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CONTEST  
RESULTS**

NOVEMBER 1984 95p

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# Practical Wireless

THE RADIO MAGAZINE



## PW'TEME' Modular QRP Transceiver

**FREE  
INSIDE**

**Pull-out  
Magazine  
COMPUTING  
IN RADIO**







# Practical Wireless

FOR THE **Radio** ENTHUSIAST ...

Free with this issue,  
*Computing in Radio*  
magazine

NOVEMBER 1984 VOL. 60 NO. 11 ISSUE 932

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*Practical Wireless*, November 1984



# LOWE SHOPS

Whenever you enter a LOWE ELECTRONICS' shop, be it Glasgow, Darlington, Cambridge, Cardiff, London or here at Matlock, then you can be certain that, along with a courteous welcome, you will receive straightforward advice. Advice given, not with the intention of "making" a sale, but the sort which is given freely by one radio amateur to another. Of course, if you decide to purchase then you have the knowledge that LOWE ELECTRONICS are the company that see the standard for amateur radio after-sales service. The shops are open Tuesday to Saturday and close for lunch 12.30 till 1.30pm.

In Glasgow the LOWE ELECTRONICS' shop (telephone 041-945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical gardens are well worth a visit...

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (telephone 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (telephone 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1039, past the science park and turn left at the first roundabout. After passing a children's playground on your left turn left again into High Street. Easy and free street parking is available outside the shop.

Cardiff now has its own LOWE ELECTRONICS' shop. Managed by Richard GW4NAD, who hails from Penarth, the shop (our telephone number is 0222 464154) is located within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Clifton Street is easily found, being a left turn off Newport Road just before the infirmary. Once in Clifton Street, South Wales Carpets is the modern brick building at the end of the street on the right hand side. Enter the shop, follow the arrows past the carpets, up the stairs and the "Emporium" awaits you. Free street parking is available outside the shop.

**MOVING . . . MOVING . . . MOVING . . .** From the 13th September 1984 the LOWE ELECTRONICS' London shop will be located at 223/225 Field End Road, Eastcote, Middlesex (the new telephone number is 01-429 3256). The new shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings. Immediately behind the shop is a large car park where you can currently park for the day for 20p. There is also free street parking outside the shop.

Finally, here in Matlock, David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

I have been using the TRIO TS711E VHF 2 metre base station for some time now. The transceiver has, as standard, a digital code squelch facility which when used in conjunction with our other TS711E operated by my colleague David, G4KFN, has proved most useful.

It was with considerable interest, therefore, that I greeted the news that TRIO were going to introduce a higher specification version of the current TR2500 that would incorporate this new call facility. As the TS711E can also be programmed to send your callsign digitally at the beginning and end of each transmission, I wondered whether TRIO would include this useful facility on the new rig.

The answer is yes! The new TR2600E has digital code squelch and will also send your callsign automatically. The digital code squelch and callsign ability are not the only new features to be incorporated into the new TR2600E. Each memory will store both frequency and whether or not the rig was set with simplex or repeater shift: Most useful on today's FM scene when a contact made by repeater quickly becomes a simplex one. Two modes of memory scan are available, the rig looking for either a clear or a busy frequency. Having locked on a signal, scanning resumes after a timed period or when the carrier drops (in open channel scan, when a carrier appears). Programmable scan is as the TR2500, lower and upper scan limits are entered into memories 8 and 9, any multiple of 5 kHz (10, 15, 20, 25 kHz) being programmable.



The TR2600E also has a priority channel and the ability to omit selected channels from the scan pattern. Anyone who has used a TR2500 will know that occasionally one or two frequencies entered in memory become superfluous. To remove these frequencies without removing everything would be most useful. A definite advantage is that the time taken for memory scan is shortened. The new higher specification TR2600E has this facility. The normal up/down frequency shift facility of the TR2500 is retained along with lockout switches for press to talk and keyboard entry. The frequency readout is improved, the full 145.500 digits being displayed and to stop the operator having to continually give 5 by 9 reports the TR2600E has an S meter as part of the top panel which doubles as a battery state indicator.

For the UHF enthusiast there is also a 70 centimetre version of the TR2600E, the TR3600E.

Until now, the TRIO TR2500 and TR3500 were "the" hand held transceivers for 2 meters and 70 centimetres - the TR2600E and the TR3600E, with their higher specification, provide the only alternative.

TR2600E	2 metre handheld complete with DCS .....	£269.88 inc VAT. carr £6.00
TR3600E	70 centimetre handheld with DCS .....	£289.00 inc VAT. carr £6.00
BC2	AC Charger .....	£10.98 inc VAT. carr £1.00
DC26	DC/DC converter .....	£19.47 inc VAT. carr £1.00
EB3	External battery case .....	£14.45 inc VAT. carr £0.75
HMC1	Headset with VOX .....	£25.00 inc VAT. carr £1.00
PB26	Nicad battery pack .....	£30.50 inc VAT. carr £1.00
SC9	Soft case .....	£18.50 inc VAT. carr £0.75
SMC30	Speaker/microphone .....	£21.58 inc VAT. carr £1.00

In trying to describe the new 2 metre FM transceiver from TRIO, I am faced with a major difficulty. The TH21E is small, 2.24 inches wide, 4.72 inches high and only 1.1 inches deep but size alone is not the rig's fascination. Only by holding the transceiver can one begin to appreciate the attention that has been placed on its ergonomics. The way in which the TRIO TH21E, once picked up, seems impossible to put down. Its ability to slip into the inside pocket and for you to forget you have it. So far no one who has seen a TH21E has been able to resist picking it up, it's as simple as that.

There is also a 70 centimetre version of the TH21E available, the TH41E.

Operating the TH21E could not be easier. Thumbwheel switches being used to set the frequency, the last digit being set by a simple top panel switch. Power output is 1 watt (HI) and 150 milliwatts (LOW). I have used the rig over the past few days and have been really amazed at the distance that can be covered on 1 watt. Both transceivers have repeater shift, the tone burst switch is on the top panel. Microphone and earphone sockets are also located on the top panel enabling both the conventional speaker/microphone and the NEW TRIO HMC1 headset to be used. A clever feature of the headset is that it has, incorporated in its connecting cable, a minute vox unit. The transceiver comes complete with aerial, nicad battery pack and charger.



## LOWE ELECTRONICS

Chesterfield Road, Matlock, Derbyshire. DE4 5LE.

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I am pleased that I can claim one of the rigs to use at home prior to writing the advertising and let the rest of the company fall out about who is having the other one. Never before can I remember two handhelds that have had such fascination.

- TH21E 2 metre transceiver ..... **£175.00 inc VAT.** carr £6.00
- 1H41E 70 centimetre version ..... **£198.00 inc VAT.** carr £6.00
- SMC30 speaker/microphone ..... **£21.50 inc VAT.** carr £1.00
- HMC1 headset with VOX ..... **£25.00 inc VAT.** carr £1.00
- DC21 DC power supply ..... **£18.98 inc VAT.** carr £1.00
- PB21 Nicad battery pack ..... **£18.58 inc VAT.** carr £1.00
- BT2 Dry battery case ..... **£9.00 inc VAT.** carr £0.75
- SC8 Soft case ..... **£9.88 inc VAT.** carr £0.75
- EB2 External battery case ..... **£14.58 inc VAT.** carr £1.00

Ever since the demise of the TRIO 700 series of equipment, we, here at LOWE ELECTRONICS have been campaigning for the introduction of a new "true base station" transceiver. Those who have used a TRIO TS700S or G will know what I mean. There is that certain feel which a base station transceiver has which the mobile or portable rig, when taken out of the car or used in the shack, definitely has not. I am pleased to say that TRIO have introduced a new 2 metre base station, it is called the **TS711E**. I have been fortunate enough to have used the transceiver over the past couple of weeks and again I am lost for words. Certainly there will be a TRIO **TS711E** in my shack, I have even prepared a space for it!

Having used the rig let me explain some of its features. In size, weight and appearance the **TS711E** is similar to the TS430S HF transceiver but unlike the TS430S it has its own internal power supply. It also has an inbuilt speech processor and IF shift, both ideal features for today's active 2 metre band. Power output is 25 watts but the rig I have been using produces 32. Typical TRIO! The **TS711E** has two VFOs and, wait for it, forty memory channels. Yes, I too wondered how one could use so many memories.

Initially I started to use the rig as I had my dual band TRIO TS780. One VFO left on 144.300 and the other on 145.500. Since the rig remembers both frequency and mode there was no problem operating SSB on one VFO and with the electronic click step engaged, FM on the other. Electronic click step? ... the **TS711E** has been designed so that as a multi-mode rig you can have a free running VFO on SSB and CW and when operating FM, a VFO with 5 or 12.5 kHz click steps. I refer to the click step as electronic because a touch switch instantly changes the VFO function. Of course, I need not tell you that the memories remember which VFO operation has been selected or for that matter whether repeater shift was required. On SSB and CW the **TS711E**'s synthesized VFO tunes in 10 Hz steps.

After using the rig for some time without the 40 memories I concluded that since it was possible to move a frequency from memory to VFO it would make sense to program the memories logically and then use them as a basis for operating. Result, the rig is a dream to use. With the **TS711E**'s memory carrying a sequence of calling channels, beacon, simplex and repeater frequencies a swift rotation of the VFO (which also serves to change memory channels) and the entire band can be looked at in seconds. To check on OSCAR 10, dial up the correct memory holding say the satellite beacon frequency, if that's audible then move the beacon frequency to the VFO by pushing the appropriate switch and there you are, tuning the correct part of the band, in the right mode and with the VFO running free. The same can be applied to the CW end of the band and with the VFO set to click stop, FM channels also.

There are facilities to put both VFOs on the same frequency, to operate split using one VFO for receive and the other for transmit. A priority call channel is available as is the ability to go back to a predetermined frequency. The **TS711E** will scan the band or the memories holding for a brief period on an occupied frequency. It will also scan the memories looking at only those frequencies entered in a particular mode. Programmable scan is also included, memory channels 39 and 40 setting the limits. The now standard full repeater facilities are included.

For the blind operator the **TS711E** is a dream come true. Full voice announcement of frequency and whether the rig is set to repeater shift comes by fitting the optional VS1 board. A push button, conveniently located on the bottom corner of the front panel, activates the voice. The careful location of this control shows TRIO's attention to detail. How difficult would the switch have been to find for the blind operator had it been located in the middle of the panel.

Mode of operation is indicated by switches which when pushed instead of a general beeping, send the morse code letter F for FM, U for USB, C for CW, L for LSB and A for auto. Auto, what's auto? ... With auto switched on, as you tune across the band the **TS711E** selects the correct mode for the appropriate frequency. You can over-ride this function and as I have said elsewhere, *you too can transmit FM on the SSB part of the band.*

Enough I hear you say. Sorry, one more feature. DIGITAL CODE SQUELCH! The transceiver has as standard an inbuilt selective tone call system incorporating a call alarm. So if you are not in the shack then you will know you have been called. The transceiver will also send up to 6 letters or numbers as part of the selective call. I am sure it will not be long before TRIO introduce a **TS711E** accessory (I am told it is called the CD-10 call sign display) which will decode the information. Then will you not only know that you have been called but who has called you, the 6 letters or digits making up the call sign.

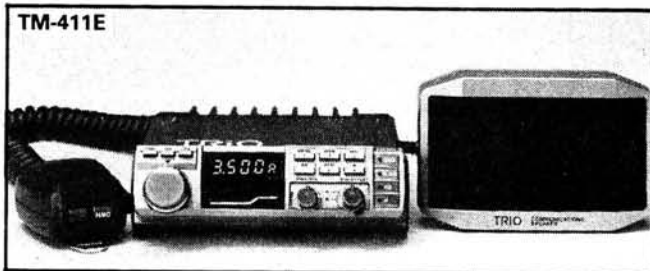
What more can I say, what a rig! For the operator who wants the finest two metre base station transceiver TRIO have produced the **TS711E**. For the UHF operator there is the TRIO **TS811E**, the 70 centimetre version. Both ideal ways of getting on to the VHF/UHF bands.

- TS711E 2 metre base station transceiver with DCS ..... **£758.00 inc VAT.** carr £6.00
- TS811E 70 centimetre base station transceiver with DCS ..... **£878.00 inc VAT.** carr £6.00
- CD10 Callsign display unit ..... **£105.40 inc VAT.** carr £6.00
- SP430 Matching speaker ..... **£30.99 inc VAT.** carr £2.50



The new DCS system has also been applied to the popular compact mobiles, the TM201A and TM401A. The NEW transceivers are the **TM211E** for two metres and for 70 centimetres, the **TM411E**. The two rigs also have front panels whose viewing angle can be adjusted. So what was an easy to accommodate rig becomes much more so. The tight space which would accommodate a rig but where you could not see its front panel is a thing of the past. Add the convenience of a digital code squelch system, 25 watts output on the 70 centimetre **TM411E** and the two new rigs from TRIO provide the only alternatives to the TR201A and TR401A.

- TM211E Mobile 2 metre transceiver ..... **£360.00 inc VAT.** carr £6.00
- TM411E Mobile 70 centimetre transceiver ..... **£410.00 inc VAT.** carr £6.00



# LOWE ELECTRONICS

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FT209RH (2.3W)	c/w FBA5, YHA14, CSC10 etc. ....	£235.00
FT209RH (3.7W)	c/w FNB3, YHA14, CSC10 etc. ....	£249.00
FT209RH (5.0W)	c/w FNB4, YHA14, CSC11 etc. ....	£259.00
CSC10	Soft case (FBA5, FNB3 fitting) .....	TBA
CSC11	Soft case (FNB4 fitting) .....	TBA

For general accessories see FT203R list.  
FNB5, FNB3, FNB4, YH2, MH12A2b, SMC8.9AA, NC15, MMB21

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FBA5	7.2/9V Cell case only (6 x 'AA') .....	£6.50
FNB3	10.8V NiCad Pack (425mAh) .....	£33.50
FNB4	12.0V NiCad Pack (500mAh) .....	£38.25
CSC6	Soft case (FBA5 or FNB3 fitting) .....	£6.00
CSC7	Soft case (FNB4 fitting) .....	£6.85
YH2	Headphone/Microphone option .....	£14.80
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SMC8.9AA	Charger (slow) 13A style .....	£8.05
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\*FT790R  
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MMB11	Mobile Mount .....	£28.19
CSC1A	Carrying case .....	£4.15
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### FT230R & FT730R FM MOBILES



FT230R	2m Transceiver 25w .....	£269.00
FT730R*	70cm Transceiver 10w .....	£239.00*
MMB15	Mobile mounting bracket .....	£14.65

\* Limited Quality available at this price

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50/726	6m module .....	£195.00
430/726	70cms module .....	£259.00
SAT726	Full duplex module .....	£99.95
XF455MC	600Hz CW filter .....	£41.85

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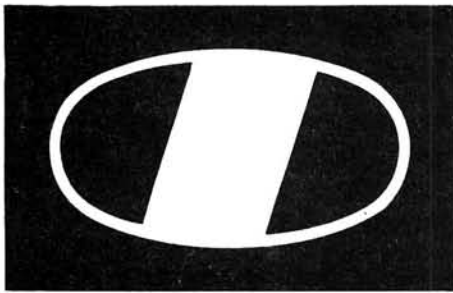
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Choice of bands	yes	no
450 MHz capability	yes	no
IF Shift	yes	yes
IF Width	yes	no
CW Filter	option	no
X-band Full Duplex	option	no
Squelch	all modes	FM only
Memory Channels	11	10

FEATURES	FT 726R	TS780
Limited Band Scan	yes	yes
Mode Memory	yes	no
Memory Backup	lithium	AA cell
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RF PWR Control	continuous	Hi/Low
Speech Processor	AF	none
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FMU-1	FM unit	44-99	MH-12A2B	Spkr mic	17-69
DCL-1	DC lead	10-84	MMB-21	Mobile mount	8-00
RAM-B	Non-volatile MEM	14-49	YH-2	Headset mic	14-49
Kuftone	Curtis Keyer	28-50	PA-3	DC adaptor	16-00
XF-8-9KC	CW filter (600 Hz)	19-35	FNB-3	10-8V batt pack	33-50
XF-8-9KCN	CW filter (300 Hz) narrow	19-35	FNB-4	12V batt pack	38-25
XF-10-7KC	CW FSK (800 Hz)	17-49	FBA-5	Batt case for 6 AA dry cell	6-85
XF-8-9KA	AM filter (6 Hz)	19-35			
<b>FT-980</b>	HF transceiver with gen coverage RX (CAT system)	1329-00	FT-203R	2m synth handie thumbwheel tuning + FNB-3	175-00
SP-980	External speaker with audio filter	61-50	FT-203R	2m synth handie thumbwheel tuning + FNB-4	184-00
FC-757AT	Automatic antenna tuner	245-00	FT-203R	2m synth handie thumbwheel tuning + FBA-5 (Accessories as for FT-209R)	155-00
FIF-232C	Computer interface RS-232	59-00	<b>FT-790R</b>	70cm portable/mobile/base multimode	259-00
FIF-65	Computer interface Apple II	54-00	MMB-11	Mobile mount	28-19
FIF-80	Computer interface N.E.C.	105-00	NC-11C	Charger	10-35
XF-8-9HC	CW filter (600 Hz)	29-50	CSC-1A	Case	4-45
XF-8-9HCM	CW filter (450 Hz)	29-50	YM-49	Spkr mic	19-25
XF-8-9HCN	CW filter (300 Hz)	29-50	YHA-44	¼ wave helical antenna	7-00
XF-455MC	CW filter (ceramic)	49-00	YH-1	Headset mic	15-75
XF-455MCN	CW filter (ceramic)	49-00	SB-2	Switching unit	14-50
<b>FT-757GX</b>	HF transceiver gen coverage all modes	719-00	MF-1A3B	Mobile boom mic	18-95
FC-757AT	Automatic antenna tuner	245-00	<b>FT-730R</b>	70cm 10W FM mobile	239-00
FP-757	Switched mode PSU - 50% duty	145-00	YM-49	Spkr mic	19-25
FP-757HD	Heavy duty PSU - 100% duty	179-00	YM-1	Headset mic	15-75
FIF-65	Computer interface Apple II	54-00	SB-2	Switching unit	14-50
FIF-80	Computer interface N.E.C.	105-00	MF-1A3B	Mobile boom mic	18-95
FIF-232C	Computer interface RS-232	59-00	<b>FT-708R</b>	70cm synth handie	189-00
FAS-14R	Remote antenna selector	49-00	NC-8A	Base stn. charger/adaptor	56-75
MMB-20	Mobile mount	18-50	NC-7	Base stn. charger	34-65
<b>FT-77</b>	HF transceiver 8 band mobile/base 100W	507-55	NC-9C	Standard charger	9-20
FP-700	Matching power supply	145-00	YHA-44D	½ DC grounded antenna	9-50
FC-700	Matching antenna unit	103-84	YM-24A	Spkr mic	22-50
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FTV-70	70cm module	241-00	FBA-2	Battery pack adaptor (NC8A-NC-7)	3-65
FTV-4M	4m module	95-00	<b>FT-703R</b>	70cm handie thumbwheel tuning + FNB-3	TBA
MU-77	Marker unit	10-84	<b>FT-703R</b>	70cm handie thumbwheel tuning + FNB-4 (Accessories as for FT-209 - FT-203R)	TBA
XF-8-9KC	CW filter (600 Hz)	19-35	<b>FRG-7700</b>	General coverage receiver	385-00
XF-8-9KCN	CW filter (300 Hz)	19-35	<b>FRG-7700/M</b>	General coverage receiver + 12CH memory	455-00
<b>FT-726R</b>	Multimode transceiver 2m fitted	774-99	FRV-7700/A	VHF converter	89-95
21/24/28	HF module	209-00	FRV-7700/B	VHF converter	90-75
50/726	6m module	195-00	FRV-7700/C	VHF converter	84-50
430/726	70cm module	259-00	FRV-7700/D	VHF converter	91-74
SAT-726	Duplex module	99-95	FRV-7700/E	VHF converter	94-25
XF-455MC	600 Hz CW filter (ceramic)	49-00	FRV-7700/F	VHF converter	94-25
XF-455MCN	300 Hz CW filter (ceramic)	49-00	FRT-7700	Antenna tuning unit	48-25
<b>FT-290R</b>	2m Portable/mobile/base multimode	279-00	FRA-7700	Active antenna	43-95
FL-2010	10W linear for above	66-55	FF-5	Filter	11-25
MMB-11	Mobile mount	28-19	<b>Base station</b>	<b>YAESU antennas</b>	
NC11C	Charger	10-35	RSL-145GP	2m 5/8 λ ground plane	24-75
CSC-1A	Case	4-45	RSL-435GP	70cm 5/8 over 5/8 λ ground plane	36-25
YHA-15	Helical antenna	5-65	<b>Mobile</b>	Stub mast RSE-2A	4-95
YM-49	Spkr mic	19-25	RSL-3-5	80m mobile whip	13-85
YH-1	Headset mic	15-75	RSL-7A	40m mobile whip	13-50
SB-2	Switching unit	14-50	RSL-14	20m mobile whip	12-99
MF-1A3B	Mobile mic	18-95	RSL-21	15m mobile whip	12-75
<b>FT-230R</b>	2m mobile 25W FM	269-00	RSL-28	10m mobile whip	12-45
YM-49	Spkr mic	19-25	RSM-2	Gutter clip for above	12-45
MF-1A3B	Mobile boom mic	18-95	RSL-145S	2m 5/8 λ whip	10-50
SB-2	Switching unit	14-50	RSL-150SS	2m 1/4 λ whip	4-25
<b>FT-209R</b>	2m synth FM handie 350mw/3W	239-00	RSL-435S	70cm 5/8 over 5/8 λ whip	17-74
<b>FT-209RH</b>	2m synth FM handie 500mw/5W	259-00	RSM-3R	Gutter clip for above	9-25
NC-15	Base stn charger/adaptor	49-94	RSM-4M	Mag mount for above	15-00
NC-18	Standard charger (FNB-4)	10-35			



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YC-500S	Frequency counter	270-00	FF-501DX	Low pass filter	28-99
YP-150Z	Dummy load wattmeter	103-95	LB	Log book	2-50
SP-55	Mobile ext spkr	16-50	QTR-24D	World clock	34-99
FLC-5	Leather case FT-208/708	32-57	YH-55	Headphones	12-50
DCL-ONE	DC lead FT-ONE	10-84	YH-77	Headphones (lightweight)	12-50
DCL-480	DC lead FT-480R	6-55	MU-7700	Memory unit for FRG-7700	75-00

## T.E.T. antennas

HB23SP	2 element tri-band beam 10, 15, 20m	172-50	MV5BH	Vertical antenna 10, 15, 20, 40, 80m	98-99
HB33SP	3 element tri-band beam 10, 15, 20m	231-50	MV3BHR	Vertical antenna 10, 15, 20m + trapped radials	78-00
HB23M	2 element tri-band beam (mini) 10, 15, 20m	169-50	MV4BHR	Vertical antenna 10, 15, 20m + trapped radials	95-50
HB33M	3 element tri-band beam (mini) 10, 15, 20m	230-00	SQ22	Double quad 144 mhz	58-95
MV3BH	Vertical antenna 10, 15, 20m	49-95	SQY06	Swiss quad/yagi 144 mhz 6 element	45-75
MV4BH	Vertical antenna 10, 15, 20, 40m	59-49	SQY08	Swiss quad/yagi 144 mhz 8 element	52-74

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HC-200	HF bands ATU 200W PEP	82-95
HC-400L	HF bands ATU 350W PEP	149-00
HC-2000	HF bands ATU 2Kw PEP	TBA

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HL-30V	30W 2m linear 0-5-3W input	39-99
HL-82V	85W 2m linear 10W input	144-50
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HL-160V	160W 2m linear 10W input	244-52
HL-160V25	160W 2m linear 25W input	209-73

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HK708	Hand morse key with A.B.S. base	13-67
HK707	Hand morse key with A.B.S. base and dust cover	14-48
HK706	Hand morse key with A.B.S. base and dust cover	15-60
HK705	Morse key with A.B.S. base	14-60
HK704	Morse key, A.B.S. base, dust cover	18-97
HK702	Morse key, marble base, dust cover	29-65
HK808	Morse key, heavy marble base and dust cover	39-00
HK802	Polished brass key with weighted wooden base	82-00
MK704	Squeeze key heavy base required	12-76
MK705	Squeeze key on a heavy marble base	23-78
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YM1X	3-5-150 MHZ 120 watt SWR/PWR meter	18-80
T430	145/430 MHZ R.F. Thru-line watt meter, 120W	44-65
T30	30 watt 3-5-500 MHZ dummy load	8-05
T100	100 watt 3-5-500 MHZ dummy load	28-18
T200	200 watt 3-5-500 MHZ dummy load	42-26
T435	145/430 MHZ R.F. Thru-line watt meter, 200W	49-35

### Baluns

BL40X	50 ohm-50 ohm 1-1 Balun 1 kw pep	14-90
BL50A	50 ohm-50 ohm 1-1 Balun 4 kw (pep) 2 kw (cw)	18-69
SA450N	2 way antenna switch, 'N' connectors	16-66
SA450M	2 way antenna switch SO239 connectors	12-65
RF2000	2 KW, 3-5-150 MHZ SWR meter	19-50
5M	PL259-PL259 patch lead 50 cm	2-24
8M	PL259-PL259 patch lead 80 cm	2-36
5MM	PL259-PL259 patch lead 3-8 m	2-99

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AE/EGG	Ceramic egg insulator	0-40 each
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**DFC70 Kit £19.95 Built and tested module £24.95**

Will also work with the Lowe SRX30 and Drake SSR/1.

With our new FM7 adaptor module, you will be able to receive sideways modulation (FM as it is otherwise known). Our superb state of art FM detector uses the very latest 3359 chip from Motorola, and has a built in IF filter and a variable squelch control for noise free monitoring. Although specially designed with the FRG7 in mind, it will happily work with other receivers or transceivers with a 455kHz IF amplifier. The FM7 will add a whole new dimension to your listening activities. You will of course be able to follow legal CB contacts but you will also hear the exciting DX being worked by amateurs on 10 metre FM. Used in conjunction with our DFC7 counter, you can accurately tune to a specific CB or amateur channel and so be sure that you will not miss whatever goes on.

**Kit Price £9.95 Tested Module £14.95** P&P £1.00 (VAT inc.)  
For FM reception on receivers with any IF up to 50MHz, the FM 42 is the answer to all your problems. *Please state frequency required when ordering.*  
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We are proud to announce that the well known RF consultant Timothy Edwards has given us the exclusive marketing rights to his new 2 metre pre-amp. Timothy Edwards RF designs are used by British Telecom amongst others and so you can be sure that this pre-amp will perform to perfection. It employs the incomparable BF981 which has a better noise figure at 2M than the often used 3SK88. Spec. Size (tiny) 34mm x 9mm x 15mm (same as Mk1) Noise figure 1.0db Gain 26db **Kit Price £4.95** (inc VAT & P&P).

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2 N6456	mHz 30	Pout/W 60	Pin/W 1.25	Volts 13.8	Price £5 (inc)	Not 3SK88 but BF981 Better 2M noise figure -0.6db £1.40 (inc) ZTX 501 Gen. purpose PNP 0.5A, 20 for £1.25 (inc)
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### 1250 DC50

The 1250 DC50 is a completely self-contained 24 cms downconverter compatible with our 50 MHz video intermediate frequency processor demodulator. The module has facilities for remote tuning and AFC input. The full 24 cms TV allocation is covered with minimal loss in gain.

#### SPECIFICATION:

Input frequency range: 1240-1325 MHz  
Intermediate frequency: 50 MHz nominal  
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Conversion gain: >25 dB; 30 dB typical  
First RF stage: MGF 1100 Ga As FET  
Mixer type: Discrete Schottky ring

Post mixer processing: SL560c amplifier  
Operating voltage: 11.5-14.0 Volts  
Operating current: 80 mA nominal  
Internal stabilisation: 8.5V; 5.5V rails  
External connections: AFC input  
Supply input  
Tuning voltage input  
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RF connections: BNC

Unlike the majority of our extensive product range this unit will not be available as a kit. The complexity of the circuitry demands a high level of instrumentation to allow correct alignment. Minor variations in assembly technique could also not be tolerated at such a high frequency. For these reasons we have reluctantly decided to modify our policy but would point out that the VIDIF for use with the above is available in either kit or assembled form.

### Inclusive Price: £69.96

Place your order now for the 1250 DC50 or any of our product range by mail order or credit card. While our staff strive to give a return of post service please allow 28 days for any possible delay particularly on assembled modules. Our current catalogue is available by return of post on receipt of an A5 stamped addressed envelope. Please add 75p to your total order for postage and handling.

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## Plain Language

THE FIRST STEP towards making the UK Amateur Radio Licence easier to understand was taken on September 10 when a new Schedule was published by the Department of Trade and Industry (see page 18 in this issue).

The new Schedule is not intended to change the basic licence conditions in any way, but simply to state clearly, and without the constant need to refer to numbered footnotes, what powers and modes may be used in each amateur band. It also aims to clear up several misunderstandings and anomalies, some of long standing, but mostly resulting from the revised emission codes adopted at the 1979 World Administrative Radio Conference.

We have not yet had time to study the new Schedule in depth, but a quick scan revealed the following points:

1. Footnote A clears up the question: "Can Class B Licence-holders send Morse using an automatic sender such as a keyboard?"
2. Footnote I, Note (b) should be useful for answering the occasional "Smart-Aleck" who enjoys asking questions like "What emission mode do I put in my log when I'm sending my callsign in speech at the end of a TV transmission?"

Although the WARC '79 emission code table gave the answer, the summary of those codes included in the Amateur Licence did not.

We understand that discussions between the DTI and the RSGB are continuing with a view to issuing a totally revised amateur licence, hopefully some time in 1985. The present licence, rather like Topsy, "just grewed". The incorporation of the mobile licence

and then the amateur TV licence into the main licence over the years has involved piecemeal alterations which mean that very, very careful reading of the licence as a whole is required for a full understanding of all the rules we amateurs should be obeying. The review now under way should clear up most of this confusion.

One point I hope they'll sort out is the difference between "telegraphy" as defined by the Radio Regulations (see the new Schedule) and "telegraphy" as in the Wireless Telegraphy Acts. The latter definition occupies almost a page in the 1949 WTA, but the important part is that it includes any wireless communication which "serves for the conveying of messages, sound or visual images" (Part III, 19. — (1) (a)). People who argue that the Wireless Telegraphy Acts don't apply to them when they're transmitting telephony (speech) had better try to think up a new excuse!

Whilst on the topic of definitions, the abbreviation ISM in the Schedule stands for "Industrial, Scientific and Medical", meaning the many uses which can be made of radio-frequency electromagnetic energy apart from radio communication and control. There are a number of frequency bands set aside internationally for the purpose, and other users of the same bands have to accept the limited-range interference generated by ISM equipment.

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 "News" pages 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.

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# The September 10 Schedule Revision

A new schedule to the amateur radio licence was introduced on 10 September 1984. This is the result of joint discussions between the Department of Trade and Industry and the Radio Society of Great Britain.

The new single-format schedule (the technical supplement to the licence which lists the frequencies amateurs may use, etc.) covers amateur radio operations of both Class A and Class B licensees. It has been designed with the needs of the user in mind and also clears up areas of misunderstanding. Operators will in future be able to see at a glance the frequencies they may use and their status (i.e. primary/secondary), the maximum power and the type of transmission permitted.

Two minor changes to the amateur licence are also being made. The first is to reflect the transfer of functions of the Radio Interference Service from British Telecom to the Department of Trade and Industry. In Clause 1(1)(a)(iii), reference to the "General Manager of the British Telecom Telephone Area" is deleted and replaced by "Manager of the Radio Investigation Service District".

The second change removes old Clause 1(2)(e) referring to Radio Teleprinter (RTTY) transmissions since *this is now* superseded by the new schedule. Old clause 1(2)(f), referring to the prohibition of offensive or indecent messages, becomes new Clause 1(2)(e).

## THE SCHEDULE

For the sake of convenience, this schedule appears in an identical format in both the Class A and Class B licences.

Frequency bands in MHz	Status of allocations in the UK to: The Amateur Service	The Amateur Satellite Service	Maximum power Carrier PEP	Permitted types of transmission
1.810-1.850	Available to amateurs on a basis of non-interference to other services.	No allocation.	9dBW 15dBW	Morse Telephony RTTY Data Facsimile SSTV
1.850-2.000				Morse Telephony Data Facsimile SSTV
3.500-3.800	Primary. Shared with other Primary services.	No allocation.	20dBW 26dBW	Morse Telephony RTTY Data Facsimile SSTV
7.000-7.100	Primary.	Primary.		
10.100-10.150	Secondary.	No allocation.		
14.000-14.250	Primary.	Primary.		
14.250-14.350		No allocation.		
18.068-18.168	Available to amateurs on a basis of non interference to other services. Antennas limited to horizontal polarisation, maximum gain 0dB with respect to a half-wave dipole.	No allocation.	10dBW —	Morse, A1A only
21.000-21.450	Primary.	Primary.	20dBW 26dBW	Morse Telephony RTTY Data Facsimile SSTV
24.890-24.990	Available to amateurs on a basis of non interference to other services. Antennas limited to horizontal polarisation, maximum gain 0dB with respect to a half-wave dipole.	No allocation.	10dBW —	Morse, A1A only
28.000-29.700	Primary.	Primary.	20dBW 26dBW	Morse Telephony RTTY Data Facsimile SSTV
70.025-70.500	Secondary basis until further notice. Subject to not causing interference to other services. Use of any frequency shall cease immediately upon demand of a government official.	No allocation.	16dBW 22dBW	
144.0-146.0*	Primary.	Primary.	20dBW 26dBW	

(\*See Footnote A opposite.)

continued ►



Frequency bands in MHz	Status of allocations in the UK to: The Amateur Service	The Amateur Satellite Service	Maximum power Carrier PEP	Permitted types of transmission
430-431.0	Secondary. This band is not available for use within the area bounded by: 53N 02E, 55N 02E, 53N 03W and 55N 03W.	No allocation.	10dBW 16dBW e.r.p. e.r.p.	Morse Telephony RTTY Data Facsimile SSTV Television
431.0-432.0	Secondary. This band is not available for use: a) Within the area bounded by: 53N 02E, 55N 02E, 53N 03W and 55N 03W b) Within a 100km radius of Charing Cross, 51° 30' 30"N 00° 07' 24"W.			
432.0-435.0	Secondary.	No allocation.	20dBW 26dBW	
435.0-438.0		Secondary.		
438.0-440.0		No allocation.		
1240-1260	Secondary.	No allocation.		
1260-1270		Secondary. Earth to Space only.		
1270-1325				
2310-2400		No allocation.		
2400-2450	Secondary. Users must accept interference from the ISM allocations in this band.	Secondary. Users must accept interference from the ISM allocations in this band.	20dBW 26dBW	Morse Telephony RTTY Data Facsimile SSTV Television
3400-3475	Secondary.	No allocation.		
5650-5670		Secondary. Earth to Space only.		
5670-5680				
5755-5765		No allocation.		
5820-5830				
5830-5850	Secondary. Users must accept interference from the ISM allocations in this band.	Secondary. Users must accept interference from the ISM allocations in this band. Space to Earth only.		
10000-10450	Secondary.	No allocation.		
10450-10500		Secondary.		
24000-24050	Primary. Users must accept interference from the ISM allocations in this band.	Primary. Users must accept interference from the ISM allocations in this band.		
24050-24250	Secondary. This band may only be used with the written consent of the Secretary of State. Users must accept interference from the ISM allocations in this band.	No allocation.		
47000-47200	Primary.	Primary.		
75500-76000				
142000-144000				
248000-250000				

#### FOOTNOTES

A. Except in accordance with clause 1 (2) (c) (ii) holders of the Amateur Radio Licence (B) are not permitted to use frequencies below 144MHz nor may they use the type of transmission known as morse (whether sent manually or automatically).

*Practical Wireless, November 1984*

#### B. Definition of types of transmission and classes of emission permitted:

Under the ITU classification (see section I) emissions are designated by groups of three characters. The types of transmissions defined here are grouped according to the third character, that is the type of information being used.



1. **Morse:** Morse telegraphy intended for aural reception using any classes of emission ending in A, i.e. \*\*A.

**Telephony:** Telephony using any classes of emission ending in E, i.e. \*\*E.

**Television:** Television using any classes of emission ending in F, i.e. \*\*F.

This may only be used where indicated on bands above 430MHz and the station's callsign must be sent periodically using either morse telegraphy or telephony on the centre frequency of the video channel, as required by this licence.

2. When using any of the following types of transmission the station's callsign must be sent periodically on the same frequency using either morse telegraphy or telephony.

**Radio Teleprinter (RTTY):** Automatic telegraphy using any classes of emission ending in B, i.e. \*\*B. This includes teleprinters using any CCITT recognised codes, and morse telegraphy intended for automatic reception.

**Data:** Data using any classes of emission ending in D, i.e. \*\*D. The Radio Regulations require that transmissions between amateur stations in different countries shall be in plain language. Transmissions between UK amateur stations and those in different countries shall be restricted to using CCITT recognised codes (in plain language); this requirement also applies to transmission between UK amateur stations in all bands allocated to the Amateur Service on a secondary basis.

**Facsimile:** Facsimile using any classes of emission ending in C, i.e. \*\*C.

**Slow Scan Television (SSTV):** Television operating in a reduced bandwidth using any classes of emission ending in F, i.e. \*\*F.

Simultaneous use of combinations of any of the preceding types of transmissions, e.g. Telephony and Data, are described as classes of emission ending in W, i.e. \*\*W.

N.B. The symbol "\*" when used in emission designators represents any appropriate symbol as defined in section I.

C. Maximum power levels refer to the rf power supplied to the antenna. These levels will be specified by carrier power. For emissions having a suppressed, variable or reduced carrier, the power shall be determined by the peak envelope power (p.e.p.) under linear conditions. For pulse emissions (P\*\*) the mean power shall not exceed the p.e.p. specified on that band.

D. For frequency bands above 1GHz, since high intensities of rf radiation may be harmful, the following safety precautions must be taken: in locations to which people have access, the power flux density on transmit must not exceed the limits recommended by the competent authorities. (Currently, this limit is 10mW per square centimetre.)

E. The bands allocated to the amateur service at 3.5, 7.0, 10.1, 14.0, 18.068, 21.0, 24.890 and 144MHz may, in the event of a natural disaster, be used by non-amateur stations to meet the needs of international disaster communications in the disaster area in accordance with the Radio Regulations.

F. The bandwidths of emissions shall be such as to ensure the most efficient utilisation of the spectrum; in general this requires that bandwidths be kept at the lowest values which technology and the nature of the service permit.

Where bandwidth-expansion techniques are used, the minimum spectral power density consistent with efficient spectrum utilisation shall be employed.

However, whatever class of emission is in use, the bandwidth occupied by the intended emission shall be such that not more than 1% of the mean power of the transmis-

sion shall fall outside of the authorised bands. This 1% does not include the power contained in harmonic and spurious emissions.

G. The class of emissions, type P\*\*, may only be used on bands above 1GHz.

**H. Primary, permitted and secondary services:** For the purpose of this licence, bands are allocated to the Amateur Service and the Amateur Satellite Service on a primary basis on the understanding that they cannot claim protection from harmful interference from any other authorised services. This applies equally to bands allocated on a secondary basis where stations of the Amateur Service and the Amateur Satellite Service are also required not to cause harmful interference to stations of a primary or permitted service to which frequencies are already assigned or to which frequencies may be assigned at a later date.

#### I. Designation of emissions:

The symbols used to designate the classes of emission have the meaning assigned to them in the Radio Regulations, International Telecommunication Union (Geneva 1982). The classification is specified by three symbols. The first denotes the type of modulation of the main carrier, the second the nature of the modulating signal(s), and the third the nature of the information to be transmitted.

##### FIRST SYMBOL

Type of modulation of main carrier.

1. Emission of unmodulated carrier: N
2. Emission in which the main carrier is amplitude modulated, including cases where sub-carriers are angle modulated.

Double sideband: A

Single sideband, full carrier: H

Single sideband, reduced or variable carrier: R

Single sideband, suppressed carrier: J

Independent sideband: B

Vestigial sideband: C

3. Emission in which the main carrier is angle modulated.

Frequency modulation: F

Phase modulation: G

4. Emission in which the main carrier is amplitude or angle modulated either simultaneously or in a pre-arranged sequence: D

5. Emission of pulses.

Unmodulated sequence of pulses: P

A sequence of pulses

(a) modulated in amplitude: K

(b) modulated in width/duration: L

(c) modulated in position/phase: M

(d) in which the carrier is angle modulated during the period of the pulse: Q

(e) which is a combination of the foregoing or is produced by other means: V

6. Cases not covered above, in which an emission consists of the main carrier modulated, either simultaneously or in a pre-established sequence, in a combination of two or more of the following types of transmission—amplitude, angle, pulse: W

7. Cases not otherwise covered: X

Note: Emissions where the main carrier is directly modulated by a signal which has been coded into quantized form (e.g. pulse code modulation) should be designated under 2 or 3.

##### SECOND SYMBOL

Nature of signal(s) modulating main carrier

1. No modulating signal: 0

2. A single channel containing quantized or digital information without the use of a modulating subcarrier (excluding time-division multiplex): 1



3. A single channel containing quantized or digital information with the use of a modulating subcarrier (excluding time-division multiplex): 2
4. A single channel containing analogue information: 3
5. Two or more channels containing quantized or digital information: 7
6. Two or more channels containing analogue information: 8
7. Composite system with one or more channels containing quantized or digital information, together with one or more channels containing analogue information: 9
8. Cases not otherwise covered: X

THIRD SYMBOL

Type of information to be transmitted

1. No information transmitted: N
2. Telegraphy—for aural reception: A
3. Telegraphy—for automatic reception: B
4. Facsimile: C
5. Data transmission, telemetry, telecommand: D
6. Telephony (including sound broadcasting): E
7. Television (video): F
8. Combination of the above: W
9. Cases not otherwise covered: X

Notes:

a) In this context the word "information" does not include information of a constant, unvarying nature such as provided by standard frequency emissions, continuous wave and pulse radars etc.

b) For the purposes of this licence, modulation used only for short periods and for incidental purposes, such as identification or calling, may be ignored when calculating the emission designator.

c) For the purposes of this licence, Double Sideband emissions with reduced or suppressed carrier are included in the designation A\*\*.

J. Interpretation:

**Gain of an Antenna:** The ratio, usually expressed in decibels, of the power required at the input of a loss free reference antenna to the power supplied to the input of the given antenna to produce, in a given direction, the same field strength or the same power flux-density at the same distance. When not specified otherwise, the gain refers to the direction of maximum radiation. The gain may be considered

for a specified polarisation. The reference antenna is usually either an isotropic antenna or a half-wave dipole. The gains may be referred to as decibels relative to an isotropic antenna (dBi) or as decibels relative to a half-wave dipole (dBd).

**Equivalent Isotropically Radiated Power (e.i.r.p.):** The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

**Effective Radiated Power (e.r.p.) (in a given direction):** The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction. By convention, e.r.p. is used below 1GHz, and e.i.r.p. above 1GHz: e.i.r.p. is 2.1dB greater than e.r.p.

**Mean Power (of a radio transmitter):** The average power supplied to the antenna by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.

**Carrier Power (of a radio transmitter):** The average power supplied to the antenna by a transmitter during one radio frequency cycle taken under the condition of no modulation.

**Peak Envelope Power (p.e.p.) (of a radio transmitter):** The average power supplied to the antenna by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions.

**Telegraphy:** A form of telecommunication which is concerned in any process providing transmission and reproduction at a distance of documentary matter, such as written or printed matter or fixed images, or the reproduction at a distance of any kind of information in such a form.

For the purposes of the Radio Regulations, unless otherwise specified therein, telegraphy shall mean a form of telecommunication for the transmission of written matter by the use of a signal code.

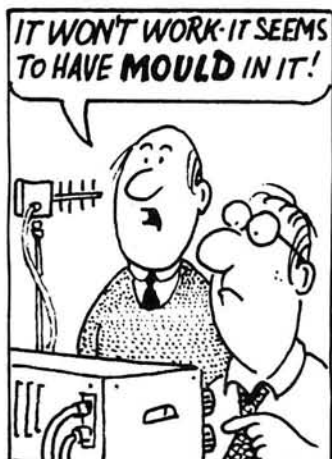
**Telephony:** A form of telecommunication primarily intended for the exchange of information in the form of speech.

**Television:** A form of telecommunication for the transmission of transient images of fixed or moving objects.

**Facsimile:** A form of telegraphy for the transmission of fixed images, with or without half-tones, with a view to the reproduction in a permanent form.

These licence conditions represent the situation in the UK. Frequency allocations may differ from the international allocations given in Article 8 of the Radio Regulations.

# Benny







A new four-day exhibition, tailored specifically for the electronics enthusiast, is to be held at the Royal Horticultural Hall, Victoria, London, between 8 and 11 November 1984.

Called "Leisuretronics" the event is being sponsored by *Practical Wireless*, *Practical Electronics*, *Everyday Electronics*, *Software Index* and *Electronics & Wireless World*.

In addition to stands devoted to amateur radio and associated equipment, other attractions will include:

## DBS IF Recommendations

The May edition of *PW* carried an Editorial Comment on the choice of Direct Broadcast Satellite i.f. frequencies (see Ifs and Buts—p.17 *PW* May) and concluded that the then known choices of 950–1350MHz (first i.f.) and 134MHz (second i.f.) could well lead to interference problems from and to amateur band operations.

A recently received paper from BREMA (British Radio Equipment Manufacturers Association) recognises that extremely high power radar systems operate throughout Europe on approximately 1300MHz. The BREMA Interference Sub-Committee has therefore recommended that UK DBS setmakers avoid the use of frequencies below 1410MHz for the first i.f. in domestic products. However this statement is qualified by acknowledging that some products will use the lower "half-band" 950–1350MHz as components for the higher frequencies may not be readily available at the start of production.

On the choice of the second i.f. the sub-committee considered two questions

- 1) Is the use of 134.26MHz practicable in the presence of 144–146MHz amateur transmissions?
- 2) If the answer to this question is no, what alternative frequencies can be considered?

The worst hypothetical case considered was a 400W p.e.p. station, located 10m from a domestic DBS system (12GHz input signal from the Satellite down-converted to 1GHz at the antenna and feeding via coaxial

home computers; satellite signalling equipment; radio control; robotics; video; electronic kits; audio; electronic music; tools and components etc., in fact just about everything to interest the electronics hobbyists.

On the *Practical Wireless* stand, we are hoping to run a special event station and display both past and future projects. Our technical staff will be manning the stand and we will also have available recent issues of the magazine, computer program tapes, copies of the popular *PW* publications and *PW* parabolic dishes.

Admission to "Leisuretronics" will be £1.50, and further details are available from the organisers; *Trident International Exhibitions Ltd.*, 21 Plymouth Road, Tavistock, Devon PL19 8AU. Tel: (0822) 4671.

cable to an indoor second i.f. and demodulator unit).

The use of 134.26MHz for the second i.f. was confirmed to be suitable, assuming the wanted carrier power is at -57dBm at the input to the indoor unit; the unit is contained within a totally enclosed metal screening box. Further, the coaxial cable between the antenna/first i.f. converter and the indoor unit must be correctly terminated at both ends (using N type connectors or better—no compromise is possible) to reduce the vulnerability to spurious fields. The quality of this cable is critical and must provide immunity to 145MHz interference of at least 50dB (Likely to be achieved by using close-weave braid or tape/braid construction).

With regard to the second i.f. unit its input rejection of signals breaking through onto the down-lead cable must be at least 70dB at 145MHz relative to the first i.f.

What these recommendations amount to is the need for a very well engineered system, using high quality components, with attendant cost. Let's hope that the industry responds because if they do not, or imported equipment, using mass-produced ineffectively screened components, become established, the prospects for mutual interference on both 144MHz and 1296MHz look decidedly grim.

## Insurance

Readers who are interested in applying to the *PW Radio Users Insurance Scheme* are advised to use the coupon published on page 18 of a previous issue.

## Repeater News

Latest Proposals—soon to go to the DTI for consideration. **144MHz:** GB3GD (R1), location Snae Fell, Isle of Man. As previously reported this unit could have initiated the implementation of 12.5kHz channel spacings for UK repeaters. However, following negotiations between the RMG and the Anglo-Scottish Repeater Group it has been decided that GB3AS will change channel to R0, leaving GB3GD to occupy the vacated channel, thus avoiding potentially widespread co-channel problems, a fine example of inter-group co-operation which should benefit all users in the North West. If the callsign rings bells with you don't worry because until now GB3GD had been allocated to the up and coming Data repeater at Leicester. However, it was agreed by all that the relevance of the Callsign was too good to miss and so the Leicester unit will operate under the Callsign GB3RY.

**432MHz:** Six proposals for u.h.f. repeaters will soon be passed to the DTI including: GB3AN—Anglesey (RB4); GB3DC—Sunderland (RB11); GB3LF—South Lakeland (RB14); GB3LR—Lewes, East Sussex (RB11); GB3NW—Hendon, North West London; GB3OV—Huntingdon. Final channel details of the last two devices are yet to be determined.

In addition to the above, two 1.3GHz f.m. repeaters will also be proposed.

## Boost for SETI

During the next two years NASA's SETI (Search for Extraterrestrial Intelligence) programme will receive a great boost when a system capable of scanning millions of channels simultaneously is brought on line. There are so many frequencies and so many directions from which any intelligent beings could try to send signals to us that the task of picking them out seems almost impossible. There have been about 45 searches for extraterrestrial signals from beings in outer space during the past 20 to 30 years, but no convincing evidence has yet been found.

Paul Horowitz, a Harvard physicist, is conducting one of the most extensive searches using a radio telescope 26 metres in diameter, but says he can scan 'only' 128 000 different channels at any one time and that this is a very small fraction of the many millions of possible channels where one might expect to find signals from the cosmos.

BD

*Practical Wireless*, November 1984



# News

## Catalogues

The new 160 page Toolmail catalogue has been expanded and contains an even larger range than ever before. A really comprehensive selection of over 3500 items all fully illustrated in colour with technical details. Also included is a large range of products for electrical and electronic work.

Toolmail's policy is to sell only top quality tools and most items in the catalogue come from established and reliable British and European manufacturers.

Most of the items are held in stock, allowing Toolmail to dispatch orders, usually within 48 hours of receipt. There is no charge for p&p on orders over £30 and a no quibble guarantee is offered on all items.

The catalogue costs £1.50, including postage, and on orders over £20 a £5 discount voucher can be used. To obtain a copy, apply to: *Toolmail (1982) Ltd., 7 London Road,*



*Sevenoaks, Kent TN13 1AH. Tel: (0732) 455252 and 452020.*

Cricklewood Electronics Ltd., the telephone and mail order component specialists, have their latest catalogue available.

This useful 32 page catalogue lists all the products stocked by Cricklewood, and is obtainable for 40p plus an s.a.e., from: *Cricklewood Electronics Ltd., 40 Cricklewood Broadway, London NW2 3ET. Tel: 01-452 0161 and 01-450 0995.*

## Will Flat Antennas Replace Dishes?

The well-known parabolic dish antennas are almost universal for concentrating the signals received from satellites; like the mirror of an astronomical telescope, the dish-shaped reflector concentrates the high frequency waves into a microwave horn near the centre of the dish.

However, work at the Weizmann Institute could make the conventional dish antenna a thing of the past. The research team there has used electromagnetic theory to analyse the operation of flat microwave antennas printed on dielectric surfaces. They expect their flat, wafer-thin antennas will replace many of the dish antennas and horns in current use for communica-

tions with satellites and aircraft as well as for television reception.

The Weizmann group believe that the compactness and low cost of the flat antennas together with their low weight will make them attractive for many communications purposes. They claim a further advantage is the ability to mount these antennas on curved surfaces.

The work is currently involving the development of complex mathematical models for forecasting the antenna properties for flat and for cylindrical shaped surfaces. This approach is expected to lead to considerable simplification in the design of the optimum conductor surface in the thin flat antennas.

BD

## Can You Help?

A reader has a "Koyo—11 Band" portable communications receiver that has developed a fault and he would dearly like to obtain a circuit/service manual for it.

Unfortunately, we at *PW* have no knowledge of the receiver, which covers l.w., m.w., s.w.(x5) and four v.h.f. bands.

If you can help, please contact: *David Townsend, Staff House 2, Grange OPH, Staverton Road, Daventry, Northants.*

## 9L1FTN 28MHz Beacon

The summer edition of *Hamster*, the journal of the Cheshunt & District Amateur Radio Club, contains a report of the successful construction by members of the group of a new 28MHz beacon now active from Sierra Leone.

Located 400 m.a.s. at Kortright, Mount Aureol, Freetown (08°30'N, 13°2'W) the beacon is in an area frequently subjected to thunderstorms and much effort went into the provision of "spike" protection, valuable help being provided by the M.O. Valve Co (GEC) in terms of advice and gas-filled surge arrestors. The beacon, whose callsign 9L1FTN can be heard on 28.27250MHz, employs a vertical  $\lambda/2$  antenna and F1A keying at 12 w.p.m. with a 20-second interval. Due to the intermittent nature of the local mains power, the unit will automatically revert to 12 V d.c. indicating this state by sending up to 8 "dits" before the callsign (corresponding to battery charge state).

Reports which will be acknowledged by special QSL card are welcomed by the group and should be addressed to Roger Frisby G4OAA (QTHR) or G4ECT via the QSL bureau.

## TRANSCANADA EXPEDITION



2½ year crossing of Canada via Hudson Bay and the North-West Territories needs volunteers to run U.K. and Canada communications stations. Must have full Radio Operator's Licence.

The purpose of the Expedition will be to travel between the Indian tribes and the Inuit (Eskimo) people, studying local culture, habitat and wild life. This will be recorded in a unique photographic documentary, in stills and film, to broaden man's understanding of his natural world and to aid education and science.

*Applicants apply to:*

**Stewart Holmes, TransCanada Expedition,  
'The Studio', 41 Moorhouse Road, London W2 5DH. Telephone: 01-727 7220.**



# an introduction to Antennas

## Part 3 by Gordon J. King T.Eng(CEI), AMIERE, G4VJV

Without delving too much into the mathematics of the progression and bringing in the component of radiation resistance (see later), a useful formula for determining the signal voltage across a loaded antenna in a given signal field is:

$$V_a = \sqrt{\left(\frac{R_a G_a G_d}{120}\right)} \frac{\lambda}{\pi} \frac{Z_L}{Z_a + Z_L} E$$

where  $V_a$  is the loaded antenna signal voltage,  $R_a$  the antenna's radiation resistance,  $G_a$  the gain of the antenna relative to a dipole,  $G_d$  the gain of a dipole relative to an isotropic radiator,  $\lambda$  the signal wavelength,  $Z_a$  the feed impedance of the antenna,  $Z_L$  the impedance of the load and  $E$  the signal field in V/m.

Let's take  $R_a$  as 73 ohms (which is close to the centre feed impedance of a half-wave dipole),  $G_a$  as unity,  $G_d$  as our previously established 1.635, the frequency as 98MHz,  $Z_a$  and  $Z_L$  both as 73 ohms (assuming correct matching from antenna to load) and  $E$  as  $100\mu\text{V/m}$ , and use a pocket calculator to secure the answer. I came up with  $48.57\mu\text{V}$ . I expect you got close to this, too, provided you didn't forget to convert 98MHz to 3.06m! Now, let's suppose that the antenna is coupled to the receiver through 24m of coaxial cable whose attenuation at 98MHz is 5dB per 30m.

The signal is thus reduced by a factor of 0.63 ( $5 \times 24 \div 30 = 4\text{dB}$  corresponding to a voltage ratio of 0.63), so the receiver signal would be

$$48.57 \times 0.63 = 30.6\mu\text{V}$$

You would obtain a similar answer from the basic formula of:

$$V_a = \frac{G_a A_f}{2} E$$

which assumes that both the receiver load and the antenna have impedances of 73 ohms and where in this case  $G_a$  is the voltage gain of the antenna and  $A_f$  the voltage attenuation of the feeder, both in direct ratios (not dB). The first formula, however, is the more versatile as it lends itself to greater scope of calculation.

### Improving Receiver Signal

The result is a miserable signal, so what can be done to give the receiver more signal? You could, of course, shift the antenna into a stronger signal field, or, indeed, raise its height since, as will be recalled from Part 2, the space-wave field increases proportionally with antenna height. Not possible? Okay so gain an extra 2dB by using low-loss coaxial cable. You have done that? Well, the only other possible thing is to use an antenna of higher gain.

You will remember that the calculation was based on an antenna of unity gain relative to a dipole. If you use a directional antenna of 6dB gain you will double your signal voltage at the receiver.

We are now getting down to the nitty gritty of antennas, but right now I would like to show you one or two important things about antenna couplings and radiation resistance. The fundamental type of resonant antenna is the half-wave dipole whose voltage/current distribution is shown in Fig. 3.1(a) and whose equivalent circuit is shown in (b).

### The Dipole and its Couplings

The voltage/current distribution alters at frequencies above and below resonance, and that shown is at resonance where the current along the antenna can be regarded as sinusoidal. As revealed at (b), the antenna constitutes a distributed tuned circuit, containing inductance, capacitance and resistance, which makes it more like a transmission line than an ordinary kind of "lumped" tuned circuit. It is tuned to the signal by adjusting its length; but because the effective capacitance per unit length is greater at the edges a dipole appears to be electrically longer than its physical length.

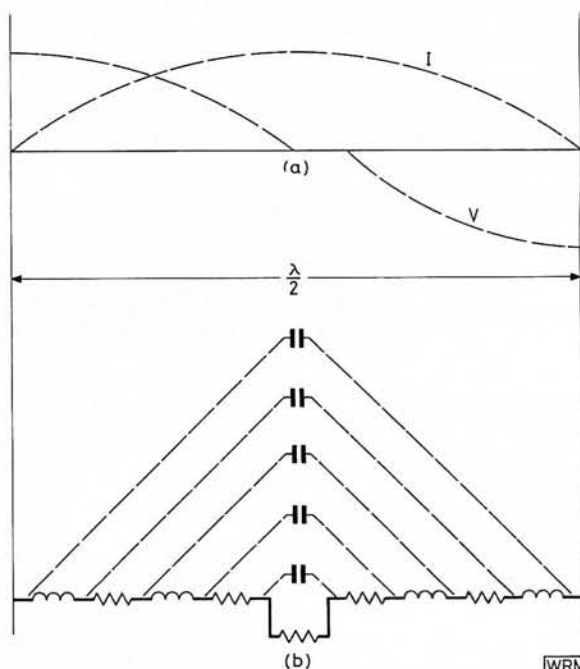


Fig. 3.1

WRM202



# an introduction to Antennas

Let us suppose that we wish to tune the antenna to 100MHz, which is 3m. The half wavelength is thus 1.5m but the physical length for resonance is around 5 per cent shorter than this—the precise length is influenced by the length/diameter ratio of the conductor—making it close to 1.425m. Velocity factor can thus be regarded as 0.95 which holds when the length/diameter ratio is around 200. You can now cut your own f.m. dipole at a frequency in the middle of Band II and it would be broad-band enough not to deviate too much from resonance at band extremes. Bandwidth increases as the length/diameter ratio falls.

Fig. 3.1(a) shows maximum current and least voltage at the centre and maximum voltage and least current at the ends. This means that the impedance is lowest at the centre of the antenna, the value being nominally 73 ohms, though this can vary above or below depending upon height. It can be as high as 98 ohms at 1m above a perfectly reflecting earth. Anyway, the centre impedance corresponds favourably to the characteristic impedance of f.m. and TV coaxial cable. We can thus achieve a relatively low-loss coupling by cutting the antenna at the centre and connecting the coaxial cable across the two points, usually aided by an insulator as shown in Fig. 3.2. Although the centre feed point of a dipole is symmetrical (balanced) and coaxial asymmetrical (unbalanced) a reasonable coupling is still attained, though for optimum results balanced feeder or, better, a balun (short for balanced-to-unbalanced) at the coupling point can be used.

## Transmission Lines

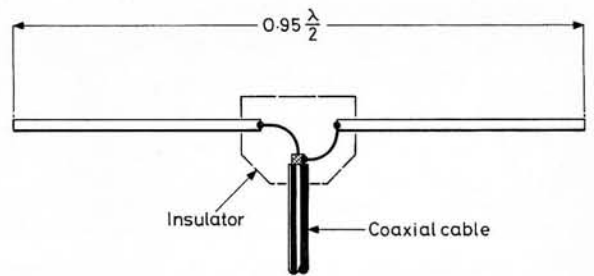
I must now show you the secrets of the transmission line and its behaviour at high frequencies. Consider an infinite length of line into which a short pulse is launched. The pulse will travel along the line and, under certain conditions, retain its shape. Now, if you put a short across the line the pulse will be reflected back from the short to the launching point. If instead of a short the line is terminated with a resistor the pulse will be absorbed and there will be no reflection when the value of the resistor is the same as the characteristic impedance of the line. The characteristic impedance is determined by the spacing of the conductors, their dimensions and shape, but is independent of frequency. When any practical length of line (i.e. less than infinite) is terminated by a resistance corresponding to the line's characteristic impedance ( $Z_0$ ) then the line's input impedance also corresponds to  $Z_0$ . This is what you aim to do when coupling your receiver through the feeder to the antenna—the antenna's impedance is close to  $Z_0$  as also is the antenna input of the receiver. The correctly matched condition is then obtained.

A feeder (transmission line) possesses distributed inductance along its length and distributed capacitance between its conductors along with the inevitable resistance of the conductors and the leakage resistance between them. For a finite line without losses the characteristic impedance is given by:

$$Z_0 = \sqrt{\frac{L}{C}}$$

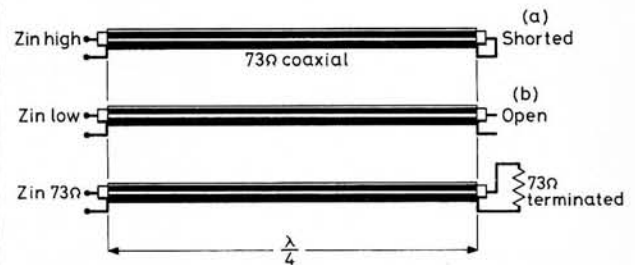
where L is the inductance in henrys and C the capacitance in farads.

If a short line is not correctly terminated—end shorted or open-circuit—the input impedance swings, over wide limits, as a function of the frequency of signal and the



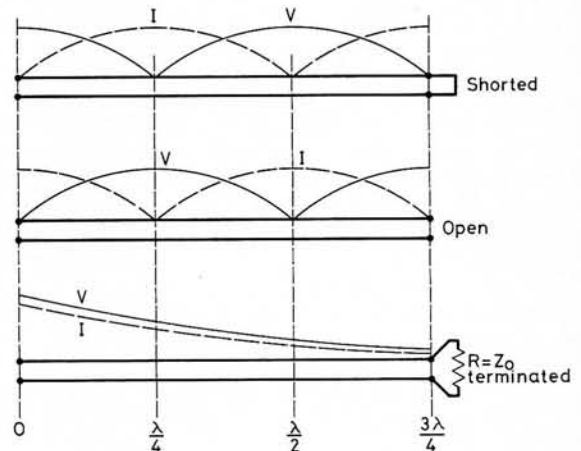
WRM203

Fig. 3.2



WRM204

Fig. 3.3



WRM205

Fig. 3.4

length of line.  $\lambda/4$  is commonly used for impedance matching and balancing, about which more will be told later when we deal with antenna phasing and so forth. For the time being Fig. 3.3 gives you an idea of the effects of a  $\lambda/4$  line (a) when the end is shorted, (b) open-circuit and (c) when correctly matched, while Fig. 3.4 shows the voltage and current distribution and the standing waves which result from non-matching.

## Radiation Resistance

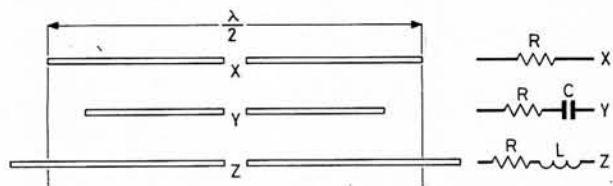
At resonance the dipole current and voltage are phase coincident and the centre impedance is equivalent to 73 ohms of pure resistance, which is the radiation resistance ( $R_r$ ). When shorter than resonance the centre feed-point swings capacitive with the resistive component falling below 73 ohms.



# an introduction to Antennas

When longer than resonance the centre feed-point swings inductive and the resistive component becomes larger than 73 ohms. These effects are illustrated in Fig. 3.5. For optimum operation the reactive component of the impedance must be minimal and  $R_r$  should be as high as possible.

Indeed  $R_r$  determines the amount of signal an antenna can receive, and as we shall see for a "long wire" m.f. antenna which is shorter than resonance by its very nature, it needs to be as long as feasible to retain a viable value of  $R_r$  and endow it with reasonable efficiency.



WRM206

Fig. 3.5

When resonant and coupled to the receiver through coaxial cable of the correct  $Z_0$ , which also corresponds to the antenna input impedance, a dipole is an efficient collector of signal in its own right. We may require more gain by adding extra elements but we shall see about that later, along with directionality. Under ideal matching conditions the losses are essentially those in the coaxial cable itself, these increasing with frequency.

## VSWR and the Bugs of Mismatching

We must now see what happens if the antenna system is not correctly terminated and matched. Let's suppose that the antenna is off-tune or the receiver's antenna input different from  $Z_0$ . If the mismatch exists at the receiver the signal will be reflected back up the cable to the antenna. A mismatch at the antenna will cause some loss (albeit small) of signal coupling to the feeder, while a mismatch both ends will cause the signal returned up the cable to be reflected back again so as to arrive a small fraction of a second after the main signal at the receiver. This can affect the quality of stereo f.m., something like multipath, depending on the length of feeder and its intrinsic attenuation factor.

A mismatch thus evokes standing waves on the feeder (see Fig. 3.4). The ratio of maximum to minimum voltage along the cable is called the Voltage Standing Wave Ratio (v.s.w.r.). The Reflection Coefficient ( $p$ ) is expressed:

$$p = \frac{\text{v.s.w.r.} - 1}{\text{v.s.w.r.} + 1} \text{ (direct ratio)}$$

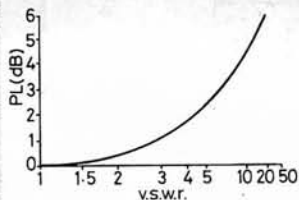
while the Return Loss is:

$$\text{r.l.} = 20 \log p \text{ (dB)}$$

From these, therefore, we can discover the Power Loss (p.l.) from any v.s.w.r. using the formula:

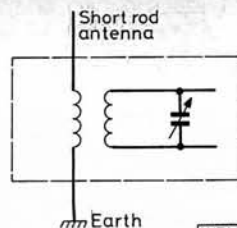
$$\text{p.l.} = 1 - \left[ \left( \frac{1}{\text{r.l.}} \right) \text{antilog} \right] \text{ (dB)}$$

This may appear to be a bit complicated but it is a useful formula for it can tell you how much signal power you will lose when there is a mismatch.



WRM207

Fig. 3.6



WRM208

Fig. 3.7

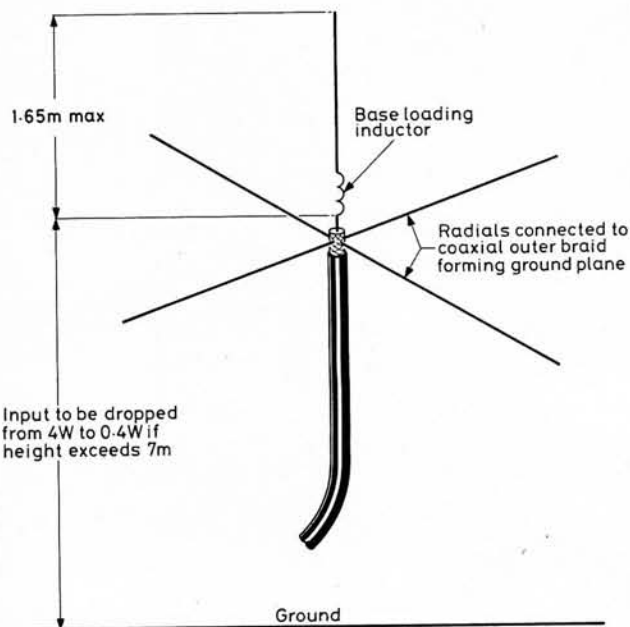
As an example, suppose that the mismatch results in 1.5:1 v.s.w.r.,  $p$  would work out to 0.2, r.l. to 13.98dB and p.l. to a mere 0.177dB, which means that the power loss is only 4 per cent, the system thus working at 96 per cent efficiency. Even with a v.s.w.r. of 3:1 the p.l. is only 1.249dB, so I think people do tend to get unduly hot under the collar about a small v.s.w.r. due to a minor mismatch at the receiver or antenna. Some CBers and even amateurs go almost crazy if they find their v.s.w.r. around 2:1. It is virtually impossible to secure a perfect match, anyway, and the matching will alter with frequency—but, of course, you should always aim for the best possible match. To save you the toil of arithmetic the graph in Fig. 3.6 expresses the p.l. over a wide range of v.s.w.r.

## MF and HF Antennas

A modest length of wire or rod will respond to the radio signals around us and yield a very small signal voltage as the result of the flow of signal current. On the long and medium wavebands the antenna will almost certainly be shorter than resonance. This means that its  $R_r$  will be low and its efficiency poor. The  $R_r$  of this type of antenna can be expressed as:

$$R_r = 80\pi^2 \left( \frac{l}{\lambda} \right)^2$$

where  $l$  is the effective length of the wire or rod and  $\lambda$  the wavelength of the signal being tuned. Let's say, then, that



WRM209

Fig. 3.8



# an introduction to Antennas

we are working at 1MHz (300m) and that the antenna is a vertical 4.57m conductor with the termination point at its lower end. Doing another little sum with your calculator you will find that  $R_r$  comes out to a mere 0.1832 ohm.

It is also possible to find the reactive component of the impedance which, of course, is capacitive (see Fig. 3.5) and works out, in fact, to  $-12.9 \times 10^3$  and thus corresponds to 2.900 ohms. One way of coupling the signal to the receiver and a good one to boot, is by loading the bottom of the antenna with an inductor having a value which cancels the capacitive reactance, leaving essentially  $R_r$ . In principle, this is what happens when a simple antenna is connected to a certain type of m.w. receiver, its internal antenna coupling taking the place of the inductor. To achieve resonance the antenna's capacitive reactance ( $X_c$ ) needs to equal the inductive reactance ( $X_L$ ), we are then left with  $R_r$  plus inductor and conductor losses. In this case  $X_c$  would be close to 55pF and  $X_L$  close to 460 $\mu$ H. If you work out the resonance of these two you will find it falls close to 1MHz! Frequency at resonance ( $f_0$ ), incidentally, is equal to:

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

where  $f_0$  is in Hz, L in henrys and C in farads.

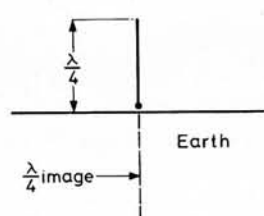
You would find out what the antenna signal would be in a given signal field by using the full formula in the section under Antenna Voltage, but this  $G_d$  is 1.5 (gain relative to an isotropic radiator). This is because in this case the antenna length is much shorter than the wavelength. The basic coupling is shown in Fig. 3.7.

## CB Antennas

A similar loading arrangement is required by law for CB antennas. Maximum length of the radiating element is 1.65m while the wavelength of Channel 20 is 10.794m (27.79125MHz). Clearly, the antenna is significantly less than  $\lambda/2$  and about 1m short of  $\lambda/4$ . It thus needs to be loaded by bottom inductance to combat the capacitance of the shortened monopole, as shown in Fig. 3.8. The recently revised specification for CB antennas allows the length to be up to 1.65m and the diameter to be 55mm, both dimensions to include any loading coils which can be placed anywhere along the antenna. Ground planes are excluded from these dimensions.

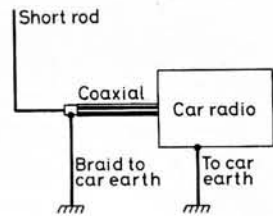
Actually, the antenna is resonated to correspond to a shortened  $\lambda/4$  monopole with the earth plane making up the missing  $\lambda/4$  part of a dipole (see Fig. 3.8). Design is based on  $Z_0 = 50$  ohms, this impedance value being applicable to the feed point of the antenna, the coaxial cable and the antenna input/output of the transceiver. The antenna is named after Marconi as distinct from the dipole which is named after Hertz. Fig. 3.9 shows the basic principle where the earth effectively mirrors the missing  $\lambda/4$  section. The Marconi antenna resonates in its own right, but when shortened for CB use requires a loading coil to counter the feed point capacitive component of the impedance. For CB the loading coil also serves as a low-pass filter, thereby helping to attenuate the radiation of harmonics which might otherwise cause interference to radio, TV and other services.

CBers are permitted to use a maximum r.f. input to the antenna of 4W (average carrier power). The e.r.p. is



WRM210

Fig. 3.9



WRM211

Fig. 3.10

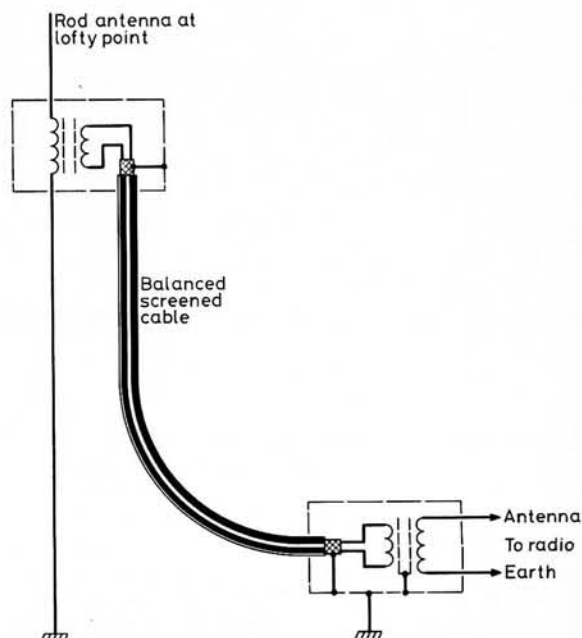
generally below this owing to the antenna limiting requirements of the Home Office. Nevertheless, with a competently designed antenna 2W e.r.p. can be achieved. Radiated power can be expressed as:

$$\frac{R_r \times W_1}{R_r + R_d + R_e} \text{ (watts)}$$

where  $R_r$  is the radiation resistance,  $W_1$  watts of r.f. from the transmitter,  $R_d$  the r.f. resistance of the loading coil and  $R_e$  earth plane resistance and other losses. Taking  $R_r$  as 7.6 ohms,  $R_d$  as 3 ohms and  $R_e$  as 4 ohms, then with 4W r.f. input the radiated power would be around 2.1W, giving an input/output efficiency of about 52 per cent. It is possible to achieve even greater efficiency while still keeping in the legal requirements as witnessed by tests I have made when the ground plane is more elaborate and less "lossy" and the loading coil is well designed.

## Car Antennas

Car antennas for broadcast reception on the l.w./m.w. bands constitute a short rod. They are closer to resonance at v.h.f. f.m. where the metal body of the car can help with loading. Coupling is shown in Fig. 3.10 where non-terminated coaxial cable is used. Resistive loading would greatly impair the signal, so the capacitance of the cable is included as part of the input circuit of the receiver. There is also usually a trimmer in the radio to peak the antenna tuning at the top of the m.w. band.



WRM212

Fig. 3.11



# an introduction to Antennas

Car CB antennas are the same as already described but the ground plane consists of the metal body of the car, and good results are possible from a well fitted mobile CB system.

## Home MF and HF Antennas

For long and medium wave reception the ferrite rod antenna is now mostly used; but sometimes there is merit in employing the old type of "long wire" antenna consisting of a horizontal span (say 9m) and a vertical down-feed (say 4.5m). Current is induced in both sections, but the horizontal section certainly enhances the signal collection. A wall-mounted vertical rod can also be relatively efficient if mounted high on a chimney stack clear of electrical interference.

Such an antenna, however, is often best fed into suitably ratioed transformers with balanced screened cable between as shown in Fig. 3.11. This prevents the pickup of interference on the downlead.

For h.f. work a tuned antenna becomes possible, such as a centre or end-fed dipole, and this is much the best way to secure good reception on short waves. There are hosts of different antennas which can be used but, sadly, there is just insufficient space here to investigate them. Design, however, is based on the tuning of antennas as already detailed.

## Ferrite Rod Antenna

This type of antenna is a development of the loop antenna which many years ago was commonly used in so-called portable radios. The loop, however, is still used for certain applications. With a ferrite rod the air within the loop is complemented by a core of ferrite of very high permeability with respect to that of air, which is unity. Core material for the l.w./m.w. bands is commonly a nickel-zinc ferrite of permeability ranging between 200 and 500 and the design is such that at these frequencies eddy current losses are remarkably small. Because of the high permeability and low losses the loop (which is now a coil) can be of small diameter, allowing the antenna to be mounted

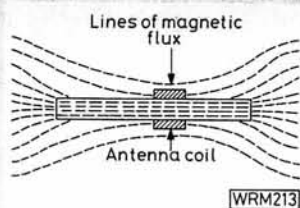


Fig. 3.12 ▲

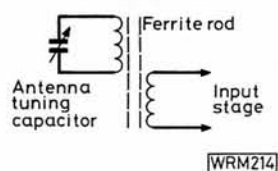


Fig. 3.13 (top right)

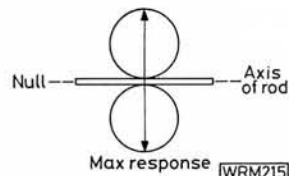


Fig. 3.14 ►

easily at the rear of the tuner or inside the cabinet of a small radio.

The antenna works by concentrating the magnetic field of the radio wave along the ferrite rod and hence through the coil as shown in Fig. 3.12 and the coil is tuned and coupled to the first stages of the receiver as shown in Fig. 3.13. Compare this with Fig. 3.7.

Although one or two arrangements have been mooted for v.h.f. f.m. ferrite rod reception, no receivers that I know of have yet been marketed with a v.h.f. ferrite rod antenna. The permeability falls off and the losses increase at frequencies much above 10MHz, though a special material which works up to about 100MHz has been developed, so perhaps we shall see f.m. tuners with inbuilt ferrite rod antennas one day.

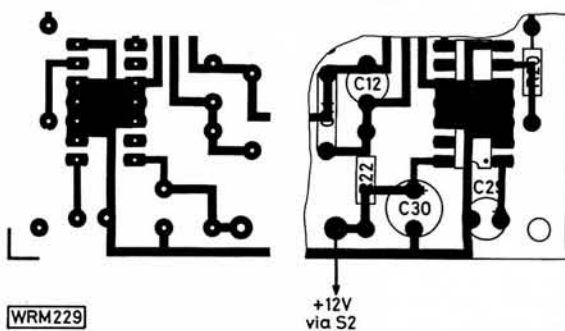
Because it is sensitive only to the magnetic component of the radio wave, the ferrite rod antenna is directional, having deep nulls when the ends are pointing to the station and maximum pick up when broadside on. This makes it possible to adjust the position to minimise interference, the polar pattern being figure-of-eight, as shown in Fig. 3.14, the same as a horizontal dipole.

This leads us to the reason why we use a horizontal dipole for v.h.f. f.m. reception. At one time the urban skyline was cluttered by vertical TV antennas in numerous configurations. Now, of course, our TV antennas are that much smaller because they are tuned to the shorter wavelength of the u.h.f. channels, but instead of being vertical their elements are horizontal, as those of v.h.f. f.m. antennas. Why, then, are some antennas vertical and others horizontal? You will have to wait until Part 4 to find the answer.

## Kindly Note

### Simple Top-Band Receiver—June 1984

The p.c.b. track pattern and component overlay contained two errors in the region of the LM380 amplifier (IC2). An amended track pattern and overlay for the affected area is shown below. If you have a p.c.b. with the wrong track pattern it can still be used simply by adding a wire link between IC2 pin 14 and R22 (+12V) and another between IC2 pins 2 and 3. It is not necessary to modify the connection to pin 13 as this is already disconnected internally.





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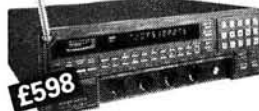
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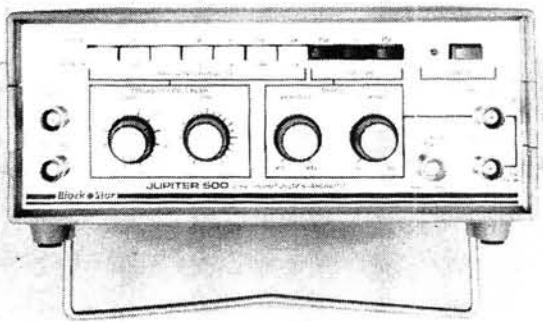
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# BATTERY STATE INDICATOR

by J. Talbot G4AYV

The author owns several pieces of battery operated equipment and because no visual indication exists that the supply is on, quite often, it would be forgotten at the cost of what are, these days, expensive batteries.

The Battery State Indicator serves not only to provide the user with an indication when the battery needs replacement within a particular piece of equipment, but acts as a low power pilot light, drawing only about six to nine hundred microamps when set up correctly.

The unit comprises an 8211 micro power sensor i.c. which, when driving an l.e.d. direct, would consume 7mA from its own internal constant current source. Of course for many batteries, this consumption when added to that of the equipment would soon exhaust them. One way to overcome this problem is to pulse the l.e.d. as this is the item that draws practically most of the current, the quiescent state being about 60µA. Even when pulsed at a slow rate the indication is as outstanding, if not more so, than a continuous light emission. Using this principle with the values given, a consumption of about 600µA average was achieved with reasonable brightness. It should be pointed out that high brightness l.e.d.s consume more than ordinary types so are less suitable for this type of application.

## Circuit

The pulser itself is formed by two inverters, gates c and d of IC2 wired as an astable, R3 and C2 governing the pulse rate. Each pulse acts as an enable signal to gates b and c of IC3. The 8211 contains an accurate voltage

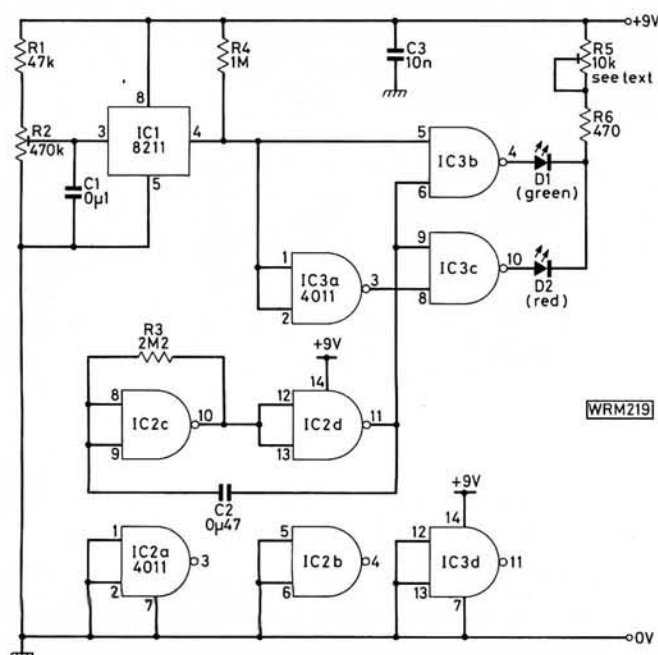


Fig. 1: Circuit diagram

Practical Wireless, November 1984

reference comparator as well as a pair of output buffers and as mentioned provides 7mA current limited output. Originally a Schmitt trigger was used to detect the voltage threshold but hysteresis proved a problem so the idea was given up in favour of the 8211 which does not have this problem, the transition being very sharp. The output of this device changes state when the sensed voltage reaches a level pre-determined by R2. In the high state IC1 turns on gate b of IC3 whilst in the low state gate c is turned on through an inversion at gate a of IC3.

For different voltages the current limiting resistor R5 had been made variable and should be adjusted for acceptable brightness commensurate with low current consumption.

It should be stressed that all unused gates should be tied to ground as is good practice, otherwise instability and higher current consumption will occur.

## Construction

A printed circuit board layout is shown in Fig. 2 although the design could be built on Veroboard if required. A maximum voltage of 18 volts should not be exceeded without modification otherwise damage to the c.m.o.s. devices will occur.

## ★ components

### Resistors

$\frac{1}{4}$ W 5% carbon film

470Ω	1	R6
47kΩ	1	R1
1MΩ	1	R4
22MΩ	1	R3

Miniature horizontal pre-set

10kΩ	1	R5
470kΩ	1	R2

### Capacitors

Polyester

10nF	1	C3
0.1µF	1	C1

Polycarbonate

0.47µF	1	C2
--------	---	----

### Semiconductors

Diodes

Red 0.2in l.e.d.	1	D2
Green 0.2in l.e.d.	1	D1

Integrated Circuits

4011	2	IC2, 3
8211	1	IC1

### Miscellaneous

Printed circuit board; Sockets for i.c.s.



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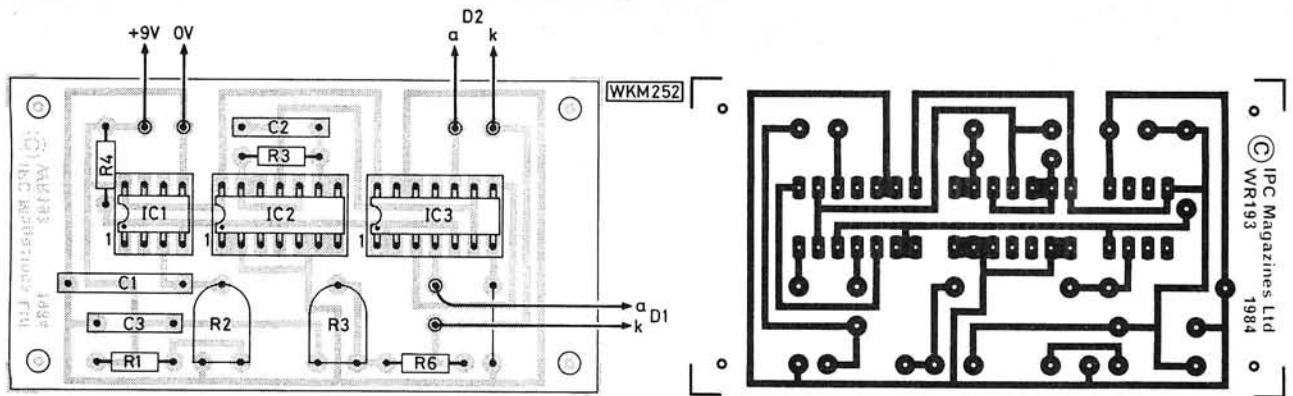


Fig. 2: Full-size p.c.b. layout and copper track pattern for the battery state indicator. The unit is wired across the battery after the on-off switch, so acting as a pilot lamp as well

Construction of the board is straightforward, but note that IC2 and 3 are c.m.o.s. devices, and that the appropriate handling precautions must therefore be taken. Sockets should be used for both devices; they should be left in their anti-static packaging until they are to be fitted onto the board; they should be handled as little as possible; they should not be fitted onto the board until it is complete in all other respects. Make sure that all the integrated circuits are fitted onto the board the right way round, and don't forget the link adjacent to R6.

To set up the circuit, simply connect a variable voltage to supply wires and adjust to the voltage at which transition from green to red is required. Now adjust R2 until this just happens. The unit is now set and ready for use.

Without switching off, the circuit has run now for several weeks on a 6-F22 (PP3) battery—the threshold having been set to 7.5V.

## BUYING GUIDE

All the components used in this project are readily available from regular suppliers.

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## BUMPER ISSUE - 8 EXTRA PAGES



# Products

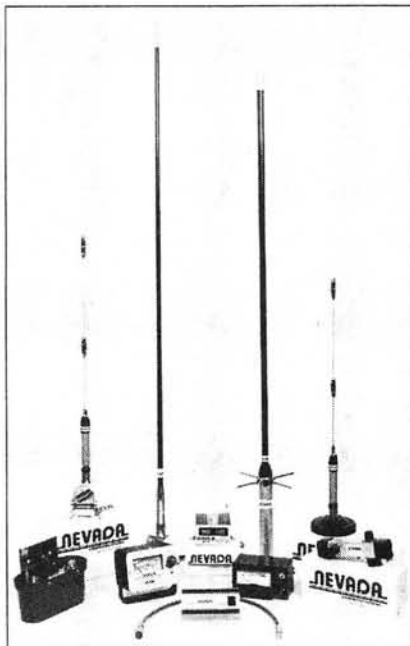
## New 934MHz Equipment

Telecomms of Portsmouth have recently introduced a comprehensive series of 934MHz CB accessories from the Nevada Communications range. Four different vertical colinear antennas are listed, all with 7dBi gain, and configured for base station, mobile, mag mount and mobile gutter mounting.

The base station PA7-E is less than 1.5m long but incorporates an array of  $5\lambda/8$  radiating elements to achieve good gain with attendant low angle radiation. Construction is of chromed steel with the radiating elements fully shrouded in glassfibre. An N-type r.f. socket is built into the base.

The HPS-900 Power/s.w.r. meter has a low insertion loss and is therefore suitable for continuous in-line monitoring (N-type connectors are fitted). The meter movement incorporates twin needles to continuously indicate the outgoing power level and system s.w.r. Internal illumination is provided by a 12V lamp and the unit is robustly constructed within a metallic case.

For increased receive capability the HRA-900 GaAs-f.e.t. masthead pre-amplifier should provide very effective results. Quoted specifications include a gain of 15dB (minimum) and a noise figure of 0.8dB (maximum). The device is supplied within a plastics/stainless steel enclosure with N-type socket connectors and a remote switched d.c. supply lead. (Supply requirements 13.8V at 200mA.) Two coaxial relays are incorporated, permitting the unit to handle up to 50W of r.f.



The photograph above shows most of the Nevada range of products and below is the Cybernet 934MHz CB transceiver

In the near future Telecomms will be marketing an all-new Cybernet 934MHz transceiver which has been developed in Japan. The basic transceiver has been designed to allow variants to be compatible with several other 900MHz CB and PMR systems, now becoming available throughout the world. We hope to have a review of this interesting equipment in a future issue. The UK version has 20 channel capability and will be readily expandable to 40 channel operation (when available).

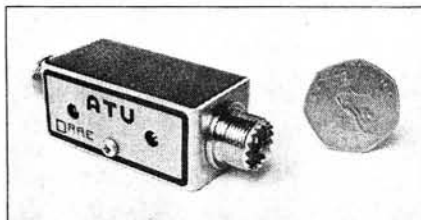
As a guide to pricing of these products (all include VAT), the PA.7 base colinear version costs £59.00 and the mobile variations all cost £39.95. The HPS-900 power/s.w.r. meter costs £89.95 and the HRA-900 masthead pre-amp £149.95. As for the Cybernet 934MHz transceiver, the rig should be available in quantity shortly after this issue is published and will be priced at £325, once again including VAT.

For further details, contact: Telecomms, 189 London Road, Portsmouth. Tel: (0705) 662145.



## Preset ATU for 144MHz

Traditionally radio amateurs have relied on the antenna pruning method to improve the v.s.w.r. of 144MHz mobile antennas. However, Davtrend Ltd., of Gosport, have come up with a new solution—the Drae preset antenna tuning unit, which when placed between antenna and transceiver, gives optimum performance for any given situation.



Terminated in U.H.F. sockets, type SO-239, the 30 watt, 50 ohm unit is priced at £11.80, which includes VAT and p&p. Full technical details and tuning instructions are included.

The Preset ATU is obtainable from: Davtrend Ltd., Sanderson Centre, Lees Lane, Gosport, Hampshire PO12 3UL. Tel: (070 17) 20141.

## Microwave Dish Feed

Mike Walters, G3JVL is now producing a 10GHz waveguide feed designed to be fitted to the PW Exe 450mm parabolic dish. The feed is based on the original concept of G4ALN but has an additional 3 point spider support

assembly. A standard waveguide 16 flange is fitted to directly connect to microwave systems. If required the feed can be supplied ready fitted to the dish. Also available are a range of interdigital and waveguide filters and versions of the image recovery mixer for both 5.7 and 10GHz. Further details: stamped addressed envelope to: JVL Electronics, 26 Fernhurst Close, Hayling Island, Hants PO11 0DT or Tel: 07016-4482.

## If you please

Please mention this column when applying to manufacturers or suppliers featured on this page.



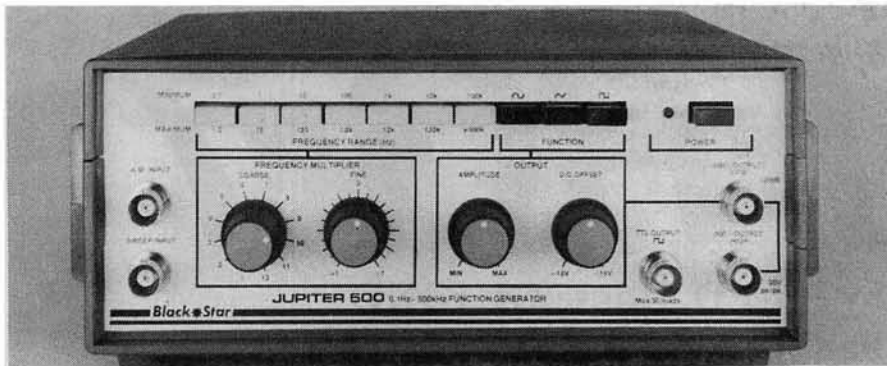
# Products

## Low Cost Function Generator

One of the latest products from the Black Star stable is a British-made low cost function generator with 30V output.

Entitled the Jupiter 500, it is a rugged mains operated instrument that offers features unique in its price range, such as full programmability of both amplitude and frequency by external voltage, plus exceptionally high output voltage of up to 30V peak-to-peak.

The frequency range covered is 0.1Hz to 500kHz via seven switched decade ranges with fine frequency control. Sine, square, triangle and t.t.l. (30 loads) waveforms are selectable, and an adjustable d.c. offset up to 15V can



be applied to the output.

Supplied with a comprehensive instruction manual and spare fuse, the Jupiter 500 sells in the UK at £110.00

plus VAT, and is available from: *Black Star Ltd., 9A Crown Street, St. Ives, Huntingdon, Cambridgeshire PE17 4EB. Tel: (0480) 62440.*

## Talking Frequency Meter

WPO Communications announce the re-introduction of the Talking Frequency Meter for the visually handicapped amateur radio enthusiast.

Designed specifically to assist blind radio operators in determining their transmit frequency, the unit may also be used for any of the applications a visually displayed frequency counter could be put to.

The unit covers the frequency range 500kHz to 150MHz (minimum) in two ranges, with resolution of 100Hz between 500kHz and 40MHz, and 1kHz

between 20MHz and 150MHz.

Via the built-in speaker, the speech quality is claimed to be good, and the meter also features either manual or automatic repeat operation, with selectable two, four or six digit groups of figures spoken. Additionally, the new unit has improved sensitivity at h.f., reverse polarity plus input protection. The Talking Frequency Meter requires an external 12V d.c. power source and is supplied ready-built and tested.

Priced at £179, which includes VAT and carriage, the Talking Frequency



Meter is available from: *WPO Communications, 20 Farnham Avenue, West Sussex BN6 8NS. Tel: (079 18) 6149.*

## Versatile Cleaner

The abrasive properties of the ends of a tightly packed bundle of glass fibre strands are surprising. Gunson's Speedplate Glass Fibre Cleaning Pencil utilises this considerable cleaning power in a neat, propelling pencil type holder.

For the electronics enthusiast this cleaning aid will prove most useful preparing metal surfaces, component leads and p.c.b. tracks prior to soldering, particularly where space is restricted as the tip of the pencil can get into nooks and crannies that other abrasives cannot reach and be efficient without causing damage to surrounding components.

As an additional bonus, the pencil's other uses are almost endless: removing rust spots on painted metal; clearing out screw threads or typewriter keys; buffing up small metal parts—in fact, hundreds of small



cleaning and polishing jobs.

The Speedplate Glass Fibre Cleaning Pencil costs around £1.75, comes complete with two refills and full instructions for use, and is available from the d.i.y. departments of major stores, and from motorist accessory shops like Halfords.

## Please Note!

A number of our advertisers have asked us to advise readers that the prices of imported products are likely to change from month to month.

The reason behind these changes is fluctuating international exchange rates. So, readers are therefore advised that they would do well to check prices with suppliers prior to sending off orders.



# Modifying The FRG-7



by Peter D. Rouse GUIDKD  
Part 3

The next constructional project in this series based around the FRG-7 receiver is for an f.m. adaptor and all-mode squelch. Although the two circuits were specially designed for the FRG-7, certain allowances have been made so that they should happily marry-up to other receivers. The printed circuit board layout has been configured in such a way that it will fit on to the stand-off panel described in the previous part for the switched filter unit.

Before going any further it is perhaps worth mentioning why it is desirable to fit the f.m. facility. Quite simply there is now an increasing amount of f.m. traffic on the short-waves particularly at the h.f. end of the spectrum. In addition to the UK CB service between 27.6 and 28MHz there is now an increasing amount of f.m. use in the 28MHz amateur band. Readers familiar with f.m. operation will know that background noise under no-signal conditions, is very high and so it is essential to have some kind of muting or squelch control to turn off the audio when no signal is present. However, such a control is also a useful feature with a.m. operation as well and it was with this in mind that the two circuits were adopted rather than the more familiar method of a separate f.m./i.f. stage with its own squelch limited to f.m. use only.

## Design Considerations

At this stage it is also worth mentioning why a separate f.m./i.f. was not considered as many will argue that a properly designed limiting i.f. amplifier would have given better performance. Indeed, two such circuits have been tried using Motorola and Plessey communication f.m. i.c.s and they have worked very well. However, they have also been far costlier and more complex than the circuit presented here. The biggest problem has been designing stable layouts to cope with the high gain and wide bandwidth of such i.c.s, they have had to have their own filters and buffers to prevent loading of the low level signal at the final conversion mixer.

Comparisons made between these circuits and the one finally chosen have shown only a very marginal difference in performance. The likely explanation for this would seem to be that when using the FRG-7 at a fixed location with a reasonably good antenna system the conditions are nowhere near as demanding as when operating mobile with problems such as flutter. In the latter instance the separate i.f. stage would possibly offer superior performance.

The same argument applies to some extent to the choice of carrier operated squelch instead of deviation muting. Whilst this may not be ideal for f.m., it is simple, it works and its operation can be extended to other modes, in particular a.m. and f.s.k.

## Circuit Operation

The f.m. stage is centred around YIC1 and just a few other components. It uses the TA7130 which is not an i.f. stage but merely an active demodulator. Although the i.c. is rarely seen in constructional projects, it is often found in equipment made in the Far East and appears extensively in CB equipment. It is inexpensive and readily available from a number of suppliers including advertisers in *PW*.

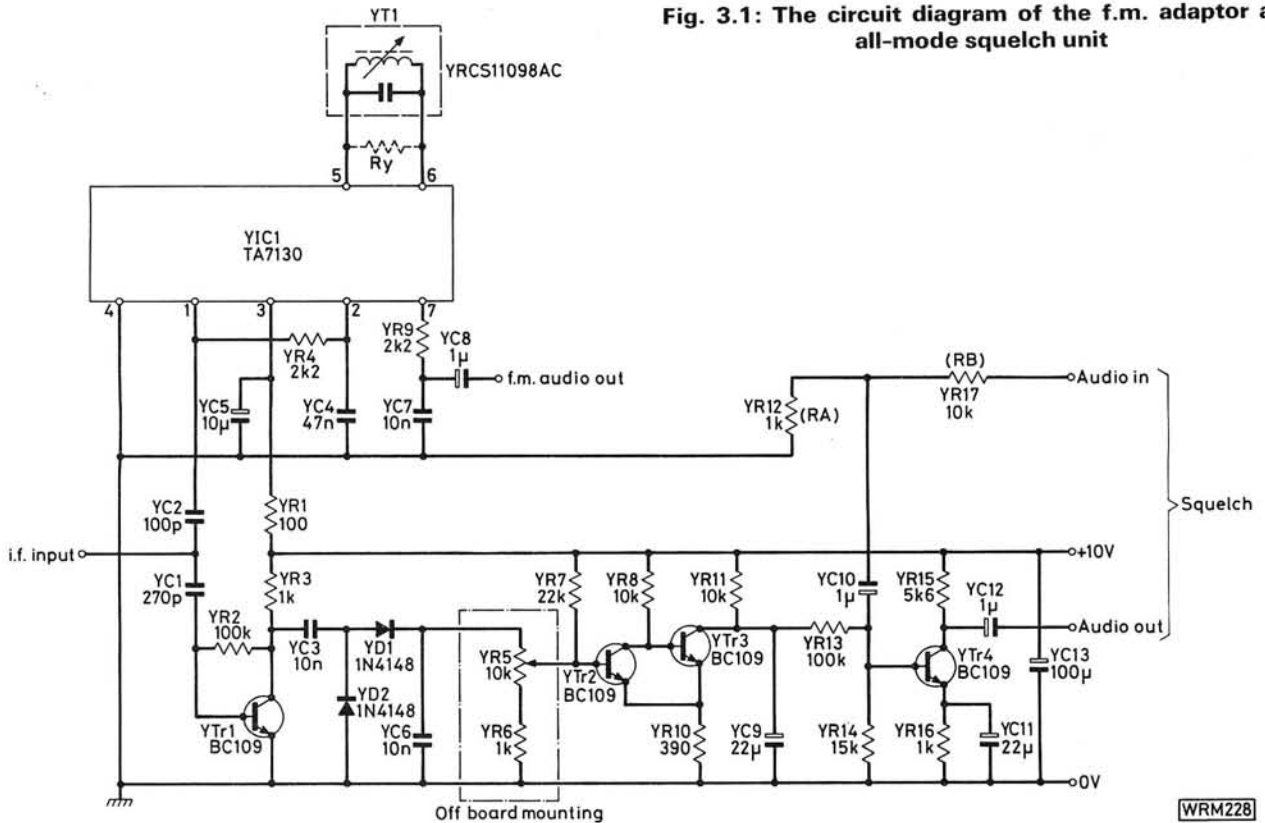
Signal for this stage is picked-off the FRG-7 final i.f. transformer, T405 at its junction with C427, C428, Q406 and R404. The signal is then fed via YC2 to pin 1 of the TA7130(YIC1). Transformer YT1 is the quadrature coil and can be almost any 455kHz i.f. transformer but preferably a low-*Q* first stage one. With some transformers that have a higher-*Q* it will be necessary to dampen the coil by fitting resistor Ry. Provision has not been made on the p.c.b. for this resistor but it can easily be soldered directly to the pins of YT1 on the underside of the board. The value of the resistor can be determined by trial and error but will probably be somewhere between 10kΩ and 39kΩ, whichever gives the best audio.

Demodulated audio appears at YC8 via YR9 from pin 7 of YIC1. The squelch stage is a fairly standard and familiar one often seen in communications equipment. It consists of an untuned i.f. amplifier, detector stage, Schmitt trigger and switched audio amplifier. The common emitter transistor, YTr1, the diode detector stage YD1, YD2 via YC3. The very high gain of this stage ensures that the d.c. that appears at the junction of YD1, YR5, swings as high as 7 volts on a strong signal and this gives the squelch a high degree of sensitivity.

Transistors YTr2 and YTr3 form a conventional Schmitt trigger which, because of the shared emitter resistor, exhibits a very positive toggling action. Resistor YR5 together with YR7 form the biasing network for YTr2 and under no-signal conditions, YR5 is set so that YTr2 is turned off which turns YTr3 on. When YTr3 is on, the audio amplifier YTr4 is turned off via YR13 and so will not amplify the audio signal appearing via YR17/YC10.



**Fig. 3.1: The circuit diagram of the f.m. adaptor and all-mode squelch unit**



However, an incoming signal will cause more current to appear at the base of YTr2, it will start to turn on and in doing so will start to switch YTr3 off, continuing until the Schmitt action causes a definite switching. As a result, YTr4 is turned on and the audio signal is amplified and fed back to the FRG-7 volume control via YC12.

Several other points should be noted about the circuitry. Resistor YR5 is a log control operated in reverse and the value of YR6 ensures that best use is made of the log taper. If you have carried out the previous modifications then the old volume control will be ideal for this application. If not, note that a linear control can be used although the value of YR6 will have to be adjusted to bring the no-signal turn-off point to about 30 per cent of the track. Another feature concerns the capacitor YC9. Although the Schmitt trigger has sufficient hysteresis to stop it from chattering on marginal signals, this capacitor has been included to slug the switching rate of YTr4 and so soften the switching thump associated with this type of circuit.

The final point concerns the divider network YR12/17 which determines the amount of audio fed to YTr4. The values shown are optimised for the FRG-7 but if the unit is to be fitted to a receiver that needs extra audio gain, these values can be adjusted accordingly by increasing YR12 and reducing YR17.

## Construction and Fitting

A p.c.b. layout is given in Fig. 3.2, and this board matches the earlier one for the switched filter unit and fits the same stand-off panel. There is however no reason why other methods should not be adopted. Circuit layouts are not critical and the only point to watch is that there should be fairly short leads around YIC1. There is also, of course, no reason why only one of the circuits should be built.

*Practical Wireless, November 1984*

Assuming the circuit board is being fitted to the FRG-7, the logical way to switch f.m. will be to include it on the mode switch in the position occupied by the automatic noise limiter (a.n.l.). In the author's view the a.n.l. is not very effective anyway. The a.n.l. connection is on the outer wafer of the mode switch and it is only necessary to break one bridging link between two tags and connect the f.m. audio as shown in Fig. 3.3.

Once the tap-off point for the i.f. has been located, connection to the board should be made with a short piece of miniature coaxial cable.

Refer again to Fig. 3.3 and locate the audio coaxial cable which runs from the mode switch to the volume control. Disconnect this at the volume control and connect it to the a.f. input of the squelch. Use another piece of coaxial cable to connect the squelch output back to the volume control.

The problem now arises as to where to fit the squelch control. If you are using the old volume control then the easiest way round this is to remove the RECORD socket, widen the hole slightly and fit the control here. The RECORD socket leads can be extended and this facility resited on the back panel next to the loudspeaker socket.

Should you need to buy a potentiometer then a suitable miniature one is available from the Alps range stocked by Cirkkit (formerly Ambit International) who also have control knobs to fit the 6mm shafts of these components.

Finally it only remains for the circuit to be connected to the 10 volt stabilised supply available in the FRG-7.

## Setting-up and Testing

Assuming all connections have been checked, switch on the receiver and select f.m. Transformer YT1 must now be



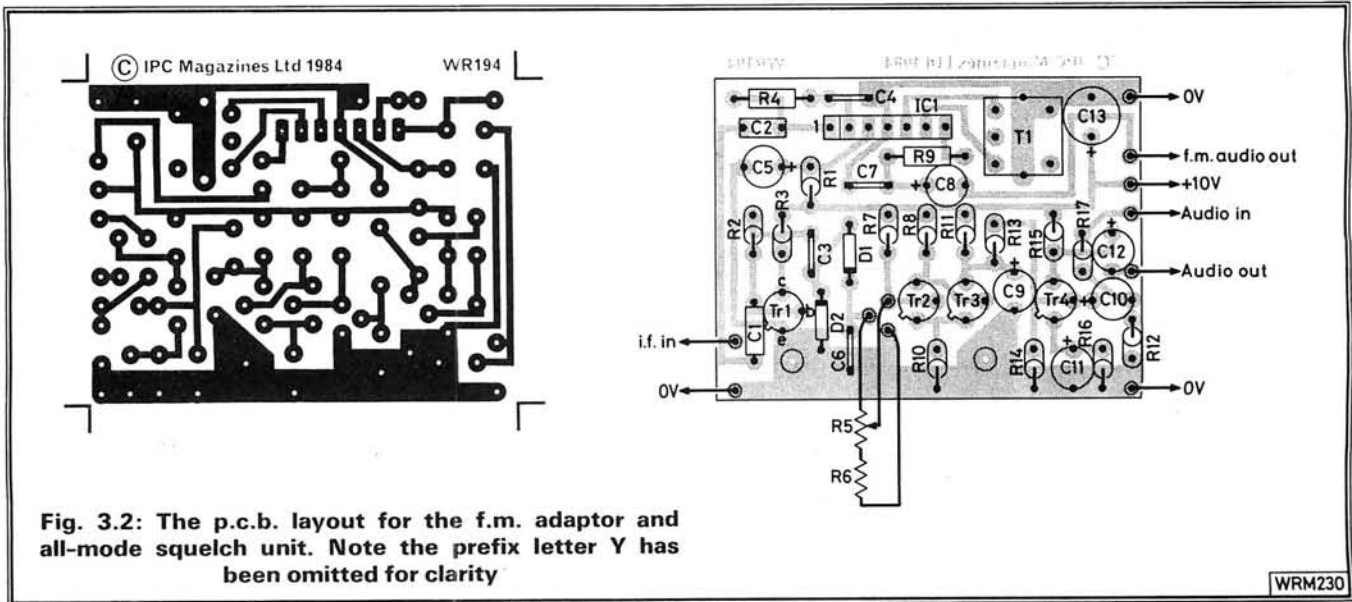


Fig. 3.2: The p.c.b. layout for the f.m. adaptor and all-mode squelch unit. Note the prefix letter Y has been omitted for clarity

### ★ components

#### Resistors

$\frac{1}{4}$ W 5% Carbon film

100Ω	1	YR1
390Ω	1	YR10
1kΩ	4	YR3, 6, 12, 16
2.2kΩ	2	YR4, 9
5.6kΩ	1	YR15
10kΩ	3	YR8, 11, 17
15kΩ	1	YR14
22Ω	1	YR7
100kΩ	2	YR2, 13

Logarithmic potentiometer (reverse)

10kΩ	1	YR5
------	---	-----

#### Capacitors

Miniature disc ceramic

100pF	1	YC2
270pF	1	YC1
10nF	3	YC3, 6, 7
47nF	1	YC4

Electrolytic 16V, radial

1μF	3	YC8, 10, 12
10μF	1	YC5
22μF	2	YC9, 11
100μF	1	YC13

#### Semiconductors

Diodes

1N4148	2	YD1, 2
--------	---	--------

Transistors

BC109	4	YTr1-4
-------	---	--------

Integrated Circuits

TA7130	1	YIC1
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#### Miscellaneous

Printed circuit board; i.f. transformer YRCS11098AC; miniature coaxial cable.

WRM243

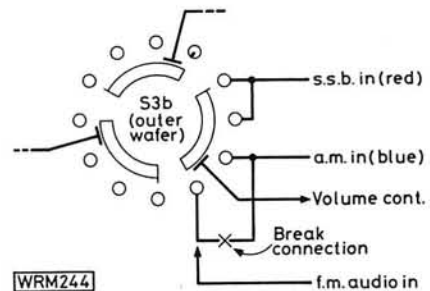
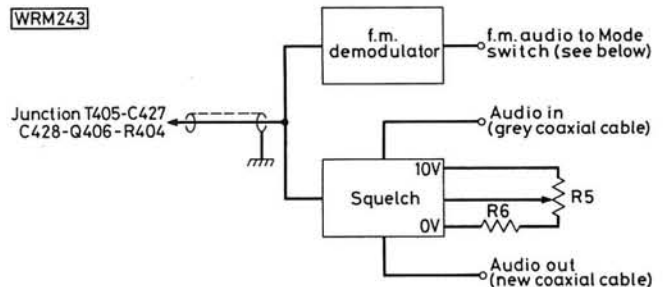


Fig. 3.3: Connection details for the new board to the FRG-7

peaked and the easiest way to do this is to find an f.m. transmission and trim it for the loudest and clearest audio output. In most areas a good source of f.m. transmissions is the UK CB service. Find a relatively weak signal and adjust YR1 for the best signal to noise ratio. Do not be surprised if some of the signals sound distorted, in the author's experience many CBers use badly adjusted accessories such as power microphones and echo boxes. However, if distortion is a persistent problem then refer to the section dealing with resistor R<sub>y</sub>.

If all is well with the f.m. stage now test the squelch. There should be a definite switch-off point with no signal and it should be found that with the squelch set to just off, even a signal that does not register on the S-meter should open the squelch "gate". If problems are encountered, check with a voltmeter that there is a definite voltage



swing at the "hot" end of YR5 when tuning through stations. The i.f. signal level at the last transformer of the FRG-7 is sufficiently high that the squelch/demodulator circuit has no noticeable loading effects. It should therefore not be necessary to re-trim T405 but if any effects are noticed it might be worthwhile adjusting the core and seeing if this cures the problem. With other receivers it may be necessary to make such adjustments and indeed if loading effects are marked it may be necessary to reduce the values of YC1/YC2, although this will de-sensitise both the f.m. and squelch circuits.

Once all is working, it only remains for the controls to be suitably marked. The neatest solution is to use white 3mm rub-down lettering on small strips of grey card and lightly stick these over the words AM/ANL and RECORD.

## Operating

Several of these demodulator/squelch boards have been built by the author and all are working well. The only operating points worth noting concern the squelch. This should be set carefully to the switch-off point as going beyond that will make the receiver deaf to all but the strongest signals.

There is no reason why the squelch should not be used on virtually any of the short wave bands although on the lower frequencies it will be found that QRM and QRN spikes are likely to trigger it.

One useful area where the squelch can be used to good advantage is when receiving RTTY, the control can be set so that the audio blocks at the end of the transmission so stopping the terminal from clattering on background hash.

# Swap Spot

Have 1937 HMV model 540AC cabinet radiogram, 1953 Marconi T19A table radio, both in good order. Also have Celestion UL8 40W speakers. Would exchange for Olympus OM10, Fuji STX, Minolta SRT 100 or Rotel/Akai stereo deck. Schomburgk, 2 Duchess Close, Whitechurch, Reading RG8 7EN. Tel: Pangbourne 3181. **W999**

Have Yaesu FRG-7 complete with Amtech 200 a.t.u. and 144MHz converter, also Codar AT5 60-180 metre TX with p.s.u. All in v.g.c. Would exchange for 144MHz transceiver. Jeff G6ZGU. Tel: 01-439 6512 (day) 01-803 5235 (evenings). Note NOT QTHR. **W001**

Have Microwave Modules RTTY to TV converter and IC-2E with charger, ICBP3, BP4, DC1, HM9, LC3. Would exchange for FT-290R/MuTek, Sinclair 48K Spectrum. Tel: 0277 354378 (Essex). **W002**

Have Pentax K1000 camera, 50mm, 28mm, 135mm Pentax series M lenses, DOI 7-element 2x converter. All immaculate boxed condition plus cases. Would exchange for R1000, R600, FRG7700 or similar direct readout receiver. Tel: 01-309 1295. **W012**

Have SBE Opti/scan model 12SM, Eddystone 358, Grundig 3400, Daiwa SR-9 (144MHz). Would exchange for pair Quad Bronze els's, SME pick up arm, Myford machine tools/equipment, Bolex 16mm cine equipment, Stuart Turner steam models/fittings. Tel: 0296 622725 (Bucks). **W013**

Have Yaesu FRG-7 receiver fitted 4kHz filter, Tandy Patrolman 50 receiver, Plustron TVR5 TV/radio, BSR-McDonald MP60 record deck. Would exchange for Telereader CWR610E, MuTek BBA500U wideband pre-amp, good discone. Graeme. Tel: 0642 318451 evenings (Middlesbrough). **W023**

Have Fidelity 3 waveband radio. Would exchange for service info, circuit diagram of Magneta public address transistor amplifier PA100. Martin, 18 High Street, Dover. Tel: 206048. **W024**

Have Edgcombe 500V Metrohm appliance, earth continuity, etc., testmeter, with case and leads. Used value over £100. Would exchange for anything useful radiowise, not necessarily same value. Home-brew equipment acceptable. Dave. Tel: Stoke-on-Trent 721904. **W035**

Have complete TV station for 430MHz TV—TX plus camera plus lens plus TV monitor. Would exchange for good condition FT-290. G4GIQ QTHR. Tel: Northwich 45584. **W054**

Have Daiwa Auto ATU CN1001, as new. Also have TR2500 144MHz hand-held with speaker mic, soft case, d.c. power lead, all boxed. Would exchange for h.f. beam, 430MHz gear, h.f. linear, or w.h.y. Dave G4WBB. Tel: 0709 67471 (Rotherham). **W055**

Have Trio 2400 hand-held, home charger, car charger, leather case, speaker mic, Welz SP15M s.w.r. meter, 9 amp p.s.u., Welz 2-way antenna switch and Drae v.h.f. wavemeter. Would exchange for good computer—not Sinclair. Brian. Tel: 051-264 9860 (Liverpool). **W057**

Have Honda 90cc motorcycle "S" registration plus Casio 602 electronic organ as new. Would exchange for 934MHz transceiver. Rowe, 7 Arrowcroft Road, Guilden Sutton, Chester. **W068**

Have FRG-7700, 10hrs use. Cost £365. Would exchange for best computer system offered. Elvin. 214 Horninglow Road, Firth Park, Sheffield S5 6SG. **W071**

Have Sony IC2001 h.f. receiver, all mode, memory, etc. New £180. Also have Olympus OM30 camera f:1.8 s.l.r., OM winder, OM in focus trigger cord, Ozyeck 2x multiplier and straps, holdall, etc. All in v.g.c. Would exchange for any h.f. transceiver. Martin. Tel: Northampton 719233. **W089**

Have Waltham Music Centre, tuner and amplifier in good working order, tape and record decks in need of slight repair. Would exchange for general coverage receiver (FRG-7 or similar) or 144MHz beam and rotator or w.h.y. Tel: 0926 57234 (Kenilworth). **W111**

## PW "SWAP SPOT"

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G4? In fact, have you got anything to trade radio-wise?

If so, why not advertise it FREE in our new feature SWAP SPOT. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless*, Westover House, West Quay Road, Poole, Dorset BH15 1JG, for inclusion in the first available issue of the magazine.

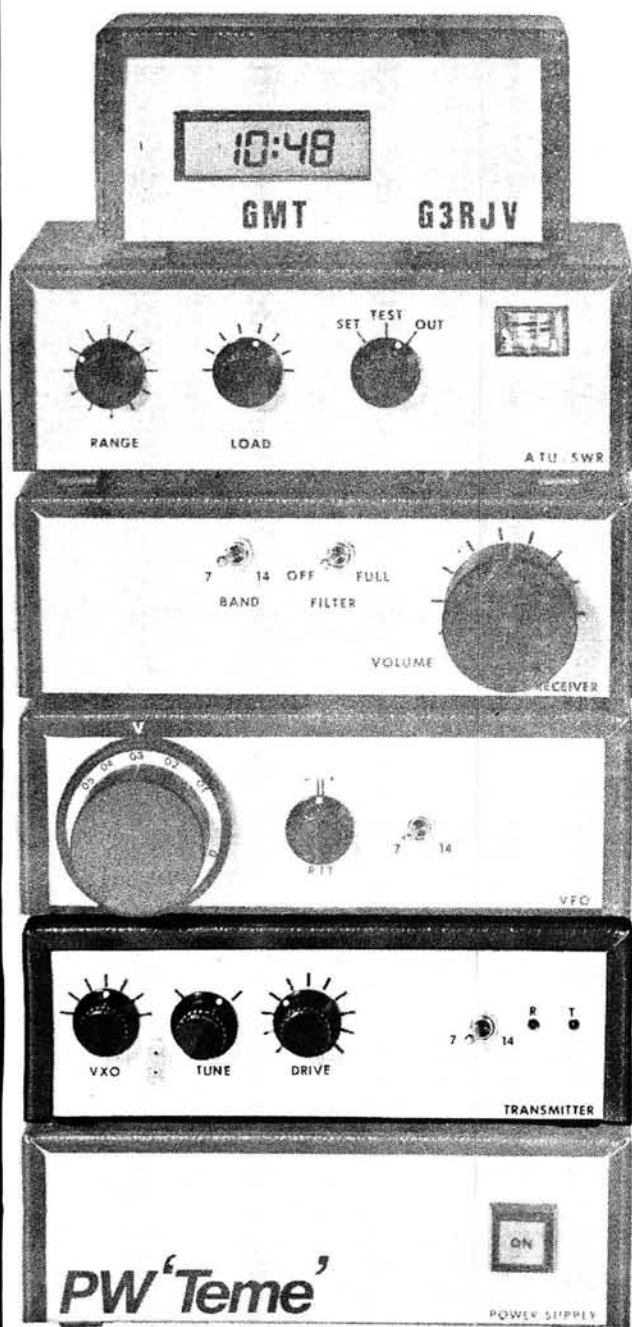
**A FEW SIMPLE RULES:** Your ad. should follow the format of those appearing above; it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale—and one of the items MUST be radio related. Adverts for ILLEGAL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



# PW'TEME' Modular QRP Transceiver

Part 1 by  
Rev. George  
Dobbs G3RJV

THIS MONTH'S  
TRANSMITTER



In the twenty or so years that I have held an amateur radio licence the ethos of the hobby has changed completely. I actually recall when radio amateurs boasted about how cheap their station was and now, so often, the reverse is true. Recently I was answering questions from a group of RAE Candidates and found that they really only had two questions to ask, "What should I buy?" and "How much is it going to cost me?" Yet in spite of the current trends in the hobby it is possible to participate fully and have a lot of enjoyment from the use of relatively simple low-power, home-made equipment. Hundreds of pounds and hundreds of watts are not required on the h.f. bands. As William of Occam (1290-1350) said,

"It is vain to do with more,  
what can be done with less."

This series of articles will describe a progressive h.f. c.w. amateur radio station for the popular 7 and 14MHz bands which can be built by the average constructor at low cost using easily obtainable components. The project takes the form of a series of add-on modules. It begins with a basic transmitter, which can be used in its own right, then further modules are added to build up to a reasonably sophisticated and highly usable amateur radio station. So right from the beginning, with the construction of the first module, the constructor has something which can be used. It is then up to the individual to add modules according to taste, ability or pocket. Each module is housed in an identical smart case. The cases are stackable, as the station grows, and smart enough to grace any room in even the most fastidious home.

## The Modules

The make-up of the final station when all the modules are completed is shown in Fig. 1.1. The basic unit is a transmitter for the 7 and 14MHz bands (with a 10-1MHz option, if required). The transmitter module also contains the changeover (transmit/receive) control circuitry which produces a number of switched power lines for controlling sections of the other modules. These lines are distributed to the various modules via a standard 5-pin DIN plug and socket on each box. The transmitter is low powered (QRP) having a drive control which can give an r.f. output from nothing to 3 watts. That might seem very low but some avid QRP operators would regard 3 watts output as being too much for them!

The basic transmitter is a variable crystal oscillator (VXO) circuit which only allows limited frequency coverage, so the second module provides a variable fre-



quency oscillator (v.f.o.) to enable the c.w. portion of the bands to be covered. The v.f.o. is on 7MHz, and a doubler on the same board allows for a 14MHz output. These two modules together give a very useful transmitter for two amateur bands and, used in conjunction with an existing receiver, could make up a viable station. This would provide a lot of satisfaction from making contacts with a home-made transmitter. But why stop there? Confound the opposition by adding the receiver module and operate a completely home-made station. The existing v.f.o. and doubler are used, together with a direct conversion receiver board to provide full transceiver facilities. The common selectivity problems usually associated with direct conversion receivers are minimised by good front end tuning and a built-in, two-position audio filter.

The station may be completed by adding a stabilised 12 volt power supply unit to save the inconvenience of battery supplies. The supply is made compact by using a toroidal mains transformer. It is well smoothed to overcome the hum problems sometimes apparent when using a direct conversion receiver on a mains operated power supply. The final module contains a standing wave ratio (s.w.r.) meter for tuning up the transmitter and an antenna tuning unit (a.t.u.) to enable a wide range of antennas to be used with the transceiver. The a.t.u. assumes the use of an end-fed piece of wire as an antenna but alternative circuits (that will fit the case) are discussed for other configurations.

The whole project is easy to build, costs very little—in fact the cost is spread out because of the modular approach. NO SPECIALISED TEST EQUIPMENT IS REQUIRED to build any of the modules. The constructor only requires a reasonable bench multimeter, in the 20 000 ohms per volt class, an existing amateur bands receiver to identify the signals in the early stages of construction, and a simple diode probe, which is built as part of the project. If a newcomer is thinking of buying a multimeter for this project, all that is required is a medium priced analogue meter (one with a needle scale) rather than a digital meter. As with a lot of amateur construction work, we will be using the meter to measure changes and peaks, rather than exact finite readings, and such changes are better seen in the swing of a needle.

## The Transmitter Circuit (Module 1)

The circuit for the transmit module is shown in Fig. 1.2. The amateur radio literature is full of circuits for, and myths about, little crystal-controlled transmitters. Many are much simpler than this circuit but practice shows that over-simplified transmitter circuits can be prone to all manner of problems. The power amplification section (1Tr2 and 1Tr3) comes from a conversation I had with Wes Hayward W7ZOI, the doyen of QRP circuit design, when we met in Houston at the ARRL Convention in 1983. This broadband amplifier circuit uses negative feedback in both stages, is very stable and easily reproducible without problems. The DRIVE control, 1R5 allows for a power range of zero to 3 watts of r.f. output using the sturdy BLY33 transistor in 1Tr3.

The oscillator stage, 1Tr1, is a simple crystal oscillator using a fundamental frequency crystal, for the 7 or 14MHz bands, as a feedback element. The series variable capacitor 1C2 allows some frequency shift in the oscillator. The amount of frequency offset available from 1C2 will vary according to the band and specific crystals. A tuned circuit, 1L1 and 1C3, tunes out the 7 or 14MHz signal according to the band in use and link winding 1L2

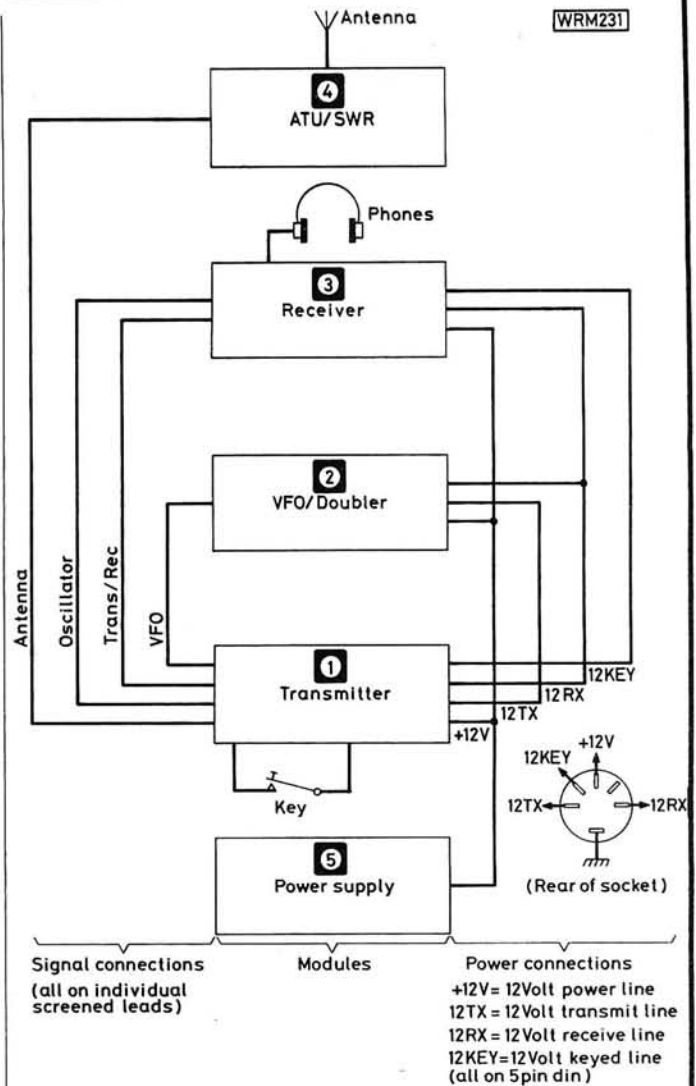


Fig. 1.1: The PW "Teme" modular transceiver system interconnection arrangements

To avoid confusion between the several modules making up the PW "Teme" project, each has been numbered as follows:

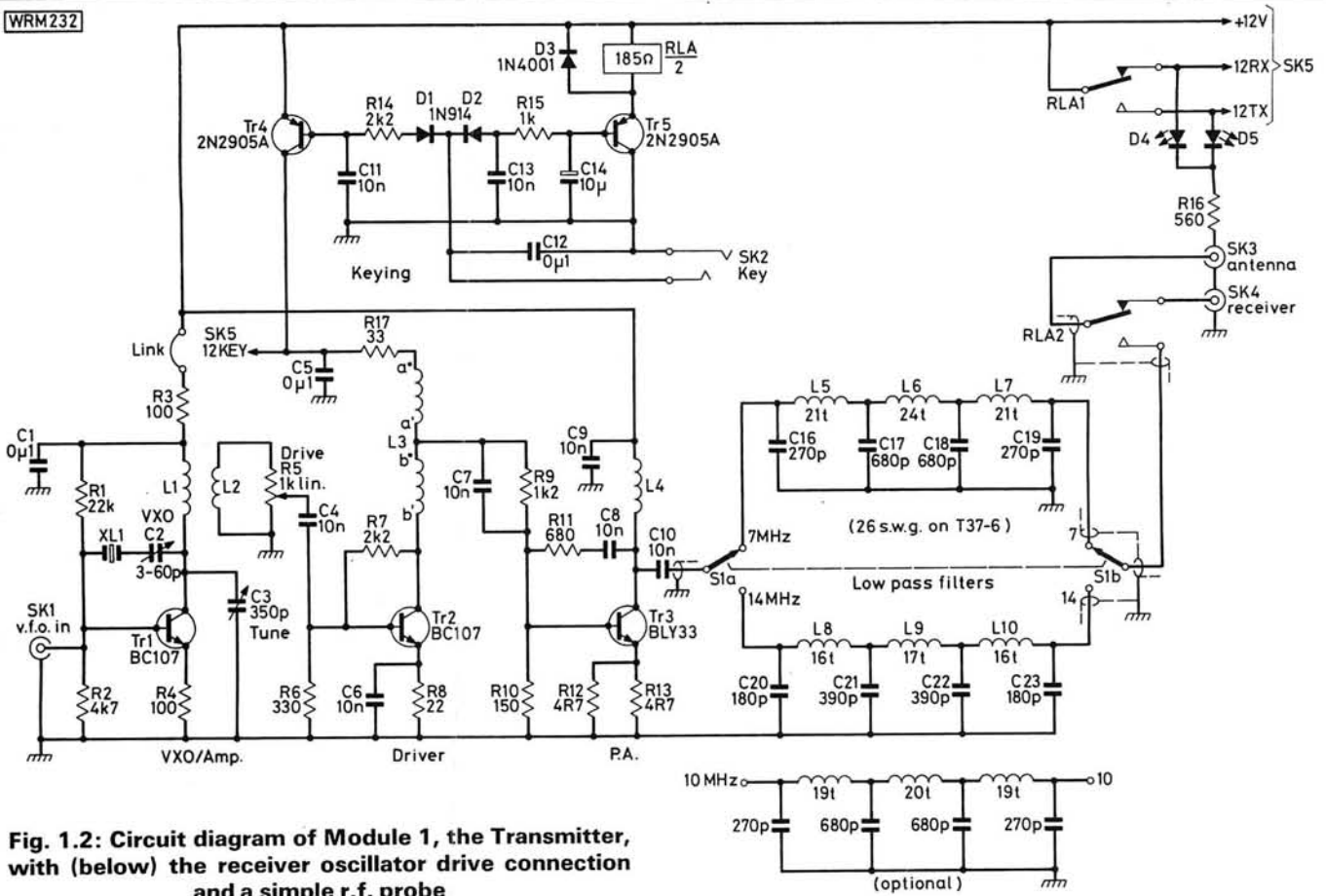
Transmitter	Module 1
VFO/Doubler	Module 2
Receiver	Module 3
ATU and SWR Bridge	Module 4
Power Supply	Module 5
Digital Clock	Module 6

Each drawing and components list will state which module number it refers to. In the text, component references will be prefixed by the module number. For example, resistor R9 in the Transmitter Module would be called 1R9, while R9 in the Receiver Module would be 3R9.

feeds the DRIVE control, 1R5, a 1kΩ linear carbon potentiometer.

The driver stage, 1Tr2, is coupled via a wideband matching transformer, 1L3, into the power amplifier (p.a.) stage, 1Tr3, which requires a heatsink of the "star type" designed for a TO-5 transistor case. The collector load, 1L4, is a small r.f. choke wound from a few turns on a small ferrite bead. Capacitor 1C10 then couples the output





**Fig. 1.2: Circuit diagram of Module 1, the Transmitter, with (below) the receiver oscillator drive connection and a simple r.f. probe**

into switchable low-pass filters. A double-pole change-over switch, 1S1 selects either the 7 or 14MHz filter.

The low-pass filters are seven-segment, standard value capacitor filters of the type popularised by Ed Wetherhold W3NQN. Simpler methods can be used to tune the output of a QRP transmitter but harmonic suppression is important even in low power transmitters. These filters, based upon the computer standardised values of W3NQN, are compact, inexpensive and provide high harmonic rejection with little attenuation of the output. The values required are listed in the chart of Fig. 1.4. The correct toroid cores and good quality silvered mica or polystyrene capacitors must be used for these filters.

Two d.c. switching transistors, 1Tr4 and 1Tr5, provide the keying and change-over control circuits for the module. Note that 1Tr4 and 1Tr5 are *pip* transistors. The key operates both 1Tr4 and 1Tr5 through 1D1 or 1D2. When the key is down, +12 volts is switched onto the collector of 1Tr4 which keys the transmitter through the driver stage 1Tr2. A little shaping to improve the keying characteristics is provided by 1C12, 1R14 and 1C11. Also when the key is down 1Tr5 conducts and energises the d.p.c.o. relay 1RLA/2. The electrolytic capacitor 1C14 holds the contacts of 1RLA in the energised position for a small interval of time. The changover from transmit to receive is controlled by 1RLA, a form of semi-automatic break-in is the result.

When keying begins the circuits switch to the transmit condition and will not release from this condition until the

key has been released. The delay caused by 1C14 allows the transmit condition to prevail during normal keying speeds so that the relay does not chatter in and out with every action of the key. The delay speed can be adjusted by changing the value of 1C14. The relay changes the antenna over from the receiver to the transmitter. It also switches a 12 volt line to provide a 12 volt receive (12 RX) or a 12 volt transmit (12 TX) control voltage. These lines are used in later modules as is the 12 volt keyed (12 KEY) line taken from the collector of 1Tr4. The 12 TX and 12 RX lines are also used to switch two small l.e.d.s, 1D4 and 1D5, which give a front panel indication of the status of the transmit module.

## Construction

The transmit module is built on one printed circuit board. The layout is shown in Fig. 1.3. The transmit board is best built a section at a time beginning with the oscillator stage, 1Tr1, so that each stage can be tested in turn. The only test equipment required is a multimeter with a simple r.f. probe and perhaps a station receiver. The circuit for the r.f. probe is shown in Fig. 1.2(b). This probe is used in conjunction with a multimeter. The probe tip is placed upon a part of the circuit and the ground clip is connected to the ground end of the circuit or the transmitter case. The r.f. signal is converted into a d.c. voltage by 1D6 and 1D7. This represents a peak-to-peak reading of the r.f. voltage present at the probe and can be used for checking the presence and progress of the r.f. signal. The prototype r.f. probe was made on an offcut of printed circuit board material, the simple track pattern being cut with a lino cutter blade. A small piece of Veroboard could be used instead. The leads to the multimeter must be screened to



# ★ components

## MODULE 1 TRANSMITTER

### Resistors

$\frac{1}{4}$ W 5% carbon film

4.7 $\Omega$	2	R12,13
22 $\Omega$	1	R8
33 $\Omega$	1	R17
100 $\Omega$	2	R3,4
150 $\Omega$	1	R10
330 $\Omega$	1	R6
560 $\Omega$	1	R16
680 $\Omega$	1	R11
1k $\Omega$	1	R15
1.2k $\Omega$	1	R9
2.2k $\Omega$	2	R7,14
4.7k $\Omega$	1	R2
22k $\Omega$	1	R1

Potentiometer, carbon track

1k $\Omega$ (lin)	1	R5
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### Semiconductors

#### Transistors

BC107	2	Tr1,2
BLY33	1	Tr3
2N2905A	2	Tr4,5

#### Diodes

1N914	4	D1,2,6,7
1N4001	1	D3
3mm l.e.d.s	2	D4,5

#### Inductors

L1-10 See text and Fig. 1.4

#### Miscellaneous

Phono sockets (4); 2-pole  $\frac{1}{2}$ in jack; 5-pin DIN socket; Crystal holder, HC25U; Relay d.p.c.o., 12V 185 $\Omega$  coil, "Continental" type (Maplin FX27E or similar); Switch d.p.c.o. min. toggle; Heatsink, push-fit TO-5 for Tr3; Printed circuit board; Case, see text and Buying Guide; Feet, knobs (3), etc.

### Capacitors

#### Miniature ceramic plate

10pF	1	C15
10nF	10	C4,6-11,13,24,25
0.1 $\mu$ F	3	C1,5,12

#### Polystyrene or silvered mica

180pF	2	C20,23
270pF	2	C16,19
390pF	2	C21,22
680pF	2	C17,18

#### Electrolytic, 16V double-ended

10 $\mu$ F	1	C14
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#### Variable

350pF (see text)	1	C3
60pF (see text)	1	C2

## BUYING GUIDE

**Crystals:** Amateur Band crystals for the transmitter may be obtained from P. R. Gollidge Electronics, Merriott, Somerset for 7030 and 14 060kHz (QRP Calling Frequencies) and 14 030, 14 040 and 14 050kHz. These are HC25U crystals priced at £4.00 each (£3.50 each for a G-QRP Club Member) including VAT and postage.

**Toroid Cores:** All the toroid cores for the transmitter can be obtained from SMC(TMP) Unit 27, Pinfold Workshops, Pinfold Lane, Buckley, Clwyd CH7 3PL, (0244) 549563, or from Cirkit. Please note, with the exception of L3, the toroids are **iron powder**, not ferrite cores. Most unmarked surplus toroid cores are ferrite.

**Cases:** The J6 Instrument Case is available from Minffordd Engineering, Sun Street, Ffestiniog, Gwynedd L141 4NE. (076676) 2572.

**P. A. Transistors:** The BLY33 is available from BCD Electronic Services, 200 Hesse Road, Hull, (0482) 225437, or Heller Electronics Ltd., 49 Blossom Way, Hounslow, Middlesex TW5 9HB. Other similar transistors could be substituted.

**Front Panel Legends:** Water slide transfers (in white only) of amateur radio legends are available from John Kaine, 74 Campden Mews, London N1 9BX for £1.25 a sheet, inc postage.

prevent stray r.f. pick-up. All the measurements for the prototype were made with this probe and an inexpensive 20 000 ohm per volt multimeter.

The variable capacitor required for the oscillator frequency shift control vx0 has a value of some 3-60pF and that used in the prototype was made from a semi-airspaced trimmer, being a much cheaper alternative than an airspaced variable capacitor. (*Note: Some of these semi-airspaced trimmers tend to have a very short life if moved frequently—Editor*). The trimmer is mounted onto an offcut of Veroboard and a short piece of 6mm ( $\frac{1}{4}$ in) diameter shafting (in the prototype, excess from the potentiometer 1R5) is counter-bored and glued onto the screw-driver control of the trimmer. This is shown in Fig. 1.5. The crystal, 1XL1 is held in an HC25U crystal holder on the front panel. Coils 1L1 and 1L2 are wound onto a single T37-6 toroid core as shown in Fig. 1.4. The main winding, 1L1 should occupy some 80 per cent of the core, each time the wire passes through the centre of the core counts as one turn.

The output tuning capacitor for 1Tr1, 1C3, covers the 7 and 14MHz bands with 1L1. This variable capacitor is a polycon semi-airspaced type of the sort used in cheap Far Eastern a.m. radios. This could be culled from such a radio but ensure there is enough control shaft to take a knob. A suitable variable capacitor can be bought from Cirkit (type CY2-3217Z). Usually such capacitors have two sections of some 350pF and may have smaller sections for f.m. tuning. Using an ohmmeter, identify the connection which is common with the shaft and join that tag to ground. Inspect the capacitor to identify a tag that goes to the fixed vanes of a large tuning section and connect that tag to 1L1.

Build the first stage as far as 1R5 and test that the oscillator works. Set the r.f. probe up with a multimeter on a low voltage scale (say 10 volts). Insert a 7MHz band fundamental crystal in the crystal socket and apply 12 volts to the top of 1R3. Attach the probe to the top end of 1R5 and adjust 1C3 until the voltmeter indicates a peak reading, which will probably be in the order of 3.5 volts. The signal can also be located on a receiver capable of tuning the frequency of the crystal. The same test can be tried with a 14MHz band fundamental crystal. Again it should be possible to obtain an output peak using 1C3.

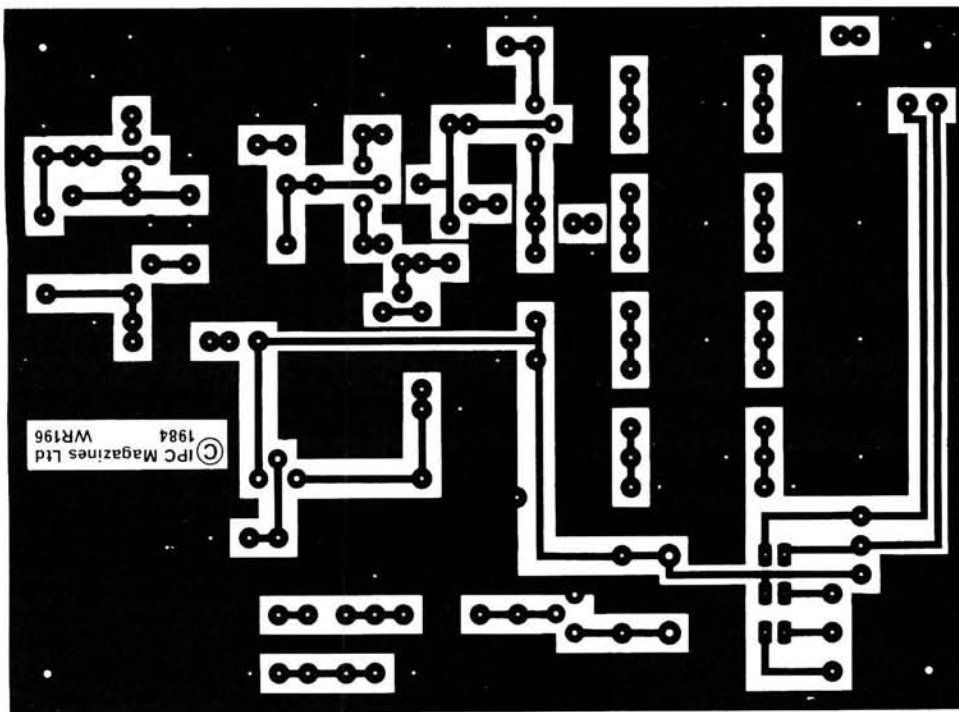
Approximate  
Cost

£ 23

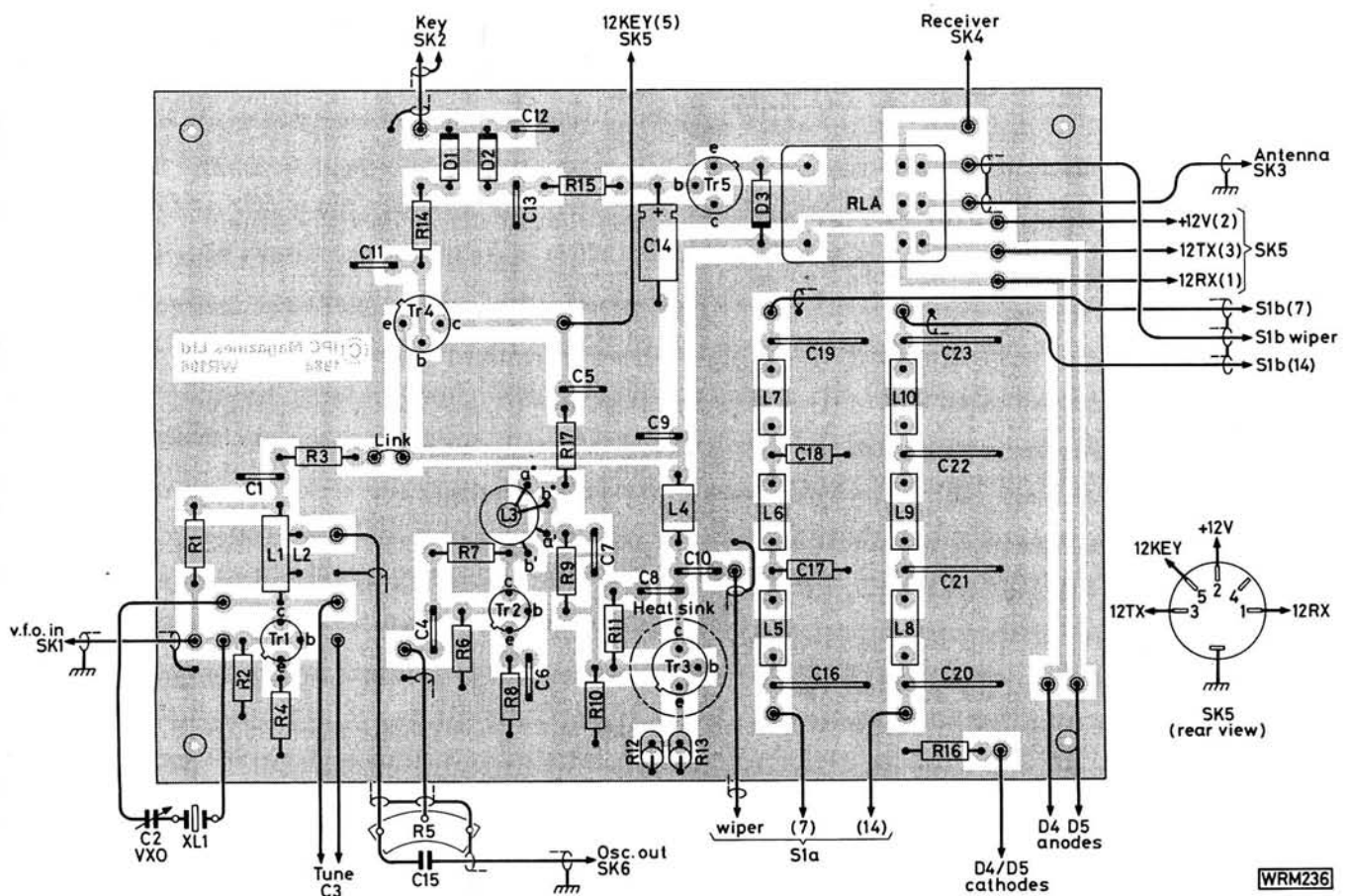
Construction  
Rating

INTERMEDIATE





Readers who intend to operate the *PW* Teme should be in possession of the appropriate licence issued by the Department of Trade and Industry to those who have passed the City and Guilds Radio Amateurs' Examination. Details may be obtained from: The Department of Trade & Industry, Radio Regulatory Department, Amateur Licensing Section, Waterloo Bridge House, Waterloo Road, London SE1 8UA.

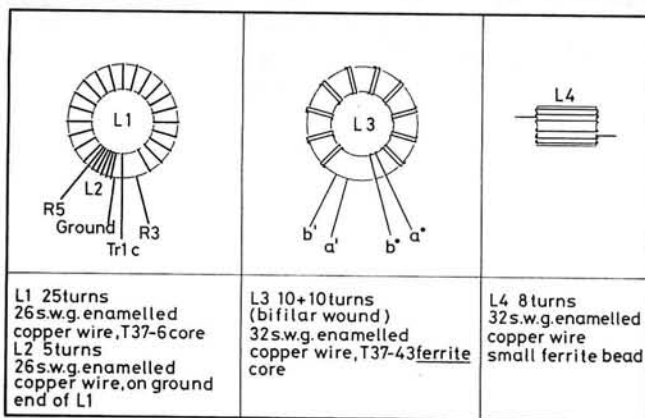


**Fig. 1.3: Full-size printed circuit track pattern and component layout and wiring diagram for Module 1, the Transmitter**

The driver stage may now be constructed as far as 1R10. The transformer 1L3 is wound on a ferrite core with a bifilar winding. The T37-43 core is ideal but almost any surplus small ferrite core would serve in this position.

A bifilar coil is wound by making two windings side by side over the small core. Take enough wire to wind two windings of 10 turns around the core. Place the wires side by side and twist them together, making roughly 8 twists per inch. The 10 turns are then wound onto the core. The start and finish of both windings must be identified using the ohms range on a multimeter and connected as shown in Fig. 1.2. With the oscillator working and peaked for





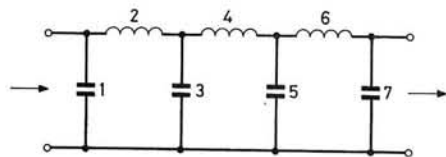
L1 25turns  
26s.w.g.enamelled  
copper wire,T37-6core  
L2 5turns  
26s.w.g.enamelled  
copper wire,on ground  
end of L1

L3 10+10turns  
(bifilar wound)  
32s.w.g.enamelled  
copper wire,T37-43ferrite  
core

L4 8turns  
32s.w.g.enamelled  
copper wire  
small ferrite bead

WRM238

7-ELEMENT LOW-PASS FILTER COMPONENTS



WRM239

ELEMENT	1	2	3	4	5	6	7
BAND							
7MHz	270 pF C16	21 turns L5	680 pF C17	24 turns L6	680 pF C18	21 turns L7	270 pF C19
14MHz	180 pF C20	16 turns L8	390 pF C21	17 turns L9	390 pF C22	16 turns L10	180 pF C23
Optional 10.1MHz	270 pF	19 turns	560 pF	20 turns	560 pF	19 turns	270 pF

INDUCTORS: 26 s.w.g. enamelled wire on T37-6 toroid cores  
CAPACITORS: Silvered mica or polystyrene types

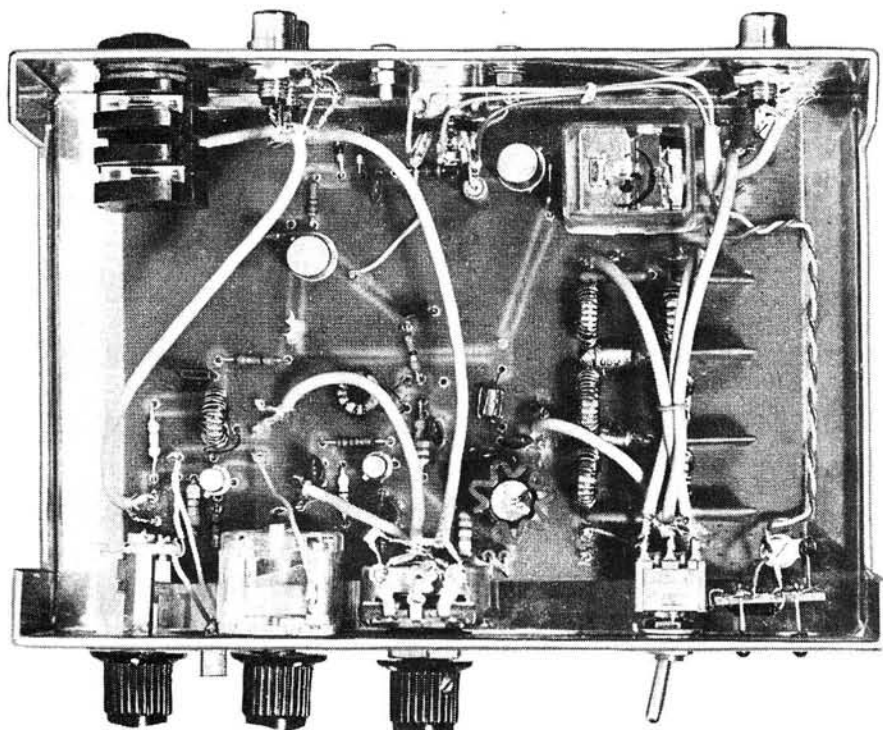
Fig. 1.4: Inductor and filter details for Module 1, the Transmitter

maximum output, 12 volts are applied to the top of 1L3 and the r.f. probe is connected to the top of 1R10. The output should be in the order of 10 to 11 volts.

The power amplifier stage is added with the r.f. choke being wound on a small ferrite bead as shown in Fig. 1.4. The output of the whole transmit board may now be checked with the r.f. probe. Transistors 1Tr1 and 1Tr3 take a common 12 volt line and 12 volts must be applied to 1Tr2 at the top of 1L3, as it will be when the transmitter is keyed. The p.a. stage requires a dummy load for the test, in fact the transmitter should not be operated without a load for the sake of the health of 1Tr3! A suitable load can be made from a non-inductive resistance of around 50 ohms. Two 100 ohm, 2 watt, carbon resistors in parallel would be suitable. Connect the r.f. probe across the dummy load to check the output of the p.a. The output will depend upon the DRIVE control, and could be in excess of 3 watts output with high drive. Rough equivalent readings to r.f. output in watts are: 3 watts output about 21 volts, 2 watts output about 17 volts, 1 watt output about 12.5 volts.

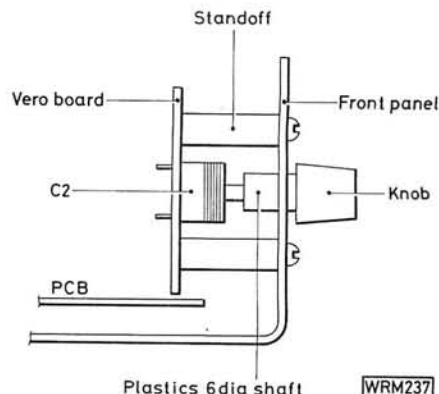
The low-pass filters are constructed from the chart in Fig. 1.4. The basic transmit board requires a filter for 7MHz and 14MHz. These are selected by a double-pole, change-over, miniature toggle switch, 1S1. The connections between the p.a., the switches and filters must be made with screened leads. The transmit board is capable of use on the 10.1MHz band with a suitable crystal and setting of 1C3. Although this band will not be used in the final project, values for the 10.1MHz band are given in the chart in Fig. 1.4 should the constructor wish to use the basic transmit module on this band.

The change-over and control circuit around 1Tr4 and 1Tr5 is best built and tested with a voltmeter before being used to control the transmitter. The relay, 1RLA/2, is a small 12 volt, 2-pole, change-over, relay with coil resistance around 185 ohms. When the circuitry around 1Tr4 and 1Tr5 has been completed and power applied, operating the key should cause the relay to come in when keying begins. The relay should remain closed until keying is stopped. Using the stated value for 1C14, the relay still remains closed at keying speeds as low as 8 words per



G-QRP Club

A specialist group for users and builders of Low Power Equipment. Details from: Fred Garrett G4HOM, 47 Tilshead Close, Druids Heath, Birmingham B14 5LT.



WRM237

Fig. 1.5: Using a semi-airspaced trimmer for the VXO control (see text)



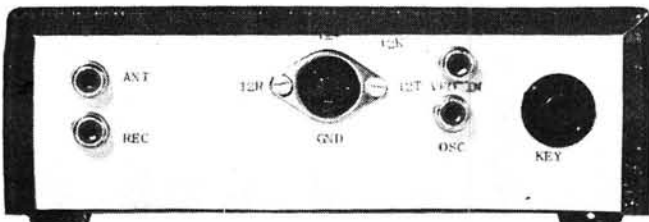
minute. Also check that as the key is operated 12 volts appears at the collector of 1Tr4 in sympathy with the keying action. The interconnections for the control system can now be added. The antenna change-over section must be wired with screened leads and the 12 volt lines, +12V, 12 RX, 12 TX and 12 KEY are connected to a 5-pin DIN Socket, as shown in Fig. 1.1, for control lines in future modules. The transmit/receive indication l.e.d.s are mounted in small holes in the front panel.

When the receiver module is added, it requires oscillator injection from the transmitter board. If this module is to be built later it is best to add the oscillator output socket when building the transmit module. The circuitry required is shown in Fig. 1.2(a). The oscillator output is taken from the top of 1R5 via a 10pF capacitor and screened lead to an output socket. All the signals leads in the PW "Teme" use the small standard phono plugs and sockets which are cheap and more than adequate for the purpose.

The photographs show the module layout. One standard case is used to house each module through the whole project, this being the inexpensive J6 Instrument Case sold by Minfordd Engineering. This case measures 152 x 102 x 51mm (6 x 4 x 2in) has an aluminium base and front/back panels with a pvc coated lid. The type I used had a rich deep brown pvc coated lid. I therefore used a lighter tone brown for the front panel. The front panel is made in the manner I have used for many years to give an attractive finish. When the front panel has been drilled to hold the controls, these are then removed. A piece of suitable thin card (pale brown in my example) is cut to fit the front panel. The positions of the holes are marked on the reverse of the card and cut out with a small pair of pointed scissors or modelling knife. The lettering is added with rub-down letter transfers and the card is lightly attached to the metal panel with "Pritt" glue. The whole front panel is then covered with a layer of transparent sticky-backed plastics film, of the sort used to cover books. This provides a durable, attractive finish and protects the lettering. A sharp knife removes the surplus plastics film from the holes and the controls are replaced. Care must be taken when tightening up control mounting screws not to bear down too tightly upon the plastics film and cause unsightly wrinkles. The whole effect is smart and durable and far superior to the usual amateur application of car aerosol paint and lettering. Constructors using dark coloured, or black, front panels could use the excellent water slide transfers of amateur radio legends which are now available for front panels.

## Using the Transmit Module

The transmitter may be used as a viable QRP rig in conjunction with an existing receiver. The receiver interconnects with the transmitter via the change-over circuitry for antenna, transmitter and receiver. The receiver may require some form of internal muting, although at these power levels just changing over the antenna and turning down the gain controls may be enough. In fact this method



A rear-panel view of the completed Transmitter module

allows the receiver to monitor the keying of the transmission. One problem is that in the circuit shown in Fig. 1.2 the oscillator stage is on the whole time and may be heard on the receiver during reception. This can be solved by making use of the link in the printed circuit board between the top of 1R3 and the +12 volt line. Remove this link and connect the top of 1R3 to the 12 TX line. This will mean that the oscillator is only switched on when the transmitter is in the transmit mode. This connection must be restored to the original circuit arrangement when the transmitter is used in conjunction with the later modules.

Operating a low-powered transmitter on the amateur bands can be great fun. Added to the challenge is the satisfaction that the transmitter is home-made. Although the signal is likely to be some two S-units down on the average UK amateur signal, the user will soon be surprised what can be worked at these power levels. The transmitter is designed for a 50 ohm termination and like most modern transmitters must be used into an antenna with a characteristic impedance of 50 ohms, such as dipole or beam, or matched to the antenna with an antenna tuning unit (a.t.u.). The vxo control should give enough frequency offset to allow stations slightly off the fundamental frequency of the crystal to be called. QRP operation can be very addictive as the 2000-plus members of the G-QRP Club will confirm. For the low outlay, this little transmitter module should provide a lot of enjoyment. ●

## NEXT MONTH

### The Variable Frequency Oscillator

# Swap Spot

Have Icom IC2E, hardly used. Would exchange for Realistic DX302 or R-600 communications receiver. Tel: 02576 2126. W218

Have 2 Hitachi colour video cameras, zoom lens, etc. One v.g.c. other for parts. Would exchange for Epson printer, FRG-7, 144-430MHz transverter or w.h.y. Tel: 031-660 4180 (days). W245

Have Vic 20 CPU, C2N Datasette unit, p.s.u. and all cables, Introduction to BASIC Pt. 1 and 16K RAM pack, cartridges and cassettes. Value over £300 when new. Would exchange for FRG-7700 or w.h.y. Tony. Tel: 0478 2548—RAE student. W246

Have CR2021 portable Uniden 0.15—29.999MHz plus f.m., 2 months old. Would exchange for a similar receiver non-portable. Must be suitable for RTTY, cash adjustment as required. G. Dutton, 40 Grafton Road, Harwich, Essex CO12 3BD. W260

Have WW-II Navy receivers, B.29 and B.41, also have Specto 16mm film projector, 2-speed, 16 & 2 f.p.s. and still. Would exchange for vintage wireless items, crystal set or components. Tel: Brighton 737076. W261

Have Super 8mm Sound Cine outfit, camera f:1.2 5x zoom, projector, screen, tripod, editor/splicer. Would exchange for automatic a.t.u. G3AAH. Tel: 021-451 3369 (Birmingham). W280

Have Chinon CM3 camera and various accessories including large powerful flash unit. Also have Realistic PRO-47 scanner with 6 crystals fitted. Would exchange for 144MHz transceiver, would prefer multimode as just passed RAE. Don. 9 St. Annes Park Road, Bristol BS4 4DT. Tel: 773390. W297





## PROTECTION—2

Last month I talked about how to protect receiver input circuits from damage caused by r.f. energy picked up on the receive antenna from an associated transmitter.

The arrangements I showed in the drawings in Part 1 all rely on a relay coil being energised when the transmitter is keyed. A better way is to have the relay contacts connected up so that the receiver is protected when the relay is de-energised, and works normally when the relay is energised. The circuit of Fig. 7 shows how this can be done, using the "back" contact of a Morse key or the "rest" contact of a changeover press-to-talk (p.t.t.) switch. The supply marked +V comes from the receiver power unit, so when the receiver is switched off and the supply disappears the receiver is protected.

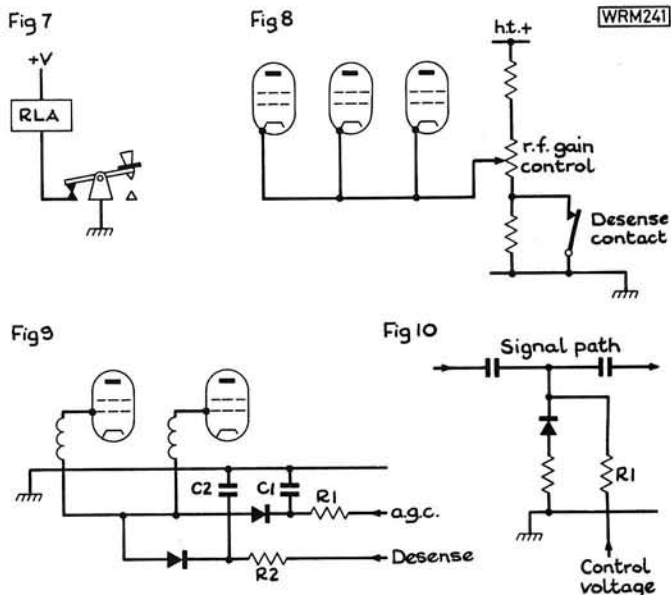
So, we have protected the receiver input, but connecting and disconnecting the antenna with the receiver operating at normal gain levels will cause loud "crashing" noises in the loudspeaker or headphones. What is needed is a way of reducing the receiver gain each time the transmitter operates. To stop the crashing noises, the gain must be reduced just before the antenna is disconnected from the receiver, and not restored to normal until after the antenna has been reconnected. The time intervals I'm talking about are only a few thousandths of a second (milliseconds).

This process of reducing the receiver's gain whilst a transmitter is operating is called desensitising. Exactly how it is done will depend on the receiver design. A favourite arrangement in valved communications receivers was to key the r.f. gain control circuitry (Fig. 8) so that the cathode bias of the controlled stages was increased (reducing the gain) whilst transmitting. Alternatively, a keyed voltage was superimposed on the receiver's automatic gain control (a.g.c.) line. Whereas the a.g.c. voltage would have a fast attack but a slow decay, the desensitising voltage must have a fast attack and a fast decay. The circuit of Fig. 9 shows the outline of the idea. The values of C1 and R1 are chosen to give a longer time constant for the a.g.c., compared with C2/R2 in the desense line. The two diodes isolate the two time-constant circuits from each other.

In transistorised receivers, basically similar gain adjustment techniques can be used, but often variable shunt attenuators are favoured instead (Fig. 10). A control voltage is applied via isolating resistor R1 to forward-bias the diode, making it conduct and shunting some of the signal away to

earth. The greater the forward bias, the more heavily the diode conducts, and the more of the signal is leaked away to earth. The diode in this arrangement is a conventional small signal diode. A single attenuator of this type gives a fairly limited range of attenuation, and normally several will be used at different places in the r.f./i.f. amplifier chain.

The techniques I have described, with suitable choice of time constants for attack and decay, and with the appropriate timing of antenna switching and desensitising, will allow you to "listen through" your own Morse code transmissions for signals from the distant station, or give instant send/receive switching when using telephony. You can, of course, keep the circuitry simpler but make your operating life more complicated by manually switching the receiver to "standby" each time you transmit, or by physically turning down the receiver gain control. Adding a little automation to the system can work wonders though, so if you're using separate receiver and transmitter, rather than a transceiver where the switching is all done for you, it's worth the trouble of wiring up a system for the protection it gives your receiver, and the easier routine it brings to operating.





# Stable TONEBURST

by D. I. Shaw G8ESN

Repeater access toneburst circuit designs, both simple and complex, have been published many times over the last few years. If your demand is for the ultimate in frequency accuracy and stability the natural choice would be to use a crystal controlled oscillator—the fact that the toneburst circuit could well cost more to construct than the ex p.m.r. handheld it's destined to be fitted to is one of those odd quirks of technology! Cheaper free running oscillators can of course be built but these invariably exhibit considerable frequency dependence on both supply voltage and ambient temperature variations.

With these considerations in mind the following design was evolved which is not only very cheap in terms of component cost but it will actually fit into a u.h.f. Pye PF1 Pocketphone without drastic surgical effort and at the same time remain very close to the required 1750Hz.

## Circuit Description

The circuit shown in Fig. 1 was designed to operate without a potentiometer for frequency adjustment. This can be justified by a potentiometer's poor stability with time and temperature. Metal oxide resistors have been used to give improved temperature stability.

Operation of the oscillator is as follows: Gates IC1a, b and c form a 3-gate oscillator. Resistors R5, R6 and R7 are chosen to restrict the voltage swing on the input of IC1c to within the voltage rails. This prevents conduction of the internal protection diodes improving the stability of the oscillator.

Components R8, R9 and C2 are the burst duration elements of the circuit. Resistor R8 may need to be varied

because of the large tolerance of electrolytic values. Gate IC1a, which supplies part of the bias for the oscillator, is on for slightly longer than the duration of the toneburst—this is for two reasons. In the first instance, the stability of the toneburst is ensured until the end of the burst and secondly the inactive current consumption of the circuit is less than 1µA.

The current consumption of the toneburst is approximately 2mA when active. The temperature stability of the oscillator is good and only drifts 2–3Hz for 10°C temperature change. Frequency stability with supply voltage is excellent, only drifting approximately 5Hz over a 5V to 20V supply variation and therefore this unit does not need a regulated supply.

As previously stated there is no provision for a potentiometer in this circuit for stability reasons so the frequency should be set on the bench by adjusting the value of R2 to bring the toneburst frequency to 1750Hz ± 5Hz. The oscillator can be kept on by shorting C2 thus facilitating the use of a frequency counter, connected to pin 3 of IC1, for setting up. It has been noticed that with some transmitters it was necessary to couple the toneburst circuit with an electrolytic capacitor in series with R4.

The printed circuit board and component layout is shown in Fig. 3. The order of component insertion is critical otherwise you will not be able to solder leads to pads. The two through-board links are first soldered in place ensuring that the i.c. socket still fits flush to the board. This socket is fitted next. A strip of thin card 10mm wide by 24mm long is placed under the resistors on the opposite side of the p.c.b. to the i.c. to prevent the resistor leads shorting onto the soldered joints of the i.c. socket. All pins and wires must be cropped as short as possible. The usual handling/static discharge precautions should be followed, leaving the insertion of IC1 until last. For those with access to an oscilloscope Fig. 2 is provided to indicate circuit conditions during operation.

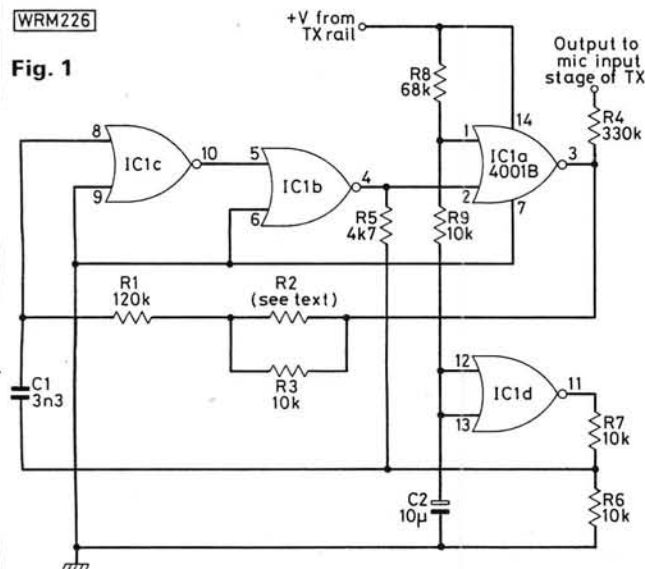


Fig. 1

## BUYING GUIDE

All components are easily obtained from advertisers in *PW*. Readers attempting this project should take careful note of all the comments in the text regarding the tolerance of components.

Approximate  
Cost

£3.50

Construction  
Rating

Beginner



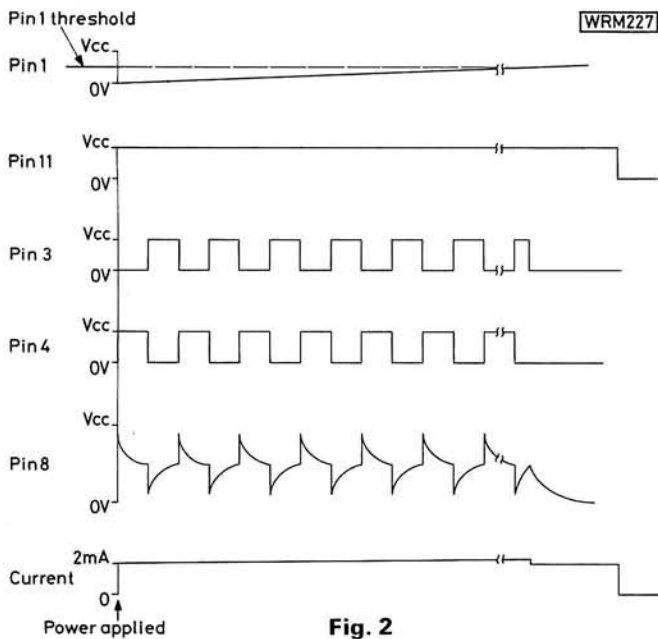


Fig. 2

## ★ components

### Resistors

0.4W 1% Metal film

4.7kΩ	1	R5
10kΩ	4	R3,6,7,9
68kΩ	1	R8
120kΩ	1	R1
330kΩ	1	R4
s.o.t.	1	R2

### Capacitors

Polystyrene 1%

3.3nF	1	C1
-------	---	----

Tantalum electrolytic

10μF	1	C2
------	---	----

### Semiconductors

Integrated circuits

4001B	1	IC1
-------	---	-----

### Miscellaneous

Printed circuit board; 14 pin d.i.l. socket.

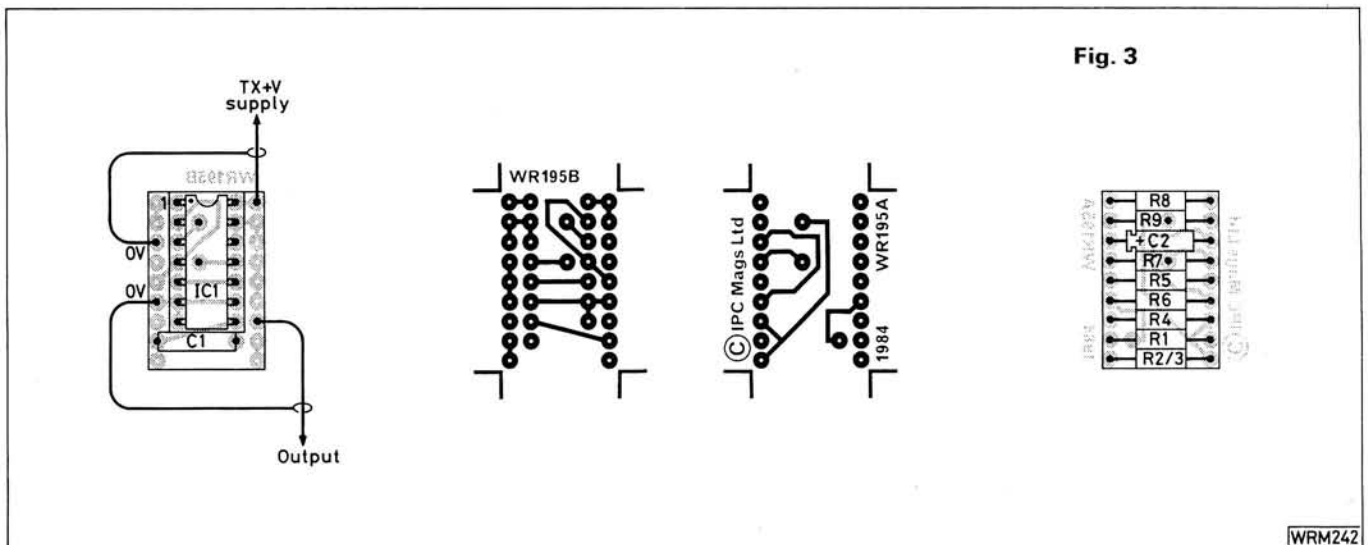


Fig. 3

# Swap Spot

Have rack mounting 150 watt amplifier, excellently made, inclusive power unit 1000V, panel metallic sea green. Ideal conversion linear amplifier. Also have power unit 400V 200mA. Would exchange for 430MHz or 144MHz transmitter. Cash adjustment. Must collect Birmingham. Tel: 021-743 5068 after 6pm. **W113**

Have Pye u.h.f. portable (the "Professionals" style) in mint condition with base charger and NiCads on the 430MHz band. Would exchange for Burndept u.h.f. portable (police style) in similar condition. Allan. Tel: 0782 612868. **W137**

Have Datong Morse Tutor, CCTV camera, 430MHz TV up-converter W & D, all in working order. Would exchange for h.f. receiver in working order. Tony G6RBK. Tel: 0923 673765 (St. Albans, Herts). **W145**

Have ZX Spectrum 48K computer, 6 months old, plus £70 worth of programs and magazines. Would exchange for Telereader **Practical Wireless, November 1984**

CWR610E or MM2001 RTTY converter or w.h.y. S. Rake, 80 Cripps Ave., Tredegar, Gwent NP2 3PB. **W146**

Have 12V Sceptre push-button car radio. Would exchange for Pye Bantam transceiver. Tel: 0788 822508 (Northants) **W154**

Have early model thermionic press-button band-change radiogram. Would exchange for mains/battery commercial receiver—Sony or similar. Tel: Caterham 49851. **W155**

Have TRS-80 16K, level 2 micro, covers, green screen, cassette, thermal printer and interface, £250 + software and books. Would exchange for v.h.f. multimode transceiver worth £250 +, e.g. FT-290, C58, etc. Andy. Tel: 0625 614510 (Macclesfield). **W180**

Have Atari TV game plus 6 different cartridges, cost £280, all in v.g.c. Would exchange for 144MHz hand-held transmitter. Tel: Ebbw Vale 301078. **W203**

Have Casio MT800 stereo electronic organ, plus Yaesu FT-208R hand-held. Would exchange for IC-251 or FT-77. Would separate Casio MT800 for FT-290R or C58. Mr Keen, 30 Bath Road, Chiswick, London. Tel: 01-995 7339. **W208**



# RESULTS RESULTS RESULTS



# RESULTS RESULTS RESULTS

## by Neill Taylor G4HLX

A staggering 234 entries were received for this year's QRP contest, held on June 17, seemingly making it the best-supported v.h.f. contest ever held in the UK. Entrants shared a common enthusiasm, although stations ranged from one-man home fixed stations to highly organised mountain-topping groups. Locations used varied between the two extremes of sea-level sites and the summit of Ben Nevis.

The Welsh hill-tops proved the most successful sites again, the leading three stations in both multi- and single-operator category taking advantage of the superb take-off available. The overall winners by an impressive margin were a group comprising GW4TTU, G8TF1, G4VXE and GW5NF, collectively known as the "Bug Bashers Contest Group". They gain the winners' cup for their operation as GW4TTU/P from Mynydd Maen, a stone's throw from the Blackwood ARS, last year's winners, now beaten into second place.

Roger Dyke, GW4NVA/P, leads the single operators from a site near Wrexham. Last year's leading single operator, Chris Otley, G4CYA, in Sheffield, this year takes the top fixed station position instead. The overall runners-up in 1983, Martyn Wright and Neil Underwood, are still the leading station in England, this year under the callsign G4RLF/P from the same Wiltshire site of Win Green. In Scotland, David Taylor and Peter Robertson, as GM4RZW/P, take the lead, and also manage 6th place overall, which is very commendable from their site on Broad Law, south of Edinburgh. Robert Loftus EI7DG/P tops the EI/GI entries from Three Rock Mountain near Dublin.

The table summarises the ten certificate winners, and shows details of the leading ten multi- and single-operator stations. A detailed list of all the entrants is available on receipt of a large s.a.e. at the Poole Offices. Those entrants who have already submitted envelopes will receive the results shortly.

The map shows how the 234 stations were distributed around the QTH squares, and also lists the leading stations in each square. The other figure in each square is the average number of QTH squares worked by the entrants in it, which may destroy a few myths about where the most favourable positions are.

### Where The Points Were Lost

Apart from the sheer bulk of 234 logs to cross-check, adjudication was a little easier this year due to an apparent general improvement in the standard of log-keeping (computerisation of the records helped, too), although a few stations will persist in presenting entries in their own format instead of that required by the rules. A handful of logs were almost illegible, too, and as a contact can't be verified if it can't be read, points have been lost. One station sent a scruffy log, containing many errors, on non-standard sized paper with the columns in the wrong order and some of the covering information missing. A pity, as the group put in much effort during the event, and the claimed score would have put them 16th.

About 50 per cent of entrants lost some points for general logging errors, only a few really losing a substantial amount. The most common error again was omitting a /P suffix from a callsign, and it seems certain that in most cases it hasn't been sent by the portable stations. Several entrants commented on this, for example G4WCK/P: "A number of /P stations did not send /P during an entire QSO, but were heard to send it in an earlier or later QSO. This was most annoying." More than one portable station even omitted the suffix on the entry sheet!

The only general lowering of log-keeping standard was with regard to unmarked duplicate contacts, which were found in even computerised logs. A few stations seem to have been operating without check-logs, relying on a quick check after the contest which has been insufficient to spot all duplicates.

### From Sunburn to Frostbite

To portable stations, weather conditions can be more important than propagation conditions, particularly if they reach extremes, which they certainly did during this event. The reports from "an absolute scorcher"—G6VAT/P, to "awful!"—GM6VDN/P. Many parts of the UK enjoyed unbroken sunshine, "the temperature 26 degrees in the shade"—GJ8RVT/P, and at the other extreme,

GM4TJL/P "reached a patch of snow" on the way to the site, atop Ben Nevis, where he found "my hands were so cold I could hardly hold the nuts and bolts that hold the elements on the boom".

At GW8FUM/P, "we were engulfed in a dense cloud which condensed on the antenna and steadily dripped on us", and G6ZME/P found that "the sun-lounger was not needed". Meanwhile, at G4CAR/P, "T-shirts and shorts were the order of the day", while GM6VDN/P "certainly needed the heavy anoraks we took".

The biggest feature of the weather, however, was thunderstorms. Violent storms raged in the south-east most of the day, and as G6WBP notes, these "effectively closed down the eastern half of ZL square, AL square and AK square . . . only the stalwarts were on the air." Many operators wondered where all the stations had gone in these squares—now you know. Even those away from the centre of the storms found that "at times nothing was heard except S-9+ static crashes"—G6NAD.

It was not only the south-east that experienced thunderstorms, and in many places portable stations closed and dismantled, for example at G4NVM/P: "discretion being the finer part of valour I unplugged everything, lowered the mast and disappeared". Some didn't even wait that long; at GW4MKF/P "I realised that I was the highest thing around", and after a lightning strike 1 kilometre away, "jumped in the car and abandoned station".

### To Malta on 3 Watts

For most of the day, tropospheric propagation was unexceptional; although a few stations reported heavy QSB at times, no real openings developed. However, this mediocrity was broken in several areas by spells of good sporadic-E paths to Italy and Malta. The areas most favoured were the far south-east and parts of Northern England and Scotland. Several stations completed contacts using QRP and were highly delighted at the achievement. "The highlight of the day" at G3YMD/P "was to work our first sporadic-E . . . 9H1GB in HV square". For a few, it happened at the wrong time; "after setting up the station . . . the first

*Practical Wireless, November 1984*



## PW 1984 QRP Contest

Pos.	Callsign	Score	Pos.	Callsign	Score	Pos.	Callsign	Score	Pos.	Callsign	Score	Pos.	Callsign	Score	Pos.	Callsign	Score
1	<b>GW4TTU/P</b>	<b>19 270</b>	40	G1DXY/P	4431	79	G6RAF	2928	118	G6HFW	1566	156	GM4PGV/P	1040	195	G4XAT	520
2	<b>GW6GW/P</b>	<b>10 956</b>	41	G4RNL/P	4410	80	G8DDY/P	2880	119	G6UXT	1560	156	G6FEX	1040	197	G6DVO	510
3	<b>GW6KQC/P</b>	<b>10 850</b>	42	GW6PKK/P	4400	81	G6MAN/P	2862	120	G6ZMO/P	1520	160	G4PUZ/P	1040	198	G14OWA/P	494
4	<b>G4RLF/P</b>	<b>9517</b>	43	G6HIE/P	4389	82	G4SJK/P	2839	121	G4XSC/P	1512	161	G1FRJ/P	1022	199	G6NUZ/P	462
5	G4WET/P	8596	44	G4RAQ/A	4368	83	G6HQT/P	2760	122	G6SVX/A	1484	161	G4XXG/P	1020	200	GW2OP	451
6	<b>GM4RZW/P</b>	<b>8343</b>	45	G6OYL/P	4255	84	G6PRR/P	2678	123	G8CYW/P	1445	162	G1BHU	1008	200	G6LUE	451
7	GW6GS/P	7776	46	GW6DTD/P	4248	85	G4RVR/P	2660	124	GM4MYL/P	1444	163	G4UIF	994	201	EI4ALE/P	450
8	<b>GW4NVA/P</b>	<b>7616</b>	47	GW4ARC/P	4212	86	G4RVJ/P	2610	125	G4JMP/P	1440	164	G6PSH	990	202	G6PBW	450
9	GW6MKR/P	7560	48	G4ARI/P	4080	87	G3BPK/P	2574	126	G6FWT/P	1422	165	GM4RGC/P	966	203	G1BOQ	450
10	G6ZME/P	7560	49	G1BIV/P	4063	88	G3YLE/P	2565	127	G4WCK/P	1422	166	G6HXU	952	205	G4SZI	424
11	G4EFE/P	7279	50	G6PHF/P	4025	89	G4PNB/P	2506	128	G4TTP/P	1416	167	G6PZT	948	206	G1DWQ	420
12	G6LJO/P	7226	51	GW4WVB/P	3990	90	G3SVC/P	2457	129	EI4FO/P	1411	168	G1EKK	944	207	G8VEL	418
13	G4XPS/P	7150	52	GW4XGA/P	3933	91	G4PIQ	2451	130	G6WKK	1392	169	G4WXX	928	208	G4PFY	390
14	G6KNF/P	7020	53	G6XYL/P	3850	92	GJ8RVT/P	2414	131	G4DRV/P	1391	170	G6YSQ	924	209	G8SSL	378
15	G6YNL/P	6939	54	GM6WIX/P	3840	93	G8SDS/P	2413	132	G4WRW/P	1350	171	G1ACY	918	210	G6NNA	360
16	G4LIL/P	6500	55	G6LKB/P	3818	94	G6LCL/P	2394	133	G6SXE	1335	172	G1BRS	913	210	G6GUX	360
17	G3BRS/P	6240	56	G4VRY/P	3780	95	G8SKM/P	2340	134	G6EPN/P	1320	173	G4UHU/P	910	212	G1AMX	342
18	G6TW/P	6175	57	G4CAR/P	3759	96	G4XYU/A	2322	135	G6VAT/P	1302	174	G4VFG/P	882	213	G6NAD	336
19	G4MWC/P	5976	58	G4VWH/P	3654	97	G6ZPN	2200	136	G4LWG/P	1296	175	G4TTF/P	871	214	G6XDZ	328
20	G3UFB/P	5940	59	G3IZD/P	3586	98	G8TWH/P	2142	137	G6CSY/P	1284	176	G4WZV	870	215	G6SXD/P	320
21	G4WWD/P	5902	60	G4JBR/P	3565	99	G8PRF/P	2109	138	G6SSH/P	1280	177	G4WGE/A	860	215	GM4RIV/P	320
22	GM4PPT/P	5871	61	G4LCQ/P	3564	100	G4HMB/P	2090	139	G8TNK/A	1246	178	GW3POM	840	217	G6NZQ/P	312
23	G4SVK/P	5798	62	GW4VIX/P	3540	101	G6PUS/P	2052	140	G6VMK/P	1241	179	G6IAZ/P	832	218	G1CFE/P	300
24	<b>GW4MKF/P</b>	<b>5778</b>	63	G4OKY/P	3528	102	G6YPH/P	2034	141	G6TPE	1235	180	GW4REI/P	810	219	G6IXS	270
25	GW8FUM/P	5592	64	G6IKU/P	3496	103	G1AWD	2016	142	G1DVI	1232	181	G6NDQ/P	800	220	G6YTR/P	250
26	<b>G4CYA</b>	<b>5525</b>	65	G4PPM/P	3408	103	GM4MDP/P	2016	143	G6WOI	1204	182	GM6WAZ/P	799	221	G1FIO	240
27	G6EKR/P	5481	66	G4SKG/P	3381	105	G6XYI/P	1989	144	G1AAJ/P	1200	183	G1FVR	756	222	G6OLK/A	210
28	G1FKN/A	5162	67	G6HNB/P	3366	106	G4VYX/P	1980	145	G6TEP	1184	184	G4SKA	686	222	G6UDE	210
29	GM4SUC/P	5100	<b>68</b>	<b>EI7DG/P</b>	<b>3350</b>	107	G6WZI/P	1938	145	GM6VDN/P	1184	185	G4TSW/P	660	224	G6YZR	198
30	G4LRP/P	4840	69	G4VIM/P	3344	108	G6IEK/P	1900	147	G6ORM/P	1176	186	G4CDD/P	651	225	G4GFY	190
31	G3YMD/P	4752	70	G4RQP/P	3297	109	G4UXY/P	1875	148	G6ICI	1173	187	G1DUR/P	640	226	GM4TLJ/P	189
32	G4NVF/P	4693	71	G4WJS/P	3280	110	G4VMM/P	1872	149	G6SBR/P	1156	188	G1BEK	630	227	GM4BAE/P	152
33	G6XWM/P	4692	72	G4NCJ/P	3240	111	G8ETD	1818	150	G4LVK/P	1148	188	G4WBR	630	228	G4UZX	110
34	G4NZY/P	4641	73	G4XPE/P	3222	112	GW1FOF/P	1800	151	G4LGG/P	1140	190	G6IJV/P	627	229	G6RAH	68
35	G4WIK/P	4598	74	G4ROB	3192	113	G4WOR/P	1750	151	G6YCY	1140	191	G6XUV/P	585	230	G6BJR	64
36	G6VGI/P	4560	75	G6YEA/P	3160	114	G4ETW/A	1728	153	G6HYZ	1110	192	G6NLZ	572	231	G6RZZ	57
37	G4SHC	4550	76	G4TKU/P	3024	115	G4NVM/P	1700	154	GM6ZGV/P	1105	193	GM6RJP/P	546	232	G14XSF	42
38	G4URT/P	4498	77	G1DYA/P	2983	116	G6ZYL/P	1664	155	GW4VPX/P	1088	194	G1GGZ/A	525	233	G4TVH	32
39	G8JAG/P	4473	78	G6WBP	2980	117	G6EDB/P	1638	156	G14KKK/P	1040	195	EI2AG/P	520	234	G2DHV	18

Bold type indicates a certificate winner

### Certificate Winners

Overall Winners	Bug Bashers Contest Group	GW4TTU/P
Runners-Up	Blackwood Amateur Radio Soc.	GW6GW/P
3rd Place	Glamorgan Contest Group	GW6KQC/P
Leading Single Op.	Roger Dyke	GW4NVA/P
Runner-Up Single Op.	Christopher Foster	GW6MKR/P
3rd Placed Single Op.	Dr. Malcolm Franks	GW4MKF/P
Leading English Station	Martyn Wright & Neil Underwood	G4RLF/P
Leading Scottish Station	David Taylor & Peter Robertson	GM4RZW/P
Leading Irish Station	Robert Loftus	EI7DG/P
Leading Fixed Station	Chris Otley	G4CYA

signal we heard was 9H1BT, who when called returned with a 5/7 report on 2.5 watts! Great, but what a pity only 0825GMT."—G4RVR/P.

At some stations the sporadic-E was less welcome. G6EKR/P was one of several groups who "could have done without the sporadic-E opening which meant that the local stations not taking part in the contest wound up their power and gave us considerable QRM".

A further report on this opening will be prepared when the information in the logs has been more carefully analysed.

## All Over The Band

Many entrants again comment on how few bad signals there were. "QRP resulted in clean signals and a relatively *Practical Wireless*, November 1984

splatter-free band"—G6YPH/P, was a typical comment, "congratulations go to all stations heard" says G4XPS/P, "as there were no poor quality signals noted". Not everyone would agree, as a few found, like GW6PKK/P, "a good deal of splatter across the band; it was ever present from start to finish".

The adjudicators' two monitoring stations, one in the north of England and one in the south, listened carefully for broad signals and found nothing really exceptional. We agree with GW6PKK/P (and others), however, that "some stations were using some forms of speech processing which gave rise to signals which were quite wide and the audio quality left a lot to be desired". Some, in fact, were so heavily compressed as to be almost unintelligible.

Some of the "odd sounding stations" were assumed by G6EPN/P to be "due to weird and wonderful ways of obtaining 3 watts". G3UFB/P points out that some rigs which "deliver 3 clean watts of s.s.b. into a 50Ω load in the shack" may "flat-top at the 2.2 watt level with a load v.s.w.r. of 1.5:1", leading to splatter.

The other side of the coin, of course, is that of the receiver's ability to handle strong signals. Some operators seem to think that there shouldn't be any strong signals in a QRP contest, but this is manifestly untrue. With so much activity from good sites and exceptional antennas, in some locations the number of strong signals at the RX front end could actually exceed those in "open" contests. It has been stated many times that a high gain pre-amplifier is a contest operator's worst enemy unless tamed by plenty of attenuation after it. "Our pre-amp was a waste of time", say GM6RJP/P, who were on one of the several sites where two or more stations operated in close proximity. "Splatter from co-sited stations was ±50kHz with the pre-amp in; once switched off the splatter went down to ±10kHz." Moral: If you feel you must use a pre-amp, make sure you can switch it off when needed.

However, the vast majority of entrants were untroubled by bad signals. Those who were, might like to spare a thought for G4WGE/A, operating at the University of Surrey, who twice had to close down while experiencing "desensitising



due to the attitude control commands for UOSAT which were about 8kW e.r.p. at a distance of about 5 metres from the shack!"

## Equipment Used

A similar selection of transceivers were in use as last year, with the FT-290R again the favourite. Only one station used a homebrew transceiver, the Newcastle West Contest Group G8CYW/P, though many had home-constructed accessories.

Emphasis this year seems to have been on antenna systems, so important in a QRP station. The leading three stations all used arrays of four Yagis which paid dividends. "The antennas took some getting up" at GW4TTU/P, "but worked very well indeed". A number of stations put up pairs of Yagis, and even some of the single operators managed this.

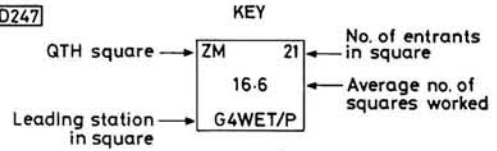
Contests always put pieces of equipment through fairly rigorous use, but GW8FUM/P took this to extremes; "the ubiquitous FT-290R showed its ability to stand rough treatment when one of our group dropped it 60m down the mountain and, although dented, it still functioned".

Three one-man portable stations, GW4XGA/P, G4ARI/P and GM4TJL/P each carried their entire stations on their back and reached their sites by walking and climbing. The most remarkable of these was John Hebborn GM4TJL/P, who reached the top of Ben Nevis. "The 11km ascent is a hard enough walk without transceivers, antennas, a portable mast and enough food and warm waterproofs to sustain life for eight hours", he says. "The top 300m of the mountain was in thick cloud . . . eventually visibility increased and I discovered I was close to the sheer drop of Observatory Gully, much nearer the summit than intended."

## Superlatives

GM4TJL/P rightly claims to have had the highest altitude of any station competing, but there are some other biggest

WAD247



		XQ 1	YQ 4						
		7.0	16.0						
		GM4TJL/P	GM4MYL/P						
		XP 1	YP 4	ZP 2					
		16.0	21.7	12.0					
		GM4PGW/P	GM4RZW/P	G4VYX/P					
	WO 2	XO 5	YO 8	ZO 7					
	13.0	10.8	20.8	13.8					
	G14KKK/P	GM4PPT/P	G8JAG/P	G4VRY/P					
VN 1	WN 2	XN 2	YN 27	ZN 23	AN 2				
9.0	19.0	23.5	19.1	17.1	24.5				
E14ALE/P	E17DG/P	GW8FUM/P	GW4NVA/P	G4XPS/P	G4SKG/P				
	WM 1	XM 1	YM 18	ZM 21	AM 2				
	17.0	16.0	16.6	16.6	12.0				
	E14FO/P	GW4VPX/P	G6ZME/P	G4WET/P	G1BEK				
		XL 5	YL 15	ZL 31	AL 18				
		17.0	21.6	14.5	14.0				
		G4JBR/P	GW4TTU/P	G4EFE/P	G6EKR/P				
		XK 4	YK 11	ZK 10	AK 5				
		19.2	17.0	17.5	21.2				
		G6XYL/P	G4RLF/P	G3UFB/P	G1FKN/A				
			YJ 1						
			17.0						
			GJ8RVT/P						

## Leading Single-Operator Stations

Pos.	Name	Callsign	Score	QSOs	Squs.	QTH	antenna	a.s.l. (m)	TX/RX
8	Roger Dyke	GW4NVA/P	7616	272	28	YN74d	13Y	559	FT-225RD
9	Christopher Foster	GW6MKR/P	7560	270	28	YL05j	2 x 10Q	800	FT-290R
24	Dr. Malcolm Franks	GW4MKF/P	5778	214	27	YM55f	2 x 17Y	640	FT-290R
26	Chris Otley	G4CYA	5525	221	25	ZN43e	2 x 12Z	200	IC-202E
36	Peter Appleyard	G6VGI/P	4560	190	24	ZN31j	2 x 14Y	500	FT-290R
38	Peter Hutchinson	G4URT/P	4498	173	26	AK02b	11Y	210	IC-251E
42	Dave Flanagan	GW6PKK/P	4400	200	22	YN65h	9Y	290	FT-290R
46	Michael Ryder	GW6DTD/P	4248	236	18	YM05j	13Y	386	FT-290R
48	Tim Raven	G4ARI/P	4080	170	24	YM65e	8Y	486	IC-202S
52	David Iles	GW4XGA/P	3933	171	23	XN80b	5Y	999	FT-290R

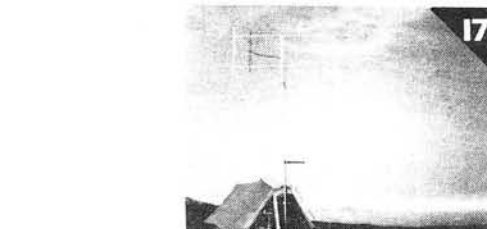
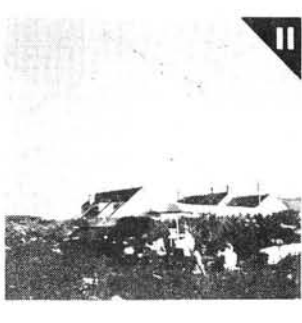
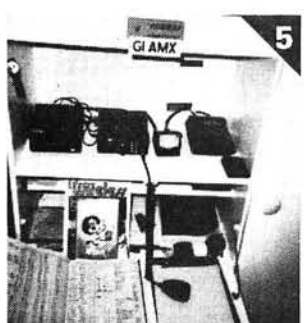
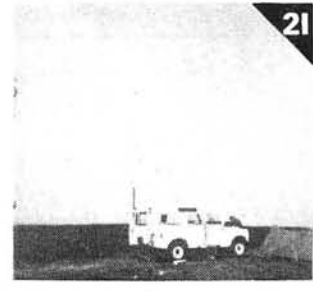
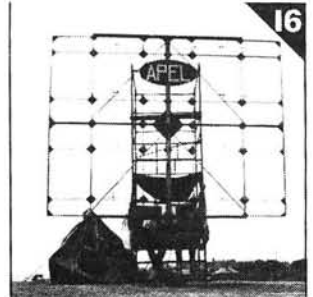
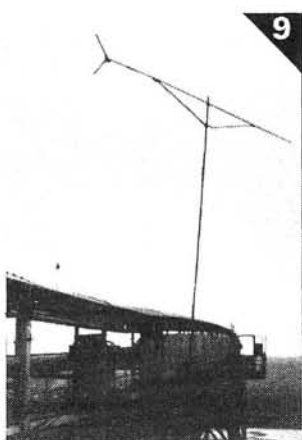
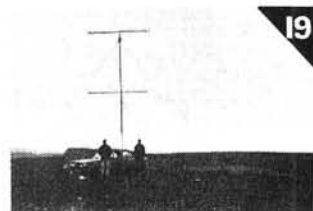
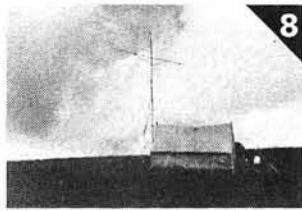
80 single-operator entries

## Leading Multi-Operator Stations

Pos.	Name	Callsign	Score	QSOs	Squs.	QTH	antenna	a.s.l. (m)	TX/RX
1	Bug Bashers Contest Group	GW4TTU/P	19 270	470	41	YL25j	4 x 9Y	472	FT-290R
2	Blackwood ARS	GW6GW/P	10 956	332	33	YL06d	4 x 9Y	430	FT-726R
3	Glamorgan Contest Group	GW6KQC/P	10 850	350	31	YL23h	4 x 14Y	610	FT-290R
4	Martyn Wright & Neil Underwood	G4RLF/P	9517	307	31	YK10a	6Q	280	TS-770
5	Triple B Contest Group	G4WET/P	8596	307	28	ZM71d	2 x 14Y	300	IC-271E
6	David Taylor & Peter Robertson	GM4RZW/P	8343	309	27	YP44f	2 x 9Y	840	IC-251E
7	Guildford & District RS	GW6GS/P	7776	288	27	YL05c	9Y	552	IC-271
9	Telford & District ARS	G6ZME/P	7560	315	24	YM35c	2 x 13Y	490	FT-225RD
11	Martin Peters & Others	G4EFE/P	7279	251	29	ZL53b	16Y	297	IC-202
12	S. Cheshire & N. Staffordshire	G6LJO/P	7228	278	26	YN70f	14Y	270	IC-290H

154 multi-operator entries





- 1: G6YNL/P on Lowbury Hill in Oxfordshire
- 2: G3UFB/P near Lewes in East Sussex
- 3: G4ARI/P Tim Raven's back-packing station, 9th placed single op.
- 4: GW8FUM/P Manchester University ARS on Pen-Yr-Ole-Wen, Snowdonia
- 5: G1AMX William Wilson's station at Cramlington, Northumberland
- 6: G4WOR/P Worthing & District ARC on Chanctonbury Hill, Worthing
- 7: G6YEA/P The "World Domination" RC! Located on Winter Hill
- 8: G4HMB/P North East Radio & Communications Club in the Cheviot Hills
- 9: G6OYL/P in its exotic location on top of a colliery slag heap!
- 10: GW4TTU/P The Cup Winners, "Bug Bashers Contest Group" nr Blackwood
- 11: GJ8RVT/P Jersey ARS, at Les Landes Racecourse, St. Ouen
- 12: G4WIK/P Devizes & District ARC on Milk Hill
- 13: EI7DG/P on Three Rock Mountain, south of Dublin. Leading Irish station
- 14: G8DDY/P with G4WNZ (right) complete with broken leg and crutches
- 15: GM4RIV/P one of the three stations of the Wigtownshire ARC
- 16: G4CDD/P Denby Dale & District ARS with 16-element broadside array known as the "Flying Bedstead", fixed in a SE direction
- 17: GW6MKR/P Christopher Foster, runner-up single op., in the Black Mountains
- 18: G4SVK/P husband & wife team on Ditchling Beacon in Sussex
- 19: GM4RZW/P David Taylor & Peter Robertson, the leading Scottish station and 6th overall
- 20: G4WWD/P Petersfield Area Contest Team (PACT) nr Hindhead, Surrey
- 21: G8CYW/P Newcastle West Contest Group on Stanhope Moor, Co. Durham



and best claims, too. "How about a prize for the longest name?", asks GW4WVB/P, the Rhosllanerchrugog Group. There also seems to be a competition on for the oddest group name, some of the contenders being "The Laugh-a-Minute Contest Group"—G4ILI/P, "The Carrot Crunchers"—G4SKA, "The World Domination Radio Club"—G6YEA/P, "The Bearded Wonders"—GW4VIX/P and "The Lincolnshire Yellow Bellies"—G4VIM/P, to name but a few.

G4PIQ claims to have used the oddest equipment, a KW Viceroy TX, Trio R600 RX and sundry bits of transverter, mainly home-made. The most unusual location must surely be that of G6OYL/P, on top of a colliery slag heap at Maltby, near Doncaster.

Several entrants bemoaned the general lack of c.w. activity (although it was up on last year), so well worth a mention are two stations who used c.w. exclusively: GM4BAE/P, who made 20 contacts and G4TVH who made 18, although 8 of these were cross-mode with s.s.b. stations.

## Let's Do It Again!

So many positive comments were received about the use of low power. Here is a selection: "QRP contests are an ex-

cellent test of ability and bring real competition to the average ham"—G4SHC. "It is very nice to hear a fairly distant station and know they will be able to hear me (barring a crystal-set receiver)"—G6IXS. "How pleasant not to live with the incessant drone of a power generator"—G3UFB/P. "There's more of a feeling of achievement"—G6ZME/P. "Very few problems with QRM"—G4RVR/P. "Astounded at what QRP can achieve"—G6WKK and many others.

Another aspect commented on was the "marvellous spirit throughout"—G1DWQ; "very courteous spirit"—G4WBR. "A pleasant surprise was the friendliness of many operators"—G1BEK. So many entrants remarked on how enjoyable the event was, even though they knew they weren't too near the top of the results table. "Not a winning entry", said G8SSL, "but one that reflects enjoyment".

Next year's QRP contest is eagerly awaited by most of this year's entrants. It will be on **Sunday, 16 June 1985, 0900-1700GMT**. The rules will be much the same as this year, although comments sent in with logs are being carefully considered.

We have shown the leading single operators separately this year in response to some of these comments. "I don't know how the single-operator stations manage to keep going for eight hours"—

G6YEA/P. "It takes a fair bit of effort . . . doing the check log, turning the mast, keeping the log all by yourself"—G4JBR/P. However, we resist two separate sections, as that would discourage one from pooling resources with a friend. Likewise a fixed station section would remove the incentive to go portable, which is essential to get the best out of QRP.

In conclusion, congratulations to the cup winners, certificate winners and all who put such an effort into their entries. Thanks to all those who sent entries and comments, including those (many) who could not be included in this summary, and thanks to those non-participating stations who sent checklogs; G1AZJ, G2HIF/P and G8RZO. Finally, good luck in the next *Practical Wireless* 144MHz QRP Contest, 16 June 1985.



# multiple choice... multiple choice... QUESTIONS multiple choice... multiple choice...

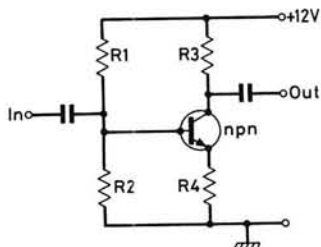
If you are an aspiring RAE candidate or just feel like testing your knowledge of amateur radio these multiple choice style questions will fill your needs. The questions are typical of those appearing in both the RAE papers; but they are not taken from these papers. For the answers, together with explanatory notes to help you, please turn to page 70.

Paper 2 Section 3. Solid State Devices—amplifiers

## Question 2-1

The gain of this audio stage can be increased by putting a large capacitor across

- a. R1
- b. R2
- c. R3
- d. R4



Paper 1 Section 1. Licensing Conditions—log /M and /P

## Question 2-2

When operating /M or /P you should fill in the log

- a. within 24 hours of the commencement of operating
- b. as soon as possible after the end of a journey
- c. at the time of operating
- d. immediately at the end of a journey

Paper 2 Section 2. Electrical Theory

## Question 2-3

What current will flow through a 24Ω resistor connected across a 12 volt battery?

- a. 0.5 amps
- b. 5 amps
- c. 12 amps
- d. 24 amps

Paper 1 Section 1. Licensing Conditions—special recordings

## Question 2-4

Which of the following special recordings may be transmitted?

- a. a triangular wave with a constant frequency
- b. two sine waves both with frequencies varying within the audio spectrum
- c. a rectangular wave with a pulse repetition frequency within the audio spectrum
- d. a sine wave with a constant ultrasonic frequency



# on the air

## AMATEUR BANDS by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR, 57 The Kingsway, Ewell Village, Epsom, Surrey, KT17 1NA.  
Logs by bands in alphabetical order.

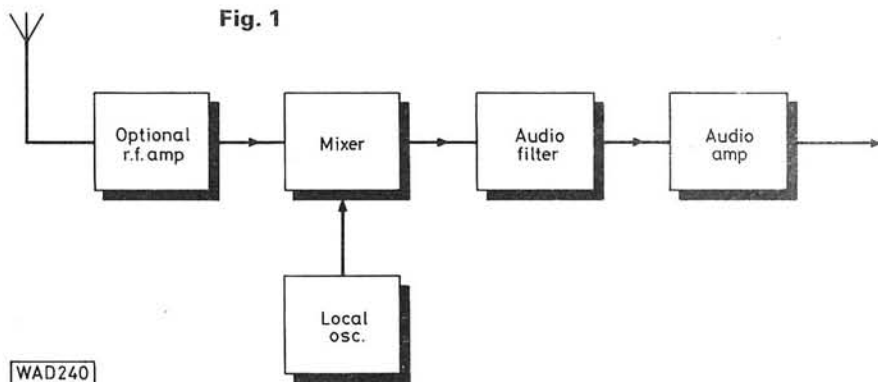
The direct conversion type of receiver (d.c.r.) is very popular and is often the first constructional effort of the tyro s.w.l. It is cheap to make and needs virtually no alignment and will often work the first time it is switched on. A block diagram of the simple d.c.r. is shown in Fig. 1 and since there is a local oscillator and a mixer stage it is often thought to be essentially a superheterodyne receiver. It is! But because the local oscillator is on the same frequency as the incoming signal the intermediate frequency (i.f.) is zero! There are no i.f. amplifying stages, the output going through an audio filter to the audio amplifier.

In a conventional superhet the overall selectivity is provided by a filter following the mixer stage and may be a mechanical, crystal or ceramic in its design. In the d.c.r. this selectivity is provided in the audio filter only, any r.f. tuned circuits providing little in the way of desirable selectivity. Unfortunately many d.c.r. designs treat the filter as just another audio filter without realising its importance in the overall design.

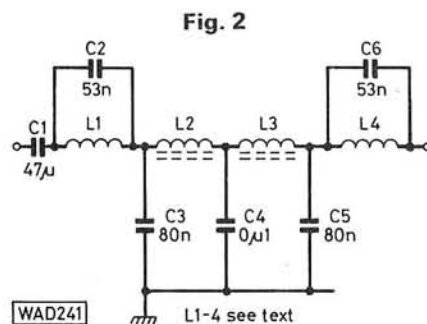
I found the filter circuit Fig. 2 in my notebook. The original source is unknown but obviously I must have thought it worthy of note at the time. It is fairly easy to make it up on a piece of circuit board and to use it to replace the existing filter and in this way either filter can be tried out by simply changing over the input lead to one filter or the other. The inductors L2 and L3 are made from the familiar 88mH toroids used in RTTY terminal units, which are advertised in *PW* and elsewhere, except that the existing winding should be increased by about 50 turns of 28s.w.g. enamelled copper wire. The capacitors of 0.053 $\mu$ F can be made up with a 0.05 $\mu$ F and a 0.003 $\mu$ F in parallel while the 0.08 $\mu$ F is formed from 0.05 $\mu$ F and 0.03 $\mu$ F in parallel.

The frequency response of this filter should be something like that shown in Fig. 3. The input capacitor provides cut-off at the lower frequencies. The other capacitors should be of the Mylar type or something similar, and  $\pm 10$  per cent is suitable. The inductors L1 and L4 are "standard" r.f. chokes comprising three windings in series on a 6mm ( $\frac{1}{4}$ in) diameter former.

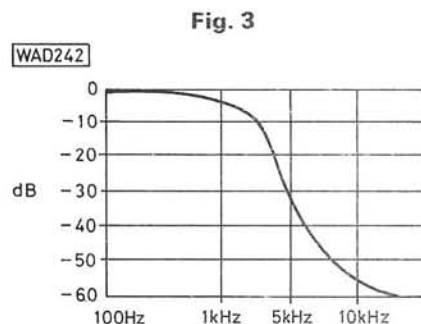
On an entirely different matter, a common complaint from s.w.l.s, and licensed operators come to that, is the "gabbling" of callsigns, to the extent that the call is not understandable even with a strong signal. While foreign amateurs can be excused if they cannot get their calls over in



WAD240



WAD241



WAD242

English there is always the international phonetic code which should solve the problem. Even the sometimes hilarious phonetics like "jolly, jumpin dog" for the JJD suffix, is acceptable if it does the trick. I have come across this problem myself, principally on the 144MHz (2m) v.h.f. band, and it has to be said that the "gabbler" is all too often an ex-CBer.

One would think that the ex-CBer would drop the CB jargon and habits and learn the accepted amateur procedures. Stations operating mobile seem the worst offenders perhaps because of the exhilaration of speeding along a motorway but this is just the time when extra care should be taken. You should always remember that an amateur callsign is unique to the owner and one's habits, language and procedures on the air are a reflection of the operator.

There is little doubt in my mind that the best amateur operators are those who have "come up through the ranks", as it were, having spent some time listening on the bands making themselves conversant with normal amateur procedures, as well as by reading the various magazines that deal with amateur radio such as *PW*, *SW Magazine* and *Radio Communication*, better known as *RadCom*, the official journal of the RSGB. The Society's

publication *Amateur Radio Operating Manual* is a must for the beginner and experienced operator alike and well deserves to be known as the "bible" of amateur radio. It is also a mine of information for the s.w.l.

## General

Stephen Beare's monthly contribution would normally appear in the DX section but unfortunately he is now unemployed and has had to sell his Trio 9R59DS receiver, so no log this month. However the good news is that Stephen, down in Feoch, Truro, Cornwall, has passed his RAE "without even trying" as he puts it, but I admit he did say beforehand that he was entering the exam just to gain experience. He is worried at the number of CBers who can pass the RAE without any previous s.w.l. experience and "wreak havoc on the v.h.f. and u.h.f. bands."

Stephen intends to make a QRP rig and in the meantime neighbour G4KNY is helping with the code practice. In the interim let us hope that one of the interviews Stephen has organised will have come up trumps by the time this appears in print. Incidentally, Stephen raised a point in this column a while back concerning Beverage antennas and was



delighted to receive some copies of QST articles on the subject from Stein Isaksen LA7CF.

I seem to be losing my regulars right, left and centre! Now DXer **Paul Martin** of Poole, Dorset, says he has passed his RAE and is anxiously awaiting his callign. He can't make up his mind about going on with the code practice and getting an "A" ticket. So I have ordered him to get on with it, which is always my advice! I know how much he wants to get cracking, working everyone he can find on 144MHz, but there are slow Morse stations around the country in the RSGB's Slow Morse service and Paul should take advantage of this while on 144MHz as he is almost certain to need to operate on the h.f. bands at some time in the future. He is very interested in RTTY and the 430MHz band at the moment.

If any of you out there who are practising for the Morse test feel that you are having a hard time a story in the latest issue of the RAIBC's journal *Radial* may stop your grumbling! The story came to light on the death of Arthur Byrnes G6AB. **Dick Boydell**, now G3VOA, told the RAIBC about his severe disability which meant that the Morse code could only be sent using his feet. "The next thing I knew was a knock on the door and there was Arthur G6AB!" He took an outline of one foot and not long after came back with an electronic bug foot key using side-operated switches, and a speaker. "After a year's hard work I was able to pass the code test, since when the el-bug has been hooked up to my transmitter".

Later G6AB was able to fix Dick up with a c.w. reader since he is unable to write anything and previously had to remember it all in his head. Information on the workings of the RAIBC can be got from Francis Woolley G3LWY, 9 Rannoch Court, Adelaide Road, Surbiton, Surrey.

Anent my bit on the headphones/speaker switching unit in the August issue **Brett Lanoish** G4NZK of Rednal, Birmingham, mentions a friend, G2FXJ, who through continued use of headphones found that he was starting to rely upon them, using the speaker less and less. He also developed a "ringing" in his ears. The point Brett makes is that one should only use headphones for the weaker signals and not let them become a habit. Personally, I have used headphones all my life and have that singing in the ears but I blame it on the fact that I spent some 8000 hours as a radio op in Dakota aircraft where the RO sits right alongside the port propeller with an unbelievable high ambient noise level!

## QRP Corner

**G. E. Slingsby** of Bury St Edmunds, Suffolk, has passed his RAE, congratulations, but admits he is unable to afford the prices of commercial transceivers so is hard at it on the Morse code in order to

get his "A" ticket right away and have a go at constructing a QRP outfit, and wonders where he can get some circuits and other useful information. The G-QRP Club's *Circuit Book* ought to fill the bill, obtainable from the club or the RSGB Publications department for £4.19 p&p, for non-members. In passing it should be noted that one does not have to be a member of the RSGB in order to buy its publications.

Membership of the G-QRP Club is really a must for the QRP operator anyway. Possibly the most economical way of getting on the air with QRP is the direct conversion receiver in which the local oscillator, which works at the signal frequency, more or less, can be switched to act as the transmitter or as a driver for a QRP p.a. stage, mentioned earlier. (See the PW "Teme" series, beginning in this issue—Editor).

**Dave Dhuglas** GM4ELV up in Glasgow continues the good work with his QRP Ten-Tec Argonaut 509 and a trapped dipole multi-band antenna at 15m and an a.s.l. of 155m, but he reckons the bands have been pretty poor of late, reflected in his short log this month. On 21MHz he managed a QSO with RJ6R in the Pamir mountains, with cards to UJ8JJ, and SPOBPT a special event station with QSLs to SP1PBT, this on 14MHz. On 7MHz he managed EI4JDX with cards via the Irish bureau. All these contacts were on s.s.b., by the way. It is worth mentioning that Dave came first in the G. Marconi QRP contest (s.s.b.—all bands) with a total of 43968 points but it seems that the contest may not be held again as the Italian QRP club is now defunct, according to IOOAY. Dave says cards for the ON5NT/HBO operation should go to ON4FK while JW5NM can be QSLed through LA6NM.

**Phil Dykes** G4XYX continues to go from strength to strength with his QRP converted CB f.m. rig and a wire dipole for the 28MHz band. A bout of 'flu kept him home for a while (oh dear, what a shame!) and found the band open most days working 207 stations in 27 countries, often able to sustain a QSO for half an hour or so. He worked LU1HCO and LU7HEA, CE3HFI, with many contacts around Europe. Of interest were W3ZNB/HB0 with cards to DA2AA, and I2DMK/IL7, QSLs to I2MQP. Phil is starting to build the PW Severn QRP rig for the 7MHz band to open up an entirely different aspect of amateur operating, namely c.w. on a band famed for the QRM.

Don't overlook the QRP Convention being run by the Yeovil club on Sunday October 14 at Preston School, Monks Dale, Yeovil, with talk-in starting at 9am, the convention opening at 9.30. There are five lectures on AR topics, the show ending at 5pm. Light refreshments available and a pub not far away. Club stations G3CMH and G8YEO will be active and there will be a display of equipment and a junk stall. Further info from Eric Godfrey G3GC on (0935) 75533.

**Bill Stevenson** G4KKI is still going

strong in the QRP mode with his latest success, a Trans-Atlantic c.w. QSO on the 7MHz band with W3GM. His normal power output is 750mW (0.75W) to a 27m wire which he tries to keep aloft with a Delta kite! Otherwise it's been round Europe on the 3.5MHz band. He has had problems with static build-up on the antennas but as I pointed out to Bill he should always have an r.f. choke between the wire and earth to provide a d.c. path for the static voltages without affecting the signal voltages. Bill is about to acquire a caravanette and hopes to have a lot of fun next year going portable. Current project is a direct conversion receiver covering the 21, 14 and 7MHz bands.

## DX Bands

Regular writer **David Price** of Wellington, Somerset, is yet another to announce his success in the May RAE so congrats all round and good luck on the bands. He's going to get his "B" licence but is swotting madly for the code exam. Good lad! He'll be too busy working the stuff soon to be able to send logs in future so this could be the last report from David. Only DX of note on 21MHz was 9J2BO but on 14MHz it was YS1RT, RJ6R (QSL UJ8JJ), VU2CVP, FY7AN, HL9SP, OD5NT, and VQ9AC on Chagos Island with cards to KA3EDN. Catch on 7MHz was VU2CVP again, and on 3.8MHz an excellent catch for this time of the year in VK2AVA at 2100Z.

I'm told that there were 8000 successful candidates in the last RAE and I think it must have included all my regular correspondents! Very few ordinary DX logs this month so far. **Michael Newell** of Kenilworth, Warks, says he has passed the RAE and is now G1HGO so I suppose we must congratulate him also. He is busy on 144MHz now with an FT-290R and a whip antenna and seems to have got into all the local repeaters. I have told him that I expect him to get on with the code and pass the test. He seems a bit reluctant to try s.s.b. on 144MHz but, contrary to his expectations, he may work a lot more DX on s.s.b. than he ever will on f.m.

Reception logs from s.w.l.s are welcomed and should be with me by the 15th of the month. For those who can write in regularly I can send them a few



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In July, members of the Bury RS visited the IBA TV transmitters at Emley Moor, West Yorkshire, if only to drool at the 275m concrete mast supporting a further 56m of mast and antennas! This mast replaces an earlier one which collapsed in March 1969 due to severe icing-up. The 432MHz and 10GHz beacons GB3MLY and GB3MLE are housed in the microwave link room at the 275m level

(Photograph courtesy of the Bury RS PRO G3VNO)



ARCHIPEL DES CROZET  
**FB8WJ**  
 WAZ 39 ~ ITU 68

TO RADIO	CONFIRMING QSO					
	Day	Month	Year	GMT	MHZ	MODE
Denon Norton LONDON	22	2	84	0450	3E	SSB

OP: Henri BOUCHET - F6EAY  
 Ex: FL6B - FB8WJ - STAY  
 QSO verified by FBV

Two interesting QSL cards received by Denis Norton of London W6, 9N1MM seems to have been around the bands from the year dot. He is seen here with a group of Nepalese children. The other card is from a rare DX spot, Clipperton Island, activated by F6EAY as FB8WJ

log sheets on receipt of an s.a.s.e. Copies of logs are not necessary, just a selection of perhaps a dozen of the best DX heard, with QSL information if copied.

It might be as well to outline what constitutes "best" DX. It is not necessarily the furthest stations heard, like the VK's which can be copied most mornings on 14MHz and are therefore commonplace, but DXpeditions to spots seldom activated by amateurs, unusual prefixes, or reception of a station at an unusual time of day or night due usually to exceptional propagation conditions.

Most s.w.l.s are anxious to log signals from as many different countries as possible or vie for the greatest number of prefixes heard so information in this feature can be very helpful as a guide to which band such stations may be found. Although the 14MHz band is the one which most DX can be found it is a good idea to monitor the other bands. The 21MHz band can prove an eye-opener at times. Although the sunspot cycle is now on the downward trend 28MHz should not be ignored, generally during daylight hours, with principal reception on a north/south path.

The 3-5MHz band can still bring surprises during hours of darkness as witness one reader with a VK2 recently. Most receivers used by s.w.l.s have coverage from the 1.8MHz to 28MHz bands so why not make maximum use of these facilities.

## Club News

Club AGMs are starting to occupy clubs and I would remind secs that if they send me the club's winter programme then there is no need to write every month unless there are any significant changes, plus details of meeting place and days and time. May I also suggest that clubs that only meet once a month should consider meeting more often in order to maintain interest and to give members a wider choice of dates.

**308 ARC** Another reminder of the bring-and-buy junk sale on Tuesday October 9 at St Marks Church Hall, Church Hill Road, Surbiton, Surrey. Cheques accepted and coffee and tea dispensed. It is suggested that this is a good opportunity to please the XYL by getting rid of the junk in the bedroom! More details from sec Dave Davis G6YQD, 13 Maple Road, Surbiton, Surrey.

**Acton, Brentford & Chiswick ARC G3IUU** The 430MHz band will be the subject for G6BLT on Tuesday October 16, at 7.30 at the Chiswick Town Hall, High Street, Chiswick, London W4, with new members and visitors most welcome, says club sec W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3.

**Axe Vale ARC** First Fridays at The Cavalier, West Street, Axminster, at 7.30. Principal event in December is the annual dinner on Friday December 7. No further details available unless you contact the sec Roger Jones G3MYK, 10 Oak Tree Close, Upton, Honiton, Devon.

**Banbury ARS** Last Thursday of the month at St Paul's Church Hall, Banbury, with latest

details from J. Burrell G8OZH, 6 Blenheim Croft, Brackley, Northants, otherwise (0280) 702900.

**Braintree & District ARS G6BRH** First and third Mondays at the Braintree Community Centre, Victoria Street, Braintree, with doors open from 7.30, with the odd bit of bartering of gear allowed up to formal start time of 8pm. Your local net is G6BRH on 145-375MHz (S15) on non-meeting Mondays at 8pm. More info on meetings and events contact sec Pat Penny G6TAF, 13 Newnham Close, Braintree or buzz (0376) 26487.

**Basingstoke ARC G3TCR G8JYN** Second Tuesday at 7.30, the Swan Inn, Sherbourne St John, near Basingstoke, with the AGM scheduled for October 9. November's offering on the 13th is to be a constructor's contest so get cracking. Advance notice of the club's Christmas Social, on December 11. Your sec is Eddie Thompson G4SQZ, 21 Wigmore Road, Tadley, Basingstoke, Hants.

**Biggin Hill ARC G4RQT G6TBH** It's construction contest time again, Tuesday October 16 in St Mark's Church Hall, Church Road, Biggin Hill, Kent, at 8.30pm, so bring along your best bit of homebrew equipment for judging. Hon sec is Ian Mitchell G4NSD, Greenway Cottage, Tatsfield, Westerham, Kent or try (09598) 376.

**Bridgend & District ARC** Third Friday of the month with the first Friday being a natter night, plus on-the-air sessions, all at the YMCA, Bridgend, in Angel Street. October's main meeting will be devoted to the AGM, while in November a homebrew contest is planned. Your contact is Trevor Morgan GW4SML, 4 Rhiw Tremaen, Brackla,

Bridgend, Mid-Glam.

**North Bristol ARC G4GCT** Friday evenings at 7pm, the Self-Help Enterprise, 7 Braemar Crescent, Northville, Bristol. Much more info from Ted Bidmead, 4 Pine Grove, Northville, Bristol.

**South Bristol ARC G4WAW** Wednesdays at the Whitechurch Folk House, East Dundry Road, Whitechurch, Bristol, at 7.30. On October 10 the club's winter project will be formulated and on the 17th it's computer activity time under the auspices of G4WOD. October 24 will be spent discussing the 1985 events calendar, leading on to a bring-and-buy evening on the 31st. If you need to know more try Len Baker G4RZY, 62 Court Farm Road, Whitechurch, Bristol, or 'fone (0272) 834282.

**British Railways ARS** The society has some 80 members garnered from the railways and associated companies and their AGM will be held at 1pm on Saturday October 20 at Stanier House, Birmingham. This is close to New Street Station and off Stephenson Street and all members are urged to attend. More on the society from G. Sims G4GNQ, 85 Surrey Street, Glossop, Derbs.

**Bury RS** A construction contest will be judged on Tuesday October 9 this being the second Tuesday of the month which are considered main meetings, with other Tuesdays being more informal. So, Tuesdays it is, at the Mosses Community Centre, Cecil Street, Bury, at 8pm. Newcomers are invited to contact hon sec Brian Tyldsley G4TBT, 4 Colne Road, Burnley or try Burnley 24254, for more gen on club matters and meetings.

**Cheltenham ARA G5BK** Friday October 5 sees a combined meeting with other local



societies, otherwise it is first and third Fridays at the Stanton Room, Charlton Kings Library, Cheltenham. More on the club from Mrs G. Harmsworth G6COH, 42 Leckhampton Road, Cheltenham or ring Cheltenham 525162.

**Cheshunt & District ARC G4ECT G6CRC** Every Wednesday at 8pm, the Church Room, Church Lane, Wormley. October 10 has a film show run by G3TIK and on the 24th G6BTQ holds forth on coaxial cables. Otherwise it's natter nights. Don't forget that the club can put you on to local RAE and Morse code classes. AGM time is November 21 so don't say you haven't been warned. Try Jim Sleight G3OJL, 18 Coltsfoot Road, Ware, Herts for more info or buzz (0902) 4316.

**Chester & District RS G3GIZ G8GIZ** Tuesdays, except the first, at 8pm the Chester RU Football Club, Hare Lane, Vicars Cross, Chester, with code practice for half an hour beforehand, courtesy of G4MOU. October 4 is a night out with a visit to the local IBA radio "Marcher Sound" while on October 16 it's RTTY Telereader time with G3LEQ officiating. G4UXD and G4EWZ expound on the latest equipment on the 23rd and G8AWS deals with amateur satellites on the 30th. Your club PRO is Dave Hewitt G8ZRE, 31 Broadmead, Vicars Cross, Chester or (0244) 316673.

**Civil Service ARS G3CSR/A** First and third Mondays at 12.30pm in the CS Recreation Centre, Monck Street, Westminster, London SW1 with an operational rig to hand. Net time is 7.30pm on Tuesdays on 144.575 (S23) and at 8pm on 3.720MHz. More from George Costin on 01-632 3875 who is the club sec.

**Coulsdon ATS G4FUR** Second Monday at St Swithun's Church Hall, Grovelands Road, Purley, Surrey, at 8, plus the last Thursday same time and place, when Morse code practice seems to be the order of the day. Ring Richard Goring G6VYT, the club's PRO, on Downland 54319.

**Dartford Heath DF Club** Needless to say frequent DF hunts are laid on and the organiser is Pete G8DYF to be found on Greenhite 844467. Pre-hunt gatherings are held at the Horse & Groom, Leyton Cross, Dartford Heath, Dartford, Kent, after 9pm.

**SE Derbyshire ARS** Tuesdays during term time at the SE Derbyshire College, Ilkeston Road, Heanor, at 7.30pm with talks or other attractions laid on. Sec is W. F. Peck G4VNB of 2 Sandfield Avenue, Ravenshead, Nottingham.

**Dudley ARC G4DAR** The Allied Centre, Greenman Alley, which is off Tower Street, Dudley, first, second and fourth Mondays according to letter received but could conceivably be every Monday. Note the AGM is on October 22. Note for the future, the demo by the Microwave Society on November 19. Meeting time is 7.45pm. Cheryl Wilding G4SQP, the sec, can be found on Codsall 5636.

**Dunstable Downs RC G4ARD G4DCC G8DCC** Two films on October 12, *The Electric Wave and Opportunity at Sizewell* while on the 26th there is a talk on h.f. antennas. Meetings every Friday at 8pm, the Chews House, High Street South, Dunstable, Beds. Sec P. G. Deaford G8XTW, will be glad to hear from visitors or potential members on (0525) 384419.

**Edgware & District RS G3ASR** Second and fourth Thursdays at 8, 145 Orange Hill Road, Burnt Oak, Edgware, Middx, with a talk likely on October 11 plus an on-the-air session. November 8 is an "Emmet" key evening with dummy loads and power meters to the fore. Will it descend to touching the ends of two pieces together, I ask myself! Try sec John Copley G4RMD on Hatfield 64342 for more gen on the club and it's activities.

**Fylde ARS** Still going strong at the Kite Club, Blackpool Airport, first and third Tuesdays at 7.45. Outings and visits to interesting venues are frequent. Make a note of the junk sale on November 13. Sec. H. Fenton G8GG of 5 Cromer Road, Lytham St Annes, is also on L-St-A 725717.

**Gloucester ARS** St John Ambulance HQ, Heathville Road, Gloucester, every Wednesday starting around 7.30, plus frequent outdoor activities. Visitors most welcome at any meeting. Tony Martin of 12 Redwood Close, Podsmead, Gloucester, is club sec.

**Hastings Electronics & RC G6HH GIHHH** Third Wednesdays at 7.45pm, West Hill Community Centre, Croft Road, Hastings, for main meetings and the clubroom at Ashdown Farm Community Centre, off Harrow Lane on Fridays at 8pm. On October 17 there is a junk sale and make a note of the Christmas Social on December 19. Sec Dave Shirley G4NVQ lives at 93 Alfred Road, Hastings and I'd like to ask him to note my correct change of QTH as in spite of a letter from me the club mag still goes to my old QTH.

**Hornsea ARC G4EKT G6EKT** Coming up! Hamfest on Sunday October 21 at the Floral Hall, Hornsea, with special event station in action, junk plus bring-and-buy stalls. The show will cover radio, computers and electronics generally. Normal venue is the Mill, Mill House, Atwick Road, Hornsea, with weekly meetings at 7.30 on Wednesdays, with a lecture to start off preceded by a code class. Secretary Norman Bedford G4NJP can be found on (0262) 73635.

**Harrow RS** Every Friday night at 8pm the Harrow Arts Centre, High Road, Harrow Weald, Middx with a constructional contest taking place on October 12 and G4UBB dealing with counterpoise design on the 19th. Other Fridays are informal with a practical aspect, together with a Morse code class. The PRO is Dave Atkins G8XBZ, 25 Maxwell Close, Rickmansworth, Herts or Rickmansworth 779942.

**Inverness ARC GMIDZU GM4TPF** Thursdays at 7.30 at the Cameron Youth Club, Planefield Road, Inverness. The Gaelic Mod in Inverness will be the occasion to have a special event station operating on the h.f. and 144MHz bands, GB2MOD, from October 12 to 19 with Gaelic-speaking ops in attendance. Needless to say the special QSL card will be worth having. Lots more details from sec David Jones GM4SXD, Beachan, Farr, Inverness also on (08083) 240.

**Ipswich RC G4IRC** Second and last Wednesdays at 8 in the club room of the Rose & Crown, 77 Norwich Road, Ipswich. This is a detached room and it is not necessary to go through the pub to reach it. Thought I'd just mention that point. A night on the air with the club station is planned for October 10 with a bring-and-buy sale on the 31st but note that this will take place at the Barrack Corner

Church Hall. The annual social get-together is planned for November 21 but before that G4BJO will talk about weather fronts and radio propagation on the 14th. More details from this very active club from Jack Tootill G4IFF, 76 Fircroft Road, Ipswich, Suffolk or buzz him on (0473) 44047.

**East Lancs ARC** A new one for the column I think. Meets first Tuesdays for a lecture, demonstration or suchlike, and on the last Tuesdays of the month for an informal get-together, at the Conservative Club, Cliffe Street, Rishton, at 7.30. For more details on the club drop a line to the PRO Stuart Westall G6LXU, 430 Blackburn Road, Accrington, Lancs where also resides Accrington 393457.

**Leith Nautical College AR & EC GM4AXG** Meetings start again in October, every Monday at 6pm in the T2-4 electronics lab of the college, a wide range of test equipment and facilities being available for use. Lucky lads! The club station sports an FT-101E and FT-221R. Students and past students and evening class students are most welcome as are s.w.l.s and members of the general public. Further info from sec/treasurer Susan Beech GM4SGB who can be contacted via the college.

**Lincoln SWC G5FZ G6COL** Second and fourth Wednesdays at the City Engineers Club, Central Depot, Waterside South, Lincoln at 8. Intervening Wednesdays are c.w. and RAE evenings with instruction on both. October 10 has a slide show on the western USA and Canada, with an activity night-cum-night on the air on the 24th. The Christmas family get-together is scheduled for December 12 this year. More info on the club from Pam Rose G4STO at the club QTH.

**Manchester University ARS G3VUM G8FUM** Every Wednesday afternoon during term time at the radio shack which is located on the first floor of the Students' Union building, next to the Main Debating Hall, with visitors always most welcome. Sec is Khee Chan G5MUR MUARS, Students' Union, Oxford Road, Manchester M13 9PR.

**Mansfield ARS** First Friday and third Tuesday of the month, Victoria Social Club, Princes Street, Mansfield, Notts, with a lecture on satellites down for October 5, by G4CUO, and the 16th being a natter night. On November 2 G4AFJ of the RSGB's Repeater Committee will be talking on that subject. This year's Buffet Disco is down for December 7. Hon sec is Keith Lawson G4AAH, 223 Southwell Road West, Mansfield, Notts.

**Newark & District ARC** Still going strong with gatherings first Thursdays at the Palace Theatre, Appletongate, Newark, at 7.30. A special meeting was held recently to bring together new and existing members and those who had lost touch with the club of late. The winter programme will cover lectures on satellites, RAYNET activities and code practice evenings. There is also an informal meeting around the middle of the month at a local pub where YLs, XYL's of OM's are welcome, and vice versa of course! Club net is on 144.525MHz f.m. Monday at 8pm with more info from sec Michael Gayler G4SDZ, 58 Fosse Road, Farndon, Newark, Notts or (0636) 702076.

**ARC of Nottingham G3EKW G6CW G8IUT** Every Thursday, 7.30, the Sherwood Community Centre, Mansfield Road, Nottingham, with G4NJH speaking on his trip to





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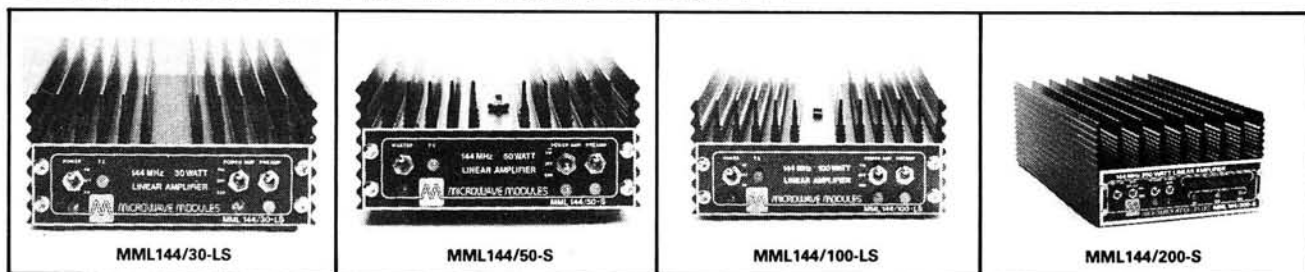
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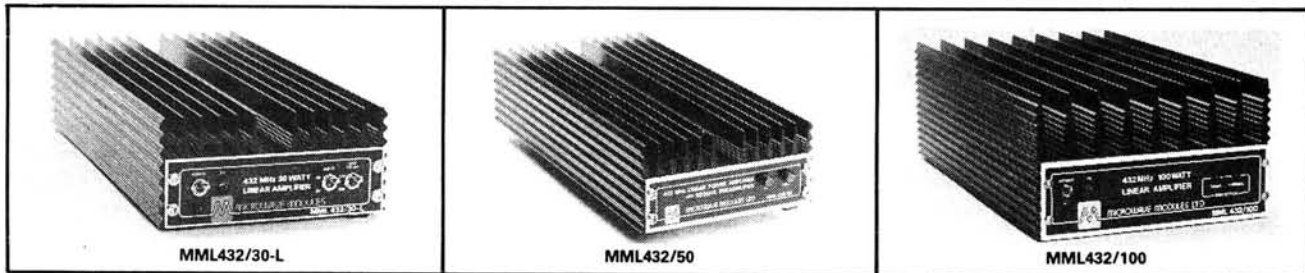
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MML432/100	10W	100W	CW.	—	—	13.8V @ 20A	✓	£245 (p&p £4.50)

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VK-land, on October 11, an activity night on the 25th. Further details from Jim Towle G4PJZ, 63 Digby Avenue, Mapperley, Nottingham or try Nottingham 624764.

**Oldham ARC** Reminder of the new venue for the club in the Bunker, Wheatsheaf Hotel, Derker Street, Oldham, on Monday evenings at 8.30pm, with visitors and new members most welcome. Further info from Fiona Butterworth G4SPX on 061-652 8862.

**Salop ARS G3SRT** AGM on October 11 takes pride of place but there will be a talk on AR by G6AKE on the 25th. Thursday evenings at 8, the Albert, Smithfield Road, Shrewsbury. Note November 8 and a talk on a very important subject, planning permission, by G4HFX. Club details from yet another lady sec Diane Parslow G4XBI, 1 Willington Close, Little Harlescott Lane, Shrewsbury.

**Southend & District RS** Brian Wood G4RDS says the club meets every Friday at the Council Offices, Rayleigh, at 7.30. Details of meetings from Brian, who is the club's Liaison Officer, at 27 Fernlea Road, Benfleet, Essex or ring (03745) 50494.

**Southgate ARC** Regular meetings second Thursday of the month, St Thomas' Church Hall, Prince George Avenue, Oakwood, London N14. On October 11 it's G6GOS dealing with audio matters. More from PRO R. F. Snary G4OBE, 12 Borden Avenue, Enfield, Middx.

**Spalding & District ARS G4DSP** I'd love to get along to the White Hart Hotel, Spalding, at 8pm on Friday October 19 when the expert Geoffrey Perry late of the Kettering Grammar School will deal with satellite reception. Straight from the horse's mouth, so to speak! Meetings second Friday of the month at above venue, and get ready for the construction contest to be decided on November 9. Christmas social and junk sale is slated for December 14. Betty Whitley G6YBL is sec, on (0775) 2781.

**Stanford-Le-Hope & District ARC** Keen to attract new members the club meets every Monday at 8pm at St Joseph's Parish Rooms, Scratton Road, S-Le-H, Essex. Sec Jim Thompson G4OVG is on the S-Le-H 642312 and ready to supply any details of the club's activities.

**Stowmarket & District ARS** First Mondays by the look of it at the Maltings Entertainment Complex which is opposite the railway station in Stowmarket. November meeting has G3ZQU telling how to get started on the 1-3 and 2-3GHz bands, a popular subject just now. The Christmas social takes place on December 3. Sec is G8SCB J. Lowe, "Bulan", 35 Barking Road, Needham Market, Suffolk or alternatively G3ZQU on Stowmarket 676288.

**Stratford-Upon-Avon & District RC** G3PGU Second and fourth Mondays starting

at 7.30 at the Control Tower, Bearley Radio Station, about five kilometres north of the town. Construction is the main theme of the club with members encouraged to bring in their own projects, either to get help or to encourage others. Chris Ousby G6DCL is PRO at Ormond Lodge, Newbold-on-Stour, Stratford-Upon-Avon, Warks, or try Ian Hopwood G6CWX on Stratford 68863.

**Street & District ARS** Meets first Tuesday at the Strode College says sec Colin Webber G4SCD of 3 Orchard Road, Street, Somerset. Like many other clubs this one will be active in the Scouts Jamboree-on-the-Air Sat/Sun October 20/21, using the call GB0SSG. The speaker on November 6 will be G6HTI on the subject of DXTV reception.

**Thames Valley ARTS** First Tuesday of the month at 8pm, the Thames Ditton Library, Watts Road, Thames Ditton, Surrey. While the title of the club is "Transmitters Society" in fact s.w.l.s are most welcome and you don't have to have a ticket! David Foster G3KQR of 56 Elmbridge Avenue, Tolworth, Surrey, is the sec also to be found on 01-399 1289.

**Vange ARS G3YCW** Thursday evenings at 8, the Barnstable Community Centre, Basildon, Essex, with a junk sale at least once a month. Talks by members are supplemented by outside lecturers. Sec Mrs D. Thompson can be found on (0268) 552606 with lots of info on the club's activities.

**Verulam ARC RAFA HQ**, New Kent Road, off Marlborough Road, St Albans, second and fourth Tuesdays of the month. G8MQT will talk about Larkspur ex-military equipment on October 23. Your enquiries to Hilary Clayton-Smith G4JKS, 115 Marshalswick Lane, St Albans, also St Albans 59318.

**Wakefield & District RS G3WRS** "Alternate Tuesdays" translated means October 16 when G8UCH deals with p.c.b.s, with a tape and slide lecture "The Human machine as a radio operator" on the 30th. Go along to Holmfield House, Denby Dale Road, Wakefield, around 8pm, with code practice sessions starting half an hour beforehand. Club sec Walter Parkin G8PBE can be located on Wakefield 378727.

**North Wakefield RC** Carr Gate WMC every Thursday at 8 with a junk sale laid on for October 4. More details from sec Steve Thompson G4RCH, 2 Alder Close, Morley or Morley 536633.

**Welland Valley ARS G4WVR** Mondays at 7.15 at Welland Park College, says Judith Day G60FZ the Publicity Officer of this new club. She can be contacted at 11 Warwick Close, Market Harborough, Leics. New members will be made most welcome as will any visitors. You can also try sec Dave Lunn G3LSL on M.H. 880746.

**Wessex ARC** Recently formed, the club will welcome prospective members and

visitors at the Cricketers, Wimborne, Dorset. Meeting "every fortnight" seems to make it October 16 and 30, Tuesdays, but hope the arrangements will be made a bit more definite 'ere long. In the meantime try sec Wendy Stacey, Spinney House, 16 Crane Drive, Verwood, Wimborne, Dorset.

**West Bromwich Central RC G4WBC** Sunday evenings at 8, the Victoria in Lyng Lane, West Bromwich. Everyone welcome with classes to help those taking the code test or the RAE. More from sec John Bates G6ZLW on 021-553 0531.

**Westmorland Radio Society** New sec is Gordon Chapman G1IIE, who can be found on 0539 28491. He tells me that future events are: October 9 a Photographic Audio-Visual Evening with G3UEC, November 13 is a St John First Aid Talk and December 11 a talk on 10 metres (28MHz) by G3IZD. That makes it the second Tuesday at 8pm in the Strickland Arms, Sizergh, near Kendal.

**Wimbledon & District RS** Meets at the St John Ambulance HQ second and last Fridays, the HQ being at 124 Kingston Road, Wimbledon, London SW19. October 12 is AGM time with a very special occasion on the 26th when a social evening to celebrate the 21st anniversary of the re-formation of the club will be held. The special call GBOWIM was issued to the club and used to the full with operation on all bands h.f. to u.h.f. at a long weekend camp near Chessington Zoo. Club sec Geoff Mellett G4MVS resides at 26 Paget Drive, Sutton, Surrey, and will be glad to hear from potential members. He can also be found on 01-644 8249.

**Winchester ARC** The Log Cabin, Stockbridge Road, Winchester starting at 7.30, with a junk sale on Saturday October 20, otherwise the third Saturday of the month. December 15 is Christmas social time again. Brian Epps G3SHQ is sec and can be contacted on Twyford 713003.

**Wirral ARS G3NWR** First and third Wednesdays, the Parish Hall, Heswall, said to be off the Milner Road, behind the church, at 7.45. This is a change of venue and a talk-in service is on the cards. Club net is on 144-725MHz every evening 7.30pm, with Sunday at noon on 7050kHz. Main item in October is the AGM on the 17th. Details from Cedric Cawthorne G4KPY, on 051-625 7311.

**Wirral & District ARC G4MGR G8WDC** Second and fourth Wednesdays at the Irby Cricket Club, Irby, Wirral with new members most welcome, as well as visitors. Sec is Gerry Scott G8TRY, on 051-630 1393.

Yet another appeal to club secs, do ensure the programme information sent to me includes the place, time and day/s of meetings. It is surprising how often the meeting place is omitted!

## MEDIUM WAVE BROADCAST BAND DX by Charles Molloy G8BUS

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

"What is the best way of matching a loop antenna into a receiver" asks reader **Peter Cutts** of Birmingham. Well there is a problem but the method used to overcome it with the standard medium wave

loop is to use a single-turn coupling winding. See my article in *Out of Thin Air*. The main winding, which picks up the signal and is resonated by the loop's tuning capacitor, consists of seven turns.

The coupling winding, which is not connected to the main winding but picks up signal from it by induction, is led off to the receiver. It should be connected to a dipole input if one is available or alter-



natively to the A and E terminals. The main and coupling windings between them form a 7 to 1 step-down transformer which provides an approximate match to the receiver. It is the best that can be done as you must have a complete number of turns on each winding or the loop will not work properly. Fractions of a turn are out!

## Differential Matching Amplifier

Why not do without a coupling winding and connect the receiver directly to the main winding? If you do this then the input impedance of the receiver will be shunted across the loop which will then be detuned and damped. Damping will broaden the tuning of the loop and weaken the signal picked up by it.

Much the best way of matching a loop to a receiver is to use an isolating or buffer matching amplifier. This will have a high input impedance which can be connected directly across the loop's main winding with little adverse effect. The low output impedance of the amplifier goes to the receiver's antenna input. This usually has a low impedance, so a good match with maximum signal transfer is obtained. The coupling winding is not used and need not be fitted to a loop intended for use with a matching amplifier.

DXers use a special amplifier called a differential matching amplifier (d.m.a.) which helps to maintain the accuracy of the loop's directional effects. A useful feature if you are interested in direction finding. For most practical DXing though, the standard one metre square loop with coupling winding is adequate. It is a good compromise as it gives good results with a minimum of complications and it is a passive device, i.e. it does not require a power supply. Improved results can be obtained by the experimenter who will find details of a d.m.a. in the February 1983 issue of *Practical Wireless*.

## North American DXing

Last month we saw how to pick up Newfoundland, the nearest part of North America so far as the DXer is concerned. Now that the long nights of winter are nearly upon us, it is worth searching for DX from more distant locations. The eastern coast of Canada, the United States and the Caribbean can all be picked up in the UK when conditions are favourable. While a communications receiver and medium wave loop antenna are desirable they are not essential. A table receiver connected to a short outdoor antenna, preferably via an antenna tuning unit (a.t.u.) should pull in some DX but it really is asking a lot to expect a small portable with internal antenna to be up to this sort of DXing.

Before we start, it is worth noting that every broadcasting station in Canada and the United States will have a callsign, just

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# LBC NEWS RADIO

261m 1152kHz 97.3VHF

like a Radio Amateur. The station is obliged to identify itself by its callsign and many of them do so frequently. This makes station identification very easy. Callsigns consist of either three or four letters. In Canada the first letter is a C while in the US it can be either a W or a K. Most of the stations we are likely to pick up will have call letters starting with a W. In the Caribbean, call letters are less frequently used except on American territory like Puerto Rico.

It is best to wait until 2300 before looking for DX. By this time the path will be in darkness and a number of European stations will have closed down for the night, reducing QRM. Check first of all for CJYQ in St John's, Newfoundland on 930kHz. This will show if the DX path across the North Atlantic is open. If you cannot pick up CJYQ then it is unlikely that you will hear anything else. Tune now to 1510kHz, 2kHz below the European channel 1512kHz. The Belgian on 1512 should have closed down by now and the weaker occupants in Saudi Arabia and the USSR should not give much trouble.

Listen on 1510kHz for WMRE which is located in Boston. This station is often the first to fade in from the United States. It is of course commercially operated so there will be adverts, frequent/station identification either spoken or sung (jingles). Try now on 1210kHz for WCAU in Philadelphia. Remember the slow fading which is characteristic of DX signals on the medium waves. The fading cycle may be spread over two or three minutes so once you have located a channel, stay tuned to it for a few minutes just to see what comes up out of the noise. Other stations to search for are WQXR on 1560, WHN on 1050, WNEW on 1130, all with studios in New York city.

Mainland Canada, strangely, is more difficult to pick up than the United States but try 940kHz for CBM in Montreal, 1410 for CIGO Port Hawkesbury, Nova Scotia and 1570 for CKLM Montreal on 1570 CKLM which is in the province of Quebec, has programming in French.

**Engineering Information**

**BBC Radio Solway**

London VHF station	London FM VHF relay	London VHF relay
Radio 1	88.7 MHz	88.7 MHz
Radio 2	90.9 MHz	90.9 MHz
Radio 3	92.4 MHz	92.4 MHz
Radio 4	93.8 MHz	93.8 MHz
Radio 5	95.2 MHz	95.2 MHz
Radio 6	96.6 MHz	96.6 MHz
Radio 7	98.0 MHz	98.0 MHz
Radio 8	99.4 MHz	99.4 MHz
Radio 9	100.8 MHz	100.8 MHz
Radio 10	102.2 MHz	102.2 MHz
Radio 11	103.6 MHz	103.6 MHz
Radio 12	105.0 MHz	105.0 MHz
Radio 13	106.4 MHz	106.4 MHz
Radio 14	107.8 MHz	107.8 MHz
Radio 15	109.2 MHz	109.2 MHz
Radio 16	110.6 MHz	110.6 MHz
Radio 17	112.0 MHz	112.0 MHz
Radio 18	113.4 MHz	113.4 MHz
Radio 19	114.8 MHz	114.8 MHz
Radio 20	116.2 MHz	116.2 MHz
Radio 21	117.6 MHz	117.6 MHz
Radio 22	119.0 MHz	119.0 MHz
Radio 23	120.4 MHz	120.4 MHz
Radio 24	121.8 MHz	121.8 MHz
Radio 25	123.2 MHz	123.2 MHz
Radio 26	124.6 MHz	124.6 MHz
Radio 27	126.0 MHz	126.0 MHz
Radio 28	127.4 MHz	127.4 MHz
Radio 29	128.8 MHz	128.8 MHz
Radio 30	130.2 MHz	130.2 MHz
Radio 31	131.6 MHz	131.6 MHz
Radio 32	133.0 MHz	133.0 MHz
Radio 33	134.4 MHz	134.4 MHz
Radio 34	135.8 MHz	135.8 MHz
Radio 35	137.2 MHz	137.2 MHz
Radio 36	138.6 MHz	138.6 MHz
Radio 37	140.0 MHz	140.0 MHz
Radio 38	141.4 MHz	141.4 MHz
Radio 39	142.8 MHz	142.8 MHz
Radio 40	144.2 MHz	144.2 MHz
Radio 41	145.6 MHz	145.6 MHz
Radio 42	147.0 MHz	147.0 MHz
Radio 43	148.4 MHz	148.4 MHz
Radio 44	149.8 MHz	149.8 MHz
Radio 45	151.2 MHz	151.2 MHz
Radio 46	152.6 MHz	152.6 MHz
Radio 47	154.0 MHz	154.0 MHz
Radio 48	155.4 MHz	155.4 MHz
Radio 49	156.8 MHz	156.8 MHz
Radio 50	158.2 MHz	158.2 MHz
Radio 51	159.6 MHz	159.6 MHz
Radio 52	161.0 MHz	161.0 MHz
Radio 53	162.4 MHz	162.4 MHz
Radio 54	163.8 MHz	163.8 MHz
Radio 55	165.2 MHz	165.2 MHz
Radio 56	166.6 MHz	166.6 MHz
Radio 57	168.0 MHz	168.0 MHz
Radio 58	169.4 MHz	169.4 MHz
Radio 59	170.8 MHz	170.8 MHz
Radio 60	172.2 MHz	172.2 MHz
Radio 61	173.6 MHz	173.6 MHz
Radio 62	175.0 MHz	175.0 MHz
Radio 63	176.4 MHz	176.4 MHz
Radio 64	177.8 MHz	177.8 MHz
Radio 65	179.2 MHz	179.2 MHz
Radio 66	180.6 MHz	180.6 MHz
Radio 67	182.0 MHz	182.0 MHz
Radio 68	183.4 MHz	183.4 MHz
Radio 69	184.8 MHz	184.8 MHz
Radio 70	186.2 MHz	186.2 MHz
Radio 71	187.6 MHz	187.6 MHz
Radio 72	189.0 MHz	189.0 MHz
Radio 73	190.4 MHz	190.4 MHz
Radio 74	191.8 MHz	191.8 MHz
Radio 75	193.2 MHz	193.2 MHz
Radio 76	194.6 MHz	194.6 MHz
Radio 77	196.0 MHz	196.0 MHz
Radio 78	197.4 MHz	197.4 MHz
Radio 79	198.8 MHz	198.8 MHz
Radio 80	200.2 MHz	200.2 MHz
Radio 81	201.6 MHz	201.6 MHz
Radio 82	203.0 MHz	203.0 MHz
Radio 83	204.4 MHz	204.4 MHz
Radio 84	205.8 MHz	205.8 MHz
Radio 85	207.2 MHz	207.2 MHz
Radio 86	208.6 MHz	208.6 MHz
Radio 87	210.0 MHz	210.0 MHz
Radio 88	211.4 MHz	211.4 MHz
Radio 89	212.8 MHz	212.8 MHz
Radio 90	214.2 MHz	214.2 MHz
Radio 91	215.6 MHz	215.6 MHz
Radio 92	217.0 MHz	217.0 MHz
Radio 93	218.4 MHz	218.4 MHz
Radio 94	219.8 MHz	219.8 MHz
Radio 95	221.2 MHz	221.2 MHz
Radio 96	222.6 MHz	222.6 MHz
Radio 97	224.0 MHz	224.0 MHz
Radio 98	225.4 MHz	225.4 MHz
Radio 99	226.8 MHz	226.8 MHz
Radio 100	228.2 MHz	228.2 MHz

The above frequencies correspond to an average field strength of 500 dBu/m at 100m distance in the plane of the wavefront at a height of 10 metres. All the off-frequency broadcast services shown in the above table are subject to a field strength of 30 dBu/m at 100m distance. The above table may be altered without notice of preference from other stations.

Engineering Information Department BBC Broadcasting House London W1A 1AA    01-262-4000 ext 2021    Information Sheet 1004/10/84

## Caribbean DX

There are several broadcasts in the Caribbean that come in regularly in the UK. The easiest to locate is the out-of-band Caribbean Beacon in Anguilla on 1610kHz. Programming is often religious and in English. Move down to 1580kHz and listen for the Voice of American relay, in English on 1580kHz. It comes from Antigua. Now try 1210kHz for Radio Caribes in Dominica in French. You can often hear it, mixed with WCAU and if the fading cycles are favourable one may fade down as the other fades up.

Radio Cayman on 1555kHz put in a good signal early in the night on several occasions last winter. Listen to Radio Malta on 1557kHz as it goes off at 2330. Then tune down 2kHz and listen for R. Cayman. Programmes are in English with a pronounced Caribbean flavour. Other DX to listen for is Radio Paradise in St Kitts on 825kHz, Radio Antilles in Montserrat on 930kHz, ZDK Antigua 1100. Next time we will have a look at DX from South America and how to send reception reports to distant medium wave stations.

## Local Radio DXing

Two interesting items picked up recently at my QTH were Festival Radio on 1530kHz broadcasting from the International Garden Festival in Liverpool and BBC Radio Wigan testing on 1296kHz. The latter is an experimental community radio outlet broadcast from a radio vehicle.

Daytime DX from my own log includes BBC Radio Solway (Dumfries) on 585kHz, Radio 4 in Newcastle on 603, York on 666, Cumbria 756, Ulster (Londonderry) 792, Furness (Barrow) 837, Ulster (Enniskillen) 873, Norfolk (King's Lynn) 873, Devon 990, Derby 1116,



Cambridgeshire 1449, Nottingham 1521 and 1584, Kent 1602. Commercially owned outlets heard were Radio Aire in Leeds on 828kHz, Radio Wyvern 990, the new Viking Radio in Hull 1161, Hereward Radio in Peterborough 1332, Manx Radio, Isle of Man 1386, Radio Tay in Perth on 1584.

All stations were picked up with a DX160 and 20 metre random wire antenna plus an a.t.u. Daytime reception is by the ground wave and some of the stations heard are quite low power, such as Cambridge on 1449kHz which is only 100 watts. Radio Tay on 1584kHz was an interesting catch. During the day it

was a weak companion to Nottingham but as sunset approached and sky wave reception became possible, the relative strengths of the two stations changed. Radio Tay peaked up and was easily identified. The period before sunset, and sunrise too, is a good time for medium wave DXing.

## SHORT WAVE BROADCAST BANDS by Charles Molloy G8BUS

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

The identification of broadcasting stations on the long and medium waves is seldom a problem for the average listener. Stations are well spaced on the dial, so it is easy to locate the one of your choice. On the short waves the situation is rather different. Broadcasting is confined to quite small segments, each crammed with stations, making it impossible with a general coverage receiver to set it even approximately to the station of one's choice.

Set designers have attempted to combat the problem using multiband sets where each s.w. band occupies the whole length of the scale and there are still a number of these sets available. Broadcasters too tried to help by using interval signals and signature tunes before the start of a transmission, so that the listener could home in on them, as it were.

### Interval Signals

Something of a misnomer, carried forward from the early days of short wave broadcasting, interval signals are widely used on the short waves today. Perhaps the most famous was the letter "V" in Morse used by the BBC during the last war as an identification of its broadcasts to occupied Europe. Today, interval signals are of infinite variety ranging from a few bars of music to bird calls, the Kookaburra bird of Australia for example, or even recordings of farmyard animals as used by Botswana. The talking drums from Tahiti are also well known to DXers.

Recordings of interval signals are both interesting and useful. Currently, a cassette of recent signals is available from the European DX Council. Send a s.a.e. to the EDXC, PO Box 4, St Ives, Huntingdon, Cambs. PE17 4FE for details. The twice weekly *DX Party Line* from HCJB in Ecuador has been playing recordings of interval signals for some time now. Each is played several times and the listener is invited to identify it before this is revealed.

Once digital readout becomes commonplace then the need for interval or identification signals will disappear, as the listener will be able to set his receiver to the desired channel with certainty. Whether they will actually vanish is a matter for conjecture. Personally I hope not, as they add a little character to short wave broadcasting and enable stations to project an image, if they so wish.

### The High Frequency Bands

The two bands designated 21MHz (13 metres) extending from 21.450MHz to 21.750MHz and 17MHz (16m) covering 17.700 to 17.900 are similar and can be treated together so far as the s.w.l. and DXer is concerned. These are long distance, daytime only bands. Reception demands a path of darkness between transmitter and receiver, so at sunset 21MHz and 17MHz appear dead or nearly so. Newcomers to the short waves sometimes think there is something wrong with their receiver when the h.f. end of the spectrum is quiet, but it is only a demonstration by the ionosphere, that we are totally dependent on it for long distance reception on the short waves.

Sunrise in the UK opens a path of daylight to the east and with it the two bands open up for the day. Typical of what can be heard is Japan on 17.755, 17.785 and 17.870MHz, Australia on 21.720, 21.525, 17.715, Pakistan on 21.775, 17.645, Dubai on 21.605, Saudi Arabia 21.495, Baghdad 17.720. No need for a sensitive receiver and long outdoor antenna. Signals on 21MHz and 17MHz come roaring in and can be picked up easily with a table receiver and whip antenna.

There are still a few stations on these bands after dark. These are from the west or south-west where the track or most of it is still in daylight. Listen on 17.790 for HCJB in Quito, Ecuador, on 21.470 for the Voice of America in the USA, on 17.820 for Radio Canada International, on 17.605 and 21.685 for the Radio Netherlands relay in Bonaire. Reception deteriorates gradually as the evening progresses and more and more of the path goes into darkness. It is a pity that many short wave receivers do not tune above 15MHz or even 12MHz. Such sets are to be avoided as their users miss a lot of interesting listening and DX.

### On the Bands

The following regular broadcasts will be of interest to newcomers to short wave listening. All times are UTC (GMT).

Austrian State Radio (ORF) has a programme for Europe at 0830 daily (0900 Sundays) on 6.155MHz (49m band) 7.170MHz (41m band) and 9.770MHz (31m band); at 1230 on

6.155 and 9.770; at 1830 (1805 Sundays) on 6.155 and at 2130 on 5.945 (49m band). ORF is easily located as the interval signal is the first few notes of the Blue Danube waltz. *Austrian Short Wave Panorama* is carried on the 0900 and 1805 transmissions on a Sunday and contains items of general interest to the short wave listener. The address for listeners' letters and a schedule is Austrian Radio (ORF), Short Wave Service, A-1136 Vienna, Austria.

The Pacific Service of Radio Australia on 6.035MHz comes in well in the UK during the afternoon and evening until sign off at 2000. Interesting to listen to programmes intended for reception on the far side of the world at breakfast time the following morning. Radio Sweden International has a daily half-hour broadcast in English which can be heard at 1100 on 9.630 and at 1830 on 6.065. Programmes cover a wide variety of topics while on a Tuesday the well known *Sweden Calling DXers*, hosted by George Wood, is on the air. Norway broadcasts in English once a week on a Sunday only, with a half-hour transmission that is repeated several times during the day. Listen at 1000 on 6.015, at 1300 on 9.590, 1400/1600/1700 on 6.015 and at 1900 on 9.590. Other frequencies used from time to time are 9.600 and 15.175.

From the United States the Armed Forces Radio and TV Service (AFRTS) beams to US Forces in the Atlantic area daily from 1100 to 0100 on 15.420MHz (19m band). Programmes are taken mainly from domestic networks and carry a large amount of sports and commentaries as well as feature programmes and news, interesting to the onlooker and providing a useful service to US residents or travellers abroad in addition to its military audience. Address for further information is AFRTS, 1016 North McCadden Place, Los Angeles, Calif 90038, USA.

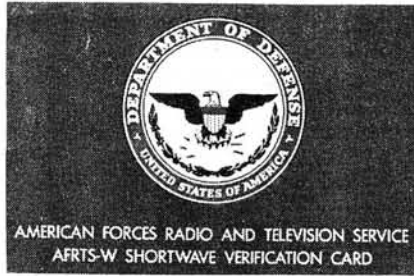
From South America, Brazil is represented by Radiobras daily at 1800 on 15.279MHz (19m band). The programme lasts for an hour and usually comes in well in the UK. The way of life, music and viewpoints from a part of the world different to our own comes over well from Radiobras, with features such as History of Carnival, Samba, Brazilian Culinary Arts. In contrast Kuwait, rather surprisingly, provides a largely western style of programming to its foreign audience. You are more likely to hear





**Radio Cairo**

rock music than Koran from Radio Kuwait. Listen on 11.675MHz (25m band) at 1800 for its daily programme which lasts until 2100 and is usually a strong signal in the UK.



**AFRTS**

### Readers' Letters

Bert Carter of Romford refers to the piece I wrote in the July issue about the Radio Japan relay in Gabon and goes on to say "I thought you might like to know I sent a report on the 21.695 transmission off to Tokyo on June 25 and received the special Gabon relay QSL on July 10. That's the fastest return I've had in nearly 40 years of QSLing . . . congratulations to Radio Japan." Shows what can happen when a station is looking for reception reports.



**Austrian Radio**

Another satisfied reader is A. M. C. Trickey who purchased a Vega 206 portable. "One can receive dozens of stations—definitely identified are Israel, Syria, Hanoi, Australia, South Korea, Pakistan, Dubai, Afghanistan. It really seems this set will get anything if one is prepared to wait for station identification, the strength of reception is phenomenal. I might say I am 80 and am like a kid with a new toy." Yes it really is remarkable what a modern receiver with whip antenna will pull in. Technology has advanced a long way since I started listening with my home-made one-valver. Good listening OM.

## VHF BANDS by Ron Ham BRS15744

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

Although the seasonal sporadic-E is predominant in almost all subjects in this episode of v.h.f. activity, there are reports about awards to RTTY operators, limited tropospheric openings, readers at the Chalks Pits museum, a couple of super QSOs and a request for help.

### Solar

On July 19, Cmdr Henry Hatfield, Sevenoaks, using his spectrohelioscope, located a very small sunspot and 6 filaments, then one spot and 4 filaments on the 28th. "Very quiet," and "even

quieter," remarked Henry about the sun on those two days; similar reports came from Patrick Moore, Selsey, and Ted Waring, Bristol. Although Ron Livesey, Glasgow, auroral co-ordinator for the British Astronomical Association, said, on August 6, "no positive sightings of auroral activity have reached me so far for July," his magnetometer was very active on the 13th and 31st and fairly active on the 15th, 16th and 19th. There was a slight increase in solar activity during the first half of August, Patrick sent a series of sunspot drawings showing what looks like a double group around central meridian on the 10th and while Ted counted

11 sunspots on that day, I recorded a few small bursts of solar radio noise at 143MHz on the 9th and 11th. The first radio noise I had recorded from the sun since June 24.

### Sporadic-E

"I had been watching Band I TV all day on June 30 and thought the prevailing sporadic-E might climb to the 144MHz band and, sure enough, it did," writes Phil Hodson G8RBY, Melton Mowbray. He took advantage of the situation and made s.s.b. contacts with stations in VB, YY, WW and WX squares with 5/9 reports both ways. One of Phil's near neighbours, Tim Fern G4LOH, worked two stations in Portugal and four in Spain using just two watts to a 16-element Tonna array. "Gerrard Boot PD0MHO, Fig 2, is a very active amateur on 144MHz horizontal f.m.," writes Tony Gould G4UAM, Norwich.

WAD239

Fig. 1

MONTH	JULY																AUGUST														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DF0AAB																															
DK0TE																															
DL0IGI																															
EA6AU																															
GB3SX																															
LA5TEN																															
LU1UG																															
PY2AMI																															
ZD9GI																															
ZS1CTB																															
ZS5VHF																															
ZS6PW																															
Z21ANB																															
3B8MS																															
5B4CY																															
9L1FTW																															



Fig. 2



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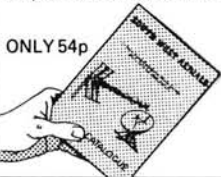
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He told me that between 0245 and 0250 on August 6, Gerrard worked 17JNE on 144MHz, a distance of some 1516km from his home in Gouda. Gerrard is an active s.w.l. on 430MHz ATV and can usually be found on 145-350MHz or S20, using horizontal f.m., and is pleased to give reports and take part in tests. Congratulations, Gerrard, let's hope we hear more from you.

At 1720 on July 23, **Harold Brodribb**, St. Leonards, logged 9 Eastern European f.m. broadcast stations between 66 and 73MHz, 49 at 1015 on the 24th, 10 at 0935 on the 31st, and 14 on August 1. During similar sporadic-E conditions I counted 9 at 1230 on July 21, 19 at 0755 and 32 at 1900 on the 24th, 28 at 1930 on the 27th, 38 at 1030 and 26 at 1915 on the 31st, 23 at 1015 on August 1, 32 at 0830 and 45 at 1217 on the 4th, 21 at 0755 and 32 at 1850 on the 5th, 51 at 1326 and 15 at 2004 on the 6th. At such times the signals from these stations are exceptionally strong. Unfortunately, they disrupt the 70MHz amateur band, but their numbers do give a general idea about the extent and intensity of the prevailing disturbance.

Signals from the users of the 27MHz Citizens Band, located in Northern Ireland, Scotland and Wales, poured into southern England during such conditions on August 4, 5 and 11, and at 0955 on the 5th one was maritime mobile off the north coast of Scotland.

## The 50MHz (6m) Band

During July, **Dave Coggins**, Knutsford, heard G3BAO, 'COJ, 'LTF, 'NOX, 'TCU, 'UGF, 'ZIG, G4CUT, G5KW, G6XM, GM3WOJ, GM3ZBE, GM4FZH, GW3LDH, GW3MHW and the beacon GB3SIX in the 50MHz band. 18-year-old **Roland Jeffery** G6DSA, Winsford, has been active listening on 50MHz since January after a very informative QSO with GW3LDH in Wrexham. Roland used his father's (G8SIG) FT-225RD and wire dipole before he purchased his TS-700G and made his own dipole. "Now I can listen on 50MHz and the 144MHz talk-back frequency," says Roland, who is also very pleased with the Wood and Douglas 50RX144 converter and already has 7 countries in his 50MHz log. During May, June and July, he often received signals from GB3SIX and the Gibraltar beacon ZB2VHF, by meteor scatter and sporadic-E.

## The 28MHz (10m) Band

"It has been a busy time on 28MHz with the sporadic-E booming through, many European countries logged and some at ridiculous strengths," writes **Dave Coggins**. He has recently added a Lowe SRX30D receiver to his station equipment. "28MHz never seemed to open up for DX working, only short

European skip, at least at my QTH," says **Bill Kelly**, Belfast, using a NRD 515 communications receiver and a 22m long-wire antenna. I logged Italian and Spanish s.s.b. stations at 1300 on July 26; EA, HB9, I, OK, SM and SP on August 4 and at 2044 on the 4th there was a lot of short skip on the band, mainly from Sweden. In fact, the 28MHz band throughout the weekend of 4th and 5th was dominated by short skip conditions. An ideal time for the variety of Morse reading machines to identify the c.w. stations at the bottom end of the band. My Tono Theta 550 certainly earned its keep that weekend. In Cork City, **John Desmond**, heard many Danish stations working into the UK on August 8 and during the short skip activity on the 11th, he heard CX9AU, a lone South American, working a station in Sweden.

## 28MHz Beacons

"DK0TE became DK0TEN on August 1," writes **Ted Waring**. This change was also mentioned in the letters I received from **John Coulter**, Winchester, and **Ted Owen**, Maldon, who said on August 18 that the past month had been very interesting. **Dave Coggins** heard the beacon DF0THD on July 27, and one morning at 0345 he switched on his rig and found very strong signals from the German beacons DF0AAB, DK0TE and DL0IGI. Typical sporadic-E, **Dave**. "Besides sporadic-E, I noticed that every night at some time I could hear DL0IGI via meteor scatter," writes **John Desmond**, who uses a Yaesu FRG-7 receiver and Hy-Gain 3-element Yagi on 28MHz. He adds, "The sporadic-E opening on the 11th was quite extensive. All German beacons were strong and for a while I could hear the Sussex beacon GB3SX, which is relatively close for me." On July 15, **Chris van den Berg**, The Hague, heard EA4CGN in beacon mode on 28-210MHz and reports that he often receives very strong signals from the Palma beacon EA6AU. "The Palma beacon was very strong at 2359 on August 1," writes **Henry Hatfield**, whose log, along with those of **Chris van den Berg**, **Dave Coggins**, **Bert Glass**, **John Coulter**, **John Desmond**, **Norman Hyde** G2AIH, Epsom Downs, **Bill Kelly**, **Ted Owen**, **Ted Waring** and my own, were used to complete the monthly beacon's analysis chart, Fig. 1.

My thanks to **Fred De Witte** NL7357, for the gen about the new experimental beacon PA0ETE, due to start transmission on 28-302MHz, with an output of 470mW, on August 10. In fact, **Bert Glass** BR32693, Plymouth, reports hearing this on test on August 1.

## 28MHz Satellites

"Among the successful users of the RS-transponders, being active almost every possible orbit are F9EA, OK3AU, I5YT, G3EMU, SM7BYU and SP9DH,"

writes **Chris van den Berg**. Both **Chris** and **John Coulter** logged signals from G3DDG on August 5 and **Chris** reported receiving 5-digit groups, plus the word "AMSAT" from OSCAR-9. Over in Belfast, **Bill Kelly** logged European stations and orbital data from the Russian satellites around 1830 on July 8 and 1245 on the 10th and in his letter, **John Coulter** said, "Plenty of QSOs on the RS satellites, mostly European except for K2AGJ, VE2LI, W0CA, W8MMC and W9YCV." **John** also received and translated such messages as, "Wishing success to the Pioneer's Ether 84 Competition," from RS3A on July 17, and "Greetings to participants in the Pioneer's Ether 84 Competition," from the same electronic bird at 1057 on August 12.

## Tropospheric

The atmospheric pressure, measured at my QTH, began this period at 30.15in (1020mb) on July 16 and remained consistent at this level until midnight on the 25th when it took off, peaking around 30.35 (1028) at 1400 on the 27th, then, by 2000 on the 31st it had slowly fallen to a low of 29.7 (1005). From midnight on August 1 to 1800 on the 5th, the pressure hovered around 30.0 (1015), rose slowly to 30.3 (1026) by midnight on the 9th and from 1400 on the 10th it gradually fell back, reaching 30.1 (1019) at 0600 on the 13th, where it stayed to the end of this report, on the 15th. "The long spell of fine weather brought some pleasant listening," writes **Bill Kelly**, having heard plenty of amateurs from England, Scotland and Wales working through the Northern Ireland repeater, GB3NI on R5. **Bill** also heard signals through the repeaters at Caernarfon GB3AR on R4, Caldbeck GB3AS on R1 and Ayr GB3AY on R2.

"Our new 144MHz repeater GB3BB, Brecon Beacons, on R4, is operational, and both **Bert Mills** GW3LJP and I can hear it well," writes **Simon Hamer** from New Radnor. Around 1720 on August 11, **Kenneth Begg**, Dundee, heard a GM4 working mobile through the Scottish Borders repeater GB3SB on R2, a distance of about 155km.

At 1840 on July 4, **David Last** G6LEU, Truro, using an FT-290R, 25-watt kit-built linear and 8-element Quagi antenna on 144MHz, worked, 5/9 both ways, EA8XS at about 2700km. The QSO was joined by G8ZDS, who then completed a QSO with the Spanish station on the 430MHz band. **David** worked the EA again on 144MHz at 2140 on the 5th and says that he also heard him working other stations on both the 144 and 430MHz bands.

## Band II

**Andrew Hill**, Walsall, is normally a short wave bands enthusiast, but for several days in July he heard Viking



Radio on 102.7MHz with a strong signal and decided to send a report, which earned him a QSL card, Fig. 3, from the station in Hull. Andrew's interest in radio began 5 years ago when he was 12 and had the chance to occasionally tune the short wave band of an old Grundig radiogram. Later he had his own Hitachi radio/recorder and now uses an ex-Admiralty B40 and long-wire antenna for his h.f. listening. On July 29, **Andrew Guy**, Newport, received BBC Radio London, LBC, France Cultur and Frequence Nord between 94 and 100MHz. In addition to the Crown SHC6300 Andrew uses for Band II DXing, he now has a Sony ICF-7600D communications receiver which he is pleased with, and writes, "The v.h.f. section is very good, not only sensitive but selective, too."

I logged 14 continental stations between 87 and 100MHz at 0945 on the 28th and early in August. When **Damien Read**, Newport, took his receiver on holiday with him to Humberside to see what Band II was like there, he logged BBC Radios Cleveland, Leeds and Sheffield and ILRs Aire, Hallam, Tees and Viking.

I used the radio section of my Plustron TVR5D while portable in East Sussex on July 27 and, with its own telescopic antenna, I counted 10 French stations in the band.

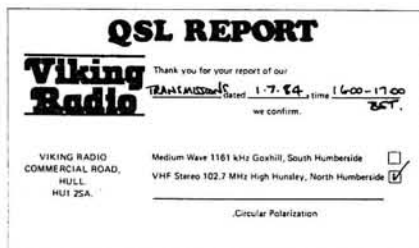


Fig. 3

During the sporadic-E disturbance on August 6, **John Williams**, Harpenden, was surprised to hear Russian speech around 90MHz, at 1400, on his Auritone clock radio with its one metre of wire antenna strung among the kitchen utensils. He then fired up his Ferranti 045 and heard a variety of East European stations between 1400 and 1415 and at 1430 a voice announced Radio Bruno, that's good DX, John. Early on the 8th, Harold Brodribb logged Belgian, Dutch and a good number of French stations between 88 and 100MHz.

## RTTY

In the BARTG Spring VHF/UHF RTTY Contest, the winner and runner-up in the 144MHz single operator section were G6CZV and GU6JST. The multi-operator section was won by G4PDY/P and G8MWU with G3WOR/P and G6LUT the runners-up. G5MUR and G3KUE/P were the No. 1 stations in the 432MHz single and multi sections, and BRS28198 and NL4483 were the leading s.w.l.s.

NL4483 and OZ-DR2135 lead a field of 15 receiving stations and ON4UN, YU7AM and UT5RP and LZ1KDP, VE1ASJ and OK3KJF lead the respective transmitting sections in the h.f. event.

Congratulations also to **Phil Hodson** G8RBY for earning the first ever 10 countries/40 squares RSGB award for RTTY QSOs on 144MHz, and he especially thanks Ray Lowes G4NJW and Kevin Coleman G6SSX for their help in taking equipment to rare DX places to give him the opportunity to work them. "What other mates would ring and ask, 'Where do you want me to go on holiday next week?' Thanks to Kevin and Ray I obtained 144MHz RTTY QSOs in AN, XM, XN, XJ and ZR squares," said Phil.

For the contest minded, the BARTG are holding their Autumn VHF Contest between 1800GMT on October 13 and 1100 on the 14th, with a compulsory rest period of 4 hours during the event. The contest is limited to the 144MHz band and is open to licensed amateurs who are permitted to use RTTY in CQ DX Zones 14 and 15. Listener reports are very welcome and will be scored separately. The 1984 Winter 144/432MHz Cumulative RTTY Contests will take place between 2000 and 2200GMT on November 5, 12, 19 and 26 and December 3. Contacts via repeaters or satellites are not valid in either competition. All details from the BARTG contest manager, 464 Whippendell Road, Watford, Herts WD1 7PT.

Between July 16 and August 15, I copied RTTY signals from 36 international prefixes, CE, CN, DJ, DK, EA, EI, F, G, GI, GM, HA, HB9, I, IT9, KP4, LA, LX, QE, QD, QH, QK, ON, OZ, SM, SV, TR, UO, UZ, VK, Ws 1, 4, 6 and 9, YO, YU and 9H4 around 14.090MHz, then seven prefixes EA, DF, DL, GI, I, OE and WI on around 21.090MHz and a German station dur-

ing a sporadic-E event around 28.090MHz. In addition to the usual European RTTY stations, Peter Lincoln received signals from A7IAD, CE3BBW, EA9JE, FG7XC, HK3PJ, JR6FC, PZ1DZ, VP2MD, VU2AIG, YB3BHP and 9M2GV.

## Tailpiece

While talking to father and son, John and Andrew Coulstock G6TXY and G6TXZ, from Tunbridge Wells and Northants respectively, I learned that they both use a Totosuko TR2100M on 144MHz while John uses a FT-208 and Andrew a FT-790 on 430MHz. For 144 at their respective shacks John has a home-brew Slim Jim and a 5-element Yagi and Andrew an 8-element Jaybeam.

On August 5, I had the pleasure of showing Paul Essery G3KFE, editor of *Short Wave Magazine*, Norman Field G4LQF, Bob Fowler G3IQF, Fred Garratt G4HOM, Colin Turner G3VTT, Ted Trowell G2HKU and Adrian Weiss WORSP, all members of the QRP Club, around the radio building at the Chalk Pits museum, along with their host, Chris Page G4BUE. Bob Fowler is a founder member of the club and at home in South Dakota, Adrian uses mainly home-brew gear for QRP operation.

Andrew Humphries BRS 34368, is looking for a circuit or any information on the vintage receiver Chakophone model 1B, built by Eagle Engineering in Warwick. Andrew has been interested in radio since he was 9 and is now a member of the British Vintage Wireless Society, RSGB and the RAFARS using AR88 and Eddystone 680X receivers and long-wire antenna on the h.f. bands and a FDK TM56B receiver and loft Halo antenna for 144MHz. If anyone can help, please write to Adrian at 21 Gould Road, Hampton Magna, Warwick CV35 8TU.

While in Italy last year, Fraser Lees took pictures of the antennas at Monte Penice, the site can be seen in TV bands in this issue.

### Did you "spot" the mistake?

Our sunspot pictures on page 64 of the October issue didn't convey much, did they? Unfortunately, between the time that we ok'd the page proofs and the actual printing of the magazine, all the sunspots disappeared. Apologies to Patrick Moore. Ron Ham and our readers.

# TELEVISION

by Ron Ham BRS15744

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

"It has been great for me logging, making graphs and plotting the map of Europe," remarked **Owen Jones**, Stoke-on-Trent, when, like many other readers, he enjoyed seeing the wide variety of captions, clocks, programmes and test cards which poured into the UK, enhanced by sporadic-E, from television stations in Eastern Europe, the Mediterranean

coasts, Scandinavia and the USSR between July 16 and August 15.

## Sporadic-E

When I had the pleasure of analysing the comprehensive letters and logs of the TVDXers named in Fig. 1, I noted that

TV clocks from Germany, Hungary, Italy, Norway, Spain, Sweden and the USSR were seen showing times which varied between 1 and 4 hours ahead of GMT. The time differences shown by such clocks can help the TVDXer to decide the likely origin of the broadcast. Among the test cards logged were Austria OFR-FS1, Belgium RTBF,



Czechoslovakia RS-KH and SR1 TV Bratislava, Denmark DR, Finland YLE-TV1, Germany DDR-1 and Grunten, Holland PTT-NED 1, Hungary MTV-1 Budapest, Iceland RUV, Italy RAI-1 (Fig. 2), Norway Bremanger, Gamlen, Gulen, Hemnes Melhus, NRK and Steigen, Poland, Portugal RTP, Rumania, Bucharesti, Spain TVE-1, Aitana 3 (Fig. 3) and Andalucia, Sweden SR and TV1 and 2, Switzerland +PTT-SRG 1, USSR and Yugoslavia JRT BGRO and RTV Ljubljana.

Among the captions mentioned were ARD, Azimut, Beograd, BPEMR, CCP, CNOPT, COMPNTE, CST, Deutsches Fernsehen, dt, EESTI, Granada, Heute, HOBOCTN, HIREK, Le Transmissiioni Riprenderanno Alle Ore 1100, NPOR-PAMMA, PRAHA, RAI UNO, SZUNET, TACC-COOBWAET, TALLINN, Telejournal, TP, TVP, TV Reklam, Vortagsprogramm, ZDF and ZPRAVY, which, to my way of thinking, was pretty good, especially when we know that pictures often ride over each other and the words are not easy to read.

At 1850 on July 21, **Simon Hamer** watched a vintage film about Hitler and his generals on Danish TV and the presenter talked about the D-Day landings. Also this month **Harold Brodribb** saw an episode of the series *To The Manor Born* with Italian sound on Ch. 1a at 1625 on July 19.

## Tropospheric

Although there were no spectacular tropospheric openings between July 16 and August 15, I am sure that readers sorted out what was going, for example, at 1335 on July 26, **Walter Haller** received a good colour weather report, Fig. 4, from Anglia TV at Sandy Heath on Ch. 24. Around the same time on the 27th, I used my Plustron TVR5D in the car park at Herstmonceux Castle and with its own telescopic antenna I received the French TDF/FR3 test card on four channels between 25 and 60. Then from home on the 30th I watched boxing, a BRT TV1 test card and Olympic swim-

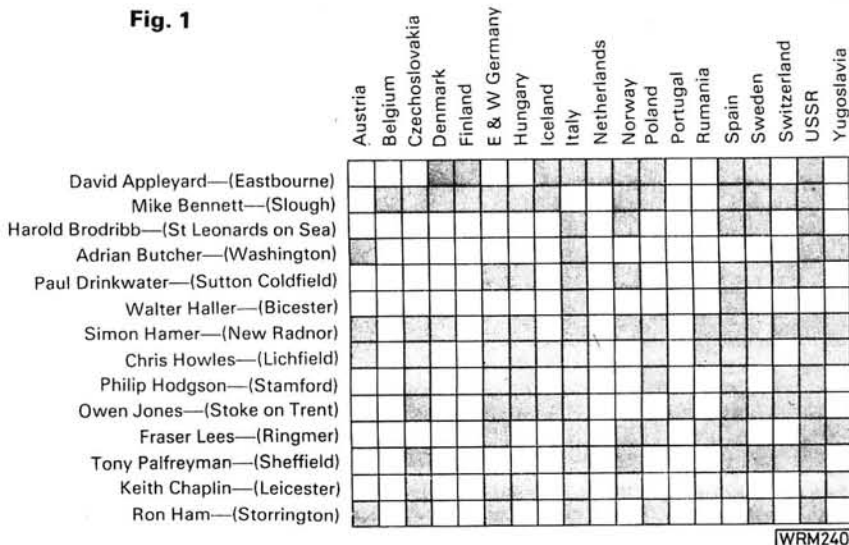
ing in Band III between Chs. E8 and 10. Harold Brodribb logged test cards from Belgium RTBF-1 Ch. E8 and BRT TV1 on E10 early on the 22nd and about 4 French stations in the u.h.f. band at 0830 on August 9. Later on the 9th **Tony Palfreyman** received Netherlands 1 and 2 on Chs. 39 and 45. At 1800 on the 11th, **Kenneth Begg**, Dundee, saw the start of the Netherlands 1 programmes followed by their news, *Nos Journaal*. Kenneth also saw the news, *Heute*, from Germany's ZDF with an Olympic report and on the 12th he watched various programmes throughout the day from ARD/ZDF and Netherlands 1 and 2 and then Belgium's RTBF 2 in the late evening. Ken could still receive the German stations in good colour on the 13th, which all fits nicely with the slight fall in atmospheric pressure which began around midday on the 10th and seen by Harold on the weather charts in his daily newspaper.

"SSTV has been quite good with signals from West Germany and Italy the most common," reports **Peter Lincoln**, Aldershot, for the month prior to August 14. Peter also received pictures from call areas F, PA, HA, HB9, LA,

OH, OK, SP and YU as well as North America, Fig. 5, in the late evenings and LU5NA and ZP5CCG from South America. Peter has written a computer test programme for generating a grey scale for SSTV equipment, I am not surprised because computers, RTTY and SSTV are his special interests as some readers know who have spoken to him on the 'phone.

Between July 31 and August 9, **Richard Thurlow** G3WW, March, had first time 2-way QSOs with CT1BK, DF0ND, DK7UD, DL1MY, DL2DV, DL4SAW, HA3MQ, PA3BUR and 4X6LM, bringing his total first timers to 2031. Richard also copied pictures from, or exchanged them with, A92NH, DA2ZE, DF3ST, DJ0GF, DL5GR, I5CYN, LU5NA, LX1DT, ZS6OZ and ZS6BTD. At 0730 on August 14, Richard got into the European SSTV Net and exchanged 8 seconds monochrome pictures with DJ1SS, DL1MY, DL1KBP and OZ3WP and 24 seconds single frame colour pictures for over half an hour with DJ1SS who was using the Volker Wrasse SG-1 converter and the latest KB-1 keyboard. "PA0LAM/EA put in a beautiful SSTV picture on 14.230MHz at

Fig. 1



WRM240



Fig. 2

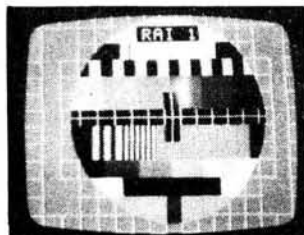


Fig. 3

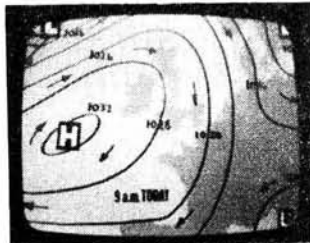


Fig. 4

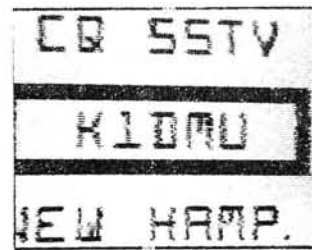


Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9



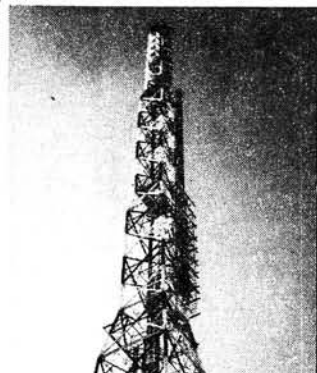


Fig. 10

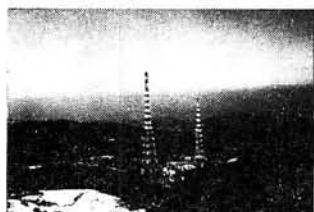


Fig. 11



Fig. 12

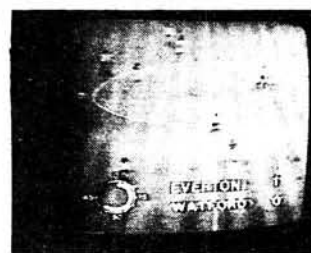


Fig. 13

0812 on the 13th, using normal 8 seconds, black and white, frame speed and received my 32 seconds mono pictures well," said Richard. He has been demonstrating his latest SSTV 12 seconds colour equipment to John Holmes G3UEU, one of the early slow scan television enthusiasts.

### Station Reports

While in Italy last year, Fraser Lees photographed the TV antenna at Monte Penice, Fig. 10 and took another shot of the masts, Fig. 11, carrying the v.h.f. radio and TV antennas, looking north toward the Alps. At the time Fraser G6JIO, was taking part in a v.h.f./u.h.f./

s.h.f. contest with his good friends I2CNC and IW2BNA.

Kenneth Begg, Dundee, is now using a Triax Unix 92 and twin BB grid system, mounted on a Hirschmann rotator on a mast some 6m above his chimneys, for u.h.f. and a loft mounted Antiference MH473, feeding a Labgear up-converter for Bands I and III. On July 7 he logged pictures from Germany and Holland and at 2330 on the 8th he received a Philips 5544 test card showing BFBS Colour.

"The month of May was fairly good for sporadic-E DX," writes Major Rana Roy from India and adds, "the main station available was Russian with Dubai a regular coming up every day between 1930 and 2130. Rana saw Indian labourers dancing and singing on an American documentary film from Dubai,

in Band I, during the evening of the 10th and a Russian test card at 1430 on the 12th. An Arabic station, Fig. 6, appeared at 1930 on the 13th and a Russian station being overlapped by a Russian test card at 1500 on the 14th. We often see this overlapping of signals here Rana especially during an intense disturbance. At 1735 on the 15th, a Russian news caster, Fig. 7, was seen on Ch. 3 and a football match, Figs. 8, 9 and 13 from Dubai, Ch. 2 on the 19th, with an Arabic song and dance programme, Fig. 12, at half time. On June 29, Rana received test cards from China and the USSR and Russian news with male and YL presenters on the 30th. At 1710 on July 1 he saw a girl playing a guitar on an Arabic station and a test card from Dubai TV at 1500 on the 2nd.

multiple choice... multiple choice...  
**ANSWERS**  
 multiple choice... multiple choice...

Are you cheating? If you are reading this page before page 54 then you are. Please turn to page 54 for the questions.

### Question 2-1. Answer-d.

A large value electrolytic capacitor across R4, the emitter resistor, keeps the d.c. bias on the transistor unchanged but at the same time prevents the emitter voltage varying with the audio, which would produce negative feedback. So the efficiency of the stage is increased; in other words, it gives higher gain.

### Question 2-2. Answer-b.

Clause 6 (1) (g) of the Licence relates to the log  
*"Entries made in respect of calls made when operating from a vehicle or vessel, or as a pedestrian should be made as soon as possible after the end of the journey and must consist of date, geographical area of operation, frequency band(s) used and time of commencement and end of journey."*

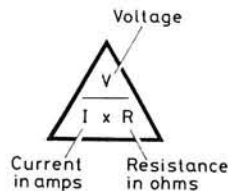
### Question 2-3. Answer-a.

We need Ohm's law for this question. Using the diagram below as a memory aid, cover up the thing we want to find out—in this case the current.

This gives  $\frac{V}{R}$  as the formula.

$$V = 12 \text{ volts} \quad R = 24 \text{ ohms}$$

$$\frac{12}{24} = 0.5 \text{ amps}$$



Although you are allowed to take calculators into the exam room (so long as they are silent and not of the programmable type), all the calculations will contain only simple numbers which you can do mentally.

### Question 2-4. Answer-b.

*"Modulation is prohibited by means of recordings of any kind other than special recordings of sinusoidal tone or tones within the audio frequency spectrum which may be either constant or steadily changing in frequency."* (Clause 8 (2) of the Amateur Licence).

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EB0F	13.10	EM84	2.00	6AV6	1.30	3GJ5A	3.00	2N3632	10.00	2SC1233C	0.40	2SC2289	12.50	MRF477	12.50	SD1080	1.55	SD1222-STUD	11.00
EB0L	12.95	EN32	16.25	6AW8A	2.65	3GJ7	1.85	2N3733	13.20	2SC2290	2.50	2SC2290	27.50	MRF492	27.50	SD1080-B	7.50	SD1224-2	13.00
EB1CC	3.20	EN81	2.80	6AZ8	3.80	3GH6	1.95	2N3866	0.85	2SC1241	1.70	2SC2247	0.30	MRF497	0.30	SD1080-F	7.50	SD1225-F	10.95
EB8CC	3.90	EN92	3.30	6BA6	1.60	3GW8	1.70	2N3926	11.26	2SC1251	10.00	2SC2369	2.00	MRF515	3.90	SD1088	26.00	SD1225-STUD	10.95
EB9F	9.25	EZ35	1.85	6BA8A	2.75	3GV6	3.00	2N3927	11.82	2SC1252	1.11	2SC2370A	18.00	MRF517	3.50	SD1089	28.50	SD1244-6	12.75
E90CC	8.50	EZ41	2.45	6BE6	1.90	3GV6	3.00	2N4416	0.75	2SC1303	5.00	2SC2379	15.00	MRF620	18.00	SD1089	40.10	SD1256	6.95
E93CC	6.50	EZ80	1.95	6BH6	2.00	3HB	2.00	2N4427	0.75	2SC1306	1.00	2SC2395	15.00	MRF644	27.50	SD1115-2	10.50	SD1262	15.00
E130L	23.50	EZ81	1.60	3HA6	3.05	2N5090	13.90	2SC1307	1.50	2SC1310	1.50	2SC2407	1.00	MRF646	28.00	SD1115-7	2.10	SD1270	3.75
E180F	8.50	EZ90	2.00	6BK4C	4.15	4HB6	3.05	2N5109	2.00	2SC1311	0.40	2SC2420	18.00	MRF648	33.00	SD1127	2.50	SD1272	10.95
E188CC	3.75	PC1805	1.85	6BL6	68.50	4HE5	4.00	2N5160	4.80	2SC1311E	0.32	2SC2494	16.00	MRF750	6.50	SD1131	3.25	SD1272-2	10.95
ES070	27.50	PL509	5.50	6BL7GT	3.80	4HF5	3.85	2N5190	1.50	2SC1314	25.00	2SC2509	6.00	MRF846	46.00	SD1133	9.50	SD1278	13.75
EB91	1.95	PL519	5.75	6BL8	1.45	4HG5	1.95	2N5589	6.00	2SC1318	0.40	2SC2531	1.30	MRF901	2.75	SD1133-1	10.00	SD1278-1	13.75
EB9C1	1.30	QV02-6	19.50	6BM6	2.50	3HG8	8.50	2N5590	8.50	2SC1368B	1.00	2SC2538	1.10	MRF904	2.95	SD1134-1	2.50	SD1285	12.75
EBF89	1.50	QV03-10	5.50	6BM8	1.50	4HS6	3.95	2N5591	8.50	2SC1383B	0.50	2SC2539	15.00	MRF911	2.50	SD1134-2	10.00	SD1300	1.25
EC90	1.85	QV07-50	1.95	6BN6	2.45	4H26	2.75	2N5643	13.20	2SC1424	1.35	2SC2545	24.95	MRF9175	22.50	SD1134-B	8.00	SD1303	2.50
EC32	2.50	QV03-12	4.50	6B05	1.60	4J5	3.15	2N5913	2.50	2SC15059	6.00	2SC2545E	0.29	MRF9176	30.00	SD1134-STUD	7.60	SD1316	2.10
EC40	2.95	4CX250B (EIM/AMP)	6BR8A	2.95	6J5GT	2.95	2N5945	8.95	2SC15446	0.45	MRF208	12.00	MRF9177	43.00	SD1135	10.25	SD1317	8.00	
EC70	3.70	4CX250B (NAT)	39J0	6B8E	1.35	6J6	2.90	2N5946	15.63	2SC1568	0.45	MRF212	12.00	MRF9004	2.00	SD1135-3	12.00	SD1405	21.00
EC81	1.60	4CX350A (EIM)	70.00	6C4	1.85	6J8	4.00	2N6081	6.00	2SC1589	5.00	MRF221	12.00	SD1005	8.20	SD1136	12.50	SD1407	27.50
EC82	1.60	4CX350A (EIM)	70.00	6C4	1.85	6J8	4.00	2N6081	8.75	2SC1622	0.33	MRF229	3.50	SD1006	2.10	SD1143	9.45	SD1407MP	55.00
EC83	1.60	4CX350A (AMP)	69.00	6C4A	1.85	6J8A	4.00	2N6082	9.20	2SC1623	0.30	MRF231	12.36	SD1012-3	10.00	SD1143-1	10.00	SD1410	21.00
EC85	2.20	4CX350F	72.00	6CA7	3.50	6JG6A	3.50	2N6083	12.00	2SC1688	19.80	MRF232	13.50	SD1012-4	10.50	SD1144-1	2.50	SD1410-1	21.00
EC88	1.70	4CX1500A	44.00	6CB6A	1.90	6J6C	4.95	2N6084	13.20	2SC1674	0.25	MRF233	14.30	SD1013	10.00	SD1158	7.95	SD1410-3	21.00
EC91	3.00	4CX1500B	37.00	6CF6	3.85	2N6094	8.95	2N6094	8.50	2SC1675	0.20	MRF234	16.00	SD1014-6	10.50	SD1201	7.35	SD1412	36.00
EC189	2.10	4CX10000D	78.50	6CG7	2.25	6JH8	3.25	2N6095	8.50	2SC1678	1.25	MRF237	3.10	SD1015	17.50	SD1202	7.50	SD1412-3	24.00
ECF80	1.45	4D21	57.00	6CH6	9.95	6JK6	2.20	2N6255	3.45	2SC1729	18.00	MRF238	12.60	SD1018-6	13.00	SD1212-4	6.00	SD1413	18.00
ECF86	2.50	4D32	64.75	6CJ3	2.30	6JM6	3.95	2SC730	4.10	2SC1730	0.26	MRF239	20.00	SD1019	24.70	SD1212-7	4.00	SD1414	36.00
ECF801	1.85	4PR60C	25.00	6CJ6	10.95	6JSGC	2.95	2SC731	3.95	2SC17400	0.20	MRF240	24.50	SD1019-5	24.70	SD1214	8.70	SD1416	33.00
ECF81	2.50	4X150A	42.50	6CK6	6.00	6K6GT	3.75	2SC732	0.25	2SC1765	7.75	MRF243	35.00	SD1020	1.50	SD1216	11.00	SD1418	30.00
ECL82	1.50	5A00A	225.00	6CL6	3.30	2AT6	1.70	2SC874	2.50	2SC1815	0.28	MRF245	16.00	SD1074	18.00	SD1218	18.00	SD1421	36.00
ECL83	2.50	5AR4	3.50	6CM5	2.30	2AT7	1.60	2SC821	6.60	2SC1906	0.33	MRF247	30.10	SD1076	18.50	SD1219-4	18.00	SD1428	24.00
ECL86	1.70	5AS4A	2.50	6CN6	4.95	2AU6	2.00	2SC828B	0.30	2SC1907	0.30	MRF260	5.00					SD1429	19.98
EF40	8.50	5B254M	24.00	6C06	2.20	2AU7A	1.60	2SC829B	0.25	2SC1945	3.50	MRF264	11.00						
EF80	1.35	5C12	128.00	6CW4	6.50	2AV6	2.00	2SC890	8.50	2SC1946	16.50	MRF309	42.00						
EF85	1.65	5CX1500A	535.00	6CW5	1.95	2AX7	1.60	2SC891	0.18	2SC1947	9.88	MRF317	73.00						
EF86	1.75	5D22	76.00	6CY5	3.80	2AX7WA	4.80	2SC900	0.19	2SC1955	7.20	MRF321	35.00						
EF89	2.30	5R4	7.00	6CY7	3.00	2BA4	2.90	2SC900F	0.19	2SC1957	11.00	MRF323	35.00						
EF91	2.95	5R4GYA/B	3.75	6CZ5	3.15	2BA6	2.90	2SC908	4.50	2SC1966	11.00	MRF323	35.00						
EF92	2.20	5R4WGB	17.90	6DA6	3.00	2SC911A	18.00	2SC911A	18.00	2SC1967	15.00	MRF326	63.00						
EF93	1.80	5SR6	6.00	6DC6	2.45	2BE6	1.90	2SC945	0.21	2SC1968	17.50	MRF327	70.00						
EF94	1.80	5JA4GB	2.50	6D5B	1.50	2BM7A	2.50	2SC945R	0.21	2SC1969	22.00	MRF329	58.00						
EF95	3.90	5UP1	40.00	6D8J	1.70	2BY7A	2.65	2SC952	0.60	2SC1969	3.50	MRF412	18.51						
EF183	2.00	5V4GA	27.50	6DK6	3.95	2BZ6	0.30	2SC982	0.30	2SC1970	15.00	MRF421	36.85						
EF184	2.00	5Z4GT	1.90	6DT5	2.30	605	42.00	2SC994	2.50	2SC1971	4.00	MRF422	42.00						
EF200	2.95	6AM6	3.50	6D9W4B	2.30	607	2.90	2SC998	3.90	2SC1972	11.00	MRF426	23.00						
EK90	1.90	6AJ8	2.50	6E5	4.20	610	5.00	2SC1001	9.90	2SC1973	4.00	MRF427A	21.00						
EL34	3.30	6AK5	3.30	6E8A	2.45	611A	14.90	2SC1011	15.00	2SC2001	0.45	MRF428	57.00						
EL36	2.50	6AK5W	2.90	6EH5	1.85	612A	19.90	2SC1019	1.15	2SC2026	0.75	MRF428A	75.00						
EL38	4.85	6AK6	1.95	6EH7	2.00	613	28.50	2SC1091	0.90	2SC2027	0.80	MRF433	16.2						
EL41	10.95	6AL5	1.95	6EJ7	4.00	613	19.90	2SC1096M	0.90	2SC2097	0.36	MRF449A	14.95						
EL43	6.00	6AL5W	1.80	6EL4A	1.45	E29B	17.20	2SC1117	1.50	2SC2099	15.00	MRF450	11.90						
EL44	1.60	6AM5	9.10	6E58	2.10	632A	81.50	2SC1120	12.50	2SC2100	24.00	MRF453	14.00						
EL46	1.95	6AM6	2.95	6E77	2.00	613	28.50	2SC1169	24.00	2SC2103	18.00	MRF454A	24.00						
EL48	1.95	6AM6A	2.95	6E77	2.85	643	10.00	2SC1121	18.00	2SC2105	15.00	MRF454A	24.00						
EL91	9.10	6AN8A	2.10	6EW6	1.50	645	48.30	2SC1122	2.00	2SC2107	1.60	MRF454A	24.00						
EL980	7.60	6A05A	1.95	6F6G	2.20	F57B	70.00	2SC1162B	0.90	2SC2116	6.95	MRF454A	16.00						
EL980	2.80	6A05W	9.10	6F6H	1.50	6H6A	61.50	2SC1169	4.85	2SC2121	3.00	MRF455A	21.00						
EL903	39.00	6A08	2.20	6F07	2.25	F68	2.50	2SC1169	4.85	2SC2221	1.50	MRF455A	21.00						
EL905	6.00	6AR5	2.85	6F55	2.25	F72A	19.00	2SC1176	14.00	2SC2233	0.90	MRF458	19.95						
EL919	6.75	6AS6	5.50	6GB5	2.80	E22	12.50	2SC1177	17.25	2SC2237	16.00	MRF466	24.50						
EL903	9.95	6ASTG	7.20	6GE5	2.90	E27	17.90	2SC1178	18.00	2SC2281	13.00	MRF472	4.40						

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- home recording equipment (what about your own studio?)
- amateur radio (your club is there and Practical Wireless has a set-up that's bound to intrigue you)
- computers (with a wide range of games, books etc)
- components (special offers galore)
- tools and test instruments
- disco and light show equipment (dazzle 'em with your brilliance)
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**SEMINARS** You want to know what's the very latest – in technique and equipment – on electronic music. **"Electronic Music Maker"** is running seminars on Thursday/Friday a.m.

**ROBOTS** How to build them. Where to get the parts. The Micros? Programming? Software? **"Your Robot"** will tell you in down to earth language on Saturday/Sunday.

**'HOME RECORDING STUDIO'** are also running seminars, so if your want to start building, here's how on Thursday/Friday.

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– and they will all be there with advice and guidance.

PW

How much will this cost you? £1.00 only if you fill in this coupon and hand it in at the Registration Desk. £2.00 without the coupon.

**Leisuretronics is organised by Trident International Exhibitions Ltd. 21 Plymouth Road, Tavistock, Devon PL19 8AU, England. Tel: 0822 4671 Telex: 45412 Tritav**

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Leisuretronics is at the Royal Horticultural Hall, London, Nov. 8,9,10,11, 1984  
 Thursday, Friday and Saturday 10 a.m. to 6 p.m., Sunday 10 a.m. to 4 p.m.



# C. M. HOWES COMMUNICATIONS

## FUN TO BUILD KITS BY MAIL ORDER

Building your own radio equipment is one of the most rewarding aspects of amateur radio. We help make construction a pleasure. All our kits come with a clear and full set of instructions, detailed parts list and circuit diagram. The kits include all board mounted components and a good quality glass-fibre printed circuit board. The board has the component locations screen printed on it for easy assembly. It has been said that one of the best things about our kits is what we don't include! We leave you to provide your own case and external parts so that you can add your own individual touch. Many customers can make their own cases, or obtain them cheaply at rallies so saving money. If you have trouble obtaining these items, we can always supply them, simply phone or write for a quote. We have done the difficult technical bit for you, but you can still build up a piece of equipment with a good deal of your own contribution to the finished item. All kits are also available ready assembled. Choose an interesting project from our range:-

### DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVER

The DcRx is a single band communications receiver that has been designed with the beginner in mind. It is straightforward to build and works amazingly well. Although this is a simple design, a lot of thought and development went into this kit and it is capable of receiving most of the signals that can be heard on very much more expensive equipment. We find that sales of the DcRx split roughly in half between beginners and experienced operators who are looking for an interesting alternative to their expensive rigs. The DcRx is a lot more fun to use than a sophisticated factory built radio, it brings back some of the challenge and satisfaction to amateur radio. You expect an expensive radio to pick up signals from all over the world, when you hear far-off lands on a simple set you built yourself, I find that a little bit of magic is put back into the hobby.

We do two versions of this receiver at the moment, one covering either 20 or 30 metres and one for 80 metres. An experienced constructor could easily modify these for other bands. We will be producing a Top-Band (180M) version of this kit, it may be available by the time you read this. If you would like to see what others think of the DcRx, G3RJV wrote an article on it in the May issue of Shortwave Magazine. Whilst I have been typing this advert out, I have had a phone call from a customer in Holland saying that he is very pleased with his DcRx kit and that a number of his friends want them too, as he is visiting the UK next week can he call round and collect half-a-dozen? They must be good! The only external parts you need to go with the kit (apart from a case and the knobs etc.) is a couple of tuning capacitors of about 50pF. If you do not have these in your junk box, we can supply suitable items at £1.50 each whilst stocks last.

#### Brief Details:

Power required: 12 to 14V DC @ 30mA quiescent - ideal for battery use.  
Audio output: Approx. 1W into 8 ohm speaker or headphones.  
Modes: SSB and CW. Bands: 20, 30, or 80 metre versions available.  
PCB size: Approx. 3 inches (75mm) square.

**DcRx Kit £14.80, assembled PCB module £19.90.**

### ST2 CW SIDE-TONE/PRACTICE OSCILLATOR

The ST2 is a very simple to build item, but gives a much nicer sounding note than most of the various Morse code oscillators on the market. The ST2 gives up to 1W output into 8 ohms at approx 800Hz sinewave. The unit will work from a Morse key (electronic or straight) or from the output of a transmitter by RF sensing. This is a very versatile unit, you could use one as a practice oscillator while learning the code, and then later use it with your TX when you have your class A licence. Most practice aids are of no further use after the Morse test, not so with the ST2. It will work with as little as 3W RF on the HF bands, so it is ideal for the QRP operator.

**ST2 Kit £7.30, assembled PCB module £10.80.**

## 139 HIGHVIEW, VIGO, MEOPHAM, KENT, DA13 0UT. FAIRSEAT (0732) 823129

### COMING SOON!

We have a couple of new kits that are up and running in prototype form as I write. They may well be available by the time this advert is published. One is a GRP CW TX for 80 metres. This will produce about 5W maximum output, the power level being adjustable. The basic TX is crystal controlled, but provision is made for adding a VFO. We will be producing a VFO kit, and another module that will enable the transmitter to be used with the DcRx as a full transceive setup. Versions for other bands will be along in a while. The basic 80M TX kit will include a crystal and the price will probably be a little cheaper than the companion DcRx receiver.

The other prototype that is working nicely on the bench at the moment is a desk mic kit. This includes a microphone capsule and a Plessey VOGAD compressor/preamp. This is a very nice sounding unit that is getting super reports on FM, both on 2M and CB. The kit is going to be priced at a very keen rate at about £10. I think you will have a hard job to beat this for value in desk mics, especially as reports over the air indicate that the audio quality is as good as some of the most expensive items on the market. If you would like more details and an accurate price on these items, send us an SAE. I will try and make sure we have an information sheet on these ready by the time this appears in print.

## XM1 mk2 CRYSTAL FREQUENCY MARKER



A must for any shack, the XM1 is a very useful piece of test equipment, as well as helping keep you "legal". This is a very comprehensive calibrator, having a built in voltage regulator and EIGHT marker output frequencies. See the picture above and read the review of the mark one version in the June issue of "Amateur Radio".

★ Marker outputs: 10, 2.5 & 1 MHz, 250, 100, 25, 10 & 2.5 kHz. These are useable from LF up to UHF.  
★ Power required: Any voltage from 8 to 24V DC @ approx. 40mA.

**XM1 mk2 Kit £16.80, assembled PCB module £21.30.**

### AP3 AUTOMATIC SPEECH PROCESSOR

The AP3 has sold over 1000 units since my article in the September '83 issue of "Ham Radio Today". This excellent processor really can make the difference between working a station and failing to get through. The AP3 uses a Plessey VOGAD chip for automatic level control and has four selectable clipping levels in approx 6dB steps. The unit has a built in voltage stabiliser, active filtering, and turns itself on and off automatically. There is only one adjustment to make to set the output level, so the AP3 is really easy to get going.

**PA2/15 10dB gain 15W 2M linear amplifier**

**Kit £18.90, assembled £23.90**

**PA2/30 30W 8dB gain 2M linear amplifier**

**Kit £22.90, assembled £27.90**

**CO1 RF or PTT operated switching unit for above amps**

**Kit £9.80, Built £13.80**

The PA series amplifiers are suitable for FM, CW and SSB.

If you would like further information on any product, simply drop us a line, enclosing an SAE. We have an information sheet on each item. We aim to keep everything in stock and delivery within 7 days.

**Please add 60p P&P to your total order value.**

73, Dave, G4KQH Technical Manager

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# SMALL ADS

The prepaid rate for classified advertisements is 36 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £12.00 per single column centimetre (minimum 2.5 cms). All cheques, postal orders etc., to be made payable to Practical Wireless and crossed "Lloyds Bank Ltd". Treasury notes should always be sent registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Room 2612, IPC Magazines Limited, King's Reach Tower, Stamford St, London, SE1 9LS. (Telephone 01-261 5785).

## NOTICE TO READERS

*Whilst prices of goods shown in advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.*

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## Software

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## For Sale Cont:

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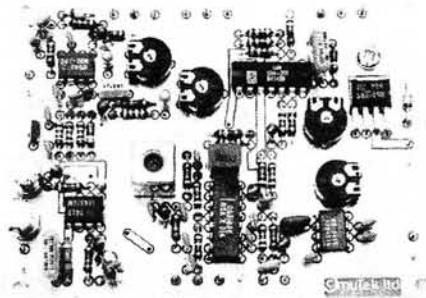
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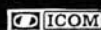
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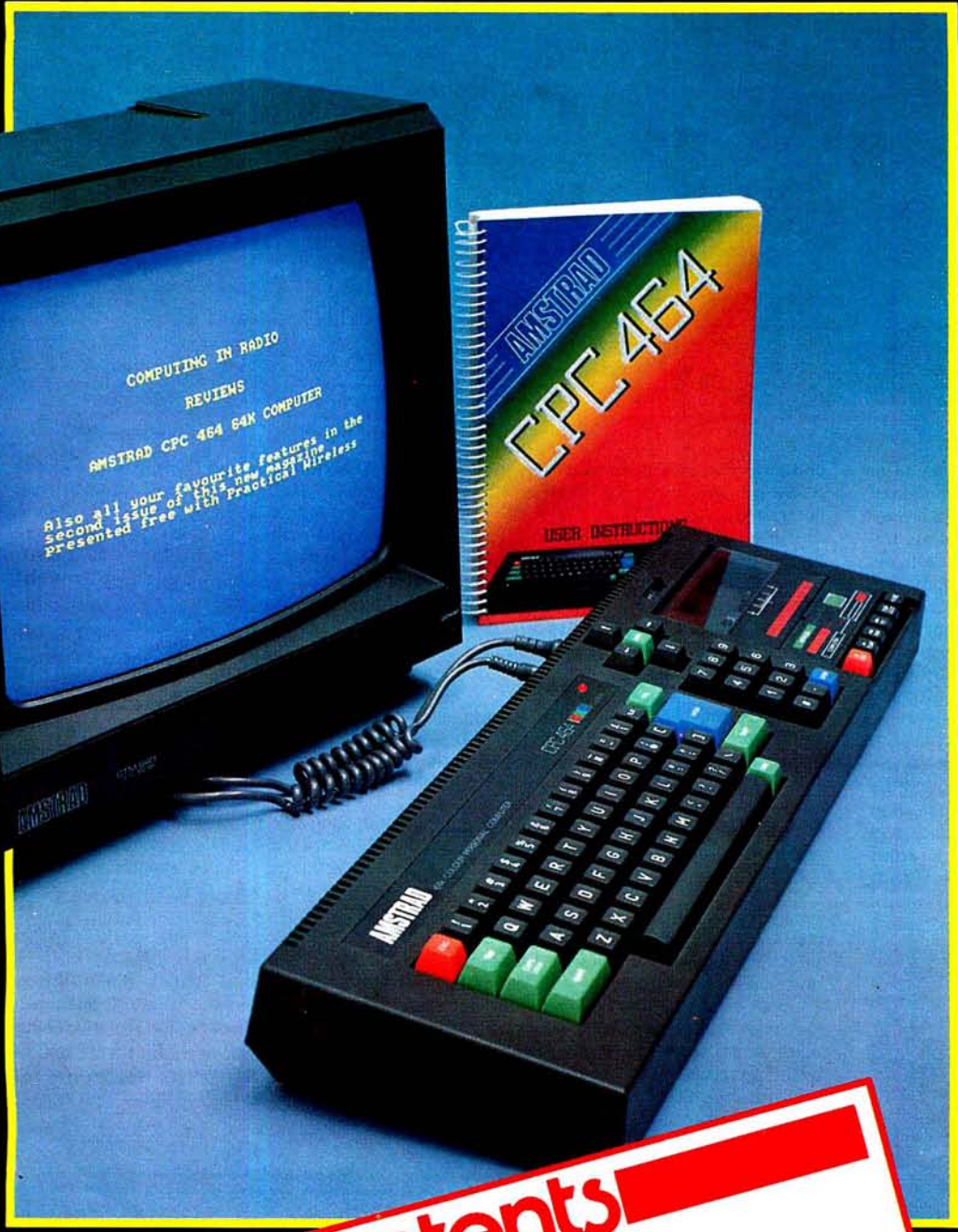
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**FORTH for the Radio Amateur**

# COMPUTING IN RADIO



## A Healthy Interest

Apologies for keeping you on tenterhooks for the second issue of *Computing in Radio*. An industrial dispute within IPC Magazines made it impossible to meet the schedule necessary for inclusion inside the October issue of *Practical Wireless*. Still it does mean that the next issue of *CiR* will come that much quicker, as you will now only

have to wait until the January issue of *PW*.

There can be no doubt that you like the format of *CiR* from the favourable comments we have received. The almost embarrassing flow of programs for review or publication indicates a healthy interest in this side of amateur radio. If you have written a program which you think could be of

interest to other radio amateurs, please let us know. We are also interested in what the smaller manufacturers and professional software writers are doing—remember, if you don't tell us of your latest product or program, we cannot tell our readers. Better still, send a sample, kit or program for review—don't wait to be asked. **G8VFH**

# news

The British Amateur Radio Teleprinter Group (BARTG) have produced a version of the ST5 RTTY terminal unit especially for use with computers. Previously, the amateur wanting to use an ST5 t.u. with his computer had to drastically modify the p.c.b. to remove a lot of unwanted components, and then add the necessary t.t.l. drivers. Now, the transmit and receive sides are on the one p.c.b. and the power supply required is just +5V. Complete kits are available at £74.50 for non-members. Members save £7 on this price, so even if you are not yet a member of BARTG you could join before you buy a kit and still be £2 in pocket! For membership, just send £5, together with your name, address and call sign, if you are licensed, to **John Beedie G6MOK, 161 Tudor Road, Hayes, Middlesex UB3 2QG.**

In the Software reviews in the Summer issue of *CiR* we managed to get the wrong address for Softricks. To order or find out more about the Softricks Morse Tutor program for the 48K Spectrum, contact **R. Gierelo, 1 Rowan Place, Dundee DD3 0PH. Tel: Dundee 88232.**

Scarab Systems are now marketing a SSTV system, receive only, for the popular 48K Spectrum. Audio from your receiver are input into the Spectrum's EAR socket and the

Advertisement

computer decodes them to display the final SSTV picture on the TV connected to the computer.

The program, on cassette, costs £15 inclusive of postage and VAT and is available from **Scarab Systems, 39 Stafford Street, Gillingham, Kent, ME7 5EN** who will be only too pleased to provide you with details of this and other programs.

The next issue of *Computing in Radio* will be presented free with the January 1985 issue of *Practical Wireless* on sale the first Friday in December 1984. To ensure your copy why not place a regular order with your local newsagent or take out a subscription.

Following on from the news in the Summer issue of *CiR* we have now received a printed price list of programs, accessories and spares for the Jupiter ACE computer. Of most interest to the radio amateur is the fact that as well as a wide range of hardware most spare parts can be obtained including partly built and bare circuit boards and the ACE FORTH ROM chip. An s.a.e.

to **Boldfield Limited Computing, Sussex House, Hobson Street, Cambridge, CB1 1NJ** will bring you full details. Boldfield have promised for the future a controller for 5¼ inch disk drives, a colour card and printer interfaces, as well as some interesting software.

Richard Wilmott GW3RRI is now selling his computer software under the Technical Software label. His address is still **Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF. Tel: 0286 881886.**

The rumours currently going the rounds that Sinclair have stopped production of the ZX81 are completely without foundation. We contacted Sinclair Research who told us that the ZX81 was still going strong and selling well particularly in overseas markets where computing was just getting going.

We also asked about the supposed differences between Issue 3 Spectrums and previous models regarding the loading of programs from tape. As far as they know there are no differences in loading any model of Spectrum from cassette.

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## GROSVENOR SOFTWARE (G4BMK)

**AMTOR** Dragon 32/64. Superb stand-alone program. FEC ARQ and Listen Modes. Type ahead, QSO review etc. Requires conventional RTTY terminal unit plus a clock/PTT board (see below). Cartridge **£49**. Addition to RTTY/CW Cart **£44**. Tape **£39**. Receive only **£24**.

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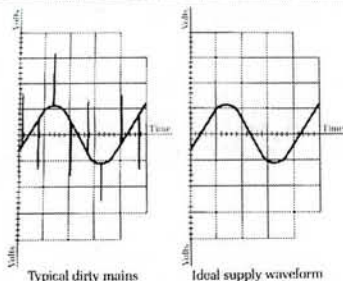
**PNP COMMUNICATIONS — QUALITY TERMINAL UNITS**  
RTTY: Dual filters + PLL: Kit **£32.50**, Assembled **£41.50**, Boxed **£63.25**. **MORSE INTERFACE: KIT £13.20, ASSEMBLED £20.12**. **AMTOR CLOCK/PTT switching unit: Boxed £22.40**, available assembled without box.

SAE for details. State computer and call sign (if any)  
22 GROSVENOR ROAD, SEAFORD, EAST SUSSEX.  
Tel: (0323) 893378



## Power Cleaning Plug

The mains supply is a constant source of worry for the computer user. Spikes and other noise on the mains may cause the computer to crash. The B&R Power Cleaner is a 13A mains plug with built-in filtering to clean up the supply. Recommended retail price is £13.46 inc. VAT. **B&R Relays Ltd., South Road, Temple Fields, Harlow.**



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### RTTY and CW TRANSCEIVE with NO TERMINAL UNIT

This fantastic program interfaces direct with your rig. Split screen, type ahead, 26 memories and much, much more. Tape and components for the very simple interface for only £17.50. For CBM64, BBC-B and VIC20 versions coming. CW-only version for SPECTRUM £10.

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**LOCATOR** Enter QTH or Universal (Maidenhead) locator or lat & long of anywhere in the world and get distance, beam and return headings, long path details, VHF contest points and totals. Converts between locator and lat & long. Not available for ZX81.

All programs are menu-driven, very easy to use, and come with full instructions. Prices include p&p 1st Class by return. Add £1 per tape if outside UK or Ireland.

## technical software

Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF. Tel. 0286 881886

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Sanyo Green Monitors .....	£97.00	Cannon 1080A Printer (inc. Cable) .....	£350.00
Disc Drives from .....	£150.00	CP80 Printer (inc. Cable) .....	£230.00
Joysticks (Pair) .....	£17.90	Printer Cable (BBC or Dragon 32) .....	£12.90
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Acorn Electron .....	£199.00	Joysticks (pair) .....	£14.90
All connectors, plugs and sockets for BBC, ribbon cable, discs C.20, C.15, C.12, cassettes etc. in stock.		ZX Spectrum 48K .....	£129.00
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R.T.T.Y. Program for BBC.B .....	£7.50	New tatung einsten computer. Send for leaflet .....	£4.99

### DRAGON SERVICE CENTRE

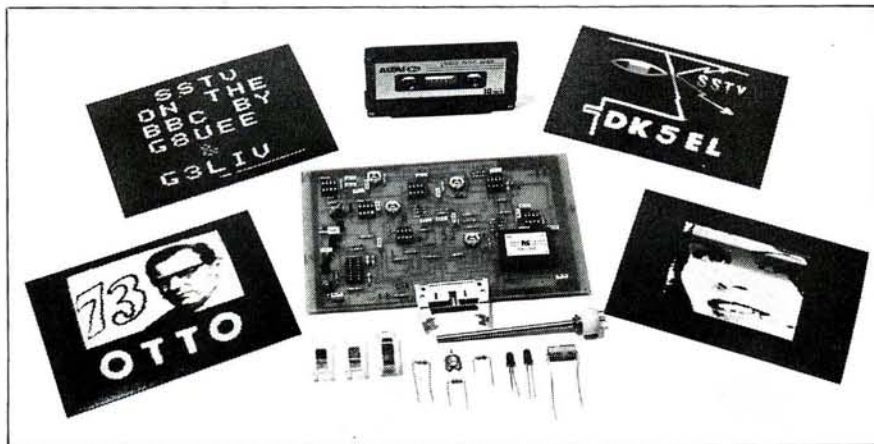
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Wide range of software for BBC, Dragon 32, ZX Spectrum etc. Please send SAE for full list. Post and package on small items £4. All available mail order. Access and Visa. 24 hour phone. All prices include VAT at 15%. Goods in stock by return of post.

### S P ELECTRONICS

48 Linby Road, Hucknall, Notts NG15 7TS.  
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## SSTV on the BBC-B



Believed to be the first SSTV program for the BBC-B, G3LIU and G8UEE are producing a package enabling the SSTV enthusiast or newcomer to display SSTV signals on a TV or monitor using the BBC.

If the sample photographs of a TV display sent to us with the review kit are anything to go by, then when we have completed tests on this piece of equipment, we should be well pleased. A full review will

follow in a future issue of *Computing in Radio*.

Program, p.c.b. and full construction details cost £17.50 inclusive, while a complete and tested terminal ready to use with program will set you back £95.

For full technical details send an s.a.e. to **J. Melvin G3LIU, 2 Salters Court, Gosforth, Newcastle, Tyne and Wear. Tel: 0632 843028.**

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*"Run more than ten tasks on a ZX81-FORTH ROM?"*

Sure! More than 10 tasks simultaneously and, in some cases, up to 300 times faster! That's what replacing the basic ROM with the new FORTH does for the ZX81 - and more!

The brains behind the breakthrough belong to David Husband, and he's building Skywave Software on the strength of it. Already orders are flooding in and it's easy to see why.

The ZX81-FORTH ROM gives you a totally new system. In addition to multi-tasking and split screen window capability, you can also edit a program while three or four others are executing, schedule tasks to run from 50 times a second to once a year, and with a further modification switch between FORTH and BASIC. Return of post subject to availability.

The ZX81-FORTH ROM gives you a normal keyboard with a 64 character buffer and repeat, it supports the 16k, 32k, 64k RAM packs, it is fig-FORTH compatible and it supports the ZX printer.

The price, too, is almost unbelievable. As a "fit it yourself Eprom", complete with manual, it's just £25 + VAT. Add £2 p&p UK (£5 Europe, £10 outside Europe) and send your order to the address below.

**Skywave SOFTWARE**

David Husband  
73 Curzon Road, Bournemouth,  
BH1 4PW, ENGLAND.  
Tel: (0202) 302385.  
International +44 202 302385.



## Amstrad CPC 464 64K Colour Computer

Computers come and go at an alarming rate these days, each one claiming to be the best thing since sliced bread.

When, over 12 months ago, we were told that a well-known company was going to launch into the home computer market with a computer that would see off every other model available, we politely said that we would be interested when it was a reality. So when Amstrad announced that it was launching its range of computers it came as little surprise, other than the name of the company. Amstrad are well known for their radio products, but the computer market is totally new to them. Even more surprising is the speed with which the range has been developed—well under the year, including a complete re-think and re-design internally. Still, isn't that just how Sinclair started!

The run-of-the-mill computer magazines will undoubtedly review the CPC 464 range with benchmark tests, comparing the speed of its BASIC with that of other competitors, etc. We, on the other hand, will tell you what it is like as far as the radio amateur is concerned.

The CPC 464 comes in four different packages, and these are so different from any other home computer that it makes comparisons very difficult. The two obvious differences are that the machine has a built-in cassette recorder with no provision for the connection of another recorder. The second is that the monitor comes with the computer and houses the power supply.

### Options

The four options centre around the monitor—two models, green screen or colour—and disk drive or no disk drive. The first choice—the monitor—is where the difficulties will lie. If you pick the green screen model to keep the initial buying price as low as possible you save £100 over the colour monitor. Unfortunately, the monitors are not available separately—yet—so that it is not possible to up-grade to a colour monitor. We found, however, that our "monitor," a home-modified Ferguson TX 14 portable colour TV, worked without any changes so if you already have a colour monitor it should plug straight into the CPC 464 video socket. You will have to provide a separate power supply.

The computer itself is well presented and pleasant to use. The keyboard is not quite so sensitive as the BBC's, requiring a distinct smart key depression rather than a light touch, but this does prevent you making entries just by brushing against a key—always a bit of a nuisance with the BBC. We particularly liked the enormous ENTER key, it made life so much easier when punching in programs. A secondary number key pad with its own small ENTER key is provided to the right of the main keyboard, with the datacorder on the right of that.

The cassette recorder was easy to use and worked every time, although it is not fast by any means—it seemed to be comparable with a Spectrum in terms of loading time. We would have liked to see the cassette inputs and outputs brought out so that two recorders could be used—very useful when developing a long program.

Expansion is catered for by two edge connectors along the rear of the computer. One of the connectors gives access to the built-in parallel printer interface which we used to drive our Tandy CGP-115 Colour Graphic Printer. Here we found a slight problem in that the computer instruction manual tells you to connect the edge connector pin-for-pin with the printer connector. Unfortunately, this is not so in this case, even though the Tandy printer uses a standard connector. Having sat down and worked out, from the information given in the manual, just what the correct connections should be, the Tandy printer worked very well indeed, and offers a low-cost means of obtaining hard-copy both alphanumeric and graphics. It would have been much better if the edge connectors had been scrapped at the start and standard IDC-style connectors fitted.

The second edge connector is used for the disk system which uses the Digital Research CP/M operating system. The version we had for review was not fitted with a disk drive, so we have no experience of this.

In the limited time allowed for the trials with the CPC 464 we tried translating some of our *PW Radio Programs* as well as some of the newer programs. To show some of the differences, the listing for the Crosshatch Generator program is reproduced here. It differs from the BBC-B version (p6) in having a circle generator.

### QRM

One of the biggest headaches for the amateur is the QRM generated by most home computers. Not all computers generate worrying amounts of interference and not all models from the same maker exhibit the same interference footprint. We have tried to equate the noise output radiated from the CPC 464 and displayed on our Marconi Spectrum Analyser with possible problems on the amateur bands. We obviously need to develop this idea further for it to be of use, but the tests performed to date would indicate that there should be little problems at 144MHz with most interference being between 30MHz and 90MHz peaking around 54MHz.

The manual provided with the computer was good but omitted a couple of important points. The first is that there is an abbreviation for PRINT. The keyword PRINT can be input by using ?, a useful feature as this is probably the most used keyword. There are no other abbreviated keywords however. The other more serious omission concerns

the Trigonometric functions or rather lack of them. For some inexplicable reason TAN, SIN and COS are available but only ATN (Arctan) in the reverse direction. Now I know that the omission of Arccos and Arcsin can be overcome by using some horrendous formulae but it is of no help if these formulae are not readily available. In our case we have a VIC 20 which also suffers from the same deficiencies in trig functions and as the VIC 20 manual's one redeeming point is the listing of the tricks needed to overcome the problem, we referred to this. Just why the designers of a computer imagine that letting you calculate trig functions in one direction only is sufficient I cannot understand.

To sum up then, will the CPC 464 satisfy the needs of the radio amateur? We think it will—it is well made, nice to use with a good display on the colour monitor. The use of edge connectors is penny pinching, particularly in the light of experience with other computers using edge connectors and their general lack of long-term reliability. The computer and monitor stood up to being left switched on for several days without a break and only got warm.

The pricing structure is realistic for what you get—£229 for the bottom of the range system with green screen monitor and £329 with the colour monitor. A disk drive on either system adds a further £200. The difficulties arise when trying to decide whether to spend £329 or whether to spend a little bit more for a BBC-B even though you don't get a colour monitor and a cassette recorder with BBC. In a lot of ways the Amstrad is nicer to actually use than the BBC but the BBC is very well catered for in terms of software specifically written for the radio amateur. **G8V FH**

```

10 REM CROSS HATCH GENERATOR - CPC 464
12 CLS:PRINT:PRINT:PRINT:PRINT:PRINT:
15 PRINT "   CROSS HATCH AND CIRCLE GENERATOR"
16 PRINT "   by J.M.Terrell G4JXZ"
17 PRINT "Translated for Amstrad CPC464"
18 PRINT "copyright IPC Magazines Ltd. 1984"
19 FOR Y = 1 TO 2000:NEXT Y:CLS
20 MODE 1
30 LET M=0
40 FOR I=1 TO 15
50 MOVE M,0
60 DRAW M,1027
70 LET M=M+45.6
80 NEXT I
90 LET N=0
100 FOR I=1 TO 13
110 MOVE 0,N
120 DRAW 1280,N
130 LET N=N+33.2
140 NEXT I
150 ORIGIN 320,200
160 FOR angle = 1 TO 360 STEP 0.25
170 xpoint = 190*COS(angle)
180 ypoint = 190*SIN(angle)
190 PLOT xpoint,ypoint
200 NEXT
210 FOR Z = 1 TO 100000:NEXT Z
220 END
    
```



# Feature

## "Piggy-backing" your ZX81 FORTH ROM

In order to make the most of the series by David Husband on FORTH for the radio amateur you will need to be able to try the various programs and ideas on a computer that will run FORTH. There are several FORTH programs available for different computers and the Jupiter Ace has recently become available again at a greatly reduced price.

However none of these options will support multi-tasking, the usefulness of which will become obvious as David's series progresses. The simplest and most cost-effective way of getting into multi-tasking FORTH is to convert your ZX81 into a two language machine using the ZX81-FORTH ROM as supplied by Skywave Software. The manual which is supplied with the ROM explains how to substitute the ZX81-FORTH ROM for the Sinclair BASIC ROM but this has the disadvantage of only allowing the machine to operate in ZX81-FORTH. By "piggy-backing" the Sinclair BASIC ROM onto the ZX81-FORTH ROM and using a small switch it is possible to select either BASIC or multi-tasking ZX81-FORTH as desired.

A study of the circuit diagram of any piece of computer hardware will reveal that many of the i.c.s used have all but one or two of their pins connected together, the chip required being selected by some form of switching of the appropriate pins. It should be obvious that any number of similar i.c.s such as ROMs can be "piggy-backed" with their leads permanently soldered together and only the chip select pins brought out to the switching system.

The drawing (Fig. 1) shows one way of "piggy-backing" the Sinclair BASIC ROM onto the ZX81-FORTH ROM using a 24 pin d.i.l. socket soldered onto the ZX81-FORTH ROM. This way round saves you from having to solder your Sinclair ROM as it is plugged into the socket. If you do not mind soldering onto the Sinclair ROM you can "piggy-back" the ZX81-FORTH ROM onto the Sinclair ROM and you may need to do this if the ZX81-FORTH ROM is supplied mounted onto a carrier.

Make sure that you use the correct set of pins or sockets on the ZX81 board and on

the two ROMs. Skywave Software should be producing a small p.c.b. which will carry both ROMs and plug into the ZX81 board and you may prefer to use this instead.

The chip select pins (20 on the Sinclair ROM and the pin directly under it on the ZX81-FORTH chip) are taken via insulated wires to a small slide switch. Resistor R28 on the ZX81 p.c.b. is lifted from the p.c.b. at the end nearest IC2 and connected via another wire to the centre pin of the slide switch. As the ZX81 will have to be RESET each time you change from FORTH to BASIC, or back again, it pays to fit a RESET button. This can take the form of a push-to-make push-button switch connected between 21A and 4B on the ZX81 edge connector. Pushing the button connects the RESET line to 0V, thus resetting the computer without having to resort to pulling out the power plug.

Now you should be able to select either BASIC or FORTH using the slide switch and reset the computer simply by using the push-button switch.

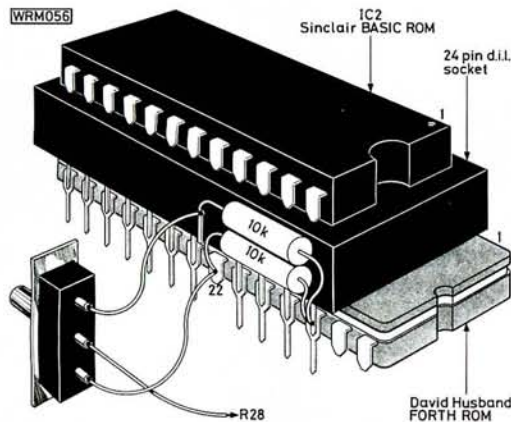
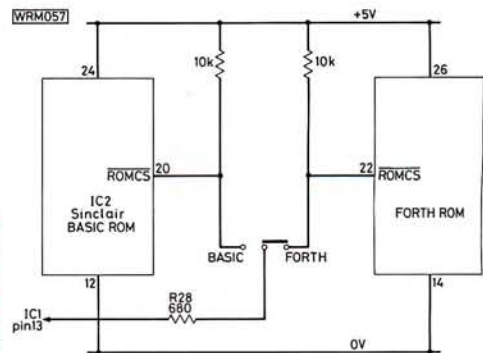


Fig. 1: One suggested method of "piggy-backing" the two ROMs. The socket can be omitted if you are prepared to solder the two ROMs together

Fig. 2: Outline circuit diagram of the "piggy-backed" ROMs. Note that R28 is already on the p.c.b. and only the pins actually needing connections are shown.



# Software

## Morse Code Tutor

Technical Software, Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF. Tel: 0286 881886

Spectrum, ZX81+16K, VIC 20, Commodore 64, Dragon Black and White

Cassette

The menu gives you 6 choices.

1. 7 characters (EISHTMO). All groups will consist of only these characters.
2. 15 characters (EISHTMOAUVNDBWJ).
3. 26 characters—the complete alphabet.
4. 10 figures.
5. 36 Mixed. This gives groups of mixed letters and numbers—but no punctuation.
6. Send Entered Text. You input a portion of text e.g. plain language or code groups and the computer will send your text.

At speeds below 12 w.p.m. if you ask for 10 characters to be sent then they are sent by the computer with no spacing after 5 letters i.e. the normal code group length. Above 12 w.p.m. the computer asks how many "words" you would like, the "words" are made up from the number of letters you have chosen and will be of varying length. For example, if you opted for 7 characters (EISHTMO) at 12 w.p.m. with 3 words this could be: SEI MTEEI SHTM

After the computer has sent the required groups of letters you type back in the answer and the computer checks it for you. By pressing ENTER you can have the answer displayed immediately.

Computing in Radio, Autumn 1984

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## PANTLING ELECTRONICS, 77 LEIGHTON ROAD, WING, LEIGHTON BUZZARD, BEDS. (tel 0296 68 406)

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With Decoder & Audio Board [Optimised for 1445/1275 mark/space. 170Hz shift]

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**CHARACTER CODE** CCITT NO. 2  
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- ★ Word Unwrap on Receive.

VIC & 64 MODULE 1 TTL £79.95 (BARTG MEMBERS £69.95)

VIC & 64 MODULE 2 £109.95 (BARTG MEMBERS £99.95)

ALL UNITS ARE BUILT TO ORDER, DELIVERY AROUND 14/21 DAYS.  
CASH WITH ORDER PLEASE. SPECIAL "RAYNET" VERSIONS AVAILABLE ON REQUEST.



## Polar Plotting *by B. P. Hainey and Tom Lawless*

The usual way of finding out the radiation pattern of an antenna is to construct a scale model which is rotated at about 60 r.p.m. and the signal received from a nearby u.h.f. transmitter displayed on an oscilloscope, after suitable processing.

Using this short program together with your BBC-B computer and a simple interface you can plot the polar diagram of your full-size antenna with the added bonus of also showing up the effects of any nearby objects such as the roof, mast, trees etc.

### Interface

The simple d.c. amplifier shown in Fig. 1 is the only additional interfacing needed between your receiver output and the computer. Construction should present no problems—Veroboard can be used here

and power supplied by two 6-F22 (PP3) batteries. Set R1 and R3 to mid-position short the input to the amplifier and adjust R1 for 0V across C1. Remove the short across the input and connect the input to the S-meter of your receiver and the output of the amplifier to the analogue input of the BBC computer. The 0V line of the amplifier is connected to Pin 8 and the output to Pin 12.

### The Other Station

Load the program into the computer. It will ask you for the rotation time in seconds of your rotator which you will have to find by actually timing the rotator from one end stop to the other.

You will need another amateur some 4km away to transmit a constant carrier for

the time that the antenna is rotating 360 degrees. Adjust the gain of the amplifier (R3) and the power output of the transmitter to obtain the best pattern on the screen. If the transmitted signal is too weak you will not see anything other than the main lobe while too strong a signal will swamp the antenna.

If you have a disk drive or tape recorder then several plots can be made and stored so that comparisons can be made after adjusting the antenna.

### Disk or Tape

The set-up can be used in reverse to plot the polar diagram of the other station. Enter the rotation time of the other stations antenna, ask for the antenna to be rotated and start the program. Your antenna should

```
10 REM DISABLE ESCAPE
20 *FX229,1
30 *FX4,1
40 REM DISABLE COPY & EDIT
50 MODE 1
60 COLOUR 2
70 PRINT TAB(13,7) "POLAR PLOTTER"
80 PRINT TAB(18,10) "by"
90 PRINT TAB(14,14) "B.P.HAINEY"
100 PRINT TAB(18,16) "&"
110 PRINT TAB(14,18) "Tom LAWLESS"
120 PRINT TAB(4,22) "Copyright 1984 IP
C Magazines Ltd"
130 PRINT TAB(6,30) "PRESS SPACE BAR T
O CONTINUE"
140 LET Q$=INKEY$(100)
150 IF Q$=" " GOTO 170
160 GOTO 140
170 CLS:CLG
180 DIM A(510)
190 VDU 28,0,2,20,0
200 CLS
210 PRINT "INPUT ROTATION"
220 PRINT "TIME IN SECONDS"
230 INPUT T
240 CLS
250 REM CALC OF DELAY LOOP CONSTANT
260 W=(T-37.96)/0.3429
270 PRINT "PRESS RETURN "
280 PRINT "TO START TEST"
290 LET Q$=INKEY$(100)
300 IF Q$=CHR$(80) GOTO 320
310 GOTO 290
320 REM TAKE IN DATA ROUTINE
330 CLS:CLG
340 GCOLOR,2
350 MOVE 640,0:DRAW 640,1024
360 MOVE 0,510:DRAW 1280,510
370 GCOLOR,2
380 MOVE 640,510
390 FOR A=0 TO (2*PI) STEP(2*PI)/504
400 LET R=ADVAL(3)
```

```
410 R=R*(400/65520)
420 GOSUB 550
430 LET A(INT(A*80))=R
440 NEXT A
450 REM PLOT DEGREE LINES
460 GCOLOR,3
470 FOR A=0 TO (2*PI) STEP (2*PI)/36
480 LET R=A(INT(A*80))
490 LET X=R*SIN(A)
500 LET Y=R*COS(A)
510 MOVE 640,510
520 DRAW (X+640),(Y+510)
530 NEXT A
540 GOTO 270
550 REM PLOT DURING INPUT SUBROUTINE
560 LET X=R*SIN(A)
570 LET Y=R*COS(A)
580 FOR D=0 TO W STEP 1:NEXT D
590 DRAW (X+640),(Y+510)
600 RETURN
```

### Cross Hatch Generator

*by I. M. Terrell*

```
10 REM CROSS HATCH GENERATOR - BBC B
15 REM by I.M.Terrell G4JXZ
18 REM copyright IPC Magazines Ltd 1984
19 FOR Y = 1 TO 5000:NEXT Y:CLS
20 MODE 2
30 LET M=0
40 FOR I=1 TO 15
50 MOVE M,0
60 DRAW M,1027
70 LET M=M+91
80 NEXT I
90 LET N=0
100 FOR I=1 TO 13
110 MOVE 0,N
120 DRAW 1280,N
130 LET N=N+85
140 NEXT I
150 END
```

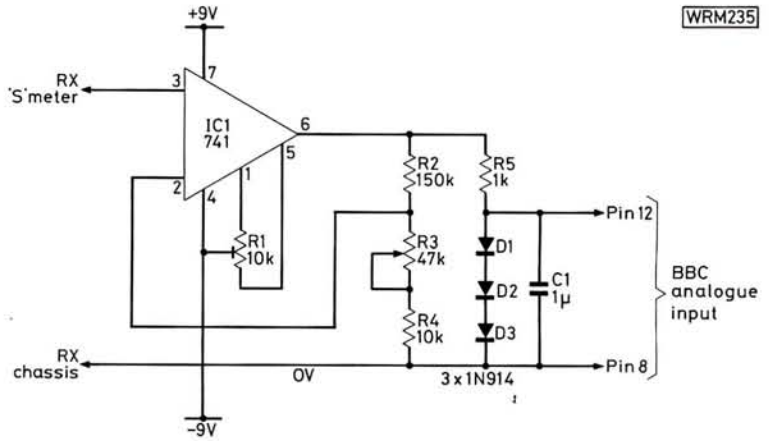


point directly at the other station.

A modified program listing can be supplied to allow the tests to be stored on disk or tape. Send an s.a.e. marked "BBC Polar Plotter" to *Computing in Radio*, Westover House, West Quay Road, Poole, Dorset, BH15 1JG.

We would like to thank Paisley College of Technology, Electrical and Electronic Engineering Dept for their help and the use of their equipment.

**Fig. 1: The circuit of the simple interface amplifier for use with the Polar Plotting program. Construction is simple and can be on Veroboard. The input is taken from the receiver's S-meter while the output is connected to the Analogue Input socket (SK6) of the BBC-B as shown. The positive and negative 9V supplies can be provided by suitable batteries**



## reviews

### Morsen Electronics RTTY Terminal Unit

The ZX81 has become a popular computer for starting in RTTY. The reasons for this are not hard to find—the machine is cheap, especially secondhand or in kit form, and lends itself to use as a component rather than a computer.

There are several programs available for the ZX81 and in this review we will look at the hardware supplied by Morsen Electronics for use with the G4IDE RTTY programs.

The G4IDE programs are held in EPROM and are either RITTY 2 for the 1K machine or RITTY 3 for the 16K version. Morsen recommend RITTY 3 if you have a 16K ZX81 and I would add that if you only have 1K of memory on your ZX81 then it would pay to add a RAMPack so as to allow you to run RITTY 3 and get the advantages of the 26 programmable stores and the other useful features such as split screen.

The program uses "time-sharing" techniques to allow you to type in your next transmission while still receiving the other station. A split screen format keeps transmission material separate from received copy and you can copy the reception screen onto a printer whenever required.

#### Stores

Up to 26 programmable stores, each holding a maximum of 600 characters, are available and these can be transmitted as desired by typing shifted S followed by the appropriate letter for the store required (A to Z). Store 1 sends 16 RYs while Store 2 sends a CQ call with your callsign in it.

The instructions on using RITTY 3 are clear and easily understood and should therefore present no problems to the user.

To be able to use RITTY 3 with your 16K ZX81 you will need the Morsen ZX-10 which is available in either kit form or ready built from Morsen Electronics. I have built the kit for both the Interface and the Terminal Unit and in this part of the review I

will cover the constructional side, leaving the performance and operational side until the next issue.

The Interface is built on a double sided epoxy-glass p.c.b. which can be used for either RTTY or Morse but not both. This dual use carries through to the Terminal Unit board and can cause problems if you are not looking far enough ahead during construction. The instruction sheets state that components for the c.w. circuits are not included with the kit so that I assumed that all the components in the bag should be used. Unfortunately this turned out to be a false assumption and I ended up with a board carrying a lot of redundant sockets and resistors. No circuit diagram is provided for this board, instead a set of connection tables are given and bearing in mind the repetitious nature of computer circuits this is a reasonable approach. However there are four small circuit diagrams given with no explanation of what they do or how they are to be connected, or even whether you need them. I would like to see some explanation given in the instructions—not every builder is an RTTY expert!

The p.c.b. when completed can be fitted either into the Morsen metal keyboard case or inside the terminal unit box which is supplied with the t.u. kit. If it is inside the ZX81 metal keyboard case then I would recommend that you hardwire both the RAMPack and the Interface unit to the ZX81 p.c.b. to give improved reliability.

#### Terminal Unit

The terminal unit kit is supplied complete with mains power supply and metal case with a screen printed front panel. Again it is a dual-purpose piece of equipment covering both RTTY and c.w. and, unlike the Interface, can be simply switched from one mode to the other. Basic construction is simple so long as you work methodically and carefully to ensure that you do not insert components into the wrong holes. Here

the component placement drawing is not the clearest.

Based on the G4IDE design the t.u. can be used with any computer having a TTL compatible I/O port. The circuit uses active filters based around 741 op.amps. for the receive section while the transmit side uses a 567 p.l.l. chip as the a.f.s.k. generator using only the free-running oscillator and not the complete phase-locked loop. To help in setting up the board a frequency counter is included and the t.u. is isolated from the Interface board by opto-isolators.

In the next issue of *Computing in Radio* I will continue with the performance and operation of the completed system, but in the meantime further details and prices are available from **Morsen Electronics, 3 Aylesbury Avenue, Eastbourne, BN23 6AB. Tel: Eastbourne 31620.**

Just as we were going to press Morsen Electronics informed us that they have improved the kit for the t.u. making it RTTY only and screen-printing the p.c.b. to make assembly easier. More on this in the next issue.

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## RTTY BBC COMPUTER

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G3LIV Terminal units. Ideal for above program. Interface directly with BBC micro but will work with other computers. PC boards or ready built. Slow Scan T.V., P.C.B.'s and Built units with Software to Interface with BBC Computer.

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Tyne and Wear.  
Tel. 091 284 3028.

Excellent reviews of both products.  
SAE to either address for full details.



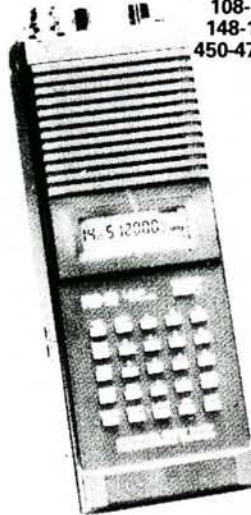
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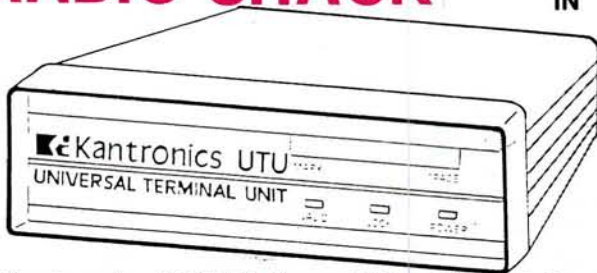
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## Kantronics UTU Universal Terminal Unit

The Kantronics Universal Terminal Unit (UTU for short) gives any computer with an RS232 port and a terminal program the ability to interface with any transceiver. The need for additional programs has been eliminated with the inclusion of a microcomputer in UTU. The internal programming of UTU allows reception and transmission of Morse code, Radioteletype, ASCII, and Amtor.

### KANTRONICS

The Interface RTTY/CW (Software required).....£139.95  
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