 or 75 ohms impedance as available. This form of construction costs next to nothing and outperforms trapped verticals as there are no compromises in element lengths.

Ideally the true GP should also have horizontal elements from the outer conductor of the coaxial cable, one at least, a quarter wave long on each band. When used for transmitting purposes these wires can be sloped downwards to give a good match to the feeder cable. The GP antenna radiates/receives equally well all round, that is it is omni-directional, at a very low angle and is ideal for the real DX. However it does tend to pick up a lot of local electrical interference.

General

An appeal from Cliff Tooke, ISWL Awards Manager, and Sid Kerrison G3MFQ, for information on the present whereabouts of Bob Ford of AC4RF fame many years ago and author of *"Captured in Tibet"*. C. E. Jefferies G5JF who was Bob's regular contact here would also be interested to know what has happened to Bob.

The last item one would think of abolishing as far as amateur radio is concerned is the log book yet this is what has happened in the United States. The reason given is "that there is no longer an official need for records of routine station activity" which doesn't convey very much. If such a step were taken here I

doubt whether one in a hundred amateurs would drop their log-keeping except perhaps those who only operate regularly on established nets.

On the other hand it would make the pinning down of an amateur guilty of causing TVI or other interference very difficult indeed for the authorities. Personally, I am very pleased to have some of my old log books that I still treasure and which still make interesting reading.

Samuel Giles in Belfast wonders how he can copy amateur s.s.b. on his vintage Murphy TA160. The answer must be "with difficulty"! But really, although one can fit a b.f.o. module of some kind the selectivity and relative instability of the local oscillator would leave much to be desired and would hardly be worth the effort involved. If anyone wants to help Sam drop a line to 16 Fallswater Street, Falls Road, Belfast 12. Sam also wondered where to buy the Realistic series of receivers which, he says, he never sees advertised. They are retailed by the Tandy group through its nationwide chain of shops.

In the current issue of *Contact*, club mag of the Bangor & District ARS, sec **Stewart Mackay** GI4OCK wonders if the several club mobile rallies held during the year over there in N. Ireland could not be combined into an annual convention with the burden of the costs being spread among the organising clubs. A well-known personality could open the proceedings and there could be a much wider range of attractions for both the amateur and the families. Stewart says that at the moment the rallies are all much of a muchness being virtually static trade shows plus a secondhand stall which is usually the main attraction. He thinks that all aspects of electronics should be covered including computers, video equipment and radio-controlled equipment.

Stewart would also like actual demonstration facilities laid on by the retailers of AR gear so that prospective buyers can check it out for themselves. As Stewart so rightly says, who would buy a car without trying it out first? After all, some of today's rigs cost as much as a good secondhand car! Stewart would like to hear from other clubs who may like the idea of an annual convention in GI land.

I don't suppose that there is any point in hiding from you all that yours truly has now retired at the grand old age of 65 and can now get a cheap haircut! I am delighted to report that I shall continue to compile this feature every month as long as the Editor will have me so keep the letters etc coming to me direct.

Best wishes to you all for the forthcoming festive season and may Santa Claus be laden down with lots of black boxes from your doting relatives!

On the Bands

A well-modified Trio 9R59DS receiver has enabled **Malcolm Tyrrell** of Moston, Manchester to pull in some good DX, mainly on 21MHz. Writing in for the first time Malcolm has managed to get up a 28MHz ZL-Special, a delta loop for 21MHz in his loft space, and a wire antenna to a short mast in his 10m-deep garden. Wisely, all antennas are coupled to an a.t.u. On 21MHz Malcolm logged AP2P, C6AEY, H44DX, HL0U, J37AH, P29MF, YC4FW, ZL2RE, 6W8BG and 9Y4RT. The 28MHz was not so dead as some would make out, finding A4XIJ, CX4HS, J28DX, SV8RV, ZS6XB, 3B9FK, 9J2JN and 9K2EZ.

Regular writer **Dave Coggins** has good news for those who decry Top Band and the apparent lack of DX there. Listening between about 2000Z and midnight he caught EA8AAU, EA9KQ, SV1DT and UK9CAA on s.s.b. plus HZ1AB, UA9KBO and 4X4NJ on c.w. all between about 1825 and 1850kHz, on his FRG-7700 and a.t.u. plus W3EDP antenna. On 3·8MHz Dave didn't do too badly either with C30AAL (QSL F6EYS), FM0GA and ZL4AV on s.s.b. The 7MHz band produced EL7C, JY9RV, VK9NS on Norfolk Island and VK0GS thought to be on Macquarie Island. Only DX c.w. on our new 10MHz band was VK3BXN. On 28MHz it was CE8ABF, YC3CEV, VJ4RS who, Dave says, is a YL crossing the Atlantic in a small boat! Then came VP8ALD in the S. Orkneys, and 3B9FK. Dave's QTH is in Knutsford, Cheshire by the way.

Another newcomer to the column is **Paul Price** of Merthyr Tydfil, Mid-Glamorgan, who was a BC bands addict until he came across the amateur bands which he now checks regularly with his Sony ICF-2001 and its whip antenna. He has tried various lengths of wire as alternatives but inevitably ran into cross modulation and returned to the whip. On the 3·8MHz band he found C30AAN and 4X6DX with mostly Euros on 7MHz. Of note on 14MHz were CR7OF, EA9LZ, J28ED in Djibouti (QSL W2TK), SV9JI on Crete, YC2OCN and 9V1VP. Of interest on 21MHz were J73HA on Dominica, SV8RX on Zante Island and VP8AEN (QSL GM3ITN).

In Felixstowe, Suffolk, our **Keith Ranger** has been having a lot of fun with his homebrew four-transistor portable t.r.f. receiver using an SK19 f.e.t. and three BC109's plus crystal earpiece and a short throw-out antenna, about 3m long, mostly at ground level. It is band-switched from 28 to 3·5MHz. Best DX so far he reckons is a ZL4 on 7MHz s.s.b. In detail, on c.w., K7GM/5N2, TR8JD, VU2RO and 3B8FK plus 7Q7LW on s.s.b. all on 28MHz. On 21MHz it was G3ZGC/J6 and 4K1GDW (Antarctica) on c.w. and TR8CR on s.s.b. 14MHz c.w. included CP2ARC, FG7CO, HB9AAX/ET3, HH2VP, JY5DT, UK0QAH, 8P6BW and 9J2LL with EL7C and YI1BTV on s.s.b. Of note on 7MHz c.w. was HK3YH and FM7WU with the ZL4BO on s.s.b. Among others on 3·5MHz c.w. was F0OV/P/FC. Rather puts some of the expensive black boxes to shame!

With his DX200, homebrew a.t.u., 10m dipole in the loft and a 20m-long wire **Dave Shapiro** in Prestwich, Manchester, has found the bands in pretty good shape of late so starting on Top Band it was EA8XS and 5B4EP both on s.s.b., with 3·8MHz providing OH0AC, OY8R and ZI4AP for a nice one. The St Paul Island DX-pedition came up on 7MHz in the shape of CY0SPI, then FK0AR, TR8GM, TU2NW, VP2KM, VS6DO, YS9EW and ZL1BOQ. For 14MHz there was TR8DX, VP8AEN, XT2BP, ZD7BW and 5T5RY with 21MHz giving up A22ME and IK0BZY, included because he was said to be using just 200mW, 3B9FK, 5R8AL, 7Q7LW and 9Q5JE. Finally on the 28MHz band Dave caught KG4DX, ST2SS, VS6DO, 3D6BP, 5Z4DE and 7P8CT, for a very fine log this month.

The h.f. bands have also been pretty well covered down in Callington, Cornwall, by **Viv Doidge** with his FRG-7700, a.t.u. and 40m-long wire. Starting with 3·5MHz the CY0SPI came up as did VK6HD and VK6DO, YS1GMV, ZF2OCZ and ZI4AP, and on to 7MHz and VS6DO, ZL2ANR and 5N8ARY. For 14MHz it was 3V8DC, 3Z0SOB (QSL SP9KZ), 4S7EA, 5T5RY, 5Z4TV, 9M2CK and 9X5CL. Up to 21MHz and FG7BZ, J37AH, WB7PSH/J73, S79WAW, ZD7BW, 5H3JR, 5R8AL ending with PJ3EK on Aruba.

D. R. Norton of London W6 has been s.w.l.ing since the beginning of the year with his FRDX500, FL21 audio filter, SST6 a.t.u. and 20m of wire and writes in for the first time, concentrating mainly on the 14MHz band where he logged 9N1MM for his best DX so far with the QSL already to hand. "D.R." also comments on those stations that still don't QSL even when an s.a.e. is provided. One can't do much more than that! Others on 14MHz were SV1TH, G3CNM/VE3, 5T5AA, VP2MO, VP8ANT, J73CB on Dominica, 9H4B on Gozo Island, 9V1VP, VU83BBJ, 5N6ATT, YB0ARA, CY0SPI and ZB2HG. C30AAN was the only item of interest on 3·8MHz but 21MHz did find AH2AN on Guam, YC5QZ and 4X4MS/P/5N0.

Studies for the RAE have occupied **David Price** down in Wellington, Somerset, but even so he has sent in a very impressive log from 28 to 3·5MHz using his FRG-7 fed from a 43m wire in the form of a delta loop which would account for the excellent DX on the 3·5MHz band, like JA6IEF, VK6LK and 5N8ARY, all between 2100 and 2300Z around 3·795kHz. On to 7MHz and ZL2BT, HK4FLT and VP8ANT (QSL POB 146 Cambridge) with 14MHz providing 8R1X, T77C, CY0SPI (QSL VE1ASJ), TR8DX, VS6DO and UN station 4U1VIC located in Vienna. The 21MHz band seems to have been the most prolific with VP8AQA, 6W8BG, VU2GO, YC4FS, 3B9FK, 5R8AL, FG7CC, 9L1DR, 4D9RG (QSL DU9RG) VP8ZV in Port Stanley and KC2CS/P/J6L on St Lucia.

Club Time

If you are not already a member of your local AR club or group why not make a resolution to do something about it right now and join in the fun of the forthcoming winter season and the pleasure and satisfaction of meeting other amateurs that perhaps you only know as distant voices on the bands.

Abergavenny & Nevill Hall ARC Note for December, the Christmas dinner on Friday the 9th at the Llanwenarth Arms on the A40, Aberg'y. Routine meetings at 7.30 every Thursday at the Pen-y-Fal Hospital, Aberg'y, above the Male Ward 2, with RAE classes at the Seminar Room, Nevill Hall Hospital, Brecon Road, Aberg'y at 7.15 on Tuesdays. Don't forget the club is an official RAE centre and applications for the March exam should be in by January 14. More from sec David Jones GW3SSY, 2 Dalwyn Houses, Llanover Road, Blaenavon, Gwent.

Acton, Brentford & Chiswick ARC G3IIU Tuesday, December 20 will see the club discussing antennas, at 7.30pm, at the Chiswick Town Hall, High Road, Chiswick, London W4 where new members and visitors alike will be made most welcome. So says sec W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3.

Axe Vale ARC Meeting spot remains the Cavalier Inn, Axminster, on the first Friday at 7.30. The RAE course run by G8AOJ has a few vacancies and is held at the St Clare's Centre, Seaton. Peter Peach G3GOS, is the hon sec and resides at The Firs, Goldsmiths Lane, All Saints, Axminster, Devon or you can ring him on A'minster 34259.

Banbury ARS Members are asked to note a change in the meeting day, now the last Thursday of the month but still at the St Pauls Church Hall, Warwick Road, B'bury, with items like DF hunts, talks, junk sales and the like. Sec remains John Burrell G8OZH, 6 Blenheim Croft, Brackley, Northants, or ring (0280) 702900.

Bangor & District RS According to PRO Stewart Mackay GI4OCK, 11 Dellmount Park, Bangor, Co Down, N. Ireland, the club is back in business for the winter season at the Sands Hotel, Bangor at 7.30 on the first Friday of the month.

Braintree & District ARS G4JXG G6BRH First of all the sec is none other than Pat Penny G6TAF and you've just got to believe that she comes from GW-land! Present QTH however is 13 Newnham Close, Braintree, Essex, or B'tree 26487. The club's mag *BARSCOM*, edited by G3PEN, is quite something and a really good read. Contact Pat for the latest information on club events.

Bromsgrove ARS G4TUI Formed last May the club specialises in outdoor demonstrations, special event stations to generally promote AR in the district, in addition to the normal run of club features. Second Tuesdays at Rigby Lane School, Bromsgrove at 8 with the 1984 programme being formulated. In the meantime try Alan Kelly G4LVK, 8 Green Slade Crescent, Bromsgrove, Worcs for up-dated info.

Bromsgrove & District ARC G3VGG Not to be confused with the other Bromsgrove group, this club meets on the second Friday at the Avoncroft Art Centre at 8pm with the December gathering encompassing the Christmas Party, says sec Jim Calder G6EAM, available on Kingswinford 8580.

Bury RS The club's AGM is scheduled for Tuesday December 13 with wine and cheese afterwards, says Publicity Officer Malcolm Pritchard G3VNQ, 56 Shelfield Lane, Norden, Rochdale, Lancs although the sec would be glad to hear from visitors or newcomers at 4 Colne Road, Burnley, Lancs (Burnley 24254) otherwise Brian Tyldsley G4TBT. Meetings every Tuesday at 8, at the Mosses Community Centre, Cecil Street, Bury.

Chichester & District ARC It's the annual Christmas Social on Thursday December 15, otherwise first and third Thursdays at the Green Room, Fernleigh Centre, 40 North Street, C'chester at 7.30, plus club net on S11 (145·275MHz) at 7pm on Wednesdays. The Bognor Adult Education Centre has courses for both the RAE and Morse code exams running currently. Hon sec is T. M. Allen G4ETU, 2 Hillside, West Stoke, C'chester, Sussex also obtainable on West Ashling 463.

Flight Refuelling ARS G4RFR G6SFR Sundays at the Sports and Social Club, Merley, Wimborne, Dorset. Following participation in the RSGB's 144MHz contest on December 4 the meeting at 7.45pm will be another of Nick's Rambles, otherwise G8MCQ, again by popular request. Incidentally the club is rather chuffed that Nick has been recruited to the RSGB's VHF Committee. On December 11 it's Paul G3MDH on "Another use for r.f." subtitled "who needs a laser" so work that one out! Another repeat performance, this time by *PW's* Elaine G4LFM on "CW Worldwide", on the 18th. Strangely, no meeting on the 25th but the club wishes members and guests a very Happy Christmas! Mike Owen G8VFY, Hamden, 3 Canford View Drive, Canford Bottom, Wimborne is also on (0202) 882271 if you want to contact the club secretary.

Fylde ARS At the Kite Club, Blackpool Airport, first and third Tuesdays at 7.45, with code classes beforehand for those interested. Date to note is December 6 when it is Christmas Party time. Your contact is H. Fenton G8GG, 5 Cromer Road, St Annes, Lytham St Annes, Lancs.

Halifax & District ARS PRO G4SDX says the club meets on the first and third Tuesdays at the Running Man, Pellon Lane, Halifax, and imagine 7.30 would be about right. XYLs and other members of the family will be welcome at the Christmas ragchew followed by a pie and peas supper on December 6. Note that on the 20th G6BPH will be giving a talk on domestic video recorders. The sec for further info is David Moss, Beechwood Lodge, Leeds Road, Lightcliffe, Halifax, W. Yorks otherwise (0422) 202306.

Hastings Electronics & Radio Club G6HH Consistently good club mag *Vital Spark* reveals membership up to 172 of which 21 are on the current RAE course, all due no doubt to the very wide spread of electronic interests. First, second, fourth and fifth Wednesdays at 8, at the Ashdown Farm Community Centre are Micro Nights, with main monthly meeting on third Wed at the West Hill CC. Tuesdays at 7.30 is code time with the RAE classes on Thursdays at 7.45. If you have a Friday evening to spare it's chat time. Highlight of December is the 21st and the Christmas Social for all the family. For info on a host of these and other activities contact George North G2LL, 7 Fontwell Avenue, Little Common, Bexhill-on-Sea, or Cooden 4645.

Leighton Linslade RC You may get your *PW* in time to take note of the December 5 meeting, a Monday, when G4ASH talks on through-line power measurements while the 19th is devoted to the usual Christmas social and fun-making. All at the Vandyke Community College, Room A64, Vandyke Road, Leighton Buzzard, Beds, generally at 7 and lasting until around 10pm, first and third Mondays. Your contact at the club is Peter Brazier G6JFN, Kingsway Farm, Miletree Road, L'ton Buzzard, Beds, also available on Heath and Reach 270.

Lough Erne ARC Bill Ward GI4NRE contributes the following bit of "useless information" that the club sits on the most westerly part of the UK! I'm sure a lot of us would like Lough Erne for a groundplane! Chairman Bill says the club meets at the Railway Hotel, Enniskillen, on the third Monday of the month, a new venue. Anyone with an interest in any branch of electronics is most welcome and should contact sec Joe GI4UHA on Enniskillen 4905 for more info.

Macclesfield & District RS G4MWS Second and fourth Tuesdays at 8, the Fenman Club, Oxford Road, M'field, which is a new home for the club. A programme for the forthcoming season in the pipeline has a wide variety of attractions so contact Dave Lucas G6HLQ, 62 St Austell Avenue, M'field, Cheshire for latest news on events, or try M'field 28610.

Magherafelt ARS GI4MFT A new one for this feature I think, meeting first Tuesdays at the club HQ at 12 Garden Street, M'felt, with a varied programme of events including code classes and an RAE course at the local tech on Monday evenings. New members are sought and visitors promised a warm welcome, says sec Jack Chapman GI4LVC, 55 Greenvale Park, M'felt N.I. (0648) 32096.

Milton Keynes & District RS Ex-DX column correspondent Alan Date is now G1AZG and says the club meets the second Monday at 8pm, the Lovat Hall, Silver Street, Newport Pagnell, Bucks, with more detailed info from sec Dave White G3ZPA, Rose Cottage, Shenley, Brook End, Bucks.

Nene Valley RC G4NWZ G6GWZ December 7 is natter nite and closing date for the club's Construction Trophy entries while the 14th has a chat on the Cambridge Repeater Group from G8HVV. It's Christmas Buffet time on the 21st but note that the club will be closed on the 28th and January 4. Which makes it every Wednesday at 8pm, at the Dolben Arms, Finedon, near Wellingborough, N'hants, with Lionel Parker G4PLJ, 128 Northampton Road, Wellingborough, N'hants willing to answer your queries about the club.

North Bristol ARC G4GCT Plenty of interesting material in the second issue of the club's new mag *Q5* to suit all tastes, including fast scan TV, RTTY and contests. Every Friday at the Self-Help Enterprise, 7 Braemar Crescent, Northville, Bristol at 7. December 9 is dedicated to a junk sale and on the 30th are the annual Christmas/New Year festivities and party. Contact Ted Bidmead G4EUV, 4 Pine Grove, Northville, Bristol for latest info on club activities.

Plymouth RC Established meeting spot is the Penlee Secondary School, Somerset Place, Stoke, Plymouth, at 7.30 with December's dates being the Christmas Quiz on the 12th, a Monday, and Christmas Social on the 17th which is the following Saturday. More on club events from M. C. Newcombe G4FJZ, 56 Dolphin Square, Plymstock, Plymouth, Devon.

Radio Amateurs Technical Engineering Club (RATEC) The sole object of this club is to promote the constructional side of our hobby and as such should be given every support and encouragement. Apart from meetings every Monday at 8 at the British Legion Club, Moor Lane, Woodford, Cheshire, there is an excellent pocket sized magazine published every two months containing anything up to a dozen constructional projects and much more useful information, and is very well produced. Forthcoming projects include a 1296MHz transceiver inspired by the new 1296MHz repeater for the Manchester area, a frequency synthesiser, 24A power supply and lots more. *RATEC News* is posted direct to members at an inclusive fee of £6 a year. Sec is now Nigel Spear G4RWI, 58 Cheadle Road, Cheadle Hulme, Cheshire.

Rhyl & District ARC GW4ARC GW1ARC I notice the club pounced on the GW1ARC very quickly and very nice too! Hon sec is John McCann GW4PFC, 67 Ashley Court, St Asaph, Clwyd, and informs me that there has been a change in the club's meeting days, now first and third Mondays, at the 1st Rhyl Scouts Hut, Tynewydd Road, Rhyl, starting at 7.30. A programme of events is being formulated by the recently elected committee but contact John for the latest info.

Ripon & District ARS Every Thursday at 7, starting off with RAE and Morse code classes followed by a talk or film or demonstration of some kind, all in the St John Ambulance Hall in Ripon. More from sec Peter Fautley G6CUG, Parkside, Thornton-Le-Street, Thirsk or buzz Thirsk 24945.

Smiths Industries RS G4MEN Meeting at the Club House, Newlands, Bishops Cleeve, Cheltenham, Glos, the next occasion being on Thursday December 8 and then on January 12 and every other Thursday thereafter. More frequent gatherings result from the extensive alterations at the club house and better facilities for operating the club station. The club thinks it is high time that there was some kind of net for club stations and proposes to be on 3735kHz s.s.b. on club evenings from 9pm onwards. With clubs meeting on every day of the week this could be a daily feature for the exchange of information. More from Roger Hawkins G8UJG, c/o Sports & Social Club, Smiths Industries, Evesham Road, Bishops Cleeve, Cheltenham, Glos.

PW* contributor Eric Dowdeswell G4AR, right, receives some retirement goodies from Keith Macdonald, MD of Business Press International, at a farewell party, like a Trio VF240 external v.f.o., an MC50 desk microphone and a low pass filter. Eric was technical editor on *Electrical & Radio Trading* prior to which he spent seven years on *PW

Southdown ARS G3WQK Sec is T. Rawlance G4MVN, 18 Royal Sussex Crescent, Eastbourne and from the excellent club newsletter I learn that the AGM will be on December 5 with meetings generally on the first Monday at 7.30, at the Chaseley Home for Disabled Ex-Servicemen, Southcliff, Eastbourne, Sx. Activities include Raynet operation, DF hunts, contest operation on all bands plus lectures and talks.

Stockton & District AR Group A reminder of the new venue at the Billingham Community Centre, Stockton, every Wednesday at 7.30, all for a mere 50p membership fee and 20p whenever you visit. Not to mention guest speakers, RAE and Morse code classes and all the usual club attractions. It's John Walker G6NRY, 7 Widdrington Court, Stockton-on-Tees, Cleveland, or buzz (0642) 582578.

Stoke-on-Trent ARS G3GBU Every Thursday at 7.30, at the rear of the Cottage Inn, Oakhill, Stoke, with visitors cordially welcomed. The club will be celebrating its 60th anniversary next year and an appeal is made for any information, photographs etc of the past activities of the club, perhaps from those who have been members but have moved away from the area. Sec now is John Wiles G4TVA, 38 Northwood Lane, Newcastle-under-Lyme, Staffs, or try (0782) 625960.

Stourbridge & District ARS G6OI G6SRS The venue is the Garibaldi in Cross Street, Stourbridge, on the first and third Mondays the latter day being considered the main meeting of the month starting at 8 prompt. Amusing note in the *STARS Newsletter* is that "the bar is deemed to be inaccessible during main meetings when the guest speaker has the floor"! Make a note now and do something about the annual construction contest to be judged on January 16. Hon sec is Malcolm Davies G8JTL, 25 Walker Avenue, Quarry Bank, Brierley Hill, or try Lye 4019.

Stratford-Upon-Avon & District RC G3PGU Meeting place remains at the Control Tower, Bearley Radio Station, Bearley, about three miles north of Stratford, on the second and fourth Mondays starting at 7.30. Home construction of gear is to be the theme for the winter season at the club where workshop facilities are being made available, with projects being lined up for members. PRO is Chris Ousbey G6DCL, Ormond Lodge, Newbold-on-Stour, Stratford-Upon-Avon, Warks, or try Ian Hopwood G6CWK on S'ford 68863 for a speedier contact.

Sunderland ARS G4LPK G6BXJ Sunday mornings at 10 plus Mondays and Thursdays at 7.30, at the Brewery, Westbourne Road, S'land are the meeting times for this group with code classes a feature. An FT-480R and TS-520S are available for use by licensed members. More from temp sec Colin Howe G4RTJ at the club address.

Sutton & Cheam RS The Christmas get-together takes place at the Downs Tennis Club, Holland Avenue, Cheam, Sy, on Friday December 23 starting at 7.30. More details of the club's activities can be got from acting sec Jack Korndorffer G2DMR, 19 Park Road, Banstead, Sy, or try Burgh Heath 58729.

Vale of White Horse ARS Canteen and Social Club, Milton Trading Estate, at 7.30pm the first Tuesday, usually formal, and third Tuesdays, but the main meeting in December will be given over to the inevitable Christmas Social so pass the word around. If you want to monitor the club nets Thursdays at 7.30pm on 28·750MHz and Sundays at 8pm on 145·2MHz. Club secretary is Ian White G3SEK, 52 Abingdon Road, Drayton, Abingdon, Oxon or (0235) 31559.

Wirral ARS G3NWR The Guide Hut, Westbourne Road, West Kirby, will find the club in session on the first and third Wednesdays from 7.45 onwards according to club mag *News & Views* which is a font of information on club activities. However for up-to-date gen on current events contact sec Cedric Cawthorne G4KPY, 40 Westbourne Road, West Kirby, also 625 7311.

Usual reminder to get your letters and copy to me by the 15th of the month and a note to club secs and PROs that at least six weeks' notice of specific events is required if they are to get into the appropriate issue of *PW*. Calendars of events are welcomed, saving a lot of unnecessary correspondence in both directions.

MEDIUM WAVE BROADCAST BAND DX

by Charles Molloy G8BUS

Reports to: Charles Molloy G8BUS, 132 Segars Lane, Southport PR8 3JG.

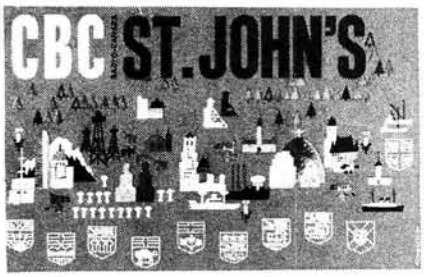
"I always wanted to discover the medium wave band but never got around to it" is a phrase in a letter from **Jeff Pascoe** (G4ELZ) that has stuck in my mind since reading it. The medium waves, often called the oldest DX band, is quite different from any other band so one does have to get the feel of it, to "discover" it, before getting the best out of it.

It was with something like this in mind that I started examining small segments of the band and we will continue along this path but first of all it might be useful, for the benefit of newcomers, to emphasise a couple of items. You must have a path of darkness between the transmitter and receiver in order to hear DX. The medium waves is allocated to local broadcasting so one has to reach through a curtain of local QRM to pick up a distant station.

621kHz

Why exactly 621kHz? It is a European channel in a plan that has 9kHz separation between stations so all sorts of "odd" frequencies come up. 621kHz is dominated during the evening by a French speaking station whose transmitter is located at Wavre in Belgium but if you listen carefully you should be aware of a weaker companion. Even if you manage to reduce the strength of Wavre by using a loop and this is none too easy with short distance high power stations, you will still not be able to separate the two as they are roughly in the same direction. What do we do now? Wavre signs off for the night shortly after 2300 so if we listen then, we will find that as soon as the Wavre carrier is switched off, up pops the weaker companion. We are now listening to the Voice of the Arabs (Sowt el Arab) at Batra in Egypt.

Batra literally does pop up. Its strength increases quite dramatically on account of the action of the receiver's automatic gain control (a.g.c.). The a.g.c. adjusts the gain of the "front end" of the receiver. You could do this yourself by operating the r.f. gain control. Turn it down when listening to a strong station. Turn it up again when listening to a weak one. The a.g.c. works automatically to combat fading so when Wavre is on the air the receiver is desensitised. Once Wavre goes off then the gain is restored.



CBN in St John's

The Voice of the Arabs programme is in Arabic but if you want to try them with a reception report send it to Radio Cairo, PO Box 1186, Cairo, Egypt. The problem will be collecting suitable material for the report. News bulletins, time checks etc, are the sort of things to look for. There is another station on 621kHz which can be separated easily from Batra with a loop. This is the government owned outlet at Santa Cruz de Tenerife in the Canary Islands. Programming is in Spanish and even if you do not have a loop you can still listen to it, as the relative strength of the two stations is constantly changing owing to fading. The address for a QSL is Radio Nacional Espana, San Martin 1, Santa Cruz de Tenerife, Canary Islands.

There are other broadcasters on 621kHz. There is a medium power Portuguese station at Vila Real and a more powerful one at Makhachkala in the USSR which signs on at 0200. Perhaps readers will search for these themselves as we are now moving to Newfoundland.

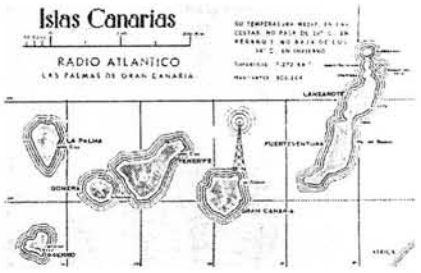
Listen to Newfoundland

Although this Canadian province is no farther away than Egypt we are in a different ballgame altogether when DXing this part of the world. The great circle path across the North Atlantic, which is the route followed by radio waves, passes not too far from the magnetic north pole in Northern Canada. Consequently reception is less reliable than from Egypt. Sometimes strong signals are heard. On other occasions you will hear nothing.

Slow cyclic fading with a period of several minutes is very noticeable on this path so we have to stay on a channel for two or three minutes to make sure. Even a good solid signal can dip to inaudibility for a short period.

It should now be approaching midnight so tune carefully up the band from 621kHz to 640kHz and listen for CBN in St John's. If there is a heterodyne, a 1kHz whistle, then it is caused by interaction between the carriers of CBN and the Spanish stations on 639kHz. The latter can be nulled out with a loop. CBN is the key station of the Canadian Broadcasting Corporation (CBC) in Newfoundland. There are several slave stations that carry the same programme so we will have a look for one of them. Go back to 621kHz and tune down the band to 600kHz. Listen for CBNA in St Anthony. If successful then come back 10kHz to 610kHz and try for CKYQ at Grand Bank. This is a commercial broadcaster that belongs to the same network as CJYQ on 930kHz which is the key station. You may hear the call "Q Radio" instead of the more formal identification CKYQ. Finally return to 621kHz and tune down slightly to 620kHz. CKCM in Grand Falls can be found here when conditions are good.

These four stations are logged regularly by DXers in the UK and they do verify. Write to CBN and CBNA at PO Box 12010, Station A, Kenmount Rd, St John's, to CKYQ at Box 6130, St John's, to CKCM at Box 620, Grand Falls, all of course being in Newfoundland, Canada.



Radio Atlantico is in Las Palmas

Features of North American DX

Several things emerge from our quartet of Canadian stations. We have been DXing ITU Region 2 where station separation is 10kHz and frequencies are multiples of 10kHz i.e. the final digit is zero. Sometimes this works out to our advantage. CJYQ on 930kHz lies neatly between European channels 927kHz and 936kHz. In the part of the band we have been looking at, the situation is less favourable so we have to rely on a reduction of QRM late at night and on the ability of our loop antenna to reduce it.

Identification of North American station is usually easy as every station is allocated a callsign which is used frequently during the programme. Those in the USA have the prefix W if they are east of the Mississippi and K if to the west. In Canada the prefix is C except for a few stations in Newfoundland like VOCM on 590kHz, which retain the old colonial prefix V.

White's Radio Log

A copy of a new edition of this very comprehensive listing of North American medium wave stations is currently to hand. At one time the log was published in parts in an American radio magazine and I still have a slim volume which I bound myself, of sections from several issues. The log has been published in book form for some time now and the new 136 page edition is available for $6·95 postpaid from Don Gabree, Worldwide Publications Inc, PO Box 5206, North Branch, N.J. 08876, USA.

The medium wave information is in two sections, one for the USA and the other for Canada. Each section has three lists, one by frequency order, one by call

letters, one by location. The new edition has been enlarged and describes itself as "an up-to-date directory of North American a.m., f.m. and TV stations including a special section on world-wide short wave stations". Not all of this information is of interest to us but the medium wave lists are a valuable source of reference for anyone interested in DXing North America.

News Items

A recent report from *Sweden Calling DXers* drew attention to Sud Radio Andorra which has resumed operations on 819kHz. It seems that this return to the air may only be temporary as the transmitter in Andorra is to be closed down when a new one in South West France is operational. If you want a QSL from Andorra now would seem to be the time to get one. The address for reception reports is Sud Radio, BP7, Andorra-la-Vieille, Andorra.

Also from SWCDX is a note that Radio Finland is using 254kHz longwave to supplement its international service at 2100 which is suffering from "interference" on 963kHz.

SHORT WAVE BROADCAST BANDS

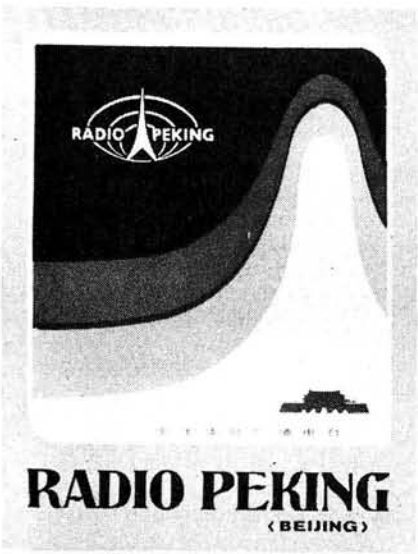
by Charles Molloy G8BUS

Reports: as for Medium Wave DX, but please keep separate.

"Are there any English language stations in Latin America?" asks **Glenn Hocking** of Redruth in Cornwall who is having difficulty with the languages used in that area. Yes there are a few. Among local broadcasters the most prominent is Radio Spice Island on 15·095MHz which can be heard between 2000 and 2130, usually with quite a good signal. Others that may be picked up later on in the night are Georgetown in Guyana on 5·950MHz, Belize on 3·285MHz and Honduras on 4·820MHz.

Broadcasts to Europe

There are special broadcasts from Latin America beamed to Europe. Listen for Radio Bras in Brasil which, at the time of writing is on 15·280 at 1800; for RAE in Buenos Aires on 15·345 at 1930 and 2230, for Cuba on 11·690 at 2010 and again on 11·705 at 2200. The most prominent broadcast to us from Latin America is HCJB the Voice of the Andes in Ecuador. Its English broadcasts to Europe are generally well heard in this country. Listen at 1900 on 17·790MHz and 21·478MHz and at 2130 on these and the additional frequency of 15·295MHz. On Mondays and Saturdays the 2130 transmission, which lasts for half an hour, is devoted to the well known *DX Party Line* presented by Clayton and Helen Howard.



Radio Beijing QSL sent in by Simon Lexton

Radio Propagation

Regular readers of this column will be aware of the ionospheric data broadcast at 18 minutes past the hour by WWV. Less well known but nearer home is a similar transmission by the Bureau de l'heure (BIH) in France. The data supplied by BIH is more comprehensive than from WWV, reception is more reliable but the transmission is in Morse code (A1A).

Four transmitters are involved. The first three, FTH42 on 7·428MHz, FTK77 on 10·775MHz and FTN87 on 13·873MHz are located near Paris while the fourth, FTA83 on 83·8kHz, is near Lyon. The ionospheric data is broadcast 4 times a day as follows:

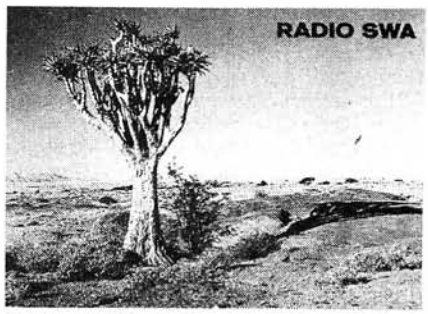
1208UTC FTA83, FTK77; 1308 FTA83, FTN87; 2008 FTA83, FTK77, 2108 FTA83, FTH42.

Unlike WWV whose clock pulses are on the air continuously, BIH only has this at selected periods, none of which occur immediately before the ionospheric data, but listen for CQ DE (callsigns) which is repeated several times before the start. The information begins with MEUDON URSIGRAM followed by a number of sections. It is the first of these called GEOALERT or GEOSOL that is of interest to us.

The Geoalert consists of a number of five figure groups, the first four groups containing the date we want. The first digit of each group is a key number. Number 9 indicates hour and date of the period e.g. 91215=1200UTC on the 15th of the month. Key digit 1 indicates sunspot data, the following three digits giving the relative sunspot number and the last digit=number of new groups that have appeared during the period. Key digit 2 is for solar flux, next three digits are the SF number and the last digit is the number of important bursts during the period.

Key digit 3 is for magnetic activity. Following three digits give the Ak index, the last digit indicates important events where 0=no event, 1=end of magnetic storm, 2=storm in progress, 6=gradual storm commencement, 8=very pronounced storm commencement. Key digit 4 is for cosmic radiation while the remainder cover solar flares.

Thanks are due to Dr Paul Simon of the Meudon Observatory who supplied this data. He said he was glad we were interested in this kind of information and mentioned that the Sunday transmission repeated the Saturday message.



Radio SWA QSL sent in by Philip Hodgson

ADDX

Reader **Dietmar Jendreyzik** of Cologne writes to say that he is a member of the ADDX which is a DX club located in West Germany. It has about 4400 members in more than 30 countries and publishes a fortnightly bulletin, in German, called *Kurier*.

Since June of this year the club has had its own transmission in German, carrying matters of interest to broadcast band DXers. "It's possible for us to make a transmission in English language if there is a need," continues our reader who goes on to say that there will be one on the 14 December 1983 at 1800UTC on 3·770MHz and 14·277MHz+/- QRM with the call DF0AD. "If your readership is interested in this special transmission in their own language they should write to us a postcard to our address ADDXeV/DF0AD, PO Box 15 01 24, D-4000 Dusseldorf 1. FRG."

Glad to hear from you Dietmar and good luck to your club's new venture.

On the Bands

"I am using a Vega Spidola 250 with approx 5 metres of wire connected to the whip by means of a clip, and using a

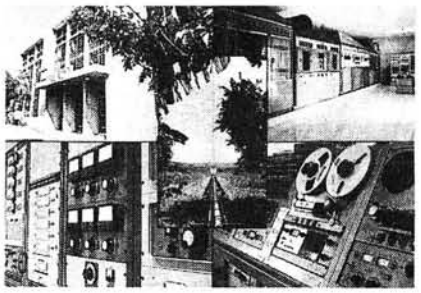
mains adaptor" writes reader **L. Lyon** from Scarborough who says that the Voice of Vietnam comes in well, the English tranmission being from 1800 to 1830 on 15·012MHz. A DX302 communications receiver with indoor antenna is in use by **Marcus Walden** of Harrogate who reports hearing SABC on 4·835MHz at 2100, ELWA Liberia on 4·765 MHz at 2050, RAE Argentina on 15·345 at 2240, Voice of Nigeria on 15·120 at 0945 and KYOI in Saipan on 15·990 at 1000 and again on 11·900 at 1130.

Radio Thailand QSL sent in by Philip Hodgson

"For anyone who enjoys a very strong signal, here are some stations that beam into the UK" says **Paul Price** of Merthyr Tydfil who uses a Sony ICF 2001 with telescopic antenna. For the benefit of newcomers, this list includes the Voice of Turkey on 11·755 at 2200, Korea on 15·575 at 1900, Cairo on 9·805 at 2200, Dubai on 21·655 at 1600 and Greece on 11·645 at 1820.

Readers' Letters

"Is it feasible to use a beam antenna for this type of listening" writes **Ed Harrison** from Victoria in Canada who is



Radio Lara QSL sent in by Bill Pentland

referring to the short wave broadcast bands. Unlike the amateur bands, the international broadcast bands are not harmonically related to one another. Consequently you would need a separate beam for each band. Physical size is against it on the lower frequencies. A dipole for the 9MHz band (31m) would be roughly 15m in length. If it had a director and reflector of similar dimensions then you would end up with a formidable structure even if it were non-rotatable.

Simon Lexton (Cheam) has been DXing for two years. "I have logged around 40 countries—on a Vega Selena B212, showing what can be done on a low budget. This should encourage any newcomer showing that he/she need not purchase an expensive black box to start with." It is worth remembering though that this type of receiver does not readily lend itself to modification or improvements nor does it usually perform well when connected to a good outdoor antenna. None-the-less this is an economical way to start out on the hobby.

Jeff Pascoe (G4ELZ) who has been a radio amateur for ten years still gets a lot of fun from our side of the hobby and he asked me to send him a list of DX clubs "so that I can follow up-to-the minute information on the subject". Readers may be interested to learn that the European DX Council (EDXC) has recently produced a list of member clubs. Write to the EDXC, PO Box 4, St Ives, Huntingdon, PE17 4FE, for further information.

A note from **Ray McLellan** (G4TAA) mentioned that the final broadcast of the DX programme *Spectrum* was on the 9 October. The presenter Dick Speekman announced that the replacement is *Talk Back,* introduced by Barry Feeba, covering communications developments, DX news and listeners' tips. Ray heard

Doha, Qatar QSL sent in by Bill Pentland

Spectrum on Radio Australia's transmission on 9·570 at 0612, 21·720 at 0810 (not reliable) and on 7·205 at 1612. A cry for help comes from 14 year old Stuart Gough who lives at 33 Cranwell Drive, Wideopen, Newcastle upon Tyne, NE13 6AS. "I have just received a letter from Radio Berlin International that says my reception report was read out over the air on 29 August 1983. I would be very grateful if any *PW* reader who recorded this programme could let me have a copy—expenses will of course be refunded." Good luck with your request Stuart.

VHF BANDS *by Ron Ham BRS15744*

Reports to: Ron Ham BRS15744, Faraday, Greyfriars, Storrington, West Sussex RH20 4HE.

What a time we all had! Openings from 28MHz to 432MHz, plenty of DX from around the world, a fair share of RTTY and a question, have you heard or worked the "ROBOT"? If so do drop me a line and tell me about the gear and antennas you use.

Solar

Both **Cmdr Henry Hatfield,** Sevenoaks and I recorded a solar noise storm on September 28 and 29 at 136 and 143MHz respectively and our technical editor, **John Fell** G8MCP, heard very strong radio noise, when he swept his 144MHz beam across the rising sun at 0750 on the 28th. Individual bursts of radio noise, lasting 4 minutes and 7 minutes, were recorded at midday on October 9 and 17 respectively and a mild noise storm occurred on the 15th.

While using his optical equipment, **Ted Waring,** Bristol, observed 9 spots on the sun's disc on September 23, 20 and some active areas on the 28th which accounted for the radio noise on that day, 10 on October 1, 12 on the 5th and 24 on the 10th. During the morning of the 17th, Henry, with his spectrohelioscope, observed one medium sized sunspot group containing about 10 spots, one double spot and a single and writes, "Things look very quiet indeed".

The 50MHz (6m) Band

Graham Rogers VK6RO, spent his holiday from August 25 to September 6, at Carnarvon, Dampier, Port Hedland and worked 150 JAs on 50MHz, all from his car with an IC505. On the 30th, he heard the Japanese beacon JA2IGY and says "I have now worked 953 JAs while on four holidays, 1980–83 inclusive, in the north-west of VK6, all with between 10 and 20W output and a quarter wave whip antenna on the car roof". This time, Graham used 50 instead of 52MHz and writes, "The difference the 2MHz made is staggering, the m.u.f. did not get much above 50MHz on most days". We often find that here Graham, DXTV on 48·25MHz but nothing on 49·75MHz.

The 28MHz (10m) Band

"The main feature of the period was the gradual opening up of 28MHz during the last week of September and the

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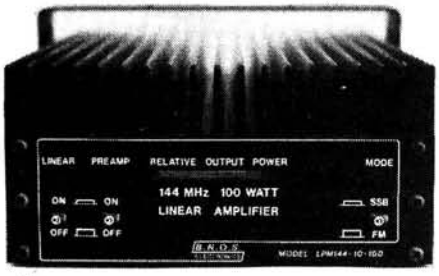

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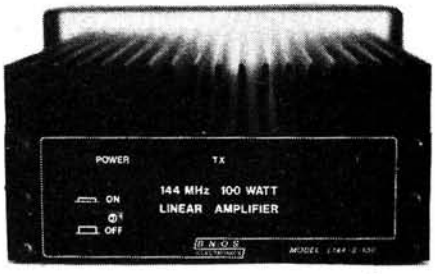

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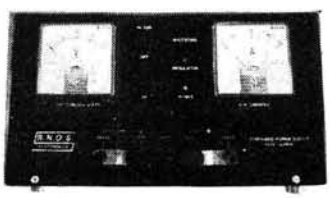

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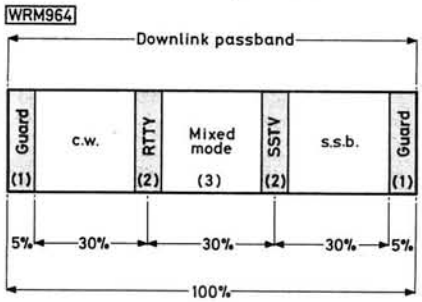
VISA

highlight was on the days October 7 to 10, with east coast and mid-west United States stations simply pouring in", writes **Norman Hyde** G2AIH, Epsom Downs. "Wall to wall Ws and VEs" writes **Fred Pallant** G3RNM, Storrington, for October 8 and 9 and adds, "at 1830 on the 9th, conditions changed, the Ws and VEs went down in strength and LUs and PYs began to appear". Fred also heard signals from EA, CT3, CX7, I, PY1 and 9J2 between September 20 and 25 and from Canada, Europe, Scandinavia and both Americas during the early evenings of October 2, 4 and 6. "28MHz is open, first time this month, I think", writes **Bill Kelly,** Belfast, who logged stations from South Africa and South America and on October 7 I heard many Ws commenting about the good conditions and the "fine opening to Europe". **Peter Lincoln** BRS42979, Aldershot, reports hearing CX7AR, H5AE, JY5ZM, ZP5CF, ZS1GL, 3D6AN and 7P8CM during this active period. **John Coulter,** Winchester, heard Canadian, European and United States stations in QSO on October 1 and 2 and says, "7Q7LW was causing a bit of a pile up on the 8th". Throughout the period I found that a Morse code reader greatly increased my enjoyment of the event especially when there were so many stations active at both ends of the band.

28MHz Satellites

Stan Williams G3LQI is very keen on c.w. and is an active member of the "First Class Operators Club", the Worthing and District Amateur Radio Club and also AMSAT–UK. At his home in Lancing, Stan uses a FT-101, 144MHz transverter and 8-element Yagi for transmitting to the OSCAR or RS satellites and a TS-120S and 3-element Tribander beam to receive the signals back, around 29·350MHz. Stan, who has worked all of Europe and many stations in Canada, the USA and the USSR via RS5, 6, 7 and 8, has also worked the "ROBOT" on RS5 and 7 and explained. "You transmit to RS5 or RS7 on 144MHz sending "RS5 DE G3LQI AR" and the satellite replies, "G3LQI DE . . ." giving a serial number and the words "op ROBOT". The details of this QSO are stored by the satellite and later transmitted to the control station for their records. Robots for RS5 can be heard on 29·331MHz and for RS7 on 29·341MHz, c.w. only.



(1) Guard area to avoid interference to beacons. These frequencies are available for emergency and bulletin stations.
(2) RTTY and SSTV are placed at the edge of the c.w. and s.s.b. passbands, conforming to their usage at h.f. where RTTY is present within the c.w. space and SSTV is transmitted in the s.s.b. sub-band.
(3) Mixed mode area. This is recommended for crystal controlled stations, or by DXpedition stations, or anyone wishing to work both c.w. and s.s.b. stations.

Bill Kelly heard signals from stations in France, Germany, Italy, Switzerland and the USA at 1617 on September 24 on 29·345MHz, possibly from RS3 and on the same day John Coulter heard "V CQ welcome contest via RS on 1OKT 2100 to 2OKT 2100Z log Moscow Box 88 til 30 Nov AR" and it continued for 3 days. I logged the same message at 0830 on the 25th and very strong signals from a satellite on 29·331MHz giving information about RS7 at 0755 on October 1.

Readers wishing to know more about amateur satellite communications and membership of AMSAT–UK, should send an s.a.e. to Ron Broadbent G3AAJ, AMSAT–UK, London, E12 5EQ.

28MHz Beacons

John Coulter, Winchester, received signals from the beacon modes of KA1YE/B on October 9 and 10, W2NZH/B on the 8th and 9th and from the Canadian beacon VE3TEN on the 12th. Among the beacon signals heard by **Ted Owen,** Malden, were ZS5VHF on September 29 and LU1UG on the 30th and Ted Waring logged the South African beacon ZS1CTB on October 7 and 10. Ted Waring, with his 3-transistor, home-brew, receiver and long wire antenna has forty 28MHz beacons to his credit and the information in his log and the logs from John Coulter, Norman Hyde, Henry Hatfield, Bill Kelly, Ted Owen and me, provided the material to complete our monthly beacon chart, Fig. 1. Between October 11 and 15, Henry noticed that the tone of the South African beacon Z21ANB, was "funny" almost auroral and at 1815 on the 18th, two German beacons DL0IGI and DK0TE, were both 599 during one of those short lived, out of season, sporadic-E disturbances.

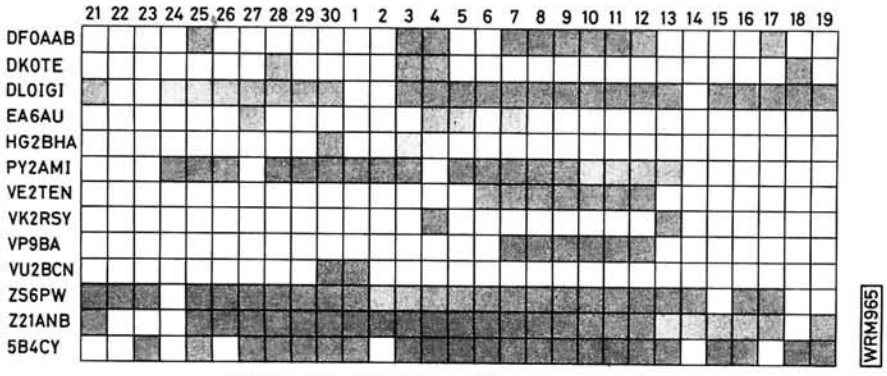


Fig. 1: Distribution of beacon signals

RTTY

In our October issue, I published one of the RTTYcallsign patterns, received by Peter Lincoln, from EA3CJF and now, **Norman Jennings,** Rye, has copied another of these, Fig. 2. He tells me that his camera was 0·6m away from his monitor screen and set at f5.6 at 0·5 seconds. During the four weeks prior to October 12, Norman, using a Telereader CWR670E terminal unit, received RTTY signals from 52 countries including CY0SPI, the St. Paul Island Expedition, who was very strong on 21MHz, EL2AT and HC1JX on 28MHz, then on several occasions RTTY signals from the ARRL HQ station W1AW, Fig. 3.

To stimulate interest in the 3·5MHz band RTTY, **Geoff Dalton** G4GZK, Wolverhampton, **Eddy** G5YM, Twyford, **Frank Wyer** G8RY, Wolverhampton and **Noel Lapper** GW2DUR, Llanelly have started a Monday through Friday net, between 0730 and 0830, around 3588kHz. Frank and Geoff use Creed 444 machines and Eddy and Geoff have both built BARTG terminal units. Frank has a Spacemark SRD–1 terminal unit and Noel uses Microdot gear. "Callers in are welcome" writes Frank, who recently installed quarter wave, gamma matched, phased verticals for 14MHz and finds this antenna most effective for DX QSOs.

Although Peter Lincoln did not spend a great deal of time on RTTY during the month preceding October 13, he did log signals from Asia and the Far East and at 2200 on September 27 he added HP2SM to his new countries list.

I noted a marked increase in RTTY activity on the h.f. bands and between September 21 and October 19, I copied signals from 23 countries, CT, EA, F, G, GM, HA, I, IT9, LA, OE, OH, OK, ON, OZ, SM, SP, SV, UK, VE, VK, W, YO and 9H1 on 14MHz, 11 countries, EA, CT, I, IT9, JA, J28, KA, UK, W, YU and 5Z4 on 21MHz and a W on 28MHz.

At 1947 on October 10, I copied I0AOF, a regular on 14MHz RTTY, operating with the special callsign IO0AOF for 1983 Holy Year.

Congratulations to **Ted Double** G8CDW, contests and awards manager of the British Amateur Radio Teleprinter Group, on achieving The Scandinavian WSRY Award at the highest level, the Gold Rosette. "Not only is he the first G station to do so, he is the only s.w.l. to do it at all" writes G3GJW, the BARTG chairman, in their Autumn newsletter. He adds "It took 4 years of patient effort with simple equipment: an indoor 14MHz dipole and one of the last valve receivers, a FRDX400. The BARTG newsletter is always full of gen and readers wishing to join the organisation should send an s.a.e. to their membership secretary, Mrs T. Crane, Greta Woods, Bromley Rd, Ardleigh, Colchester CO7 7SF.

One of the interesting results from an extensive survey taken among BARTG members is that the first 3 places in the league table of bands used for RTTY are 144MHz, 14MHz and 3·5MHz.

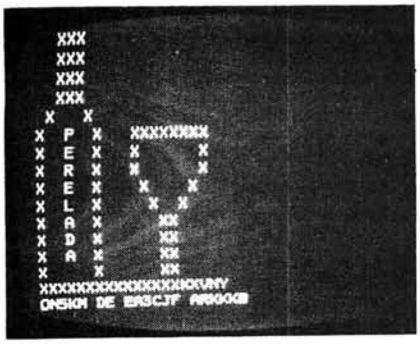


Fig. 2: Signal from EA3CJF

Norman Jennings

Tropospheric

Following a sharp drop to 29·7in (1005mb) at 1800 on September 21, the atmospheric pressure, measured at my QTH, rose to 30·2 (1022) by midday on the 22nd, giving good v.h.f. conditions which continued to improve as the pressure reached 30·4 (1029) at 1100 on the 25th and gradually fell back to 30·0 (1015) by midnight on the 29th. Apart from watching his barometer, **Harold Brodribb** followed the path of this high pressure system on the weather maps published in his daily newspaper. By noon on October 1, the pressure was up again to 30·1 (1019) where it hovered until midnight on the 12th, when it began to fall rapidly reaching 29·4 (995) at 0600 on the 16th and then began to rise again slowly as a bad weather system passed by.

"The period September 23 to 29 produced exceedingly good 144 and 432MHz tropo DX into all parts of Europe from Denmark and Scotland, Ireland to south of France, Austria, Spain and Switzerland", writes John Fell G8MCP, who added that most of the stations he worked in Germany and Holland commented on the high level of sunshine. John noted an extensive opening, lasting all day, into Europe with strong signals from 144MHz stations in Austria and

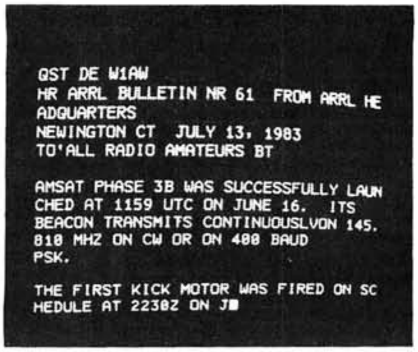


Fig. 3: ARRL station

Norman Jennings

Czechoslovakia on the 23rd. On the 24th and 25th, John worked stations in France, Germany and Holland and was pleased with his QSOs with DL5BBL at 770km and PA3DBJ/P who was using only 2·5 watts to a hand-held HB9CV antenna at sea level. During the period, John had contacts with stations having the prefix letters, DF, DG, DL, DJ, EA, EB, EI, F, GD, GI, GJ, GM, GW, ON, PA, PE, PI and TO. He also heard signals from the 144MHz beacons in England GB3CTC 144·915MHz and GB3VHF 144·925MHz, France FX0THF 144·895MHz and FX8VHF 144·955MHz, Scotland GB3ANG 144·975MHz, Spain EA1VHF 144·867MHz and Switzerland HB9HB 144·865MHz. When John heard the Spanish beacon at 0742 on the 28th, he also heard signals from EA1TA and during the evening heard many EA and EB stations being worked on both the 144 and 432MHz bands. John concluded the evening and I would think a very satisfactory week, by working GI4OMK, GI8EWM and GI4GVS crossband 144/432MHz and received a 59 plus 40dB signal from EI9Q on 432MHz. A fine effort John, you have shown how rewarding amateur radio can be during a tropospheric opening as did **Mike Joy** G4MUB, Lychett Matravers, when he heard LX1JA in QSO with a French station on S20 f.m.

Simon Hamer heard Dutch stations working through the 144MHz repeater in Birmingham GB3BM R5 on the 23rd, signals through the repeaters in Leicester GB3CF R0 and Wells GB3WR R0 on the 25th, Enfield GB3NL R7, Hertfordshire GB3PI R6, Bournemouth GB3SC R1 and Stoke-on-Trent GB3VT

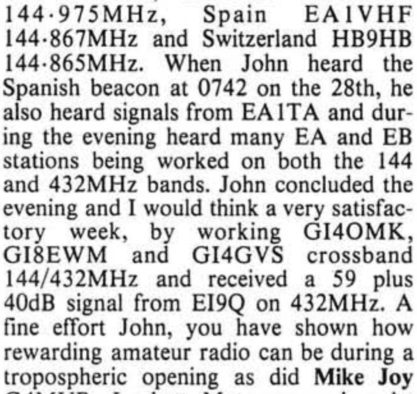


Fig. 4: QSL card from Eric Sandever

R1 on the 27th and EI1DK R0 on the 29th. At 0900 on the 23rd, I heard an ON working through a repeater on R5, around 0200 on the 24th three PD0s were working G stations through a repeater, possibly GB3KN, on R4, strong signals through GB3BM on the 25th and at 0200 on the 28th I logged a QSO through the Malvern Hills repeater GB3MH R3, between ON1OY in Ohey and a GW4 in Abergavenny.

Band II

John Berridge, who uses a National Panasonic or a Pioneer receiver when he is in South Wales and a Sanyo portable, which has travelled the world with him, when he is in London, finds that Band II provides both "curiosity and interest". While John was in Algiers he listened to a classical concert from Madrid, around 85MHz, at 1930 on Sundays and during the early part of the September opening he heard a French station, in Cherbourg, around 103MHz, about 500km from his QTH in Wales.

Fig. 5: QSL card from Fred Southwell

I counted at least 17 foreign stations between 87 and 104MHz at 0900 on September 23rd and at 1030 **Ian Davidson,** Carmarthen, received 10 French stations around 94MHz on his Sanyo G1005 music centre fed by a 6-element Yagi. At midday on the 25th and around 0700 on the 26th, **Denis Parkes,** Brighton, received the ILR station Signal Radio and many Belgian and French stations some in good stereo, between 100 and 104MHz. On the 27th, Denis heard *BBC* Radios Devon and Cornwall. Not too far from Denis, at St. Leonards-on-Sea, Harold Brodribb logged between 10 and 20 French stations each day from September 23 to 30, Dutch stations on the 26th, 27th and 28th and Radio Gwent on the 23rd, 24th and 27th.

"I heard so many Belgian, Dutch, French and German stations, mostly in good stereo, but could not identify all of them" writes **Steve Green,** who, like Simon Hamer also heard the BFBS from Bielefeld on 101·5MHz. In addition to the abundance of continentals in Band II, Simon heard *The Breakfast Show* on ILR Southern Sound and identified other locals: Capital Radio, LBC, Piccadilly Radio, Thames Valley, Hereward Radio and Radio Trent.

TELEVISION by Ron Ham BRS15744

Reports: as for VHF Bands, but please keep separate.

LA4TG learned about G3WW's SSTV activity through reading *PW*, Peter Lincoln logs two SSTVers chatting about our magazine, Fig. 1, and the end of September tropospheric opening are among the main talking points this time.

Amateur Television

Alan Cross G6NQE, Bristol, using a *PW* converter and 48-element multibeam on August 17, received amateur television pictures from **Ken Stevens** G4BVK, Figs. 2 and 3, and **R. Worth** G8ZQF, Fig. 4, both in Bristol. Alan tells me that two of the receive only stations G6ASP and G8YCL are also using *PW* converters and G6SPA has a converted television receiver.

Sporadic-E

Sheffield reader **Tony Palfreyman** began TVDXing on July 29 when he installed a 2-element beam for Band I, which he made from the drawings in Roger Bunney's book, *Long Distance Television*. Between then and the end of the 1983 sporadic-E season Tony received pictures from Czechoslovakia, Scandinavia, Spain, the USSR and Yugoslavia and during a disturbance on October 4 he added Hungary MTV-1 Budapest on Chs. R1 49·75MHz and R2 59·25MHz and Romania TVR Bucuresti on Ch. R2. Around 1600 on October 3, I received a strong test card from Yugoslavia scribed RTV JRT LJNA on Ch. E3 55·25MHz and **Simon Hamer,** New Radnor, reports a disturbance around Chs. E3 and R2 during the evening of October 10.

Although we are some 5 months away from the 1984 sporadic-E season it is well worth taking a look at Band I for these short-lived openings which often occur during the winter months and can be very rewarding. Weak pictures were seen on Chs. R1 and E4, during such an event around 1815 on October 18.

SSTV

During the evening of September 27, **Richard Thurlow** G3WW, March, had a two-way colour slow-scan QSO with **H. Mitchell** G4DYB in Sheffield and with **John Stace** G3CCH in Scunthorpe. G4DYB was using a Robot 400 with a recently-fitted VE3EGO Colorscan 403 kit of three memories and automatic rotating colour filters in front of his mono TV camera, and John was using his home-brew SSTV equipment. "Both were transmitting beautiful colour pictures in the 8 seconds 3×3×3 mode", writes Richard, who tells me that the Essex f.m. SSTV net on 144·5MHz continues every Wednesday evening and following a meeting between himself and G3LUI at the Colchester Mobile Rally, they later exchanged both 24 seconds and normal time-frame colour pictures.

Richard met up with G3CCH, G4DYB and G4NJI at the Doncaster show and they were impressed by the new Volker Wrasse SC-1 SSTV/FAX converter. During a lull in the second part of the DL SSTV contest, Richard had a 2-way QSO with **Martin Hyde** G4IHZ, Barnsley, who was using the SC422A he purchased at Doncaster the previous day. On October 8, G4NJI used his new SC-1 Volker Wrasse converter to send 24 seconds single-frame, three-colour, 256×256-lines, 64-shades, pictures to G3CCH on 144·230MHz. John Stace taped the pictures and transmitted one, Fig. 3, to Richard, who received it under marginal conditions with his SC422A at 0900 on the 9th. Richard recorded the picture with a 20-year-old Polaroid camera and was pleased with the results all around.

Among the recent newcomers to 2-way SSTV operations are DL5GR, DL8GG, EA3AO, I1CEL, I5TSC, LA5VB, OE5RI, VE3DX 50 miles within the Arctic Circle, WA1VIA, WA3SRU, WB4IQB, WB4ONI, WB4UFP and WD8OHA on 144MHz and G6OHM on 144MHz f.m. At 1616 on October 10, Richard had a QSO with VK6SP giving Richard his 1929th first-time 2-way SSTV QSO, believed to be a world record.

"There have been a few openings to north-America on 14MHz", writes **Peter Lincoln,** Aldershot, who, on October 11, copied a CQ from WA1ZMJ, Fig. 10 and watched a QSO between DJ0GF, Fig. 1 and G4GOZ who were talking about the SSTV pictures which have appeared in this column. Peter, who sent me one of the pictures under discussion, has sent a copy to DJ0GF and we look forward to hearing more about it. I am always pleased to hear about the activities of SSTV stations at home and overseas, so, don't forget lads and lasses, drop me a line and I will use what I can.

Tropospheric

The atmospheric pressure, see *VHF Bands,* did all the right things to give us that tropospheric opening which began on September 23 and ended on the 30th. "And what an opening it was" writes **Mike Bennett,** Datchet, who, on the 23rd saw the Belgian station RTBF 1 on Ch. E3 and the Dutch station NED-1 on Ch. E4 62·25MHz. Around 1950 the NED-1 test card was followed by a clock and for about 3 hours Mike saw adverts for aftershave, a bank, biscuits, an appeal for the disabled, Scotch Whisky and the *Willy Ross Lotto Show* followed by the news. Mike tells me that the word VARA is a programme company name and that this Dutch station was so strong that no other signal could break through. At 1239 on the 23rd, while using my Plustron TVR5D with its own rod antenna near the Kent/Sussex border, I received strong test cards labelled SW1-HGR on Ch. E9, RTL with a digital clock showing 1339 and Wendelstein around Ch. E10, any ideas? I also noted strong, negative, pictures from French TV transmitters on about 10 spots between Chs. 21 and 69. I tried again at 1452 and received test cards from Belgium BRT TV1 and BRT TV2 on Chs. 43 and 45. About an hour later I was at Sissinghurst Castle and identified the French captions FR3 and TF1 between Chs. 21 and 27 and during a final check at 1821, situated above the Bewlbridge reservoir some 100m a.s.l., I found a very strong Dutch station giving a programme schedule on Ch. E10 and the u.h.f. band was full of French stations. During that evening, **Adrian Butcher,** Washington, watched an American film, *Not With My Wife,* with Belgian sub-titles on BRT-1 and saw their clock, programme line-up and the news with a YL presenter. On August 21, Tony Palfreyman installed a pair of Triax BB Grids, and a Triax combiner and amplifier for u.h.f. to feed his Grundig 6400T receiver and was rewarded with DX from Holland on Chs. 39 and 45 on the 25th and Germany ARD ZDF on the 28th and 30th Figs. 7 and 5. Among the pictures Tony received during the September opening were again from Holland and Germany on Chs. 39 and 45, Figs. 6 and 8 and a mystery test card, Fig. 9, on Ch. 55, any ideas?

"I do not have any u.h.f. DX gear but today I had a chance to use some while a lift was in progress" writes **Paul Hardy,** Reading, on September 24, when, between 1036 and 1330 he received test cards from Belgium RTBF-1, BRT TV1, France FR3, TF1, TDF, Antenne 2 and Holland PTT-NED 1 and PTT-NED 2. Paul also saw *Clash of the Titans* and *Dukes of Hazzard* from France and Teletext from Holland. A fine effort Paul, you picked a good day to give it a try. During the event, **Harold Brodribb,** St Leonards-on-Sea, received pictures from Belgium, France and Holland between Chs. 21 and 69. Simon Hamer also looked around the UK for DX and received Anglia TV from Sandy Heath on Ch. 24, Sudbury Ch. 41 and Tacolneston Ch. 59, Central TV from Oxford Ch. 60 and Waltham Ch. 61, London Weekend TV from Crystal Palace Ch. 23 and Guildford Ch. 43 TVS from Dover Ch. 66, Hannington Ch. 42 and Midhurst Ch. 58 and Tyne Tees from Bisdale on Ch. 29. Simon also watched such

Fig. 1: SSTV picture *Peter Lincoln*

Fig. 2: Test card *G6NQE*

Fig. 3: SSTV picture *Richard Thurlow*

Fig. 4: ATV test card *G6NQE*

Fig. 5: German TV *Tony Palfreyman*

Fig. 6: Dutch TV *Tony Palfreyman*

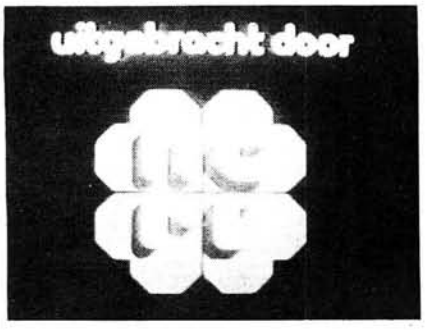


Fig. 7: German TV *Tony Palfreyman*

Fig. 8: German TV *Tony Palfreyman*

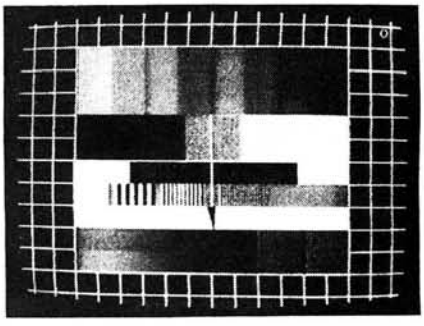


Fig. 9: Mystery test card *Tony Palfreyman*

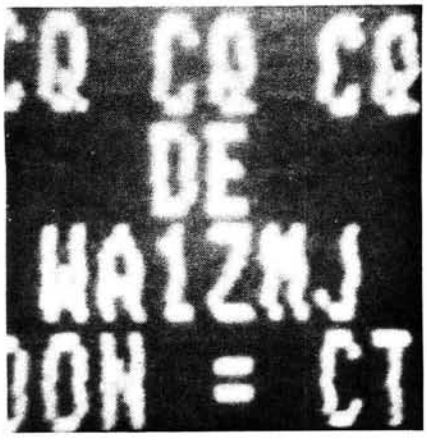


Fig. 10: SSTV CQ *Peter Lincoln*

programmes as *Coast to Coast* on TVS, *South Today* on BBC 1 and *Thames News* from Thames Television.

At 1344 on the 27th, from a site 300m a.s.l., I received test cards from FR3 and TDF on 9 spots between Chs. 21 and 69 and at 1650, at another location some 80m a.s.l., I logged very strong test cards from Belgium, BRT TV2 on Ch. 25 and Warve Canal 28 Tele 2 on Ch. 28 and BRT-II Teletext on Ch. E10.

Between the 23rd and 28th, **Steve Green,** Malvern, concentrated his efforts on Band III and logged stations from Belgium on Chs. E8, 9 and 10, France E11, Germany E6, 9, 10 and 11 and Holland E5 and 6. Most of the signals Steve received were in good colour and he was pleased to see BRT showing a *Popeye* cartoon with sub-titles.

My thanks to TV DXer **Ian Moody,** Sutton, for the information that BF272 transistors are manufactured by SGS-ATES (UK) Ltd., Planar House, Walton Street, Aylesbury, Bucks.

Very often specific technical points or statements are made, especially in magazine articles and specialised books, which require further explanation to the reader and this is where I find a glossary of technical terms or a good questions and answers book, dedicated to the subject, is invaluable. Newnes Technical Books have published the third edition of *Q and A Colour Television* by Eugene Trundle (ISBN 0 408 01305 2), and with more than 120 pages of sensible questions and easy-to-read concise answers, in my view, it is well worth a student engineer or TVDXER sporting £2.50 for it.

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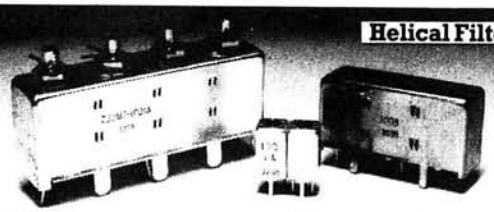

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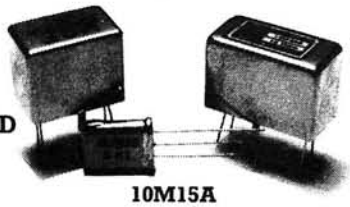
* All above 50Ω in/out impedance

Crystal Filters



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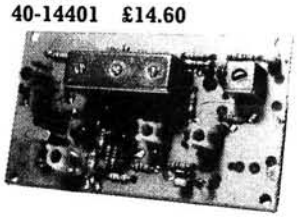
2SK168	59-01168	0.37	MRF245	58-14245	40.00
3SK45	60-04045	0.49	MRF475	58-14475	4.60
3SK51	60-04051	0.54	PT8811	58-18811	9.50
3SK60	60-04060	0.58	2SC1945	58-01945	2.60
3SK81	60-04081	1.32	2SC1971	58-01971	2.49
3SK88	60-04088	0.99	2SC2053	58-02053	0.63
40823	60-03823	0.65	2SC2097	58-02071	14.75
3SK112	60-04112	4.60	TP2320	58-12320	10.24
BF960	60-06960	0.99	VN66AF	60-02066	0.95
BF981	60-06981	1.20	ZTX3866	58-03866	0.45
J310	59-02310	0.80	2N3866	58-13866	1.20

PROJECT PACKS

MkII 2m Convertor

2m to 10m Converter with 3 chamber Helical filter

40-14401 £14.60



Auto Modulation Meter

This unit will scan 20-175MHz, automatically lock into a NBFM signal and read the deviation.

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2m Monitor (UOSAT etc)

Complete 2m/UOSAT VHF NBFM receiver system. With mains PSU and high spec ceramic filter.

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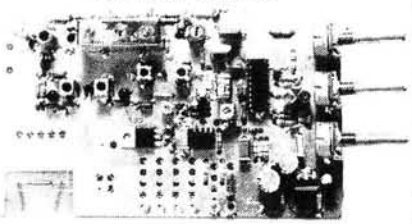
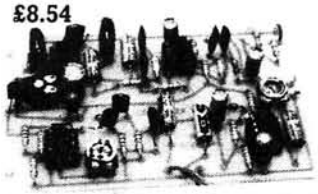


CW Filter

41-00205 £8.54

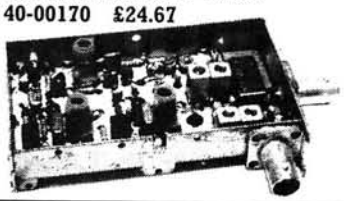
Two stage band pass filter and phase-locked loop to regenerate CW from noisy signals



UHF converter

70cm to 2m and 70cm to UHF TV Band

40-00170 £24.67



2mPreamp

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3. 10W TV Transmit	(As 1 above plus 70FM10 + BDX35)	50.00
4. 10W TV Transceive	(As 2 above plus 70FM10 + BDX35)	70.00
5. 70cms 500mW FM Transceive	(70'T4 + 70'R5 + SSR1)	70.00
6. 70cms 10W FM Transceive	(As 5 above plus 70FM10)	90.00
7. Linear/Pre-amp 10W	(144PA4/S + 144LIN10B)	36.00
8. Linear/Pre-amp 25W	(144PA4/S + 144LIN25B)	40.00
9. 70cms Synthesised 10W Trans.	(R5+SY+AX+MOD+SSR+70FM10)	120.00
10. 2M Synthesised 10W Trans.	(R5+SY+SY2T-SSR+144FM10)	100.00

70cms EQUIPMENT

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FM Receiver	70FM05R5	68.25	48.25
Transmitter 6 Channel Adaptor	70MC06T	19.85	11.95
Receiver 6 Channel Adaptor	70MC06R	27.15	19.95
Synthesiser (2 PCB's)	70SY25B	84.95	60.25
Synthesiser Transmit Amp	A-X3U-06F	27.60	17.40
Synthesiser Modulator	MOD 1	8.10	4.75
Bandpass Filter	BPF 433	6.10	3.25
PIN RF Switch	PSI 433	7.10	5.95
Converter (2M or 10M i.f.)	70RX2/2	27.10	20.10
TV Products			
Receiver Converter (Ch 36)	TVUP2	26.95	19.60
Pattern Generator	TVM1	39.93	32.53
TV Modulator	TVM1	8.10	5.30
Ch 36 Modulator	TVMOD1	10.15	6.95
3W Transmitter (Boxed)	ATV-1	87.00	—
3W Transceiver (Boxed)	ATV-2	119.00	—
Power Amplifiers (FM/CW Use)			
50mW to 500mW	70FM1	14.65	8.85
500mW to 3W	70FM3	19.65	13.25
500mW to 10W	70FM10	30.70	22.10
3W to 10W	70FM3/10	19.75	14.20
10W to 40W	70FM40	58.75	45.20
Combined Power Amp/Pre-Amp	70PA/FM10	48.70	34.65
Linears			
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3W to 10W (Compatible ATV1/2)	70LIN3/10E	39.10	28.95
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MOSFET Miniature (14dB)	70PA3	8.25	6.80
RF Switched (30W)	70PA2/S	21.10	14.75
GaAs FET (16dB)	70PA5	19.40	12.65

2M EQUIPMENT

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PIN RF Switch	PSI 144	9.10	7.75
Power Amplifiers/Linears			
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1.5W to 10W (SSB/FM) (Auto-Changeover)	144LIN10B	35.60	26.95
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DLS10	13.50	ECL86	0.74	GZ37	4.50	TD03-10E	28.00	6BS7	4.50	40KD6	5.50
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AC176K	0.31	BC182	0.10	BF336	0.34	TIP146	2.75
AC187	0.25	BC183	0.10	BFX29	0.30	TIP2955	0.80
AC187K	0.28	BC184LA	0.09	BFX84	0.26	TIP3055	0.55
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AD142	0.79	BC212L	0.09	BFX86	0.30	2N3054	0.59
AD149	0.70	BC213	0.09	BFX88	0.25	2N3055	0.52
AD161	0.39	BC213L	0.09	BFY50	0.21	2N3702	0.12
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AF125	0.35	BC327	0.10	BT106	1.49	2N3773	1.95
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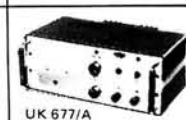

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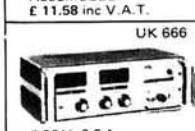

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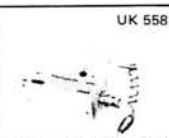

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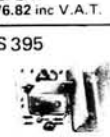

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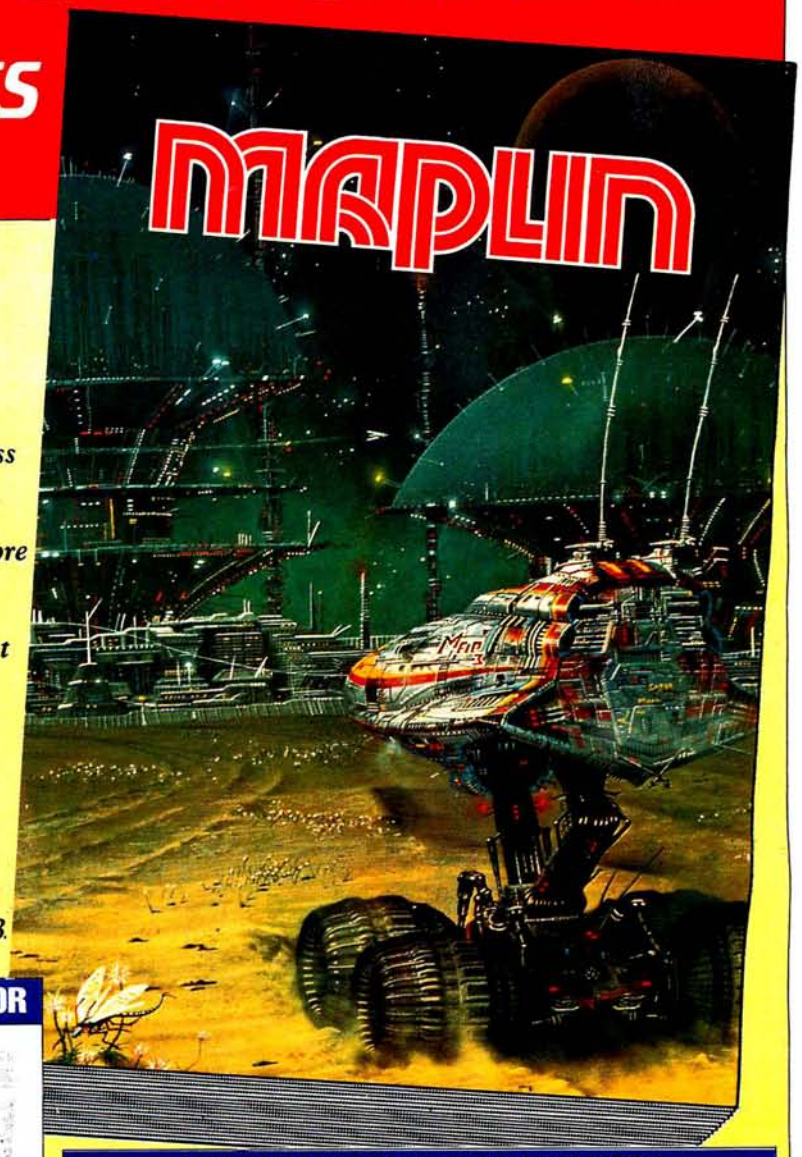

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