

HAM

AN ARGUS SPECIALIST PUBLICATION

OCTOBER 1986 £1.20

RADIO

AMATEUR TELEVISION

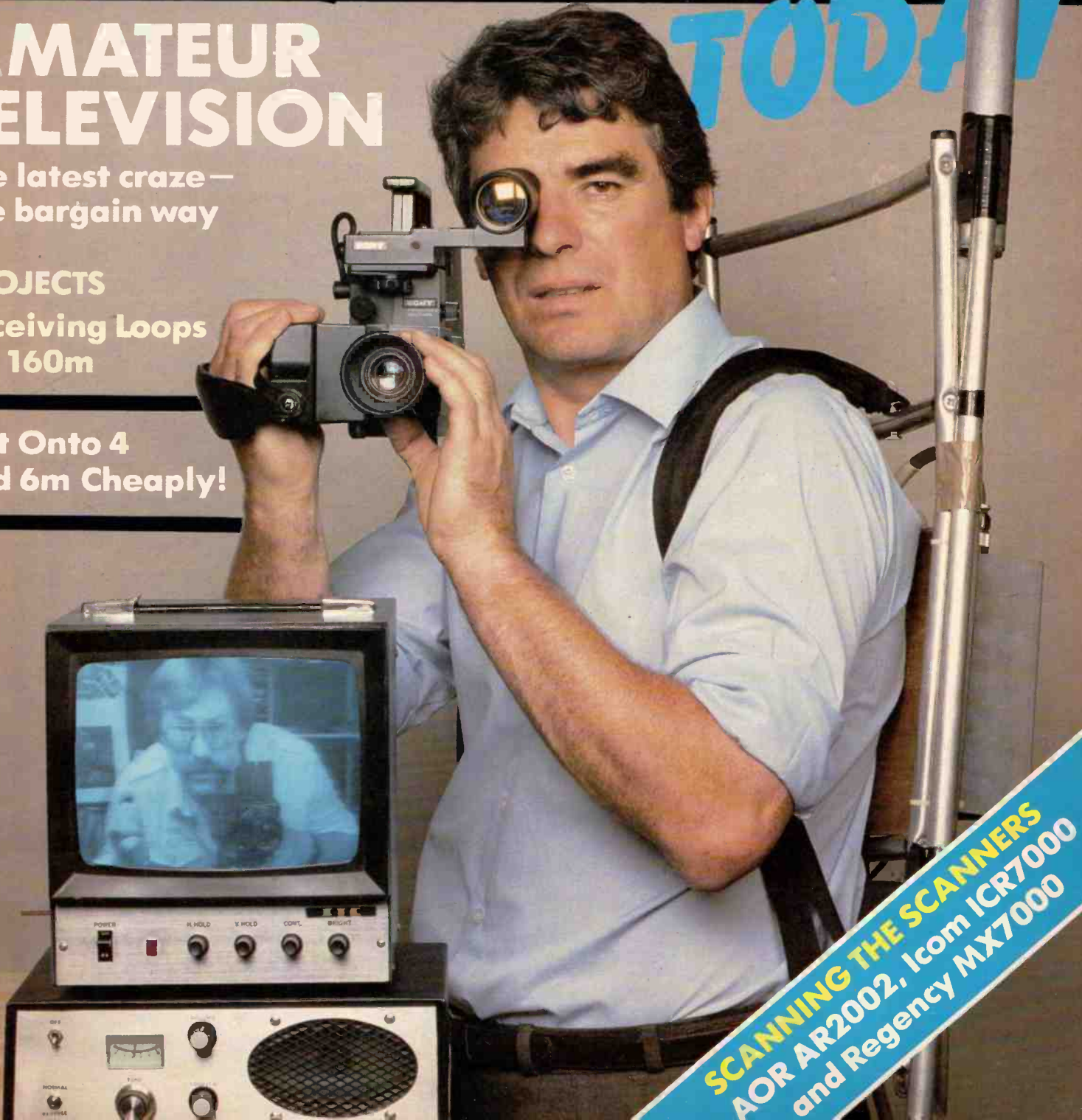
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FT203R-FNB3	2mtr H/H 2.5W	219.00
FT203R-FNB4	2mtr H/H 3.5W	225.00
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YM49	Speaker MIC for FT290R	18.50

Full Range Stocked



ICOM	Description	RWC Price
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BP5	High capacity q/charge 10.8V Nicad	57.50
DC1	12V mobile regulator pk (2E)	16.95
EX243	Curtis keyer unit for IC735/745	53.00
EX257	FM unit for ICR71	38.50
EX310	Speech synth. unit for 271 etc	41.95
HP1	3.5-30 MHz mobile ant.	189.00
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IC-AT10	Matching automatic ATU for IC735	289.00
IC-AT50	500W automatic ATU	455.00
IC-CPI	Mobile ch'ng lead c/lighter	6.50
IC-HM9	Speaker MIC Assy.	19.95
IC-PS30	Power supply unit 25A cont.	339.00
IC-UT 16	Voice synth. for IC27 series	
IC02E	2 mtr LCD k'board 2W t'ceiver	289.00
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IC271E	2 mtr all mode 25W b/stn	759.00
IC271H	High power 100W version of IC271E	959.00
IC27E	25W 2 mtr FM mobile 9 memories	379.00
IC27H	45W version of IC27E	419.00
IC28E	New 25W Super 138-174 MHZ	325.00
IC290D	25W version of IC290E	499.00
IC290E	10W multimode 2 mtr mobile	479.00
IC2E	2 mtr H/H thumbwheel 2W	185.00
IC2KL	1KW PEP linear auto band switching	1250.00
IC3200E	Dual band 25W t'ceiver	499.00
IC471E	UHF m/mode b/stn 32 mem	879.00
IC471H	75W version of IC471E	999.00
IC4E	70cm thumbwheel H/H 2W	279.00
IC505	3/10W 50MHZ SSB(FM) transceiver	459.00
IC735	New all mode all band t'ceiver	879.00
IC745E	All band SSB/AM/CW gen cov TX-RX 16 mem	975.00
IC751E	All band all mode t'ceiver 32 mem	1350.00
IC04E	70cm LCD keyboard entry handheld 2W	285.00
ICR7000	New all mode scanning RX 25 Mhz-2GHz	879.00
ICR71	All band short wave t'ceiver 32 mem	775.00
LC11/14	Leatherette case Assy for IC02AE	7.77
LC12/3	Leatherette case for IC2/AE	6.50
PS15	External power supply 20A	139.00

SAE FOR LATEST ICOM LEAFLETS, NEW MODELS EXPECTED RWC TOP 100

ADONIS	AM303G	Base stn FM/SSB m/phone	39.95
ADONIS	AM503G	Base stn FM/SSB comp. m/c	52.50
AKD		120-450MHz wavemeter c/w ant.	24.95
ALINCO	ALM-203R	Dual band 6/8 + 3X 5/8 mobile	249.00
ALINCO	ALM-203E	2 mtr H/H transceiver 3.5W	239.00
ALINCO	EDH-25	DC/DC 12V converter	13.50
ALINCO	EMS-20	Speaker MIC for ALM203	18.50
ALINCO	ESC-3	Leatherette case and strap	14.50
AOI-MIC	DM300	600 OHM replacement microphone	6.50
AOI-MIC	DM301N	600 OHM replacement noise can. MIC	7.50
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DAIWA	SA450M	6 OHM replacement ext. loudspeaker	6.60
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FDK	FDK	2 mtr 25W FM mobile transceiver	269.00
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GAMMA	S-JIM	Gamma twln slim Jim type ant.	9.50
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Hi-mound	HK703	Straight key	29.25
Hi-mound	HK704	Straight key	19.25
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Hi-mound	HK707	Straight key	15.90
Hi-mound	HK808	Deluxe straight key	49.95
Hi-mound	MK703	Squeeze key c/w base	28.95
Hi-mound	MK705	Squeeze key	25.65
Hi-mound	MK706	Squeeze key	23.50
Hi-Q	Hi-Q coil	2X coil/formers/insulators (pat-pend)	7.50
HOXIN	70N2DX	Dual band 6/8 + 3X 5/8 mobile	25.90
HOXIN	70N2M	144/432 dual band 1/2W + 2 x 5/8 mobile	22.85
HOXIN	70N2V	Dual b/tbase ant. 3'6" long	39.00
HOXIN	HS-358	430MHz tripole 5/8 6.3dB	33.78
HOXIN	HS-770	144/432 duplexer 50W 30dB Isolation	19.55
HOXIN	HS-78F	2 mtr 7/8 fold over 4 5dB	16.95
HOXIN	HS-88F	2 mtr 8/8 fold over 5.2dB	16.95
HOXIN	SMC155E	15 mtr 130W PEP mobile ant. 1.72M long	21.50
ICS	AMT-2	AMTOR/RTTY/CW/ASCII terminal unit	245.00
ICS	RM-1	L-cost AMTOR/RTTY/CW/ASCII modem	69.00
Jaybeam	8XY-2M	2 mtr BE crossed ant.	41.50
Jaybeam	LR1-2M	2 mtr omni-directional colinear	39.00
Jaybeam	LW10-2M	2mtr 10 element YAGI	27.25
Jaybeam	MBM48	70cm 48E antenna	40.75
Jaybeam	Q4-2M	2 mtr 4 element quad	33.95

Full Jaybeam range in stock.

MuTek	Description	RWC Price
BBBA	20-500MHZ low noise wide band preamp	34.90
SLNA	2.mtr low noise RF switched preamp	33.95
SLNA	Optimised preamplifier for FT290R	39.00
TVVF50c	High performance 2M-6M transverter	189.90
Series II	12A PSU	49.00
7.1MHZ	7.1 MHZ traps. c/w instructions	8.95
6146B	PA valve	12.85
2044/5	Nest of dipoles w/band ant 26-500 MHz	69.00
REVCO	Wide band discone ant 30-500MHz	29.95
REVCO	Wide band discone ant 10 mtr loaded 1/4W tilt-over	12.50
KG208	SE10	
KG309	SE2	
SE2	5/8 mtr tilt-over ant	13.50
SO239/CGM	Cast/chrome SO239/gutter mount Assy.	4.75

RAYCOM MOD KITS

757	FT757GX fast tuning mod kit improves VFO tuning	29.50
FBX-RWC MOD	LC7136-7 10 mtr FM mod kit kit c/w ins. (Built & Tested).	23.50
LCL/DNT MOD (inc. post)	As above but kit of parts only LCL/DNT 10FM mod kit	17.50

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RAYCOM ANTENNAS

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GP900	3db 800-1000MHZ colinear c/w BNC	19.50
HBD	Highband dipole assembly	8.50
2M HB9C Vnc. Post		9.98
70cm HB9C Vnc. Post		7.98
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Swivel-mag	Swivel base mag-base c/w cable PL259	9.25
Trap-dipole	7.1MHZ trap dipole com. kit	29.95

RAYCOM RF POWER AMPS

V15L-145	2mtr 15W linear amp. 1-3W input	49.50
V25F-145	2mtr 15W linear amp. 1-3W/ppt	48.50
V35L-145	2mtr 35W linear amp. 1-3W input	59.50
V45F-145	2mtr 45W FM amp. 1-3W input	62.50

SPECIAL OFFERS

ARM-ANT	Multi P-6	Multi-polarization P/ant 140-800MHZ complete	36.00
Kopek	AR1002	50g loading 3-core auto-rotator	38.50
Raycom	discone	60-500MHZ	27.50
DNT	M40FM	modified 10FM	49.50
DNT	M40FM	unmodified CB27/81	29.50
ALINCO	ALR206E	25W mobile	249.00
ICS	AMT2	AMTOR/RTTY CW Terminal	169.00

SCANNING RECEIVERS

YAESU FRG-9600 MKII very latest mod. gives improved 'S METER' on RX and extended coverage up to 950MHz.
FRG9600/MK2-RW 60-950 All mode scanning RX 469.00
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REGENCY MX8000/AOR2002 429.00
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20419	432MHz 19 element	36.50
20422	435MHz 21 element ATV	31.25
20524	1296 23 element ant.	27.95
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20813N	144MHz 13 ele. port. ant.	39.50
20817N	144MHz 17 ele. fixed ant. 'N'	47.83
20818N	144MHz 9 ele. crossed antenna 'N'	41.50

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HAM RADIO CONTENTS


TODAY

VOLUME FOUR NO 10 OCTOBER 1986

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On the front cover, G4TVC demonstrates his 23cm ATV setup. The camera is a Sony 2010P bought second hand for £60. The Tx is a 1W homebrew using a BATC design and a G3IPP brewed Solent Scientific converter and BATC demodulator for receiving. The Tx antenna is a 1/2 size afford slot. These have a total cost of about £75. The range for this setup is about 3/4 mile.

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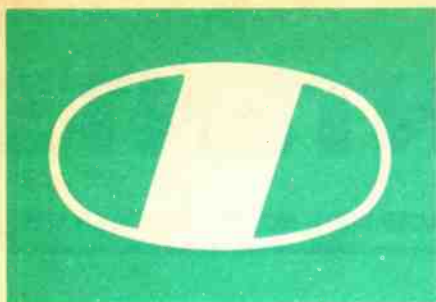
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ICOM

VHF/UHF FM Handportables

If you want a handheld with exceptional features, quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM range of FM transceivers. All ICOM handhelds come with an IC-BP3 nicad battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and personal earpiece as standard.

IC-2E/4E, 2 metre and 70cm thumbwheel handportable.

These popular handhelds from ICOM are still available. For those Amateurs who require a simple but effective FM transceiver the IC-2E and 4E take some beating. Frequency selection is by means of thumbwheel switches (with 5kHz up-switch) and duplex or simplex facility. Power output is 1.5 watts or 150 milliwatts (2.5 watts is possible with IC-BP5A battery pack).

IC-02E/04E 2 metre and 70cm keypad handportable.

These direct-entry CPU controlled handhelds utilize a 16-button keypad allowing easy access to frequencies, memories and scanning. Ten memories store frequency and offset. Three scanning systems, priority, memory and programmable band scan, (the IC-02E now with an improved CPU retains duplex offset). These handhelds have an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. Power output is 3 watts or 0.5 watt in low power position for the IC-02E and 2.5 watts or 0.5 watt for the IC-04E. (5 watts is possible with the IC-BP7 battery pack or external 13.8V. DC.)

STOP PRESS. New handheld available. Just released is the **IC-12E** 23cm keypad handportable, this new transceiver has direct keypad entry for frequency, memories and scanning systems. Ten memories store operating frequency simplex or duplex. An internal power module provides 1 watt or 100 milliwatts of RF power. Five tuning speeds including 12.5kHz and 25kHz.

Also available for ICOM handhelds are a large range of optional extras including a variety of rechargeable nicad power packs, dry-cell battery pack, desk charger, headset and boom mic, speaker mic, leatherette cases and mobile mounting brackets.

For more information on these handportables and other ICOM Amateur equipment contact your local authorised ICOM dealer or Thanet Electronics Ltd.



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LETTERS

CAUSING A STIR IN THE DTI

Sir, I was very pleased to read in your June edition "Interference — is there a breakthrough in sight?" by Hilary Clayton-Smith and Neil Brinkworth. It dealt fairly and usefully with a problem that is all too likely to get worse before it gets better.

The Department of Trade and Industry as the licensing authority for radio amateurs has to exercise that authority as fairly as possible and to be seen to be doing so both by radio amateurs and TV viewers. Fortunately the vast majority of radio amateurs operate with high regard to the comfort of their neighbours and by modifying their transmission practice or by solving the EMC problems caused, ensure that they do not give rise to complaints from neighbours. It is certainly the case that the more radio amateurs follow the advice offered in the article the less they will find themselves at odds with the Department over the licence condition which requires them not to cause undue interference. The element of self-training explicit in the radio amateurs' licence extends to EMC as well as to all other aspects of radio operation.

Since you have kindly agreed, I shall be sending copies of your article to all the Radio Investigation Service district managers who will, I am sure, also want to read it.

Miss D Gane
Director, Radio Investigation Service.

STARTING EARLY

Sir, On my trip to England, I had the pleasure of obtaining the August issue of HRT and reading the 'Journal of a Teenage Amateur' by Geoff Petit, GU0BGP. He is to be admired for what he has accomplished at his young age.

His advice to get started before the distraction of "the GCE or other exams" goes further than he thinks. It is also important to get started before the distractions of puberty come to the fore — before the young ham discovers that girls are not just soft boys.

Charles E Cohn, KB9XV.

As one of those who are "not just soft boys" and who took the RAE at the vulnerable age of 20, I've found the distractions of "puberty" came once on the air, not when studying. Perhaps I'm just a late starter? G1CKF.

RECORDING CBers

Sir, I have just taken by RAE (May 12th) which a number of us have worked hard in our studies for. About a month from the exam we were talking on the 27MHz band, and asking each other some RAE questions to help understand some of the subjects better. We jokingly discussed whether it was possible to make a tiny transceiver which if you were stuck at a question in the exam, you could use to talk to some of the others using morse code. We just laughed about it as it would have been impossible for us to make and we couldn't even use morse code.

It just so happens that one of the amateurs from the Arga near Kilmarnock heard this and taped it. Later on, he played the tape recording of our conversation, over the 2m band to his friends and said that he would be phoning up the college to inform them of what we had said.

Is this the sort of attitude of radio amateurs or is it just a small minority? I think this is a slander on amateur radio and on the people concerned and to be truthful, it isn't the first time what we have said on 27MHz has been repeated on 2m. I believe that

playing a tape recording of this nature on any amateur band is breaking the licensing conditions. The conditions say that a recording of a radio transmission of this type can only be retransmitted for the reception by the originating station. Maybe you can tell me if I am wrong on this subject.

O P, Ayrshire.

You are quite correct in your interpretation of the licence conditions. The radio amateur who transmitted the recording was breaking his licence regulations. If you wish to take this matter further you should make your complaint to the local branch of the Radio Investigation Service.

COVER UP

Sir, If the tools shown in the picture on the front cover of HRT August 1986 are typical of what some radio amateurs (sic) are using to 'tweak' their rigs, then it is no wonder that equipment suppliers are loathe to repair the damage.

T W Mansfield, G3ESH.

We had to give the model something to hold, to stop him 'tweaking' it with his fingers.

ANY OLD IRON?

Sir, On Sunday 21st September, we will be running the 3rd National Amateur Radio Car Boot Sale, at the Shuttleworth Collection, Old Warden Aerodrome near Biggleswade, Beds. This very successful event is now well established as the main (and possibly largest) event of its kind in the country, with over 100 stalls selling everything from radios to components (old and new).

Unlike other rallies, which are



sometimes called 'Shiney Black Box Sales', this one offers both buyers and sellers plenty of room to breath, and it's almost totally amateurs selling to amateurs. It's a very pleasant day for everyone with bargains to be had by all. Don't forget to visit the famous aircraft and motor museum.

Talk-in will be provided by GB4SC. So come along and see us again on Sunday 21st September from 10am to 5pm. Admission 50p, with parking free. If you have some equipment, or even 'junk' to sell then why not have a plot of your own (it's very cheap). For details contact Phill Morris G6EES on 0582 607623. We look forward to seeing you.

Phill Morris, G6EES
Secretary, Dunstable Downs Radio Club.

MATHS FILTERS IN

Sir, I am writing to draw attention to the serious errors in fundamental AC theory which appeared in the article "Brickwall Audio Filter" by Robert Penfold in the March '86 issue.

In the section dealing with C-R filters, page 39, column 1, the statement is made "At the frequency where Ca's impedance becomes equal to that of Ra the output signal has an amplitude equal to half that of the input signal, or a loss of approximately 6dB". That is incorrect.

Because of the way in which capacitive reactance and resistance in series combine (purists would cringe at either being called "impedance") the total impedance is $\sqrt{2} \times$ either.

$$\text{In general } Z = \sqrt{R^2 + X_c^2} = \sqrt{2} \times R \text{ when } X_c = R$$

The output voltage across R is given by

input voltage

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

or input voltage $\times 0.707$

$$\text{Gain} = 10 \log_{10} \frac{\text{Power out}}{\text{Power in}}$$

$$\text{decibels (dB)} = 20 \log_{10} \frac{V_{\text{out}}}{V_{\text{in}}} \text{ dB}$$

provided the input and output resistances are the same, as they are in this case. In fact it is the same resistance since it is the output voltages across the one resistance but at different frequencies which are being compared.

Since the output voltage at middle frequencies, when $X_c \ll R$, is equal to the input voltage, giving no gain or loss, the "gain" at the frequency at which $X_c = R$ is given by:-

$$\text{"Gain"} = 20 \log_{10} \frac{V_{\text{out}}}{V_{\text{in}}} = 20 \log_{10} 0.707 = 20 \times -0.15 = -3\text{dB}$$

The "gain" is in fact a loss, the attenuation is 3dB (not 6dB as stated in the article).

$$\text{At half that frequency } X_c = 2R \text{ so } Z = \sqrt{R^2 + (2R)^2} = \sqrt{5} \times R$$

$$\text{output voltage} = \frac{\text{input voltage}}{\sqrt{5}} = \text{input voltage} \times 0.447$$

$$\text{Attenuation} = 20 \log_{10} \sqrt{5} = 20 \times 0.349 = 7\text{dB, a change of 4dB per octave.}$$

$$\text{At one quarter that frequency } X_c = 4R \text{ so } Z = \sqrt{R^2 + (4R)^2} = \sqrt{17} \times R \text{ output voltage}$$

$$= \frac{\text{input voltage}}{\sqrt{17}}$$

$$= \text{input voltage} \times 0.242$$

$$\text{Attenuation} = 20 \log_{10} \sqrt{17} = 20 \times 0.615 = 12.3\text{dB, a change of 5.3dB/octave.}$$

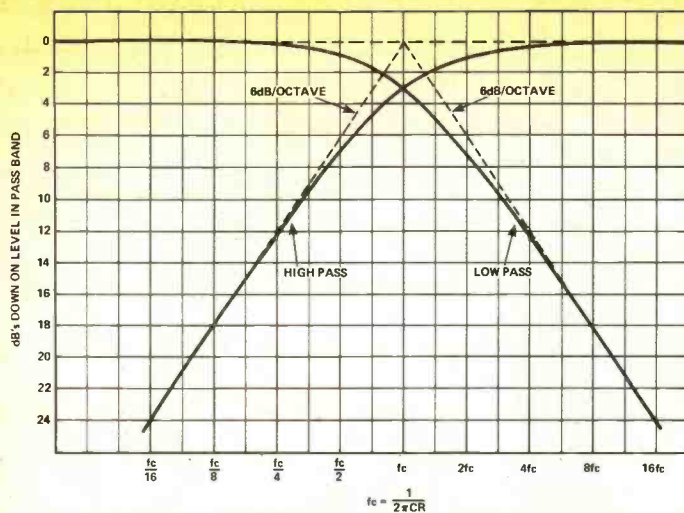
In a similar way, when $X_c = 8R$ the attenuation is almost 18dB, and it is only beyond that point that the attenuation characteristic becomes asymptotic to the "6dB per octave" line.

However, at the frequency which makes $X_c = R$, commonly called the "cut-off" frequency or "break point", the attenuation is definitely 3dB.

The mathematics at the bottom of column 2 and the top of column 3 on page 39 is also suspect. If $R = 10K$ and $X_c = 10K$ at 500Hz, then at that frequency the attenuation is 3dB. (Not 6dB as stated). That, as described above, is correct for a high pass filter. It is also correct for a low pass filter. It is not clear whether the example in the article refers to a high pass filter or a low pass filter. The figures of 500Hz and 250Hz suggest a high pass filter, but in that case the attenuation at 250Hz would be greater than at 500Hz, not less. If high pass the attenuation would be 3dB at 500Hz and 7dB at 250Hz. If low pass the attenuation would still be 3dB at 500Hz but at 250Hz would only be about 1dB.

If $X_c = 2R$ then

$$Z = \sqrt{R^2 + (2R)^2} = \sqrt{5} R$$



Normalised single section C-R filter response curves.

$$V \text{ out (across capacitor)} = \frac{2}{5} \times V \text{ in} = 0.89 \times V \text{ in}$$

$$\text{Attenuation} = 20 \log_{10} \frac{V \text{ out}}{V \text{ in}}$$

$$= 20 \log_{10} 0.89 = 20 \times 0.048 = 0.96 \text{ dB}$$

I make no comment on the attenuation rates quoted for the active filters.

N F Whale.

As far as we can see, you are correct. However, this in no way affects the working of the filter.

PUBLICITY AND THE RSGB

Sir, I was interested to read the letter from 'William' and appreciate his deep concern regarding the poor public image of amateur radio. There are three basic reasons for this and none of them have anything to do with the complexity of the RAE.

1. In the late '70s and early '80s, the antics of the illegal CB brigade received enormous publicity and the newspapers printed case after case of grossly irresponsible operation and "interference with essential emergency services". Invariably, the people involved were described as 'radio hams'. Newspaper editors regrettably make no distinction between them and us and the mud stuck to us all!

2. Many years ago, when equipment was mostly home made, the public regarded anyone who could communicate around the world with a transmitter built on the kitchen table as jolly clever, although possibly a bit

eccentric. Today of course, Australia is as near as your telephone and the public no longer regards as wonderful the most remarkable scientific achievements.

I agree with William that amateurs should raise their standards, possibly by everyone observing band plans on VHF.

And how about getting rid of some of the stupid jargon that can be heard?

What amateur radio needs is a strong national society, able to afford to generate first class publicity and the RSGB can only be this if all British amateurs are members. Only a powerful body can negotiate with Government and the executive of the society must be a body of people of such calibre as to command respect. In the main both past and present committees of the RSGB would seem to meet this criteria and they need and deserve the support of all of us.

One rarely opens the Letters page of a radio magazine these days without finding at least one whingeing letter going on about the internal politics of the society. Most people don't care anyway or there would be far higher voting figures in the society's elections. The subscription level considering that one gets a good radio journal each month, together with the QSL bureau, not to mention all sorts of back up and other services must represent a bargain.

The people who write these letters would almost certainly not be able to replace what they are seeking to destroy and would seem to be just malcontents. Perhaps they are just another

version of the loony fringe elements that one hears about in other spheres of national life.

L N Buck, GODLR.

RESPONSE TO MEMBERS

Sir, The RSGB negotiates with Government departments and other authorities and what is decided affects *all* UK radio amateurs. If they really represent the views and wishes of these amateurs this is quite acceptable. But do they? In my view, the answer has to be a resounding *no*.

Nearly half of UK amateurs do not belong to the society. In my experience, having been a member of the RSGB for over 40 years, the ordinary member is completely disregarded. He/she is expected to pay the subscription each year and accept what they are told. If the member attempts to put forward suggestions, ideas and opinions then, again judging from my experience, they are completely ignored! In fact, I have estimated that the RSGB represents only as few as 2 or 3%. Of the Council members/officials I have contacted, only G3OSS had the courtesy and politeness to reply.

Judging from the comments of other amateurs, my experience is certainly not unique! A year ago, you asked Ian Abel, G3ZHI, why he did not rejoin the society to put forward his views from inside the society. At that time I agreed with you, but no longer. What is the use of belonging to a society which goes its own way and takes no notice of its ordinary members? The only use the society has for these ordinary members is for them to pay their subscriptions so that the society can boast that it represents all UK radio amateurs when it does nothing of the sort.

I feared that the society was typical of radio amateurs, but others have made it very obvious that this is not the case. The radio amateur is usually most friendly and helpful. Actually I am severely disabled and in my innocence hoped for — though never asked luckily — help from the RSGB but certainly did not expect disdain and no help.

D B Slack, G3GFE.



HAM RADIO DOES NOT HAVE TO BE EXPENSIVE!

HOWES QRP equipment offers you the chance to enjoy amateur radio without the need to spend a fortune! Take our **DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVER** for example: This is an easy to build, single band receiver for CW and SSB reception. It will work from a 12 to 14V DC supply and gives up to 1W of audio output to drive a loudspeaker or headphones. For a simple receiver, the performance is quite amazing. Compare one against an expensive radio, you will be surprised! Versions are available for 160, 80, 40, 30 or 20M bands. The **DcRx** kit costs **£14.80**, or as an assembled PCB module, **£19.90**. With ready wound coils, and little alignment, this makes an excellent project for both the newcomer and the experienced operator building a QRP station. A case and a couple of tuning capacitors are the only major items to add to finish your receiver. We have suitable capacitors for all but the 160M version at £1.50 each. You can read a review of this super little kit in the July 1986 issue of Practical Wireless.

HOWES QRP TRANSMITTERS. We have three QRP CW transmitters in our range at the moment. The **CTX** transmitters are available for 40 or 80M bands, and the **MTX20** is for 20M. All three feature adjustable output power, up to about 5W on 80, 3W on 40 and 10W on 20M. The heatsinking for the output stage is onboard, and one crystal is included. There is space for two more crystals on the PCB, and provision is made for connecting a VFO. The CVF VFOs are available for 40 and 80M at the moment, the 20M version is under development. The VFOs have dual buffered outputs, so that not only will they drive the transmitter, they can also drive the DcRx receiver as well, for full transceiver operation. Voltage regulation, and IRT (clarifier) facilities are included.

CTX80 80M Transmitter Kit £12.95
CTX40 40M Transmitter Kit £12.95
MTX20 20M Transmitter Kit £19.90
CVF40 or CVF80 VFOs: Kit £ 9.30

Assembled PCB Module £18.95
Assembled PCB Module £18.95
Assembled PCB Module £26.95
Assembled PCB Module £14.90

HOWES 2M to HF TRANSVERTERS

If you have a 2M SSB/CW transceiver (an FT290 for example) you can get on to 20 or 80M without having to spend a fortune on an HF transceiver. These transverters also make HF Mobile operation much more practical, as a small 2M rig is all that has to be mounted within reach of the operator. These units deliver about 10W output from mismatch proof transistors, and do not require any fancy test equipment to set them up. A high proportion of fixed value filter components keeps alignment simple, and the output spectrum clean.

HC220 20M Kit £48.90
HC280 80M Kit £48.90

Assembled PCB Module £79.90
Assembled PCB Module £79.90

HOWES CTU30 ANTENNA MATCHING UNIT

The CTU30 is a "T" match type ATU for use with receivers and transmitters of up to 30W output on all bands from 1.8 to 30MHz. It uses two air-spaced capacitors, and 12 switched inductance settings. An unusual feature in a small ATU is the provision of a balun for feeding balanced antennas in addition to the more common unbalanced types. All the parts are PCB mounted in this novel design. Simply add a case and connectors to fit in with your station, even the knobs are included in this kit!

HOWES CTU30 Kit £24.90

Assembled PCB Module £29.90

HOWES TRF3 SHORTWAVE BROADCAST RECEIVER

The TRF principle was developed 80 years ago. Here it is brought up to date with modern silicon devices. The receiver tunes from about 5.7 to 12.8MHz in three bands, if you wind the coil as suggested in the instructions, although you can easily experiment with the coverage if you wish. The TRF3 has switchable input impedance and attenuator, so it can be used with large or small antennas. This is an excellent educational project for the "junior op", as well as providing a bit of fun for the old timer as well! You should be able to read all about building it in the September issue of Ham Radio Today.

A suitable tuning capacitor is available at £1.50

HOWES TRF3 Kit £13.90

Assembled PCB Module £18.90



All **HOWES** kits come with a good quality PCB which has the parts locations screen printed on it for easy, accurate assembly. Full, clear instructions are provided, as are all board mounted components. We think you will like the quality of our products. If you would like further information on any item, simply drop us a line, enclosing an SAE. We have a free information sheet on each product and a general catalogue.

Please add 80p P&P to your total order value. Export prices are the same as above, but add £2.00 per kit for airmail delivery outside Europe.

UK delivery is normally within 7 days.

73 from Dave G4KQH

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"AS REVIEWED IN JULY HRT"



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RADIO TODAY

The Ability To Communicate

One of this month's letter writers comments on the poor publicity amateur radio has attracted in the past. Perhaps the following will repair the balance. Dave Green, G4OTV, who is chairman of West Kent ARS, introduces us to a young man who through sheer determination has become GOEMZ.

Mark Brownfield is now 22 years old and until the age of nine, he was a normal healthy youngster. At that age he contracted a disease which left him severely physically disabled. He could no longer see, speak or hear and was permanently confined to a wheelchair without the ability to communicate with the outside world. As with so many physically disabled people, Mark's mental abilities have in no way been impaired but his inability to communicate other than through touch seemed likely to mean total isolation for the rest of his life.

By a stroke of good fortune, Mark had been interested in amateur radio before his illness and as a result of visits made to a local amateur in Gravesend he was familiar with morse code. Thus it was that the staff of the Seven Springs Cheshire Home where Mark was now resident discovered that with patience they could talk to Mark by using hand pressure to send morse code. Using this method, and with the untiring assistance of helper Mrs Daisy Fletcher, Mark entered and won an essay competition on the theme of "What I want most in life". The essay which Mark wrote entirely himself was transcribed from morse by Daisy and then sent back to Mark so that he could make corrections and alterations. What Mark wanted most in life was the ability to communicate.

Morse + Computer = Communication

Mark's prize was £650 in cash, which was used to purchase a TRS 80 computer system. This was modified by the Seven Springs technicians to allow text entered at the keyboard to be converted into morse which was then sent to a pair of high powered headphones. Whilst Mark was unable to hear the morse sent he was able to sense the signals as a result of bone conductivity and could by now decode morse sent in excess of 20 words per minute. Once again Mark could communicate with outsiders. He was also developing some powers of speech with some words becoming intelligible by careful and practised listening.

During the autumn of 1983, Mark visited an exhibition for the disabled at Tonbridge at which West Kent ARS were running a demonstration station. The mutual interest members present and Mark had for what each was doing led to the building of a relationship that was to lead to great things.

At the next West Kent committee meeting, Mark's extraordinary achievements were discussed and the inevitable question was put "would it be possible to train Mark to pass the RAE?". The difficulties seemed insurmountable. Could

"I am very thrilled to be a radio amateur. It is a fine hobby especially for people who are disabled. 18 months ago, I had very little communication with anyone but now I am talking to people all over the world. I am amazed at the number of CW ops and at how friendly they are. So far, I have worked three continents and 25 countries." GOEMZ

the syllabus be explained when the only means of communication was morse? Could concepts be explained without the use of diagrams? Could Mark physically take the examination?

Studying For The RAE

West Kent's elder statesman, Bob Smith, G6TQ, took little persuading to take on the daunting task of leading a team of members who would attempt the tuition. Through the generosity of club members and others Mark was now using an automatic keyer with which he could communicate directly with those knowing morse code and via his computer with those who did not. Bob started making up lessons for Mark on tape which were followed up by question and answer sessions and tuition on a one to one basis at weekly visits. At the same time Daisy was busily transferring the entire text of the RSGB's examination manual into morse via the computer keyboard. The task was long and hard and at times frustrating but Mark's perseverance together with the efforts of Daisy, Bob and the West Kent members led to the booking of a special RAE test in December 1985, just 2 years and 4 months after the initial meeting at Tonbridge.

An official City and Guilds examiner visited Seven Springs to conduct the examination. Mark was excused the questions which involved diagrams but no other concessions were made and he had to demonstrate the same technical knowledge as any other candidate. Unfortunately, half way through the exam the computer broke down so Bob had to be called in to send each question and each of the four alternative answers in morse. This session took no less than 6½ hours of continuous concentration and morse sending by both Bob and Mark. But all the efforts was rewarded with the eventual arrival of a pass slip.

The morse test was of course a doddle. An official examiner travelled down from London to complete the test. Mark's only problem was slowing down.

In due course, a brand new call, GOEMZ, arrived and Mark was on the air. As a result of the unstinting generosity of amateurs and commercial organisations, Mark was now the owner of a KW Century 22 transceiver and trap dipole. His first QSO was on 26 March 1986 on the 80 metre band when he worked ON4AGG. On Sunday, April 6, Mark joined the West Kent ARS 10m CW net and was still there over two hours later sounding like a seasoned operator — it was the longest running club net for a very long time! At the club's AGM, Mark was declared Member of the Year and additionally a special award was made to Bob Smith for his hard but immensely rewarding work.

If you are a CW person please listen out for GOEMZ on the bands, you are assured of a memorable QSO.

In addition to those mentioned, special thanks for help and support are due to AMTEX, The London Institute for the Blind, The Radio Amateurs Invalid and Blind Club, G8KW, Invicta Sound and many others. For years Mark seemed destined to be shut off in his own isolated environment; now he looks forward to making friends all over the world.

THE DOUGLAS BADER FOUNDATION

Help Us To Help Them

To coincide with 'Battle of Britain' week and to raise funds for the Douglas Bader Foundation, who are moving there, Milton Keynes DARS will be running a special event station on the weekend of 13 and 14th September. Their sponsored station call GB4DBF will hopefully raise £10000 from the 1000 firms who have been circularised in the area and donations from

fellow radio amateurs. They hope to operate on 2m and HF and a special QSL card signed by Lady Joan Bader will be given to all contacts.

Any contribution sent to GB4DBF, The Douglas Bader Foundation, Bath Road Woolhampton Reading RG7 5SQ, will be gratefully received and will go towards the Rehabilitation Centre and Sports facility for the Limbless to be built at Simpson, Milton Keynes.



Dr Martin Sweeting at the controls in the old Control Station

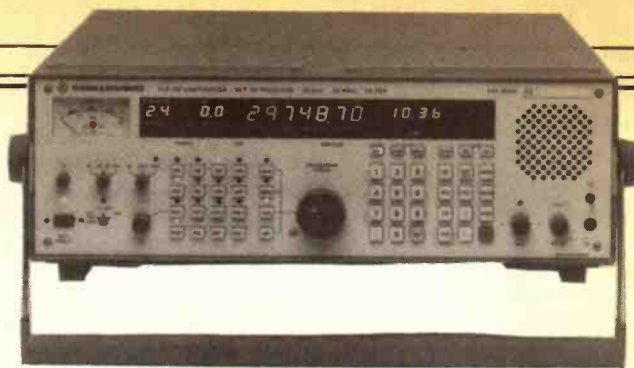
Space Meeting Success

Dr Arthur Gee, G2UK, Chairman of AMSAT-UK, reports on the recent space colloquium held at the University of Surrey, Guildford.

With the recent rapid development of amateur interest in space activities has come the realisation that some sort of 'get together' was becoming necessary to correlate the various interests in this field. Obviously the numerous problems, such as the rise in cost of new, more sophisticated satellites and the difficulties of finding launching facilities, required the combined efforts of interested groups in more than one country. The problems are too great for even the largest country's amateur radio societies.

Several attempts have been made over the past few years to organise such a conference of interested parties, but for a variety of reasons these have failed — that is until the Colloquium held over the weekend 5th and 6th July. This was organised jointly by AMSAT-UK and the University of Surrey. The venue was the University, a particularly suitable site as it is at the University's Department of Electronics that a specialist Department for Space Science has been established.

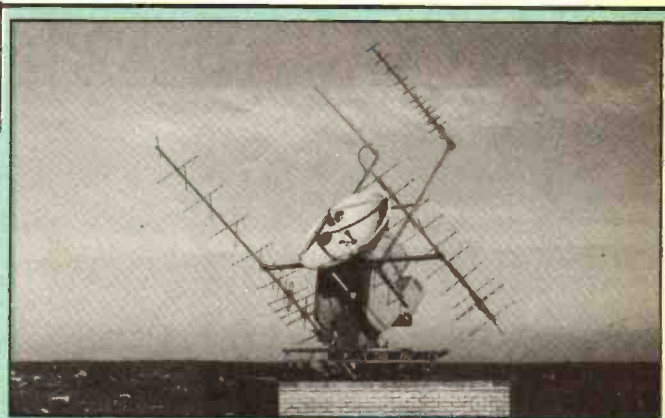
One of this Department's activities has been the construction and operation of two satellites specifically designed for scientific research and education — these are known as UoSAT 1 and UoSAT 2. There is also a complete Satellite Control Ground Station, for controlling the function of these satellites and collecting data from them.



Gen Cov Rx For VLF/HF

If your appetite was whetted by our feature on the bottom end of the RF spectrum (100kHz And Down, May 1986) you might be interested in a new receiver from Rohde and Schwarz. Called the EK085, it has a frequency range of 10kHz to 30MHz with modes AM, SSB,

CW and FSK. It claims to have excellent selectivity characteristics for whatever is down there and has what the requirements of an 'all-singing, all-dancing' rig should have, 100 memories and scanning facilities. If you would like further information about the EK085, contact Rohde and Schwarz UK Ltd, Roebuck Road, Chessington, Surrey.



The antennas for controlling UoSAT's 1 and 2. They are mounted on an old WWII Bofors Gun mount giving altitude and azimuth variable direction. They form a prominent landmark on top of the Dept of Electronics building! Courtesy U. of S. Audio Visual Aids Unit.

AMSAT-UK is of course, the organisation which organises and services the requirements of amateur radio satellite enthusiasts primarily in this country. However, they have been so successful in their activities, that they have attracted members from many other countries.

Together AMSAT-UK and the team around Dr Martin Sweeting, the Director of the Space Science Department, put on a very good weekend Colloquium indeed. The occasion attracted over 160 members from 14 countries and many prominent personalities from the amateur satellite world were present. Lectures on such varied topics as satellite orbits and their tracking, computer applications to satellites, details of the Oscar 10 satellite and some of its problems, ideas on future satellites, their funding and launching were discussed.

The UoSAT satellites were especially well dealt with; their on-board computer hardware and software, telemetry and experimental data facilities, the specialised data equipment carried such as the radiation detectors, particle wave experiment, the CCD experimental camera, attitude determination, stabilisation and control and so on. Much of this was of particular interest to the audience as little of the details had so far been published. In this connection, details were given of the new Ground Control Station which was just being completed at the University to replace the first, highly experimental one. Visitors were able to view the new Control Station which more nearly resembles a miniature NASA Spacecraft Ground Station Control. Altogether a very informative and useful occasion, for which there are already requests for another such event in the not too distant future.

College Quest For 100 Year Old Student

The London Electronics College, which celebrates its 80th anniversary this year, intends to mark the event by setting out on an international quest to find its oldest former student. The College, formerly known as the British School of Telegraphy founded in 1906, trained early Marine Radio Officers using the original Marconi Wireless Telegraph, some 300 of its students being at sea in 1912. Harold Bride, wireless operator on the SS Titanic, and Thomas Cottam on the SS Carpathia, the first ship to acknowledge radio distress messages, were both trained at the College.

Nowadays, the College specialises in professional electronics technician education, having ceased Radio Officer

training in 1980. The nautical connection was maintained to the end as the College was amongst the sponsors of the trans-globe polar expedition led by Sir Ranulph Fiennes during 1979-82. Lady Fiennes, the expedition Radio Operator, trained at the College during one of the last Marine courses.

Since its foundation, the College reckons it must have trained some 5000 students. In honour of the College's 80th birthday, a general signal 'QSO' is being sent out to all former students asking them to get in touch again. It's just possible that some of those original 1906 Marconi wireless telegraph operators will respond to the call. Present day staff and students would be delighted to welcome such visitors on a tour of inspection — just to see how much electronics has changed.



Perfect Morse From A Brass Pounder

Do you use a straight key that no-one can understand you on, or would you like to be known as the perfect morse sender without having to try. Well, Invotron from Blackrock in Eire have produced a digital morse processor that could just do the trick for you. The DMP1 interfaces between any morse key and a transmitter and will decode what you send, buffer it in an 8k RAM store and then output it as a continuous stream with all the mark and space durations precisely correct. It will also store messages and calls to be repeated and can be used as a trainer to improve both your sending and receiving ability. The unit costs £275 and Invotron Ltd can be contacted at Brookfield Avenue, Blackrock, County Dublin.

Courses For The RAE

AMERSHAM

Amersham College on Tuesdays at 7pm from 16th September. Course tutor G4HES. Enrol on Wednesday 3rd September. A morse course, run by G3NCL, will begin Monday 15th September at 8pm.

BIRMINGHAM

Fox Hollies Leisure Centre, Acocks Green (phone course tutor, G4ABV, on 021 778 1311 during school hours or 021 743 5104 evenings) on Mondays at 7.15pm. Enrolment is at the Leisure Centre from 6pm on Wednesday 10th September. Ring G4ABV for details of the fee and date. A morse class is also available on Thursday evenings from 7.15pm at the same venue.

BRIGHTON

College of Technology, Pelham Street (phone 0273 685971). Details of commencing dates, times and cost of course from Mr Bravery, G3SKI, at the college. Enrolment is on the 8th and 9th September between 4 and 8pm. Course lecturer G3XUS. Morse class available if sufficient demand.

BRISTOL

Twyford House, High Street, Shirehampton (phone 0272 822400) from Wednesday 1st October at 7pm. Enrol by post to the Director of Education, Stoke Lodge, Shirehampton BS9 1BN. The fee is £30.60 (reductions available).

CRAWLEY

Ifield Community Centre, Lady Margaret Road, Ifield from Monday 15th September at 7pm. Enrolment is on 8th and 9th September between 7 and 8pm. For further details, ring course tutor G3LNM on Crawley 24007.

DERBY

College of Further Education, Wilmorton (phone Derby 73012) are running an RAE course and an advanced radio amateurs course. Both will be 30 weeks long and two hours per week. Enrol on 8th or 9th September. Contact course tutor G4MLL on ext 52 for more details.

FAREHAM

Adult Education Centre, Wickhams Road (phone 0329 28079) from Friday 26th September for the 27 week course (exam in May '87) or Monday 15th September for the 11 week course which assumes some previous knowledge (exam December '86 at 7pm on both nights. Enrolment by post to the centre or in person from 8th September. The fees are £25.50 for the 27 week one, £14.40 for the 11 week course (reductions available). Course tutor G3CCB.

FARNBOROUGH

Wavell School, Lynchford Road (phone 0252 540084) from Thursday 25th September at 7.30pm. Enrolment should be by post to NE Hants Adult Education Institute, St Albans Hall, Lynchford Road, North Camp, Aldershot. The fee is £28.35. There are also two morse classes: the first is a 20 week course to take beginners to the level of the Home Office Certificate starting Monday 22nd September and costing £39.20. The second course is for 10 weeks and is for advanced operators. This runs at the same time as the RAE course and costs £19.60.

GUILDFORD

College of Technology, Stoke Park (phone 0483 31251) from Monday 15th September at 6.30pm. Enrolment will take place at the college on the 8th and 9th September between 2 and 4pm and 6 and

9.30pm. The fee for the course is £23.05. Course tutor is G1RNV.

KINGSTON UPON THAMES

College of Further Education, Kingston Hall Road on Monday evenings from 7pm. Enrolment is on 8th and 9th September. More details from Paul Farmer on 01 546 2151. A morse class is also available on Tuesday evenings.

BOREHAMWOOD, LONDON

De Havilland College, Elstree Way (phone 01 953 6024) from Tuesday 16th September from 7pm. Enrol on 8th and 9th September between 2 and 10pm. Course tutor G3HB.

HENDON, LONDON

College of Further Education, The Burroughs (phone 01 202 3811). Enrolment is on Wednesday 10th September from 2 till 8pm at the college. Contact the college for further details.

ISLINGTON, LONDON

Islington Institute, Rising Hill Street from Monday 22nd September at 6.30pm. Enrolment is on Monday 15th September at 6pm. For details of the fee, ring the course tutor G3ZKE on 01 485 7065. The institute also runs a morse course on Wednesday evenings from 7pm.

PADDINGTON, LONDON

Paddington College, 25 Paddington Green (phone 01 402 6321). This course is a little different from others available in that it covers the syllabus and the college facilities are available for practical experiments in electronics theory. This means that attendance is required on two evenings: the main one being Friday with the choice of either Tuesday or Thursday for the practicals. Enrolment will take place on the 8th and 9th September at Paddington College between 1 and 4pm and 6 to 8pm. The course tutors are G4KKM and G6MFR. Further details from the college.

MANCHESTER

Hulton High School, Longshaw Drive, Little Hulton, Worsley from 24th September at 7.15pm. Enrol 10th September. Tutor G6EBR.

PRINCES RISBOROUGH

Adult Education Centre on Thursdays at 7.30pm from 25th September, run by G3NCL. Enrolment 9th and 10th September. Morse classes taught by GOAZV will be held at the same time.

EDGELEY, STOCKPORT

Avondale Evening Centre, Edgeley, Stockport on Monday 15th September. Further information from the evening centre head or course tutor G4WAU on 061 427 4730.

REDDISH VALE, STOCKPORT

Reddish Vale Evening Centre, Reddish Vale Road (061 477 3544) on Mondays between 7 and 9pm. Enrolment is on 15th, 16th and 18th September at the college between 7 and 9pm. Further details are available from the college during school hours ext 237. Course tutor G4UJD. A morse course will also be run on Thursday evenings at the same time to take students up to about 17wpm.

THANET, KENT

Adult Education Centre, Hilderstone House, St Peters, Broadstairs from Friday 3rd October at 7 pm. The course will involve demonstrations and practical projects. Course tutor is G3JIX. The Hilderstone RS which meets on the same night can provide morse practice sessions. For further details contact the centre or Annette Penfold on Ash 812723.

ASTRID For More Computers

ASTRID — the satellite receiving and decoding system reviewed in last month's Micro' Net column — is now suitable for the following computers:

Acorn — BBC model B; Electron with official serial port; Master series. Sinclair — Spectrum 48K and 128 with interface one fitted; QL is still under investigation. All Amstrads with the correct

serial port for the model. Apple IIc and IIe; Commodore 64 with communications cartridge; Osborne 1 and Execute computers. The Tandy TRS80 series are still under investigation. We have also heard that the SUDD program from G4HLX for the Spectrum has been updated and can now show pictures. The new program is called SPIX and is available from 87 Hunters Field, Stanford in the Vale, Faringdon, Oxon SN7 8ND.

EMC Conference

Judging from the response we've had since publishing our series on Interference, interest is growing on this irritating subject. The IERE have organised an international conference to be held in York University from 30th September to 3rd October on electromagnetic compatibility and latest trends in immunity and suppression.

The conference will include special sessions on methods of improving immunity to interference arising in PCBs, and EMC

education. The first day will be devoted to subjects such as spectrum analysis screening, suppression components and filters, EMP, measuring techniques and instrumentation and particular emphasis is being placed on the methods of measurement of emissions from aerial systems. There will be an exhibition of more than 30 stands to support the event.

For more details and a registration form (open to anyone) contact the conference secretariat, IERE, 99 Gower Street, London.

Making More of Morse

In 1983, two Dutch radio amateurs, Rinus Hellemons, PA0BFN, and Dick Kraayveld, PA3ALM, began publishing a quarterly journal, MORSUM MAGNIFICAT, for morse enthusiasts. Contributions were written by amateur and professional, young and old, morse telegraphers from around the world; but as the journal was in Dutch, its circulation has been very limited.

In 1985, an experimental, one-off, English version was published to "test the ground" for a wider audience. Now, Tony Smith, G4FAI, has joined the editorial team as English Language Editor, and a new

English version of Morsum Magnificat will shortly be available by post, worldwide.

Its aim is to publish material about morse, past and present, not normally found in popular magazines today, and will include history, illustrations, anecdotes, and adventures in both wire and wireless telegraphy. At last, CW addicts can have their fill of morse matters and have their say, sure of the attention of a specialised and receptive readership.

UK subscription for a year (4 issues) is £6 post paid, from G4FAI, 1 Tash Place, London, N11 1PA, cheques payable to MORSUM MAGNIFICAT. For further information, including overseas rates, send an SAE or telephone 01 368 4588.

Interested in ATV?

You may have seen at several rallies this year a stand run by Astley Video Services from Manchester. They specialise in new and used ATV equipment including cameras and

monitors. But if our article gets you interested, you'll have to be fast getting to their stand, they have been known to sell out. For any advice on ATV ring Steve, G4BVN or John G6DBM on 061 790 4649.

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AMATEUR TELEVISION

Amateur television is no longer the specialised expensive art that it used to be. Any amateur can transmit pictures either generated by a home computer or with a bog standard camera. Here Chris Lorek, G4HCL, introduces a three part series which will get you onto ATV without making a big hole in your bank account.

Not many years ago, amateur television (ATV) was a rather specialised art, practised mainly by highly technical boffins. Their shacks were equipped with large cameras, monitors, panels full of knobs and buttons and the essential oscilloscope or two lying around for good measure. This was, of course, before the 'home video revolution', so you really had to "know your stuff". This could have been the reason why so few amateurs became operational on the mode. In fact when I first became licensed a completely separate licence was required, you were even issued with a special G6***/T call sign.

These were the dedicated amateurs, keen to exploit new technology and be at the forefront of specialist modes of communication. The result of their labours was that magical feeling of being able to see as well as hear the person they were communicating with; to be able to see around their shack without leaving their own; the thrill of receiving pictures from a new station, often a local amateur they themselves had helped get set up for the mode.

Can I Join In?

You may be thinking to yourself, "But I need so much specialised gear to get going, I would never be able to justify it". Well look around you, you probably have most of it already! A TV set is normally the most expensive part which many amateurs have,

a video recorder, although not necessary, adds to the convenience. A home computer, no matter how simple, may be used to generate pictures for transmission in the absence of a camera, or your video recorder may be used to play back video. Video movie-makers may already be in possession of a camera.

Several amateurs already have aerials up, but for 24cm a cut-down TV aerial performs very well for the price. This just leaves the transmitter and receiver. Those who have a satellite TV set up, (with the dish 'posing' next to the 'D' reg XR3i in true keep-up-with-the-Jones's style!) will already have an amateur TV



The G4HCL portable 23cm colour TV and sound system uses Solent Scientific transmitter and receiver units (costing £120) Philips VK4000 series camera (costing £195 brand new, surplus) all powered by a 12V NiCad pack (which cost £8 surplus ex JVC stock). Reception utilises the built in VDU on the camera. Note the 23cm coaxial dipole mounted on the camera.

receiver without probably realising it. An aerial and preamp is all that is needed to receive extra amateur TV programmes relayed from your local TV repeater.

Several ready built units, as well as construction kits to get you onto ATV, are available on the amateur market from suppliers such as Comex, Solent Scientific, Wood and Douglas and DC To Light. A complete TV transceiver can easily cost you less than £100 in fact.



An ATV station with a VK4901 camera on the left.

AM Is Dead, Long Live FM

Current television broadcast signals from your local UHF transmitter use amplitude modulation for the video signal and an entirely separate transmitter for FM sound, the two being combined into one aerial. As often happens, the mode in use is not the most up-to-date in terms of technology and efficiency, but is used for compatibility with present receiving equipment. Times are changing and FM video together with intercarrier sound is being used for modes of the future such as DBS (Direct Broadcasting by Satellite).

If you consider an AM transmitter, the carrier requires modulation either by transformer or series-pass transistor methods. If your RF power amplifier transistors are rated at 12V supply then this is the maximum you can supply them with on absolute peaks of modulation. The standing voltage, therefore, under no modulation conditions is only 6V. However, the same transmitter line-up using FM instead may be run at higher power, with only a low power modulator being required. For amateur purposes, this of course means more watts per pound!

On receive, AM is marginally better for weak signal reception with a given signal strength, but FM is far more superior in giving a fully limiting signal and hence good picture quality free from noise, once the limiting threshold has been reached. In an AM transmission, the accompanying sound carrier is transmitted 6MHz away — 5.9996MHz actually. Whereas on FM, the audio may be superimposed on the video signal again at 6MHz, or whatever, removing the need for two transmitters. Commercial microwave TV links invariably use FM for these reasons.

Table 1 TV repeater list.

Callsign	Channel	Site	Present State
GB3AF	RMT2	Durham	Planned, awaiting licence
GB3CT	RMT2	Crawley	Planned, awaiting licence
GB3GT	RMT2	Glasgow	Planned, awaiting licence
GB3GV	RMT2	Leicester	Operational
GB3HV	RMT3	High Wycombe	Planned, awaiting licence
GB3PV	RMT2	Cambridge	Planned, awaiting licence
GB3TV	RMT2	Dunstable	Operational
GB3UD	RMT2	Stoke on Trent	Operational soon
GB3UT	RMT1	Bath	Operational
GB3VI	RMT1	Hastings	Planned, awaiting licence
GB3VR	RMT2	Worthing	Moving to new site

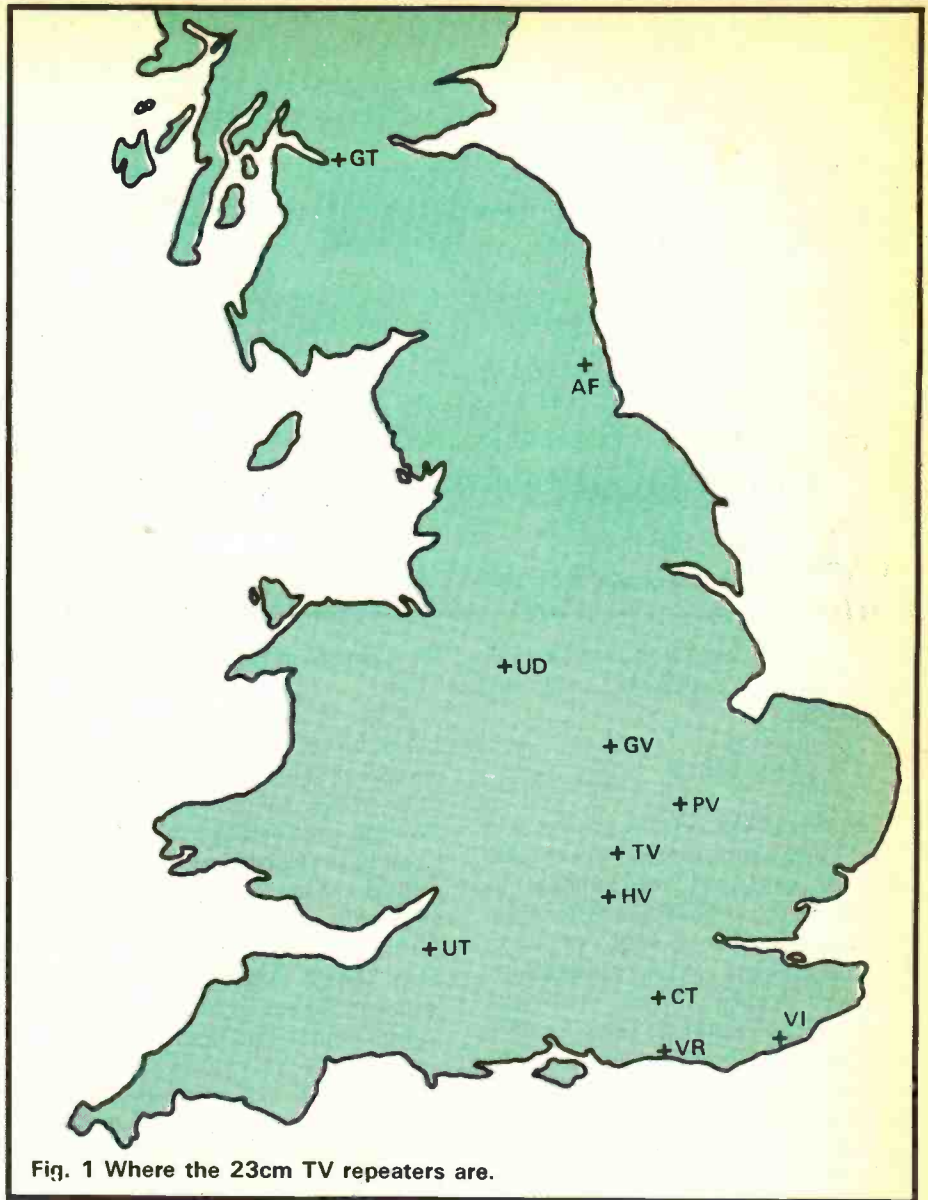


Fig. 1 Where the 23cm TV repeaters are.

70cm or 23cm?

The majority of TV activity has, up until recently, been on 70cm. This is now becoming rather limited though, as the bandwidth available is only enough to fit one black and white video signal with no sound, using DSB AM or standard FM. Colour transmission is only possible by the use of vestigial sideband transmission, which is a very

specialised art requiring sophisticated measuring gear to set up. A typical video signal has modulation components up to around 4 or 5MHz, plus any superimposed sound carrier. QRM to and from other modes of communication on the band has also to be contended with. Repeaters are out of the question due to bandwidth limitations.

On the next band up however, we have a whole 85MHz to play with, more than all the lower frequency bands added together. This allows several full colour TV QSO's to take place whilst still allowing plenty of room for other modes, and this is the band I shall be concentrating on in this series of articles. Some areas around the country suffer airport radar interference on 23cm, but this normally occurs only in certain band segments, and hence by careful

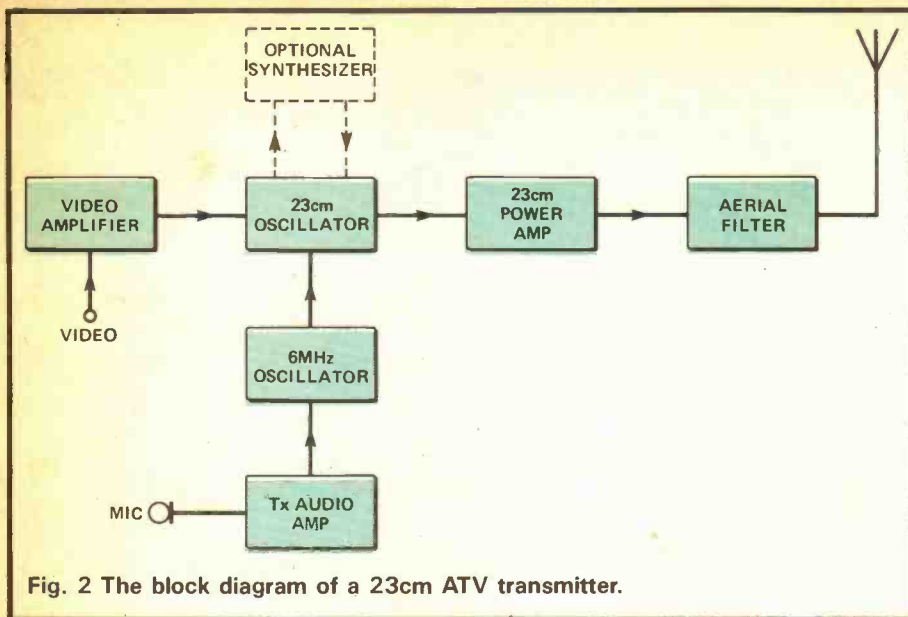


Fig. 2 The block diagram of a 23cm ATV transmitter.

choice of operating frequencies and so on, the problem can be minimised.

TV Repeaters

Yes, just like on the phone and data, TV repeaters exist around the country and are multiplying in number all the time. The nearby map, Fig. 1, shows the positions of those currently on the air and planned for the near future. Three 'channels' exist and are shown in Table 2. RMT 1 is normally used for units with AM outputs. This makes reception easier for stations using simple down-converters into standard AM TV receivers. The remainder are normally used for pure FM input/output units.

Channel	Input frequency	Output frequency
RMT 1	1276.5 MHz	1311.5 MHz
RMT 2	1249.0 MHz	1318.5 MHz
RMT 3	1248.0 MHz	1308.0 MHz

Table 2 The present frequencies for TV repeaters.

The repeaters act as a 'focus' for TV activity, as most stations use highly directional beam aerials or even dishes — multi-way QSO's are made much simpler as a result. In areas not currently served by a repeater, 1255MHz and 1286MHz are commonly used for direct working, but often initial calls are made on the national TV calling frequency of 144.750MHz. If you take a listen on there, or even put a call out yourself, you'll get an idea of TV activity in your area.

Transmitters

Fig. 2 shows a typical transmitter block diagram. A free running oscillator is normally employed, as this would be stable enough for average shack usage. For the perfectionists, a phase lock circuit may be added, with several ICs being available such as the Plessey SP5000 series designed for single chip TVRO downconversion oscillators — Solent Scientific produce a purpose designed board for amateur applications.

FM is carried out at the oscillator and a further 6MHz signal with FM sound modulation is added at this stage, superimposed on the video modulation. Standard buffering and amplification stages follow, with

typical output powers of between 1 and 10W. Further amplification for the power merchants can more economically take place using a 2C39A type valve stage. Ensure the amplifier design you use can handle the bandwidth required, several published designs or commercially available amplifiers are too narrow. One design I would recommend is the modification of the G2RD unit by G8VBC and G4FZL, published in CQ-TV Nos 119 and 120.

A technique sometimes used is generation of a high power FM 70cm TV signal which is then tripled up to 23cm using a varactor. This has the advantage of using commonly available 70cm amplifiers, usually at lower cost, but is offset by the requirement for good bandpass filtering at 23cm. If this is omitted, you could be putting power out at the upper tuning range of your neighbour's TV at 860MHz as well as on 23cm. This has happened to one or two friends without them realising it, with comical results!

Receivers

For AM reception and 'poor man's' FM reception, a simple down-converter from 23cm to channel 36 UHF may be either built up or purchased, to fit between 23cm aerial system and your domestic type TV receiver. Astec produce a ready built module, available from Comex Systems. FM reception is possible by 'slope detection', as shown in Fig. 3. This relies on the slope of the receiver passband to

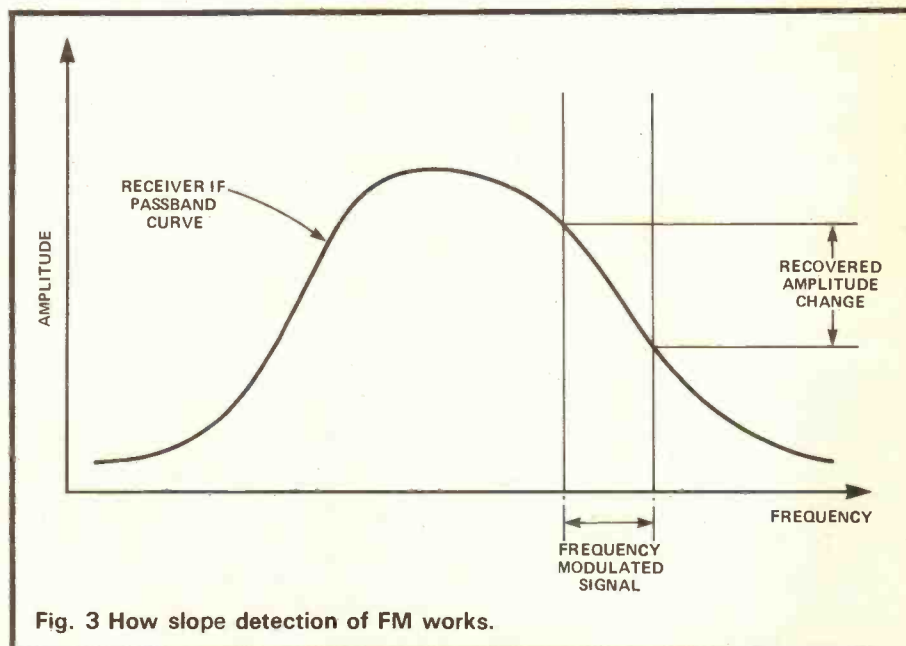


Fig. 3 How slope detection of FM works.

convert the frequency modulation changes into amplitude variations. You will of course lose out on sensitivity and absolute picture quality together with loss of sound, but it would act as a low cost starter for local signals.

For the enthusiast, Fig. 4 shows the usual set-up of a downconverter followed by a true FM video receiver. The video, complete with intercarrier sound, is amplified and again down-converted to a lower IF, where further amplification, filtering and demodulation takes place. The 6MHz sound carrier is tapped off from the video and demodulated separately.

The resultant audio and video signals may be fed direct to a monitor or modified TV for the best quality (my shack TVs have Scart sockets which are very useful in this capacity), or fed to a UHF modulator for application directly to the aerial socket of a normal TV receiver. These modulators are available at low cost ready built from firms such as Astec, or may be built up yourself, Wood and Douglas provide a kit of spare parts.

The Aerial System

The word 'bandwidth' is again of great importance here. If you wish to get the best results from, say, a local repeater operating on RMT2, your aerial must have a bandwidth of at least 70MHz. Forget the Tonna 23 or 55 ele completely, tests I have performed in my lab on a 1296MHz 23 ele version show this to be over 9dB down at 1249MHz. The Jaybeam 15/15, although not as narrow, is also unsuitable. I would recommend the Jaybeam CR23 corner reflector, which gives useful gain over the entire band, or the JVL 1.3 GHz loop quad. Some amateurs swear by helical beams, which give wide bandwidth but you instantly lose 3dB due to the fact they are circularly polarised rather than the current standard of horizontal for all terrestrial operation here.

With this problem of aerials in mind, I thought of the idea of cutting down a standard group C/D TV aerial in size, and my colleague, G4XHM, put this into practice with good results as predicted. Next month we reveal all, together with a four way splitter design which will cost you less than £1! The Worthing and District Video Repeater Group, who

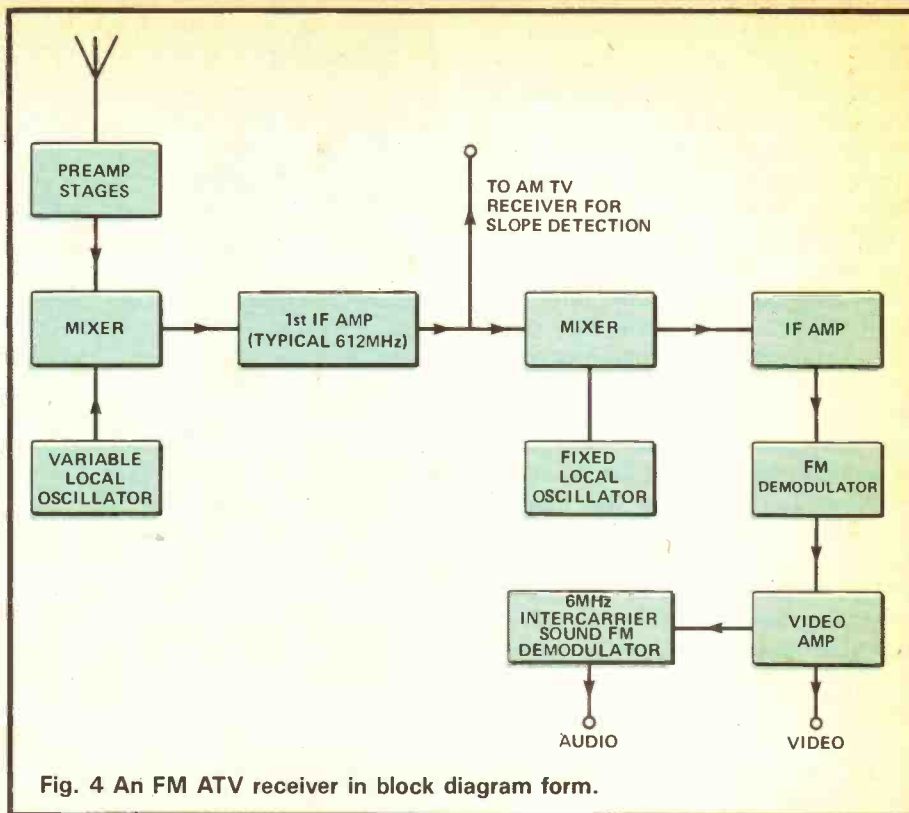


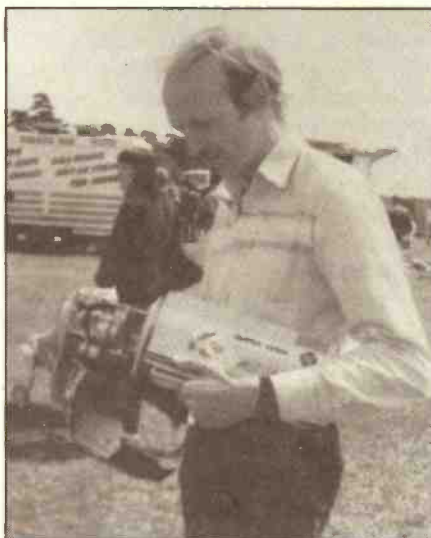
Fig. 4 An FM ATV receiver in block diagram form.

run GB3VR, produce an excellent part built colinear kit for £10.95, which would certainly get you going, though I would advise a good dose of weather sealant for outdoor mounting.

Feeder losses become more of a problem, the higher you go in frequency and I would advise you to use the best you can afford. UR67 is all right for short runs; H100 is better; heliax for the perfectionist. Don't be tempted to use PL259 connectors as they are only rated up to 300MHz and are not even 50

ohms. Use 'N' type as much as possible, although BNCs are useful and convenient for short runs between equipment in the shack if you need to use thinner coax for interwiring.

A very useful improvement on the receive side may be gained by the use of a masthead preamp. LMW Electronics do a nice line in kits and Microwave Modules produce cased up preamps which are very popular. This is of course, 'guiding the lily' for those out to achieve the best performance possible, but is money well spent even by the beginner.



G4BIK stands pleased with his newly acquired Lynx camera bought for £10 at Elvaston Castle rally this year.

Cameras and Computers

Once the kids have got fed up of playing games on the family Spectrum or Vic-20 computer, grab it for the shack! No, not to use as a database, but an excellent source of video such as testcards, captions, CQ calls, station details and so on. All done for you, just tap off the connection to the internal UHF modulator (or the direct composite video monitor output if it's a posh one) and feed it into your transmitter. The GB3VR Group — very enterprising group this — produce a program for 48k and 16k Spectrums, giving numerous video facilities for ATV use, including even an alarm clock, for £6.00.

For those of us wishing to become TV stars, several ex-surveillance cameras are available on the second hand market. 'Lynx' cameras are commonly available from around £10-40 at rallies. Recently several modern 'Small Shop Type' VK4901 cameras have appeared at around £50-60 in new condition complete with lens and built in mic. These are a very good buy, as second hand ones (like mine, a bit battered) go not much cheaper. When looking for any type of video camera at rallies, ensure you get a lens included in the price, as these often cost more than the camera itself. If at all possible, try the camera before buying it as vidicon tubes with burnt out patches are all too often the reason for them appearing for sale in the first place. Finally, always carry the camera with the lens upwards.

If you own a camera for video home movie use, then by all means put it to good use in your station — a group of us even operate 23cm video portable as 'roving reporters' at local events. A complete video transceiver can be carried in a small case. It is much lighter than a portable recorder and can transmit both 'live' and back to a receiver linked to recorder in a nearby car or club stand at an event. Portable aerials are so small they are hardly noticeable!

Homebrew Construction

Most circuitry at 23cm RF utilises stripline construction, which places strict requirements on track mechanical tolerances and board dielectric. The use of unknown component types in terms of lead length and internal inductances places other limitations. Sorry 'junk box' component construction is unlikely to work well at these frequencies. Even professional RF design engineers often need more than one attempt to get something working first time after theoretical design. Yet, there is great scope for building kit designs at RF providing good construction techniques are used or employing modules. There are many accessories such as test card generators, IF and audio stages, vision mixers and effects generators operating at video baseband level (up to a few MHz) which may easily be built.



Some of the British Amateur Television Club's publications.

The BATC

If we've got you interested, the next step is to tell you about the British Amateur Television Club. They produce a very good quarterly magazine as well as several useful books for the more technically inclined amateurs. They also run a convention each year in the Midlands, see 'Radio Today', HRT July 86. Designs for transmitters, receivers, add ons and general operating news feature in each issue of CQ-TV, well worth the £5.00 a year in my opinion. Amateurs with Prestel facility may find the latest news from them on page 81062620a.

The second part in this series will take a closer look at available gear and commence a full constructional project with complete kits of parts available to get you going on FM transmit and AM or FM receive at low cost. Details of dimensions for the modified TV aerial together with laboratory performance figures will be given plus a design for a super, low cost, four way aerial splitter. On top of all that, details on modifying

the VK4901 surveillance camera for direct video with built in 6MHz inter-carrier sound output.

Useful Addresses

BATC Mr D Lawton, GOANO, 'Grenehurst', Pinewood Road, High Wycombe HP12 4DD. Tel 0494 28899

DC To Light, 15, Bursley Way, Bradwell, Stoke on Trent ST5 8JQ.

Comex Systems Ltd, Comet House, Unit 4, Bath Lane, Leicester LE3 5BF. Tel 0533 25084

Microwave Modules Ltd, Brookfield Drive, Aintree, Liverpool L9 7AN. Tel 051 523 4011

LMW Electronics, 102 Stamford St, Ratby, Leics LE6 0JU. Tel 0533 386364

Solent Scientific Ltd, 75 Chalk Hill, Southampton. Tel 0703 464675

Wood and Douglas, Unit 13, Youngs Industrial Estate, Aldermaston, Berks RG7 4PQ. Tel 07356 71444

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Get onto 50 The Cheap ai

There is an increasing amount of interest in modifying commercial PMR gear, and already a great many rigs are used for the 4 metre band. The coming of the 6m band will no

Two words of warning are appropriate here. Firstly, the RF section of the rigs and, possibly, the IF sections will need re-alignment to obtain optimum performance on the

Want to get going on 4 or 6? Too broke to buy the latest gear, but not experienced enough (or not got the time) to build from scratch? Ted Nield, GW3ARP, describes a tuner unit (and, next month, companion VFO) to provide flexible Tx/Rx operation on popular surplus PMR rigs.

doubt increase the amount of this gear being re-deployed into the amateur frequencies.

This article describes the design and construction of a tuner unit which will enable the receive section of the most popular 'low band' commercial transceivers to tune across the entire band of the permitted amateur frequencies. This is done by removing the rig's crystal and injecting a variable frequency at the same point.

This article concentrates on making a unit that will enable the Pye Vanguard, Cambridge or Westminster to tune the 4 metre band. Details are given towards the end on how to adapt the design to Storno rigs, and how to adapt it for 6m use.

amateur bands. And secondly, whilst so far as we know, the unit described here will work with all the rigs described, we cannot guarantee that it will work with every single example ever made. You will just have to check for yourself we're afraid, but surplus PMR gear is so cheap, if this doesn't work with one, you can just go and buy another!

Also described is a stabilised PSU for use with the tuner, which has enough spare output to drive the transmitter VFO to be described next month.

Design Deliberations

The oscillator frequency f_0 needed to tune in a signal of

EQUIPMENT	FORMULA	OSCILLATOR FREQUENCY (MHz)	
		LOW END	HIGH END
Pye Vanguard Cambridge Westminster	$\frac{f - 10.7}{2}$	29.66	29.90
Storno (later solid state model)	$\frac{f - 10.7}{6}$	9.88	9.97
Storno (older, low band model)	$\frac{f + 0.455}{7}$	10.06	10.14

Table 1 The formulae used and the frequency ranges needed for the most popular commercial PMR rigs.

Q	d or e	g or b	s or c
1	7.1	—	—
2	10.0	—	3.0
3	3.0	3.6	5.7
4	6.4	5.7	0

Table 2 Test voltages around the circuit with 10V at the junction of VR2/R10.

frequency f_1 is:

$$f_0 = \frac{f_1 - f_2}{n} \quad (1)$$

or

$$f_0 = \frac{f_1 + f_2}{n} \quad (2)$$

where f_2 is the 1st IF frequency band and n is the number of times f_0 is multiplied before the mixer stage. Where the oscillator signal at the mixer is higher in frequency than the signal, formula 1 applies, otherwise formula 2 is used.

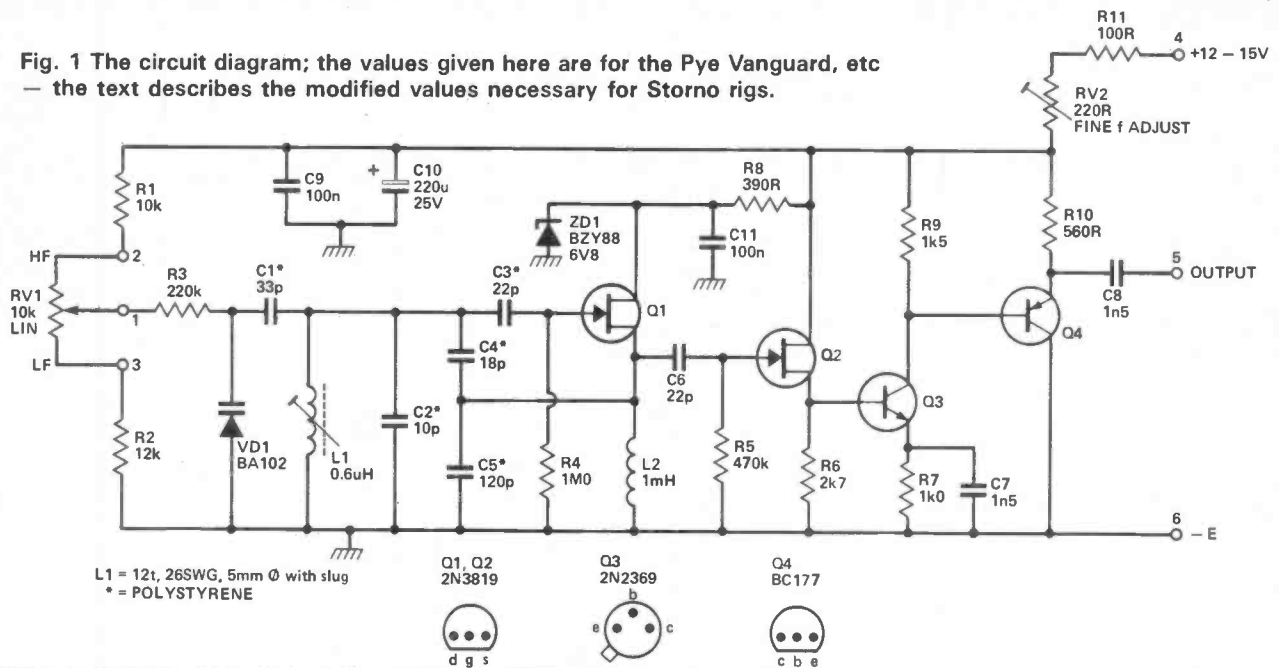
Table 1 shows the formulae and frequencies needed for 4 metre working by the most popular of the commercial transceivers in use.

The oscillator built round Q1 is of the Colpitts type and requires no tapping on the coil L1 which makes construction much easier. Because of the high cost of tuning capacitors, a varicap circuit is used and tuning is by a linear potentiometer RV1 driven via a slow-motion tuning dial. The varicap diode VD1 is coupled via C1 to the rest of the tuned circuit L1, C2, C4, and C5. Q2, a source follower, isolates the oscillator from Q3 which amplifies the signal. Q4 is an emitter follower output stage.

The components C1 and C2 are mounted on short wire posts fixed to the PCB making it easier to change their values if necessary during the initial tuning adjustments. RV2 is for fine tuning during the setting up procedure, and the slug core in L1 is a coarse frequency control. Table 2

and 70MHz - nd Easy Way!

Fig. 1 The circuit diagram; the values given here are for the Pye Vanguard, etc - the text describes the modified values necessary for Storno rigs.



shows the voltages to expect around the circuit with a 10V potential at the RV2/R10 (etc) junction.

Construction

The unit is built on a piece of Veroboard measuring about 7.5cm x 4.0cm and the overlay is shown in Fig. 2. Note the posts for capacitors C1 and C2; it proved convenient to use two similar posts for the leads to L1, which is close-wound on a 5mm core with a slug. The core is attached to the PCB with an epoxy resin glue. Two fixing holes (FH) are provided where they do not interfere with the circuit conductors.

The output is taken to a TV type coax socket. A coax lead takes the signal to the rig where it couples (via another TV plug/socket) to the crystal holder of the receiver.

The unit is housed in a die-cast box 17 x 12 x 6cm, which gives room on the panel for the dial together with a calibration graph. Power from the PSU enters via the speaker type socket alongside the output socket.

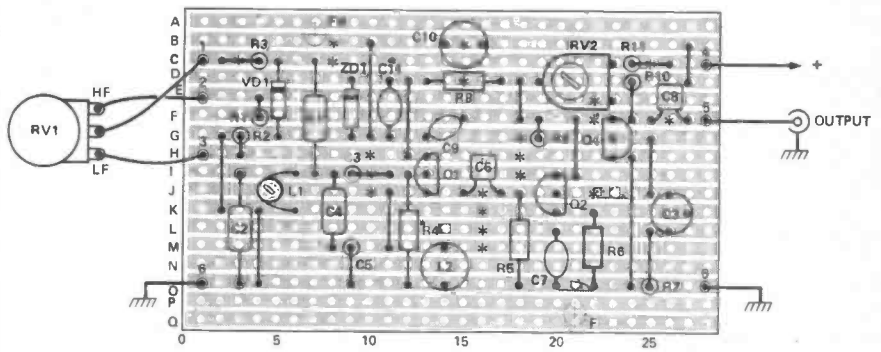


Fig. 2 Suggested circuit layout for strip-board construction.

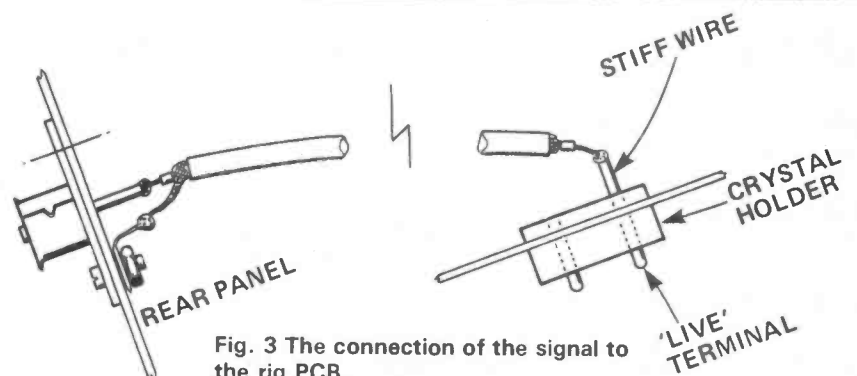
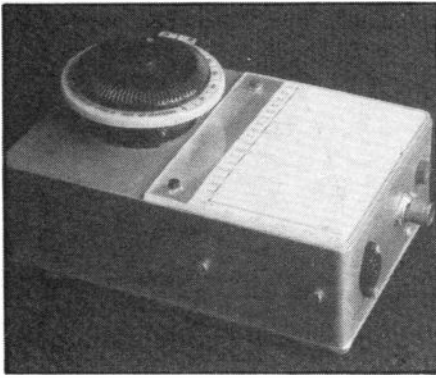
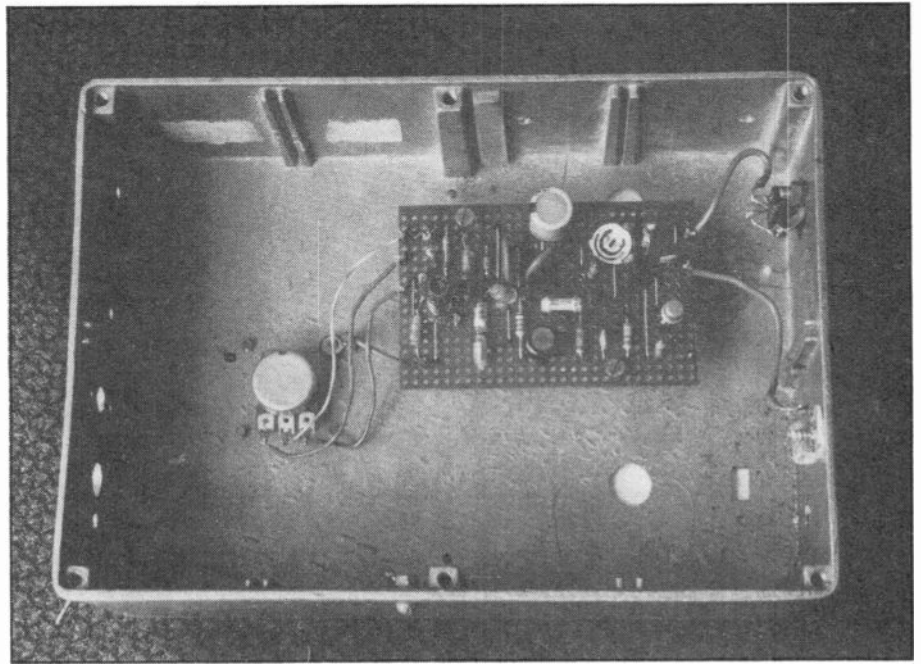


Fig. 3 The connection of the signal to the rig PCB.



The finished unit cased (above) and inside the unit (right).



L2 is available from Cirkit (stock no. 34-10201) and, probably, other suppliers. There should be no difficulties in obtaining other components.

Setting Up

This is most conveniently done using a frequency counter, but one may, in the case of the Pye equipment, make use of a receiver covering the 10 metre band. The signal emitted by the oscillator may be tuned in on the upper end of the 10 metre band and preliminary adjustments to the core of L1 and RV2 carried out. The approximate tuning range can be observed and adjusted as described below. Precise calibration would follow using a frequency substandard with 100kHz harmonics. In some areas a 4m beacon may be available.

The range covered on 4m by the values given extends slightly outside the ends of the band. Should the range need to be extended, C1 should be changed for a larger value with possible reduction of C2. The entire range can be moved bodily up or down by means of the slug in L1

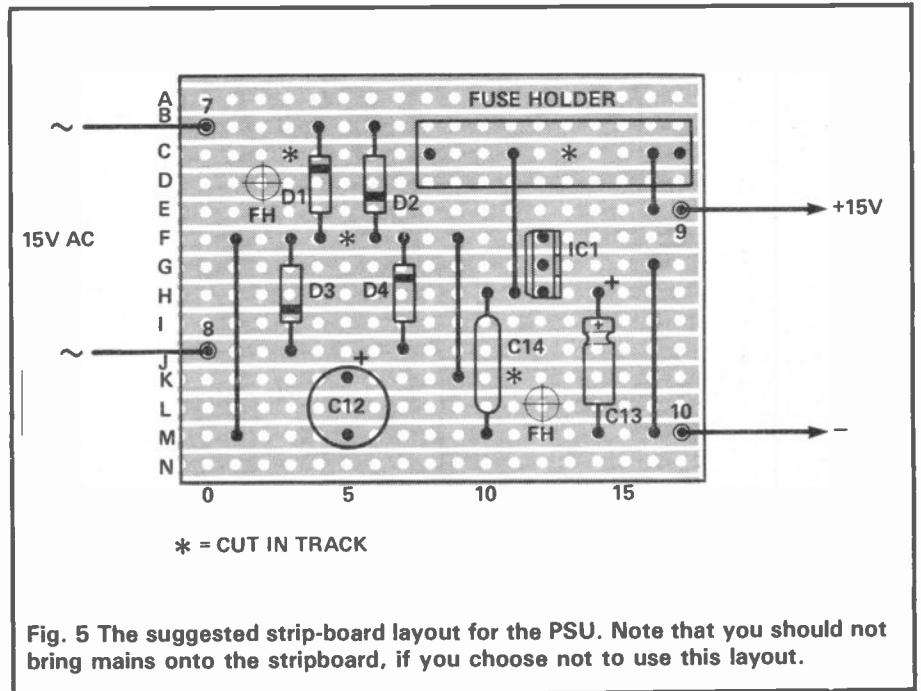


Fig. 5 The suggested strip-board layout for the PSU. Note that you should not bring mains onto the stripboard, if you choose not to use this layout.

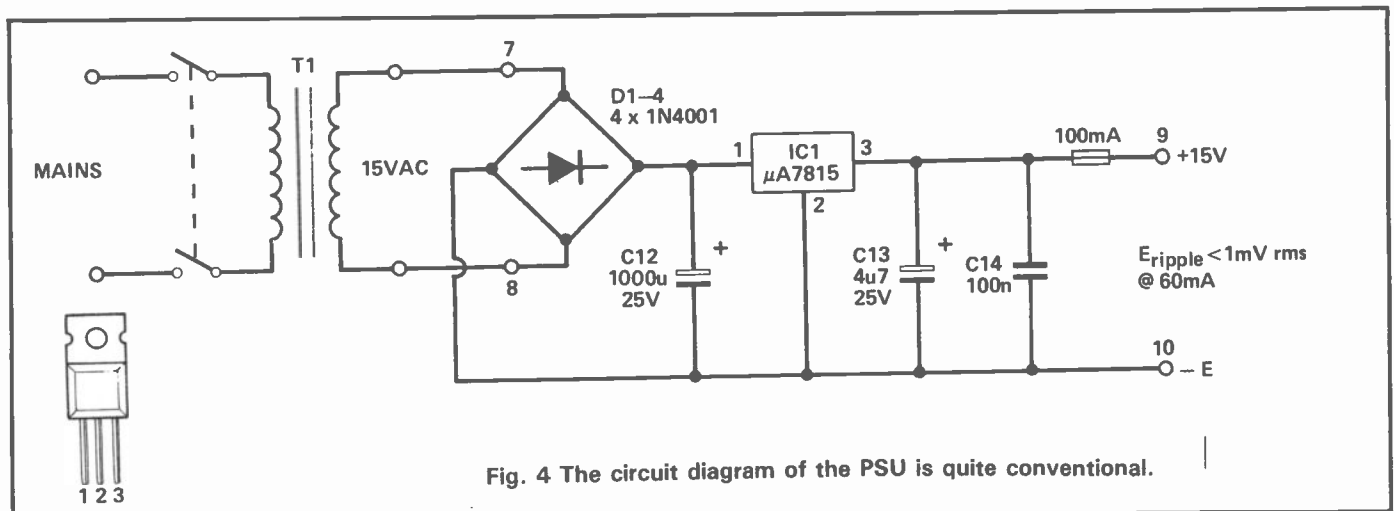


Fig. 4 The circuit diagram of the PSU is quite conventional.

(coarse) or by RV2 (fine).

For use on 6 metres the lower frequency will necessitate an extra two or three turns to the coil, and possible changes to C1 and C2. For the much lower frequencies associated with the Storno equipment it may be necessary to double the values of C1, C2, C4 and C5 as well as increasing the inductance of L1. Because of the larger multiplication factor preceding the mixer, no major changes to the component values elsewhere in the varicap control need to be contemplated.

The oscillator, when used with the PSU described will give a clean note with a minimum of frequency drift. (2-3kHz max. following the first minute after switch-on.)

PS Unit

Owing to the use of varicap frequency control the stability of the PSU is all important; also the ripple content must be negligibly small. Thanks to modern ICs such as the μ A7815 these parameters are not difficult to achieve.

Fig. 4 shows the circuit and Fig.

5 the overlay plan. The output voltage is 15V with an on-load ripple content of less than 1mV. The tuner

takes about 20mA leaving ample capacity for supplying the VFO driver for the transmitter section.

Components Listing — VFO Unit

RESISTORS (all 1/2W carbon film)

R1	10k
R2	12k
R3	220k
R4	1M0
R5	470k
R6	2k7
R7	1k0
R8	390R
R9	1k5
R10	560R
R11	100R
RV1	10k lin (carbon)
RV2	220R miniature vertical preset

CAPACITORS

C1	33p polystyrene
C2	10p polystyrene
C3	22p polystyrene
C4	18p polystyrene
C5	120p polystyrene
C6	22p ceramic
C7,8	1n5 ceramic
C9	100n ceramic
C10	220u 25v radial electrolytic

SEMICONDUCTORS

Q1,2 2N3819

Q3	2N2369
Q4	BC177
ZD1	BZY88 6V8
VD1	BA102

INDUCTORS

L1	12t 26swg close wound on 5mm dia. former with slug.
L2	1mH. (Toko 187LY — 102)

MISCELLANEOUS

TV-type coaxial chassis mounting socket; DIN speaker socket; 1 slow motion dial; Veroboard; case.

Components List — PSU

CAPACITORS

C12	1000u 25V radial electrolytic
C13	4u7 25V radial electrolytic
C14	100n polycarbonate

SEMICONDUCTORS

IC7	μ A7815 (15V stabiliser)
D1,2,3,4	1N4001

MISCELLANEOUS

Mains transformer 15V AC at 100mA; mains switch DPDT; fuse and holder; case; Veroboard.

Addendum

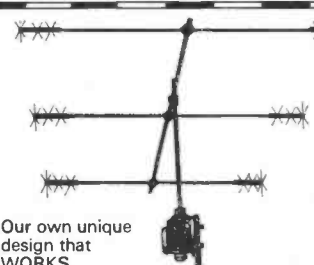
RTTY DECODER AND SERIAL INTERFACE (June 1986, page 53)


Unfortunately, there were several errors in the circuit diagram (Fig. 3) and on the component overlay (Fig. 6) on this project. However, these mistakes should not have affected the working of the decoder unit and the foil pattern is correct as printed. The errors are on Fig. 3, the pin configuration of the op-amp IC2 is wrong. Pins 5, 6 and 7 should be pins 2, 3 and 1 on IC2a and pins 1, 2 and 3 should be pins 7, 5 and 6 on IC2b — all respectively.

On the component overlay the following components are wrongly labelled:—

- D1 should be D4,
- D2 should be D3,
- D3 should be D2,
- D4 should be D1,
- C6 should be C15,
- C7 should be C16,
- C15 should be C6,
- C16 should be C7,
- R8 should be R14 and
- R14 should be R8.

Finally, on the circuit diagram, the unmarked pin on IC4 should be pin 4.





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Forward Gain Dbd	3.8 to 4.8	5.5 to 7.5	3.8
Front to Back Db	13 to 15	16 to 18	12
Side Null Db	25	25	20
VSWR (typical)	1.1:1	1.1:1	1.1:1
Weight	7.5lb	12lb	12lb
Wind load	2ft ² 0.18M ²	3ft ² 0.27M ²	3ft ² 0.27M ²
Turning radius	76"/1930mm	96"/2438mm	114"/2895mm

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Short Circuit

Want to keep an eye on the activity on your local 23cm repeater? Then try this basic circuit from Chris Lorek, G4HCL.

On 23cm, repeaters are licensed as beacon/repeaters, meaning that they will radiate a carrier at all times. When scanning channels for activity, it can be annoying to have one's rig constantly stopping on carriers even when there is no activity. Also if one intends to operate mobile, it can be distracting to be always receiving a possibly fluttery signal from the repeater for fear of missing a call.

Most proposed 23cm repeaters will radiate a 100Hz sub-audible tone whilst they are in 'talk through' mode, ie when someone is using it, otherwise with just a plain carrier with FSK callsign (which is inaudible on an FM receiver). This can be used to advantage by adding a switchable tone decoder to one's rig so that received audio only appears from the speaker when activity is present.

The circuit, shown in Fig. 1, uses a PLL tone decoder in an eight pin dual in line package, so the entire circuit can be built on a board of approximately one inch square in order to fit most rigs. An R-C

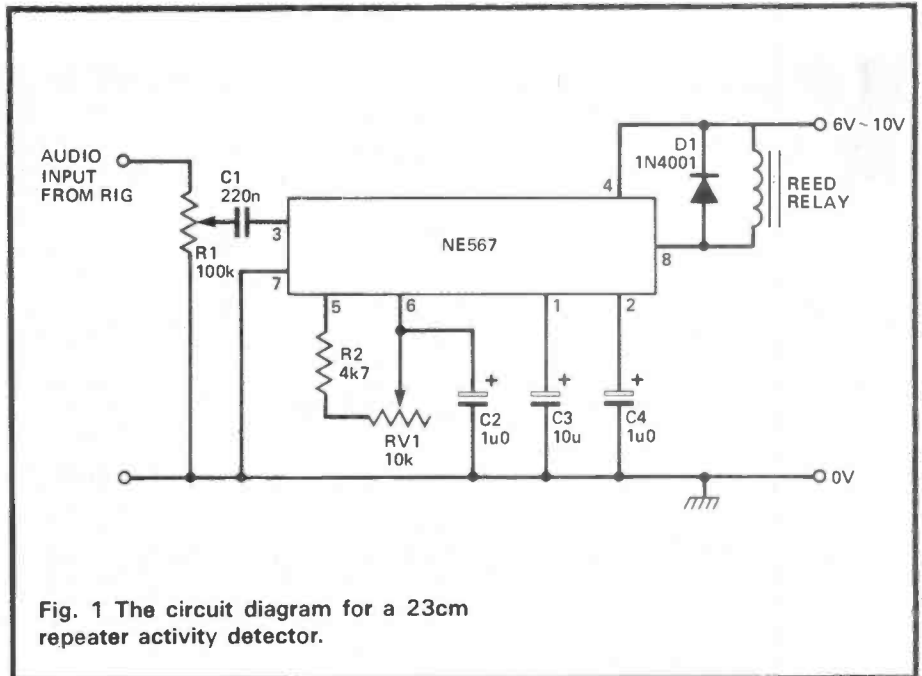


Fig. 1 The circuit diagram for a 23cm repeater activity detector.

network establishes the decode frequency according to relationship

$$\text{Frequency (Hz)} = \frac{1}{RC}$$

where R is in ohms and C in farads.

The frequency range extends from 0.1Hz to 500kHz, and in this circuit, R1 is the 4k7 resistor in series with the 10k potentiometer, RV1, with C2 as 1uF, giving a centre frequency of 100Hz. The supply voltage may be anything conveniently available in the range of 6 to 10 volts, preferably stabilised.

Audio can conveniently be taken from the top of the volume control in the receiver, with the reed relay contacts switching the audio from the volume control wiper.

The NE567 output, which switches 'low' on decode, can sink up to 100mA, so it can be used to drive several things such as in indicator lamp, tape recorder, etc. The 10uF capacitor, C3, sets the bandwidth of the decoder, whilst the 1uF capacitor, C4, smoothes the output voltage.



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PART EXCHANGE

A Fresh Look At The Yaesu FT101ZD



*The FT101ZD is now a standard rig to be seen at
bring and buys and everyone seems to know
someone who has one. But they are getting on a bit
and have seen many changes of interest — to their
detriment occasionally. Harry Leeming, G3LLL,
describes what to look for and how to repair the
damage of old age and the dreaded 'tweakers'.*

check that it is stamped on the back "234 V". If it isn't, look inside and re-wire the mains transformer as explained in the instructions in the user manual.

Whilst on the power supply take out the fuse and check that it is a 3 amp quick blow type — silver paper or 20 amp fuses have caused minor faults to result in £100 plus repair bills. (This is quite profitable for yours truly, so I do hope there will still be some non 'Ham Radio Today' readers who will continue to short out their fuses!)

Re-alignment

The alignment of the FT101ZD series does not normally require much attention as long as the rig hasn't been "got at". Unfortunately, many second hand ones have at some time or another been fitted with CB crystals and the alignment has often been upset in the process. Some CBers when doctoring the FT101ZD did little more than swop the 10 metre crystals. Others, however fitted extra relays for more crystals, re-aligned the 10 and 12 metre bands and fitted 6.5-7MHz in place of 7-7.5MHz.

If any odd bits have been fitted to the local pre-mix crystal oscillator board, it is advisable to restore things as near as possible to the original before fitting a correct set of amateur crystals. The crystal oscillators can be aligned using the instructions in the user manual. An output of 300mV is suggested in the manual, but checks on new FT101ZDs shows that they are normally factory set to give 200-300mV on the lower frequencies rising to 400-500mV on the higher frequency bands. The important point is to set the oscillator core below the point of maximum output otherwise the

Last month, I described the various attributes of the FT101ZD series and how it works. Perhaps more important, certainly to the new owner of a secondhand one, is how to check it over and repair it if found lacking. First though, a word of warning: be careful as close on 1000 volts is present in the power amplifier and power supply stages, and that the capacitors hold this voltage for several minutes after the rig has been switched off. So before trying to replace the PA valves or doing any work here, wait two minutes, and then short the anode caps to chassis before poking your fingers in!

Checking Out A Second Hand One

Particularly during the surge of interest in CB, many 101ZDs came into the country other than through the authorised distributors. Often these units had been left set on 220V, this being particularly prevalent with the Sommerkamp versions. Whilst many have survived, others have not. Certainly if you wish to risk blowing electrolytic capacitors or having arcover in the PA stage, running the rig at excessive voltage is the way to do it. Before you operate any unknown unit, do

oscillator will sometimes refuse to start.

Aligning The Bandpass Filters

If it has been used for operation on illegal bands, the bandpass filters will need retuning after correct coverage of the 10 and 40m bands is restored. The manual gives these details using a sweep generator, but in practice this is not usually necessary.

The cores in the bandpass filter are very difficult to get at and really an extension board is required to do the job properly. So do check that alignment really is necessary before touching the cores. If the 10m bandpass filter has been interfered with, you will probably have plenty of Tx drive at the low frequency end of 10m but will run out of steam above 29MHz. Likewise, good drive below 7MHz falling off above will indicate that the 40m bandpass filter is in need of adjustment. To adjust the filter, either borrow an extension board (not from me — sorry!) or remove the BPF board and adjust the two relevant cores by trial and error a quarter of a turn at a time until good drive is obtained over the required frequency range.

Aerial RF and Driver Alignment

Whilst alignment of the IF unit is dealt with in the user manual, that for aerial RF and driver stages seems to have escaped a mention. (Although it is covered in the workshop manual).

Unless there are obvious signs that they have been interfered with, you will be well advised not to touch the settings of the three cores that are ganged to the pre-selector control. You may wish to peak the trimmers, the positions of which are marked for the 9 and 6 band versions in Figs. 6A and 6B.

To align, start at 160m and tune the calibrator at 1.9MHz peaking the pre-selector for maximum receive S meter signal strength. Now switch to transmit and load up as normal without touching the pre-selector adjustment, then reduce the carrier control until the PA current is about 70mA. Peak the driver and RF trimmers for maximum PA current, turning down the drive control if this exceeds 150mA. Once these two

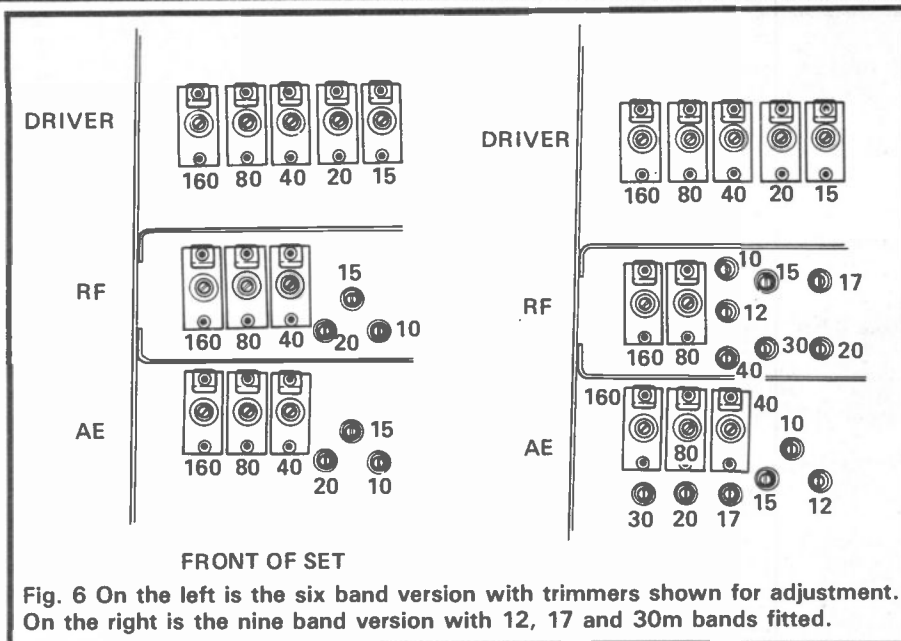


Fig. 6 On the left is the six band version with trimmers shown for adjustment. On the right is the nine band version with 12, 17 and 30m bands fitted.

trimmers are tuned to maximum, go back to receive and without touching the pre-selector, peak the aerial trimmer for maximum S meter reading on the calibrator. Repeat these adjustments until the pre-selector peaks at the same point on receive as it does on transmit.

It will only normally be possible to get the peaks on transmit and receive to coincide if an NEC or other suitable make of 12BY7A driver valve is used. Valves with different electrode capacities can only be used if TC1 on the RF unit is reset, but you are strongly advised to leave this alone and just fit the correct valve. Having aligned 160m, repeat the procedure at the centre of the 80, 40, 20 and 15 metre bands.

10, 12, 17 and 30m Bands

Having first ensured that the 80-15m bands are correctly aligned — don't touch the trimmers once they are — tune to 10m and peak up the calibrator on receive at 28.5MHz. Load up into a dummy load and back off the drive to below 100mA. Whilst rocking the pre-selector either side of maximum, adjust the 10m RF trimmer until you find the combination of pre-selector and RF trimmer settings that give maximum drive. Switch back to receive and without touching the pre-selector, adjust the aerial trimmer for maximum. Repeat the above procedure at the centre of 12, 17 and 30m bands taking care not to touch any of the trimmers previously adjusted.

The IF Unit

Although this is covered in the manual, a few points are worth noting. The fixed resistor shown in the circuit as R41 330k is in most sets replaced by a miniature 500k variable preset. This is the ALC meter sensitivity adjust, which should be set so that on bands where there is plenty of drive, the ALC meter will just reach full scale when the rig is overdriven. Later sets also have a variable preset in the hole designated C31 at the output of XF03. This controls the drive when the speech processor is switched in and should be adjusted if sufficient drive is not available in this mode.

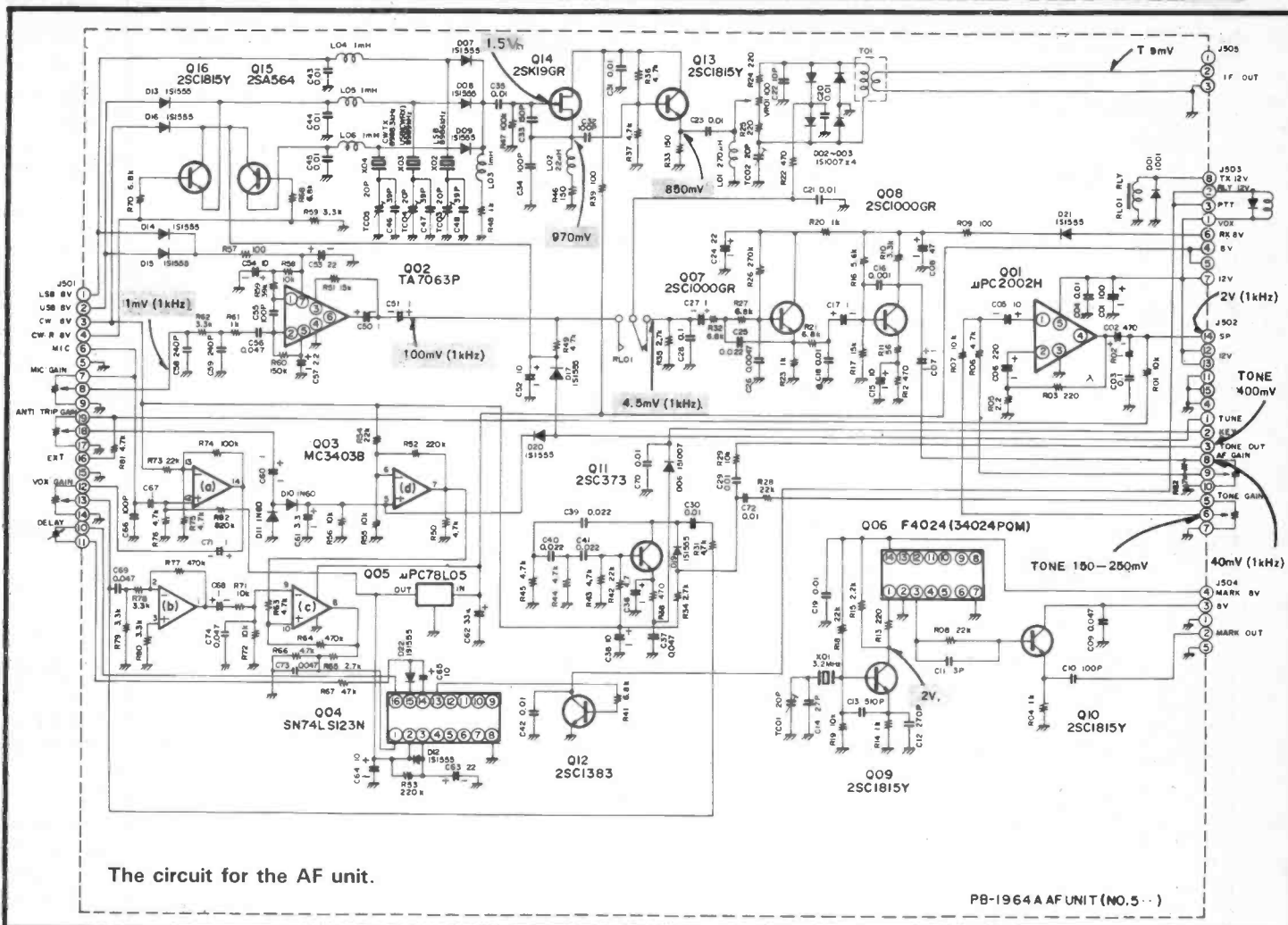
A Few Faults To Look Out for...

Frequency Drift or Jump

Long term, temperature affected drift in the VFO can be very expensive and time consuming to cure, although thankfully it seldom occurs. What can be troublesome in the 101ZD is frequency jump because of bad contacts on the VFO 'INT', 'EXT' or 'TX'/'RX' clarifier buttons. The cure here is to clean or replace the switches.

Tx Distortion and/or VOX Locking

Early FT101ZDs often suffered with poor quality transmit audio and VOX problems due to RF feedback via the microphone socket. The cure is to fit three 0.01F disc ceramic capacitors with the shortest possible leads between all three live pins and chassis on the rear of the microphone socket.



Blowing Fuses

As with most valved rigs, the most common faults here are short circuit high voltage supply rectifiers or power amplifier valves. Occasionally, the HT windings on the mains transformer has been known to develop shorted turns. This normally only happens if a fuse larger than 3A has been fitted — so don't!

PA Heaters Not Lighting

An 11 pin link between pins 1 and 2 must be inserted into the AGC socket at the rear for the power amplifier stage to function. Apart from this, heater voltage can also disappear if the relay on rectifier 'A' unit has bad contacts or the printed circuit on 'Rect.A' board is fused.

Burst Electrolytic Capacitors on 'Rect.B' Board.

This is caused by the PA valve flashing over and the screen circuit should be modified as recommended in Fig. 5 on page 28 of the September issue of HRT. Running the set on 240V mains whilst wired for only 200 or 220V has the same effect.

Intermittent Rx Audio

If you have this, and the S meter still reads correctly, and it cures itself if the microphone is keyed, then the trouble is probably the small relay on the AF unit. Remove the plastic lid and apply some non-oily switch cleaner. Trouble with this relay can also cause intermittent transmission.

Dead on One Band (often 80m)

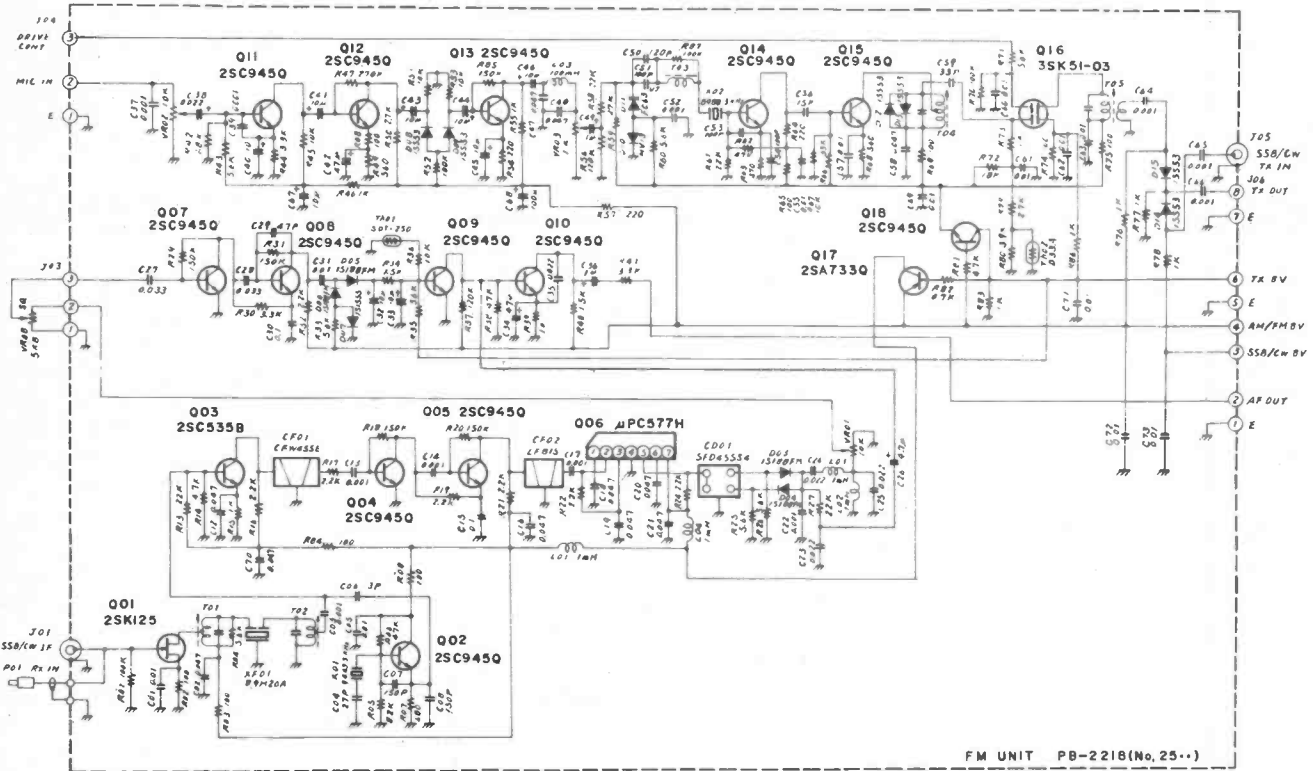
This is usually due to a faulty crystal on the local premix oscillator board. Check that there is no output on the affected band by measuring the RF voltage at the common point where all the diodes meet — it should be between 150 and 500mV. If you are sure that the crystal is faulty, you have a 50% chance of curing it if you try heating it with a soldering iron until the solder just starts to melt. (Try this on a good crystal and you have a 50% chance of ruining it!) Do note that this fault can also occur on 10 and 40 metres if the rig has been peaked up with a CB crystal in. In this case, try adjusting the relevant oscillator core before cooking the crystal.

Poor CW Keying When Hot

Slight leakage in Q1001 on PB1968 will cause dots and dashes to run together on the transmission while everything sounds okay on the side tone monitoring. If you do get odd reports, listen on a separate receiver and watch your power output meter when keying the rig after it has been hot for an hour or so. Before replacing the transistor, try connecting a 4.7k resistor between the collector of Q1001 and chassis. Even a new transistor will sometimes have enough leakage to cause the trouble without the help of the resistor.

Poor Receiver and Weak Calibrator Signals

The obvious candidate here is Q1 on the RF unit. (Lightning in the vicinity or a flashing over 12BY7A is the usual cause of this blowing). It can be replaced by most common dual gate FETs such as the 40763 or 3N201, if an original is not available. Another fairly common cause of this trouble is the J310 FET designated Q02 in early FT101ZDs and the Q03



The circuit for the FM unit.

in later models. Whilst any small signal N channel FET such as the MPF102 will do to get the rig on the air (providing you get the connections right), the J310 is a special high signal handling type and the correct replacement will give better results.

Poor Receiver But Calibrator Still S9+

If an enormous signal comes down the antenna (a mobile nearby or another rig on a different antenna), a protection lamp mounted near the antenna changeover relay is designed to blow. The set will spring to life if this is shorted out but you are advised to fit a 6-12V 100mA lamp to ensure protection in the future.

Loose Tuning

Replacing the eqicycle drives on the early series of the FT101s was, fortunately, simple as it gave quite a lot of trouble. The drive on the FT101ZD is a different story as whilst it does not often give trouble, its replacement is a major operation

requiring the removal of the VFO. Rather than go to this trouble and expense, you can repair drives that are not too bad by removing the main tuning knob and fitting a felt washer between this and the front of the rig.

Shortage of Drive on CW Narrow

The FT101ZD transmits CW through the CW filter, hence the carrier oscillator must be correctly set especially if a narrow CW filter is fitted. To check this, switch to CW narrow, tune up and note if much more drive is required than in the CW wide position. If drive is down on the CW narrow position, leave the key down and set the drive control to give about 80mH of PA current. Whilst transmitting trim TC505 (next to the CW crystal on the AF board underneath the FT101ZD) for maximum PA current backing off the drive as necessary to avoid overheating the PA valves.

Tx Audio Frequency Response and Mic Gain

I have always thought that Japanese microphones, by and large,

suit Japanese voices — many are too bassy for European and American voices. The FT101ZD sounds quite good with normal hand microphone providing the speech processor is not turned up too much — then it definitely sounds muffled and nasal. One way to improve things is to fit a series capacitor of about 0.05uF in the microphone lead. Even better, fit the capacitor and change the microphone for a Shure 444D if clarity of speech in adverse condition is what you are interested in. The mic gain of the FT101ZD is a little on the low side if you speak quietly. If you require more gain, increase the value of R51 on the AF unit to say 33k. This will give you about 6dB more gain, do not try to get too much extra gain or hum and RF feedback problems will raise their heads.

The FM Board

The FT101ZD was not originally designed with FM in mind and various problems with hum have occurred due to earth loops. There

is cut and dried cure to these. However, one answer to hum is by trial and error finding out which earth connections via the screen of the coaxial cables are needed and which are not. In some rigs the mic gain control is in circuit on FM and in others it is not. Generally less hum occurs if the input to the FM board is wired direct to the mic socket and the Tx audio is set by the preset mic gain on the FM board. This is VR2502 nearest to the edge at the end where two preset pots are fitted. The other pot at this end is VR2503, the deviation control, and this is best left alone. The pot at the opposite end is VR2501 and is the preset squelch. This should be set so that the squelch control at the front of the set works in the centre of its range.

Oscillation and Instability on FM Receive

This is often due to a dry joint on

the screen of the input cable. If this fails to cure the trouble, slightly adjust T01 and T02 (the coils nearest XF01) for the best compromise to give good gain and stability on a weak FM signal.

If, after fitting an FM board, you find that the FM carrier is 20 or 30kHz off frequency and has no modulation, do not despair. Due to previously mentioned hum problems Yaesu have isolated the earth connections on later boards so that the earthy end of the transmit circuit is not common with the receive circuit. Check that the screens of the input and output leads are actually connected to chassis if you have this difficulty as a disconnected screen which possibly cured a hum on a previous board will stop a later board transmitting correctly on FM.

New Bands

Early "WARC" FT101ZDs were fitted with the new 30, 17 and 12m

bands, but would not transmit them — presumably to comply with import regulations in some countries. FT101ZDs fitted with these bands but non operative, will be found to have the driver switch wired as in Fig. 7A. Rewire it as per Fig. 7B and everything should function.

How Long Is It Going To Last?

Experience with earlier Yaesu rigs show that equipment looked after and stored in a heated dry room will be good for anything up to 20 years or so providing as always, that spares are available. In this connection, do stock up with spare valves as whilst they may seem expensive at the moment, the writer would be very surprised if they don't at least double in price in the next few years. One wonders how long suitable valves will be available at any price.

Of course, if you store the rig in a cold damp room and then insist on smoking heavily when using it, you probably will not need to stock up with spare valves! Actually the FT101ZD is not too allergic to cigarette smoke but it certainly does not help. The model that followed the FT101ZD, the FT102 has proved to need a new set of five relays every 18 months or so if used by a very heavy smoker — but that's another story.

If you intend writing to G3LLL, please send it to Amateur Electronics/Holdings, 45 Johnston Street, Blackburn BB2 1EF, enclosing an SAE.

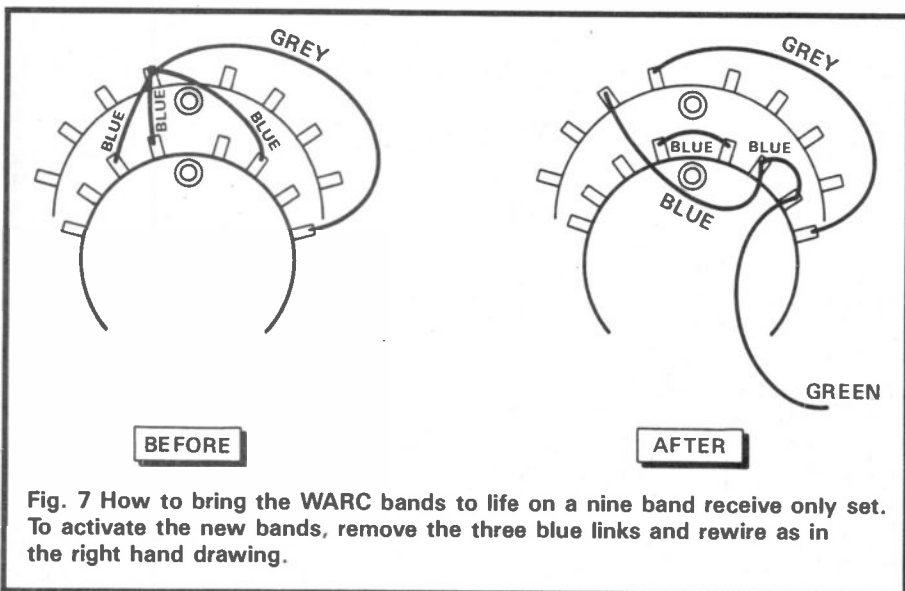


Fig. 7 How to bring the WARC bands to life on a nine band receive only set. To activate the new bands, remove the three blue links and rewire as in the right hand drawing.

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MC1350	2.00 74LS90 .32 KANK 333R .56

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10KNC 3767EK	.56	Presets	1.0	4mm Terminals	.45
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27m 10RB	.83	Plate ceramics	.06	14 Pin DIL socket	.09
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A Converter For Scanners

This simple project will extend the frequency range of a scanning receiver to cover the medium and short wave bands. The particular receiver this was built for was the AR2001, but it should be possible to

and finally (at least here), they have very wide dynamic ranges, up to 105 dB. Amongst the costs of using such a device is the need for quite a bit of power from the local oscillator, typically 5 mW.

This gives a rapid increase in stop band attenuation with a slight penalty of some pass band ripple. This filter severely attenuates frequencies above 28MHz and should remove all signals which might generate unwanted products (eg 90MHz-40MHz= 50MHz, which would be received without the filter). The low pass filter is designed for 50 ohm at each end of the filter.

The signals pass into the RF port of the double balanced mixer (DBM). The SBL-1 is designed to perform to manufacturers specification only from 1.0 to 500MHz; below 1.0MHz its conversion loss increases to above 6.0dB, rising to around 10dB or more at 100kHz. This is due to the inadequate low frequency coupling in the trifilar wound ferrite transformers within the device.

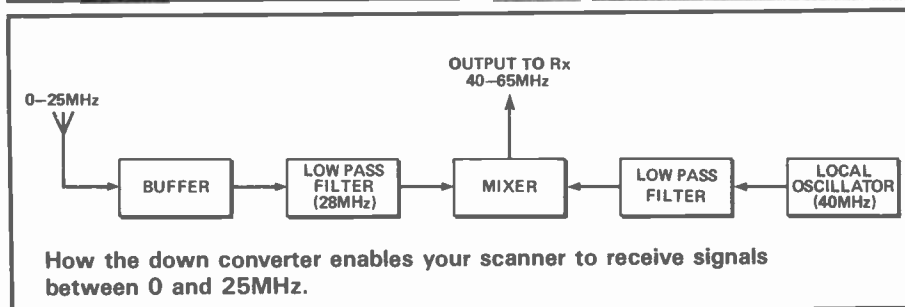
This frequency dependence could be overcome by interchanging the IF and RF port, as the IF port is rated from DC to 500MHz. But this would be to the detriment of the mixers strong signal performance and would increase the leak through of local oscillator which might feed through into the broadband front end of the scanner and overload its mixer.

If you particularly want to listen below 1MHz, it would be better to purchase a mixer specifically designed for a lower input frequency, eg the mini circuits GRA-3 model DBM designed for 0.025-200MHz.

The local oscillator is formed round Q2, with a crystal as the feedback element between the collector and emitter. The transistor used is a 2N2369A which has a high Ft, and was chosen largely for its cheapness. Any high-Ft RF NPN transistor should work equally as well, eg BF199 et al.

The output from the oscillator is taken via a single turn on the tank coil, and then is filtered to reduce the harmonics before being fed to the oscillator port of the SBL-1. The 1kΩ resistor on the tank primary (R7)

Does your scanner cover the 'medium' and 'short' wavebands? Build Mike Pinfold's down (or up, depending on your point of view) converter, and it soon will!



use this project with many other scanners, perhaps with a little modification.

The whole project is based on an SBL-1 hot carrier double balanced mixer module. An active antenna feeds, via a low pass filter, to one input port of the mixer module, and a crystal controlled local oscillator, with fixed frequency of 40MHz, feeds the other. The result is that signals in the range 0 to 25 MHz are converted up to an 'IF' of 40 to 65 MHz, and can be received on the scanner.

There are a number of advantages in passive mixers of the type employed. They are essentially broadband in nature and can be designed to cover from, say, 1.00 MHz to 1000 MHz; they have low noise figures (around 6.0 dB for the SBL-1 when terminated into 50 ohms and fed with 7 dBm local oscillator drive); they have good port-to-port isolation, ie a signal fed to one port should, ideally, not appear at the other two ports (though a small signal will appear due to component mismatch, stray capacitance, etc);

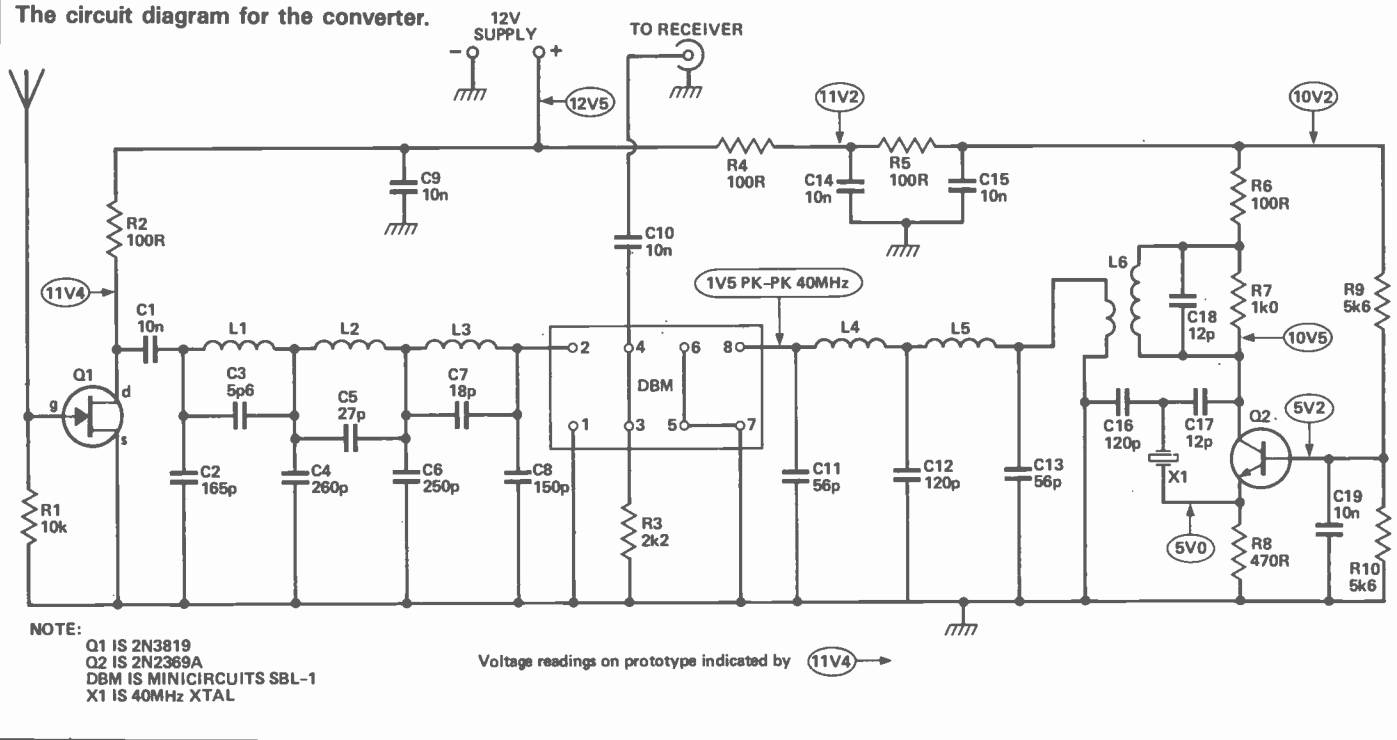
The 40-65 MHz band is a good choice as an IF for a number of reasons. It is not well populated with many high power transmissions. The double balanced mixer provides good local oscillator suppression at that frequency. The RF circuitry at these frequencies is not really critical to layout faults. And one can use quite simple test equipment at 40MHz, like diode probes, etc, and still get meaningful readings.

Description of the Circuit

Signals are picked up on a 3-4' whip antenna and fed into the high impedance gate of the 2N3819 FET (Q1), forming an active antenna. Active antennas of this configuration operate in a purely capacitive way and the efficiency of the system depends on the residual antenna gate capacitance to the surrounding earth plane.

Q1 provides a crude but effective form of high to low impedance transformation. The output of Q1 is then fed into a low pass filter designed in the elliptic configuration.

The circuit diagram for the converter.



helps with the overall oscillator stability.

On the prototype, I measured across a 47 ohm resistor connected to the oscillator output 3V peak-to-peak RF: more than adequate to drive the SBL-1. The RF spectrum was quite full with the second harmonic only 18dB down and the third 32dB down on the fundamental. The DBM requires a little bit of steam to drive it and this helps in lowering the response to the harmonics of the local oscillator.

The down mix signals appear at the IF port of the SBL-1 and are fed through a DC blocking capacitor to the scanning receiver. As already mentioned, the mixer suppresses the 40MHz LO by up to 45dBm, and it also suppresses any leak through of RF signals in the range 40-65MHz by a measured 26dB (with the LO running) and the upper image (85-105 MHz) fed through by 25dB. This attenuation of undesirable signals supplements the attenuation of the low pass filter in the RF signal path.

Finally, C9, 14, 15 and R4 and 5 should supply ample RF bypassing to minimise power lead radiation of the 40MHz local oscillator signal.

Bit Hunting

The most expensive parts are the mixer and the crystal. The SBL-1 double balanced mixer is available from Cirkit Holdings PLC for around

£6; an alternative DBM is the Anzac MD108, which is available widely through radio component retailers.

Many constructors will have a 'tame' source for crystals; I used McKnight of Glasgow for this particular crystal. A suggestion when ordering any crystal: send the supplier a copy of the proposed circuit, with all component values and semiconductor types. This should make it possible for him to send you the most appropriate crystal for your circuit (always assuming the supplier really knows his stuff!).

None of the other components should be hard to get or cost very much.

Construction and Testing

The circuit is constructed on a double sided PCB. This makes production of a circuit layout dead easy as one merely solders earth returns to the unetched ground plane on the component side of the board. A ground plane is an excellent screen and tends to keep the RF where you want it.

When preparing this PCB, don't forget to countersink the ground plane around the components holes and remove all swarf to prevent short circuits.

For added reduction in 40MHz feed through to the scanner, I placed a tin plate screen around the local oscillator to reduce direct radiation

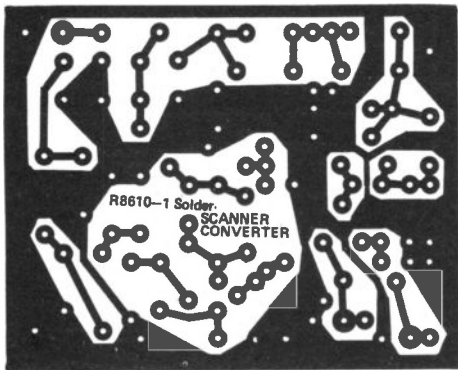
of the LO signal to a minimum. (TV sets have a 5MHz plus bandwidth IF centred around 39MHz and you can see the interference pattern on the picture if the unscreened 40MHz oscillator is used close to a TV set).

I don't need to tell you to double check the circuit before connecting up the supply volts. The whole circuit is powered by 12V DC and draws around 10mA, most of this being consumed by the crystal oscillator. The DC voltages shown around the circuit were measured on the prototype with a DVM and represent guidelines to help with fault finding.

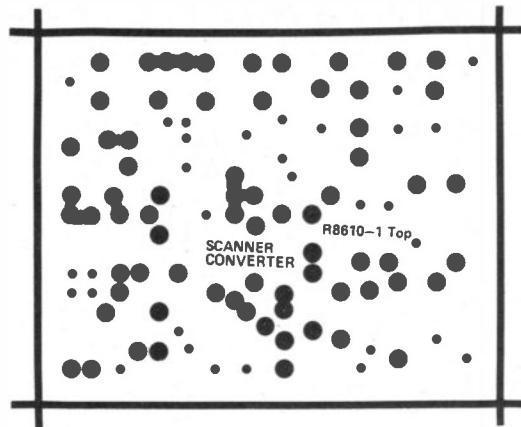
The oscillator should be heard on the scanner, providing the oscillator voltages are within those of the circuit diagram. You may have to tweak the slug in the oscillator coil if it doesn't start right away. If the voltages at the components are a long way from those on the circuit diagram (but note that there may be some variation in the voltage at Q1's drain), check component placement and make sure there are no short circuits of component leads passing through the ground plane.

If the circuit is showing correct voltages and you are happy with the components, then you should hear the LO on 40.000MHz and local broadcast signal around 41.000MHz.

Don't put too long an aerial on the converter or you will overload the JFET. With a 3 or 4ft whip on it, the

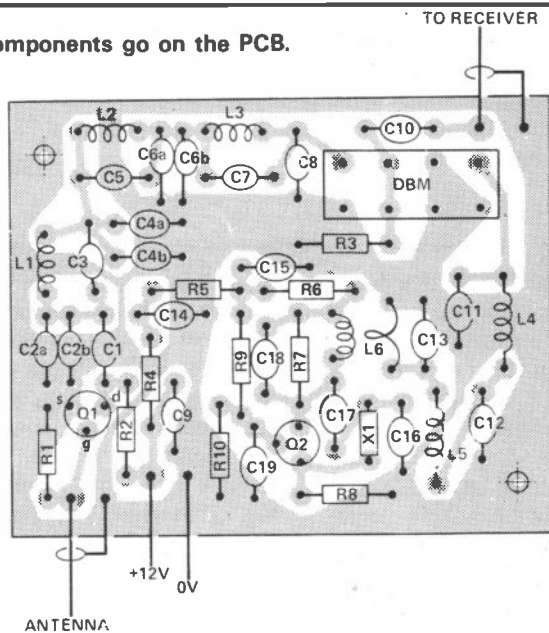


The top foil pattern.



The ground plane side of the PCB.

Where the components go on the PCB.



converter should pull in quite a few stations on the broadcast and short-wave bands. If it appears to be somewhat insensitive and you are using a different oscillator transistor than the one that I used there may not be enough drive level to the DBM. Try feeding the local oscillator direct to the mixer to see if there is too much loss in the low pass filter.

The Obvious Mod . . .

There is no great problem in changing the output frequency range by substituting another crystal and

associated tuned circuit. If the range chosen here doesn't suit your scanner, eg those of you lucky enough to have an all mode machine such as the Yaesu FRG9600 which starts at 60MHz, you can use a 60MHz crystal and mix the HF bands up to 60-85MHz.

You will also have to change the components of the oscillator output low pass filter to suit the new frequency or, alternatively, just leave it out. Trial and error, and a grid dip oscillator will help to arrive at a 60MHz tuned circuit; I suspect a

couple of turns off the coil should probably allow 60MHz operation.

Further Reading

If you would like to know more about double balance mixers, I suggest you beg, borrow, steal or even buy a copy of the American Radio Relay League's publication 'Solid State Design for the Radio Amateur', which is available from the RSGB and other sources of radio books.

Components List

RESISTORS

R1	10k
R2,4,5,6	100R
R3	2k2
R7	1kO
R8	470R
R9,10	5k6
All ¼ W 5%	

CAPACITORS

C1,9,10,14,15,19	10n
C2	165p (82+82)
C3	5p6
C4	260p (220+39)
C5	27p
C6	250p (100+150)
C7	18p
C8	150p
C11,13	56p
C12	120p
C16	120p
C17,18	12p

SEMICONDUCTORS

Q1	2N3819
Q2	2N2369A or similar

MISCELLANEOUS

DBM	Minicircuits SBL-1
-----	--------------------

Neosid 5mm coil-former, with slug; 24 gauge wire; 34 gauge wire; double sided PCB board; 40MHz crystal.

Coil Winding Data

Coil	Details of Construction
L1	4½ turns on 10mm dia, close wound, 24 gauge wire
L2	2½ turns on 10mm dia, close wound, 24 gauge wire
L3	6 turns on 10mm dia, close wound, 24 gauge wire
L4,5	10 turns on 5mm dia, close wound, 24 gauge wire
L6	9 turns on Neosid slug-tuned core, close wound in 34 gauge wire: 1 turn over-wound in 24 gauge wire.

Note: all diameters are inside diameters.

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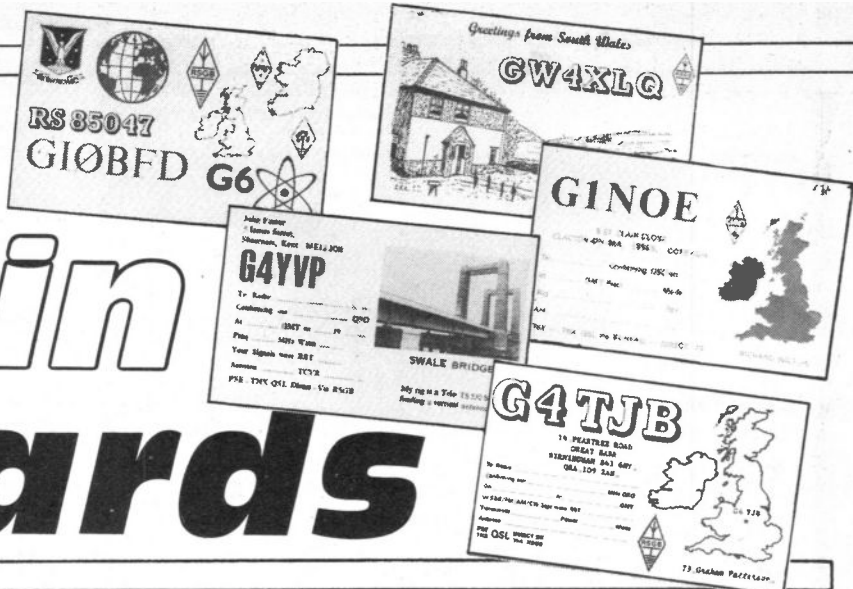
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HRT/9

BLOCK CAPS PLEASE

Best Buys in QSL cards



I felt that I was being got at when asked to do this article! It certainly reminded me of all the times that I have said I would QSL while getting around to having any cards printed and this pricked my conscience. The reason for my laziness can be summed up by the fact that I hate writing letters. If you look in any radio magazine you will find adverts saying "QSL cards — send in sae for details of prices and samples" and somehow I am a little wary of writing to an unknown address.

In fact the editor actually asked me to phone up QSL printers to get information on prices, etc but this proved impossible in most cases. Any company using a trade name was not listed with directory enquiries and those adverts supplying a name and address were very often ex-directory. In the end I had to overcome my reluctance to write and sent eleven QSL advertisers a letter requesting a price list and samples, plus a questionnaire to fill in.

While waiting for replies, I had plenty of time to consider the practice of QSLing. Among my local amateurs, only especially long distance and exotic contacts seem to be offered the chance of QSL nowadays. I think that the most off-putting reason against QSLing must be that it takes so long for foreign cards to reach you via the RSGB bureau. A survey done by the bureau suggested that the Swedish were the most likely to QSL, the French the least likely and the British somewhere in between. Local amateurs think that Eastern European countries are the keenest to QSL, but it can take up to three years for cards to be exchanged.

I hope that I was being fair to

**Sharon Metcalfe,
G6LCC, surveys the
quality and service you
get from QSL card
printers.**

advertisers by expecting their replies within four weeks which included Christmas and the New Year. Companies whose reply reached me before the end of December, I deemed to have answered promptly to my enquiry. The other replies reached me by the 8th January and should not be considered less favourably for this reason alone. As you will see from Table 1 there were some companies who just didn't bother to reply. I had made it quite clear that I was going to use their information for this article, so I can only assume that the defaulters

want only bad publicity.

In addition to advertising QSL manufacturers, I also obtained prices details for QSL cards available from our local emporium, a printing firm in my village of Hurstpierpoint and a local amateur who runs a printing business.

It was interesting to see the different qualities of sample cards supplied that arrived in reply and the detailed (or otherwise) answers given to my questionnaire. However, I was not concerned with quantity, only that I should have all the right facts and figures at my fingertips.

I received a charming covering letter from Alan, G3YNI, who owns the Brean Down Press and a nice personalised note from Graham Patterson, G4TJB. F G Walden, the owner of Delta Cards, who is an SWL, and J S Coats, a full-time specialist QSL printer, also replied in great detail to my questions. The

Advertiser	Reply sent	Sample copies
Brean Down Press	yes, promptly	17 well assorted designs
Caswell Press	no	
J S Coats	yes, promptly	16 well assorted designs
Creatamedia	no	
Delta Cards	yes, promptly	6 'standard' cards sent
Deroga Printing	yes, promptly	no longer printing QSL cards
G4TJB	yes, promptly	15 well assorted designs
G6DQS	no	
Q/Cards	yes	4 designs all red on white
S M Tatham	no	
Twrog Press	yes	45 different examples sent!

Table 1 Of the eleven questioned, these were the replies.

Table 2 Types of card available.

Advertiser	Gloss	Matt	White	Colours
Brean Down Press	both sides	yes	yes	no
J S Coats	front only	yes	yes	gloss only
Delta Cards	no	yes	yes	no
G4TJB	front only	yes	matt only	gloss only
Q/Cards	yes	yes	yes	yes
Twrog Press	front only	yes	yes	matt only

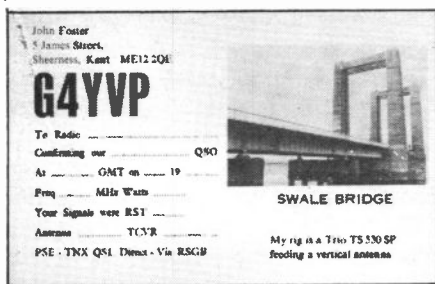


Fig. 1 A sample from Twrog Press which has a block made from a photograph. This would add an extra £10 to the cost.

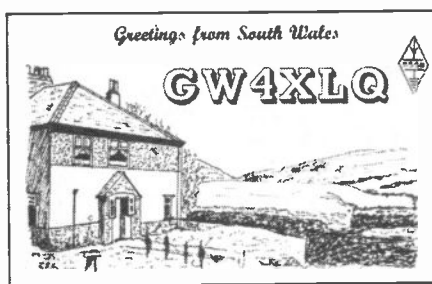


Fig. 2 J S Coates were asked to make a line drawing from a photo for this QSL card.

replies from Q/Cards and Twrog Press in the stark form of yes or no (the former even writing "no comment") did nothing to endear themselves to me but I must not be biased here!

Down To Business

My first question related to any special discounts for larger quantities than shown on the standard price list, or for club stations or for RSGB members. Delta Cards explained that 99% of their customers were RSGB members and as such discounts on this basis were not feasible. He also said that a sample mailing to club secretaries offering discounts met with nil response.

Graham, G4TJB, pointed out the reason that he (along with Delta Cards, Brean Down Press and J S Coates) could offer discounts on large quantities was that the most expensive and time consuming part of any order is the artwork and production of the printing plates. For this reason printers tend to prefer large orders and Q/Cards quote a minimum order size of 1000. The price list mentions the local printer (Hewitt and Sons Printers Ltd) who said that the quantities of less than 500 would cost virtually the same, since the cost of the differing quantity of card used is almost negligible. Their spokesman also said that the prices would not vary for any type/colour of card used.

My next few questions referred to the extra details that could be added to customise 'standard' cards, for instance adding extra colours. Several of the companies sent sheets of diagrams illustrating the 'standard' designs that could be incorporated. The idea here was that the customer could cut out the relevant pictures and stick them onto

one of the sample cards to give the exact design required. For the less artistic of us that seems an eminently sensible idea. In fact, the only companies that didn't subscribe to this scheme were Q/Cards and G4TJB. The latter allows for a unique customer design to be sent in at no extra charge, although you could always cannibalise the sample cards if you don't feel up to drawing, say, a sketch map of Great Britain.

If you want a completely unique QSL card, you will have to read the advertisers words very carefully.

G4TJB seems to be the only printer to really mean 'free artwork'. Once you look closely, you realise that the artwork itself may be free but that because a special block will have to be made up from scratch, there may be an additional cost to pay. The form that the printers prefer differ in size but are usually black on a white background. Twrog Press were happy to reproduce a photograph as part of the design, see Fig. 1, and J S Coates had the task of turning a photograph of a customer's house into a line drawing.

And The Unusual

I couldn't resist asking the manufacturers, "What is the most unusual design/order that you have been asked to fulfil?". J S Coates had been asked by a lady from Australia for a reclining nude. G4TJB had a request that beats the lot though, "a full colour card with a picture of the amateur's wife topless on the front"! Incidentally, he said that 10% of his orders came from outside the UK. In the past, Brean Down Press has also had its share of overseas customers,

Table 3 a Pre-printed 'economy' cards one colour ink unless stated (in £). These prices were correct at the time of writing, but may have changed since. Please check first.

Advertiser	100	250	500	1000	2000
Brean Down Press	10.00	13.00	16.00	24.00	35.00
J S Coates	9.90	12.10	16.50	22.00	39.00
Delta Cards			13.50	22.50	(see note 1)
G4TJB		17.85	20.75	23.50	
Q/Cards				15.00	(minimum no.)
Twrog Press			11.50	19.00	(black/matt)
Twrog Press	7.00	9.71	14.21	23.21	41.00
Local printer			21.00	30.00	
G6DRJ (local amateur)			15.00	20.00	

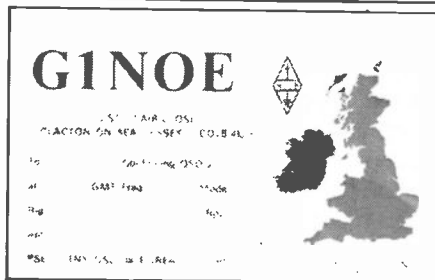
Note 1. These cards are printed in red and black on yellow or pink matt card.

Table 4 Prices for two colour cards (in £).

Advertiser	100 cards	250	500	1000	2000
Brean Down Press	12.00	15.00	18.00	28.00	41.00
J S Coates	11.00	13.20	18.77	25.00	43.25
Delta Cards		11.85	17.60	29.25	
G4TJB		20.85	24.75	28.50	
Q/Cards				33.00	
Twrog Press	10.17	13.40	18.77	29.55	52.00
Local printer			35.00		
G6DRJ (local)			15.00	20.00	

Table 5 Prices for three colour cards (in £).

Advertiser	100 cards	250	500	1000	2000
Brean Down Press	14.00	17.00	18.00	23.00	47.00
J S Coates	13.90	15.40	21.00	28.75	48.00
Delta Cards		15.35	20.85	33.75	
G4TJB5	not available				
Q/Cards	not available				
Twrog Press	13.33	17.09	23.33	35.89	62.00



A typical 'standard' layout card from Brean Down Press.



Some typical 'standard' motifs supplied by Delta Cards for their customised 'standard' design cards.

days, although Brean Down Press can boast that one order to the Channel Islands was received the very next day (an exceptional case though).

I had wondered if the companies were going to be helpful should the QSL cards not be up to a good standard. All the advertisers stated that they would speedily rectify complaints. G4TJB had only ever received one complaint — an impressive boast — and J S Coates could only think of three complaints — two of whom had replaced cards and the third who had his money refunded.

Does it make any difference to the service whether the printers are full-time or not? No, since all the printers are amateurs or SWLs, they certainly take pride in their work. As G4TJB put it, "I started printing cards myself a year ago after receiving some poor quality cards which I ordered and decided I could do considerably better myself."

In the course of this survey, I have certainly learnt a lot about printing. Delta Cards summed up the situation where designs have to be reproduced by the letterpress (traditional) method: "I do not offer gloss card because this is best suited to offset litho with chain delivery. Letterpress tends to pick up the gloss china clay from the surface, pushes the ink to the edges of the letters and with some colours gives a mottled effect, all of which is very unsatisfactory. Many customers expressed a dislike of gloss card because it is difficult to write on."

Table 6 Prices for printing on the reverse side of QSL cards.

Advertiser	Details
Brean Down Press	Charged as an extra colour
J S Coates	Charged as extra colour (see note 1)
Delta Cards	Charged as an extra colour
G4TJB	Add £3 per 250, £4 per 500, £5 per 1000
Q/Cards	Charges for 2 colours (Table 4) are for one colour per side.
Twrog Press	Add £3.16 per 100, £3.69 per 250, £4.56 per 500, £6.34 per 1000, £11.00 per 2000
Local printers	Approximately £50.00 per 500
G6DRJ (local)	Add £5.00 per order

Note 1 Prices as follows for four colours (ie. three on front plus printing on reverse) £16.00 per 100, £17.25 per 250, £23.55 per 500, £31.75 per 1000, £53.25 per 2000.

particularly from Australia and Canada, who without purchase tax on export orders, found it cheaper to buy QSL cards from the UK.

Having written away for your sample cards, what kind of help/advice can you get before placing your order? After finding it impossible to contact the advertisers directly by telephone, I was particularly interested in whether they had considered adding a phone number to their adverts. Brean Down Press replied, "I think a person would like to see our samples if only to compare" and that requests for sample cards, accompanied by an sae, were "back in the postbox within hours". G4TJB replied that it would be difficult to explain cards over the phone and added "I prefer to write, but anyone can look me up in the call book and phone — and a few do".

In spite of the fact that initial contact had to be made by letter (with an enclosed sae) all the advertisers except G4TJB provided phone numbers on their price leaflets and were very happy to discuss the finer details of your design before you sent off your order which had to be cash with order in all cases. It is interesting to note what percentage of enquiries turned into firm orders as shown in Table 8. It certainly seems that it is profitable to attend

rallies where prospective customers can see samples and discuss the order in person.

Once you have sent off your order how long can you expect to wait for your QSL cards? This question brought a range of answers from next day to 21 days (see Table 8). Even going to your local printer may not reduce the time significantly. All the companies use parcel post for sending back your cards which they say takes between two and five

Table 7 The discounts offered by the companies asked.

Advertiser	Discounts
Brean Down Press J S Coates	5% on orders of 5000 or more For larger quantities deduct the 1000 card rate from the 2000 card rate and this gives the price per additional 1000
Delta Cards G4TJB Q/Cards	Price available on request Prices for larger orders and for Clubs on request Single sided cards, one colour matt: 5000 for £50.00, 10,000 for £76.00 Double sided gloss cards (one colour): 5000 for £73.00, 10,000 for £113.00
Twrog Press	No discounts available.

Table 8 % samples sent to orders received and times to process orders.

Advertiser	% into orders	processing times
Brean Down Press	33%	within 14 days
J S Coates	80%	14-21 days
Delta Cards	25-30%	10-14 days
G4TJB	45% from adverts, 70% from rallies	within 14 days
Q/Cards	"No answer!"	14 days
Twrog Press	unanswered!	unanswered!



His own card!

Perhaps the other companies should take more note of this for Brean Down Press, Twrog Press and G4TJB sent me sample cards with varying degrees of blotchiness when printed on gloss card. Admittedly, most of this was minor and did not detract from the attractiveness of the cards but Twrog Press had some problems with the small typeface with the amateurs address which could be a problem for foreign contacts QSLing direct. I've noticed that the buff and blue gloss cards printed with red or with black outline letters looked perfect, so think about that if you are about to order.

Satisfaction Guaranteed

So, how satisfied are the customers? As one would expect, all the companies wrote of amateurs phoning back to say how pleased they were with their cards. This is proven by the large number of repeat orders that are made.

With all this encouraging in-

formation, how do you choose the company for you? Well, to begin with, I would choose different companies depending on the type of cards I wanted. However, here are some conclusions based on the survey and the information provided.

For the cheapest type of QSL cards which just have a space for you to write in your callsign try a pack of 250 for £4.20 from Brean Down Press. If you want 'standard' design cards and you are sold on the glossy look, J S Coates gets my recommendation for good quality printing with very fair prices. However, if you prefer to deal with a radio amateur, I would give glossy cards a miss as their quality does not seem consistently good. An exception could be Brean Down Press who only had slight problems in filling in maps of GB with a mottled effect and everything else of theirs was good with, again, prices being very fair.

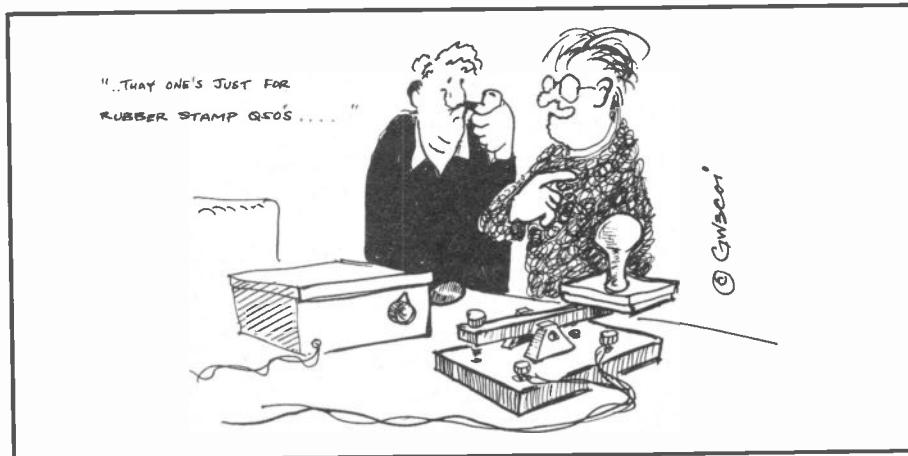
With printing on 'coated' white card, which is basically matt but

with a slight attractive sheen, G4TJB has the answer, but please read his price list carefully for everything above one colour printing has supplements. The price list is self-explanatory but the cost of postage also has to be taken into account with G4TJB. (In the price tables I have added in this charge since it is unavoidable — all the other companies automatically include postage and packing). When it comes to cards with a matt finish all the printers turned out very good quality results. Be aware that the size of the cards advertised by Q/Cards is only 125x80mm compared with 140x90mm from all the other companies. They also have the problem that, unless you pay £4.60 extra to choose your colour ink, you seem to have very little say over the final effect.

From the other companies, you will have to consider the best price for the quantity of cards you want. After all, you don't want to buy 1000 cards if you are likely to change your address or callsign within the next few years. For example, 250 cards printed in two colours on the front and an information panel on the back will cost only £13.90 from J S Coates.

It's 10% cheaper than prices shown if you want matt card and 10% more for coloured gloss card. For 500 matt cards printed with just two colours — or one on front plus one on back — J S Coates still takes the lead but is followed closely by Delta Cards. On the other hand, you could look at it from the viewpoint that the 500 matt cards from Delta Press will cost you virtually the same as the 500 white gloss cards from J S Coates and decide that the latter gives you better value for money.

If you are thinking of your own design you will have to be prepared to pay about £10.00 more than for the same colour printing of a 'standard' design. For one colour printing on coated white card, G4TJB provides a cheap way to get your own exclusive cards since there is no extra charge for the artwork/plates. If you have a definite design with several colours that you want reproduced I am afraid that I can't save you any 'legwork'. However, if you want a more 'standard' design (and there really does seem plenty of scope within the QSL card printers 'standard') I hope that I have saved you some postage.



Practicalities

Nowadays one seldom sees the old preselectors or preamps used with HF receivers. Receiver developments have meant that it is comparatively easy to produce front ends for these frequencies where the receiver noise is less than noise received at the aerial. However as the frequencies

Ian Poole, G3YWX, assesses the value of a preamp in a VHF/UHF setup and of ceramic resonators. He also offers designs for a cheap HF aerial and a voltage regulator.

increase so the atmospheric noise decreases, leaving more scope for even lower noise designs.

Most of today's VHF and UHF receivers or transceivers are designed to meet a budget so they can be appreciably improved by adding a suitable low noise preamp. Accordingly, there are many 2m and 70cm preamps sold advertising noise figures of below 1dB. This all seems to be the ideal answer to hearing weaker stations and having a better chance of contacting better DX stations. However, when using a preamp you should be aware of the disadvantages of using them incorrectly otherwise they may cause more problems than they solve, resulting in the receivers being able to hear fewer weak stations and not more!

There is more variation in strength at VHF or UHF between the very strong local stations and the weak distant ones. This situation is not always helped by directional aerials where the weak station being sought is in the same general direction as a strong local station. It can mean that the receiver front end has to handle a tremendously large dynamic range. Therefore if a preamplifier is added to the system it is more likely to overload the receiver front end (if it is not already overloaded) with the possibility of the various distortion products masking out the wanted signal.

Therefore when incorporating a preamplifier into a system, it is always advisable to provide a means for switching it out of circuit. This will enable the preamp to be disabled when there are strong signals overloading the receiver front end and give the receiver a better chance of picking out the weak signals. In addition to this it could also prevent the embarrassing situation of wrongly accusing someone with a strong signal of spluttering over the band. This is not to say that there are not stations which splutter up and down the band, but that is a different story.

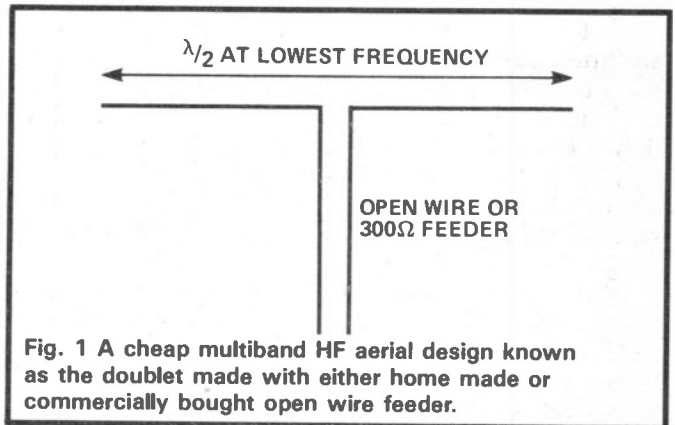


Fig. 1 A cheap multiband HF aerial design known as the doublet made with either home made or commercially bought open wire feeder.

A Cheap Multiband HF Antenna

There seem to be a large number of people like myself who want to put up a multiband HF aerial in a small garden without it taking over the neighbourhood and looking an eyesore. Although there is a wide selection of commercially made trapped verticals, these not only cost money but are also fairly narrow band, having to be trimmed to operate either on the CW or phone ends of the band. Having tossed several other ideas about probably one of the most attractive is a doublet fed with open wire feeder.

Whilst this may seem old fashioned, a doublet fed with open wire feeder does have the advantage that it has been proved to work by many people over the years. It is a truly wide band aerial which can operate at frequencies above the point where it is a half wave dipole provided that a suitable ATU is used. Unfortunately a tuning unit with a balanced output has to be used since not all ATUs these days have balanced outputs but instead only have connections for coaxial lines. In addition to this, the bandwidth between points where the aerial tuner has to be retuned may be small if a long length of feeder is used, however this may not be a particular disadvantage, or the aerial can be sited at a reasonable distance from the station.

The feeder is not as difficult to install as might be expected. Either it can be home made or the new high quality 300 ohm ribbon cable can be used. Both types of feeder can normally be used, although, if high power operation is envisaged then open wire feeder should be constructed from a suitable gauge of wire. It is not only cheap to construct but is also very versatile, lengths are not critical. It can be used not only on the 'old' bands but also on the new 'WARC' bands which are not always covered by some of the commercially made ones.

Ceramic Resonators

For quite some time it has been possible to obtain small ceramic filters very cheaply. These are not the high performance units often used in communications receivers, but single element units for use in applications such as AM and FM radios, as their bandwidth is fairly wide. Their main advantage is that they are inexpensive and they are often used in preference to the wound life transformers. These filters are made out of ceramics which exhibit a piezo electric effect, and they are similar in many respects to the more familiar quartz crystal. However these ceramics do not possess the high long term and temperature stability that quartz has, nor do they exhibit a Q factor which is as high.

Fairly recently there have been some ceramic resonators introduced onto the market. In essence they are very similar to quartz crystal and they can be used in an almost identical manner. Like their filter counterparts they are cheaper than the crystal equivalents, although they have a few drawbacks to their use in certain applications. Firstly, the manufacturing tolerance of a quartz crystal will be measured in terms of around 100 parts per million (ppm), whereas a ceramic resonator will be about 0.2% and similar percentages will be quoted for long term and temperature stabilities.

Normally these resonators are intended for uses such as microprocessor clocks, but they could easily be used in many applications where a low tolerance is required. They may also prove useful in VXOs for example. In view of the fact that technology is advancing at a very high rate it should soon be possible to see ceramic resonators being sold on an equal footing to the familiar quartz crystals.

A Simple Voltage Regulator

When building or designing amateur equipment, or any electronic equipment for that matter, there is often a need for a rough and ready form of voltage stabilisation. Whilst it is very easy to use one of the fixed voltage regulator IC's such as the 78— series, it is an unfortunate fact of life that they tend not to be very plentiful in the junk box, at least not mine! Moreover they are only

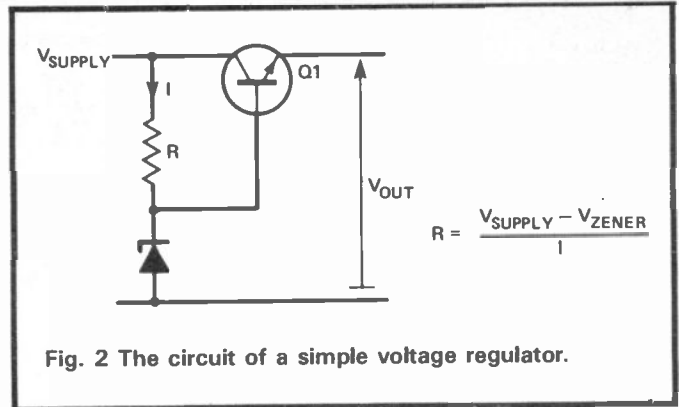
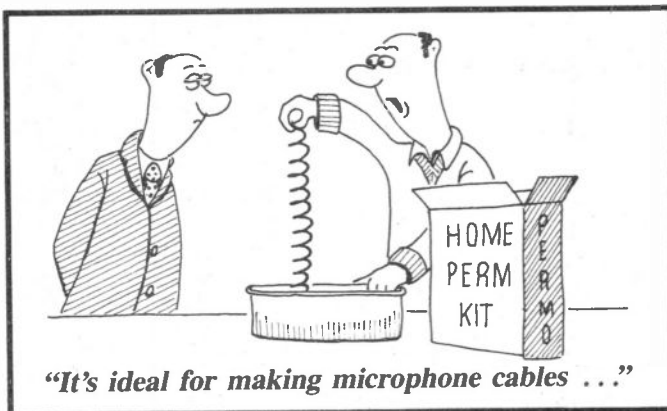


Fig. 2 The circuit of a simple voltage regulator.

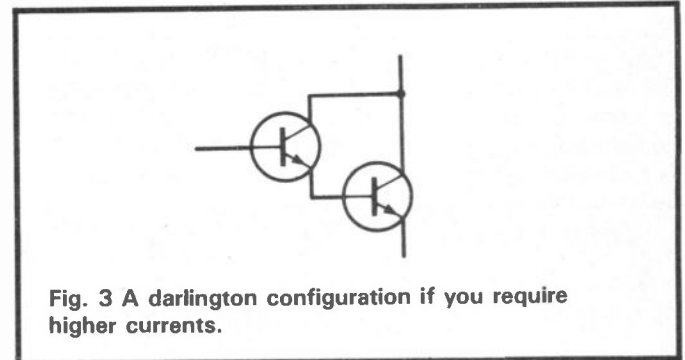


Fig. 3 A darlington configuration if you require higher currents.

available at certain fixed voltages, the 5 and 12 volt versions being the most common, although it is possible to obtain other values at times. However it is quite easy to construct a simple regulator circuit using only a resistor, a transistor and a zener diode as shown in Fig. 2.

The way in which the circuit operates is very simple with the resistor and zener diode providing the voltage reference and the transistor connected as an emitter follower to increase the current capability. The resistor, R1, is chosen so that the zener diode draws about 10-15mA which will keep it conducting sufficient current for its voltage to remain fairly constant whilst keeping the heat dissipation within acceptable limits for most cases. Using Ohms law this means that the resistor value will be the supply voltage minus the zener voltage divided by the current through the zener. The base of the transistor will also draw some current depending on the load but the resistor zener combination should be able to accommodate this without losing stabilisation if a small output current is required from the output. In fact the base current will be the output current divided by the current gain of the transistor. Therefore this circuit ought to be able to supply around 50mA without too much difficulty. If high currents are required then a darlington arrangement can be incorporated as this will greatly increase the current gain of the circuit.

There are obviously going to be a few drawbacks to a circuit as simple as this. Firstly, the regulation is not particularly good, and secondly the output voltage is 0.6 V less than the zener voltage for each transistor used. Despite these disadvantages it is still possible to use this type of circuit in many applications.

Receiving Loop Antennas For 160m

Through the winter of 1985-86 increasing numbers of amateurs decided to operate on 160 metres. Some were no doubt driven there by the sometimes abysmal DX condi-

when using an indifferent receiver. The big antenna systems which are needed on Top Band represent large 'capture areas' for noise and they induce much higher noise voltages

directions. A good dipole cut for 1.8MHz should be at least 150 to 200 feet above ground (more than $\frac{1}{2}$ wavelength) if it is to be useful for DX work, so many enthusiasts are driven to using an inverted 'L' or vertical arrangement. This means that their noise problems become exacerbated.

Some successful DXers on 160m use Beverage antennas for reception. These long low wires are excellent for their low noise but they are very directional and also take up lots of real estate. A Beverage should be between 500 and 1000 feet long if it is to be useful on Top Band.

Recently I held a long 'rag chew' on 14MHz SSB with WOZV. Bill is a successful DX worker on 1.8MHz and has given many European stations their first Colorado contact on that band. In addition to his 130' vertical antenna and an inverted vee,

Interested in Top Band but put off by the level of background noise and the length of aerial required?

Well, John Heys, G3BDQ, describes a receiving antenna that overcomes both problems and is ideal for the 160m operator and listener alike.

tions on the higher frequency bands which are a feature of the approaching sunspot minima of solar cycle 21. Whether these operators use 160m for DX or semi-local (inter-UK) working, they soon experience the frustrations of trying to copy weak signals through an inherently high noise level. This background noise may often rise to S9 and more. Even on a 'quiet' evening, my receiver shows an S5 'no signal' noise level.

The reasons for this high noise level include atmospheric disturbances or QRN which may originate many hundreds of miles away from the receiving point, various man-made noises from leaky power lines, electrical machinery and the all-too-common radiation from the line time bases of TV sets. Most amateur receivers or transceivers have lots of gain on 160 metres and many operators resort to switching in 10 or 20dB attenuators in order to preserve their sanity!

The 'goodness' of a receiver in terms of sensitivity may be measured by comparing its output noise both with and without an antenna connected. On the 144MHz band, a poor receiver shows no change in output noise when the antenna is switched in, but at LF the difference can be enormous even

than the smaller HF band wires.

The writer now uses a vertical antenna system on 160m which, although fine for long haul working, is noisier than a long wire or half wave dipole would be. Much of the incoming local noise seems to be vertically polarised, and of course a vertical antenna will also receive noise, including QRN, from all

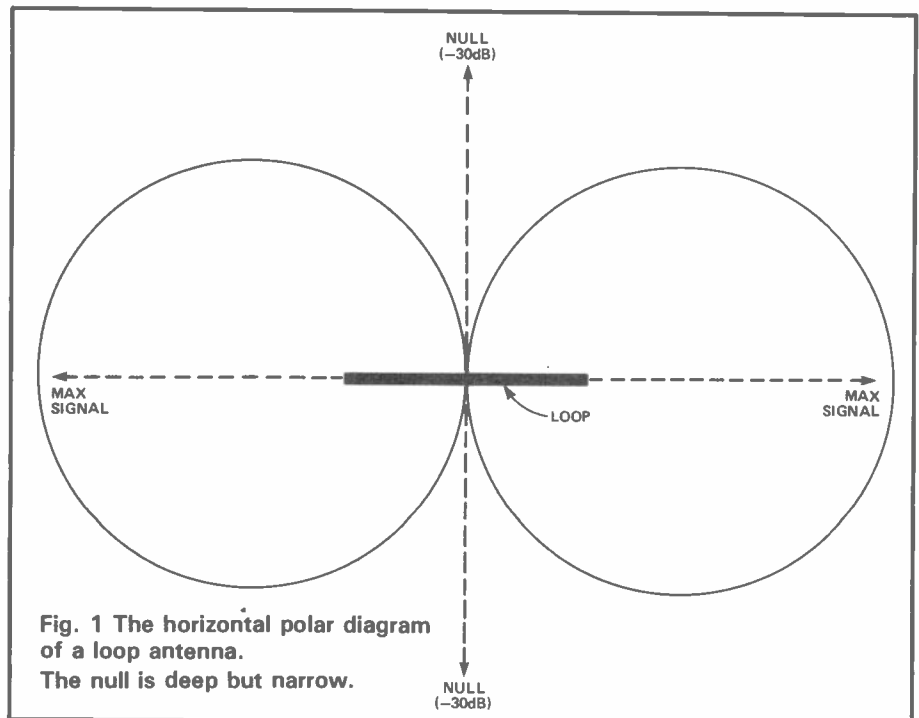


Fig. 1 The horizontal polar diagram of a loop antenna.
The null is deep but narrow.

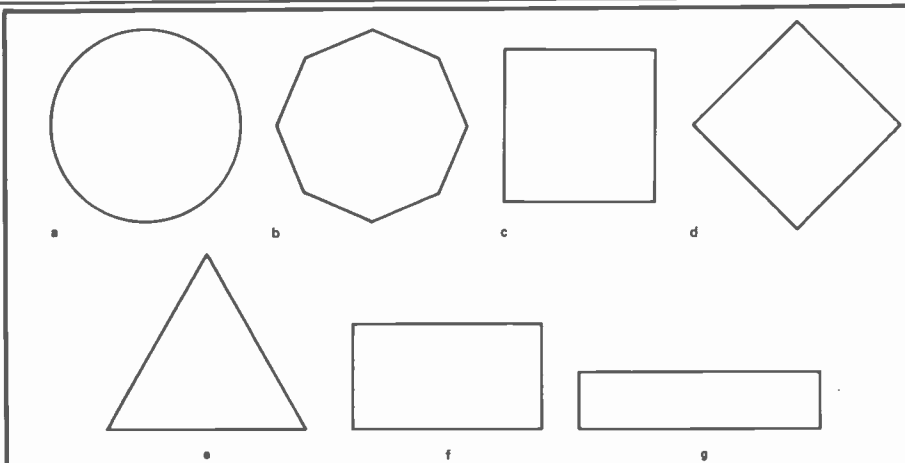


Fig. 2 Possible configurations for loop antennas all using the same loop length but diminishing enclosed areas from 'a' to 'g'. Patterns 'a', 'b', 'c' and 'd' are effective arrangements but triangles and narrow rectangles should be avoided.

WOZV has seven Beverages for receiving! Not having such wide open spaces here in my Sussex village, G3BDQ has sought another solution to the 160m band noise problem.

Receiving Loops

Fortunately 'small' receiving loop antennas can be very effective, and my researches in this field led to an article published in QST (March 1974) by Doug DeMaw, W1FB which describes his work with shielded single turn coax loops on 160m. This article is also included in the 14th edition of the ARRL Antenna Book and it has provided me with much useful information and the stimulus to try out a receiving loop antenna.

Small loops have long been used for direction finding as they exhibit deep nulls — of about 3dB — at right angles to the loop as shown in Fig. 1. This characteristic may be turned to advantage when the loop is orientated to minimise strong local electrical noise. The nulls are quite sharp but away from these points there is little variation in received signal strength. This means that the loop may be positioned to cut out noise, and unless the wanted signal is in line with the noise source there should be no reception problems.

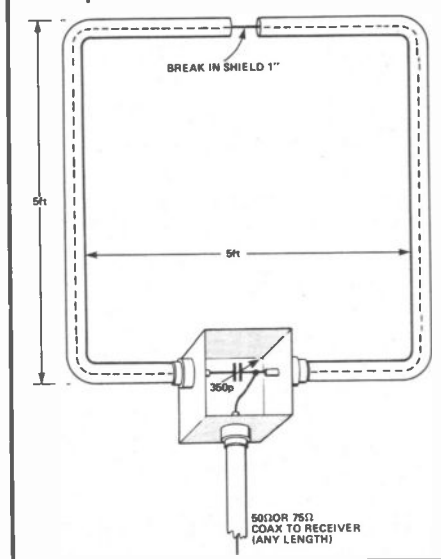
Open unshielded loops are affected by nearby objects and are prone to electrical sparks from all sorts of machinery or domestic appliances. By using a shielded loop, this noise is greatly reduced and in addition the loop can be located indoors such as in a loft or roof space where there are often all kinds of

metal objects such as water tanks, pipes and wiring. Even noise coming from a direction at right angles to the loop null will be much less than the noise picked up by a big wire antenna. This reduction is so dramatic that users of loops at first think that they don't have an antenna connected!

Practical Shielded Loop Antennas

The signal strengths when using loop antennas depend upon the total length of the loop wire plus the area enclosed by the loop. A circular loop will always have the best area to length ratio; a fact discovered by the ancients who found that a round

Fig. 3 Constructional details of a practical shielded loop with 5' sides. This can be used out of doors if the metal box and the connectors are waterproofed.



house used much less building material for a given interior area than any other shape! In practice a circular loop is difficult to make so other configurations may be used. These range down from octagons to simple squares or diamonds. The various loop shapes are shown in Fig. 2 in descending order of efficiency. When used indoors, the loop can be held into shape with strings at the corners — spreader arms are not then needed.

The basic shielded loop is made from a length of coaxial cable arranged as a single turn. Half way along this loop, at the top centre the shielding braid is broken (for about an inch) allowing the remaining braid to operate as a Faraday shield. Were this break not to be made, the loop would be completely screened and would not pick up any signals!

A small loop, if it is to retain a sharp bi-directional pattern must not be more than 0.1 wavelength long. This is about 50' on 1.8MHz, but such a length cannot in fact be realised when using standard coaxial cable. This is because the controlling factor is the self capacitance of the cable which is a large proportion of the total capacitance needed to tune the loop to resonance. The maximum length of coax for a Top Band shielded loop is about 30' and then great care is needed to ensure that resonance can be achieved by using low capacitance cable. In practice a loop length of 20' is better and such a loop will be 0.036 wavelength long and have a self inductance of about 15uH. It will need a total of about 500pF to tune it to 1.8MHz.

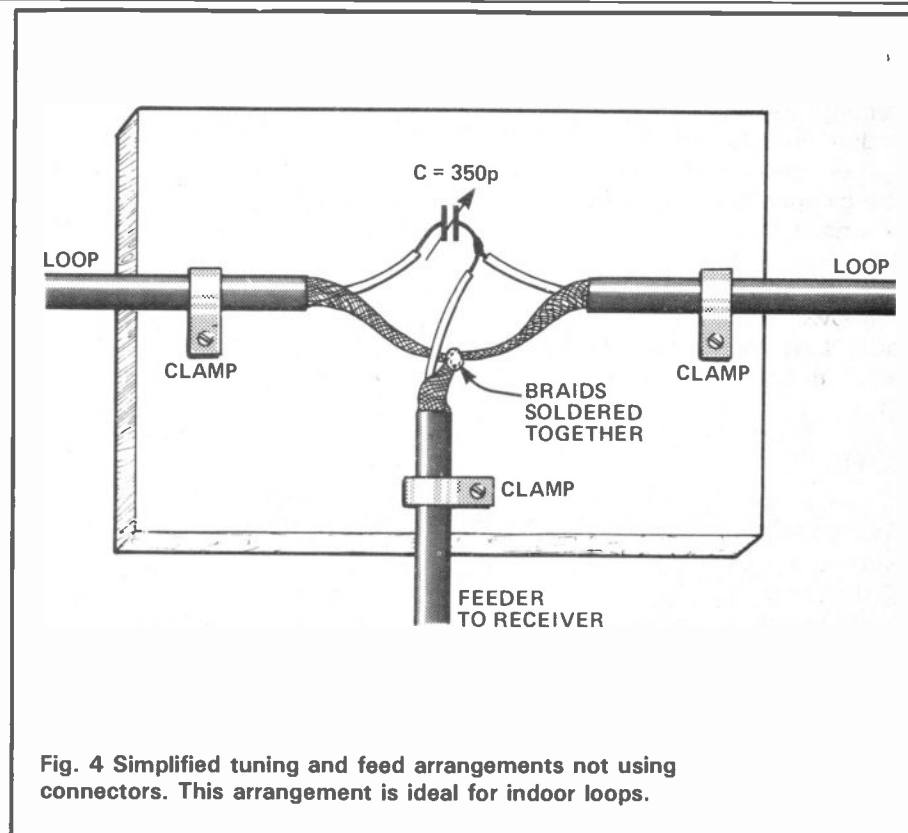
Before embarking upon the construction of a shielded loop antenna, make sure that the coax you intend using has a low self capacitance. The writer was prudent enough to first check some spare 50 ohm coax that he intended using and which was sold as 'standard' antenna cable for CB'ers by a local Tandy outlet. This cable has a solid white insulating material around the inner wire and amazingly when put on to a capacitance bridge, it exhibited a self capacitance of 60pF per foot! This means that the 20' loop would have a capacitance of 1200pF and would be impossible to resonate on 160m.

A search through the 'wire box' revealed a forgotten 30' length of 75 ohm semi-airspaced cable (not foam) at least 20 years old, and

which when tested showed a self capacitance of only 16pF per foot. 20' of this was then cut off for the loop and a simple calculation showed that the loop's capacitance would be around 320pF and an additional 180-200pF would be needed to tune the antenna to resonance on 1.8MHz. The antenna was soon made up using a small aluminium box, three pairs of plugs and sockets and an ancient 350pF variable capacitor from a scrapped broadcast receiver. Another length of coax, this time 50 ohm 'standard' cable was used to connect to the box and the receiver; self capacitance not being significant in this instance.

An initial test to show that the antenna could indeed tune to the band was made with the loop hanging over the open door of an adjacent bedroom with much of it actually lying on the floor. That seemingly ever present commercial CW station on 1831kHz (callsign OSN) was tuned in on the station receiver and the variable capacitor in the box was adjusted to give maximum signal strength. Assured that the antenna did actually tune properly it was then taken up into the roof space and arranged as a vertical square having maximum pick-up NW and SE. House wiring ran just inches from the lower part of the loop and there was a big galvanised water tank only feet away. The station receiver was tuned to a spot near 1835kHz (G3BDQ is a CW addict!) away from any signals and with all receiver gain controls at maximum (AGC OFF). Up in the loft with the trap door open the loop tuning capacitor was set for maximum receiver noise.

Further testing was left until the next morning when the pre-breakfast dawn 'lift' should allow DX working. It was soon discovered that North American stations, which were either just on or below the noise on the vertical antenna, could be read with ease when receiving on the loop. Some DX which was impossible to copy became a clear S3-4 on the loop. My station does not have any elaborate signal strength measuring gear but a lengthy and carefully made series of tests showed that when the noise from the vertical was S7, the loop gave no actual S meter reading! When OSN (not favourably located at my QTH with a NW/SE loop) was



3 S points over noise (15dB), the loop gave an S meter reading of 4 (20dB) with no reading for noise between signals.

A steady carrier which is often present on the band and which seems to lie to the north of my QTH was 20dB over the noise of the big antenna and 38dB over noise on the loop. This represents a signal/noise improvement of 18dB or better than 3 S points. When using the loop for working American DX it was noticed that certain European signals from NE of my location were weaker than their usual pulverising S99. This helps to reduce any cross modulation effects in a receiver and again makes DX working easier.

The original article by W1FB suggests that the directional properties of shielded loops only manifest themselves on ground wave signals, but my experience has shown this to be incorrect, and DX stations in the 'null' directions are very weak indeed.

A Second Loop

Not being content with just the one loop which had pronounced nulls towards Asia and South America, a second version was built and put up in the loft about 15' from and at right angles to the original.

This second loop did not have a metal box, plugs, sockets etc, but just had a variable capacitor screwed to a flat piece of board with all the connections soldered up (Fig. 4).

This model works just as well and as efficiently as the prototype and proves fine for hearing stations to the NE and SW. It has a real null on North America with stations from that continent falling from S8 to S2-3 when the receiver is switched to loop 2. The depth of the nulls and the strength of DX in the favoured directions changes with conditions and no doubt incoming wave angles; but the nulls are always present to some degree.

No pre-amplifier has ever been used with my loops. Some workers use differential amplifiers to boost signals, but I feel that any receiver worth its salt has more than enough gain on 1.8MHz to render any amplification unnecessary. The tiny 2' diameter and often rotatable loops used by some keen MW broadcast DXers have a very low signal output and they must be used with an amplifier, but the 20' loops are effective without amplification. Using an amplifier introduces complications such as the need to have it switched out when transmitting and having to ensure protection from transmitted RF.

A shielded loop may of course be put up out of doors and it need not be far up from the ground. Waterproofing can be a problem with outdoor installations and a water-tight diecast metal housing for the tuning capacitor becomes essential. An outside loop will not show much gain advantage over a loft version so it hardly seems worthwhile; unless it allows a distancing from a particularly troublesome source of electrical interference such as a TV set.

Finally

I often chat with British stations around 1.93MHz SSB and several of them have told me that they have been unable to even hear some of the DX stations that I contact at the CW end of the band. That is an opening for me to voice my love for the shielded loop antenna!

A shielded loop is a low 'Q' system and does not need to be re-tuned if initially set to the middle of the band. My loops are peaked around 1835kHz but they still enable me to copy weak SSB 100 and more kHz higher which is unreadable on

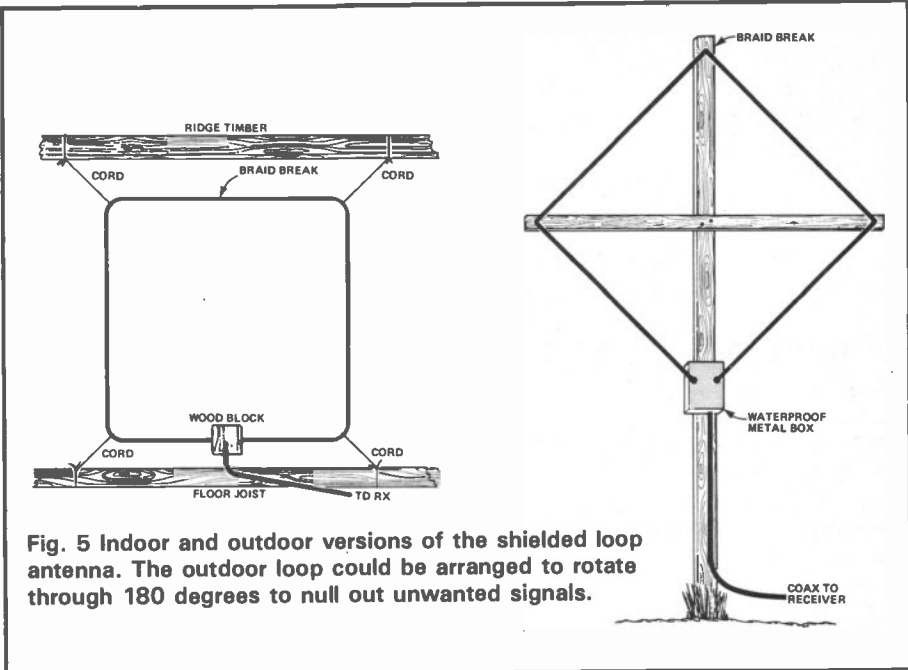


Fig. 5 Indoor and outdoor versions of the shielded loop antenna. The outdoor loop could be arranged to rotate through 180 degrees to null out unwanted signals.

the transmitting antenna. The coax feeder is obviously not properly matched to the loop but the use of either 50 or 75 ohm feeder makes no difference to the received signal strengths.

It must finally be stressed that these loops are not transmitting

antennas and cannot be used as such. The old maxim, "You can't work 'em if you can't hear 'em" still holds true, and a shielded loop will enable a Top Band operator or SWL to work or hear elusive DX that is just below the threshold noise on a transmitting antenna.

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Metre wave

Memo to class A operators: suppose somebody called you up on 80m one evening, knowing you to be a keen metre wave person, and asked you something like, "I've heard a lot about this VHF lark. You know a lot about it. Do you think it's worth my while going in for it?" How would you respond? Would you answer in vague generalities or could you give your enquirer some factual information about the metre waves that would persuade him to have a go?

Do you really know what the score is on VHF/UHF? Here, Jack Hum, G5UM, makes a few suggestions on how to assess your station performance.

Memo to class B operators: suppose someone called you up on 2m, knowing you to be an enthusiastic operator on 70cm, and asked you to tell him something about the 433MHz band. Would you be able to give him hard facts or only general opinions? Would you be able to persuade him that 70cm has a great deal to commend itself to those who wish to get away from what somebody once called "...those same old boring conversations on 'Two' "?

Simply to describe to either of these enquirers what kind of transceiver and aerial you use on 2m (or 70cm), while helpful, is rather inadequate by way of reply. Each of them will want to know much more than that. The class A enquirer may well ask: "What am I likely to work, what's the level of activity on 2m, and what about all those repeaters I read about?" The class B enquirer will want to know what results he is likely to achieve on 70cm compared with those he already gets on 2m. Will it be worth his while spending money on a rig for "the next band up"?

You can answer both of them effectively if you are in a position to give statistical evidence of the levels of activity they will experience if they do take their respective plunges. You will be able to give such evidence if you are one of those operators who keeps much more detailed records of his activity than the minimum requirements of the station log.

To many people the word "statistical" is off-putting, to say the least. They probably remember that someone once said (it was Mark Twain, in

fact) that "...there are lies, damned lies and statistics". So let's forget the word from now on, and instead use the phrase "station performance".

Here is a simple method by which you can keep an accurate record of your station performance literally day by day and month by month. It involves no card index (cumbersome things!) and no computer (incomprehensible things!). All that is required is a sheet of paper on which is inscribed one vertical column for each of the bands you use, plus 31 horizontal columns for each day of the month (or 30 days or 28 days as appropriate).

If you operate, say, 2m and 70cm only, you draw four columns on your sheet of paper at the beginning of each month. Why four? Because you need one column in which to insert a figure showing your daily simplex contacts on 2m, another column in which to inscribe the 70cm QSO total for the day, and two further columns to take through-repeater figures. If being a metre wave person with a class A licence you also use 70MHz and 50MHz, you will need to include a column for each of these bands.

What information do you put in these day-by-day columns? Nothing more than a figure to show how many contacts you have made that day on any particular band. However, the sheet is *not* an extension of the station log: it is nothing more than a record of station performance per band per day. At the end of each day you tot up the number of contacts you have made on each band, and pencil that number into the appropriate column.

Example: if you worked ten stations on 'Two' on the 23rd of the month you would pencil in "10" in the 2m column against that day. If you made two through-repeater exchanges on 433MHz you would pencil in "2" in the "70cm (R)" column. It's as simple as that. But do it daily: tomorrow will be too late!

Those readers who have followed their G5UM thus far will recognise the method described as being nothing more than a system of diary entries. You can indeed use a commercial diary to serve the purpose described: on each day of it you enter the number of contacts made on each band. But this is rather wasteful of a good diary when a single sheet of paper will serve the same purpose (and can be tucked in to the station log). Anyway, flicking over the 31 pages of a diary each month is quite a chore by contrast with doing a simple tot-

	6m	4m	2m	2m (R)	70cm	70cm(R)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
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22						
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24						
25						
26						
27						
28						
29						
30						
31						
	=====	=====	=====	=====	=====	=====
	=====	=====	=====	=====	=====	=====

Fig. 1 The scoreboard that displays your station performance for the month on a day to day basis. Down the left hand side the days of the month, across the top — columns for each of the bands you work. How to use the scoreboard: if you work 10 stations on 2m on the 23rd of the month, write the figure '10' in the '2m' column against that date. If you contact a couple of the locals through 70cm repeater, you insert '2' in the '70cm (R)' column. Don't leave it until tomorrow, insert the figures as you sign off the log for the night. At the end of the month, tot up the totals at the foot of the columns — you'll then have the performance per band for that month.

up at the end of the month from a single sheet of paper.

What Is "A Station"?

Armed with your scoreboard, you should be in a position to answer factually any enquiries you receive about levels of activity on the bands you use. But suppose you run into one of those sceptical (or blatantly cussed) individuals who refuses to accept what you say? There are plenty of them about in all walks of life. "It's all very well for you to tell me you had 31 contacts on 4 metres during the month, but they could all have been with the same station! What is the *real* activity like on 'Four'? How many stations am I likely to be able to work?"

The question is a reasonable one and can be answered in a reasonable manner if you have kept a list of the number of different stations worked on each of your bands. Many metre wave people have been doing this for years. Even today, the new 6m band offers a challenge to its occupants as to how many different stations they can work on it, and operators there are regularly heard discussing their "scores".

In totalling up the number of different stations you have worked it is important to define to yourself just what "a station" is. This is not difficult. All the reputable awards systems accept these categories. Home based, Alternative address (anywhere), Portable (again anywhere), and Mobile.

Example: if the Editor operates from his home QTH he signs himself "G1HRT". If he takes his 2m transceiver to the office and operates from the roof at lunchtime he signs "G1HRT/A". On his way home in the car he obviously signs himself "G1HRT/Mobile". If he happens to feel like

motoring further out to the Surrey hills and erecting that sectional mast and 5 element Yagi he had been carrying on the roofrack he would then qualify as "G1HRT/P". He could not possibly be mobile for he would be decidedly *immobile* in such circumstances.

Four categories of "different station", then, to include in your summation of activity on those bands you occupy. A word of warning: never but never count a repeater as a "different station". It isn't, and you can't collect it as one! You cannot have a QSO with a repeater: you talk through it to other people when you cannot communicate by direct means (if you can it is anti-social and selfish to use one). For these reasons repeaters must be categorised separately. In the "scoreboard" in Fig. 1 you will find that they are, as distinguished by the suffix "R".

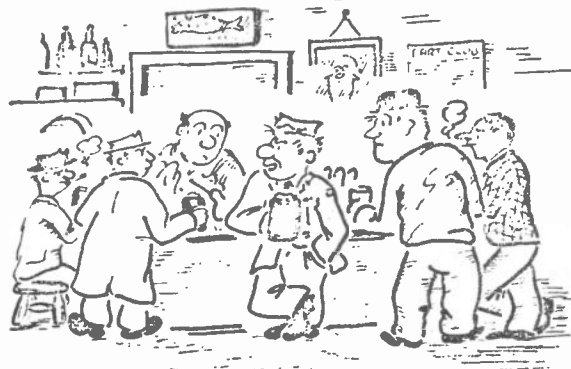
As an aside, it must be reiterated that you do not have "a QSO" through a repeater: you have an exchange. Operators who thank other operators for "this QSO via the repeater" are in error, and are using the English language loosely. It is not a QSO. Nor does it rate for a QSL. Logically, you should send your QSL to the repeater itself. You won't get one back. The thing can't read or write even though it can talk.

This is in no way to denigrate repeaters. Often enough in this space they have been hailed as representing the biggest collective technical effort ever to have occurred on the British amateur radio scene. It is important, then, that their existence, their sheer numbers and their great value should be emphasised to those enquirers who ask you what it's like at metre wave.

And that seems to be more or less where we came in.

The Civilian Wireless Reserve

At what point in the worsening international situation in 1938 the Air Ministry decided to form a 'Civilian Wireless Reserve' is not clear. At the 1938 RSGB convention, Air Commodore C W Nutting formally announced the Ministry's intention of making it a part of the RAF Volunteer Reserve. There was a ready response from the amateur ranks; a large number of fully and 'AA' licensed (AA = artificial aerial) members enrolled, along with some shortwave listeners. Together they formed the hard core of the fledgling CWR.



"Of course, I suppose I might be described as a sort of scientist dealing with highly secret radio stuff."

In 1938 with war looming and a limited supply of technically able people in the Forces, radio amateurs found their skills in great demand. Many joined the RAF's 'Civilian Wireless Reserve' and among them were Brian Herbert, G2WI, and Sid Hall, G3BR.

Before the outbreak of the war, the organisation speedily split the original members up into groups on a more or less geographical basis. Each group was in the charge of a Controller who arranged training by means of radio networks or 'nets' on frequencies for which the Air Ministry provided appropriate crystals. Each member was given a distinctive lapel badge together with rail passes and documents needed for travelling in the event of war and the mobilisation of the CWR.

The Air Ministry was, apparently, intending to form civilian maintenance groups to repair or replace malfunctioning or damaged radio communications equipment at major airfields. It turned out that the CWR personnel suited this requirement nicely. A considerable number of those 'mobilised' at the outbreak of

hostilities found themselves sent to RAF Cranwell for a short course of instruction on current radio equipment. From there they were dispersed in groups of eight or nine to already established sites scattered over the UK, all of this under the control of 'Ham' Whyte, G6WY.

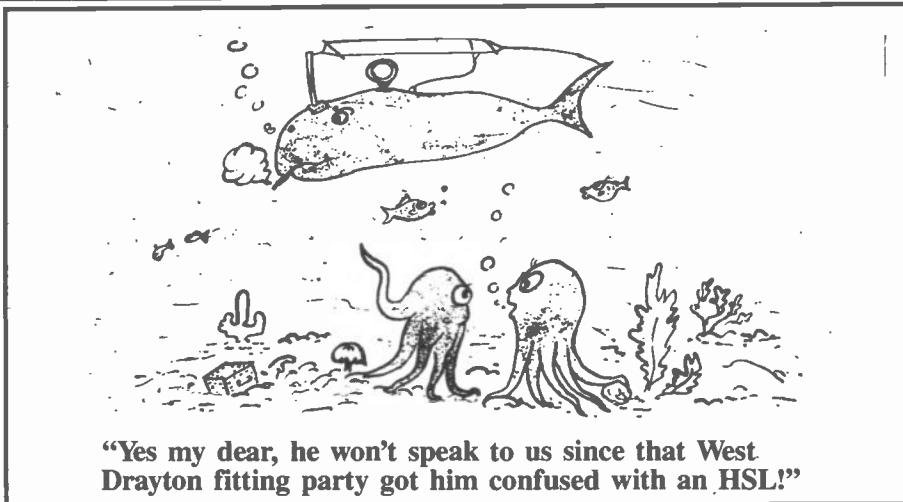
The 'Early Birds'

Of those who did not go to Cranwell, some, with morse speeds of 15wpm and upwards, found themselves in France within a few days of the start of the war. These became known as the 'early birds' and served with the Wireless Intelligence Screen, liaising with the 'Y' services, who were monitoring enemy communications. They had some very lively adventures, moving back and forth across the country-

side and living rough. The early birds were soon joined by a further draft mainly of ex-Cranwell CWR members. However, those members who were actually in France by the 5th September 1939 were and are still proud of the fact that they were truly early birds. They eventually returned when we left Europe at Dunkirk and were posted variously in the UK and overseas.

Those people in the maintenance groups or 'emergency fitting parties' (EFPs as they were known) had an astonishing variety of tasks, including setting up both ground and aircraft installations, and the jobs continually diversified as the war wore on. It was quite usual in the early days for the technical plans for the work to arrive at the site after the work had been completed and even accepted into service!

The technical abilities of the amateur workforce often surprised the station signals officers and there were often occasions where experience gained in the amateur ranks enabled problems to be solved. One instance of this was when a newly installed radar transmitter emitted a pulse which completely 'swamped' the local receiver. One amateur on



“Yes my dear, he won't speak to us since that West Drayton fitting party got him confused with an HSL!”

the party made up a 'Lamb Noise Blanker' — then a very new amateur development — which completely cleared the trouble, much to the astonishment of the Air Ministry technicians who arrived to clear up the trouble.

As we have said, the very diversity of the fitting parties tasks was astounding. We worked on ground and airborne radar equipment, installed radio equipment in high speed launches (HSLs — fast motor boats), the maintenance of 'Defence of Great Britain' radio receivers, as well as the manning and servicing of equipment used to jam installations in attacking German bomber planes.

At Home And Abroad

As time progressed, the Ministry realised that the far flung sitting of the fitting parties made their administration and maximum utilisation very difficult. The personnel of the original EFPs were therefore drawn together into a 'Central Installation Section' based at No 1 Signals Depot, RAF West Drayton. From there specialist groups were despatched to work all over the UK and, in some cases, overseas.

Of the latter, one member based in Alexandria was loaned to the Navy to install and commission the new VHF gear to three cruisers in port. On completing the job he was 'shanghaied' by the Navy and remained on board one of the cruisers. He took part in some 14 convoys to Malta, as well as being involved in the invasion of Sicily and Italy, and not 'escaping' for nearly 18 months! When he did eventually arrive back in the UK, the RAF had lost all trace of him and he was closely vetted before his credentials were fully accepted.

Another member was posted to take charge of the signals section of a newly formed squadron, which turned out to be 617 Squadron, subsequently to become famous as the 'Dam Busters'. Incidentally, it was a fitting party from West Drayton who installed the VHF radio telephone in the squadron's Lancasters prior to the dam raids, enabling the Master Bomber to communicate with his Squadron over the target area.

We also have a member who served in Ethiopia and another who was in the Balkan Air Force in Yugoslavia. These were possibly the only amateurs who served in these countries. Others were aboard the 'SS Lancastria' during the evacuation from France and literally had to swim for it when the vessel was bombed. Unhappily we lost two amateurs. Another member was part of an aircrew which was shot down and unfortunately had to be invalidated out of the service. Space does not permit any further stories, of which there are many.

As indicated earlier, not all the original members were collected into the EFP organisation or the Wireless Intelligence Screen. Some, when mobilised, were sent from the Reporting Centres either to RAF stations or to the signal schools at Cranwell and Yatesbury. It is notable that some CWR members to arrive at these schools found themselves retained as instructors since, as in most departments of the Service, there was a great dearth of suitably qualified and capable personnel.

The EFP organisation depended heavily on the 'workshops' section at West Drayton manned by selected personnel, who saw to all the equipping of the parties. In the very early stages, parties had to obtain

materials via the station signals officer and stores. But this was frequently slow and frustrating and so dependence was laid on workshops. This section rapidly developed their own system for equipping a party for any job scheduled. It was a common experience once workshops was really established, to arrive at the station where you had been sent to do a job and find all the necessary material delivered, clearly labelled for the 'CIS, West Drayton Fitting Party', and simply waiting for use.

In Praise of 'Workshops'

The personnel in 'workshops' also had a lot to do in modifying equipment, fitting out mobile vehicles etc. Theirs was a valuable and essential part of the whole organisation.

With the progress of the war, it was inevitable that some of the personnel became 'detached' to other parts of the Services. Many were commissioned, a number achieving senior rank in the various commands both at home and overseas. Without exception all the original members had by the end of hostilities reached NCO rank.

In concluding this short account of the amateur contribution to the war effort, we should mention that of the original members some 150 are known to be still active amateurs. Those in the UK join in from time to time on 'Ex RAF CWR Net' which takes place on the first Monday of every month on or near 3710kHz SSB at 1000 hours (local time).

A VE and VJ (Victory in Europe and in Japan) Commemoration Day Net took place this year in which the special event call signs GBOCWR and GB4CWR were activated. Apart from other reminiscences each member recounted where he was on VE Day. One member was in Changi Gaol, Singapore and heard the news on a clandestine radio! Anyone who was in the CWR and has not made themselves known to the group are invited to get in touch with G3BR who is QTHR.

The cartoons were drawn by a member of a fitting party who signed himself Twist. They were stapled into small books and sold for a small sum in aid of the RAF Benevolent Society.

OPINION

50MHz For All

Geoff Smith, G4AJJ, opines that the current level of activity on 50MHz is too low and the band should be opened to class B licensees...

With a blaze of glory, it was published that radio amateurs in the UK would be allowed to use the 6 metre band (50.00-50.50MHz) on a 24 hour basis from 1st February 1986.

This, we were told, was the culmination of several factors notably:

1. The result of negotiations over many years between the RSGB and the appropriate Government departments.
2. The success of the permit experiment.
3. The closure of the Band 1 television service.

Although initially for class 'A' licence holders only, to reduce the risk of interference to the European 'primary users', the allocation was clearly in accord with the Merriman Report for this part of the electromagnetic spectrum. Other measures to minimise the interference risk included power limits, no /P or /M operation and, rather strangely, no repeaters. I say 'strange' because a repeater station can so easily be engineered to give the intended local coverage only, even if located on a hill top or similar site.

Accepting the foregoing restrictions, one might have expected the band to be bustling by now with class A calls anxious to contact each other and being on the lookout for the openings into W1, W2, W3 etc, using what the RSGB has described as exciting propagation phenomena not yet fully understood. The band is an ITU Region 2 and 3 recommended allocation and apart from the path into the USA, there have been the 6m/10m crossband contacts that took place 1979/1980 between VS6FX in Hong Kong and several DL stations. What is more, 50MHz is as good a local chat band as a DX band.

Yet tuning around the band results in only a few signals and this lack of activity is soon confirmed by QSOs on 80 and 2m — many class As openly admit they are not QRV on 6 and have no immediate plans to be so. In fact, a large percentage of activity seems to be amongst those who were holders of the original permits.

Further analysis suggests that the lack of activity on the band is perhaps to be expected. We see the same thing on 70cm in many parts of the UK, in spite of a vast but heavily underused repeater network and wide range of both commercial and surplus equipment available. A similar lack of activity shows itself on the new HF bands 10, 18 and 24MHz as well as on 1.8MHz.

So, why is this happening? Why, when the 3.5, 7, 14, 21 and, of course, 144MHz band are so heavily used, are the new bands still virgin territory? Clearly, for the average amateur, there is a limit to what range of different bands — once licensed — he is able to operate on, has the time to operate on or, more relevant perhaps, has the funds to enable him to be able to operate on. In the case of 50MHz, why spend cash for what initially is a one year allocation? Old habits die hard and our operating tends to be concentrated on those parts of the spectrum to which we have become

accustomed and for which we are equipped. The majority of amateurs, class A or B, do not appear to have the attributes of being rich and adventurous.

The argument put forward for years by the IARU — the Amateur Service worldwide is 'bulging at the seams' and it has the highest and therefore the most efficient use of allocated spectrum in terms of simultaneous QSOs per MHz — is wearing a bit thin as justification for the allocation of even more spectrum at no additional cost.

Readers can work out for themselves how much they pay per MHz per year. It is an interesting figure when you compare it to how much you get for your TV licence. Although before being accused of having a death wish, I hasten to add that the amateur bands are used more than most other spectrum users. What is being advocated here is the need for a more even spread of amateur activity over the bands we have allocated to us — and that means 50MHz.

There is a school of thought that suggests the RSGB would do better selling 50MHz transverter kits, or kits to convert rigs to the new HF bands, rather than pushing out Morseman kits. They now employ full time staff, such as the Technical Officer, whose job it is to produce radio projects. Perhaps they have not noticed that Datong and others do not yet produce 50MHz gear.

The fact that the RSGB have not produced kits or real practical advice on how to get QRV on our new bands is not surprising though. They have consistently resisted the use of SSB at 10MHz (although authorised in the licence conditions, including emergency use) fearing the risk of interference to the primary users. Assuming the Society is consistent in its approach to such matters, they can be expected to adopt the same approach to the 50MHz band.

Another school of thought raises the possibility of the 'Guinea Pig' theory. This suggests that for one year the DTI are hedging their bets a little at 50MHz — they are testing the temperature. If interference to the Europeans proves a problem — especially during summer lift conditions — then this will be for one summer only. They can easily discontinue amateur activity on the band in early 1987. Such an exercise would not be possible with commercial users (work out their cost per MHz per year!). Unfortunately, our one year 'probation' on 50MHz is unlikely to be conclusive as regards interference aspects, any more than the permit experiment for the same reason — lack of activity.

A third school of thought takes all the foregoing into account and comes to a logical (although not practical) conclusion. Since the numbers of class A and B licences are about equal, the second six months of the probation period should be allocated to class Bs.

Although there is no evidence that they would be any more active, there is every evidence that class Bs would be as equally active as the class As. The evidence is that if all UK amateurs had access to 50MHz, the total level of activity would have virtually no more chance of causing interference in Europe than has been the case since the permits came in. What it would do is prove conclusively, one way or the other, if there is a problem or not. We should not forget that way back in the late '50s we had 50MHz for a short time outside UK TV hours but inside European TV hours — no complaints were received.

The RSGB should not wait until the end of the current year's experiment before again pressing for the class B allocation at 50MHz instead they should be advocating for that allocation to be made as soon as possible. There is no sound technical, operational, political, legislative or administrative reason why such an allocation could not be granted.

RADIO Tomorrow

Your at-a-glance guide to what's happening around the clubs, on the air and in general radio-wise.

- 1 Sept** Basingstoke ARC: Surface Mounted Devices by G4OXX.
Braintree ARS: Power Supplies by G3PEN.
Sheffield ARC: SSTV demonstration and discussion by G8RWV.
Southdown ARS: meeting.
Stourbridge DARS: informal.
Welwyn Hatfield ARC: Digital Construction Techniques by G6YIQ.
- 2 Sept** Delyn RC: meeting.
East Lancashire ARC: surplus equipment sale.
Fylde ARS: visit to Blackpool Airport fire station.
Kidderminster DARS: AGM.
Warrington ARC: open forum.
Wolverhampton ARS: Rig Testing (Receivers) with G4WAS and his magic box.
Wythall RC: operating G4WAC every Tuesday night from 8pm to promote and support the Worked All Midlands Clubs award. Usual club meeting at the Community Centre, Silver Street.
308 ARC: meets every Tuesday at the Coach House, Church Hill Road, Surbiton.
- 3 Sept** Chesham DARS: meets every Wednesday at Bury Farm, Pednor Road, Chesham.
Fareham DARC: natter night.
Hornsea ARC: meeting at the Mill, Atwick Road, Hornsea.
Norfolk ARC: Technical Topics at the Valley Drive Community Centre, 97 Plumstead Road, Norwich starting at 8pm.
SE Kent (YMCA) ARC: natter night.
Stroud ARS: meeting.
Telford DARS: natter night.
Three Counties ARC: Propagation by G3LTP.
White Rose ARS: SSB FD briefing.
- 4 Sept** Bredhurst RTS: lecture by G3RJV of the G QRP Club.
Cheshunt DARC: home construction.
Douglas Valley ARS: meeting.
Horndean DARC: another junk sale.
N Wakefield RC: AGM.
Salop ARS: natter night.
Telford DARS: visit to Ironbridge power station.
Vale of Evesham RAC: VHF Then and Now by G5UM at the Round of Gras, Badsey, near Evesham.
- 5 Sept** Aberdeen ARS: junk sale.
Borders ARS: field day preparations.
Coventry ARS: night on the air.
Maidstone YMCA ARS: open evening for beginners and new members.
N Bristol ARC: natter night.
Wimbledon DARS: 2m DF hunt starting at 7pm from the new venue of St Andrews Church Hall, Herbert Road, Wimbledon.
- 6-7 Sept** IARU Region 1 SSB Field Day.
RSGB 144MHz Trophy contest.
- 8 Sept** Felixstowe DARS: social.
Milton Keynes DARC: American Scientists and Discoveries.
S Cheshire ARS: Operation Raleigh.
Sheffield ARC: Iceland on Foot slides and talk by G3PHO.
Southdown ARS: meeting.
- 9 Sept** Armagh and Dungannon DARC: meeting at the Winemarket, Lonsdale Road, Armagh.
Bury RS: Hamfest 1986 at the Mosses Youth and Community Centre, Cecil Street.
Chester DRS: An Introduction to Microwaves by G3PFR.
Dartford Heath DFC: pre hunt meeting.
Dorking DRS: informal at the Star and Garter pub.
Harpenden ARC: The GB3HN Repeater by G8OPE.
Keighley ARS: informal.
Newbury DARS: junk sale.
Warrington ARC: junk sale.
Wolverhampton ARS: Discone Aerials discussion.
Workshop ARS: Sheffield brewery visit.
- 10 Sept** Crawley ARC: informal.
Fareham DRS: Mountaineering by G1MCP.
Farnborough DRS: pre AGM meeting.
Hornsea ARC: meeting.
Norfolk ARC: visit to Yarmouth coastguard station.
SE Kent YMCA ARC: How Raynet Works.
Stockport RS: SSB FD post mortem.
Telford DARS: open meeting.
White Rose ARS: meet your committee.
- 11 Sept** Bredhurst RTS: construction/natter night.
Conwy Valley RC: club quiz.
Edgware DRS: Relays by G3GC.
N Wakefield RC: junk sale.
Pontefract DARS: visit to N Wakefield RC.

- Salop ARS: DF hunt.
Southgate ARC: The Quick And Painless Way to Learn CW by G3ZVW.
- 12 Sept** Aberdeen ARS: Raynet by GM8GDN/GM4NHI.
Coventry ARS: treasure hunt and barbeque.
Maidstone YMCA ARS: natter night and RAE.
- 13-14 Sept** **BATC International ATV contest from Sat 1800 to Sun 1200 BST. On 70, 23 and 3cm FSTV. Further details from G6IQM. GB00LD will be operational during the open days of Oldbury nuclear power station. The organisers, Thornbury DARC, will work on HF, 2m and 70cm and special QSL cards will be issued to all contacts. Scottish Amateur Radio Convention organised by Glenrothes DARC. Contact Ken, GM3ZSP, on 0334 53336 for further details.**
- 13 Sept** Basingstoke ARC: Bishops Channoler School fete demonstration station.
- 14 Sept** Braintree ARS: car treasure hunt.
GB2WHC will be operated by Welwyn and Hatfield ARC to support the Welwyn Hatfield Water Carnival. The station will be active on HF and 2m from Stanborough Lakes, Welwyn Garden City. QSL cards will be available to all contacts.
Dartford Heath DFC: DF hunt.
Dunstable Downs RC: visit to Alton Towers.
Eastbourne EARC: morse and RAE classes and club meeting at the Archery Youth Centre, Seaside Road, Eastbourne at 7.30pm.
- 15 Sept** Edgware DRS: 1986 Top Band Fox Hunt.
Braintree ARS: Arrow Electronics visit.
Stourbridge DARS: meeting.
Todmorden DARS: chat night.
Welwyn Hatfield ARC: informal and special event station analysis.
- 16 Sept** Biggin Hill ARC: The Work of the RIS.
Chester DRS: Video tapes — satellite communications and packet radio.
Delyn RC: meeting.
Fylde ARS: informal and morse class.
Kidderminster DARS: VHF Propagation by G8BKL.
Midland ARS: surplus sale.
Rugby ATS: auction of amateur goodies plus trade and club stands, refreshments available. Admission free and doors open at 7.30 pm. Venue: the Cricket Pavilion, B Building Entrance, BTI Radio Station, A5 Trunk Road, Hillmorton, Rugby.
Warrington ARC: homebrew test equipment by GOCNH.
- 17 Sept** Fareham DARC: natter night.
Hastings ERC: lecture by G4KYQ.
Hornsea ARC: meeting.
Norfolk ARC: One Year On — The Peterborough Rally by G4HMF.
SE Kent YMCA ARC: natter night.
Stockport RS: informal.
Stroud ARS: meeting.
Telford DARS: HF Propagation by G3USF.
Three Counties ARC: Amateur Television by G8LES.
White Rose ARS: natter night.
- 18 Sept** Bredhurst RTS: meeting.
Douglas Valley ARS: meeting.
N Wakefield RC: Contest Operating by G3ZXZ, G4IAU, and G4RCE.
Salop ARS: natter night.
Vale of Evesham RAC: meeting at the Anchor, Fladbury, near Evesham.
- 19 Sept** Aberdeen ARS: Morse Keyer Project.
Borders ARS: Top Band Working by G3YOG.
Coventry ARS: night on the air.
Maidstone YMCA ARS: ATV lecture and demonstration starting at 7.45pm.
N Bristol ARC: GWR by Ron Gardner.
- 20 Sept** Pontefract DARS: Went Valley Hike Raynet exercise.
- 21 Sept** **The National Amateur Radio Car Boot Sale at the Shuttleworth Collection, Old Warden, near Biggleswade. Admission is 50p though parking is free and doors open at 10am till 5pm. Peterborough Mobile Rally at Wirrina Sports Stadium, Bishops Road, Peterborough. Opening from 10.30am till 5pm. Free parking, refreshments, talk in on S22 and GB2PB. Details from Peter Wilson, 221 Tyesdale, Bretton, Peterborough. N. Cheshire RC: radio market and car boot sale at Morley Green Social Club, Morley Green, near Wilmslow, from 11am to 4pm. Trade stands, refreshments and talk in on S22 available.**
Eastbourne EARC: morse and RAE classes.
Felixstowe DARS: meeting.
- 22 Sept** Chester DRS: How Marcher Sound Radio Station Works by Julie Hallam.
23 Sept Dorking DRS: Raynet at Ashcombe School.
Harpenden ARC: informal natter night.
Wolverhampton ARS: Antennas and Feeders by G8MWR.
- 24 Sept** Crawley ARC: The RSGB by G4VEC.
Fareham DARC: Homebrewing The Legal Limit on 2m by G4XZL.
Hornsea ARC: meeting.
Norfolk ARC: surplus equipment auction.
SE Kent YMCA ARC: meeting.
Stockport RS: Frequency Meters by G8CZW.
Telford DARS: Homebrew Testing and Measurement by G0CZD.
White Rose ARS: Satellite Communications video.
- 25 Sept** Bredhurst RTS: construction/natter night.
Edgware DRS: Floating QTH Construction by G0CAJ.
G Peterborough ARC: video.
Glossop DARG: equipment display.
Pontefract DARS: Raynet by G3PSM.
Salop ARS: Slow Scan TV by G4IUT.
Southgate ARC: informal.
- 26 Sept** Aberdeen ARS: Computers In Amateur Radio.
Coventry ARS: visit.
Maidstone YMCA ARS: natter night and RAE.
N Bristol ARC: QSL card display.
Worksop ARS: quiz night vs Maltby club.
- 28 Sept** Basingstoke ARC: 2m DF hunt. Check with Sec or 2m net at 1pm.
Eastbourne EARC: RAE and morse classes.
Wolverhampton ARS: 2m DF hunt.
- 30 Sept** Chester DRS: Lowe Electronics visit.
Delyn RC: meeting.
E Lancashire ARC: informal.
Keighley ARS: talk by Mr Fleet, BBC senior transmitter area manager.
Kidderminster DARS: an evening with G3PGQ.

<p>1 Oct Wolverhampton ARS: night on the air. Chesham DARS: meets every Wednesday. Fareham DARC: natter night. Hornsea ARC: meeting at the Mill, Atwick Road. SE Kent YMCA ARC: natter night. Stroud ARS: meeting. Telford DARS: natter night. Three Counties ARC: HF Antennas and Feeders by G5RV. White Rose ARS: meeting</p> <p>2 Oct Bredhurst RTS: inter club quiz. Douglas Valley ARS: meeting. Horndean DARC: AGM. N Wakefield RC: meeting. Salop ARS: natter night.</p> <p>3 Oct Aberdeen ARS: junk sale. Clifton ARS: club meeting. Coventry ARS: AGM. Maidstone YMCA ARS: mobile rally briefing. N Bristol ARC: Microwave Modules visit.</p> <p>5 Oct Wakefield Mobile Rally (formerly Bretton Hall) at Outwood Grange School, Potovens Lane, Wakefield. Doors open 11am (10.30 for disabled) and free admission with stalls for radio, electronics, computers, handicrafts and kidstuff. Licensed bar and refreshments, parking and talk in. Welsh Amateur Radio Convention at the Oakdale Community College, Blackwood. Doors open at 10am with official opening by the President of the RSGB at 11am. Programme schedule is planned and there will be morse tests available (apply to the RSGB). Trade stands and all the usual attractions. Admission is £1.50 and talk in on S22. Eastbourne EARC: RAE and morse classes.</p> <p>6 Oct Basingstoke ARC: AGM. Baintree ARS: Consumers and Public Protection. Felixstowe DARS: social. Sheffield ARC: QRP Techniques by G3RJV. Southdown DARS: informal. Stourbridge DARS: informal. Todmorden DARS: surplus equipment sale. Welwyn Hatfield ARC: The Work of the RSGB by G4FRX.</p> <p>7 Oct Fylde ARS: Aerials for DX by G6CZ. Wolverhampton ARS: AGM. Worksop ARS: return quiz vs Maltby. 308 ARC: AGM starting at 8.30pm.</p> <p>8 Oct Crawley ARC: informal. Fareham DARC: Packet Radio by G4CJO. Farnborough DRS: EMC presented by the RSGB. Hornsea ARC: meeting. SE Kent YMCA ARC: Fire Service Communications. Stockport RS: Logic Circuitry by G8OMH. White Rose ARS: meeting.</p> <p>9 Oct Bredhurst RTS: construction/natter night. Edgware DRS: Syntony by G4HFL. N Wakefield RC: photography night. Salop ARS: AGM. ELOHEX 1986. An amateur radio, computer and electronics exhibition at the Floral hall, Hornsea. Local club and trade stands, raffle and tombola, junk and bring-and-buy stands. Talk in on S22 with G4EKT. Refreshments available and doors open at 10am.</p> <p>10 Oct Aberdeen ARS: 40th anniversary cheese</p>	<p>11 Oct Armagh Radio Rally in Armagh Cricket Club, The Mall, Armagh with ample parking, model demonstrations, stalls and bring-and-buy. RSGB Midlands VHF Convention at Madeley Court Centre, Telford. Doors open at 11am and there is a programme of lectures scheduled plus a measurements facility, small trade show, bring-and-buy and book stalls. Admission is £1.20 and the car park is free.</p> <p>12 Oct Eastbourne EARC: morse and RAE classes. Carmarthen ARS rally at St. Peter Hall.</p> <p>13 Oct Milton Keynes DARS: AGM. S Cheshire ARS: AGM. Sheffield ARC: AGM. Southdown ARS: meeting.</p> <p>14 Oct Armagh and Dungannon DARC: meeting. Bury RS: construction contest. Chester DRS: quiz with Ellesmere Port club. Dartford Heath DFC: pre hunt meeting. Delyn RC: meeting. Dorking DRS: informal. Keighley ARS: informal. Wolverhampton ARS: The Skin Effect discussion.</p> <p>15 Oct Fareham DARC: natter night. Hastings ERC: junk auction. Hornsea ARC: meeting. SE Kent YMCA ARC: natter night. Stroud ARS: meeting. Three Counties ARC: Oscar Operation by G3RWL. White Rose ARS: The TDZ Portable Transceiver by G3TDZ.</p> <p>16 Oct Bredhurst RTS: Ack-George. Felixstowe DARS: East Anglian Daily Times visit. Salop ARS: natter night.</p> <p>17 Oct Aberdeen ARS: amateur radio microwave demonstration. Clifton ARS: club meeting. Coventry ARS: DIY Forum. Maidstone YMCA ARS: junk sale.</p> <p>18-19 Oct BARTG Autumn VHF contest.</p> <p>19 Oct Dartford Heath DFC: DF hunt. Eastbourne EARC: morse and RAE classes.</p> <p>20 Oct Baintree ARS: construction contest. Felixstowe DARS: Testing and Troubleshooting by G4SYG of BT Research Labs. Stourbridge DARS: meeting. Todmorden DARS: Ant Products visit. Welwyn Hatfield ARC: video show.</p> <p>21 Oct Biggin Hill ARC: antenna demonstration. Chester DRS: Avionics by G1LML. Midland ARS: AGM. Wolverhampton ARS: RTTY by G8VXY. Worksop ARS: AGM.</p> <p>22 Oct Coventry ARS: AGM. Fareham DARC: lecture. Farnborough DRS: surplus equipment sale. Hornsea ARC: meeting. SE Kent YMCA ARC: DF hunt on 160m. Stockport RS: Shocks and socks by G4SSN. White Rose ARS: natter night.</p> <p>23 Oct Bredhurst TRS: construction/natter night.</p>
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Edgware DRS: Club History with G3MNO.
 G Peterborough ARC: meeting.
 N Wakefield RC: DX Chasing by G4RCG.
 Salop ARS: Spread Spectrum Communications.

- 24-25 Oct** Leicester Amateur Radio Show.
24 Oct Aberdeen ARS: 40 Years of Amateur Radio by the members.
 Clifton ARS: club meeting.
 Coventry ARS: night on the air.
 Fylde ARS: informal and morse class.
 Maidstone YMCA ARS: natter night and RAE class.
26 Oct Basingstoke ARC: 2m DF hunt. Check with the Sec of the 2m net at 1pm.
 Eastbourne EARC: morse and RAE classes.
 Wolverhampton ARS: 2m DF hunt.
28 Oct Chester DRS: Basically Speaking by G4FJQ.
 Delyn RC: meeting.
 Dorking DRS: junk sale.
 Keighley ARS: junk sale.
 Wolverhampton ARS: night on the air.
 308 ARC: junk sale starting at 8pm.

- 29 Oct** Crawley ARC: Microwave Modules visit.
 Fareham DARC: natter night.
 Hornsea ARC: meeting.
 SE Kent YMCA ARC: natter night.
 Stroud ARS: meeting.
 Three Counties ARC: HF and VHF stations on the air.
 White Rose ARS: bring-and-buy sale.
30 Oct Bredhurst RTS: QRP/homebrew/components contest.
 Glossop DARG: natter night.
 Salop ARS: natter night.
31 Oct Aberdeen ARS: 40 years Halloween night festivities.
 Clifton ARS: club meeting.
 Coventry ARS: construction contest.
 Maidstone YMCA ARS: construction of a valve 29MHz 100W amplifier.

Will club secretaries please note that the deadline for the December segment of Radio Tomorrow (covering radio activities from 1st November to 1st January) is 29th September.

Contacts

Aberdeen ARS	Don	04676251
Abergavenny & NH ARC	GW4XQH	0873 4655
Aberporth ARC	GW0DPR	023987 274
Alyn and Deeside ARS	GW4RKX	0244 660066
Amateur Radio & CC	Trevor	04895 81032
Armagh DARC	J. A. Murphy	0861 522513
Atherstone ARC	Roy	0203 393518
Axe Vale ARC	Bob	029 74 5282
Ayr ARG	GM3THI	Ayr 42313
Barking RES	R. Woodberry	01 594 4009
Barry College RS	John	065679 710
Basingstoke ARC	Dave	07356 5185
Bath DARC	G4UMN	Frome 63939
Biggin Hill ARC	GOAMP	0689 57848
Borehamwood Elstree ARS	Tony	01 207 3809
Braintree ARS	Pub Sec	0376 28714
Bredhurst RTS	Kelvin	Medway 376991
Brighton DARS	Peter	0273 607737
Bristol ARC	G4YOC	Bitton 4116
Bristol (Shirehampton) ARC	Ron Ford	0272 770504
BT (Reading) ARC	G4MUT	0734 693766
Bury RS	Allan	0204 706191
Cambridge DARC	D. Wilcox	0954 50597
Chesham DARS	Liz	09278 3911
Cheshunt DARC	G4VMR/G4VSL	092084 250
Chester DRS	Dave	0244 336639
Chichester DARC	C. Bryan	0243 789587
Clifton ARS	RA Hinton	01 301 1864
Conwy Valley ARC	GW4KGI	0745 823674
Coulsdon ATS	Alan	01 684 0610
Coventry ARS	Robin	0203 73999
Crawley ARC	Jack	0293 28612
Darenth Valley RC	Sec	0322 63368
Dartford Heath DFC	Pete	0322 844467
Denby Dale DARC	G3SDY	0484 602905
Derwentside ARC	G1AAJ	0207 520477
Donegal ARC	EI3BOB	074 57155
Dorking DRS	John	0306 77236
Droitwich DARC	G4HFP	0299 33818
Dudley ARC	John	0384 278300
Dunstable Downs RC	Phill Morris	0582 607623
Eastbourne EARC	G1BRC	0323 29913
East Kent ARS	Stuart	0227 68913
East Lancashire ARC	Stuart	0254 887385
Edgware DRS	John	Hatfield 64342
Exeter ARS	Roger Tipper	0392 68065
Fareham DARC	Alan	0329 288139
Farnborough DRS	Mr Taylor	0252 837581
Felixstowe DARS	G4YQC	0473 642595
Fishguard DARS	Bernard	0348 872671
Fylde ARS	PRO	0253 737680
Galashiels DARS	GM3DAR	0896 56027
G. Peterborough ARC	Frank	0733 231848
Halifax DARS	D. Moss	0422 202306
Harpندن ARC	G1BJC	0582 72455
Harrow RS	Tony	01 861 0419

Hastings ERC	Dave Shirley	0424 420608
Haverhill DARS	Rob Proctor	0787 281359
Havering DARC	GOBOI	04024 41532
Hornsea ARC	Richard	0401 62498
Horsham ARC	Pete Head	0403 64580
Inverness ARC	Brian	0463 242463
Keighley ARS	G1IGH	0274 496222
Kidderminster DARS	Tony	0562 751584
Kingston DARS	G3ODH	Epsom 26005
Lagan Valley ARS	Jim	0846 682474
Leeds DARS	G1EBS	0274 665355
Leighton Linlode RC	Pete Brazier	052 523 270
Lothians RS	Robin	0506 890177
Loughborough ARC	Philip	0509 412043
Maidenhead DARC	John	0628 28463
Maidstone YMCA ARS	GOBUW	0622 30544
Maltby ARS	Ian Abel	0709 814911
Medway ARTS	Tony	0634 578647
Midland ARS	G8BHE	021 422 9787
Mid Sussex ARS	G1FRF	0791 82937
Mid Ulster ARC	Sam	0762 22855
Mid Warwickshire ARS	G4TIL	Southam 4765
Milton Keynes DARS	Dave	0908 501310
Morecambe Bay ARS	G3PER	Heysham 52659
N. Cornwall RS	J. West	0288 4916
N. Staffs ARS	G6MLI	0782 332657
N. Wakefield RC	Steve	0532 536633
Newbury DARS	G3VOW	0635 43048
Norfolk ARC	Andy	Norwich 610874
Oswestry DARC	Brian	0691 831023
Peterborough RES	Peter	G4PNW QTHR
Plymouth ARC	G4SCA	0752 337980
Pontefract DARS	GOAAO	0977 43101
Preston ARS	George	0772 718175
Rhyl DARC	GW1AKT	Nantglyn 469
Salisbury RES	Neil	0980 22809
Salop ARS	Simon	0743 67799
Sheffield ARC	John	Sheffield 581766
Shefford DRS	G4PSO	Hitchin 57948
S. Bristol ARS	Len Baker	0272 834282
S. Cheshire	Chris	07816 73185
S. Lakeland ARS	Dave	0229 54982
S. Manchester RC	Dave Holland	061 973 1837
S. Tyneside ARS	G4XWR	S. Shields 54395
S. E. Kent (YMCA) ARC	John	0304 211638
Southdown ARS	P. Henly	0323 763123
Southgate ARC	Dave	0992 30051
Stevenage DARS	G4ISO	0462 892765
Stockton DARS	John Walker	0642 582578
Stockport RS	Mel	061 224 7880
Stourbridge DARS	G3ZOM	K/ford 288900
Stowmarket DARS	M. Goodrum	0449 676288
St Helens DARC	A. Riley	051 430 9227
Surrey RCC	John	01 657 0454
Swale ARC	B. Hancock	0795 873147
Telford DARS	Tom Crosbie	0952 597506
Three Counties ARC	Keith, GOBTU	0730 66489
Tiverton (SW) RC	Alan	0392 881569
Todmorden DARS	G1GZB	070 6817572

SCANNING RECEIVERS

Scanning receivers seem to be radio's 'hot-cakes' — people cannot get enough of them or care too much what price they pay for the benefits they may offer. The attraction of a 'scanner' is obvious; instead of manually tuning around looking for stations and noting them

Tony Bailey, G3WPO, scans three of the latest scanning receivers: the AOR AR2002, Regency MX7000 and Icom ICR7000 and evaluates their real usefulness.

down on paper until you eventually get fed up, you can now have the majority of the manual drudgery taken care of by the ubiquitous silicon chip. The receiver can look specifically for stations you have programmed into its memory, or through whole bands at a time until a station is found. All — with some scanners — without laying a hand on the rig.

Add a home computer plus interface and possibilities increase by a large factor, allowing almost limitless memory and search capacity. For instance, if you are a broadcast fanatic, you could get the scanner to look for certain stations only when the propagation conditions are likely to be correct by using your computer's built-in real-time clock in the search routines. Then it can log the station and even its signal strength if you want. The amateur can check beacons to determine propagation conditions — there are limitless possibilities given the software and hardware expertise.

Those more interested in 'other things' broadcast on the air have access to virtually all bands from upper HF to VHF/UHF in a continuous tuning range with most scanners. Most manuals make great play on the fact that they cover military UHF, cordless telephones, government facilities, emergency services, police etc. However, you might like to note that interception or listening to such things as Cellnet telephone transmissions is a criminal offence, punishable by up to two years in prison — it's the same as an illegal telephone tap.

AOR AR2002



Back in August 1984, our review of the AR2001 scanner stated that this receiver had a good reputation and was not easy to find ex-stock for this reason. It was billed in the adverts as the scanner to beat all others — hands down. Well, with the new version, the 2002, all the previous statements apply. Anyone who wants to buy one may face a long search among the retailers to find one ex-stock.

In appearance, the 2002 is similar to its predecessor in size and shape with the unique angled front panel — very ergonomic. It is now made from light grey ABS plastic, rather than the older black case. The display is the same, but otherwise things are radically different.

One of my gripes with the 2001 was the membrane keypad. It was a right pain just like the ZX81 keyboard! This has been replaced by pushbuttons with good tactile feedback — plus the inevitable beeps when pushed which are not intrusive. It includes one feature much needed on the 2001, an encoder type tuning knob.

Despite the scanning facilities, there are times when you want to tune around between channels and having to push buttons makes it a weary process — a standard tuning knob makes it 'feel right' to my mind. It was unfortunate that shortly after receipt, this tuning control developed a fault and would only increment in two channel jumps both ways. It is difficult to see whether the construction makes this a 'one-off'. Besides, this still left two manual stepping buttons so all was not lost.

What Can It Do?

The coverage begins at 25MHz, which allows reception of CB and 29MHz amateur FM, up to 1300MHz. There is a gap from 550 to 800MHz missing out some of the UHF TV band of little consequence. The 2001 does not have the upper part so it is a welcome extra and gives access to 934MHz CB, cellular telephones, 1296MHz amateur

and various other services. These coverages are without gaps incidentally, although there are a few sproggies within the range — which are unavoidable in this sort of design with multiple conversion and associated crystal oscillators (primarily the 47.000MHz second local oscillator).

Looking at the front panel, there are some 26 controls plus a headphone socket, display and S meter. The meter is of the bar LED type, with seven green and three red. Its readings are somewhat optimistic though, the first red LED — presumably the S9 mark — comes on at 6uV pd on AM and NBFM. One would like this to be more 50uV for sensible readings. The meter starts reading at around 1uV.

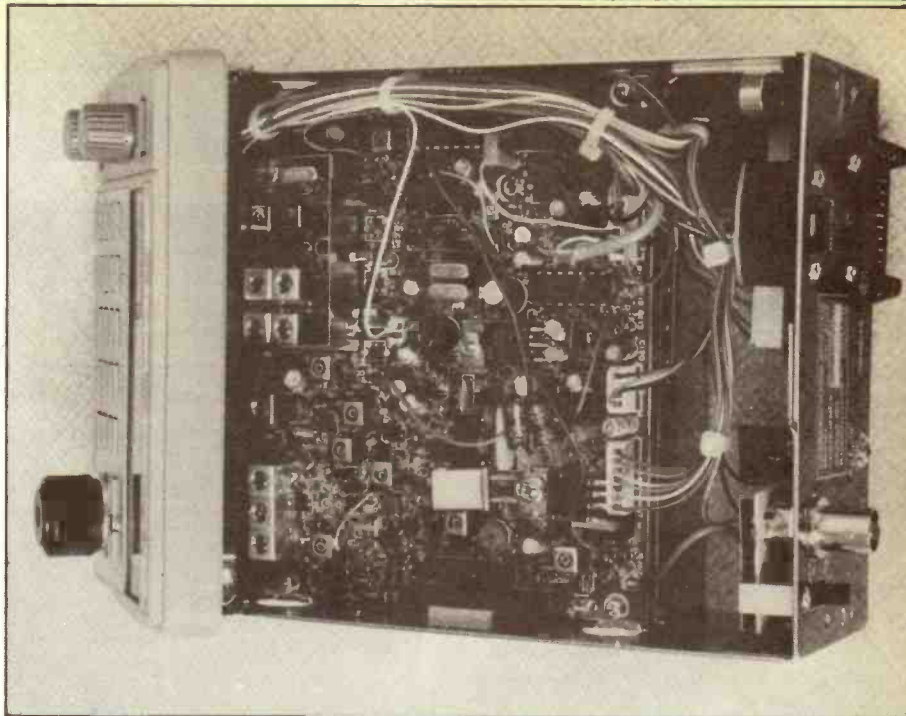
The dedicated LCD display appears to be the same as on the 2001, with frequency, channel number, selectable time, and various annunciators for scan, priority etc. The real time clock will display on request while monitoring a frequency but not while scanning. You can also tell the time when the main on-off power button is off but the rig is still plugged into a power source. The latter can be either your own +12V DC supply, or the AOR mains adaptor. There does not appear to be any reverse polarity protection for the DC supply judging by the warnings of dire consequences in the manual.

Pressing The Buttons

There are the usual rotary controls for volume and squelch, the rotary tuning knob and 22 keys to play with. Twelve keys comprise the numeral entries, decimal point and 'enter', but most also have a second function depending on other buttons pressed. The main less used facilities are for a light for the display, 'key lock' which disables nearly all keys to prevent accidental entries indicated by an LED above the S meter, a clock and 'lockout' used for removing nominated channels from scan sequence.

Three of the numeric keys also select the step rate from 5, 12.5 and 25kHz thus covering most of the used channel spacings. With the double function keys, pressing 'enter' after the specified key selects its non-numeric function. The 'modes' receivable are NBFM, WBFM and AM, again these are a double function on the numeric keys. 'Scan' allows the 20 memory channels to be searched in sequence with 'speed' selecting one of two speeds alterable during scanning and 'delay' setting whether the scan resumes immediately a carrier drops or after a two second delay.

Entering channels into memory is relatively easy. You first punch up the frequency, press enter, after which CH starts flashing on the display, inputting



Inside the AOR AR2002 after removing the top cover. Note the Regency MX7000 will also look like this with its top cover removed.

two digits between 01 and 20 followed by enter transfers to memory, together with the mode and step rate. If you want to miss a channel out of the scan sequence this can be achieved using the 'lockout' button. Any number of channels can be omitted, even all 20 whereupon the display shows 'pass', which seems a bit superfluous.

The other scanning mode is 'search' where a specified band is scanned in whatever steps programmed between lower and upper frequency limits. You can search either up or down in direction using appropriate keys and anywhere within the spectrum coverage.

This facility has one limitation, common to some scanners. If you come across a carrier during search (or scan for that matter), the rig will stay on that frequency until the carrier goes. If it doesn't go away (there are plenty of such carriers around, also possibly receiver sproggies within your specified tuning range) you will have to intervene and press a button to resume scanning. To my mind this is against the whole principle of scanners. You should be able to continuously scan whatever memories or part of the spectrum you want without touching the buttons at all. There are two ways of overcoming this problem, one is to resume scanning after say five seconds whether or not the carrier is still present, or, less satisfactory, as on the FRG9600, to provide an audio squelch where the rig only stops if it detects audio actually present on the carrier.

If you run the 2002 into a computer via the optional RS232 interface (socket on the rear) then this problem could be alleviated by software control of course,

although no other info is provided in the manual.

A 'priority' function can be used to keep tabs on a specific frequency while doing something else at the same time. The priority channel is entered into memory channel 01 when it will be checked every two seconds. There is the usual and unavoidable problem that the rig has to stop whatever it is doing each time the priority channel is checked so that you have brief interruption every two seconds on the non-priority frequency.

In Use

It was observed that rotating the tuning knob also changed the speed while scanning. This was not in the manual but is a useful alternative to pressing the proper button. The fast scan rate is around five channels per second but the precise speed varies depending on whether the micro has to change modes and steps from one channel to the next.

One annoying problem occurs when you are monitoring a frequency dialled up from the keypad or tuning knob. If you then select the clock to check the time, on reverting to frequency display you lose the original frequency you were monitoring. The closest you can get is by returning from clock by using one push of the up/down buttons which will then put you off frequency by one unit of step rate that was present at the time. Using the 'manual' button puts you straight to memory channel 1 instead. If you do want to get back to a previously selected memory channel from the clock position, press enter not manual as the latter will

increment one memory channel on returning.

The 2002 does have memory backup once power is removed from the set totally. This is in the form of one of the special high value (0.47F/5.5V in this case) capacitors now available and is said to give about a week's retention (nearer five days in fact).

Around The Back

This has sockets for antenna (BNC), attenuator (10dB), RS232 interface and DC power (a small three pin type with one lead supplied with open wires at the other end). There is also a socket for an extension speaker, disabling the internal speaker when this is used. A telescopic whip is also supplied for portable use.

The internal speaker is mounted on the bottom section of the case and is adequate for most communications monitoring. However, an external speaker gives much better quality as the frequency response of the internal one is limited inside the plastic housing. The internal AF amplifier is rated for 1W output at 10% distortion.

How Does It Work?

Like the AR2001, the manufacturers do not supply any circuit so not much can be said about it. The first IF is of the order of 750MHz and the second 45MHz, thus giving a relatively sproggie free coverage. The main Rx board is not the same design as for the 2001 and uses the ubiquitous MC3357 for both WBFM and NBFM detection (two separate 3357's) with a Murata ceramic ladder filter for NBFM selectivity.

Looking at the receiver input connected to a spectrum analyser — to see what is coming out and re-radiating back up your aerial — didn't show anything too drastic with spurious radiation generally around the -50/60dBm level, which is negligible. When tuned to around 220MHz there was an output at 972MHz (first local oscillator) at -30dBm which is a little more worrying being at 1uW but is unlikely to cause any real problems.

The sensitivity up to 550MHz and between 800 and 1300MHz agreed with the specification give or take a fraction of a microvolt (less than 0.3uV 12dB Sinad for NBFM). Image and second IF rejection varied from about -42dB down to -80dB+ depending on where you were tuned — the specification says better than 150dB.

The manual supplied was somewhat rudimentary, limiting itself to describing what does what plus a few warnings about not pouring liquid up the extension speaker socket etc. AOR could certainly take a lesson from Icom and Yaesu in manual preparation.

All in all, it did the job it was designed for very adequately. The squelch is effective on all modes and appears to be carrier driven on both AM and FM. There is a tendency for the scan not to stop if the control is too far advanced, but this is not unusual with many scanners. 20 memories was just about enough for my purposes, but others may find more could be useful (easily enough obtained via the RS232). My only adverse com-

ment is the lack of ability to continue scanning after a predetermined period once a signal is found.

The AR2002 has a recommended price of £435. Some caution should be exercised here as some of the imports are not brought in by 'dealer accepted' routes and you may have trouble getting service later. Thanks to Arrow Electronics for the loan of this one.

Regency MX7000



This one provided a surprise on opening the cardboard box — it appears to be an AR2001 under another name but with extended coverage from 800-1300MHz! A look inside the case revealed that the electronics belong to the AR2002. So what we have is basically a 2002, but with a 2001 front panel. It seems a shame that the 2002 panel with its improved pushbuttons and tuning knob couldn't have been used but there must be some valid reason for this. In fact, a new version is on the way which is claimed to have a new keyboard. This will be the 2002, but called the MX8000.

Regency are based in Indianapolis but presumably have these made by AOR. There is no mention of this anywhere other than an obligatory 'Made in Japan' on the rear panel. The AR2001, of course, was reviewed in the August '84 issue so another review of what is basically the same box isn't necessary except for an overview, and the

differences. The control options available are exactly the same as with the 2002 as well.

Frequency entry is via a membrane keypad, rather than pushbuttons as such and this method does not give such a positive feel when keying in. As with the 2002, the numeric buttons are dual function and have the same functions — not surprising as the microprocessor looks to be the same in both. The display is the same as the 2002.

There is no manual frequency control knob which is a definite loss in my opinion. You have to be content with the membrane up/down functions which makes manual stepping a bit laborious. The squelch/volume controls are concentric rather than separate and the lock and light functions are activated by two slide switches rather than pushbuttons on the main keypad. Also, no RS232 interface connection is provided on the rear panel, nor any cut-out/wiring

provided for retrospective fitting. Unlike the 2002, it has no S meter fitted or 'phones' socket on the front panel.

The manual is intended for the Stateside market and has been made up by Regency. It has a few pieces of information which are not applicable to us — some of the frequency band allocations stated are incorrect and of course we run AC mains at 240V or so rather than 120V! The unit will run from an external +12V PSU of the type that plugs straight into a mains socket, but this was not provided. As with the 2002, a telescopic whip is provided. This is particularly useful at UHF if you don't have a resonant antenna — it will give

much better results at above 900MHz than your 70cm beam! The manual also gives the upper frequency limit of the unit as 1.2GHz rather than the correct 1.3GHz.

Needless to say, the measurements came out very similar to the 2002 results. Hence whether you purchase this version rather than the AR2002 depends on whether the absence of a control knob and the use of a membrane keypad worries you; which model you can get hold of; whether you want to wait for the MX8000, and of course, the price.

Thanks to Garex Electronics for the loan of the Regency MX7000.

Icom ICR7000



I suppose that this rig can now be classified as the 'creme-de-la-creme' of scanner receivers and also boasts the highest price, retailing at around £957. It is a much larger unit than the previous two examples and looks more like a 'normal' receiver in its presentation. It does contain its own mains PSU which accounts for much of the size difference. Icom state that this is the 'most sophisticated, continuous coverage receiver' available. In terms of facilities they are certainly correct and I found a need for the reference manual and 'L' plates when attempting to use it a first. Fortunately the manual is to Icom's usual high standards and runs to 36 pages with lots of illustrations and even a full circuit diagram.

For your money, you are offered a receiver capable of tuning 'from 25MHz to 2GHz' according to several advertisements. Such adverts are misleading as the true coverage is only guaranteed from the specification as 25-999.999MHz and 1240-1300MHz.

What you are being sold is a general coverage 25-1GHz receiver, with a crystal controlled converter for the 1240-1300MHz band added on. The section 1000-1239.9MHz missed off. Any extra coverage is obtained by using the converter outside of its specified range. You may be able to receive signals but the sensitivity will be well down. Within these limitations, the user has total control over just about every function found in a scanning receiver plus a few new ones. This is where the manual comes in useful when trying to get to grips with the multi-ability memory functions.

Before looking at these functions, let's have a look at the rest of its features. The receiver can cope with SSB (upper and lower), FM wide, FM narrow, AM and CW. One immediate gripe is that the switch for selecting USB or LSB is on the rear panel! To swap you have to grope around the back for it — then again USB is the most used mode on VHF/UHF.

For the FM modes, you have a choice

of filter bandwidths depending on what part of the world you are in. It comes set at UK standard 150kHz for wide FM and 15kHz for narrow FM. 15kHz is a bit wide really for 25kHz spacing; you could change it for 6kHz using a switch on the rear panel, but this is too narrow for UK use! There is a separate filter for SSB, rather than using the often cheaper alternative of simply switching in the AM filter.

The frequency, memory channel, mode and various other annunciators use a similar display to that used on the TS930/940 series. The white fluorescent digits have the advantage of clarity, easy readability from any angle and in any light and it can be dimmed at night. To the left of the display is the S meter, calibrated up to S9+60dB. One advantage over the FRG9600 (a competitor albeit with less coverage and half the price) is that it has a true analogue meter rather than a lemons and cherries bargraph and is therefore much more useful for comparison. It can also be used as a centre zero frequency meter for FM and is accurate with a +/- 10kHz range.

Frequency Entry

I have often wondered why the keypad layout on scanners cannot agree with that of a calculator. For some reason you always seem to get the 1, 2 and 3 on the top row of the pad rather than the bottom. It takes a bit of mental reorganisation when you use it.

Aside from that, you can punch up a frequency using the keypad followed by enter. To move from there you use the main tuning knob with an appropriate channel spacing chosen from 0.1, 1, 5, 10, 12.5 or 25kHz (all spacings are available on each mode). The basic synthesiser step rate is 100Hz.

For frequencies above 1GHz, you simply enter the frequency digits below 1GHz and then press the '1GHz' button — red annunciator on the display indicates its use. Pressing this button operates a few relays as the UHF converter is switched in.

Memories

There are 99 memories available on the R7000, although I would recommend you store important frequencies only in the first 79, for reasons to be explained. The procedure to store in a nominated memory channel is to first select the memory channel via the keypad. Press the memory channel selector switch (that is, the rotary control itself. I spent some time trying to find the button until I realised that the rotary switch could be pushed in!) This puts up the memory channel (if empty — a blank display). The frequency is then entered from the keypad, the mode is selected and the

'mem CH write' button pushed.

To get a frequency into memory which has been dialled up using the tuning dial is a bit more complicated. First you need to press the 'M set' switch, and while holding this down, select a memory channel number using the keypad. Press the memory CH rotary switch. Releasing the M set switch and pressing the memory CH write button then transfers the indicated frequency and mode into the memory channel. For some reason the manual says that this is a temporary operation but it is in fact permanent. Memory channels can be cleared at any time using the 'clear' button.

Having got a number of frequencies and modes into memory, there are quite a number of things you can do as a result. Recalling a memory can be achieved either by keypad entry or via the memory CH rotary switch. The latter simply steps through all 99 channels in sequence, empty or occupied. Once recalled, the main tuning dial will tune away from the indicated frequency if required. Note that frequencies in the 1GHz+ mode cannot be stored directly in memory as there is no CPU control of the 1GHz selection function.

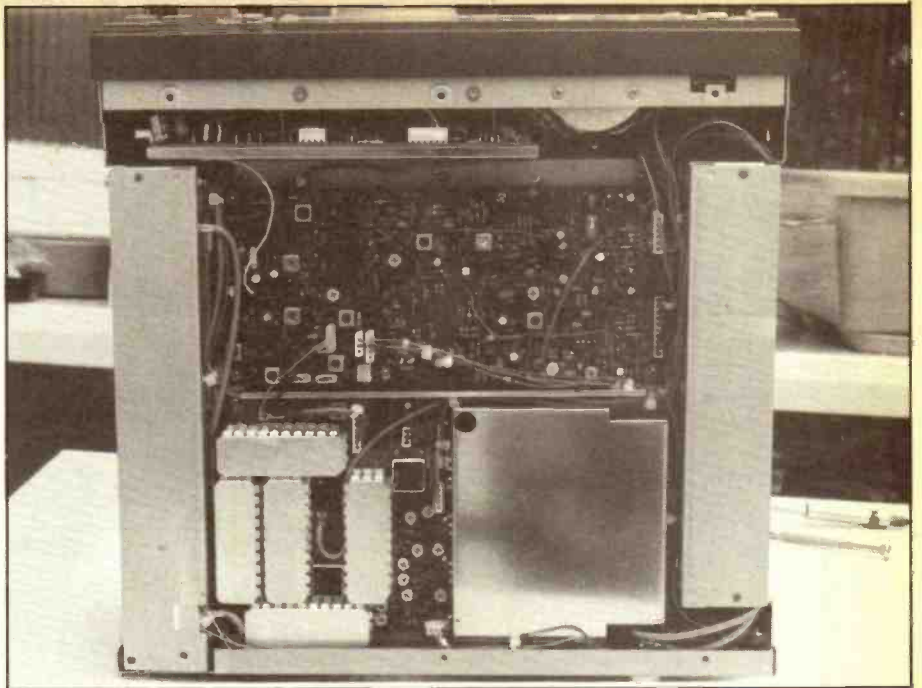
Scanning And The Ideal Control

There are six scanning functions available, the simplest being a straight memory scan in sequence through all written memory channels. The way the scan stops is controlled by three other controls. 'Scan speed' does what it says and is variable from about 2s to 8s with no adverse effects such as channel jumping at the fast speed.

'Scan delay' is often missing on some receivers. This one has four options giving total control. In the off setting, the scan stops on a signal and stays there until the signal goes, then resumes. On 5 or 15, the scan stops for the appropriate number of seconds then carries on regardless of whether the signal has gone. Finally, on infinity, the scan is stopped permanently on the first signal found.

The other control is for signal strength itself. Although all receivers can achieve this by appropriate setting of the squelch control, the R7000 is unique in that as the squelch control is turned clockwise, the S meter eventually starts to increase its reading as well. This enables you to set the squelch against a precise meter reading, below which the squelch will not open.

Last of the general scan facilities enables you to scan whichever mode is selected from the start, so if you start with FM narrow, then memory channels with any other mode are ignored. Possible uses are say scanning airband (AM) channels when you also have



The Icom ICR7000 has a totally different look inside.

amateur FM narrow channels in the memories.

You can also select a number of specified memory channels for selective scanning by appropriate entry following the handbook instructions which are too complicated to explain here. Once this is done, it doesn't affect scan operation in say normal mode when all channels will still be scanned. It is possible to clear the selected memory settings only without actually erasing the memories themselves by using the 'sel-M CL' button provided.

A programmable band scan function is available. This allows lower and upper frequency limits to be programmed into two special, separate memories. The receiver will then continuously scan from the low end to the high end. In conjunction with the 'prog' scan function, the automatic memory scan can cover memory channels 80-99. What this does is to scan between the lower and upper frequency band limits and each time the scan stops, the frequency and mode are automatically programmed into a memory channel, starting at 80 and progressing in single steps. This can be very useful in certain parts of the spectrum especially for monitoring a specified band when you don't know where signals are going to appear. The storage sequence is incremental so that the band can be scanned many times if needed — once filled up to channel 99 the scan will stop automatically.

A Word of Warning

The 'auto' scan feature has one nasty feature. As soon as it is selected, it automatically clears all memories from

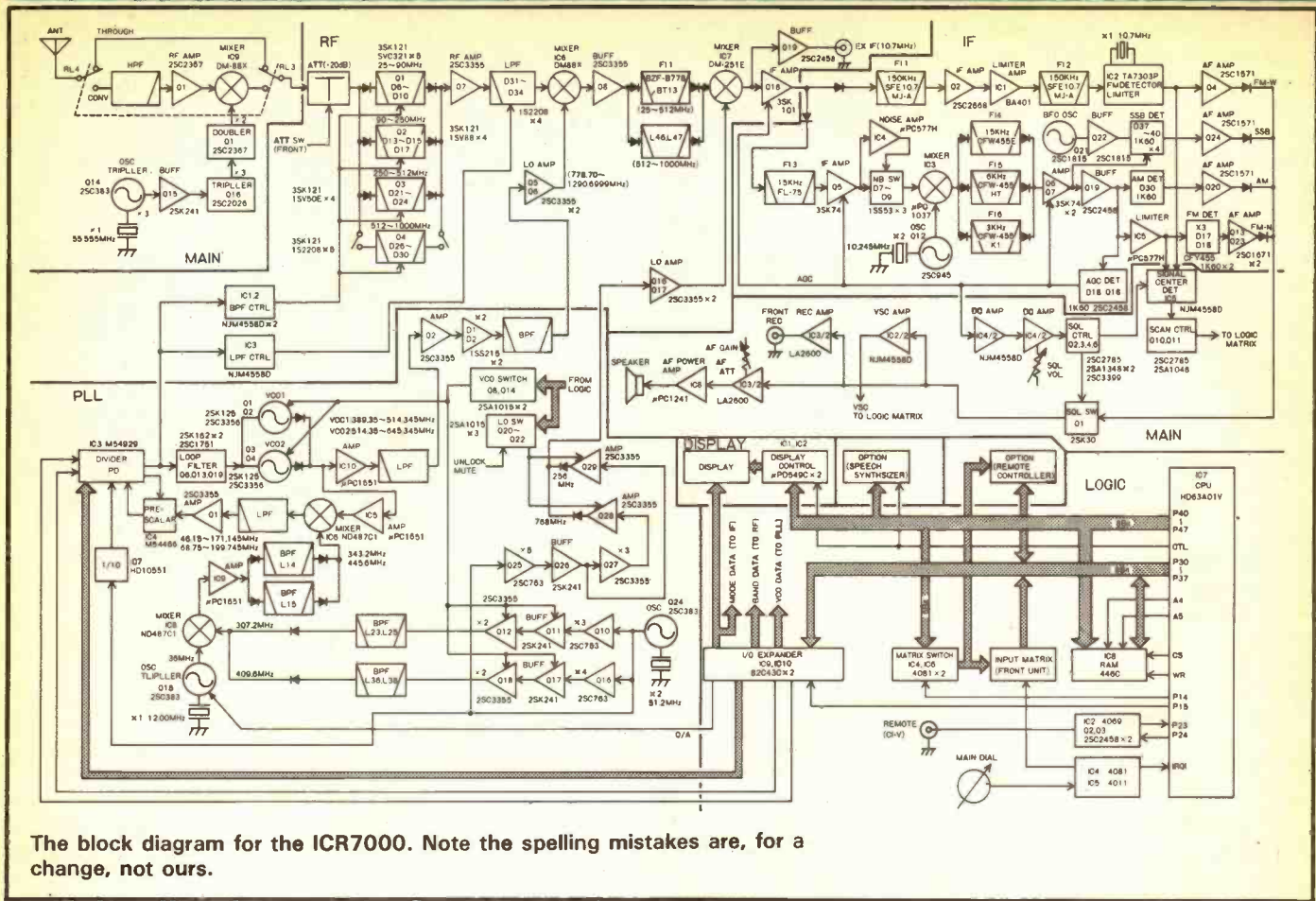
80-99 before starting the scan. The problem is that the button is immediately below that of the normal memory scan select and it is easy to press it by mistake, whereupon you have to re-enter anything that was in memories 80-99. What you should do is to transfer anything from these memories into other channels between 00-79 by using the M set button.

Priority

The usual 'priority' feature is included which lets you monitor a specified frequency every so often while primarily listening to another channel. If a signal appears on the priority frequency the receiver will switch to monitoring that channel. This facility is often rather impractical and the R7000 is no exception.

To give priority, the receiver has to temporarily change frequency in order to check for a signal. In doing so, you obviously get a burst of silence on the original frequency as the receiver only has one IF system to use. If the checking period is short this may not be much of a nuisance but in this case it is about 500ms which, when it happens every few seconds (depending on the setting of the speed control) makes the original signal unlistenable. Once a signal has been detected on the priority frequency, the scan will stop as determined by the delay setting.

The very final scan button has VSC on it which stands for Voice Scan Control. This performs a similar function to the AF scan control on the FRG9600, allowing the receiver scan to ignore frequencies which have carriers but no modulation onboard. It does also tend to ignore weak signals which do have



The block diagram for the ICR7000. Note the spelling mistakes are, for a change, not ours.

modulation but on narrow FM they are generally distorted anyway.

Other Functions

A diode switched pi-network resistive attenuator is provided at the antenna input giving some 20dB of signal reduction when in operation on any mode. Also incorporated is a pulse type noise blander for use on AM and SSB. You can 'lock' the receiver to disable the main tuning knob and the keypad. This does leave everything else available though.

A remote control facility is available as an option but was not fitted. The sensor is above the keypad and is activated by depressing the 'remote' button. Another option is a 'voice synthesiser' which will announce the displayed frequency on command from a front panel button. The installation note does not say anything about it also speaking the memory channel number which would be useful to a blind operator. I in fact doubt that this receiver would be particularly suitable for such a person even armed with the voice synthesiser. The scan functions are quite complex and you really need to be able to actually see what is happening a lot of the time. With no reference available for the memory channel number it would make it particularly difficult.

The usual headphone socket is

provided on the front panel (4-16 ohms impedance). Next to it is a 'record' level output jack for use with a tape recorder.

Rear Panel

This gets quite hot after an extended period of operation (the whole set consumes about 330W) being straight passivated steel with no additional heatsinking. It has a number of switches and sockets. The antenna socket is an N type. The switches are for USB/LSB changing and altering the bandwidth on FM. There is an external speaker socket, RS232 port for external computer control (but with little information in the handbook as to its implementation), a 10.7MHz IF output and a jack labelled 'recorder-remote' which is controlled by the squelch and will turn a tape recorder on when the squelch is opened. If you are using a tape recorder, you can also add information from the voice synthesiser (if fitted) using the 'recorder-speech' switch.

The internal speaker is mounted on the underside of the receiver top cover and provides very adequate audio reproduction. Possibly, on FM wide, the tone is a bit on the crisp side and some form of tone control would have been useful. I am somewhat surprised that we have not yet seen a communications receiver that has stereo and full

bass/treble controls to match its FM wide capability.

How It Works

The block diagram shows the extreme complexity of the receiver. It also shows that someone can't spell with such juicy mistakes such as Tripller and Tliplier.

For signals below 1GHz, there are four switched front end bandpass filters controlled by the CPU, covering 25-90, 90-250, 250-512 and 512-1000MHz. Signals above 1GHz are initially routed through the switched converter, whose local oscillator is at 1GHz, derived from a 55.555MHz crystal, giving a tunable IF of 240-300MHz for the specified coverage of 1230-1300MHz. The converter is preceded by a low pass filter with a cut off probably just below 1GHz.

The rest of the IF circuitry is fairly standard with much use of ceramic filters appropriate to the mode in use. Down conversion to 455kHz is via 10.7MHz for all modes except FM wide which is detected directly at 10.7MHz. The SSB filter is a 2.8kHz at -6dB ceramic ladder type.

For the 25-512MHz section, the first IF is 778.7MHz and for 512-1000MHz, an IF of 266.7MHz is used, in conjunction with a VCO running from 778.7 - 1290.7MHz (actually derived from two VCOs each covering half of this range

before doubling).

The specified sensitivity for the range below 1GHz is 0.3uV for 10dB S/N (taken as S/N+N). It met this quite happily, however I was unable to check its sensitivity above 1GHz.

In Use

Certainly of all the scanner receivers I have seen so far, this must rate as the best, but is also the most expensive. The general presentation, circuit and features show that Icom have taken a lot of care in the design and production of the R7000 rather than opting for converting something else not really intended for amateur or professional use. This receiver will get a welcome amongst professional users for all sorts of monitoring purposes. It has the advantage of full SSB capability to the top of its range with fairly pure recovered audio showing that the PLL noise is under control.

Used with various antennae, including a wide band discone for general scanning, it did very capably all that was asked of it — its major feature being the versatility of the scanning modes. It is possible, after some thought, to set up the R7000 for automatically scanning a whole variety of different options, each selected by depressing only one button.

For instance, you could set up a number of memories holding air band frequencies in AM mode, and select these for scan using the mode scan option. Amateur FM repeaters or simplex channels could also be set up on narrow FM and again scanned selectively using mode scan. If you monitor beacons these could be scanned on SSB (with the aid of the squelch) still via mode scan. You could monitor the whole of 432MHz, say, using prog band scan. Another set of frequencies could be marked using the sel-M scan mode, even with mixed modes.

So far the above example has illustrated that you can scan five completely different sets of memories simply by depressing one of four buttons. On top of this you can scan all the memories at once if you wish. Although the FRG9600 is capable of scanning ten sets of ten separate memories, you are limited to ten maximum whereas with the R7000 you have up to the whole 99 available for scanning at any one time.

With the addition of the RS232 option all sorts of scanning options become possible such as frequency selective monitoring depending on time of day, season etc. For VHF lift fans, one could try monitoring a number of specific stations for an increase in signal strength, then shifting to a completely

different scanning program depending on which stations were showing increases in strength.

Along with the non mode dependent tuning steps, random tuning around could easily be suited to the mode and band in use. With some scanners you are limited to certain frequency steps depending on the mode in use.

I particularly liked the auto memory function, allowing for the slight problem arising if you push the wrong button inadvertently. It enabled me to continuously scan a specified portion of spectrum, then come back later with any frequencies that had been in use automatically stored in the memories from 80-99. If all were full, the scanning stopped and you didn't lose anything. For permanent storage these frequencies could then be transferred to lower numbered memories quite easily. The R7000 has full memory back-up to five years or so.

If you want an all singing and dancing scanner with the widest frequency and mode coverage available and don't mind paying the requisite price for it, then this should be the answer (until something else comes along). Its high versatility with memory functions makes it stand out from the rest of the competition.

Thanks to Thanet Electronics for the loan of the rig.

In Reply

Thanet Electronics have made the following remarks with regard to the Icom ICR7000 review.

The ICR7000 is not a 25MHz to 1GHz receiver with a 23cm converter. Above 1GHz, the signal is routed via a 900MHz (approx) high pass filter to a 2SC2367 broadband amplifier and mixed with 1GHz in a Schottky DBM before being routed back to the normal 25MHz-1GHz input. As there is no band pass filter to define the pass band, the sensitivity is only degraded by the insertion loss-v-frequency of the mixer and gain-v-frequency of the broadband amplifier. Thus the receiver does tune 1025-2000MHz. From 1025-1240MHz, there is minimal loss in performance. Above 1300 for the above reasons, the sensitivity has dropped by typically 3dB at around 1500MHz and 10dB at about 1700. Use above 1300 is not a problem provided normal microwave practice is observed (ie reasonably high gain antennas, mast head preamps and low feeder loss).

15kHz filters are standard for 25kHz channels on all Icom equipment for amateur, PMR and marine use. 6kHz is the standard filter for 12.5kHz channels which is virtually everything other than amateur and marine at VHF and soon UHF too.

The RS232 port is covered by a separate handbook giving full control codes, etc. The book is called the Icom CI-V handbook.

Free Readers' ADS!

FOR SALE

ZX MICRODRIVE, good condition, with manual and Trans-Express tape copier, only £25. Waltham cassette deck, Dolby, working order, £20. BBC Roms, Wordwise Plus, £12. Disc, doctor, £10. Print Master, £10, offers taken. Phone Bookham (0372) 56327 for details.

FDK 750E 2 mtr multimode 1/10w scan, hand mic, plus 10 ele J/beam, long Yagi, £240. Trio 7930, 2 mtr FM, 5/25w mobile/base, scan, hand mic, plus MC55, mobile, safety boom, boom mic, £265. May swap/px for FRG 7700 or similar. Why? Tel Bridgnorth 3790 (Shropshire).

PSU, 0-19v, 5A, protected, £19. 2m quarter wave and mag mount, £5. January 1984 to April 1986 radcoms, 1 missing, 53 Practical Wireless and 24 Wireless Worlds, between Feb 1978 and May 1985, any offers. Free if collected. Blackpool (0253) 45431.

OFFERS invited for DSB80 with case, digital readout and full 160/80 constructional details. 3.5 watts out. VFO drifts. Oldfield, 49 Stansfield Street, Todmorden, Lancs OL14 5EB. Tel Todmorden 6165.

VERSATOWER 60 electric winch, £300. Heavy duty rotator, £80. Two el beam, new condition, £100. FT102 tcvr (FM), FC102, FP102, mint, £700. TS700G, £250. Silver Eagle mic, £45. Sure mic, £20. Ring Rotherham 850517.

FOR SALE, communications receiver, Yaesu FRG8800 with VHF converter and Yaesu FRT7700 antenna tuner, also Yaesu headphones, YH77, all mint condition, 6 hours use only, boxed, £395. Horsham 62882.

PROFESSIONAL Marine Tx/Rx hand held for sale. Motorola four channel FM, including Ch16 emergency. One/five watts. Nicads and trickle/fast charger, vgc, £185 ono, or swap for 2m multimode/FM

mobile or hand held. Steve, 108 Freedom Road, Sheffield (0742) 339896.

FT290R 2 metre including batteries, charger, case, mobile mount etc. Bargain £240. G4ZRG Bill. Phone 051-638 1550 QTHR.

3KW! Kubota generator which has only run for thirty hours. Is again for sale. £495. Can deliver Midlands. Phone 0905 620041 anytime.

QAUD 33/303 hi-fi amplifier, perfect working order, complete with handbook, leads and original packing £150 ono. Davis G3TDL phone Brighton (0273) 506598 evenings after 7 or weekends.

FOR SALE Yaesu FT480R, 100W microwave module linear amplifier, BNOS 30A PSU plus manuals, SWR/power meter etc. Full 2mtr all mode station. All mint condition ideal for new licensee £500. Contact Mr De, Ste, Croix, 46 Nelson House, Grimsby, Sth Humberside DN32 7HH.

TOWER free standing unguaged 58ft heavy duty galvanised steel westower 3HO, framed base plate type, tilts over, winches up and down, fitted with safety winches. £725 ono. Tel: G6DPP on Loughborough (0509) 233318.

CR100 B28 Marconi short wave marine receiver. Excellent condition. SO-239 sockets fitted for antenna and earth, £30 buyer collects. Phone Hull 54299 ask for Paul or call 12 The Paddock, Anlaby Park Road North, Hull.

FDK750 2mtr multimode transceiver 10 watt output, vgc, £230. 0235 815338.

YAESU 757 transceiver excellent condition £550. Yaesu automatic antenna tuner £180. Phone evenings 0277 823434, daytime 01592 7800.

SMALL qty 7104CPL DVM chips (Maplin) normal retail over £8 only £3 each includes p&p. Also ½" displays to suit 4 off £3 incl p&p. All brand new. C Barker, 52 Spode Street, Stoke on Trent, Staffs ST4 4DY.

REALISTIC PRO-2003 programmable AM/FM scanning receiver with direct keyboard entry system, three months old, VHF 68-174MHz UHF 410-512MHz £195. Tel: Kendal (0539) 32395.

WIRELESS World SC84 computer card. PSU VDU 64K RAM CPU, all in working order £100 ono. Tel: 0933 678421 evenings.

FOR SALE FT101E mint condition, DC leads, original packing £275. FC301 switched ATU/power/SWR, mint condition £100. TB1 trapped dipole 8 months old, mint £40. Altai GDO brand new never used £35. Owner going QRT. Manchester 061 794 6536.

FT290R Mutek plus 4KHz coverage from new, nicads, charger, case, vgc, boxed £240 ono. Also pair PF1s, xtalled RB6 £15, 19 set whp aerial base £3. GW4RYK. 068 686 255.

MAPLIN frequency counter for sale 10Hz-600MHz, 8 digit. Mains or battery operation, fully calibrated, variable time gate. With service manual and circuit diagram. Offers around £135. Tel: (0484) 850327 after 6 pm. D. Pratt, 2 Slades Lane, Helme, Meltham, Huddersfield HD7 3RW.

YAESU FT290R vgc, nicads and charger, quick sale required, hence the price, £200. Phone Mansfield 648381 anytime.

YAESU 225RD multimode 2m base station. Mutek board, immaculate condition £550. Yaesu 290R no mods, never used mobile, 18 months old £225. Tel: Chas 01 764 6767.

YAESU FT270RH fitted FVS-1 used very little £285. No offers. Datong morse tutor, 2 months use £35. Tel: 01 514 5998.

KATSUMI electronics keyer model EK150 £50 ono. Alinco ELH-230D linear amplifier 3m 30 watts out, new £45 ono. Tandy pocket computer and cassette interface £30 ono or £115 the lot. Ring Tom 01-348 3336.

FOR SALE Eddystone 840C receiver, general coverage in pristine condition, best offer over £50 secures, also have three QRP transmitters and lots of bits and components for QRP. Write or phone for further details 01-958 6887 anytime.

MARCONI 801B VHF signal generator 12-470MHz, vgc with manual £55. Buyer collects (Harrow Middx). Phone 01-427 1379.

SHIMIZU SS105S. Fully xtalled, 500Hz CW filter,

RF/NB board. Aligned by Lowe. Excellent first transceiver £250 ono. G4OJQ QTHR Cornwall.

TWO ZX81 computers £20 each, ZX81 16K RAM pack £10 or £45 lot. Boat radio 0.1-4.2MHz good for 80 & 160 metres £50. 14 Doverfield Road, Brixton Hill, London SW2 5NB. Mike or Jane 769 6298.

SPECTRUM 48K with Saga keyboard, interface and microdrive. 15+ cartridges, green screen monitor, Alphacom printer and paper. Loads of software, mainly graphics, business, utility with lots on microdrive. With all books and manuals £180. Dyer, Warwick (0927) 491848.

GET ONTO Prestel. Modern (A4 size) self-contained view-data terminal, with built-in full keyboard, RGB/UHF & printer etc, interfaces. Cost £225 — £95 ono. Also Microvitec 4031 RGB monitor with Spectrum interface. Suit above £175. Leave details on 0223 313254.

ICOM IC02E hand held with charger, spare nicad pack and speaker mic. As new £195. Tel: Derby 0332 551945.

PANASONIC HF/Rx 150KHz-30MHz AM/SSB/CW/FM BFO wide & narrow filter, mains or battery, with 2m converter, £160 ono. Rx ATU boxed as new, hardly used, cost £62, £45 ono. Reftec Mk2 934MHz Tx 8 watts output, boxed with mag mount, co-linear £150. £300 the lot or split as above. May take new & boxed RT852 CB in p/x. M Hynes, Flat 1, 3A High Street, Torrington, North Devon.

HAM-INTERNATIONAL Jumbo 27MHz home base, rare opportunity to obtain this rolls-royce of base stations. Limited edition produced as fully legal UK 40 channel FM, 240V. Immaculate, complete with matching Big Puncher desk mic, £100. Phone 0723 862924.

SALE 50w linear amp with pre-amp £40. Ex PMR rig 70cms, 6 channel, 3 in use. 40W output mobile mount. Circuit diagrams etc, £60. G6FDM QTHR. Phone Milton Keynes 613739.

TRIO R600, new October, original packing, not used a lot, genuine reason for sale, £250. Deal (0304) 363687.

FOR SALE, one x 10ft 6in beach caster carbon fibre rod,

one combination fly/boat rod, one surf caster, fixed spool reel, good condition, £20. (091) 4569352 after 6 pm.

FOR SALE, Sony ICF2001 receiver, 150kHz to 29999, AM, SSB, CW, 78 to 108MHz, FM, freq readout, six MF Moray unit, power supply, good condition, £90 ono, also Oric Atmos computer, 48k, m/condition, swap for YR-901 or FRV 7700 (D). York 38660 or 14 Pinfold Court, Clifton, York.

RACAL RA117E communications receiver with KA63 SSB adaptor, in Racal steel cabinet, £300. Plessey ISB adaptor with matching ATU for Plessey PR155G receiver, £150 the two. Two SSB adaptors for B40 receiver, one £30, one £50, B41 receiver, £40. Mr Clarke 0403 (Horsham) 54848.

ICO2E speaker mic charger, new, £200. Trio ATU AT230, new, £120. SM6, £25. Ring Mr Aitkenhead on 0698 (Lanarkshire) 459301 after 6 pm.

TRISTAR 777 multi mode (usb, Isb, CW, AM, FM), ten metre rig, covers 28.000 to 28.890 MHz and 29.300 to 29.700 MHz, £110 ono. Maidstone 63918.

ORIC Atmos programmes and manual, can copy and return. EC55 valve also wanted. Please write to:— Howard Ketley, 1 Tewkesbury Avenue, Mansfield Woodhouse, Notts NG19 8LA, or phone Mon-Thurs after 7 pm (0623) 20990.

DRAKE TR7, PS7 power supply, RV75, synthesized VFO, MS7 speaker, MN2700 2kW ATU, fitted balun Drake desk mic, all filters fitted, aux 7 with three modules, NB surge protector, all in mint condition, £1200. G40OK QTHR. Ring Stuart (0642) 211685.

YAESU 225RD two meter multi mode, Mutek board, excellent condition, £550. Yaesu FT290R, 2 meter multi mode, no mods, £225. Datong morse tutor, £35. Phone Chas 01-764 6767.

AIRMEC, stabilised/variable PSU, 700 volts + LT, £25. Small slope (Cossar) OK, TX monitor, £25. Bendix D/F radios, £20 each. 200+ Wireless Worlds, £25. Loop antenna, £35. Marconi D/F Rx L/M/Short waves, £25. 2 metre cavity w/meter, £15.

Neath (0639) 820356.
TRIO TW4000A 2m/70cms transceiver. Sony ICF7600D receiver (black), both as new. Offers. GM4DHJ, 041-889-9010 (Glasgow).

TOWER, 58ft, free standing, un-guyed, heavy duty galvanised steel Westower, 3HD, framed base, plate type, tilts over, winches up and down, fitted with safety winches, £725 ono. Telephone G6DPP on Loughborough (0509) 233318.

WRAASE SCI SSTV/FAX Rx/Tx unit, latest model, £695. Mutek BD1F107UR 10GHz Tx/Rx Gunn unit, £41. Tokyo Hypower linear, 2 metre, 10w (in), 80w, £95. FP80A (Yaesu) PSU (matches 480/780), £35. Phone Paul (0293) 515201 (evenings).

SPECTRUM slowscan television transmit and receive program, £5. New tape heads, £1.50 each. 9 tubes of heat-sink compound, 20ml, £1 each. 60 stereo 3.5mm jack plugs, only £6. 24 low power 555 timer ICs, only 50p each. P. Goodrum, 9 Ryston Close, Downham Market, Norfolk PE38 9BD.

SSTV transmit and receiver program for the Sinclair Spectrum home computer, no hardware needed. I have received excellent slowscan television pictures using this super program, £5. P. Goodrum, 9 Ryston Close, Downham Market, Norfolk PE38 9BD. Tel (0366) 388615.

ELECTRONIC organ, Jen Allegro, two keyboards, rhythms, synth, auto, Leslie, etc, two internal 30 watt amplifiers, three internal speakers, walnut cabinet, lockable rolltop, as new, bench seat, £450, buyer arranges and pays for delivery. Middleton, 49 Wolseley Road, Stafford ST16 3XW.

YAESU FT480R 2m transceiver FM SBB, as new, £230. ICS Amtor terminal unit for RTTY and Amtor and CW, will work on BBC Vic 20, Cm64, Cm128, excellent condition, can be seen working, £200. Tel 2239171.

TWO 8in Mitsubishi M2896-63 half-height disk drives, both boxed, with technical manuals, £60 each or £100 for both, as new, never been used. Tel Danny after 6 pm, 01-471-0669.

FOR SALE, Yaesu FT757GX, £590. FP757HD PSU, £110. FC757 ATU, £190. Yaesu MD-1B8 desk mic, £40. Yaesu FRG9600 UHF/VHF scanning receiver, £330. BNOS 12v 6 amp PSU, £40. All items mint condition. Tel John G4YDM QTHR 091-4162606.

YAESU FT290/790 optional extras: mobile mount MMB11, £22. speaker-mike, YM49, £12. PTT switch-box, SB2, £10. All as new with boxes, can deliver south east. Phone 07914 2823 evenings, weekends; also I want to swap my FT708 for an IC4E, must be vgc.

LINER 2, 2 metre sideband mobile, mike, power lead, manual, £50. Bedford 214663.

WANTED

WANTED, Nato 2000 good price paid for late model, also FM27MHz hand held. Phone 0283 221870. Also modulator 119-136MHz or any others for FRG7700. Phone 0283 221870.

SWL requires AR88D or reasonably good Rx. Can collect if practicable. Weston-S-Mare 418829 (0934) anytime.

WANTED any very cheap or free 11m multimodes in working or nearly working condition (condition of case etc no matter). For large project. Contact Mr I Graham, 3 Keysoe Rd, Riseley, Bedford MK44 1DE.

WANTED Yaesu FR7 or Yaesu FRG7700 receiver 0-30MHz or Trio or Icom, with AM SSB LSB USB. All letters will be answered, distance no object, details of price and condition please. Mr Richardson, 7 Grange Road, Thornaby, Cleveland TS17 6LT.

WANTED Eddystone 888, 880, 680, model. KW76, 77; Drake 2B. All letters answered, Mr Smith, Hirsts Cottage, Spa Lane, Lathom, Ormskirk L40 6JG.

WANTED circuit diagram for Heathkit GC-1U "Mohican" communications receiver. Expenses gladly refunded. G4IFD QTHR phone 0268 551462.

WANTED Eddystone 888 must be in pristine condition inside and out with accessories if poss. Good price paid for perfect RX. Peter Beavan, 18 Leamington Rd, Davy-

hulme, Manchester M31-2AZ. 061 747 8831.

WANTED FT2, IC22A or other cheap 2m rig, must be working. Phone (0851) 3738, ask for Chris.

WANTED service or operators info for National HRO receiver and circuit diagram for same. All reasonable costs refunded. Copying available if only loaned. John Cottrell, 21 Ryton Grove, Shard End, Birmingham B347RS. 021-747 3940.

WANTED Trio TR2500 h/held with chargers etc. Not too expensive. Have got scanner Realistic PRO2002 might swap or sale. RAIBC member. Phone Bursledon (0421 21) 4333. Hants. Not too far away please. Ask for Syd.

WANTED Eddystone general coverage receiver (0.5 to 30MHz) to compliment models 770R & U. Please phone Fred at 074 378 372 (Shropshire).

WANTED VFO to cover more frequencies than mine which is 25-995MHz to 28-000MHz, to fit CB Cobra 140GTL SSB AM, or preferred, info where to get new or old one. Mr Smith, 15 Little Beck Road, Bridlington, YO16 4AW.

WANTED Datong D70 morse tutor, reasonable price paid. Phone Cowes 294984 evenings.

WANTED Yaesu FT101ZD and matching ATU, will pay for carriage by Securicor or other safe means. Old age pensioner. Write giving price and partic's. Must be good condition without any modifications. Mr Smith 24 Clifton Road, Sharlston Common, nr Wakefield, W Yorks WF4 1AR.

WANTED TV502 2m transverter to suit TS520S and converted 10m FM Tx/Rx in exchange for Icom 260E 2m multimode or will buy TV502 or cash adjustment. C Hughes GODQW, 6 Woodpecker Close, Sundorne, Shrewsbury SY1 4UB. 0743 241191, 09.00-18.00 daily.

WANTED FT790R multimode 70cm transceiver, must be working and in good condition with ni-cads and charger. About £250 please. Tel Ken on 0628 29755.

WANTED urgently SP120 matching speaker for Yaesu 221R, your price paid. Please ring 01 980 3283 after six.

WANTED Heathkit RA-1 or

RG-1 receiver. Mr N Cameron, 16 St Mary's Cres, Westport, Co Mayo, Eire.

WANTED Ham Radio 1983, must be in first class condition. G4MLS QTHR, 01 571 5338 (Also require Jan 85 issue).

FOR HEATHKIT RX SB300, wanted, filter 404-210 3.75kHz AM FL3 filter 404-202 400cps cw filter FSL2 or secondhand SB300 Rx if complete valve compaction, REF 6AS11. Tel Ballymena, Co Antrim, N Ireland 41468.

WANTED Packer 70cms ATU or similar, recent Dx listings (non-USA) call book, old microphones for collection. GW6AYM QTHR. Tel: Swansea (0792) 204146.

WANTED IC402 SSB 70cm Tx/Rx, any condition. Phone 036283 8142 or write to Mr Tye, Inter-Nos, Swanton Morley, Dereham, Norfolk NR20 4NU.

HELP! SOS! Mayday! etc — any info on Malden Electronics digital counter model 7735 and Advance frequency divider type TCD40. Has anyone a pre-scaler for above, any details to Brian Dudhill, 12 Eilam Rd, Rotherham, S Yorks S61 3PQ. (0709) 554665 all reasonable expenses re-imbursed.

WANTED service manual purchase or borrow for Pye VHF signal generator SG1U or any operating information ie frequency range crystal calculations, all postage, copying costs will be covered, also required HC6/U crystals 12.027MHz 12.030 12.037v. Mr Eyles, 41 Bredon Grove, Poolbrooke, Malvern WR14 3JS.

WANTED PSU for Labear LG300 Tx. Also manual or copy for DST100 Rx and SP41 valve for same. P Quested, 252 Barton Hill Drive, Minster, Sheerness, Kent ME12 3LZ.

WANTED Hallicrafters CR50 Rx and small airband Rx made by Sony. Also wanted, front facia for Ham International multimode 2 and volume squelch knobs for MM2, vgc please. John Higgins, 30 Underwood Road, Portishead, nr Bristol, Avon BS20 8PJ. Phone (0272) 845351.

PYE Whitehall control head plus? wanted. Also wanted BE600, BE473, Pye W1SU VHF boot mount pack. Have

Dragon computer plus bit's and pieces. No silly prices please as hard up. Phone 0302 835280 also for sale new radio harness suit Burndepts.

WANTED circuit diagram or p/copy for receiver type RL85, serial no PL451, will pay well for same and all costs. Phone Ron on 061 231 5028.

WANTED, up to £100 paid for Concorde 3, would also consider Nato 2000, must be in mint condition. Phone Glyn, 0492 515021 (home) or 0745 823855 (office), North Wales.

WANTED, Yaesu FT707, also operating manual for Realistic DX-302 receiver. Please write to Mr D. C. Fox, 123 Unett Street, Smethwick, Warley, W Midlands B66 3TA.

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WANTED, Ham Radio Today magazine, December 1984, postage will be refunded. Mr T. A. Barield, 91 Ollerton Road, New Southgate, London N11 2JY.

WANTED, copy of RSGB book Amateur Radio Awards, any condition. Please send details to Mick Hudson, 29 Prioress Road, Canterbury, Kent CT2 8NX, phone Canterbury 458464 (anytime).

WANTED, cabinet for Rascal RA17L. Phone Dublin 607155 or write Tony Byrne, 81 Tritonville Road, Sandymount, Dublin 4, Eire.

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WANTED, 3 element HF tri band beam, TA33, TH3, TB3 or similar, must be in good working order. Also rotator. Phone Nigel, GOASM, 091 5288079.

WANTED, circuit diagrams for Pye U450L and PTC703 base

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WANTED, SK610A or 620A valve bases for amplifier project. Phone Mark on Newton Le Willows 5829 (anytime).

WANTED, Yaesu FV-901DM or FV-101DM digital VFO. Also YO-901 multiscopes with or without bandscope. Phone 0329 284105.

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WANTED, good receiver for HF or VHF bands, must be vgc, money is short. Send full details. Also does anybody want to write to a hopeful amateur? I sit the exam in November 1986. Robert, SB13, PO Box 43, Kirkcaldy KY1 2YY, Scotland.

WANTED, data, h/helds, transceivers, Burndept UHF BE357 Mk 2/1S, also Dymar type 885 UHF transceiver circuits, manuals, conversion data, also present addresses of Burndept & Dymar. Your prices paid for data. F. Eyles, 41 Bredon Grove, Poolbrook, Malvern WR14 3JS.

WANTED, tuning dial, Eddystone type 898 or anything similar for home brew receiver, even an old non-working receiver with good dial. Phone Lincoln 46798

(after 6 pm), ask for Charlie. **CIRCUIT** diagram required, Sommerkamp FT250 or Yaesu FT200, original or readable copy, costs and postage returned. Phone Radley Heath 69094.

WANTED, any or these scanners secondhand, SX-400, Regency MX7000, FRG-9600, AR2001, AR2002. Write to Michael Clarke, 220 Edenbeg, Craigavon, Co Armagh BT65.

WANTED, alignment data for ex-RAF R1132A VHF receiver. Phone 0892 30131, Russ Bareham, 16 Delves Avenue, Tunbridge Wells, Kent.

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SWAP my Westminster W15U, boot mount, converted 70cm, six crystallised FM channels and/or boxed Spectrum 48K with cassette software, books, both vgc, for VHF/UHF scanner or HF Tx/Rx. Phone Peter, 01-995 3578 (Chiswick).

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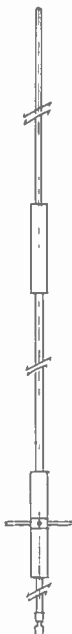
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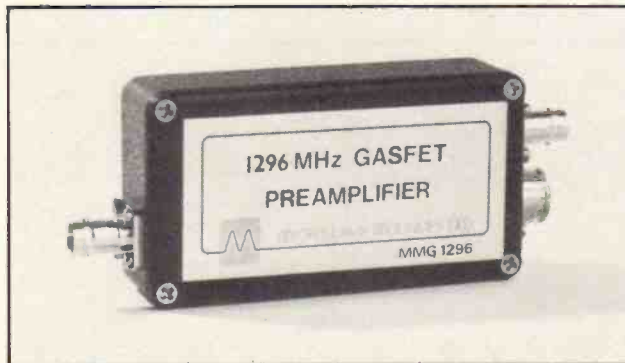
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