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DECEMBER 1984

RADIO

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TODAY

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DXpedition?

The Old 5m Band
— a 'Radio Yesterday'
special feature

Peter Metcalfe, G8DCZ,
investigates 70cm 'mobile' and the
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IARU LOCATOR
OVERLAYS





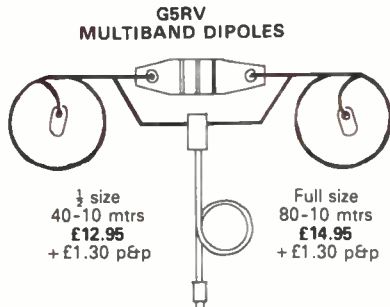
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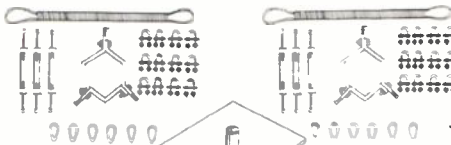
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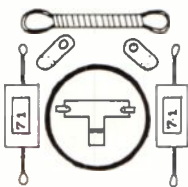


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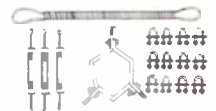
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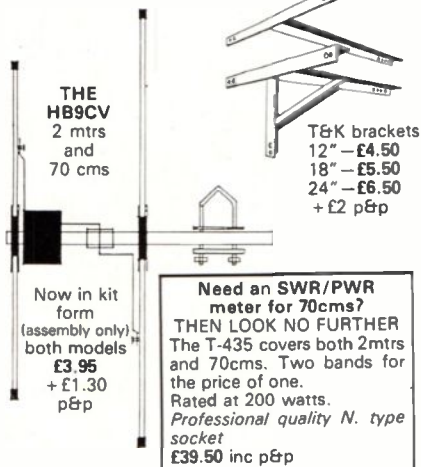


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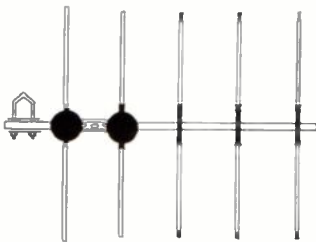
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Due to production difficulties we regret we are unable to bring you the Project Omega 100W RF Amplifier this month.

LETTERS

MAIDENHEAD RQA?

Sir, I have read you contributor (Old Cheshire Tom) on the Maidenhead QTH (Not QRA) Locator with some interest, and am sorry that your Table 1 may have mislead some readers. The first two indicators, representing the major fields are correctly referred to as being "letters" but your table has printed them (apart from J) as figures. I almost feel that a repeat of the Table, correctly set up, might be of advantage.

His final comment about "it is not yet really possible . . . etc." is hardly fair to the originator of the system. The 576 squares (AA — XX) are quite easy to determine, remembering only that AA is a square of 5 minutes longitude and 2½ minutes latitude east and north of, say, 4 degrees W. Long and 50 degrees N. Lat. It is even easy to determine one's final two letters by investing in a map such as Bartholomew's National Map series 1:100 000. The whole of Great Britain is covered by 62 separate sheets, and the advantage of these maps, compared with any of the Ordnance Survey series, is that they are provided with ruling at ten minute intervals for both Latitude and Longitude. It is easy to interpolate the 5 minute longitude by halving the distance, and the 2½ minute latitude by means of an accurate rule.

Just two words of warning: i. it is not an easy computer job to convert XK55E to IO70KG, remembering that the computer will only give you the mid point of the relative squares in any case and ii. it is imperative that the exact latitude and longitude are necessary to be sure that one's new locator is correct. Many quite small towns in Cornwall are in at least two squares, and parts of Newquay feature in four of the squares!

A final point about the Bartholomew Maps: while I do not know whether the smaller squares will be identical through the UK, they will measure about 7cms by 5cms which should be sufficient for the station to be reasonably sure of his location!

Ron Ledgerton, G2ABC

In Table 1 of 'Through My Filter', the first indicator of the new squares which are indicated as 1 should have been I. This was a simple typesetting

error, which should have picked up by the article's editor — for which I apologise. If you have brought this issue, you will have found a series of Grid Overlays to suit 'The Penguin Map of the British Isles'. The combination of the two should enable enthusiasts to find new IARU QRA locators the length and breadth of 'Gran Britannia' and Eire, with some considerable accuracy.

You seem to have some ability as a proof reader Ron, I could offer you a position, unpaid of course . . .

Incidentally, the code QRA (What is the name of your station . . . my name is . . .) has been misused, nay re-interpreted for some 15 years now. Words and phrases often change their meaning over a period of years, for instance the meaning of the word 'sentiment' is radically different from the time of its coining in the 18th century. Why should 'Q' codes be exempt . . .

CHARITABLE AMATEURS

With reference to the letter in the October edition from John H. Clifton (Whisky Sierra 96).

As the Chairman of the QTI Talking Newspaper Association, which provides reading to over ninety blind radio amateurs around the world, a service which provides three hours reading each fortnight, I can only give credit to members of Amateur Radio Clubs all over the country.

Our service is incredibly expensive — the Radio Amateur Invalid and Blind Club have very kindly provided us with two tape recorders of a very superior quality and one radio dealer made up the takings from a collection made at a rally to buy us a high quality tape recording machine. Other dealers provided over £400 some three or four years ago to buy a fast copying machine for QTITNA. By means of the "underground" another set of fast copying machinery, worth at new prices over £5,000, was provided to us at a cost which exactly matched the small amount in our funds at the time.

One of the most surprising things in this "underground" charity are the number of sighted Radio Amateurs who adopt a Blind Radio Amateur and provide them with the necessary tapes and pouch to use QTITNA either by a small donation or actually

purchasing them for the Blind Radio Amateur and sending them off on their behalf.

There are a larger number of Radio Amateurs who, quietly and without any publicity seeking, record on to tapes for Blind Radio Amateurs to listen to in their own homes. There are to my knowledge about four organisations of this kind operating in the United Kingdom, of which we are perhaps the largest Technical Service.

When we are really tight on funds, we find that Amateur Radio Clubs will let us take up a collection, and we're usually invited along to the rallies at our local radio clubs. Yes indeed, Mr Clifton is correct, he has never read in Amateur magazines about Amateurs doing this kind of work, because by and large, they are a quiet bunch, and they tend to do their fund-raising and charity work quietly, "underground."

If anyone wants to join QTITNA, particularly those who've got a decent tape recorder, a little bit of technical knowledge, and not necessary the use of their limbs or a lot of cash in their pockets, contact us here. We can give them tapes, postage and articles to read, which will then be assembled into a Magazine which will then be distributed all over the world. We are particularly interested in anybody who feels that they can put some meaning into their particular specialist part of the hobby, be they DX'er, constructor or just an electronic hobbyist.

John F. Feeley, Chairman QTITNA, G4MRB

CONVERTING 'ILLEGAL' CB SETS II

Sir, I was intrigued by the mathematics which Basil Spencer used in his article "Converting Illegal CB Sets to 10m" (August edition).

Using the worked example to demonstrate the use of a 21.5MHz crystal in the band selector function, he assumes that the VCO would still start at 17.555MHz for channel 1 on Band 1 to give an input/output frequency of 28.3MHz.

If this was so then the input to the programmable divider would be 21.5 - 17.222 = 3.945 (ie 2.55 - 2.11MHz) which would be outside the range which the programmable divider would accept. Surely the VCO

would have to move up in frequency, unless I have missed a vital point?

I think the more usual relationship for this kind of loop is:

$$f_x = (f_c + f_{if}) \div 2 + (f_{prog\ in} \div 2)$$

where f_x = Band selector xtal frequency

f_c = Wanted input/output frequency

f_{if} = 1st IF frequency

$f_{prog\ in}$ = Programmable divider input frequency

Rearranging for f_c , this would yield a value of f_c (channel 1) for the 21.5MHz band selector crystal:-

$$\begin{aligned} f_c &= 2f_x - f_{prog\ in} - f_{if} \\ &= (2 \times 21.5) - 2.55 - 10.695 \\ &= \mathbf{29.755MHz} \end{aligned}$$

If we now wish to specify the three crystals to cover

1. 28.36 to 28.8 MHz
2. 28.81 to 29.25 MHz
3. 29.26 to 29.7 MHz

these become:

20.8025 MHz

21.0275 MHz

21.2525 MHz

I would like Mr Spencer's comments on this.

J. Tournier

Basil Spencer, G4YNM replies: *For the rig I used in the example (Ham International Concorde), the VCO internal frequencies do not vary outside the range of 17.555 MHz to 18.445MHz when a crystal change is undertaken. The frequencies of the VCO for these three bands are shown below.*

Band 1 17.555-17.995MHz

Band 2 17.780-18.220MHz

Band 3 18.005-18.445MHz

Thus when the rig is on channel 1 of band 1, the VCO runs at 17.555MHz and if fitted with a 21.5MHz crystal has a high local oscillator of 39.055MHz, which is mixed with the 10.695MHz 1st IF to give a Tx frequency of 28.360MHz.

The second output from the mixing (of the VCO at 17.555MHz and the crystal at 21.5MHz) is at 3.945MHz for this channel and band. This is not outside of the range that the Programmable Divider can handle. The 3.945MHz is fed into the Programmable Divider, and the one fitted to the Concorde has nine binary inputs (Pins 7 to 15) equating to a maximum divide by N of 5 11, although some of the pins are permanently held in one logic state of the other and only six being actually varied by the channel selector (divide by 0 giving infinity).

This means that the maximum input frequency to the Programmable Divider must not exceed 5.11MHz, which would be given by using a crystal of 23.115MHz for Band 3 covering 30.425MHz to 30.865MHz,

well outside the limit. Bearing in mind that, as the channels go up, the divide by N comes down — so that in the fortieth channel, the divide by N would be 467. This is the theoretical maximum that a CB set can go up to without resorting to divide-by-two chips to halve the input to the Programmable Divider. In reality it may be somewhat hard to get a CB to go up to the 511 limit, it is certainly not at all difficult to get them up to 29.7MHz!

Therefore, the formula given in the article for calculating the crystals that are required is entirely sound, and the crystal frequencies given for the said coverage shown are correct in respect of the Ham International Concorde, I trust that this clarifies the matter.

NOVICE CONTROVERSY

Sir, I was pleased to see in the "Letters" section of your October issue how you have dispelled (or tried to) the illusions held by Mr. Clifton, "Whisky Sierra 96".

This gentleman does not know much about the American scene either — there are in fact five classes of licence, Novice, Technician, General, Advanced and Extra, not eight as he states. I am surprised you did not point this out also.

One imagines that Mr. Clifton, in addition to having troubles passing the RAE, cannot handle morse very well either. Perhaps he thinks that if he passed a halting 5wpm "Novice" test this would mean easy access to some of the HF Spectrum.

Is it not time that this "Novice" nonsense was squashed once and for all? Let this vociferous mini-minority accept the world as it really is and, by guts and determination, and a little hard work (that's the part they don't like) obtain their 'A' licences.

Yes, many amateurs appear stand-offish, by the same token many beginners alienate themselves by pretending to know things about which they have no experience.

EG Allen, G3DRN

PIE IN THE SKY?

Sir, With reference to the photograph and caption on page 10 of HRT for October 1984, regarding the intention of Frank Ogden, G4JST, to make 2m FM contacts whilst airborne in his 'Micro-lite'. I fear that if he does so, he may well be in breach of his Amateur Licence A, in particular Section (2)(a) which states — 'The Station shall not be established or used in an aircraft or public service vehicle'. As the holder of a PPL for hot-air balloons, I have always been aware of this restriction, as balloons, in common with powered hang-gliders,

are registered as aircraft. While this may not at first appear to be relevant to non-powered hang-gliders, which are not registered as aircraft, it may also affect them. Ian, G4MWD, a fellow member of the Horsham Amateur Radio Club, made telephone enquiries via Waterloo Bridge House a year or two ago, when he was planning to use his 2m hand-held while making a free-fall parachute jump, but was told that it was not worth pursuing, as permission would not be granted. Mike, G4LAP, another member of HARC, also entered into correspondence with the Home Office a while ago and received the same message.

From my own, admittedly very cursory, enquiries I have gathered the impression that, as soon as your feet leave the ground under the influence of any aerial conveyance — powered or otherwise, you become subject to other sections of the Wireless Telegraphy Act, the provisions of which appear to be administered by the CAA. (Incidentally, all the foregoing remarks also apply to CB operators).

Now, it may be that Frank has applied for and been granted exemption from those provisions, in which case he presumably isn't liable to be the recipient of one of Jack Hum's 'pink tickets'. If he has been granted exemption, I for one would be interested to discover what paperwork is involved, as I would love to take my IC2E up in my balloon and operate /AM. Unfortunately, I don't believe that there is such a mode available in the UK.

There is always the possibility that the caption was a 'wind-up', in which case the joke is on me, but you have at least discovered the identity of one of your regular readers!

CJ Smith, G4NUX

I regret that you are quite correct — amateur radio operation from a 'Micro-lite' would indeed be illegal. According to the CAA, a Micro-lite is classified an 'aircraft' and therefore operation is illegal under Section (2)(a) and Frank's plans therefore scuppered. (Shamel) That being said, operation from a balloon or a parachute would seem to be quite legal: neither is categorised as an aircraft by the CAA as far as I am aware — they are certainly not usually 'public service vehicles'! (If you were licenced to give commercial rides in your balloon, then the latter could be said to be true. . .)

As far as I can see, no permission is required from the Home Office for private balloon or parachute operation under the terms of our licence, although operation in close proximity to an airfield would clearly be foolish.



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FIF-80	Computer interface N.E.C.	105-00	NC-11C	Charger	10-35
XF-8-9HC	CW filter (600 Hz)	29-50	CSC-1A	Case	4-45
XF-8-9HCM	CW filter (450 Hz)	29-50	YM-49	Spkr mic	19-25
XF-8-9HCN	CW filter (300 Hz)	29-50	YHA-44	¼ wave helical antenna	7-00
XF-455MC	CW filter (ceramic)	49-00	YH-1	Headset mic	15-75
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FP-757	Switched mode PSU - 50% duty	145-00	YM-49	Spkr mic	19-25
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MMB-20	Mobile mount	18-50	NC-7	Base stn. charger	34-65
FT-77	HF transceiver 8 band mobile/base 100W	507-55	NC-9C	Standard charger	9-20
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FTV-2M	2m module	119-00	FNB-2	Battery pack	23-00
FTV-70	70cm module	241-00	FBA-2	Battery pack adaptor (NC8A-NC-7)	3-65
FTV-4M	4m module	95-00	FT-703R	70cm handie thumbwheel tuning + FNB-3	TBA
MU-77	Marker unit	10-84	FT-703R	70cm handie thumbwheel tuning + FNB-4 (Accessories as for FT-209 - FT-203R)	TBA
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SAT-726	Duplex module	99-95	FRV-7700/E	VHF converter	94-25
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MMB-11	Mobile mount	28-19			
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CSC-1A	Case	4-45	RSL-145GP	2m 5/8 λ ground plane	24-75
YHA-15	Helical antenna	5-65	RSL-435GP	70cm 5/8 over 5/8 λ ground plane	36-25
YM-49	Spkr mic	19-25	Mobile	Stub mast RSE-2A	4-95
YH-1	Headset mic	15-75	RSL-3-5	80m mobile whip	13-85
SB-2	Switching unit	14-50	RSL-7A	40m mobile whip	13-50
MF-1A3B	Mobile mic	18-95	RSL-14	20m mobile whip	12-99
FT-230R	2m mobile 25W FM	269-00	RSL-21	15m mobile whip	12-75
YM-49	Spkr mic	19-25	RSL-28	10m mobile whip	12-45
MF-1A3B	Mobile boom mic	18-95	RSM-2	Gutter clip for above	12-45
SB-2	Switching unit	14-50	RSL-145S	2m 5/8 λ whip	10-50
FT-209R	2m synth FM handie 350mw/3W	239-00	RSL-150SS	2m 1/4 λ whip	4-25
FT-209RH	2m synth FM handie 500mw/5W	259-00	RSL-435S	70cm 5/8 over 5/8 λ whip	17-74
NC-15	Base stn charger/adaptor	49-94	RSM-3R	Gutter clip for above	9-25
NC-18	Standard charger (FNB-4)	10-35	RSM-4M	Mag mount for above	15-00

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YC-500S	Frequency counter	270-00	FF-501DX	Low pass filter
YP-150Z	Dummy load wattmeter	103-95	LB	Log book
SP-55	Mobile ext spkr	16-50	QTR-24D	World clock
FtC-5	Leather case FT-208/708	32-57	YH-55	Headphones
DCL-0NE	DC lead FT-0NE	10-84	YH-77	Headphones (lightweight)
DCL-480	DC lead FT-480R	6-55	MU-7700	Memory unit for FRG-7700

T.E.T. antennas

HB23SP	2 element tri-band beam 10, 15, 20m	172-50	MV5BH	Vertical antenna 10, 15, 20, 40, 80m	76
HB33SP	3 element tri-band beam 10, 15, 20m	231-50	MV3BHR	Vertical antenna 10, 15, 20m + trapped radials	95-50
HB23M	2 element tri-band beam (mini) 10, 15, 20m	169-50	MV4BHR	Vertical antenna 10, 15, 20m + trapped radials	95-50
HB33M	3 element tri-band beam (mini) 10, 15, 20m	230-00	SQ22	Double quad 144 mhz	58-95
MV3BH	Vertical antenna 10, 15, 20m	49-95	SQY06	Swiss quad/yagi 144 mhz 6 element	45-75
MV4BH	Vertical antenna 10, 15, 20, 40m	59-49	SQY08	Swiss quad/yagi 144 mhz 8 element	52-74

ATU's

HC-200	HF bands ATU 200W PEP	82-95
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HL-110V	110W 2m linear	179-95
HL-160V	160W 2m linear 10W input	244-52
HL-160V25	160W 2m linear 25W input	209-73

Linears UHF

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HL-90U	90W 70cm linear 10W input	268-59

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HK708	Hand morse key with A.B.S. base	13-67
HK707	Hand morse key with A.B.S. base and dust cover	14-48
HK706	Hand morse key with A.B.S. base and dust cover	15-60
HK705	Morse key with A.B.S. base	14-60
HK704	Morse key, A.B.S. base, dust cover	18-97
HK702	Morse key, marble base, dust cover	29-65
HK808	Morse key, heavy marble base and dust cover	39-00
HK802	Polished brass key with weighted wooden base	82-00
MK704	Squeeze key heavy base required	12-76
MK705	Squeeze key on a heavy marble base	23-78
COK-2	Code oscillator for practice	7-99

Toyo meter

YM1X	3.5-150 MHZ 120 watt SWR/PWR meter	18-80
T430	145/430 MHZ R.F. Thru-line watt meter, 120W	44-65
T30	30 watt 3.5-500 MHZ dummy load	8-05
T100	100 watt 3.5-500 MHZ dummy load	28-18
T200	200 watt 3.5-500 MHZ dummy load	42-26
T435	145/430 MHZ R.F. Thru-line watt meter, 200W	49-35

Baluns

BL40X	50 ohm-50 ohm 1-1 Balun 1 kw pep	14-90
BL50A	50 ohm-50 ohm 1-1 Balun 4 kw (pep) 2 kw (cw)	18-69

SA450N	2 way antenna switch, 'N' connectors	16-66
SA450M	2 way antenna switch SO239 connectors	12-65
RF2000	2 KW, 3.5-150 MHZ SWR meter	19-50
5M	PL259-PL259 patch lead 50 cm	2-24
8M	PL259-PL259 patch lead 80 cm	2-36
5MM	PL259-PL259 patch lead 3-8 m	2-99

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RADIO TODAY

Yo Ho Ho . . . And A Bottle Of Sawdust

Many radio enthusiasts have an interest in the pirate radio scene, which, after a lull in the late seventies, is now booming, particularly as the present government show very little interest in extending the existing commercial franchises. There is also considerable annoyance about the lack of true 'community radio' in this country, aggravated by the free and easy situation existing on the other side of the Channel. Many local communities and most minority groups in this country have little voice in existing commercial and BBC stations.

An interesting story recently reached the HRT News Desk of a radio amateur who had been involved on the fringes of 'offshore radio' for some years. We thought that readers might find this of interest. Before the Editorial staff are accused of condoning pirate radio, we would like to point out, as does the story, that the gentleman concerned may have lost a large sum of money through his involvement with this. No, not through the Law Courts — it seems that 'pirates' are not always keen on paying their bills. You are invited to draw your own conclusions. . . G3ZZD

Paul Rusling, a licensed amateur,

Paul Rusling, seen here holding a tape of the last minutes of the Dutch pirate, Radio Veronica.



self-confessed "radio junkie" and one-time disc-jockey on Radio Caroline, has mixed business with pleasure more than once in the clandestine world of pirate broadcasting reports Steve Anderson, G6VBU.

Paul's latest venture involved helping to set up Britain's new offshore station, "Laser 558", which beams Top 40 material and 'golden oldies' from a former survey ship anchored in international waters off the Thames Estuary. But his forays into pirate radio began in a much smaller way when, as a teenager, he lent a hand(!) in launching a 50-watt 'rag station' for students at the University of Hull. The year 1967 also saw the young Mr Rusling compiling a petition aimed at saving his native Yorkshire's only commercial radio station, Radio 270, from the clutches of the Marine Broadcasting (Offences) Act.

Paul lost that particular battle, as did the station itself, Radio London and countless other individuals throughout the land. The legislation, coupled with earlier legal action and threats, consigned a lot of dreams to a watery grave! But Bridlington-born Mr Rusling, who later went on to study radio engineering and pass the RAE and to own a successful taxi company in Kingston-upon-Hull, has never been one to concede defeat without a fight. Government action or not, he has always been determined to maintain his particular, direct interest in offshore radio.

He spent some time in the 1970s spinning records aboard Radio

Caroline's longest-serving base, the MV Mi Amigo, which founded in the English Channel earlier this decade. Caroline returned to the airwaves in August 1983, in readiness for its 20th anniversary earlier this year, but it was that station's new neighbour, "Laser 558", which played a much larger role in Paul's career as a broadcasting consultant. Employed by representatives eager to set up the new operation, but who were lacking the contacts and technical skills, he helped to secure the Laser ship — the 490-ton Gardline Seeker, which was subsequently renamed the MV Communicator — and to build and test the twin 25-kilowatt transmitters.

But, by supervising the RF and studio installations while the vessel was being fitted out in Florida, Paul says he has not contravened British law. . . which could account for his willingness to talk to journalists about his experiences! In addition, G4LBC's connections with the project were severed before the station went on the air in the spring, although Paul's voice has been heard on Laser, courtesy of pre-recorded tapes.

Despite his pride in having helped to establish the station, however, Paul has had serious misgivings about its management and method of operation. Paul claims he is still owed some £7000 for his work on the Laser project. Laser itself has provoked extensive inquiries by the British authorities and a crop of complaints from other broadcasters at home and abroad. The aforesaid to one side, Paul's amateur radio activities have certainly been enlivened by his 'professional interest'. "I can't go on any of the local repeaters without being asked for the latest news from the North Sea," he told me. "Everybody expects me to know what's happening."

"Let's face it, though. If there weren't any pirates there would be nothing exciting for the Radio Investigation Service to do!" (*Hmm. . . Ed*)

Paul is hoping to recoup some of his losses from the publication of a book simply called "The Lid Off Laser 558". This tells the inside story of the station's conception and birth.

Mr Rusling, a publican, believes the volume's detailed contents may have been the reason for an arson attack on his 'Punch Tavern' in mid-September(!) Fire reportedly caused £10,000 worth of damage to the premises and Kent police are said to have taken away an oil can recovered from the scene of the blaze. No-one was hurt in the fire, which has led to the tavern being closed for more than a month.

Undeterred, with the losses covered by insurance he has continued to sell his Laser exposé. "It has sold over 1000 copies in the first three weeks," he told me.



Roger Whitehead, G3ZUK, and Dr Tim Cole, G4RHQ, of the Dunn Nutrition Unit watching the AMTOR terminal in action.

AMTOR And ICS To The Rescue

The Medical Research Council's Dunn Nutrition Unit in Cambridge has been a licenced amateur radio club station, G4DUN, since 1976. Part of their work involves research into malnutrition and the Nutrition Unit have a research station in Keneba, an isolated village in The Gambia, West Africa.

The radio link is apparently invaluable for keeping in touch with colleagues in Keneba, both for maintaining morale in difficult circumstances and for helping out in the occasional crises that blow up there. Last year, for example, an epidemic of the potentially deadly disease, meningococcal meningitis, was averted by the Dunn unit being able to obtain drugs from France and send them to The Gambia, *on the same day as the disease was diagnosed in the village.*

The Club station is run by the Unit's director, Dr. Roger Whitehead, G3ZUK, C53U and previously 5X5NA in Uganda, (right in the picture) and Dr. Tim Cole, G4RHQ (left); also newly licenced in Cambridge is Dr. Chris Bates, G1DAR. Six other members of staff have had Gambian callsigns at different times, the current holders being Dr. Bill Lamb, C53EE, and Dr. Mark Lawrence, C53EW.

Until last year they had daily voice skeds between the Dunn and Keneba using a Yaesu FT101ZD at each end, but with the drop in sunspot activity the skeds became more and more difficult. The purchase of two ICS AMT-1 AMTOR units in May last year (one for each end) has seemed to transform their radio contacts. Previously, anything factual had to be repeated several times, where as with the AMTOR unit, information typed in at one end only ap-

pears on the sender's screen when it has been received at the other end. All the uncertainty about whether or not the message was copied correctly vanished with the change to the AMTOR Mode.

The two AMTOR units, connected to BBC Model 'B' micros, are left on standby during the day, so that either end can call up the other whenever necessary. The Dunn uses selcal GDUN, while Keneba is selcal CCEE or (when Bill is on leave) CCEW. They can usually be found on 21.110 kHz, so give them a call!

'ere John, Got A Rascal?

A new group has been started to bring together radio amateurs who own and use communications equipment made by Rascal. Large numbers of RA17/117 receivers and ancillaries have been available for some time in the surplus sales and at various emporiums. In order to share information and knowledge of Rascal equipment, a group of enthusiasts banded together and recently brought out their first quarterly newsletter.

The newsletter tries to give advice on the continual problem of any older equipment — where to obtain valves and spares — as well as a feature on SSB/ISB adaptors and a section giving lesser known information about the equipment.

So far the organiser, Peter Barker, G8BBZ, has had 45 enquiries from outsiders and hopes that more will come along as the word goes through the grapevine — which, of course, is the idea of this piece. For more details of the group and newsletter, contact Peter at 8A Alwyne Place, London, N1 2NL and enclose an SAE.

TAU Try Ready Made

Following on from their successful launch of their range of ATU kits at the RSGB Amateur Radio Convention at the NEC earlier this year, TAU are now set to launch a new addition to their range. The venue will be the Leicester Amateur Radio Show on Friday and Saturday 26/27th October at the Granby Halls, Leicester.

In response, apparently to both public and trade requests for a cabinet finished ATU "with all the features that operators now demand", TAU instigated a development programme, reportedly investing "very heavily" in their new product, the SPC-3000.

The SPC-3000 uses a design based upon the classic "Super Transmatch" from the American ARRL Radio Amateurs Handbook and features 'transmitter type' wide spaced capacitors rated at 5kV (and tested to 7kV); 'roller coaster' inductors; built-in 4:1 balun, rated at 1kW; a switched Tx input, either direct to the antenna or via ATU; switched 5 position ATU output ie balanced, unbalanced etc and twin



TAU SPC-3000

meter SWR/Power meter. The SPC-3000 also exhibits TAU's commitment to producing high quality ATUs which are also aesthetically pleasing (see photo). Retailing at £349.95 including VAT this may be obtained direct from TAU (carriage is extra) or from "authorised retail dealers", such as SMC or Amateur Electronics UK.

Repeater News

From the Central Scotland FM Group, HRT has received some news of VHF/UHF repeaters in Scotland. In an example of goodwill on the airwaves, the Anglo Scottish Repeater Group has agreed to move their 2m repeater, GB3AS, from R1 to R0. This will enable a proposed Isle of Man repeater, sited on Snaefell, to use R1. If the DTI agrees to these changes, GB3IM, as the proposed repeater has been tentatively designated, will come on the air in 1985.

The Grampian Repeater Group are considering making a proposal to the RMG for a 2m Repeater on the Buchan Peninsula, which would cover the area between GB3GN (Durriss), GB3SS (Speyside) and GB3BI (Mounteagle).

Members of the Sussex Repeater Group are currently building and testing a 23cm repeater and beacon, GB3CP. The receiver has yet to be added to the much modified Pye Westminster transmitter, which runs on 70cm into a varactor tripler. However, the beacon is sending its callsign, QRA locator and channel number, RM3, on 1297.075MHz.

Crawley and District Video Repeater Group have applied for a licence for a 24cms ATV repeater. The project has reached an advanced stage. Field trials show good coverage of North Sussex and South Surrey. The design uses circuitry which is fairly readily available: Control logic is the GB3US sound repeater PWB, with additional video detection and switching and the video caption generator is a Cropedy Electronics design. The Tx gives an ERP of 20W from a 6dB horizontally polarised Alford Slot antenna on 1318.5MHz. Rx frequency is 1249.0MHz, with FM in and out.

The complete unit, which cost about £150 to build, will be sited in Crawley at 325 feet ASL, ZL80H. Further information from Bob, G6LVN (hon. secretary) or Jack, G4TVC, on 0293 28612.

On the 24cm ATV scene, it seems that there is a veritable hive of activity at present. A number of radio amateurs in the Bournemouth/Southampton area have met to discuss the possibility of a 24cm ATV repeater for this area. Several possible locations are being discussed. Suggestions have been made that it may be better to have two repeaters — one for the Poole/Bournemouth area, and one for the Southampton area. This would permit better coverage of the low lying areas in the central parts of Southampton, Bournemouth and Poole. In order that any proposals can take into account all interested amateurs in the areas concerned, it would be most helpful if those genuinely interested in 23cm TV operation in the areas in question could contact Nick Foot, G4WHO, 47 Mallard Road, Colehill, Wimborne, and let him know of their interest.

Alarming Developments at muTek On 10GHz!

muTek Ltd's, new GDIF 107ub back-end processing system makes the

completion of a 10GHz WBFM transceiver apparently much easier. It contains all the necessary audio and IF processing to turn a good quality intruder alarm module (i.e.g. Solfan type) into a 10GHz WBFM system — just add an antenna, microphone, loudspeaker and a few controls!

The receiver IF is 10.7MHz. With typical modern Gunn diodes, this is sufficiently high so as not to incur sensitivity limitations due to oscillator sideband noise. A low noise integrated circuit head amplifier (the Plessey SL560) takes the signal from the microwave head mixer diode, and drives a passband-defining ceramic filter. Following the filter, a multi-function integrated circuit provides limiting, demodulation (muting) drive for signal level and centre-zero meters, and AFC and DC voltage reference outputs for the Gunn power supply circuitry. An audio power amplifier completes the receive signal path.

The power supply is short-circuit protected and has been designed to allow limited tuning of the Gunn oscillator by supply voltage pushing. Typical oscillators will have a tuning rate of about 10MHz/volt within the range 5-8 volts. With the imminent amendment to the 10GHz bandplan putting WBFM operation between 10370 and 10400MHz, this would seem to be quite adequate without recourse to mechanical tuning methods. Voltage tuning allows the provision of frequency modulation and AFC means of power supply modulation — this is all done by the GDIF 107ub. The GDIF 107ub contains both an AGC controlled microphone preamplifier and a tone oscillator for initial setting up of contracts.

The GDIF 107ub comes as a ready GDIF 107ub PCB

assembled, aligned and tested PCB, with instructions and helpful hints on how to get the whole system together and is available from muTek at Bradworthy, Holsworthy, Devon EX22 7TU (040924 543) for £49.65 plus £1.50 postage.

Leslie McMichael Commemoration

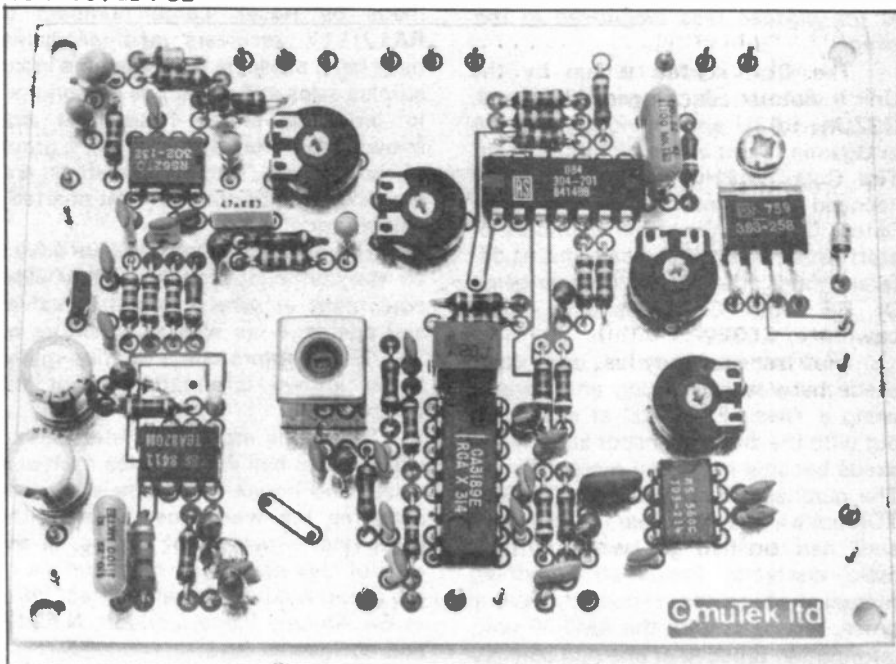
A Special Event Station, GBOLMC, will be on the air the weekend of the 17-18th November to commemorate the birth of Leslie McMichael 100 years ago. The station will be operated by members of the McMichael ARS from their clubhouse in Stoke Poges, Bucks.

Leslie McMichael, who held the callsign MXA from 1913 until the first world war, was one of the founders of the London Wireless Club (later to become the RSGB) in July 1913. He became the first Vice-Chairman in 1914 and then Secretary in 1919. The following year he was licensed as 2FG, and allowed to use up to 10 watts on 180 metres. The licence allowed him to contact only three named stations!

In 1921, on behalf of the Wireless Society of London, he successfully petitioned the Postmaster General to allow the broadcasting of speech. This led to the establishment of the Marconi Company's Station 2MT, which broadcast speech and music for nearly a year, and soon after, to the formation of the BBC.

Leslie McMichael was one of the few Honorary Members of the RSGB, and died on his birthday in 1951.

Details of the station are available from R.F. Muggleton, G6AMN, 23 Randolph Road, Langley, Berkshire. SL3 7QF.



Soldering Can Be A Gas . . .

Greenwood Electronics claim a world first with a 'revolutionary' new butane powered, portable soldering iron, the Oryx Portasol.

Little bigger than a felt tip pen, the Portasol works on different principles from conventional gas-powered irons. There is no flame during operation, the chemical energy of the butane gas being converted directly to heat by means of a patented catalytic converter in the solder tip. Conversion rate is adjustable to provide control over tip temperature and, at its maximum setting, the iron delivers power equivalent to a 60W electric soldering iron, the tip temperature being adjustable between 250 and 450 degrees centigrade.

The Oryx Portasol iron will run for up to 60 minutes on its internal gas supply and refuelling is identical to that of a gas cigarette lighter. The same principles that make gas cigarette lighters safe are applied to the Portasol.

The Oryx Portasol can be carried in the pocket. It is supplied with a protective cap and is immediately ready for use, the cap including an igniter to start the catalytic conversion. Further information from: Greenwood Electronics, Portman Road, Reading, Berks RG3 1NE. Tel: 0734 595844.

AJH Electronics On The Move

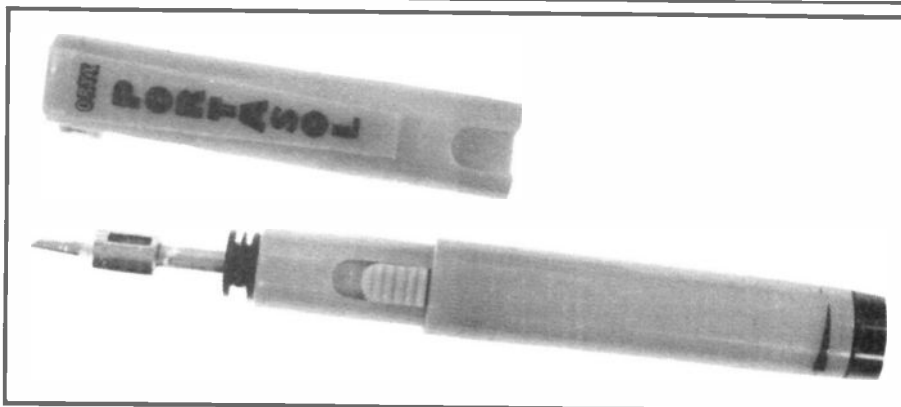
Tony Hibberd, G8AQN, has been around in amateur radio for many years and is known with respect for his various kits and components he has supplied to the amateur since the mid 60's.

In the early seventies, a good percentage of the population on 2m seemed to have transmitters built around Pye Vanguard and Cambridge strips purchased from his emporium.

We can now report that Tony has recently opened a new emporium in Rugby and HRT's Dave Gadsden, G4NXV, recently spent a pleasant couple of hours there, being shown around and listening to Tony's thoughts on our hobby.

The shop is easy to find, located on the Rugby to Leicester road on the outskirts of Rugby in a small main road shopping precinct, with easy parking close by.

Tony offers a wide range of goodies for sale, but is particularly pleased to be offering the Yaesu range of equipment together with Sun, TET and J Beam antennas, the Tokyo range of power amps, RSGB books, components and of course the AJH range of



kits and a wealth of information and advice to those who need it. Zycon equipment is also available, as is a range of PMR equipment for the professional. Tony promises his customary service with a smile. You can pop in and see for yourself at 151a Bilton Road, Rugby (0788 76473).

Crash Morse Course

An all day Morse course is being run on the 1st November at the Amersham College, Amersham-on-the-Hill, Bucks. The course tutors are Shirley, G4HES, and Ron, G3NCL, originators of the HRT Morse course, who will cater for *all* speeds. (*Wow - Ed.*) A Post Office examiner will be present in the afternoon to conduct the 12wpm test - for the more fluent of the students! The course should cost between £5 and £6, a very reasonable price for getting you at least started on your way to an 'A' licence. Contact the college on Amersham 21121 between 9am and 4pm for further details.

Yet More Societies? Yes!

The founding of the Hilderstone Radio Society, Thanet, Kent, took place in the Nottingham Castle, Westwood during July this year. The Group has evolved from a successful RAE course run in the local Adult Education Centre last session. The activities envisaged include the usual talks, demonstrations, visits and things like Junk Sales.

The constitution will make a special point about beginners and listeners, as well as those who are especially keen on constructional work in Radio/Electronics. In other words, there will be *no* prejudice or status differences between those with different interests, ie the possession of a callsign will not confer status and so on.

All interested persons in the Society venture - irrespective of age, race, sex etc. are very welcome to con-

tact Dr Smith, G3JIX, Staple Farmhouse, Staple, Canterbury, regarding meetings, visiting and joining. An SAE would be appreciated.

Anyone interested in joining a club in South London, but wary of anything formal, should try the new club which has recently started meeting every Wednesday at **Danielle's Nightclub(I)** in Eltham. This can be found just off the A2 at Eltham, next door to the Dutch House Public House.

The club started out simply as a meeting of friends in the bar, but has grown to include anyone in the locality interested in amateur radio. The regulars are friendly and not in the least standoffish. The unique style of the club comes with being *very* informal; having no name or committee.

There is usually a lecture and/or demonstration of a particular aspect of the hobby. In the past few weeks, they've had a computer night, a lecture on AMSAT UK given by no less a personage than Ron Broadbent, G3AAJ, with a demonstration of OSCAR 10 working, and a demonstration of AMTOR and an HF station. But you can simply go along for just a drink and a chat.

The average attendance for one of these meetings is about 45 people - including wives and girlfriends. There is no membership, merely a 50p entrance fee. After the expenses are paid, the remaining door money is raffled off.

Having visited a couple of clubs and felt out of place, I found this group welcoming, keen but not pushy. Worth a visit, since there's no one person to contact, just go along any Wednesday at just after 8pm. I think you'll enjoy it! **G1CKF**

Transatlantic Special Event Stations

The Sidmouth (Devon) Amateur Radio Society are organising a special-event station, GB2UST, in preparation for the fourth annual Transatlantic link with Plymouth, Massachusetts on



The link between GB2UST (upper pic.) and WA1NPO (lower) is an annual event, celebrating the departure of the Pilgrim Fathers from Sidmouth and their arrival in Plymouth, Massachusetts.



American Thanksgiving Day, Thursday 22nd November.

The US station, WA1NPO, will be located in Plimoth Plantation, a living-history museum which vividly depicts life in Plimoth Colony, the first permanent English settlement in the New World. The museum's exhibits include a reproduction of the Pilgrim Village as it existed in 1627, and a full-size replica of the Mayflower.

WA1NPO will be looking for calls from any UK station, and an attractive certificate featuring the Mayflower will be available for confirmed contacts on receipt of QSL and three IRCs to: Box

48, Whitman, Mass. 02382, USA.
 The operating schedule will be:
 14180 or 14255 kHz SSB from 1300 to 1400,
 14180 kHz CW from 1400 to 1500,
 14180 or 14255 kHz SSB from 1500 to 1600,
 14345 kHz SSB from 1600 to 2000; and on 15m:
 21260 kHz SSB from 1300 to 1430, and
 21385 kHz SSB from 1700 to 2000.
 All times GMT.
 Sidmouth ARS will be looking for Stateside contacts on 20 & 15m, but will be pleased to work UK stations all day on 80 & 40m under the callsign GB4UST; special QSL cards will be available.

STOP PRESS!



Constructors everywhere will be pleased to note that Cirkit have just brought out their Autumn '84 catalogue. Priced at 85p, this is available from WH Smiths or direct from Cirkit at Park Lane, Broxbourne, Herts and contains 3 £1 vouchers, each of which may be redeemed for £1 against a £15 order, plus a rather unusual competition — which involves spotting "frogs hiding among the components"! Yes, honestly!

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1243	SP-980	Speakers	59.00
1244	FT-757GX	All Mode Transceiver/General Coverage	675.00
1245	FP-757GX	AC PSU	139.00
1264	FC-757AT	ATU	239.00

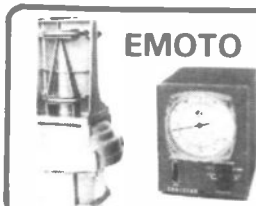
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1248	FRG-7700	General Coverage Receiver	366.00	1258	NC-7C	Base Charger for FT 208/708	33.00
1249	FRG 7700M	General Coverage Receiver with Memory	430.00	1260	FBA-2	Battery Sleeve for NC-718	3.00
1254	FRT 7700	ATU	46.00	1261	MMB-10	Mobile Bracket	6.00
1255	FRA-7700	Active Antenna	42.00	1262	NC-9C	Compact Trickle Charger	9.00
1257	FRV 7700	Converter 118/130 140/150 70/80MHz	85.00	1263	FT-230R	2m FM Mobile Transceiver 25W	255.00
1273	MEM7700	Memory Unit	73.00	1237	FT-726R	VHF/UHF Multiband multimode Tr. ceiver c/w 2m	735.00
1246	FL 2100Z	HF 1200W Linear Amplifier	499.00	1238	430/726	70cm module	248.00
1251	1251	Cabinet for SP-101	17.00	1239	SA726	Satellite Unit	95.00
1276	1276	AM Unit for FT-101Z	15.00	MICROPHONE/ACCESSORIES			
1200	NC-1	Desk Charger for FT-202R	19.00	1208	MH18B	Hand mic scanning	15.00
1201	9A-1	12V Adapter for FT-202R	18.00	1214	YM-35	Hand mic scanning for FT-1102/707 series	18.95
1205	FP 4	AC PSU 4 Amp	42.00	1235	YM-38	Desk mic scanning for FT-1102/707 series	26.00
1220	FP-80A	AC PSU 4.5 Amp	53.00	1250	YM-49	Speaker/mic for FT-290/230R	18.00
1234	FT-290R	2m All Mode Transceiver portable	260.00	1213	QTR-24D	24 hour quartz clock	32.00
1202	CSC 1A	Carrying Case	4.00	1216	YH-55	Lightweight headphones	11.00
1210	MHB 11	Mobile Mount	27.00	1219	YH-77	Lightweight headphones	12.00
1211	NC-11C	Charger	18.00	1278	1278	Battery Holder for FRG-7	4.00
1247	FL-2010	2m 10W Linear Amplifier	63.00				
1241	FT-720RU	70CM Mobile Transceiver 10W	219.00				
1217	E 72L	Extension cable 4m	14.50				
1218	S 72S	Switching box	37.00				
1233	FT 208R	VHF Handie FM Transceiver	199.00				

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Cat. No.	Type	Description	Price £
Inc. VAT & Carr.			
1331	TS-930S	Transceiver HF w gen cov receiver	1125.00
1330	TS-930S	As above with automatic ATU	1225.00
1329	SP-930	Speaker and filters	57.00
1313	MC 60A	Desk Top Microphone scanning	54.00
1357	YK-88A1	6MHz AM filter	32.00
1356	YK-88C1	500Hz CW filter	32.00
1348	YG-455C-1	500Hz CW filter	75.00
1349	YG-455CN-1	270Hz CW filter	90.00
1324	TS-430S	Transceiver HF w gen cov receiver	730.00
1310	PS-430S	DC power supply de luxe coated	113.00
1319	SP-430	External speaker	30.50
1314	FM-430	FM Unit	33.75
1321	MB-430	Mobile Mount	12.50
1352	YK-88SW	1 BkHz SSB filter	—
1314	PS 30	DC PSU	114.00
1326	TS-530S	Transceiver HF	619.00
1327	SP-230	External Speaker	45.00
1325	AT-230	Antenna Tuning Unit	149.90
1302	KB 1	De Luxe VFO knob	11.50
1328	R 600	Receiver	259.00
1333	DCK-1	DC Operation Cable kit	8.25
1332	R-1000	Receiver	299.00
1335	R-2000	Receiver	415.00
1337	TR-2400	Transceiver 1.5W FM 10CH Mem	199.00
1301	ST-1	Base Stand	45.00
1309	MC-30S	Hand Microphone	14.00
1322A1-250	Automatic ATU	260.00	
1338	TR-2500	2m FM Transceiver	219.00
1304	ST 2	Base Stand	52.00
1342	VB-2530	25W Amplifier	17.00
1306	SMC-25	Speaker microphone	17.00
1361	BT 1	Manganese Battery Case	6.50
1311	PB-25	Nicad Battery	29.00
1305	SC 4	Soft case	14.00
1375	TR-2300	2m Transceiver (demo)	170.00
1325	AT 230	Antenna Tuning Unit	130.00
1340	SM-220	Station Monitor	275.00
1344	DS-2	DC/DC Converter for TS830S	52.00
1343	TR-8400	70cm Transceiver	270.00
1369	SP-40	Compact Mobile Speaker	16.75
1371	MIC-45	Auto-patch Up-Down microphone	41.50
1339	TR-9130	2m All Mode Transceiver 25W	439.00
1373	SP-120	External Speaker	34.00
1370	BC-1	AC Adaptor for memory back-up	6.43
1307	PS-20	DC Power Supply	59.00
1316	TL-922	2KW HF Linear Amplifier	929.00
1351	HC-10	Digital World Clock	65.00
1350	PC-1A	Phone Patch	50.00
1303	RA-1	Antenna	8.00

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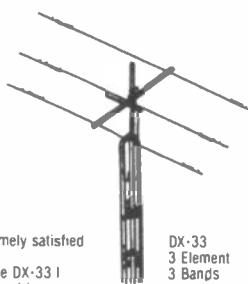
DX "PENETRATOR"

HERE'S THE SPECIFICATION . . .

- ★ 3 elements on each band
- ★ heavy duty 2kW rated
- ★ Gain up to 8dB
- ★ Broadband operation
- ★ Stainless steel hardware
- ★ SWR less than 1.3:1

HERE'S WHAT THE CUSTOMERS SAY!

1. 'VK7NOW' I have recently installed a DX-33 beam and I would like to advise you that I am extremely satisfied with it. It certainly outperforms the TH3JNR which I previously used and also the VSWR is lower . . .
2. 'G3AAE' This letter is to tell you how pleased I am with the DX-33 antenna. On unpacking the DX-33 I was immediately impressed with the quality of the hardware, and in operation it is just as impressive. I have used it on all three bands and have been obtaining excellent reports from DX stations all over the world. I have conducted tests with other stations and these show the electrical figures included in the DX-33 specification are fully met in practice.
Congratulations on a very fine product!"



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3 Bands

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1076	DX 7/3	7MHz 2 ele Yagi Gamma matched 40 boom	364.55
1077	DX 51	Rotary dipole for 28 24 21 18 and 14MHz	93.15
1080	DX 6V	10 Bm Multi band vertical plus 30m	102.35
1081	DX 31	Dipole 10/15/20m 2kw p e p	83.95
1082	DX 32	2 element 10/15/20m 2kw p e p	128.80
1083	DX 33	3 element 10/15/20m 2kw p e p	189.60
1084	DX 34	4 element 10/15/20m 2kw p e p	264.50
1085	DX 31/32	Conversion Kit	51.75
1086	DX 32/33	Conversion Kit	65.10
1087	DX 33/34	Conversion Kit	78.29
1089	DX 103	3 element 10m Yagi	93.15
1090	DX 105	5 element 10m Yagi	117.30
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Cirkit miniature 2m PRE-AMP

If you are sensitive to comments about your receiver's sensitivity this high quality pre-amp should silence the critics noise as well as your rig's.

Q1 is taken straight to ground thereby eliminating any possible impedance that would be present in any parallel RC network.

The FET, a NEC 3SK88 is a

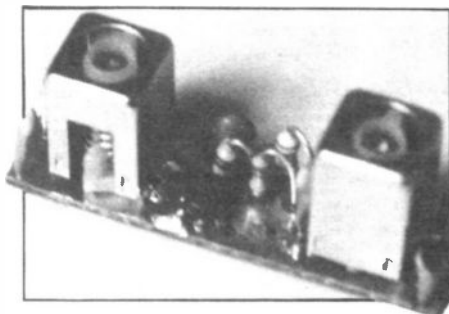
Note that the source leg of Q1 and the can legs of L1 and L2 are soldered on both sides of the PCB.

To install the pre-amp first cut the co-ax cable to the receiver. Then carefully solder the co-ax going to the receiver to the track under C5, inner to the small track outer to the larger track. The other cable is soldered under C2 in a similar fashion. As a guide the direction of signal flow is shown by an arrow on the track side of the PCB. Note that if the unit is to be used with a transceiver it must be connected between the aerial changeover relay and the receiver input. Do not try to transmit through the pre-amp by putting it in the aerial lead. A suitable (less than 16V) supply should be located within the receiver and taken to the track on the free end of R3.

Improve the performance of your 2m receiver with this miniature, high quality design from Cirkit.

Many 2m receivers and transceivers have 12dB SINAD sensitivities of around 1.0-0.5uV with some of the best available offering only 0.25uV. Use of the Cirkit pre-amp in a transceiver with a low loss changeover relay will typically produce 12dB SINAD on an FM signal of less than 0.1uV. Not bad when in practical terms a 12dB SINAD roughly equates to a 5 and 5 signal.

The purist might suggest that fitting any pre-amp could degrade the intermod performance of a receiver. While this is the case in theory, in practice it has not caused any problems, although if one lives next to a Home Office or taxi transmitter a cautious approach should be taken. Crossmod and intermod in the pre-amp itself is very unlikely as the maximum output is 65mW.



900MHz device chosen because of its noise figure which is, at 144MHz almost as low as that achievable. It is relatively inexpensive, shows no signs of instability and has proper gate protection, unlike some of the earlier BF900 series.

The output network of C4, C5 and L2 was derived to match into 50R with a consistently adequate RF band width.

Alignment

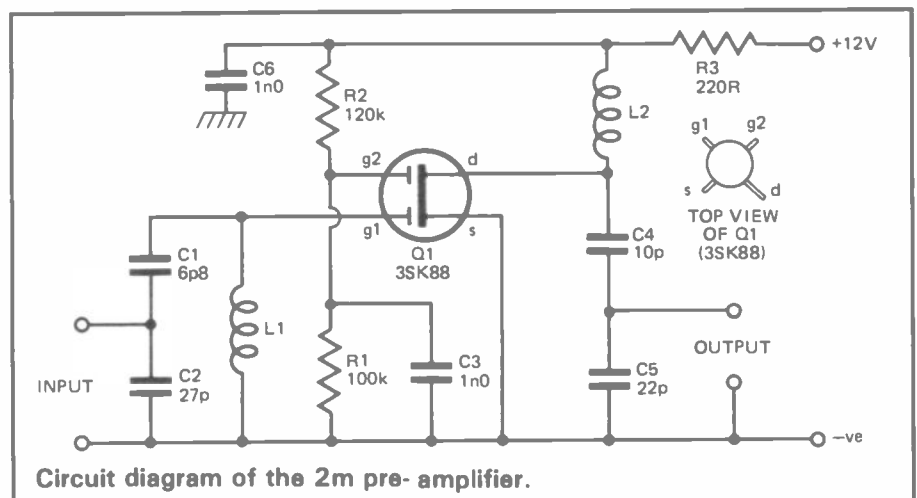
Pre-set the cores of L1 and L2 to be flush with the tops of their formers — use a correctly fitting non metallic trim tool. If all is well at switch-on there will already be an improvement. Tune to a weak noisy signal and adjust L2 for maximum signal strength meter reading, or minimum background noise. Tune L1 for a dip in the noise of the same noisy signal, do not adjust L1 for maximum signal

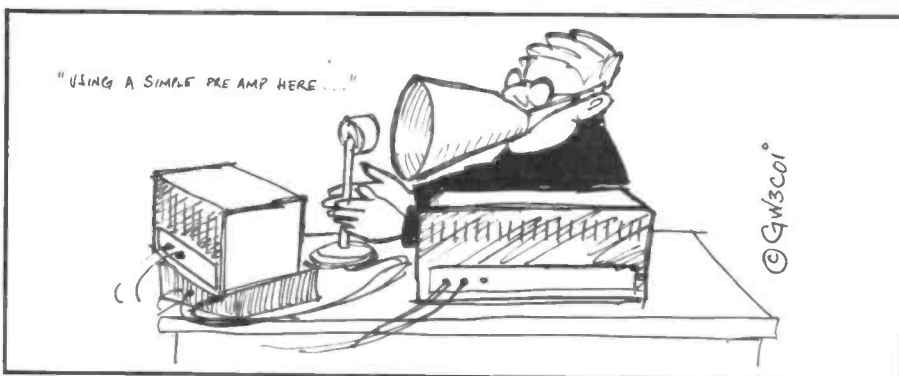
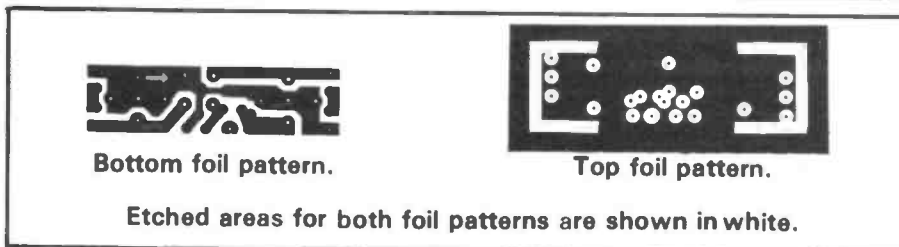
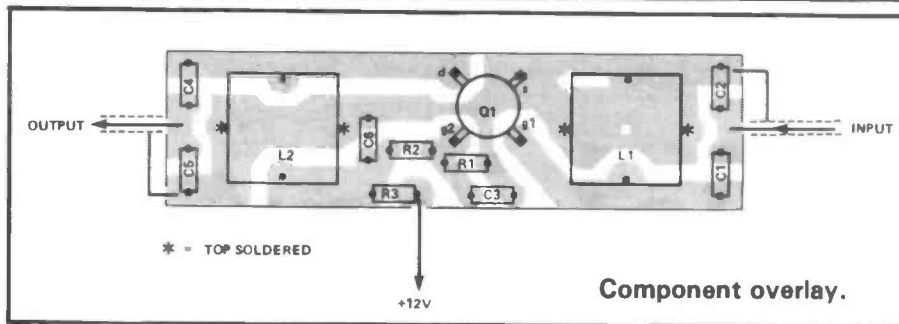
Circuit Description

The capacitively tapped tuned circuit C1, C2, L1 matches the 50R input to gate 1 of the MOSFET. With the values of C1 and C2 computed to give the correct impedance transformation, the noise figure was measured at 4-5dB, this is to be expected as the optimum noise figure very rarely coincides with the best impedance or gain match. The values finally chosen consistently give noise figures less than 1.5dB. The potential divider formed by R1 and R2 supplies approximately 5 volts to gate 2, which according to the NEC data sheet for Q1, gives the lowest noise figure and the highest gain. This is realised in practice. The 'source' of

Construction

Mount all the components, leaving the coils and cans until last.





strength reading on a meter. The pre-amp has sufficient bandwidth to cover all of 144-146MHz for use in multimodes etc. Tuning the unit at 145MHz will give very acceptable performance over the whole band.

A large quantity of these pre-amps have been built and all have worked perfectly the first time. If however, yours doesn't, double check the position of all the components and the orientation of Q1. Check for dry joints and solder splashes between tracks and finally test the DC voltages shown on the circuit diagram, these are measured with a 12V supply and will vary slightly with a different voltage supply.

Conclusion

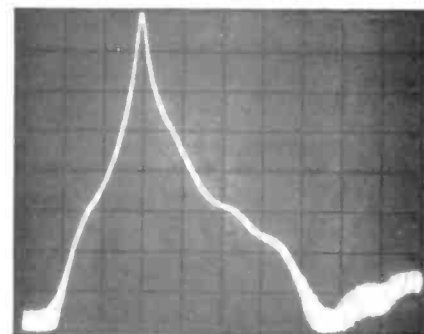
The pre-amp should perform better than most commercially available models and will undoubtedly cost less.

The spectrum analyser photographs were taken with matching tracking generator to give a measured performance of 'wanted signal', band-width and 'out of band' response. It can be seen that the pre-amp provides useful extra rejection at 27MHz.

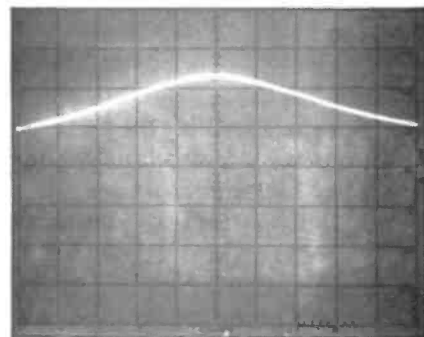
A complete kit of parts is available for this project price £4.50 inc. VAT (Stock No. 41-01307) from: Cirkit Holdings PLC, Park Lane, Broxbourne, Herts. EN10 7NQ.

SPECIFICATION

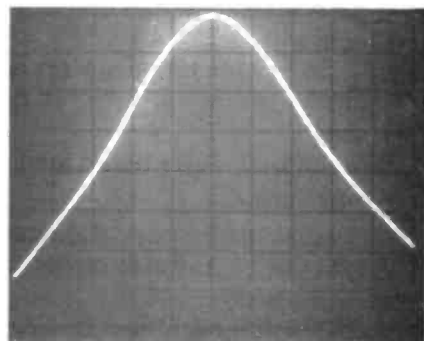
3dB bandwidth:	6.0MHz
Noise figure:	Less than 1.5dB
Gain:	22dB
1dB compression:	+ 15dBm (30mV) for - 6dBm input
Saturated output:	+ 18dBm (65mW)
Supply voltage:	8-16V nominally 12V
Input & output impedance:	50R
Size:	34mm x 9mm x 15mm



Ultimate Rejection: Vertical 10dB/div, Horizontal 50MHz/div.



Gain: 0dB set to +40dB (Center line) Vertical 10dB/div, Horizontal 2MHz/div, centered on 145MHz.



Bandwidth: Vertical 2dB/div, Horizontal 2MHz/div, centered on 145MHz.

COMPONENTS LIST

Resistors (1/4W carbon film)

R1	100K
R2	120K
R3	220K

Capacitors

C1	6p8
C2	27p
C3	1n
C4	10p
C5	22p
C6	1n

Semiconductor

Q1	3SK88
----	-------

Inductors

L1, L2	MC108 7.5 turns
--------	-----------------

Miscellaneous

Coil cans	7mm type
PCB	

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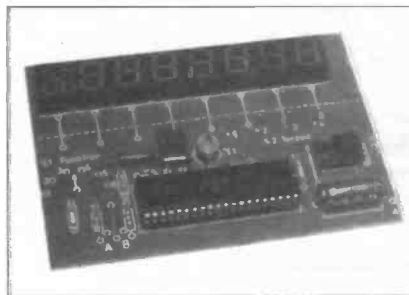
New Winter
Catalogue
Out Now!

10MHz DFM

A DFM capable of operating at frequencies up to 10MHz. The kit can be configured in six different measurement modes including: frequency, period, elapsed time and unit counter. Applications can be extended using the CIRKIT prescaler and preamp.

SPECIFICATION: Input signal: 2.0V (min) TTL. Frequency range: 0 to 10MHz. Period measurement: 0.5 to 10 secs. Time measurements: up to 10 secs. Output: BCD multiplexed. Display: 8 digit 12mm LED. Supply: 6-9V DC at 100mA(nom).

41-01500 54.10



10MHz DFM

DFM PRE-AMPLIFIER

The rise time of some low frequency signals, even apparent square waves, is often too slow to give a constant readout from a DFM. The use of a pre-amp ensures that these signals are input to the DFM at the correct level and with the correct shape. This simple addition greatly increases the effectiveness of a DFM at low frequencies.

SPECIFICATION: Frequency range: 1Hz-5MHz. Sensitivity: 1Hz-3MHz:20mV, 3MHz-5MHz: 40mV. Max input voltage: 100V (220V Instantaneous). Power supply: 5V 8mA. Input signal: Any. Output signal: TTL square wave.

41-01502 5.13

DFM PRESCALER

This prescaler is intended for use with the Cirkit 10MHz DFM, although it is compatible with other frequency counters. The function of the prescaler is to divide the incoming frequency by ten and to shape it into a waveform suitable for the digital input requirements of the DFM. This enables the frequency range of the DFM to be extended up to 50MHz.

SPECIFICATION: Supply voltage: 5V DC. Nominal current: 25mA. Frequency range: 10kHz-50MHz. Input sensitivity: 20mV(typical). Output: 5V TTL level. Dimensions: 80mm x 50mm.

41-01501 8.55

2m POWER AMP

A carefully designed 20W, 144MHz linear power amplifier, to boost the output of hand-held and transportable transceivers such as the TR2400 IC2E, FT208, FT290 etc. With 10dB gain to give a 20W output from a 2W input. Automatic changeover relay - switched from RF sense circuit. High power - output relay, robust construction with die-cast box, plus RX pre-amp.

SPECIFICATION: Bandwidth -3dB: 144-146MHz. Power gain: min 10dB. Output power; 1W input: 10W, 2W input: 20W. Supply voltage: 10-16V. Supply current (at 12V): <3amps-20W output. Input/Output impedance: 50Ω. Size (excluding sockets): 122 x 96 x 44mm. Pre-amp section spec as 2m Pre Amp Kit.

41-01404 32.87

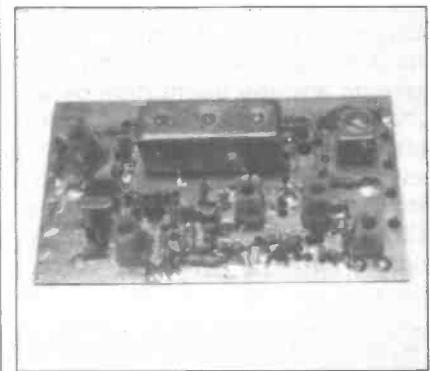
2m CONVERTER

Low noise 2m to 10m converter. This design uses low noise dual gate MOSFETs in the RF and mixer stages which, together with a TOKO pre-aligned helical filter and pre-wound coil, give a high specification and repeatable performance.

A reliable 116MHz overtone oscillator circuit is followed by a double tuned stage which gives a very clean output, this reduces spurious to a minimum. As the circuit is basically linear any mode - AM, FM or SSB - can be converted. The complete circuit is built onto a double-sided PCB.

SPECIFICATION: Noise figure: Less than 2dB. Gain: Min 22dB. 3dB Bandwidth: 144-146MHz. IF Output: 28-30MHz. Input/Output impedance: 50Ω. Supply voltage: 10-16V. Supply current (at 12V): 28mA. Size: 97 x 57 x 22mm.

41-01306 17.35



2m Converter

2m PRE-AMP

Very compact low-noise MOSFET 2m pre-amp. The overall PCB is sufficiently small to be installed inside receivers or transceivers.

SPECIFICATION: Noise figure: Better than 1.5dB. Gain: 18dB Min. Input/Output impedance: 50Ω. Size: 34 x 13 x 10mm.

KIT INCLUDES: Double-sided PCB - All resistors - All capacitors - MOSFET - Coils and cans.

41-01307 3.91

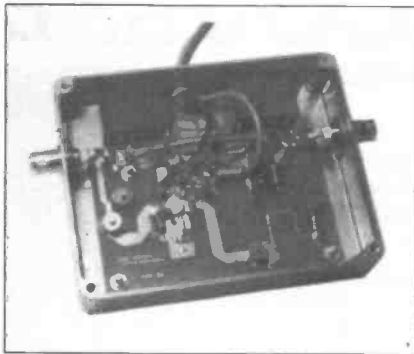
fectly loud and clear.

70cm CONVERTER

70cm to 144MHz low profile converter employing high level Schottky diode double balance mixer, pre-aligned helical filter and low noise transistors. The complete design gives a low noise figure and uses pre-aligned filters and pre-wound coils to give repeatable performance with minimum alignment.

SPECIFICATION: Bandwidth: 430-440MHz. RF Gain: 8dB min. Noise figure: <2.5dB. IF output: 144-146MHz. Supply voltage: 10V. Supply current: 30mA. Size: 97 x 57 x 15mm.

41-01405 21.50



70cm 10W Power Amp

70cm 10W POWER AMPLIFIER

The current generation of UHF handheld synthesised transceivers have almost all the facilities found in mobile/base transceivers, the only major limitation being their output power. For handheld operation 1 watt or so is adequate, but for mobile to mobile and for use with higher power repeaters, the addition power provided by the CIRKIT amplifier increases the range considerably. This is especially noticeable, as is to be expected, at the limits of the service area.

The Cirkit 70cm Power Amp will boost the output power of hand held transceivers up to 12W. Automatic relay switching between TX and RX, is provided via the RF sense circuitry. The finished unit is mounted in a tough pre-drilled die-cast box, which provides sufficient heatsinking while providing a rugged low profile housing.

SPECIFICATION: Power gain (2W LP): 7.2dB. Output power (13.8V) 2W input: 10W(min). Saturated power output: 14W. Supply voltage: 10-16V (13.8V nom). Input/Output impedance: 50R. Bandwidth: 430-440MHz. Supply current: 2 amps at 12W. Dimensions: 119 x 94 x 34mm.

41-01505 33.82

70cm PRE-AMPLIFIER

This high performance pre-amp offers increased receiver sensitivity and a corresponding extension of the useful communication range. The completed unit is sufficiently compact to be built into virtually any existing receiver and does not require the use of any test gear when setting up.

SPECIFICATION: 3dB bandwidth: 425-445MHz. Noise figure <2dB. Gain: 13dB(min). 1dB compression: -3dBm (0.5mW). Saturated output: -2dBm (0.7mW). Supply voltage: 8-12V (12V nom). Input/Output impedance: 50R. Dimensions 50 x 10 x 17mm.

41-01506 4.78

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Full HF coverage, tunes from 1.5MHz continuously to 29.350MHz. Based on the renowned SPC transmatch configuration, TAU innovated this composite module design with large air-spaced capacitors rated at 5kV, tested to 7kV. Roller inductor infinitely variable. Solid precision radio engineering. Heavy weight long life construction. Will tune any transmitter/aerial combination to optimum. A lifetime investment and should never need replacing. Power handling capabilities from a few milliwatts to above 3000 watts PEP. Undoubtedly the finest ATU module available today.

STU 5K ATU Kit 41-50500 130.00

CABINET - custom-made for STU 5K ATU 41-50510 62.50

DIGITAL TURNS COUNTER

Multi-turn, vernier scale with digital indication, for use with roller coaster, with or without cabinet. Turns counter 41-50520 27.94

BALUNS

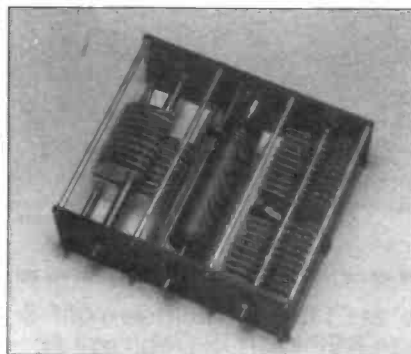
To complete the ATU, we have the following Baluns:

Location	OB	PEP	Ratio	Stock No.	Price
Outdoor	OB141	1kW	4:1	41-50141	27.35
Outdoor	OB111	1kW	1:1	41-50111	27.55
Indoor	IB241	200W	4:1	41-51241	17.25
Indoor	IB141	1kW	4:1	41-51141	22.35

ROLLER COASTER

To complement existing equipment, covers 1-30MHz, 28uH inductance, tapered pitch for 10 and 15 meters.

Roller Coaster 41-50540 46.00



TAU ATU

AKC AERIAL KIT

Unique clip-on spacer system for open wire feeders. Patented design manufactured from an ultra-violet resistant poly-propylene the spacer can be configured to give a 75,300, 400 or 600 ohm system. Kit contains 20 spacers, 1 Tee piece and 2 Ceramic insulators.

AKC Aerial Kit 41-50530 12.70



CIRKIT ELECTRONICS TOOL KIT

Contains: 15W Soldering Iron, 2 spare bits, heat shunt, solder, pliers, cutters, and screwdriver.

41-00007 15.56

Selected Lines

PB2720	80dB Piezo Buzzer	43-27201	0.55
10M15A	10.7MHz Filter	20-10152	2.10
FC177	LCD Freq. Meter	39-17700	20.00
CM161	Min LCD Clock	40-80161	8.25
8 x 0.3"	IC socket	28-00800	0.12
14 x 0.3"	IC socket	28-14000	0.13
16 x 0.3"	IC socket	28-16000	0.13
CX120P	COAX relay (PCB)	46-90120	11.96
CX520D	COAX relay (N type)	46-90520	26.98
CX540D	COAX Relay (BNC)	46-90540	26.98
HC6010	10MΩ DMM	56-06010	33.00
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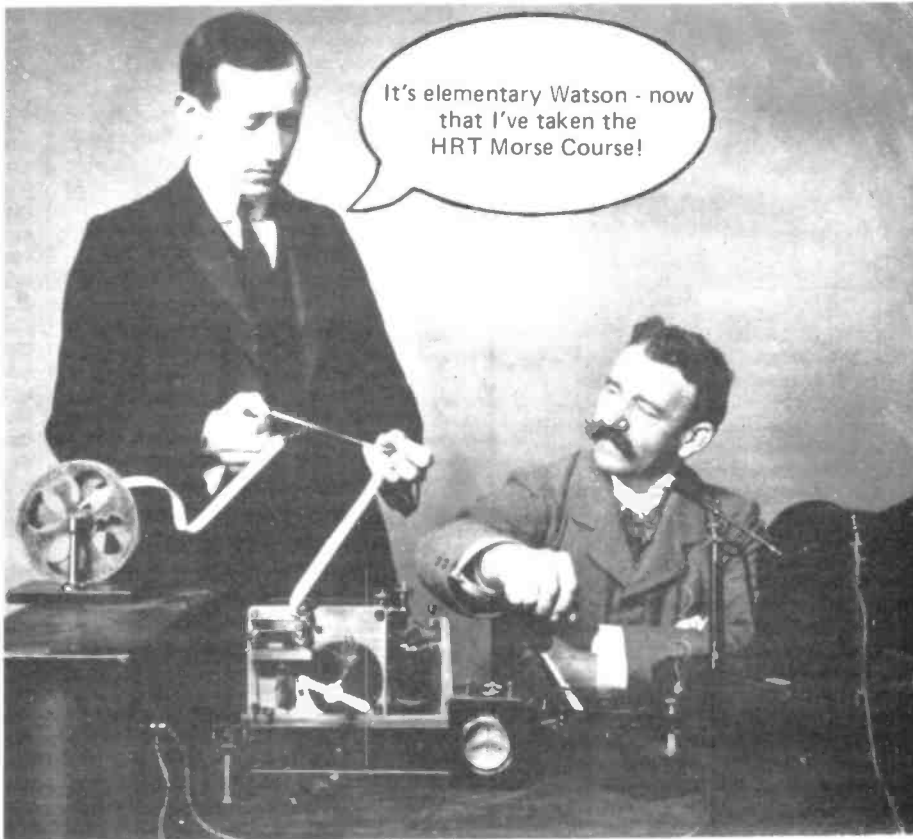
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So you *really* want to go on a DXpedition?

Over the last few years a large number of DXpeditions have set off for exotic island countries. Most made it there and back successfully, giving DXers "a new one" for

had broken down several hundred miles away and would not be repaired for some time. The expeditioners proceeded to scour every bay and harbour on the west coast

to the North Cooks — expensively by light aircraft, and less expensively on one of the inter-island trading schooners. Victor decided to travel as a deck passenger on a schooner, the very cheapest way, and we'll let him pick up the story in his own words.

Martin Atherton, G3ZAY, has come across some curious and highly dangerous setbacks that have been incurred on some of the more outlandish DXpeditions undertaken to obtain the coveted DXCC awards.

their DXCC, Worked All Zones, or other award. But, a few had problems. All three phases of an expedition — getting there, staying there, and getting back — caused trouble.

If you are considering a DXpedition yourself then this article may help you to avoid some of the pitfalls. If you are more of an arm-chair expeditioner, the mishaps recounted here may reassure you that your approach is the right one. First let's look at the problems involved in getting there.

Clipperton Island (F08)

In March this year, a large number of operators from all around the world, assembled in Manzanillo, Mexico, to await the arrival of the chartered boat that was to take them to Clipperton Island. Clipperton, an uninhabited atoll named after an English pirate, is a French possession in the eastern Pacific and a DXCC country in its own right.

Seven days after the group assembled on the quayside they were still sitting there waiting for the boat to appear. Eventually, a message arrived to the effect that it

of Mexico for an alternative, but after a further week had to concede defeat and return to their various homes. The total value of wasted airline tickets must have run into many thousands of pounds.

At the time of writing, their equipment is still in store in Mexico and various possibilities are being examined for an expedition in early 1985.

ZK1CG in Mannihiki

Victor Rivera, ZK1CG, is a young American living on Rarotonga, the main island of the Southern Cooks group in mid-Pacific. (Many HRT readers will have seen him, without realising it, as he appeared as a stretcher bearer in the film "Merry Xmas Mr. Laurence" much of which was shot on Rarotonga).

Back in early 1982, Victor decided to pay a visit to Mannihiki, an atoll in the Northern Cooks, several hundred miles from Rarotonga. For DXCC purposes Northern Cooks is a separate country, and quite a rare one with no more than one or two permanent amateur residents in all the islands.

There are two ways of getting

to the North Cooks — expensively by light aircraft, and less expensively on one of the inter-island trading schooners. Victor decided to travel as a deck passenger on a schooner, the very cheapest way, and we'll let him pick up the story in his own words.

"As we headed out to sea, the waves started to wash over the deck, at times hitting the tarpaulin under which the passengers were trying to sleep. My tool box and a case of rum were washed overboard almost immediately and I decided to stay with my gear to prevent it going the same way. I lay down to sleep with the waves breaking on the deck and washing over my feet and was falling asleep when there was a loud roar, the tarpaulin burst open, and a large wave swept me and my gear across the deck. I became entangled with a bicycle which had come adrift from the bulkhead and could feel nothing but water under me. When the wave receded, a woman was hanging over the railings and I helped pull her back on board. My boxes had split open, the plastic rig covers had torn off, one rig had gone, and everything was soaked in salt water." I will stop here because it only gets worse.

Despite being washed into the sea on another occasion, Victor made it to Mannihiki successfully and DX News Sheet reported numerous Europeans working him on 15 & 20 metres. Although a success from a radio point of view, the DXpedition was a financial disaster as Victor lost equipment worth several thousand dollars.

As a postscript to this tale, Victor is still QRV from Rarotonga,

though a wife and a new baby are restricting his DXing.

K6LPL/KH5 Palmyra

The atoll of Palmyra lies about 1000 miles south of Hawaii and together with Jarvis Island, counts as a DXCC country. Back in January 1980, a group of American DXers including Dave Gardner, K6LPL, chartered an aircraft to fly them down to Palmyra's abandoned World War 2 airstrip, some of the group intending to continue by boat to Kingman Reef, yet another DXCC country.

The first flight had to be aborted after about half an hour, when the plane's radio failed and the attempt was re-scheduled for the following day. This time the flight down from Hawaii was uneventful, but disaster struck as their aircraft came into land. A wingtip caught one of the palm trees which had sprung up along the edge of the runway and the plane slewed into the jungle. Miraculously no-one was killed through WA6YQW was severely injured and had to be evacuated by a US Coast Guard helicopter. The rest of the group took the view that the show had to go on and continued with their plans, almost as though nothing had happened. The equipment was undamaged and they managed many thousands of QSOs from Kingman and Palmyra. They even used a picture of the



crashed plane for the front of their QSL card!

Fate had another trick to play when K6LPL slipped while holding a glass mug and severely cut his hand. As he was the only doctor on the island, he had to use his good hand to make temporary repair to his injured one, and the Coast Guard were again summoned for a medical evacuation. This time they removed the whole group. The island's runway is now officially listed as "unserviceable".

Being the USA, the story has a legal postscript. On the group's return, law suits flew in all direc-

tions. When the blizzard of paper cleared, the expedition member who had arranged the transportation and signed the contracts found himself in considerable financial difficulties, as a result of being found personally liable for a wide range of crash damages.

PY0ZSA etc St. Peter & Paul Rocks

600 miles from the coast of Brazil, in mid-Atlantic, is an extensive reef with a few rocks poking about 30 feet out of the water — the St. Peter & Paul Rocks. This reef is another of the DXCC countries and is visited every few years by an amateur DXpedition. In the autumn of 1982, it was the turn of the US based International DX Foundation to sponsor a group consisting of WA2MOE, K8CW, N4B-QW, PY2BZD and PY2CPU, for a stay of about one week on the rocks.

A sailing boat was chartered and its skipper assured the the Foundation that he was competent and adequately equipped for an ocean voyage. Unfortunately, such did not prove to be the case. Not only did he fail to supply food and a landing dinghy as had been agreed, but he signed the amateurs on as crew and made them perform all the work of sailing the boat. Navigation was a task he kept to himself until, after several days, he admitted he was lost and handed

TO RADIO	DATE	UTC	RS	FREQ. (MHz)
G3ZAY	1979 JUNE 11 12 13 14 15	1702	59 2XSSB	7 (14) 21 28 50

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the job over to Stu Greene, WA2MOE, a former World War 2 air navigator. Stu eventually located the rocks after a sleepless night peering into the darkness, but tying up proved to be another job the skipper was unable to perform. After five attempts, it was managed by K8CW & N4BQW.

The operation proved to be reasonably successful, with some 14,000 QSOs being made, though it did attract some criticism at the time for spreading its pile-ups across almost the entire 20m phone band!

That seems to have covered most of the problems that have arisen in getting to remote places. Now let's look at a few of the problems involved in staying on them.

Nauru (C21)

The Pacific island of Nauru presents a major problem to would-be DXpeditioners — obtaining a tourist visa. The island is one enormous pile of fossilised bird droppings and the revenues from fertiliser exports have made the inhabitants some of the wealthiest people in the Pacific. They seem to like to keep their island to themselves, (and it has to be admitted that most foreigners are quite happy to let them!) and have never tried to develop a tourist industry.

In consequence, it is usually only possible to get a transit visa, which allows the holder to stay for the time needed to catch a connecting flight on the national airline — Air Nauru. The challenge for DXers is thus to find a combination of incoming and outgoing flights which gives a reasonable length of time on the island. Three days seems to be about the maximum. For those who manage to get at least one overnight stay, the club station

C21NI is usually made available.

St. Peter & Paul Rocks

Bird droppings seem to be the theme of this section! The expeditions that have made it to these rocks have discovered that almost every flat surface is at least ankle deep in guano — to get it its polite name. The only clean areas are the ones that are washed by the waves. Thus the technique usually adopted has been to set up the stations just below the high water mark, shroud them with plastic sheets to protect them for the spray which is a problem even at low tide, and dismantle them entirely when the water starts to lap up around the operator's feet! The rocks are razor sharp, finding somewhere to sleep is virtually impossible, and for a tropical location, the nights are surprisingly cold. Nobody stays there very long.

Okino-Torishima (Parece Vela — 7J1)

One of the strangest places to make an appearance on the DXCC list in recent years was Okino-Torishima, or in European atlases, Parece Vela. This is several hundred miles south of Japan and is no more than a semi-submerged reef. At high tide, a few boulders protrude a few inches above the water!

Finding a natural feature from

RADIO	DATE	TIME	MHz	REPORT
G3ZAV	JAN. 9 8 '80	0820 1816 GMT	14 21	SSB 55 59

Our thanks to Madison Electronics, J.W. Miller, Hustler, Hy-Gain, the Red Stick DX Association and the Fairfield (CT) ARA for their support in making this expedition possible.
We also would like to thank N6AHU, W6PJX, W7PHO, WD6AEI, and the others who assisted us with the emergency traffic. Our sincere thanks to KH6ETG and KH6CY for their assistance with the gear in Hawaii after the teams returned stateside.
Our congratulations to the crew of the Varua, led by Captain Russ Nilson, but most of all, our highest esteem goes to the United States Coast Guard. Their immediate responses and understanding of the problems will long be remembered by the entire team.

The Story . . . Shortened Version . . . dates are Hawaii referenced
JAN. 4, 1980 - Flight to Palmyra aborted (radio failure) approximately 120 miles south of Hawaii. Returned to Hawaii.
JAN. 5, 1980 - Crashed on landing at Palmyra. Jan. WAGYOW seriously injured. Coast Guard, with C-130 arrives and evacuates Jan to Hawaii. After a team vote, we decide to stay. Palmyre is put on the air.
JAN. 6, 1980 - Varua leaves Palmyra for Kingman Reef. Kingman spotted mid afternoon. Anchor off Kingman Reef shoals early evening. Despite high seas and difficult landing, we settle on the reef. Kingman Reef put on the air.
JAN. 7, 1980 - Despite high seas and difficult landing, we settle on the reef. Kingman Reef put on the air.
JAN. 8-9, 1980 - Both sites active.
JAN. 10, 1980 - Kingman Reef de-activated. Returned to Palmyra at sunset.
JAN. 11, 1980 - K6LPL seriously injured. Coast Guard arrives with C-130. Entire team leaves Palmyra at Sunset arriving in Hawaii at 10 P.M. 15,000 QSO's were made from Palmyra Island.
JAN. 12, 1980 - K6LPL receives 4 hrs. of hand surgery at Queens Hospital and returns home Jan. 14
 OPERATORS Palmyra: K6LPL, DAVE and K2HFJ, BOB
 73's and Thanks

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which to operate was clearly impossible, and the approach adopted by the two expeditions that went there before the ARRL yielded to common sense and deleted it from the lists, was to construct a multi-storey scaffolding platform perched hazardously on the rocks. The first floor of the platform housed the generators, and the second floor the operating position. A ship was kept standing by at all times because any large waves would have brought the entire structure crashing down. The operators remained on the air as long as the weather allowed.

The QSL cards for both operations have a picture taken at high tide, showing what appears to be open ocean with scaffolding growing out of it. The widespread distribution of these cards was probably responsible for the country's deletion.

Other Tropical Islands

There is usually a good reason why an island is uninhabited and DXpeditions tend to discover that reason quite quickly. Wildlife is a recurring theme. Birds have already been discussed, but rats, mice and crabs can be equally troublesome. Many DXers have reported having to fight off these creatures with one hand while operating with the other. Some of the wilder CW heard from DXpeditions has been attributed to the operator losing the fight! Crabs in particular, seem to be designed for iambic keyers as their claws give them a good grip on the paddles. Presumably the lack of a regular human presence makes the creatures more 'friendly' than they are on inhabited islands.

Soaring daytime and plunging night-time temperatures can also make life unpleasant, and it is often quite difficult to get advanced information about the climate. Few of the more remote DXCC spots are listed in the holiday information brochures at travel agents.

Once the operation is over and the logs have been safely wrapped up, the only problem is getting home. This hasn't always been easy.

VK0JS Heard Island

One of the longest return journeys of recent DXpeditions was

that made by VK9NS, VK9NL, WA8MOA, OE1LO and VK7ZSJ after their operation from the Antarctic location of Heard Island in early 1983. Their vessel was a converted whale-catcher which, theoretically, should have had sufficient fuel for the round trip from Australia to Heard Island and back. However, a combination of poor engine performance and unplanned steaming in the vicinity of the island meant that a few days after setting out for home the fuel ran out.

As the prevailing winds were blowing towards Australia, the crew rigged a makeshift sail from some old tarpaulins and the boat drifted in approximately the right direction at about 60 miles per day. There was just enough fuel to run the generators for a few hours a day, and the outside world listened in to the radio skeds and followed progress with interest. When the boat neared the Australian coast, a re-fuelling vessel came out to meet it and enabled it to do the last few hundred miles under its own power. The return trip had taken about five weeks longer than planned. Some of the DXpeditioners had to hope that they still had jobs to return to.

ZL8AMO etc Raoul Island, Kermadec Group

The Kermadec Group, a possession of New Zealand, is uninhabited apart from a small weather station on Raoul Island, and counts as a separate DXCC country. In April this year, four DXers (ZL1AMO ZL1BQD ZL1AAS and ZLOAJW) and a small group of research scientists chartered a boat to take them to Raoul Island. The journey over was uneventful, and the operation went well with many thousands of QSOs being made, but after they had been on the island a few days, a tropical storm swept down on them and dashed their boat onto the cliffs. They were marooned with no transport expected for several months.

The more selfish members of the DX community were looking forward to an extended operation and a chance to work Kermadec on nine bands when it was announced that a trading vessel plying between Tonga and New Zealand was

being diverted to pick up the group. In the end, they got away roughly on the day they had planned, though at a price of \$3000 for the diversion. DXpeditioning can be an expensive business.

Spratly Islands (1S)

No article on this topic would be complete without mentioning last year's ill fated expedition by a German group to the Spratly Islands. It is the only DXpedition in recent years during which some of its members died.

DJ3NG, DJ4EI, DJ6SI & DK4FK set out from Singapore in early April on a sailing vessel and headed for the South China Sea. As they passed Amboyna Cay, one of the first islands in the Spratly Group, they were shelled by its occupants and their boat was set on fire. DJ4EI was killed immediately, but the others managed to scramble into a dinghy which fortunately drifted away from the island. Their suffering as they lay for 10 days in the tropical sun with virtually no food or water are scarcely imaginable. But they were eventually spotted and picked up by a passing ship. Tragically, the rescue came a few hours too late for DJ3NG who died from exposure.

This incident caused a good deal of debate over whether such dangerous places should be kept on the DXCC list. The outcome was a ruling from the American Radio Relay League (the administrator of the DXCC Programme) that operations from the Spratly Islands would, in future, only count for DXCC credit if they took place from one of the occupied islands, with the full permission of the occupying authority. Freelancers such as the DL group, searching for an unoccupied sandbank would not be recognised. Almost all the countries around the South China Sea are occupying one or more of the Spratly's so future DXpeditions should not be too hard to arrange.

If this list of disasters has put you off the idea of mounting your own DXpedition, remember that the vast majority of trips passed off with no problems at all. If you are wondering why such a large number of obscure rocks should count as "countries", enlightenment in the form of another article by G3ZAY will be coming soon.

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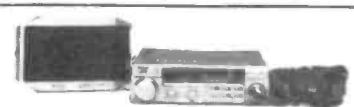
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The ALPHA Transceiver

Part 4

The only remaining job with ALPHA is to fit the Active Filter unit if this is being used. This is the same unit as used with the OMEGA Project, and details of how to get the article were given in Part Three last month.

The filter as originally described

seven options are used for these positions. For general use, we would suggest that position 'G' is used for 'wide' (this is suitable for both SSB and CW), and 'I' for CW. It would also be possible to wire the switch to use three selectivity op-

Fitting the active audio filter and a few corrections to the previous three parts. By Tony Bailey, G3WPO, and Frank Ogden, G4JST.

offers a total of seven positions of selectivity, using cascaded op-amp active filter sections. These progress from a bandpass response, suitable for SSB use, down to a very narrow peaked response (centred on 800Hz) for CW, with intermediate degrees of selectivity. In use with ALPHA, in conjunction with the three position slide switch, only two of the selectivity options are used, marked 'wide' and 'narrow' on the front panel. It is entirely up to the constructor which of the

tions, where the 'OUT' position in fact goes through the filter — this would be a viable option for primarily CW use of ALPHA.

Construction

The filter is built exactly as described in the original article, except that R6 becomes 22k (rather than 2k2) to adjust the gain of the filter to the correct level, and C31 in the output isolating network is now 100n, rather than 10uF.

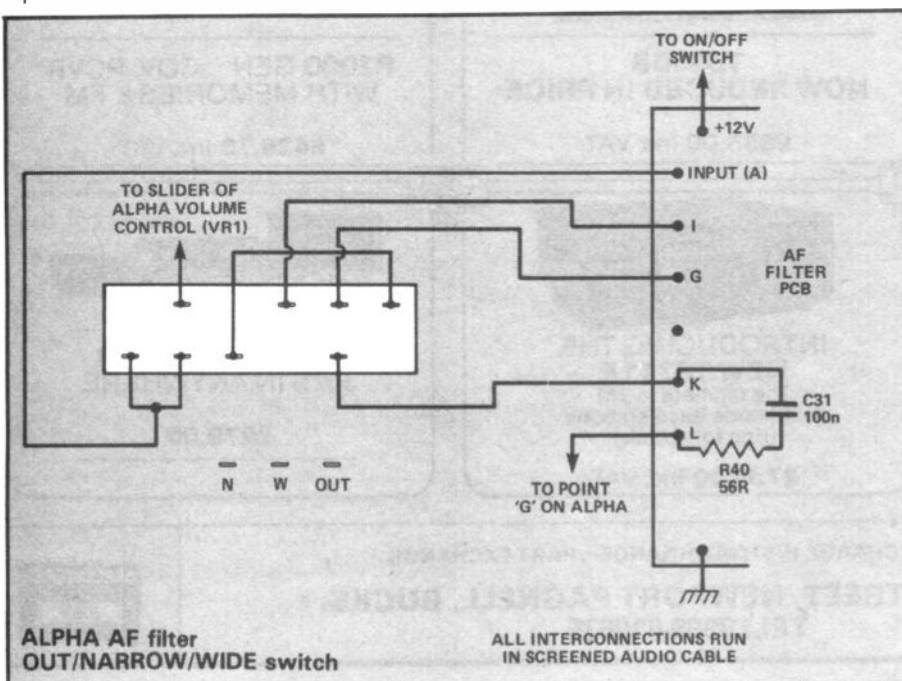
The filter is connected into ALPHA at point 'G' — the slider of the volume control potentiometer. The drawings show how this is done, and give the wiring detail for the three position front panel switch. All interconnections between the filter board and the ALPHA main PCB are made using miniature screened audio cable, with the braids earthed at both ends. The +12V supply can be taken from the rear of the on/off switch.

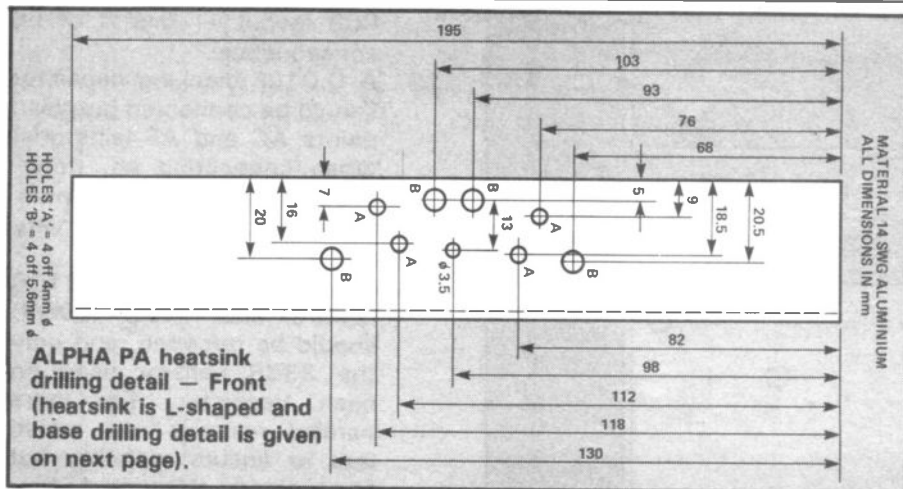
If the ALPHA case is being used, the filter mounts on the underside of the lid, above the heat sink, on two of the stud bolts provided on the left hand side (looking from the underside). Two half nuts should be used to space the board from the sink.

ALPHA Corrections

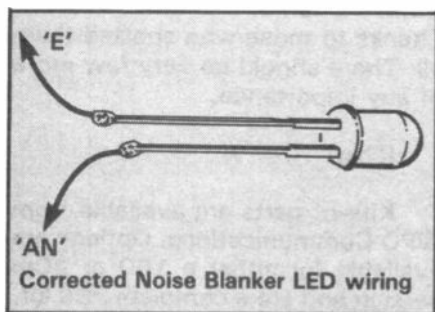
There are a number of corrections to the preceding parts of this series, many passed on by existing builders, for which many thanks. There are already a number of ALPHAs on the air. This is a listing of all known errors in addition to those already published on page 55 of October HRT.

1. The frequencies for X1 (USB or LSB crystal) in the components list are reversed for 160m and 20m.
2. Q30 should be a BC308 in the components list.
3. R58 (470R) is missing from the components list.
4. On p16 of part 2, towards the bottom of the centre column, the reference to joining up all points marked should read RL1 & RL2, not RL2 & RL3.
5. C107 in the components list should be 330pF.





6. D33 should have its own non-earthed pins connected together to short out the unused half of the diode pair.
7. The present close by RL3 on the circuit diagram is RV10 (not R107). Please note that this was a late addition the board, and unfortunately the end shown earthed shouldn't be! It is intended to be a series variable resistor — not as shown.
8. The diode to the right of point K (meter) on the circuit diagram is D24.
9. On the connection diagram, the blanker LED is shown incorrectly wired, as R56 goes to earth, not to +8V Rx as on the diagram. Therefore, wire

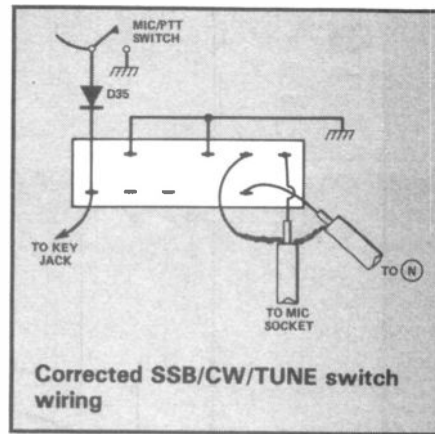


10. Please do not attempt to shorten the transmission lines! They are tuned in conjunction with the series inductors on the PCB. They can be coiled up to save space with no ill effects. On 20m, it may be necessary to adjust the spacing of the turns on L3 and L4 to get full power output, or even to remove a turn from each (the permeability of the cores varies somewhat which varies the inductance).

11. R6 should be 1k5 in the components list. C101 should be 10n on circuit diagram. R108 should be 22R in the components listing.
12. C119 on the circuit diagram (by Q33) doesn't exist (it is a duplicate of C130).
13. D25 (blanker near IFT8) is shown the wrong way round on the overlay diagram.
14. Recommend Q16 is soldered in before C55 to avoid problems.
15. For 160m, R148 should be 470R, and C113 should be

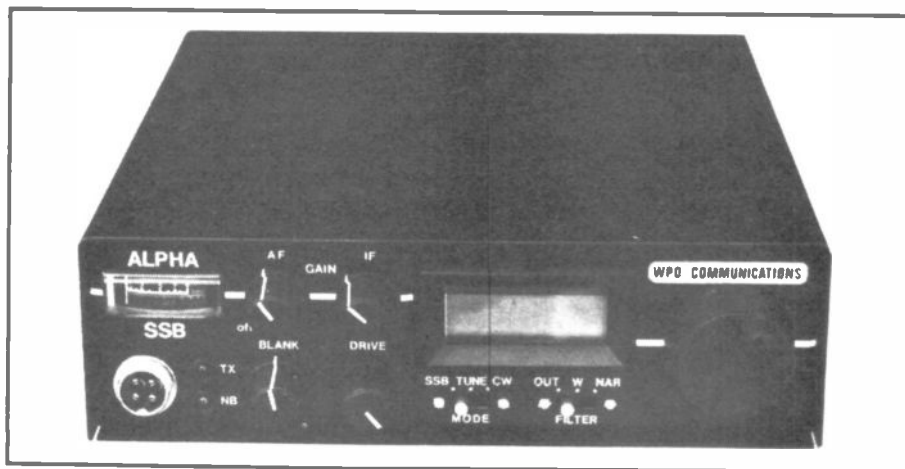
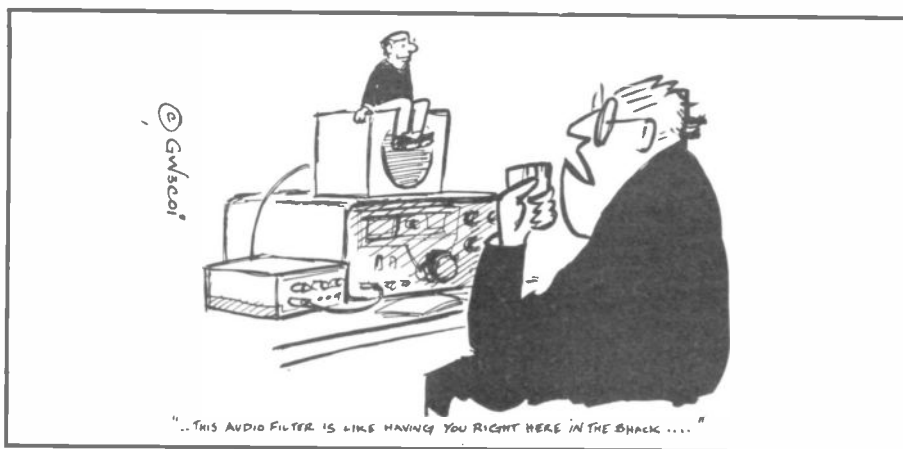
220p. For 20m, C113 should be 47p (these are changes since the article was written).

16. On the wiring diagram, both the SSB/TUNE/CW switch connections and the wiring for D35 are incorrect. The drawing shows the original type of switch which has



changed later to the type in the parts list. See the switch drawing for correct layout.

17. The AF volume control on the circuit diagram should read VR1, not RV1.
18. C132 and R148 (Loop filter) are reversed compared with





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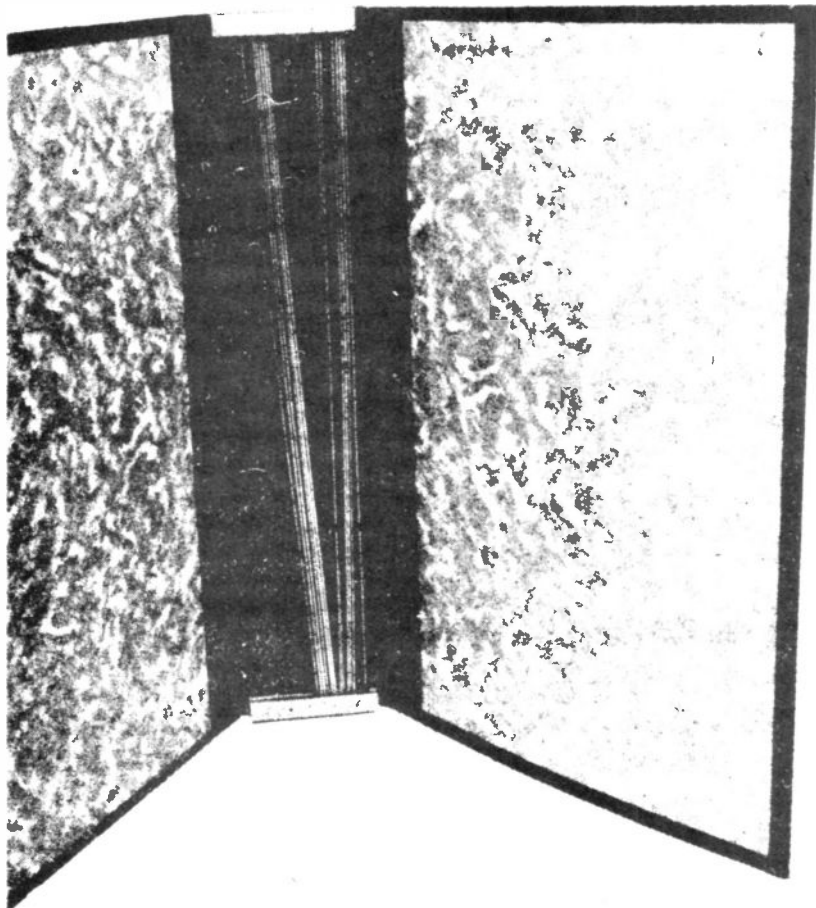
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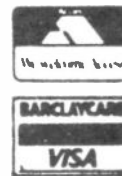
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A Broadside multiband dipole for HF

Does your garden point in the wrong direction or is it the wrong width for the best chance of world-wide DX? Here is a suggestion to

Readers with antennas oriented roughly north-south, will find that on 20, 15 and 10m most of their precious RF power is covering

Resonant Stubs

This antenna is designed and constructed using a system of resonant stubs (referred to recently as "linear resonators") to move the radiation pattern on 14, 21 and 28 MHz through 90 degrees. For those unfamiliar with linear resonators, these 'stubs' formed within the length of the antenna, are effective at 'cutting it off' at the correct points for half wave

Many multiband dipole antennas for 80-10m change in impedance and tend to propagate RF in very different directions as you change bands. Brian Herbert, G2WI, offers a design which avoids both these problems to a considerable extent — without using 'lossy' traps!

overcome the problem without moving house or annexing neighbours gardens! A second advantage is that the antenna will follow the transmitter from band to band (like the proverbial lamb) without recourse to an ATU.

Careful construction will ensure operation on all the intended bands with low SWR and excellent results. The dimensions given, produce peak resonances in the popular parts of the SSB segments of each band. Anyone wishing to peak the antenna at particular frequencies need only adjust the appropriate lengths slightly or use an ATU.

The W3DZZ/G8KW type of multiband 'trapped dipole' usually increases its electrical length by half wavelengths as frequency increases (ie half wave on 80/40m, 3 half waves on 20m, 5 half waves on 15m). This can either help or hinder depending on which direction the antenna is running in.

areas of the globe which are only inhabited by polar bears. This is because as the electrical length of an aerial is increased in multiples of half wave lengths, the main direction of 'fire' of the antenna moves from right angles towards the direction of orientation of the antenna (ie 'end fire') as shown in Fig.1. To retain multiband operation but changing the radiation pattern for more populous areas of the globe is not difficult.

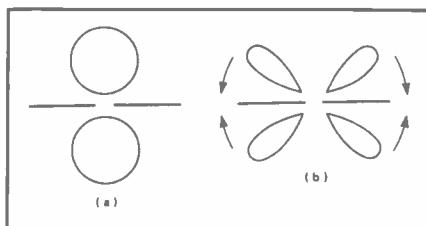


Fig. 1 As the electrical length of an aerial is increased in half wavelengths, the main lobes of radiation approach the line of orientation of the line of the antenna. (a) half wave dipole (b) full wave dipole:

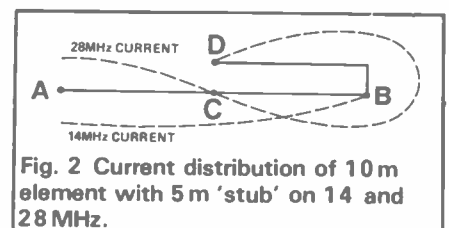


Fig. 2 Current distribution of 10m element with 5m 'stub' on 14 and 28 MHz.

resonance in the various bands. To give a greater insight into how the stub works, envisage a wire $\frac{1}{4}$ wave long on 20m (which will be 5m (16' 6") approx).

Fig.2 shows that 20m RF fed to A will 'see' resonance (ignoring ground or other parts of the array). This wire could not be easily fed with 28MHz RF from a low impedance transmitter output at point A as this would try to produce a current max at point B — which being the 'free' end is physically impossible! However, if a parallel wire is joined at B and carried back close to the original wire for a length of 2.5m (8'3"), then 28MHz RF can be current fed at A. The resulting current diagram is also shown in Fig.2: let me explain some more, the radiation from the length C-B

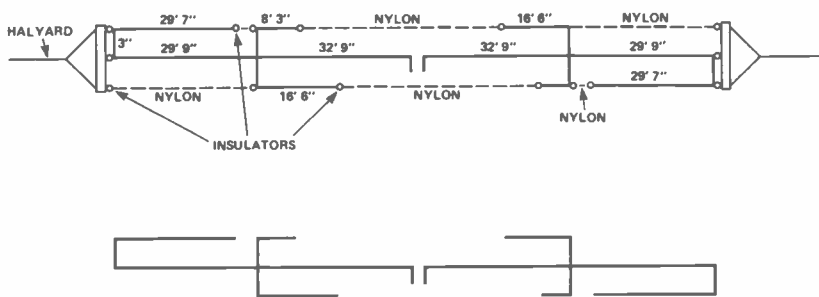


Fig. 3 Full plan skeleton diagram.

will be cancelled out by this from B-D, so that the only effective radiator will be the portion A-C — which is a quarter wavelength on 10m. This gives a radiation element which will automatically cover two bands; if a dipole is constructed using this method, it will produce a two-band antenna, current-fed, and 'firing broadside.'

This system can be simply extended to produce an antenna which will cover all the (old) bands 80-10m. Yet, some may say that five half wave dipoles all in parallel across a common feeder is effectively the same antenna. True, but then it would be very clumsy to erect (fancy having to find ten tying off points for the ends!). There is also the strong possibility that the feeder/antenna match will be anything but perfect due to the reactance of the unused dipole elements. The described design preserves a non-reactive feed point on all bands.

The plan view of the antenna is given in Fig. 3 which also carries the dimensions. It will be seen that the overall length is 38.12m (125'), however, the extremities (up to 30-40%) may be bent down without any impairment of the 3.5 and 7.0MHz results. The whole length of the main wire resonates

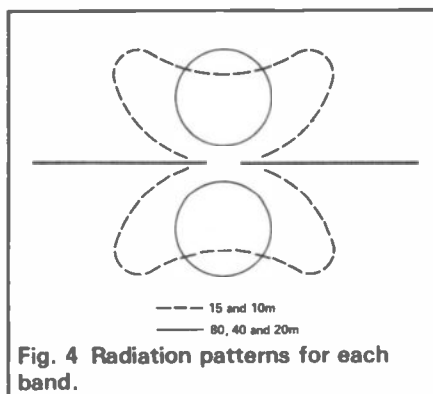


Fig. 4 Radiation patterns for each band.

slightly above 3.5MHz, the stub wires giving a little loading.

On 7 and 21MHz, the 9m (29'7") stubs reduce the main wire to an effective 20m (66'), which resonates at 7MHz as an half wave and on 21MHz as the three half waves. This radiates as a 'heart shape' on each side of the main wire. Similarly, the 5m (16'6") and 2.5m (8'3") stubs shorten the 7MHz portion of the wire to produce resonance in the 14MHz and 28MHz bands. Again the 28MHz radiator will be three half waves long with the same radiation pattern as for 21MHz. The radiation pattern for each band is given in Fig.4. With an approx. N-S antenna line these radiation characteristics will cover most of the land masses of the globe.

Constructional Details

Three wires, each 38.12m (125') long, are stretched parallel to each other, with the centre of the one to be the main radiator carefully marked. This will be the point of attachment of the feeder. From this centre point, measure 10m (32'9") toward each end and solder the wire securely to the centre of 15cm (6") length of 3/8" brass rod. Stretch the two subsidiary wires as taut as the main wire, and keeping the brass crosspieces at right angles, solder the subsidiary wires to the ends of the cross-pieces.

Continue along the main wire another 9m (29'9") in each direction and solder on a 8cm (3") length of brass rod. These are only half the length of the previous ones because they have only to connect the main wire to one of the subsidiaries, the other to the opposite subsidiary.

Cut two pieces of 5/8" beech dowelling 18cm (7") long, soak them in melted candle wax (weather proofing) and attach three 'egg' insulators, one in the middle and one at each end. These three insulators take the three wires at the end of the antenna. A piece of nylon cord bound round each end of the dowelling enables attachment to the halyard. To avoid upsetting the tautness of the array, the insulators must be prepared as in Fig.5. When all these are ready, mark the places where they are to go in the subsidiary wire; with the

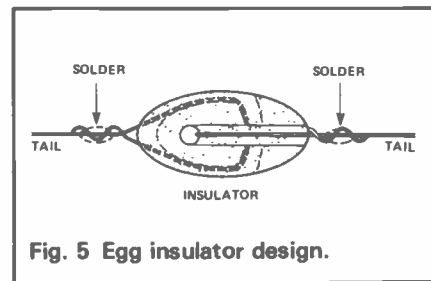


Fig. 5 Egg insulator design.

array laid out on the ground cut the wire, offer up the insulator and solder the 'tails' to the wires, having made a secure twisted joint. Try to preserve the original tension in the wires.

And Finally . . .

The antenna is now complete save for the attachment of the feeder. This should be accomplished using one of the conventional porcelain 'T' pieces: I recommend balanced twin low impedance type feeder. If using co-axial cable, a 1:1 balun could be put in the centre of the antenna.

If the points from which the antenna is to be suspended are less than 38.12m (125') apart and the ends are to be bent down, try introducing some more beech dowelling spreaders at the points of bending to form attachments for the halyards. Incidentally, the bending down of the extremities has little effect on the radiation — as long as they are not carried back under the main top.

For those who positively cannot get the 38.12m (125') length, the antenna can be terminated at the 20m (65-66') points. This will preclude 80m working but will provide a 4 bander with precisely the same radiation pattern on 7, 14, 21 and 28MHz as the full size version.



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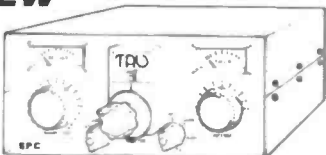
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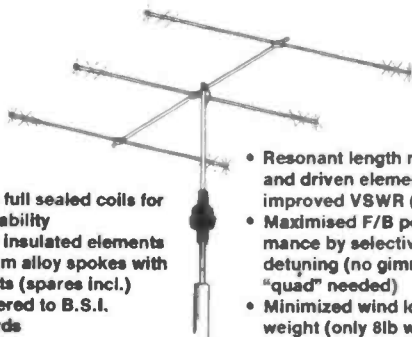
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REVIEW: Global HP4A

Probably most transmitting amateurs have had the dreaded knock on the front door from a rather irate neighbour complaining that your transmitter was breaking

A variety of 'high pass' filters are available to stop television interference from HF transmissions. Ian Poole, G3YWX, had cause to investigate one of these...

through on his telly and "he cannot watch his favourite programme." Unless the neighbour is very understanding or has had some previous experience of TVI, then he is more than likely to assume that his TV is working perfectly correctly and it is your transmitter which is the offending item. Not only can the problem of TVI present technical problems but it can also present serious diplomatic ones as well if you are to live in harmony with the neighbours and continue to transmit.

Obviously, the first step which should be taken, even before any TVI is reported, is to ensure that the transmitter is not radiating a level of spurious capable of causing interference. The next stage is to ensure that one's own television can be used perfectly well whilst the transmitter is in use. The classic solution to TVI which is not a result of transmitter spurious is to insert a high pass filter into the television aerial feeder in order to 'remove' the strong amateur signal, which is lower in frequency than the TV signal (hence the name - high

pass). Whilst it is quite easy to build your own filters for this purpose, it is usually more acceptable to the neighbour if he sees a 'professionally made' piece of equip-

ment attached to his television. After all, to him you may be an 'amateur electrician' (as I was called once!). There are a reasonable selection of high pass filters on the market today which are easy to obtain, look professional and are fairly small - which means they can neatly fit behind the television! One such filter which I tried when TVI reared its head at my station was the HP4A available from Waters and Stanton. The filter arrived neatly packaged

on a display card which gave instructions about its fitting and also its uses. The filter itself is enclosed in a small plastic case which had a coax socket at one end and a short lead with a plug on the other. Therefore installation was just a matter of placing the unit in the TV feeder ie no solder connections etc.

The filter itself is constructed on a small PCB and has filters on both the inner conductor and the outer braid to give a higher rejection of the unwanted signals - this also tends to stop RF picked up on the coax braid, which is often the cause of the TVI in these days of UHF TV.

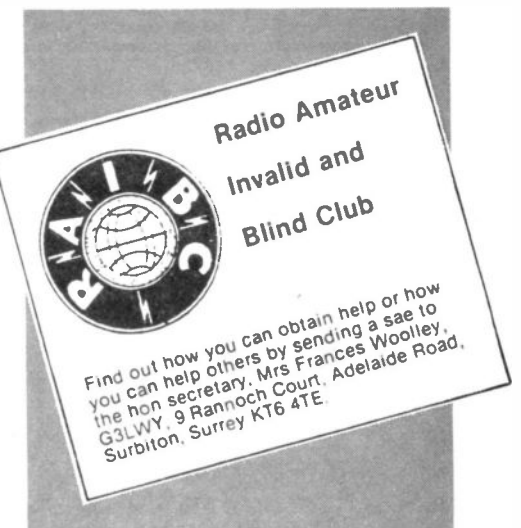
Under test the filter was found on the HF bands to give approximately 30dB rejection over the whole spectrum. This is equivalent to reducing the transmitter power from 100 watts to just 0.1 watt -

which should be sufficient to cure most cases of TVI if the interference is entering the set via the aerial connection. As for the insertion loss, there was no noticeable picture degradation when the filter was inserted and the TV tuned to a weak station.

In practice the filter was successful in eliminating the breakthrough on a TV whose aerial was a matter of six feet away from the transmitting aerial carrying 100 watts of RF. From the neighbour relations point of view the filter is neat, small and has a professional finish to it.

The cost of the unit is currently £5.95 plus 50p postage which is

not a great amount when one considers that it may preserve neighbour relations and allow operation on the HF bands into the bargain. The filter may be obtained from: Waters and Stanton Electronics, 18-20 Main Road, Hockley, Essex.



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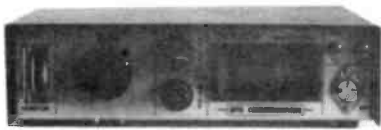


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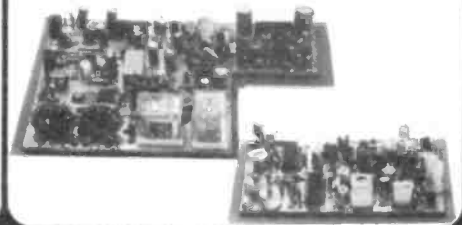


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Radio Yesterday

The writer is just old enough to have been slightly involved in 5 metre (56 MHz) activity before 1940. As a schoolboy SWL, I avidly read the accounts of activity on that band; a band then called an 'ultra-shortwave' band, and was in-

to a full history of the opening up of our first VHF amateur band. Such a history has still to be written, as so many of the principles who were then involved are no longer with us and so many of them left no documentary records of their ex-

John Heys, G3BDQ, takes a nostalgic look back at the old 5m band.

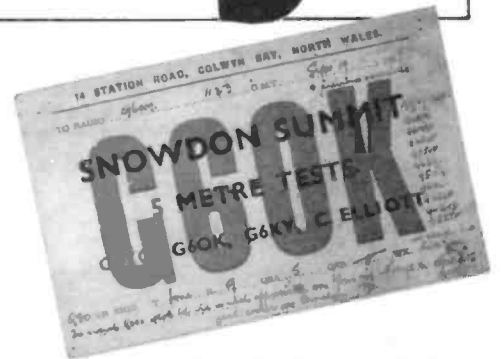
duced to build a 'rushbox' super-regenerative receiver. This was to, hopefully, pick up signals from a Field Day station that was to operate from the summit of Snowdon, during the late summer of 1937. Then I lived in a small town in East Cheshire, and will remember sitting out all day in our backyard with the receiver on a stool, wet and dry batteries beneath and an antenna wire slung up into our only tree! No signals were heard, which was hardly surprising, for a receiver check later at the shack of the late G2HB (my only amateur within walking distance) revealed that although it tuned the band, I had inadvertently used galvanised iron wire for the tuning coils!



Memories of those times have prompted the research needed to prepare this article, which however does not claim to be anything close

to a full history of the opening up of our first VHF amateur band. Such a history has still to be written, as so many of the principles who were then involved are no longer with us and so many of them left no documentary records of their ex-

plots, its writing will prove a daunting task. As early as 1925, British amateurs had started working on 5 metres and distances up to 20 miles were being achieved. The wavelengths below 10 metres seemed to be a 'free for all' and there was no restriction or band plan. A 'Wireless World' dated August 10th 1927 has an illustration on its front cover showing three amateurs and their portable gear by a riverside. It is titled 'Outdoor Transmission, An 8 Metre Set At Work'. The transmitters used then and for more than a decade later, consisted of self-excited valve oscillators, usually arranged in push-pull. The valves were carefully picked from a batch and were 'de-based' to reduce RF loss and lead capacitances. Receivers



were generally simple one or two valve TRF designs at first, but these were replaced when the tremendous gain of detectors using Armstrong's super-regenerative principle was realised. Super-regens were used right through the 1930's. Very few superhets for 56 MHz were in amateur use during that time, and such a wide bandwidth approach together with the inherent frequency instability of the transmitters, severely limited DX capability on the band. In 1927 the American firm of RCA were marketing their new UX-852 transmitting valves, which would oscillate down below 5 metre wavelengths and give a useful 75 watts output. British amateurs tended to use QRP on 56 MHz and few stations ran more than 10 watts of input power.

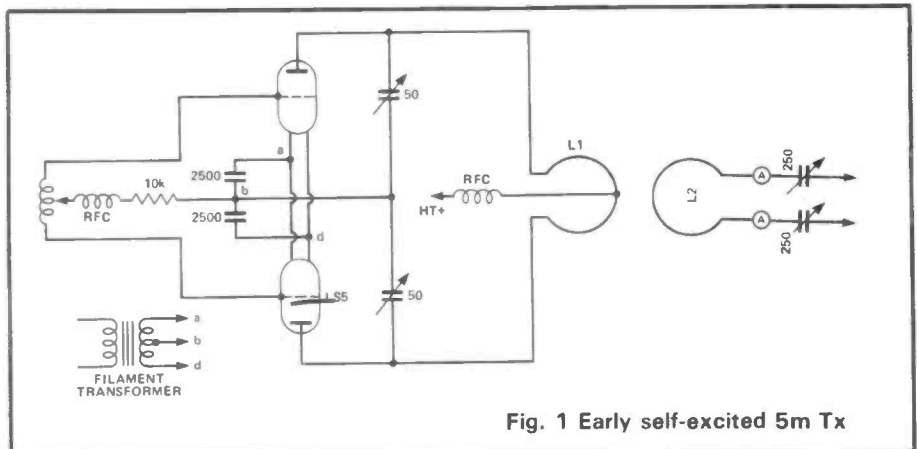


Fig. 1 Early self-excited 5m Tx

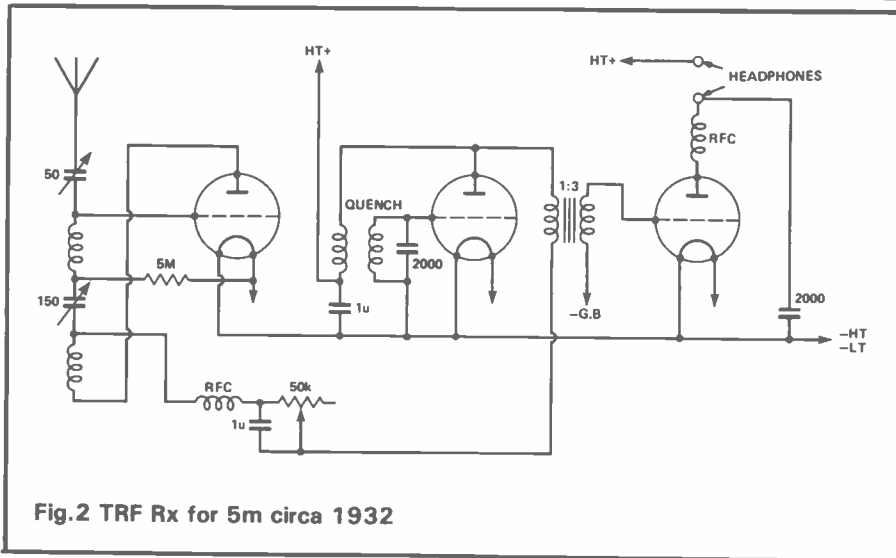


Fig.2 TRF Rx for 5m circa 1932

G5BY Leading DXer

Right through the mid and late 1920's, Hilton L. O'Heffernan, G5BY, was perhaps the leading British DX worker on the HF bands. He won many awards for contest operation, was a world leader in Frequency Measurement Contests and also won the 'QST' magazine Station Description Cup for having the World's best amateur radio station in 1929. G5BY was the top British entrant in seven consecutive ARRL International DX Contests. In late 1931 O'Heffernan teamed up with S. G. Morgan, G6SM, and began to seriously investigate propagation and design techniques on the five metre band. By then the British Amateur Licence included the five metre band and operation was allowed between 56.07 and 59.93 MHz; that is from 5.35 to 5.005 metres.

G5BY and G6SM developed a push-pull transmitter circuit (Fig 1) using a pair of LS5 valves. These could give from 10 to 45 watts output on the band and could be modulated with tone (for morse work) or telephony using the, then common, 'Heising choke' modulation method. Simple carrier CW could not be received on super-regenerative receivers so tone modulation was necessary. An open 'breadboard' form of construction was in favour, at that time and the Tx was laid out along a piece of stout plywood some two feet in length. the anode coil was a single turn 5 inches in diameter! Their receiver was a super-regen (Fig 2) using a separate quench

oscillator valve, which worked at just above the highest audible frequency and with a single audio stage of amplification. The detector circuit was based on the Meissner design and allowed the use of a fairly large capacity, tuning capacitor (150 pF), which was really in series with both coils and the valve interelectrode capacities. This circuit was to become a favourite with many of the early VHF workers, for it allowed the use

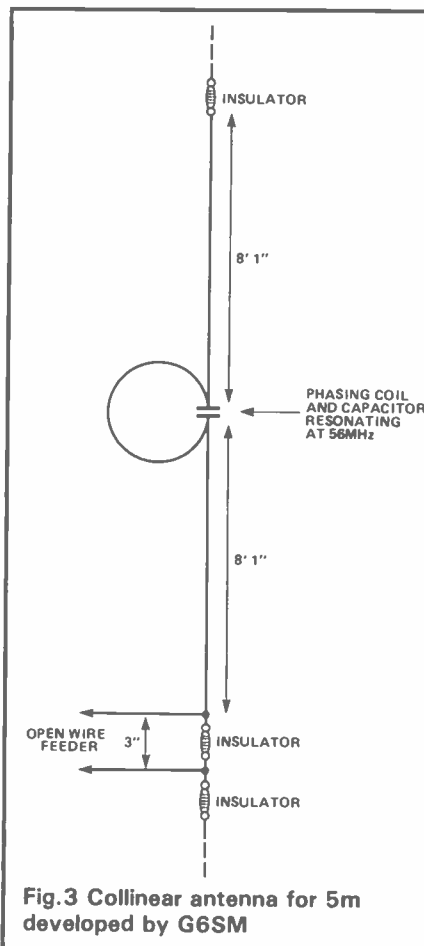


Fig.3 Collinear antenna for 5m developed by G6SM

of valves not specially designed for operation on the 'ultra-short' wavebands. The G5BY detector used a Mazda HL2. There were similar circuits which relied upon self-quenching action but they were inherently tricky to set up and tune.

Vertical polarisation was favoured by the five metre enthusiasts and an 8 foot vertical was commonly used. G6SM however was one of the first amateurs in this country to use a collinear antenna (Fig 3) and his version used two half waves in phase supported vertically. The correct phasing was obtained from a tuned circuit between the two half wave sections. Open wire 'Zepp' feed was used and G5BY suggested that the feeder could be any odd multiple of a quarter wavelength long. This would present a lowish impedance at the transmitter end, with current feed to a link coil, which was coupled to the anode coil of the transmitter.

5 Metre Mobile!

All this five metre gear was often taken out by open car into the countryside south of London and many tests were carried out by G5BY and G6SM. Ignition interference severely restricted mobile working, but coasting along with the engine switched off, at speeds up to 50 mph, (not recommended!) allowed good phone working at ranges of 6 to 7 miles. Their most effective antenna, when mobile, proved to be a horizontal wire, ten feet long, slung between the front windscreen and the back of the car. A ten foot vertical wire tied to a thin bamboo pole was not so good and it once resulted in a comment, from a couple of urchins who asked whether the "Guv'nor was goin' fishin'"! G5BY hoped he could install a QRP 5 metre transmitter in an aeroplane to discover the maximum range possible, but this feat was successfully carried out by the South London team of G6QB, G6HP, G6NF, G6JP and G5CV during May 1933.

O'Heffernan, however went on to create DX records on the five metre band. He set up the 56 MHz World Record in August 1933 for transmitting telephony 200 miles. On December 27th 1936, G5BY was the first European station to be

AMATEURS START RADIO REVOLUTION

130-Miles Broadcast on Five Metre Wave

HEARD 10,000 FEET ABOVE THE SEA

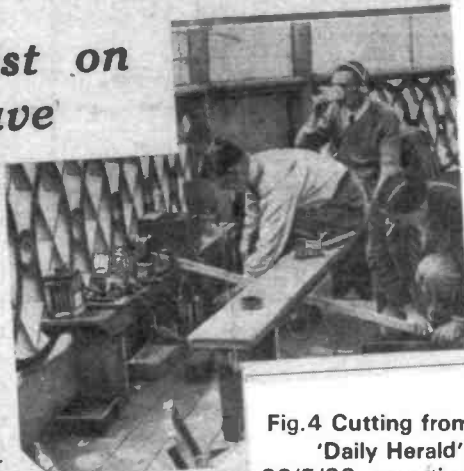
HOW PLANE PICKED UP TRY-OUT MESSAGES

RADIO free from atmospheric and at exceedingly small cost is likely to be the ultimate result of an experiment carried out yesterday by a group of London amateurs.

Flying 10,000 feet above the North Sea, two "Daily Herald" men heard a speech broadcast from the Crystal Palace—130 miles away—on the amazingly low wavelength of five metres.

Science had said that this was impossible—that broadcasts on ultra short-waves could only be heard a few miles away.

A year's painstaking work by a few amateurs, most of them using home-built sets, has, however, borne its fruit. Soon, it is thought, radio will become the cheapest means of communication in the world—and so simple will be the sets that the merest child will be able to operate them.



The amateur wireless enthusiasts on the North Tower of the Crystal Palace, whose broadcast was picked up by the aeroplane when over the North Sea.

Fig.4 Cutting from 'Daily Herald', 22/5/33, reporting the reception of signals from G6JP and G6QB by G5CV in a light aircraft.

Special Licenses

May 1933 was the month when the successful reception of 5 metre signals transmitted from the Crystal Palace (later burnt down) was achieved by amateurs, in an aeroplane 130 miles away over the North Sea at a height of 10,000 feet. The South London amateur group mentioned above included George Jessop, who is still an active and enthusiastic worker on VHF and is a long-time RSGB Council member. I was privileged to have been a close friend of another participant in this episode and got much information from 'Tommy', the late G6QB whom I met regularly for twenty years. G6QB was an organist at the Crystal Palace in 1933. This perhaps helped him to receive permission to transmit from the top of the 282 foot north tower. An earlier exploit of 'Tommy' had been to take a small 5 metre rig to the top of one of the huge, wooden gas holders in Battersea. He told me that the climb up to the top of this structure was certainly 'interesting' and not for the chicken hearted!

The Postmaster General and the General Manager of the Crystal Palace both agreed to the experiment and a special licence was granted. All amateur licences then depended upon proof that scientific experiments were going to be

undertaken. In 1933 the BBC had a powerful 7 metre transmitter in London, but it could only achieve a range of about 10 to 15 miles. This gave the Crystal Palace tests some importance for, at the time, little was understood about long distance propagation on VHF. The transmitter atop the north tower had an input of ten watts, derived from the mains supply, and transmissions began on May 21st.

Douglas Walters, G5CV, was an important member of the Crystal Palace team. Walters, who lived near Bedford Park, Chiswick, was a qualified Radio Engineer and also the Radio Correspondent for the Daily Herald. He was able to supply the newspaper with accurate information relating to the tests, and the Daily Herald reports were detailed and contained no exaggerations. G5CV was using QSL cards at the end of 1938, which reveal that he was licenced to use up to 250 watts input; so must have been held in high regard by the GPO. He was also, incidentally, the first person in Britain to receive television from the USA; that is before the end of 1938.

Aircraft Mobile!

On the 21st of May 1933 the light plane took off. The operator listening for the ground station was G5CV and at first, he heard a number of five metre stations in the London area. These faded out as the range increased and, eventually, only the signals from G6QB operating from the Crystal Palace and from George Jessop, G6JP, at Hammersmith were being copied. Then at about 80 miles from London both these stations faded out too. The pilot was asked to climb higher, and when they reached 10,000 feet, the Crystal Palace morse signal was heard again, soon to be followed by G6QB's telephony. The antenna on the aircraft was just a few feet of wire, draped across a wing and the receiver used by G5CV had also been built by him. Shortly afterwards, a transmitter was flown and two-way QSOs were made with a station at Wendover, at a range of 40

miles. On June 18th, G5CV and G6JP became the first amateurs in Europe to establish two-way communication between two aircraft. These two stalwarts each flew in De Havilland Dragon-Moths, which had been chartered by the Daily Herald and Popular Wireless. The transmitters were home built, battery powered and only ran from about five to seven watts input.

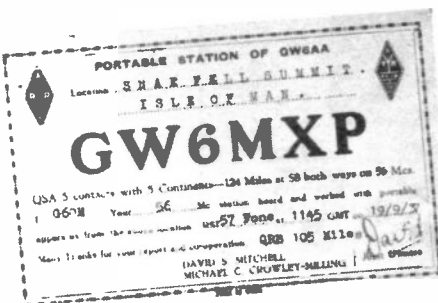
The late Ian Auchterlonie, GW6OM, (formerly G6OM and a past Council member of the RSGB) worked on the 56 MHz band in the 1930s, and recently, the writer was fortunate in obtaining many of his old QSL cards. Amongst these were a few of his contacts on that band and a few listener reports were also found. These cards are a valuable record of amateur achievement on the band and mention some of the equipment then being used. In 1934 G6OM lived at Heswall on the Wirral but by 1937 he had moved to Manchester. Two 1934 contacts on five metres were with G6DO, a close neighbour in Birkenhead and G2II in Colwyn Bay, North Wales. G6DO used a super-regenerative pentode receiver and said on his card, "Vy glad to QSO on this band at last. Nothing stops us." David S. Mitchell, G2II used a 'straight' 0-V-1 receiver and a 66 foot Zepp antenna. He wrote, "Congrats on a very FB fone transmission."

By 1937 there were many more amateurs on the five metre band and their gear was becoming more sophisticated. G5US in Cheadle used a simple 8 watt 6A6 valve in a push-pull circuit for transmission and had a half wave vertical antenna at 20 feet. He wrote however, "Thanks for crd. OM and report on my 56 MHz wobble. Have now scrapped s.e (self excited) on 56 MC. Hope get gng on c.c (crystal control) soon." G6TL in Stalybridge had a crystal controlled transmitter with 7 watts input and a 3 valve super regen. receiver; but G2GA in Bury was still running a push-pull TPTG using a pair of 'super power 2 volt valves' at 2 watts input from a 120 volt dry battery. His receiver was a straight 0-V-1 and the antenna was a half wave dipole.

/P on Snowdon

In my introductory paragraph I

mentioned my attempts to receive the portable station at the top of Snowdon and some details of this expedition to Wales by Messrs G6YQ, G6OK, and G6KY can be found on the QSL card they sent to G6OM for a QSO with them on September 19th 1937. On the card is written, "Your sig always a real corker on Snowdon." And there was also a list of the stations worked from that elevated site on the 19th. These were G6OM, G6MXP, G6GWP, G8JVP, G6SQ, G5MQ, G6GL, G2DCP, GW2KD and G5ZTP. The letter 'P' at the end of the suffix indicates that they were portable stations. On that same day the portable station of GW6AA using the call GW6MXP (note he had also worked Snowdon!) operated from the summit of Snaefell on the Isle of Man. A joint owner/operator of this station was the same David S. Mitchell who had operated on five metres from G2II in 1934. The Isle of Man card confirmed a QSO with G6OM at a distance of 105 miles. This was then considered 'real DX' and was almost as good as Mitchell's best of 124 miles.



G6HH On The Air

Much of the long distance working on the five metre band was achieved during the RSGB Annual Field Days which became very popular with Radio Clubs. G5DFP operating from a site on the Cockhill Moors 8 miles NW of Halifax had a Field Day QSO with G6OM in 1937 and gave him a report of QSA5 R7 in buzzer mode (MCW) and phone. My own local Club at Hastings was formerly keen on the 5 metre band and their call G6HH which is still used on Field Days was obtained specially for such work before the war. I once saw a photo of their FD transmitter as used around 1937 and it used a twin triode of the 6A6 type and was a self-excited job. Perhaps the most popular circuit for short haul working, say up to five miles, was a

simple two valve transceiver arrangement. This consisted of one triode operating as a self quenched super-regen, detector, followed by an AF transformer coupled triode amplifier. A simple switching arrangement put into circuit a 20k resistor to replace the 5 Meg grid leak and also connected a carbon mike (via a 100:1 mike transformer) to the grid of the AF stage. This stage became the modulator. The primary of the interstage transformer acted as the choke in the familiar Heising arrangement to anode modulate the oscillator, which ran at about 1½ watts. This simple circuit was most effective and a version using Hivac miniature valves was used by one of the Everest expeditions. The writer must confess that he and a schoolboy friend were tempted to try this arrangement and for a few months before the start of the last War, had many illegal but exciting cross-town contacts!

The 'Big QRT' came in the autumn of 1939. At the end of hostilities, almost seven years later, everyone turned to crystal controlled transmitters and selective narrow bandwidth superhet receivers. The old 'rushboxes' were still often used for local natters, but they were anti-social devices which radiated noise for some distance, even when used with an RF amplifier. Instead of seeking mountain tops to enhance communication ranges, amateurs began to investigate and exploit the natural phenomena of 'skip' propagation during sunspot maxima, sporadic 'E' and extended Tropo working. The rapid expansion of TV broadcasting sounded the death knell for the five metre band, but it enabled the emergence of two metres and our other VHF and UHF bands. Happily, we will soon regain some of the lost spectrum around five or six metres and it should prove to be a happy hunting ground, showing some of the characteristics of the HF bands and also the quirks of the higher frequencies.

In 1937 VK5LD wrote on the back of a QSL card sent for a 28 MHz QSO with G6QB, "Look out for my sigs on 57,000 Kc during the coming season. Would like to make the first contact with 'G' on 56 Mc!" Perhaps such a QSO will take place before fifty years have gone by that is by 1987?



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Finding your IARU LOCATOR

One of the advantages of the new system is that it is worldwide, unlike the old QRA system, which repeats at intervals over the Earth's surface. The price for this is an extra character in the locator, the new system having six. However, with

to the latitude. Thus, the first four characters specify the same area as a QRA square (eg IO92 is the same as 'ZM' square in the QRA locator). Each numbered square in a field is further subdivided into 576 "sub-squares", coded AA (bottom left)

to XX (top right). Again, the first letter refers to longitude, the second to latitude.

Using The New Locator

Ham Radio Today is keen to promote the use of the new locator, and last month we presented a new locator map of Western Europe. This map can be used to find your field and numbered square (eg IO92), but the scale is too small to allow the full locator to be determined accurately. This month, we are presenting a set of grids to

The new IARU locator system ("Maidenhead locator") is scheduled to come into force from 1 January 1985, following agreement at the IARU Region 1 conference in April. It will replace the QRA locator system, which has been used for many years on the VHF, UHF and microwave bands.

the increasing amount of intercontinental contacts being made at VHF and higher frequencies using satellites and moonbounce, a worldwide locator is now needed. A secondary advantage of the new system is that it is far more logical than the QRA system, and computer programs for distance calculations (eg for contest scoring) are considerably simplified.

How It Works

The six characters of the new locator consist of three groups of two characters. For example, the locator IO92LD comes from IO, 92 and LD. The first group is called a 'field' and specifies an area of the Earth's surface 20 degrees wide (longitude) by 10 degrees high (latitude). There are 324 of these fields and each field is given a two letter code AA and RR. The first letter refers to the longitude and the second letter refers to the latitude. Field AA extends from latitude 90S to 80S, and 180W to 160W and field RR extends from 80N to 90N and 160E to 180E. Each field is subdivided into 100 numbered "squares", each 2 degrees wide and 1 degree high (the same size as QRA squares). Square 00 is in the bottom left of a field, and square 99 is top right. The first number refers to the longitude, the second

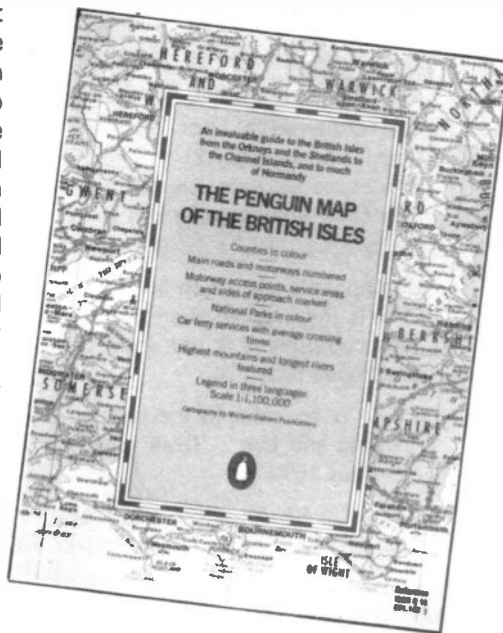
BASIC program for converting latitude and longitude into the new locator

```
10 INPUT "LOCATOR? ";A$
20 FOR K = 1 TO 6
30 A(K) = ASC ( MID$( A$,K,1) )
40 NEXT K
50 L1 = - 180 + (A(1) - 65) * 20
      + (A(3) - 48) * 2 + (A(5) -
      64.5) / 12
60 L2 = - 90 + (A(2) - 65) * 10 +
      A(4) - 48 + (A(6) - 64.5) /
      24
70 PRINT "LONG= ";L1;" LAT= ";L
      2
80 END
```

BASIC program for converting new locator into latitude and longitude

```
10 REM L1=LONGITUDE, L2= LATITUDE
20 INPUT "LONG,LAT? ";L1,L2
30 L1 = (L1 + 180) / 20
40 L2 = (L2 + 90) / 10
50 A = INT (L1)
60 B = INT (L2)
70 L1 = (L1 - A) * 10
80 L2 = (L2 - B) * 10
90 C = INT (L1)
100 D = INT (L2)
110 A$ = CHR$( A + 65) + CHR$(
      B + 65) + CHR$( C + 48) + CHR$(
      D + 48)
120 A$ = A$ + CHR$( INT ((L1 -
      C) * 24) + 65) + CHR$( INT
      ((L2 - D) * 24) + 65)
130 PRINT "LOCATOR = ";A$
140 END
```


enable you to find your exact locator in a few seconds. These have been designed to be used with a readily-available large-scale map of the British Isles (scale 1:1,100,000). This map is called "The Penguin Map of the British Isles" (ISBN 014 051,1407) and is available from most good bookshops. Before putting the map up on your shack wall, it is a good idea to mark the new locator numbered squares, by drawing over the lines of latitude and every other line of longitude on the map. The squares are bounded by each degree of latitude, and even numbered lines of longitude (ie 0, 2, 4 etc). To find the last two letters of your locator, mark your position on the map, select the appropriate grid of your square, lay it over the map (taking care to align the grid with the edges of the square) and read off your sub-square letters. If you do not wish to mark the map, an alternative method is to use a piece of tracing paper laid on the map, and to mark the corners of the square and your position on the tracing paper. The tracing paper can then be laid over



the grid to determine your sub-square. Nothing could be easier!

A home computer can also be used to find your locator, and to convert the new locator to latitude and longitude. The two programs listed here are in BASIC and are based on programs which appeared in a technical note about the

Maidenhead Locator by SM5AGM. The first program converts latitude and longitude (in decimal degrees — north and east positive, west and south negative) to the new locator. To check that the program runs correctly, try the following example: longitude 1.785W and latitude 51.078N (input — 1.785,51.078) should convert to IO91CB. The second program converts a locator back to latitude and longitude, and could be incorporated into an existing QRA locator based distance calculation program, by replacing the existing QRA to latitude/longitude routine. To test the program, try converting IO91CB — the answer should be latitude = 52.1458, longitude = -1.0417. When exchanging the new locator over the air, the recommended methods are: on SSB, "my locator is IO92LD" and on CW, "loc IO92LD"

The above text, the IARU locator map and the Grid Overlays were specially produced for *Ham Radio Today* by Charles Suckling, G3WDG, and Petra Suckling, G4KGC.

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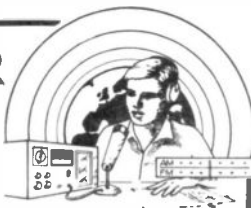


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OMEGA Update

CIFPU — Modification

During some tests on one of the OMEGA CIFPU modules, we have found that a large (6-12db) increase in sensitivity of the basic IF unit can be achieved by simply increasing the number of turns on the two balun transformers used in the noise blanker. As given, the number of turns is only marginally sufficient for the frequency in use.

The modification simply consists of doubling the turns used, winding with 38swg wire, or finer. T1 now has a 12 turn primary and centre tapped 2 turn secondary, while T2 now has a 4 turn centre tapped primary and 12 turn secondary.

QRO PA

Those of you following the OMEGA Project will be pleased to hear that the 100W Broadband PA and associated control board will be published next month. This features ALC and Thermal protection, together with SWR and Peak Reading power meter circuits.

Addendum

The 'Supernotch' (Nov '84)

Circuit diagram (p 42)

The capacitor between IC5 pin 5 and earth is C18 and is 100n ceramic. The capacitor between IC4 pin 8 and SW2a is C15 and is 220u electrolytic.

Components Listing (p 45)

C25 is incorrectly given as 10u, whereas it should be 270p ceramic. This component is *not* shown on the overlay diagram and should be positioned near IC4.

There is an error in the text on p44 fourteen lines below the heading 'Testing and Use'. '(Half supply +10%)' should read '(Half supply plus or minus 10%)'.

Circuit 2m RF Amplifier (Nov '84)

The specifications of this project were left off due to lack of space.

Power gain	10dB (max).	Input/voltage impedance	50 ohms
Bandwidth	144-146MHz.	Output power (13.8V)	2.5W in . . 22W (min)
Saturated output power	25W.	Supply voltage	10-16V (nominally 13.8V)
Supply current	3A (at 22W O/P).		

Newsletter

WPO Communications run a newsletter service for all those actually building, or interested in constructing OMEGA. This details all corrections and mods as they arise, with issue 6 carrying a full listing of

all those currently interested in the project. Inclusion on the Newsletter together with full information on all the modules and current prices for the kits can be obtained by sending £1 in stamps to WPO Communications. This includes a copy of all back Newsletters. **G4JST/G3WPO**

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. . . or just those of you who sometimes think "I could do better than that!"

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We particularly need:

- Projects for the Commodore Vic 20 and 64, the Amstrad, the BBC A and B, and the Electron computers;
- Simple projects that do something useful, perhaps in a novel or instructive way;
- Radio projects (not necessarily for radio amateurs);
- Features on amateur satellite radio.

If you're interested in writing for us, send an outline of your proposed article to: Dave Bradshaw, Group Editor (*Electronics*), Argus Specialist Publications, 1 Golden Square, London W1R 3AB.

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MICRO' NET

As I write this, watching next-door's cat float past in the first flood of the Essex monsoon season, Tiddles seems as surprised as I am that winter has arrived so soon. For humans, and us amateurs too

Aunty Gets Up Early

There's good news from the BBC for nearly all micro users as the 'Chip Shop'

Dave Bobbett, G4IRQ, brings news of the BBC's 'Chip Shop' and looks at how the new licence schedule affects keyboard communications.

for that matter, it means that it's time to get out the soldering iron, dust off the radio theory books, then go out and buy a new rig for Xmas! So for those of you who will greet me with 'I'm just trying out a new FT9', and everybody else for that matter — HAVE A VERY HAPPY XMAS.

Reports Just Coming In

Despite being fairly early days, the Micro Net mailbag is starting to turn up one or two interesting items already. And whilst we are on the subject of mailbags this may be the pertinent moment to remind Microphiles that any information, hints, tips or snippets of micro-radio news will always be welcome — just drop a line either to the HRT offices or direct to G4IRQ, QTHR.

The first piece of news concerns RAMTOP, which is a micro-radio magazine edited by the Rev. Richard Butcher (G4NWH) and based in Northampton. Published four times a year (in April, July, September and January) RAMTOP currently has a circulation of about 130 and in addition to the magazine, subscribers also have the option of receiving eight newsletters during the intervening months. The July edition which Richard sent to HRT consists of 24 pages, ten of these being devoted to the development of a Circuit Design Program and the remainder to a variety of programs ranging from an ATV colour bar generator for the BBC micro to an HF Prediction program for the Vic 20. Richard also gave food for thought in his newsletter which dealt with the implications of the new licence schedule for micro-radio users — but more of this subject a little later on.

gets under way again on Radio 4, however this winter there is an added bonus in the shape of a new 'Radio 1 Chip Shop'. Full marks to the producers and presenters but clearly breakfast TV seems to have gone to the planners heads!

Question: "How do you get the punters to crawl out of bed at 7.30 on a Saturday morning for a computer program?"

Answer: "Simple, transmit the software at five to six so that they'll be awake

in plenty of time." I predict that time-switches will be very popular presents this Xmas!

As if the software transmission times weren't daft enough, I have also been told by a 'Chip Shop' spokesperson that she was 100% certain that the software would be broadcast on Medium Wave *only*. I am still sceptical about this last point, but as this item was written in early September, only time will tell.

Basicode 2 +

A new edition of the original Basicode 2 translation tape together with a revised handbook, has been launched to complement the 'Chip Shop' programmes. The good news is that a number of new micros are now supported, but unfortunately the Sinclair ZX81 has been deleted — apparently due to the restric-

Table 1 New Schedule Do's and Don'ts

BAND MHz	LOCATION OF OTHER STATION	
	WITHIN THE UK	OUTSIDE THE UK
1.8	Plain Language & CCITT Codes	Plain Language & CCITT Codes
3.5	No Restriction	As above
7	No restriction	As above
10	Plain Language & CCITT Codes	As above
14	No Restriction	As above
18	MORSE ONLY	MORSE ONLY
21	No Restriction	Plain Language & CCITT Codes
24	MORSE ONLY	MORSE ONLY
28	No Restriction	Plain Language & CCITT Codes
70	Plain Language & CCITT Codes	As above
144	No Restriction	As above
430	Plain Language & CCITT Codes	As above
1240	As above	As above
2310	As above	As above

NOTES:

1. 'Plain language' also includes BASIC Programs.
2. CCITT codes include Baudot (RTTY), & Moore codes (AMTOR).
3. ASCII codes may be used instead of CCITT codes.

tions which it placed upon the type of programs which could be broadcast. Owners of the earlier Basicode 2 kit will not need to 'upgrade' to Basicode 2 + as all aspects of the new kit are compatible. The new list of machines which Basicode 2 + supports is as follows:

- Acorn Electron.
- Apple I & IIE.
- BBC Model A & B.
- Colour Genie.
- Commodore: Vic 20, 64.
- Pet 2001, 3000, 4000 & 8000 Series.
- Dragon 32 & 64.
- MSX Range.
- Oric One & Atmos.
- Sharp MZ80A & MZ80K.
- Sinclair Spectrum.
- TRS-80/Videogenie.

Two final points concerning the Basicode 2 + kit, the first being that the kit is now available from a different address (see Address Box) and secondly, Broadcast Support Services have told me that delivery will be typically 14-21 days, unless they get completely inundated with orders.

Right On Schedule?

It is probably true to say that the new schedule is even more significant for micro-radio users than for the average amateur, the main gain being that a number of bands are now specifically authorised for data transmissions. Cer-

tainly for all users it clarifies the status of each band and clears up certain ambiguities left over from the old schedule. There will no doubt be many pages of discussion on this topic for weeks to come, however in order to clarify the situation from the point of view of Micro Net readers, **Table 1** summarises what you can and can't do. Perhaps I should mention that the information has been compiled following consultation with the Department of Trade and Industry and so it is *not* G4IRQ's 'view of the world as he would like to see it'!

In brief, there are two factors which dictate what is permissible when transmitting data, these being i) the *status* of the band in question and ii) whether the 'other' station is located in the UK or not.

If the station which you wish to contact is outside the UK then you *must* use 'plain language'; the DTI considers a program written in BASIC to be 'plain language', but cross-border transmission of assembler or machine code programs is not acceptable. Also, when transmitting to non-UK based stations you *must* use one of the recognised CCITT codes such as Baudot (as used for RTTY) or Moore code (eg AMTOR). However, the DTI is also willing to permit transmissions using ASCII code as an alternative to CCITT.

If the band which you wish to use has 'secondary status' then all the restrictions just mentioned still apply, both to UK and non-UK contacts. But, if the band has 'primary status' and the

other station is also in the UK then no restrictions are imposed — ie you can send machine code by waving coloured flags at each other if you want to and the DTI will be quite happy!

This probably all sounds very convoluted but hopefully the table will clarify matters, perhaps it is worth noting that under the new schedule, BASICODE programs can be exchanged on any 'data' band.

Basicode Subroutines

I don't know if you have the same problem as I do when writing Basicode programs, but I invariably find that I can't remember which subroutine does what — and rather than having to dig out the handbook every five minutes, I have made up a list of Gosub's with a brief description of what each one does, and it's nearest equivalent command on my micro (**Table 2**). No great originality is claimed here but it can be very useful if, like me, you start off by writing and de-bugging a program in 'normal' BASIC and then convert it into Basicode when everything is working OK.

Half A Raspberry!

The first of my 'Half a Raspberry' awards this month goes to whoever (*it wasn't us!*) it was in the HRT offices (to be known as 'the crypt' from now on!) who amputated a few line numbers in the Satellite Predictor Program (Fig.3, October Micronet). Looking at the end of the program, lines 5000 to 5020 should read 25000 to 25020 and the REM statements which run from 0000 through to 0060 should read as 30000 to 30060; by doing this the program will follow the Basicode line numbering convention outlined in Fig.2 of the article.

Address Box

For Chip Shop Basicode 2 + kit
 (£3.95 inc. p&p)
 Broadcasting Support Services
 2 Cater Road
 BRISTOL BS13 7TW

For RAMTOP magazine,
 4 issues per year £4.50
 plus optional newsletters,
 8 per year £3.00

RAMTOP
 Great Billing Rectory
 NORTHAMPTON NN3 4ED

To contact Micro Net:
 Dave Bobbett
 'Micro Net'
 Ham Radio Today
 1 Golden Square
 LONDON W1R 3AB
 or G4IRQ, QTHR

Table 2 BASICODE SUBROUTINE FUNCTIONS

GOSUB NO.	EQUIV TO	DESCRIPTION
Gosub 100	Clear screen, home cursor.
Gosub 110	Places cursor at specified point on screen. HO is horizontal position, 0 to 39 VE is vertical position, 0 to 23
Gosub 120	Returns current cursor position via HO and VE.
Gosub 200	CHECKS to see if a key has been pressed, if so puts character in IN\$. If no key is pressed then IN\$ is an empty string.
Gosub 210	WAITS until a key is pressed and places character in IN\$.
Gosub 250	Beep or Bell, cannot define note or duration.
Gosub 260	Returns a random number between 0 and 1.
Gosub 270	Gives No. of RAM bytes free in FR.
Gosub 300	Creates a string SR\$, using the value of SR. NOTE: A null string is illegal.
Gosub 310	Defines print format of SR\$. CT = Total No. of Characters. CN = No. of characters printed after the decimal point.
Gosub 350	Switches printer on and sends SR\$ to printer only. Does not close line. Switches printer off.
Gosub 360	Switches printer on. Closes current line. Switches printer off.

RADIO Tomorrow

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

- | | | |
|--|--|---|
| <p>1 Nov
2 Nov
3-4 Nov
3 Nov
4 Nov
5 Nov
6 Nov
7 Nov
8 Nov
9 Nov</p> | <p>Horsham ARC: Ring PRO for details.
Shefford DRS: <i>Outside Broadcasting at the BBC with Ron Chown.</i>
Cray Valley RS: Surprise Evening
Amersham College: All day Morse course at the college Amersham-on-the-Hill, Bucks. The course tutors are Shirley, G4HES, and Ron, G3NCL, who will cater for all speeds. The Post Office examiner will be present in the afternoon to conduct the 12wpm test. The course should cost between £5-6. Contact the college on Amersham 21121 between 9am and 4pm for further details.
Axe Vale ARC: AGM
West Kent ARS: Surplus Equipment Sale.
Maltby ARS: G6OYL 70cm Linear.
RSGB 144MHz CW and Marconi Memorial.
North Devon Radio Rally at Bradworthy Memorial Hall near Holsworthy. It starts at 10.30am until 5pm with all the usual stalls including bring and buy and a Talkin on S22.
Worked All Britain LF CW Contest 1400-2100 UCT.
Stourbridge ARS: A Surprise (?) Informal.
Stowmarket ARS: <i>Getting Started on 13 and 23cms by G3ZQU.</i>
Dudley ARC: Committee meeting/Natter night.
Sutton and Cheam RS: Natter Night.
Todmorden DARS: <i>Lecture by Crime Prevention Officer.</i>
S Lakeland ARS: Barbeque.
Chichester DARC: Junk Sale.
Dartford Heath DFC: Pre hunt meeting.
Fylde ARS: <i>Morse Code - History, General Usage and value to the Amateur by G4CSA.</i>
Bristol ARC: <i>Aerial Theory and Demonstration by G3JMY.</i>
Fareham DARC: On-air/Natter Night.
Cheshunt DARC: <i>Modern TV Receiver Design by Peter Tingey of the BBC.</i>
S. Bristol ARC: <i>Informal Talk - GWR Steam Engines by Ron Gardner.</i>
Braintree DARS: <i>HF Aerials.</i>
N. Cornwall RC: <i>4CX250 Amplifier Talk and demonstration by G4LXS and G4VRL.</i>
Telford DARS: <i>Safety in the Shack by G4AUZ.</i>
Southgate ARC: G6QM Construction Contest.
Edgware DRS: Emmet Key Evening.
Shefford DRS: <i>Inside the Chip - Semiconductor Manufacture G8LSA.</i>
Haverhill DARS: Sudbury Repeater Group.
Dunstable Downs RC: <i>Talk by CEGB Engineer.</i></p> | <p>10 Nov
11 Nov
12 Nov
13 Nov
14 Nov
15 Nov</p> <p>W. Kent ARS: Informal.
Maltby ARS: <i>Three in a Row - G4BVV, G3ZVG and G4TVD.</i>
RSGB Second 1.8MHz Contest.
Dartford Heath DFC: Club Hunt.
Milton Keynes DARS: Bring and Buy Junk Sale
Sutton and Cheam RS: Committee Meeting.
Mid-Warwickshire ARS: Natter Night.
Wakefield DRS: Pen and Pie Supper at Rose and Crown Inn, Methley.
Bury RS: <i>Home PCB Manufacture by G4KLT.</i>
Westmorland RS: <i>St John First Aid Talk.</i>
Bristol ARC: RTTY Night with the club's new RTTY Station.
Farnborough DRS: AGM.
Cheshunt DARC: Natter Night.
S. Bristol ARC: 10m FM Activity Night by G8BDZ.
Telford DARS: Display of latest Yaesu Equipment by G3IMP.
Shefford DRS: <i>Security Alarms G6PTB.</i>
Cray Valley RS: Crystal Set Judgement and Natter Night.
Chichester DARC: Club Meeting.
S Lakeland ARS: Junk Sale and Video of Club Events.</p> |
|--|--|---|



" OH YES OLD MAN - WE GD'S ARE PRETTY RARE - - -



- 16 Nov Sutton and Cheam RS: *Pocket Radio* by G3CDK, G3MES and G3HSK.
W Kent ARS: *Adventures in Amateur Radio* by G6SX.
Maltby ARS: *Amateur TV*.
Shefford DRS: Club Dinner.
- 17 Nov Verulam ARC 'Club Contest'
Here's a nice short and well supported SSB contest to cut your teeth on. The contest is in two sections and on two bands, 160 and 2m. Section One is from 2000 - 0000GMT tonight on 1900 - 1990kHz. Exchange serial number plus the name of your local club. You score 3pts per contact - with a bonus of 5pts for the 1st member worked from each club. A bonus of 25pts is given for each club station proper worked (ie G6HH Hastings ERC station) and 50pts are given for working G3VER! Entries to G4JKS QTHR by 10th December.. Section Two, the 2m section, is on 25th Nov - see 25 Nov for details.
- 19 Nov Stourbridge ARS: Annual Junk Sale.
Dudley ARC: *Microwave Society Talk and Demonstration*.
- 20 Nov Biggin Hill ARS: To be announced.
Flyde ARS: Equipment Sale.
Bristol ARC: *The Good Old Days* by G5KT as a forerunner to the clubs 21st birthday celebrations next year.
Cheshunt DARC: AGM.
Hastings ERC: *Recce and Image Processing*. (Not to be missed)
S Bristol ARC: Top Band Activity Night.
Braintree DARS: Junk Sale.
Telford DARS: Guest Speaker.
- 22 Nov Shefford DRS: *Home Constructed HF Transceiver* by Lorin Knight G2DXK.
Edgware DRS: *Professional Video Tape Recording* by G3PSP.
Haverhill DARS: Video.
- 23 Nov Dunstable Downs RC: Film Night.
W Kent ARS: Informal.
Maltby ARS: *Getting on 2m Cheap* by G4BVV.
Verulam ARC 'Club Contest' Section Two 0900 - 1300GMT on 144.15 - 144.4MHz. See entry dated 17 Nov on Section One for rules.
Dudley ARC: *The Burma-Siam Railway Experience* by G3BA.
25 Nov Mid-Warwickshire ARS: RSGB Films.
Wakefield DRS: On-the-air/Natter Night.
Verulam ARC: *Operating Techniques* by G4DJX.
26 Nov Bristol ARC: Computer night with SSTV receiving on 48K Spectrum.
27 Nov Farnborough DRS: The Chairman's Evening.
Cheshunt DARC: Natter Night.
S Bristol ARC: *Pocket Phones Revisited* by G4SDR.
Telford DARS: Natter Night and Committee Meeting.
28 Nov Shefford DRS: Aerial Circus Video (provisional).
29 Nov W Kent ARS: *QRP* by G4BUE.
30 Nov Maltby ARS: *AMTOR* by G3XTL.
1 Dec Bristol ARC: Christmas Fayre at YMCA, 6 Park Road, Kingswood. Special event callsign GB2KCF.
2 Dec RSGB 144MHz Fixed Station Contest.
Sutton and Cheam RS: Coulsdon Club Flea Market.
3 Dec Stourbridge ARS: Informal.
Stowmarket ARS: Christmas Social.
Sutton and Cheam RS: Natter Night.
Todmorden DARS: Social Evening.
4 Dec Chichester DARC: Club Meeting.
S Lakeland ARS: Club Meeting.
Dartford Heath DFC: Pre-hunt meeting.
Fylde ARS: *Radio Astronomy* by G3KEN.
Bristol ARC: *Visit and Talk* by RSGB Regional Rep - G3LP.
5 Dec Cheshunt DARC: *Remote Imaging* by G8LOK.

	S Bristol ARC: <i>Test Equipment with G4KUQ and G3SDR.</i>	13 Dec	Southgate ARC: AGM.
	N Cornwall RC: Ring PRO for details.		Shefford DRS: Constructors Contest.
	Telford DARS: Telford Radio Rally Group AGM.	14 Dec	Edgware DRS: Junk Sale.
6 Dec	Horsham ARC: AGM at The Queen's Head, Queens Street, Horsham.		W Kent ARS: Annual Dinner.
	Shefford DRS: Junk Sale.	16 Dec	Maltby ARS: <i>Make It Work with G3ZVG.</i>
	Cray Valley RS: <i>'OSCAR' by G3RWL.</i>	18 Dec	RSGB 432MHz CW Contest.
7 Dec	Axe Vale ARC: Annual Dinner.		Dartford Heath DFC: EGM.
	S Lakeland ARS: Annual Dinner.		Fylde ARS: Christmas Party.
	W Kent ARS: Informal.	19 Dec	Bristol ARC: Christmas Goodies or "It'll Be All Right On The Night".
	Maltby ARS: <i>Using Test Equipment G3XXN.</i>		Cheshunt DARC: Christmas Video Show with G8NDR and G4OAA.
9 Dec	Dartford Heath DFC: Club Hunt.		Hastings ERC: Christmas Social.
10 Dec	Milton Keynes DARS: <i>Fibre Optics.</i>		S Bristol ARC: Club Families Evening with G4YZR.
	Sussex Repeater Group: AGM Queen's Head, Brighton Road, Horsham at 8pm.		Telford DARS: RSGB Video Films.
11 Dec	Mid-Warwickshire ARS: Christmas Celebrations.	20 Dec	Cray Valley RS: Natter Night.
	Wakefield DRS: Christmas Social Evening.		Chichester DARC: Christmas Social.
	Bury RS: AGM and Cheese and Wine.		S Lakeland ARS: Club Meeting.
	Westmorland RS: <i>Talk about 10m by G3IZD.</i>		Shefford DRS: The Chairman's Mince Pie Evening.
	Bristol ARC: <i>Crime Prevention.</i>		Sutton and Cheam RS: Christmas Get Together.
12 Dec	Farnborough DRS: Christmas Social Evening.	21 Dec	Maltby ARS: Christmas Junk Sale.
	Cheshunt DARC: Natter Night.		W Kent ARS: Cheese and Wine.
	S Bristol ARC: HF CW Activity Night with G4SQQ.	28 Dec	S Lakeland ARS: New Years Eve Party.
	Telford DARS: Quiz Night.	31 Dec	

Contacts

Axe Vale ARC	Roger Jones	Upottery 468
Barking RES	R. Woodberry	01 594 4009
Braintree RS	J. Roberts	0376 448678
Bristol ARC	T. Rowe	Bristol 559398
Bury RS	Bryan Tydesley	0282 24254
Cheshunt DARC	Roger Frisby	0992 464975
Chichester DARC	C. Bryan	0243 789587
Cambridge DARC	David Wilcock	0954 50597
Dunstable Downs RC	Phill Morris	Dunstable 607623
Exeter ARS	Roger Tipper	0392 68065
East Kent RS	Stuart Alexander	0227 68913
Edgware DARS	John Cobley	30 64342
Farnborough DRS	Mr Taylor	Farnborough 837581
Fylde RS	PRO	Lytham 737680
Halifax DARS	DL Moss	0422 202306
Harrow RS	Dave Atkins	0923 779942
Hastings ERC	Dave Shirley	0424 420608
Haverhill DARS	Rob Proctor	0787 281359
Hornsea ARC	Norman Bedford	0262 73635
Horsham ARC	Pete Head	0403 64580
Westmorland RS	G. Chapman	0539 28491
Leighton Linlade RC	Pete Brazier	052 523 270
Maltby ARS	Ian Abel	Rotherham 814911
Medway ARTS	Andy Wallis	0634 363960
Mid Ulster ARC	DF Campbell	0762 42620
North Cornwall	John West	Bude 4976
Preston ARS	George Earnshaw	0772 718175
S. Bristol ARS	Len baker	0272 834282
S. Lakeland ARS	Dave Warburton	Ulverston 54982
S. Manchester ARC	Dave Holland	061 973 1837
Shefford DRS	G4 PSO	Hitchin 57946
Stockton DARS	John Walker	0642 582578
Stowmarket DARS	M. Goodrum	0449 676288
Southdown ARS	P. Henly	0323 763123
Telford DARS	Tom Crosbie	Telford 597506
Vale of White Horse ARS	Ian White	Abingdon 31559
Verulam ARC	H. Clayton Smith	St Albans 59318
West Kent ARS	B. Guinnessy	0892 32877
Welland Valley ARS	J. Day	0858 32109
Wirral ARS	Cedric, G4 KPY	625 7311
Wirral DARC	Gerry Scott	051 630 1393
Worthing DARC	Jim Hicks	0903 690415
308 ARC (Surbiton)	Dave Davis	01 399 5487

FAULT FINDING TECHNIQUES

3. Area Of Fault

Moving on from the previous steps, it is now necessary and logical to determine the area of the block diagram/circuits in which the fault is likely to lie. Clearly arriving at a decision as to the area of the

superhet, even when it has six VCOs, local oscillators running at VHF, up conversion/down conversion and remixing back to the same lower frequency again to produce pass band tuning or IF width and shift! Look at your old 4m rig in the corner — both the Drake TR7 and

- (a) Signal Path.
- (b) Signal Injection.
- (c) Mixers.
- (d) Frequency Generation.
- (e) Function Control.
- (f) Operating Conditions incorrect (often due to)
- (g) Power Supply.

In the second part of this series, James Finnegan, G14FFL, of QSK Electronics describes a logical approach to finding the area of a fault and gives some practical examples.

circuit in which you intend to start to make measurements is most important. Sometimes though, through necessity, a deduction that, for instance, a signal is present (or absent) at a certain stage is all that can be arrived at from the observations and measurements which you can make. It must be said though, that deductions can sometimes be inaccurate and the potential exists to lead yourself up a blind alley in pursuit of a fault. A point always worth keeping at the back of your mind, but not to the extent that it makes you totally indecisive. At this stage your most useful piece of information is normally the block diagram. Although, as indicated earlier, even this can look complex enough at first glance! But a superhet is still a

the Yaesu FT1, for example, have local oscillators capable of running higher in frequency than it. In the case of the FT1, even its first IF is above 70MHz.

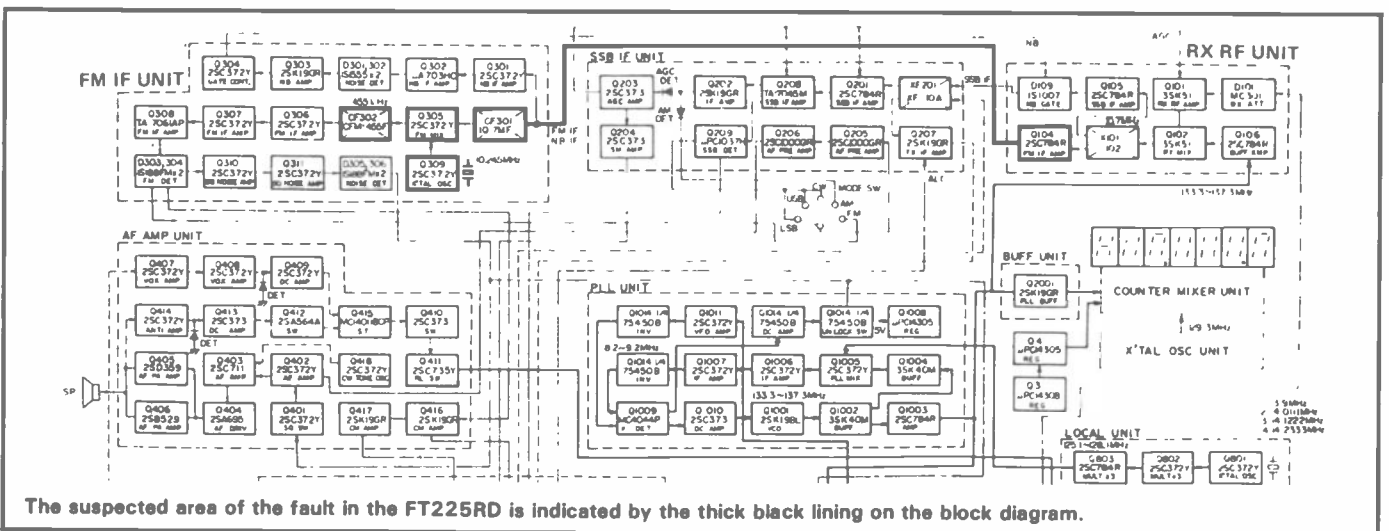
As a preliminary exercise try to locate the building blocks of the rig as laid out in the block diagram. Most diagrams indicate separately: the transmit and receive signal paths, stages common to both, control paths, and signal injection paths to the various mixer stages. The rest of the diagram is usually taken up with frequency generation, control stages and additional facilities, such as off-set frequency counters to measure the local oscillator o/p.

It can be seen, broadly speaking, that the majority of the faults will lie in the following areas:-

Returning to the examples of the faulty FT225RD, FT107M and TR7 the area of faults are arrived at in the following way:-

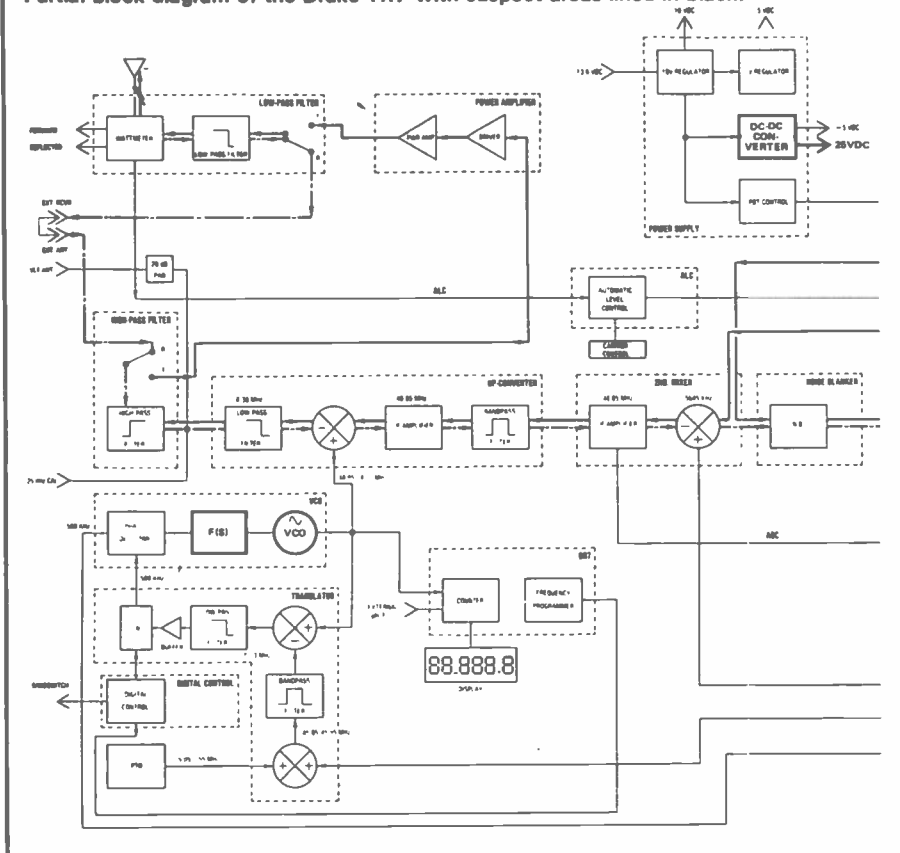
1. FT 225RD — Area (of fault)

The fault symptoms appear to indicate an area of the rig which only functions on receive on FM, such as the 455 kHz IF AMP. Since the 'S' meter and RF gain worked normally on signals 'off air', it can be deduced that the Rx RF unit and SSB IF unit are also working OK on FM (see block diagram). Although marked SSB IF unit, this functions on all modes to provide AGC, drive to the 'S' meter and IF amplification on AM. Likewise, the FM IF unit also separately provides NB IF amplification, detection and the blanking pulses to the noise blanker gate on the other modes. Since the Rx 'roars' normally on FM when the squelch is opened manually, it seems likely, at this stage, that the FM IF amp (Q306, Q307), IF amp/limiter (Q308), the FM detec-



The suspected area of the fault in the FT225RD is indicated by the thick black lining on the block diagram.

Partial block diagram of the Drake TR7 with suspect areas lined in black.



tor (TA7061AP) and the squelch stages (Q310, Q311 and D305/306) are functioning OK. Likewise, of course, the common AF pre amplification stages on the SSB IF unit. This leads us to suspect that the area of the fault may be between, say, the I/P to Q306 and the O/P of the xtal filters XF101 and XF102 on the Rx RF unit. (which contains the first stage of FM IF amplification Q104). (See again block diagram). You can see that these sections have stages which encompass the following 'areas' (ie as was detailed).

Signal Path

Mixer

Signal Injection

(they of course, require the appropriate voltage supplies available to function correctly so area (g) is also a possibility — as I was to find to my cost!). In the next section — Method — we try to confirm this, ie (fault lies between I/P to Q306 and O/P of XF102) and show how to check the above stages and how to work towards locating the actual fault.

2. TR7 — Area (of fault)

As described previously, the Drakes fault symptoms would certainly appear very worrying to an owner, especially one without a

service manual, since in this case the only block diagram and a concise description of the "theory of operation" appear in the operators handbook. So, presuming that most readers will not have the detailed service manual (although it is available on request) only the block diagram will be used here and the nature of the fault briefly described. *From the fault symptoms we can take it that the local oscillator is unstable and incapable of being tracked or switched to its highest frequency ranges.*

Basically the local oscillator injection is produced by one of two VCOs depending on frequency of operation selected on the rig (a point not obvious from the block diagram), and runs higher than signal frequency by an amount equal to the first IF, which is 48.05 MHz.

The method of determining and generating the LO frequency is quite involved:- as can be seen, the 40 MHz reference signal and the output of the 5.05-5.55 MHz Permeability Tuned Oscillator (a feature of Drake and some Collins rigs) is mixed in the translator unit to produce a 45.05 to 45.55 MHz O/P. This is filtered and mixed with the O/P of the VCO (which, when

everything is working correctly will be in the range 48.05 to 78.05 MHz). The difference frequency (in the range 3.0 — 33.0 MHz) is selected, filtered and applied to a programmable divider (the + N stage, translator module) whose rate of division is determined by a binary coded decimal load number (in decimal form, this is simply a whole number lying between 6 and 65) produced in the digital control unit, and which is determined by both the band switch and the 500 kHz shift up/down controls. The O/P of the + N stage is exactly 500 kHz when "the VCO is tuned to the correct frequency, thus satisfying the phase detector and locking the synthesizer loop." Let us look at an example:-

O/P freq = 28.2835 MHz

$$\therefore \text{VCO freq} = 28.2835 + 48.050 = 76.3335 \text{ MHz}$$

(remember the L/O runs IF above signal freq ie L/O = Signal freq + IF)

$$\text{PTO freq} = 5.05 + 0.2835 = 5.3335 \text{ MHz}$$

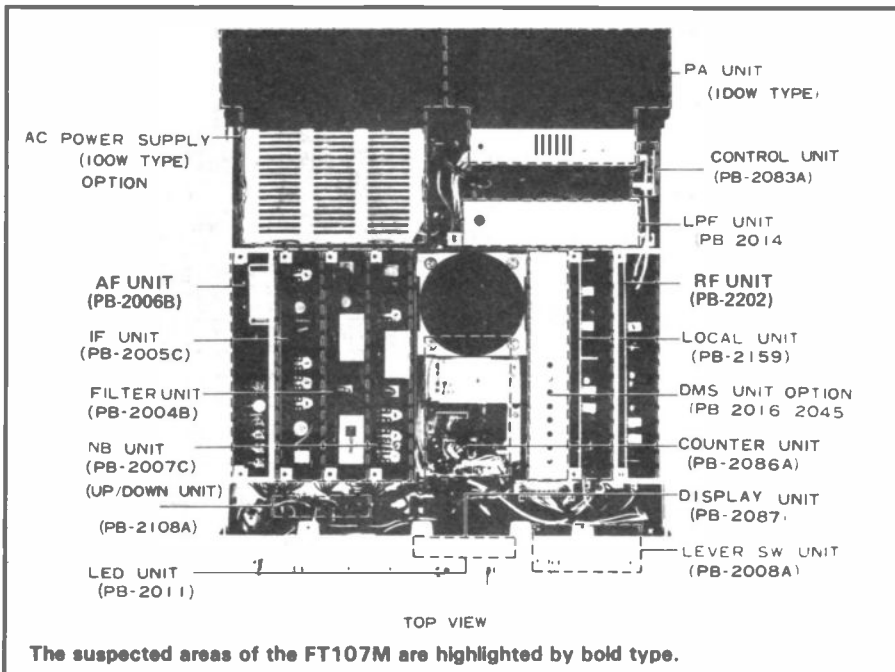
$$\text{Variable reference freq} = 5.3335 + 40 \text{ MHz} = 45.3335 \text{ MHz}$$

$$+ N \text{ I/P freq} = 76.3335 - 45.3335 = 31 \text{ MHz}$$

$$+ N \text{ output freq} = 500 \text{ kHz}$$

\therefore programmable divider must divide by 62 to produce 500 kHz from a 31 MHz I/P. "It can be seen that each time the + load number is altered by one, the VCO frequency will be forced to change by 500 kHz to satisfy the phase detector and maintain a locked condition. By the same token, as the PTO is tuned the VCO must follow exactly to maintain phase lock" (Quote from TR7 operators manual). *I'm afraid this TR7 wasn't doing this!*

If you find reading all this a bit tedious, think how I felt(!) working out and then confirming that the appropriate load numbers (in BCD, of course) were available and incremented correctly to the + N counter, and that the 45.05 to 45.55 MHz I/P on the translator board was exactly correct — and then wondering why I was working around this area since it seemed to confirm that the fault is probably in the VCO! (Although the fear was that the + N stage was somehow faulty *only* at higher rates of division.)



this relay changed over correctly on transmit but *did not change back on receive*. Hence, the audio O/P of the balanced modulator was not being passed on to Q13 for amplification. Only on switching the rig off did RL01 de-energise, but only to latch on again as before when the sequence was repeated! What was going on?

A quick voltage measurement of the Tx 13.5V line on the board showed that it was about 4 volts on receive — which it certainly should not have been! This meant that once energised, RL01 was able to stay latched on because of the residual voltage — and only released when the power *to the set* was switched off. Somehow, the supply line had this lower voltage present incorrectly all the time. As mentioned earlier in "symptoms", the reason for this fault was eventually found to lay in a part of the rig far away from the AF unit. The method used to locate this and the FT225RD fault are described in the next section.

4. Method

This stage is mainly concerned with decision making, and measurement. Or should that be measurement and then decision making, since they are so interdependent! On occasions starting at one and not the other can prolong the process, as with the Drake TR7, but you will get there in the end, of course!

By now you should have a fair idea as to what you want to do, but may feel that masses of test gear must be essential for you to make your next step. This isn't strictly true, since the main requirements are usually to measure DC and RF levels, both of which can usually be done with an ordinary 20 Kopyv multimeter and, with experience and interpretation, a simple RF diode probe (see last month's Part I). It's certainly best to try to measure what you can (to provide you with further, and hopefully, not misleading information) than to do nothing at all. The aforementioned two devices will pin-point a surprising number of faults.

Even with more complex and expensive test equipment, experience and interpretation can often be important especially in the absence of specific information from the circuit diagrams and manual. *Deciding on what is reasonable, under the circumstances, for the rig you are working on, is the key.* One example of this is in the process of test signal injection where, depending on the equipment and matching, it is possible for you to misinterpret the working or gain of a stage. Indeed, in progressing through some sections of a transmitter or receiver, the RF voltage levels will go down and not up! This phenomena usually corresponds with an increase in power, but into a different termination (ie more power but into a much lower im-

pedance than before). Strictly speaking, the "gain" of a stage is more than just the ratio of the O/P voltage to I/P voltage, as the I/P and O/P impedances are likely to be different. Remember the law $P = V^2/R!$ Your main requirement now is to determine a point of reference in the rig which you can measure — and on which you can make a definite right/wrong decision if possible.

For example — being sure that a certain voltage or RF level should be present at a specific point and then finding that it is not enables you to progress closer towards locating the fault. The first measurement found to be *definitely incorrect* will help increase your confidence and will stop you irrationally concerning yourself about all that could be wrong in parts of the circuit which you now know are working OK.

This is a most important step in fault finding and you're now on your way — the mystery has been largely removed and the next logical steps — "decision/measurement" — "if the result is?/next step is?" — should begin to bring the location of fault within sight. Whatever the method used, when working on electronic equipment safety precautions must always be observed — not only to protect the set but more importantly *to protect you!* It certainly pays to take your time and be cautious and careful. For example, some rigs with separate power supplies to provide 13.8V to them will have the mains available at the on/off switch at the rig — usually close to where you want to put your fingers! *Do check this out carefully!* Also, many sets with valve PA stages will have the HT supply (900 volts) present immediately from switch on — even on receive. Is your rig one of these? When working on stages with H.V. present, especially in linears, don't provide a path of conduction through yourself — always keep one hand well away from the work area, preferably in your pocket, and make sure that you remove all rings and watches etc. from your hands. This is good practice, even if the rig is powered only from a small battery since it prevents you accidentally shorting out something within them — thus providing you with more faults and even more expense!

As seen in the national press



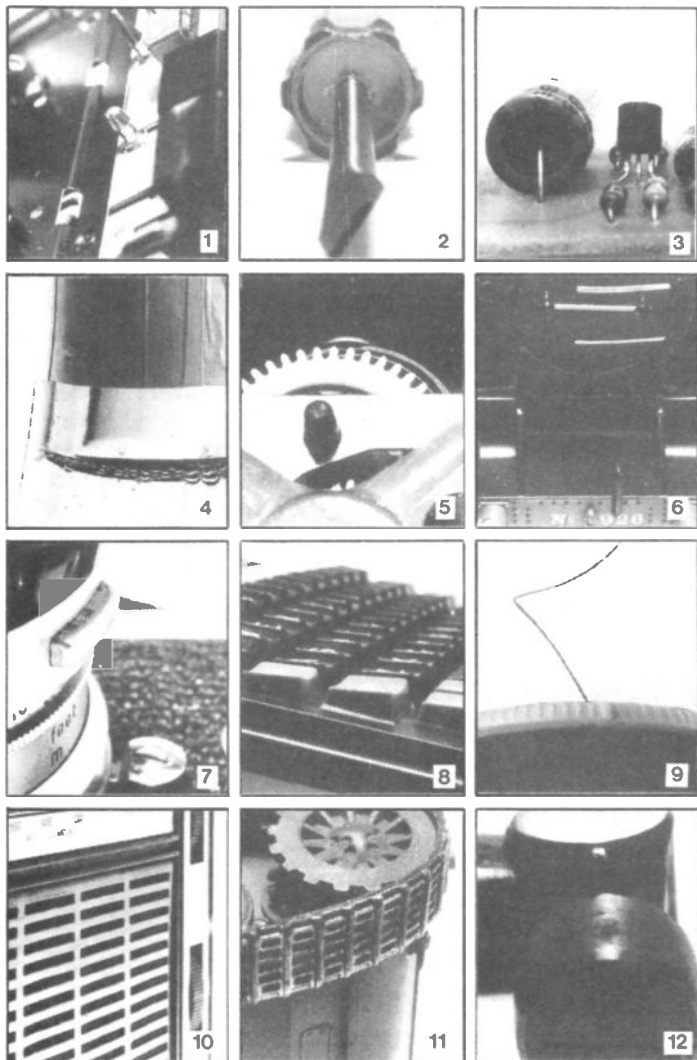
The Prizes:

You could win £2,500 to be spent on a dream holiday of your choice for you and your family!

Second prize — a complete Canon portable video outfit worth £1,300.

Third prize — a BBC Model B micro computer plus software worth £450.

Fourth prize — Minolta X700 camera with a 50mm lens and flashgun, worth £280.



How to enter:

Just identify the twelve objects pictured opposite....

HINT — the Argus Specialist Magazines listed below might give you a clue:

Electronics Today International
 Personal Computing Today
 Movie Maker
 Your Model Railway
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REVIEW:

Yaesu FT730R

70cm FM Transceiver

Have you ever tried 70cm? If you haven't then you've probably heard the stories about calling for days and nothing happening, or how the expected range of 70cm mobile is

mobile and "put in a bit about your impressions of 70cm operation as well", I jumped at the chance. I started out on 70cm when I was first licensed way back in 1960

Seventy 'cems operation, particularly 'mobile', is shrouded in much misconception. Pete Metcalfe, BSc, G8DCZ, tried out the Yaesu FT730R alongside his 2m rig with surprising results...

barely better than 20km or even how 'Syledis' blots out everything. But if you have, then you're probably hooked on it already. It's sad that the band has such an undeserved bad name. Most of the folklore about 70cm is like all 'old wives tales' ie a grain of truth which has been exaggerated out of all proportion.

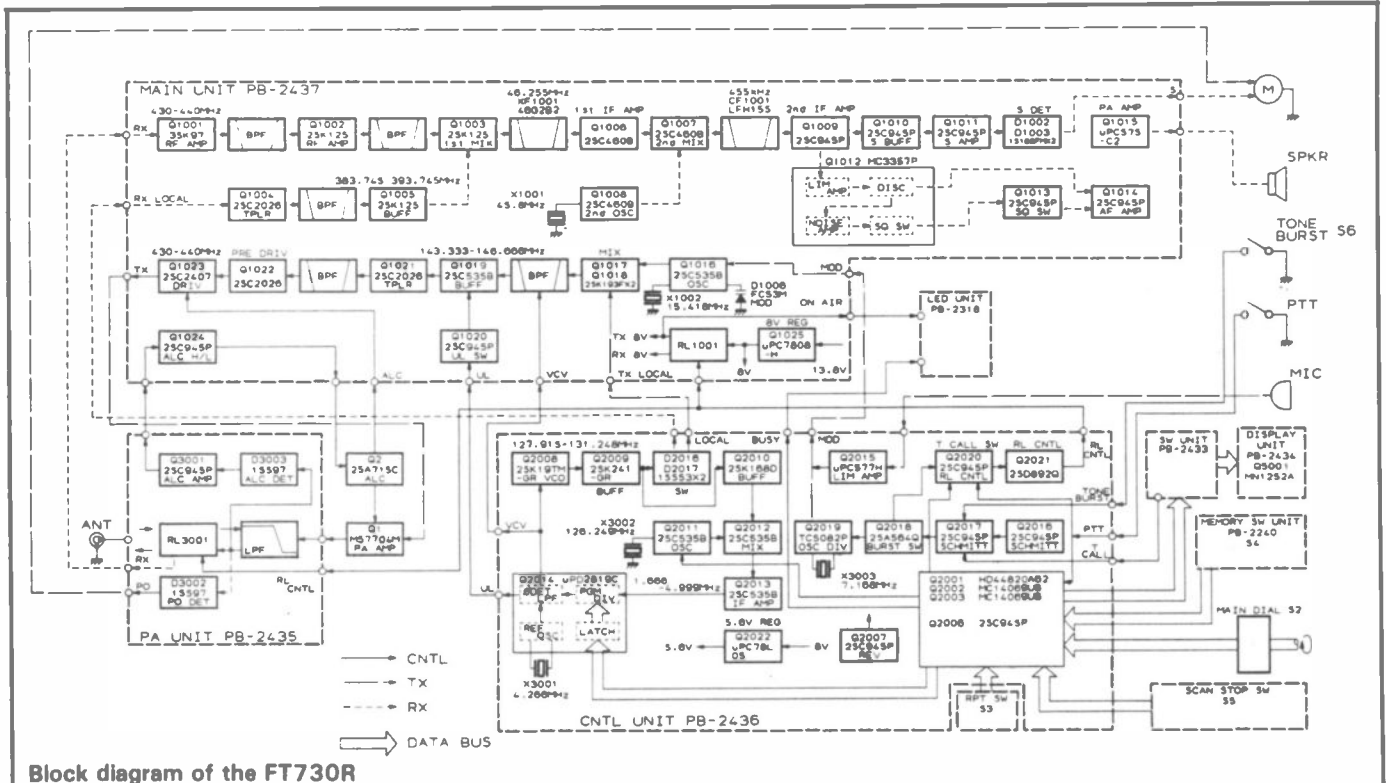
When asked if I would like to review the Yaesu FT730R FM

something (when in fact only 70cm and up were scheduled for class B licensees) but with the advent of 2m, to my shame, I deserted 70cm apart from having had a 100mW rockbound handheld rig for the last few years. How the band has changed!

It is only comparatively recently that manufacturers have offered any amount of 70cm 'boxes' and, considering the difficulty in finding

readily available 'front end' and PA devices that can handle 400-500MHz efficiently, this is hardly surprising. However, they are now appearing on the market thick and fast — usually as a complementary to the 2m range ie the same box and logic, and hence the same functions but with re-vamped RF circuitry. This is confirmed by comparing the FT290 and FT790, the TR2500 and TR3500 and of course the FT230 and FT730. Almost without exception, the 70cm version has a rather lower output power than its 2m counterpart and this seems to indicate to me that we still have a long way to go in increasing the efficiency of the output stage. I mention this first because when operating the 730R the rear heatsink seemed to run rather hot — watch where you mount it in a car. However, the rig





Block diagram of the FT730R

seemed perfectly happy, even on long 'rag-chewing' type QSOs (although it was a little disconcerting to see the output power slowly reduce!), but I feel that plenty of ventilation can't do any harm!

Following the modern trend, the 730R is an extremely small rig measuring approx. 6" x 8" x 2" and weighing only 1 1/2kg. (If they carry on like this, I'll soon find one small enough to fit into my small car properly!) What is useful is that the rig is small enough to fit into a glove compartment or briefcase when leaving the car, the mobile bracket being quick and easy to use. Anything to reduce the theft statistics can't be bad!

Looking At The Spec'

The output power is quoted as 10W and a quick measurement on my rather ageing Daiwa CN630 into a dummy load seemed to confirm that this was true for the whole 430-439.975MHz range, no mean feat over such a wide band and, of course, of great importance to 70cm repeater shift of 1.6MHz. As far as receive performance is concerned, I have few facilities for checking, but it seemed to have quite a flat response throughout the available FM and repeater spectrum. However, and here is my major gripe about this rig, while I

wouldn't go so far as to say that the 730R is 'deaf', the receive capabilities on the review model didn't seem to match up to the 10W output*. Regularly I sent reports of 5/5 but received ones of 5/9 from comparably equipped stations. Repeaters could frequently be accessed easily which could be heard only at fairly poor strength (which rather spoiled my fun when working 70cm mobile!).

Anyway, back to the specifications. The 730R seems to have most of the functions demanded by the discerning 'black box' operator (more of this later). The quoted audio output power is a rather too modest 1W with no indication of the distortion level. I am convinced that most rig designers drive around in a nice quiet Mercedes or Rolls (or whatever the Japanese equivalent is).

An interesting discovery I made, and which did not help the aforementioned criticisms, is that a very large proportion of 70cm operators have very low modulation, making it almost impossible to hear them when travelling at speed. I'm sorry to say that the 730R under review also suffered from this malaise but a few seconds with a screwdriver can soon put this right. . . ! The VR2003 centre rear of the underside of the PA board, can easily be turned *anticlockwise*

to *increase* the deviation. You've got to hand it to Yaesu — their manuals are good and informative! It is nice to see that Yaesu have gone for 'N' type connectors, to my mind a must at this sort of frequency. Unfortunately, this would mean that a 'N' type to PL259 adaptor (or a splitter box) would be necessary if one were also using a 2m rig in the car with a dual band aerial. I've often thought of standardising my equipment and getting rid of those awful 259s — anybody know where I can get hold of ring mounted N type sockets that will fit my TR9130?

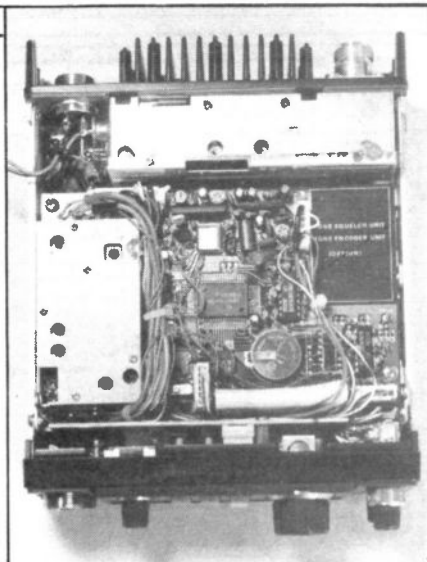
Off With The Covers!

So, what are things like inside? On removing the covers, and after a little trouble with the bolts on the rear heatsink, the top board indicates how Yaesu have managed to get in the 12 ICs, 9 FETs and 27 transistors (plus one or two other bits and pieces) — it certainly is a tight squeeze! Having said that, the board is very well laid out, high quality masked and labelled and uses sockets extensively for off-board connections. Coupled with the excellent layout diagrams in the manual, I foresee few difficulties in store for maintenance and the experimentally minded — provided he has patience and good eyesight —

now where's that VR2003?. This top board contains most of the RF circuitry with the signal transmit/receive switching being performed by a relay, which is very nice to see, especially at this frequency. The receive front end is a 3SK97 GaAs-fet with what appears to be a rather unusual method of biasing the second gate ie connecting it directly to the source! (Perhaps a little fiddling around in this area would improve the front end's performance? — after the guarantee has expired, of course).

A liberal sprinkling of lumped and crystal filters together with the inevitable IC limiter/discriminator/squelch and IC audio amplifier completes the fairly standard line-up. There's nothing too unusual on the transmit side either, FM being achieved by vari-cap swinging the main 15.4MHz oscillator and mixing the result with the PLL derived nominal 130MHz signal, the resulting 143-146MHz signal then being tripled up to 430MHz. The use of 143MHz and tripling does of course mean that problems could be encountered when working crossband 70cm/2m, and one should thus choose the frequencies for this carefully. For example, SU17 has a small amplitude 'sprog' on about 144.475MHz and SU20 on 144.5MHz etc so check for any very local 2m all mode section operators! In fairness to Yaesu though, I must say that they seem to have gone to town on the filtering and, even with co-sited aerials, I could discern little difference between these 2m sprogs when setting the 730R to 1W and then 10W output, so I would guess that very little is getting up to the aerial. The final RF output is from a 10W module and I think that I've given enough views on modules in previous articles to say "enough said" here!

The lower portion of the rig contains the PLL and control circuitry along with a 5 year Lithium memory back-up cell. The rig is actually sent with the back-up switched off, so check the manual to see how it is activated. The current consumption from this cell is quoted at about 0.1uA, which rather puts my TR9130 and TR2400 in the shade. I feel that this is one of the single most useful advances in control to have emerged



The heart of the FT730R is a 4-bit microprocessor (HD44820A-62) — see centre of pic.

over the last year or two — so one up for Yaesu! It is in the lower portion of the 730R that my first few surprises came. The review model was of course the European BC version and so lacked the tone encoder and squelch unit. This, coupled with the flat pack main microprocessor means that there is a huge amount of empty space, leaving plenty of room for installing a pre-amp, perhaps. Another nice touch is that on the underside there is a hefty reverse polarity protection diode, which means that the line fuse would blow rather than the rig if you were to do something silly.

Mobile In Mind

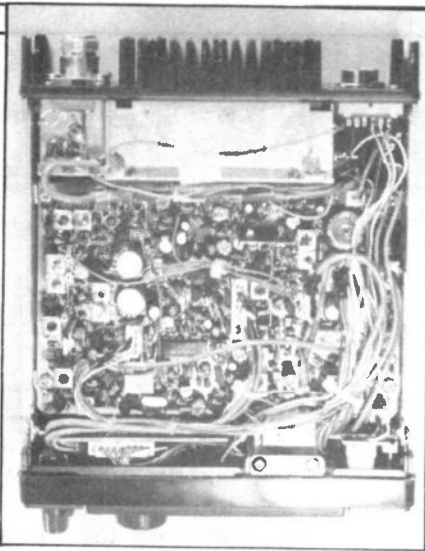
The front panel on the 730R is quite well designed with one or two features to make mobile operation safer. For example, the 10/1W power switch stands proud of the other buttons when in the 10W position. This serves as a good reference point for locating the other buttons without the need to take one's eyes off the road. The feature of having two VFOs and ten memories (rather unusual for an FM rig) is also very handy for mobile operation. I found it extremely useful to program the ten repeater channels into the memory with SU20 on VFO'A' and my favourite QSY channel on VFO'B'. This makes for very fast and safe operation, especially when using the memory step feature (as opposed to memory scan) ie single presses of the microphone's

up/down buttons. Ten memories may seem rather a lot but I can assure you that, with lots of 70cm repeaters about, they save an awful lot of dial twiddling! With 1.6MHz shift on UK repeaters, I was relieved to find that Yaesu have incorporated a very simple to use 'listen on the input' facility — and that the frequency display follows you up too. (They don't all do that you know!) Odd repeater shifts can easily be catered for, so if you want to go chasing those 7.6MHz shift German repeaters you are all set.

Scanning On 70cm

Now as far as scanning and priority channel operation goes, I have previously considered these features as rather useless, 'flashy' bits. However on 70cm I have revised my opinion for a number of reasons. Firstly, the band is so big and in many parts of the country can be very quiet making a CQ call from any station seem like a novelty, so why miss it? (I'll talk to anybody!) Secondly, curiously enough, and irrespective of what the bandplan says, there is no single 70cm FM calling channel. This stems from the historic fact that many people on 70cm have graduated to the band using ex-Government/prison/police/PMR rockbound rigs. When you've only got two or three channels, what do you crystal up for? Most people (myself included) tend to have the local repeater and, say, SU8. This tends to make SU8 and SU20 FM calling channels, again making scanning or, better still, priority channel functions extremely useful. Incidentally, if you call and then work on SU8 on a fully synthesised rig you had better watch out, for in some parts of the country, especially the Midlands, people tend to reserve SU8 for rockbound operation. So, if you can both get off SU8, please do so. (I think that this is a nice idea, but I'm biased!) Thirdly, it is sad that an awful lot of people tend to think of 70cm as a 'repeater band' and simplex operation in some areas of the country is very limited. So it's very useful to be able to scan the repeaters to find a contact (and then try to drag him/her off to a simplex channel? Go on, start a trend!).

To finish off discussing the



Top side

panel controls, I found the 'Call' button, which sends the rig into transmit with a tone burst, very useful. This is especially useful when 'mobile' because the normal PTT toneburst enable switch is on the rear panel ie virtually inaccessible when the rig is mounted in a car. As all the 70cm repeaters that I have come across (and the review model did join me on trips to the Midlands and West Country this summer) allow audio access after the initial toneburst, I tended to leave off the PTT toneburst completely. Frequency steps on the 730R are either 25kHz or 100kHz. With the band being so large, I found the 100kHz steps especially useful. Unfortunately if you are on, say, 433.425MHz and want to go up to 433.525MHz, pressing the 'step' button for 100kHz steps and rotating the dial only takes you up to the next 100kHz section of the band ie 433.500MHz and then 433.600MHz etc. It would have been nice to jump just 100kHz and get the intermediate frequencies as well. Finally, the frequency display is of the liquid crystal type and has quite a large viewing angle, meaning that the display is visible on the brightest sunlight (well almost!). At night the dial lamp takes care of visibility — it's somewhat bright and if this had been my rig I would have done something to tone it down to avoid distraction while driving.

Consistent comments of 'excellent audio' were received using this rig (especially with the deviation increased slightly) and, after getting used to the intricacies of its microprocessor, it was a pleasure to use. However, the old 'chestnut'

of the S-meter rears its ugly head yet again and the 730R unfortunately had one of the most lazy that I've come across. As an example, while in QSO from my homebase (using a vintage 48 ele multibeam), with a friend operating mobile with ½W or so, I gave an 'audio' report of 5/9 and an 'S-meter' report of 5/1 for some time until fairly suddenly the S-meter went up to 5/8. "Hey, that's good — where are you now?", I said. "Just pulled into your drive.", came the reply! Another friend of mine had the right idea I'm sure — he's stuck tape over his 'S' meter!

70cm Vs 2m Mobile

During the course of trying out this rig, it was taken 'mobile' to the Midlands, the West Country, locally around Sussex, up 850ft to a local high spot and canal boat 'mobile' on the Oxford canal. So, I feel qualified to answer a few questions about what 70cm is like. Firstly you'll need to get/construct yourself a decent aerial. On 70cm, homebase aerials look so much like TV ones that you should be able to get away with murder, without alerting your neighbours. (That being said, watch out for TVI-430MHz can cause big problems!) On the car, a 5/8 over 5/8 wave colinear is smaller than a 5/8 wave for 2m so there's no clang-clang as you wander around multi-storey carparks. Also worth noting is that some of the dual band 2m/70cm mobile aerials perform very well indeed. The beauty of 70cm aerials is that they are small — which tends to encourage one to experiment with the odd coat-hanger just for the fun of it! The other thing about 70cm is that some very odd propagation effects can be experienced. Have you ever watched TV, seen 'continental interference' patterns and immediately leapt up to the shack only to find that 2m is dead? Well, try 70cm instead!

What about the range on 70cm? I spent quite a time over the summer comparing 70cm with 2m mobile and found surprisingly little difference between the two, taking account of the power and aerial gain. (The latter is where 70cm has the advantage, for, in the same physical space you can pack in a much better 70cm aerial than a 2m

one.) Locally, the South Downs tend to get in my way but it was surprising to see just how favourably 70cm compared with 2m. (Signals from stations equipped with comparable equipment on both bands disappeared at the same place finally. However, before that, 70cm was almost always copyable at places where 2m was lost.) While driving westwards, I held an excellent QSO on 70cm with a chap in Poole for over 35 miles of motorway driving, while moving away from his base station at that. With the advent of the massive repeater network on 70cm, quite some fun can be had, however, as a word of warning, since so many repeaters are sited on the same channel and tend to have a rather low output power, if you are hurtling down a motorway keep your QSOs short. (I found this out the hard way, going rapidly in and out of range of any one repeater while travelling down the A1 rather rapidly!) It's odd to see why the usage of 70cm varies from area to area. The Midlands and West Country on the whole seem very quiet and here 70cm lives up to its image of calling for hours without any reply. However, in the South East of England, 70cm is now very active (people fed up with bad operation on 2m repeaters?).

All in all, 70cm is a lot of fun and the adage 'the gentlemen's band' seems well justified. I am not being derogatory of 2m but life somehow seems slower and more pleasant on 70cm and even the London repeaters are accessible (make of that what you will!). You could do a lot worse than choosing the FT730R as an introduction to the 70cm band. I certainly enjoyed using it and if you want a further incentive, check the price of it (currently £239) compared with its 2m version. (Surprisingly enough, the price of the 70cm version is lower!) Go on, give it a go and put a bit of sanity back into mobile operation. See you on SU8.

*The sensitivity of the review sample checked out at 0.12uV for 12dB SINAD, better than the Yaesu spec'. Perhaps some 70cm transmitters are a little lacking in RF output? . . . a puzzled G3ZZD.

The author would like to thank South Midlands Communications Ltd of Totton, Southampton for the loan of the review equipment.

SYNTHESISER CHIPS

IC chips for radio frequency synthesisers are probably the single most important development in the technology of our hobby since we went over from valves (in

for amateur radio use will always require an external VCO — voltage controlled oscillator — to produce the RF output signal which is the *raison d'être* of the system. It

shown in Fig.2. Most equipment designs require that the synthesiser should be able to reduce both the transmit frequency and the same frequency plus or minus the first IF, for use as local oscillator injection or receive. In the 2m case, the VCO would have to cover from 133 to 135MHz and 144 to 146MHz. With modern varicaps it would be no trouble to build an oscillator which covered the band continuously from 133 to 146MHz, with just a few volts' change on the control line. However it would be far better practice to aim for a 2MHz change for a 50 per cent control voltage swing to minimise the effect of any noise on the control line. Thus Fig.2 shows a PIN diode switch to coarse tune the VCO to either 133 or 144MHz for receive/transmit function. Putting a few figures on things, the control voltage from the phase comparator could possibly swing over a 12V range. Taking a figure of 50 per cent to allow for overshoot, the practical control voltage swing is 6V for 2MHz or around 330kHz/volt. A suitable VCO for 70cm would require a sensitivity of about 1.6MHz/volt when used with a 12V swing phase comparator.

A few months ago, HRT ran an article which discussed the basic ideas behind frequency synthesis. Now, Frank Ogden, G4JST, explains the genesis of a practical 'frequency synthesiser', as a foundation for a number of articles on the applications of current PLL synthesisers to Amateur Radio.

the main) to transistors. In the days before IC synthesisers, perhaps the greatest skill required by the home designer/constructor was obtaining the necessary frequency stability with full VFO control on every band. It was particularly difficult to get full and continuous coverage on 144MHz and 432MHz.

I plan to write a series of articles giving practical application notes and examples for the currently available radiocomms circuits — NJ8812, MC145140/50 series, HEF4750, NJ8820, 4000 and 4500 series MSI building blocks. All these circuits are intended for general purpose use. I would also like to take a look at some of the consumer PLL synthesiser systems for their applications to amateur radio. This series will principally be of interest to VHF and UHF constructors but, where possible, HF applications will also be offered.

Because the subject matter is so wide, I have to keep basics to a minimum in favour of practical details of such things as pin function, level requirements, phase comparator types etc. This necessarily assumes detailed knowledge of the subject. I therefore wish to restrict this first part to offering the groundwork necessary for understanding the rest of the series.

VCO

A practical synthesiser system

always has one input for a DC control voltage, and two RF outputs. One of the RF output feeds the desired output signal to the equipment while the other output siphons a proportion of the same signal to the digital electronics of the PLL system. The position of the VCO within the complete PLL system is shown in Fig. 1.

The essential parameter of an RF VCO is the frequency change in the output signal for a given change in voltage on the DC control line. Mathematical expressions of VCO and phase comparator performance tend to come out as radians/volt or radians/second. But as someone who still thinks in terms of megacycles, all quotes of time and phase will be restricted to Hz, which everybody understands. Thus the essential parameter of a VCO is MHz/volt.

A typical 2m band VCO is

Phase Comparator

This part of the synthesiser

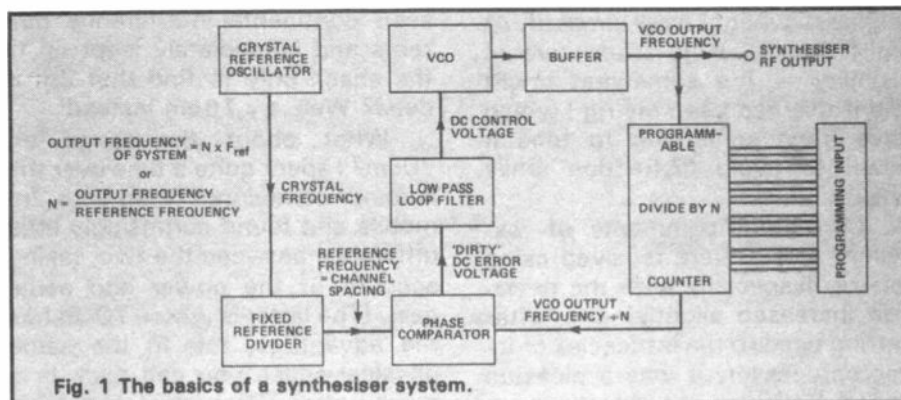
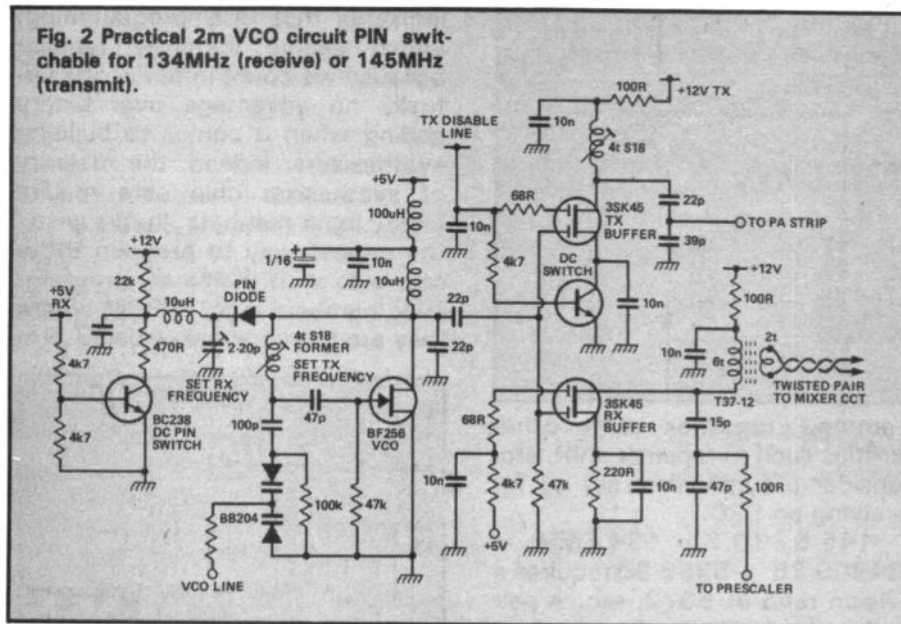


Fig. 1 The basics of a synthesiser system.

Fig. 2 Practical 2m VCO circuit PIN switchable for 134MHz (receive) or 145MHz (transmit).



system is nearly always integrated onto the main IC within the PLL, where it compares the fixed reference frequency — which is usually proportional to the system channel spacing — with the divided output of the VCO. In practice, this means that the phase comparator has to produce a control voltage for the VCO proportional to the frequency variation between a reference signal of exactly 25kHz (in a 25kHz channelled system) and a divided VCO signal of about 25kHz. Naturally, the 'sense' of the phase comparator output should be to act in the direction which pulls the VCO into spot-on timing with the crystal controlled reference signal.

People with a reasonable memory will recall those marvellous days of NASA's Apollo programme which culminated in astronauts walking on the moon. As the lunar orbiter disappeared behind the moon, communication was lost but, on the emergence of the craft from behind the far side of the moon, Mission Control at Houston invariably used the expression "We have lock".

What they were referring to was the operation of a circuit shown essentially in Fig. 3, the grand-daddy of all digital phase comparators. Invented by NASA, this simple arrangement of just a gate and a couple of flip-flops has the remarkable ability of not only being able to keep two signals in phase, but also it can decide which of two input signals has the highest input frequency and move the out-

put control line in the correct direction to reduce the frequency difference to zero.

It works like this. Imagine that the two input signals are competitors in a race. The two flip-flops are lanes in a race track. The race is won when the fastest runner gets past the finishing line, sprints over

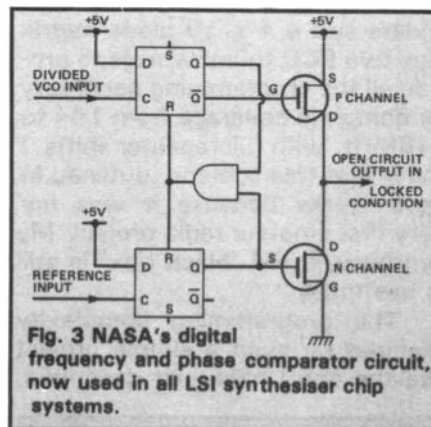


Fig. 3 NASA's digital frequency and phase comparator circuit, now used in all LSI synthesiser chip systems.

to the judges' table and stops the clock on his slower competitor. He has won and the positive pulse on the Q output on his flip-flop race track declares him the winner. Stopping the clock (the gate performs this function by pulsing the flip-flop resets) also has the effect of returning both competitors to the starting line where the race is re-run ad infinitum until the slower signal picks up speed (or the faster one slows down). In all, a circuit of true ingenuity.

With a train of pulses present at the Q output of the flip-flop with the faster signal — timed from the leading edge — the mark/space does not matter one iota: available

continuously, it is a circuitry doddle to translate these to a DC control voltage for the VCO.

Although almost universally used, the circuit does have one short-coming. With both input signals perfectly in phase, there is a 'dead' period lasting a few tens of nanoseconds either side of the nominal lock condition. This is due to the propagation delay from clock input to reset action. This places a degree of design constraint upon the loop filter: the bandwidth of the VCO control loop must be limited to the point where no 'hunting' around the phase comparator dead band can occur. If such low level, high frequency instabilities are present, the VCO output may well show high level 'sproggies' for no otherwise apparent reason. The 'dead' band rarely presents too much of a problem in practice.

The highly advanced HEF4750 series from Philips also carries a sample hold type comparator, as does the Plessey NJ8820. This type of circuit uses a very short pulse with a repetition rate, determined by the reference frequency to cut a thin slice out of a ramp waveform derived from the VCO divided signal. This sample level, which has a value proportional to its position on the ramp, is held as a steady output voltage in a sample hold circuit until updated by the next reference sample. This method has spot-on phase comparison accuracy, but is not frequency sensitive. When used in IC synthesiser systems, a digital comparator pulls the circuit into rough lock, is disabled, and the high accuracy sample hold circuit takes over the task of keeping the loop in lock. This gives the Philips, and the new Plessey chip, superb performance at the expense of increased circuit complexity. Fig.4 shows the block schematic of a sample hold comparator.

Reference to Fig.1 shows where this component comes in the chain. The basics are that, however the circuit may be implemented, it divides the output frequency of the VCO by a ratio which equals the wanted output frequency divided by the system channel spacing. I shall explain this with a real example. You wish to build an FM synthesised box for 2m operation. A pair of thumb-wheel switches should read so that '20' is S20 or

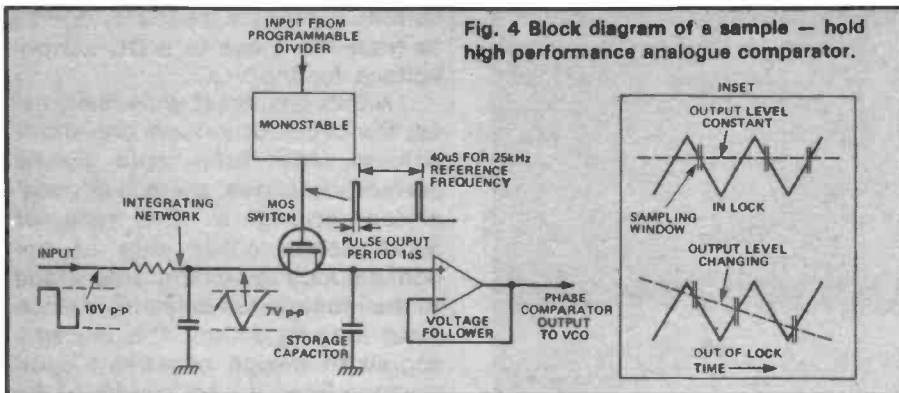


Fig. 4 Block diagram of a sample - hold high performance analogue comparator.

145.5MHz. It follows that the frequency step between each position on the thumb wheels has to be 25kHz. Using the rule given at the beginning of the paragraph: 145500 (kHz) divided by 25 (kHz) = 5820 = division ratio required by programmable divider between VCO and phase comparator. When carrying out such a calculation, make sure that all quantities are of the same units.

Similarly, the division ratio required for S19 would be 5810 = 145.475MHz; S18 = 5818, etc. S0 would require a division ratio of 5800 = 145.000MHz. 144MHz = 5760.

Assuming that a given programmable divider has four digits to program so that the VCO output is at the correct frequency - for S20 it would be 5 (MSD), 8,2,0 (LSD) - it would be convenient to hardwire the 5 and 8, and use a single pair of thumb wheel switches in BCD coding for the two least significant digits.

All this seems straightforward until one considers that the LO receive frequencies need to be pro-

grammed together with other facilities such as repeater shift, etc. Consider a synthesiser set up for receiving on S20.

$145.5 - 10.7 = 134.8\text{MHz} = 134800/25 = 5392$ S0 requires a division ratio of 5372, etc. A pair of thumb-wheels in the last two positions clearly cannot be used without extra logic, a BCD adder, and extra positions in the hard wired programming arrangement. Similarly, a 600kHz repeater shift requires the addition of 24 to the receive division ratio.

CMOS programmable dividers, such as the 4059 four decade BCD divider, require three 4560 BCD adders and a 4 x 16 diode matrix plus two BCD thumbwheels to provide all the programming necessary for complete coverage from 144 to 146MHz, with full repeater shifts. I know that this scheme, outlined in Fig.5 works because it was my very first amateur radio project. My synthesised FM 'black box' is still in use today.

The programming complexity required by even a simple project like the one I have just described,

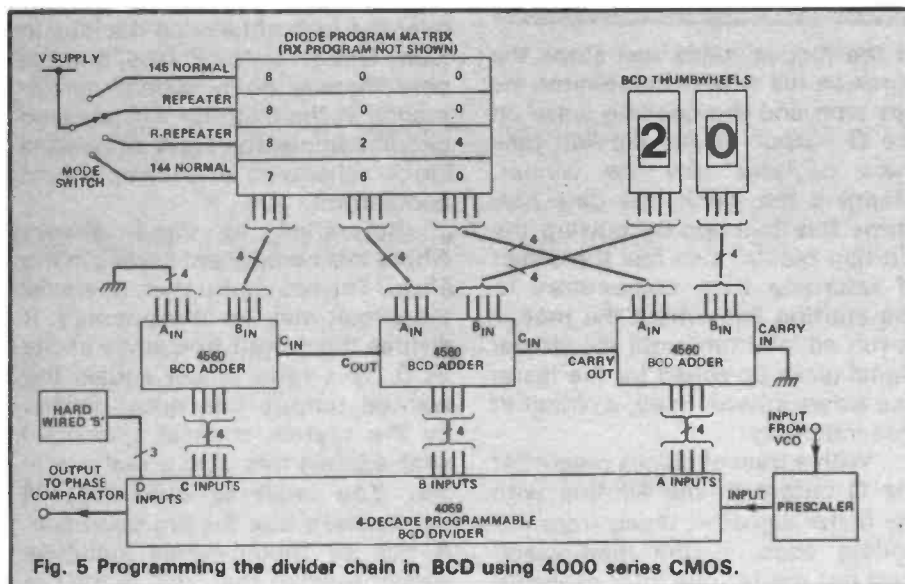


Fig. 5 Programming the divider chain in BCD using 4000 series CMOS.

indicates that BCD programming, which seems instantly familiar because we count in ten's, has virtually no advantage over binary coding when it comes to building synthesisers. Indeed, the majority of synthesiser chip sets require binary input numbers. In this case, the easiest way to program these sets is to stuff the binary programming numbers in an EPROM where they are then addressed using sim-

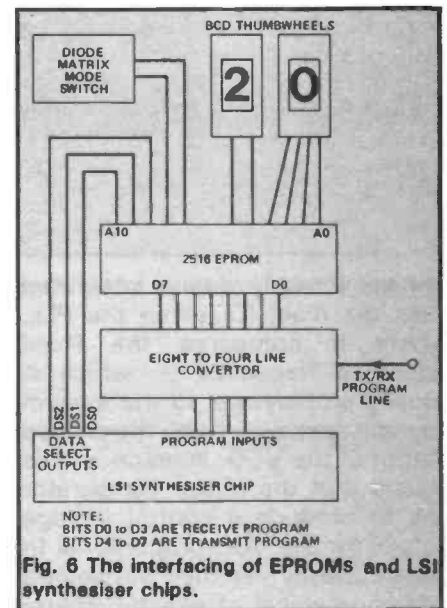


Fig. 6 The interfacing of EPROMs and LSI synthesiser chips.

ple BCD code as the address inputs. Fig.6 shows the straightforward way in which this man-to-machine translation is achieved.

Frequency Limit

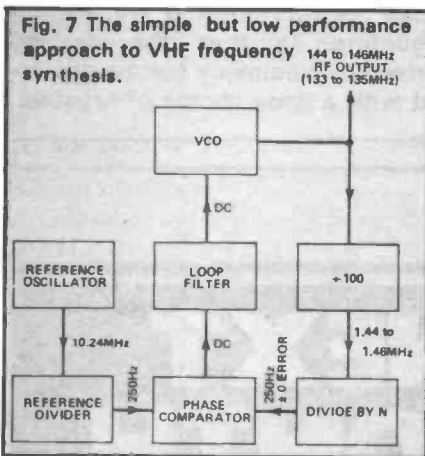
Programmable dividers of the sort that will be covered in the following series have upper input frequency limits spanning from 5 to 30MHz. Not one of them will operate directly at the VCO output frequency of a two metre rig. One of three tricks has to be employed to reduce 150MHz down to 5MHz or whatever.

The most obvious, but technically the least desirable method, is simply to feed the VCO output into a fixed high speed divider. Provided that the reference frequency (channel spacing) is divided by the same amount, the programmable divider can be programmed precisely as if it were operating directly from the VCO output. An SP8629 divide by 100 prescaler, connected to the output of a 2m VCO, would produce an output to the programmable divider ranging from 1.44MHz to

1.46MHz (in transmit). This frequency would be easily handled by any programmable divider. The 25kHz reference frequency would also have to be divided by 100, resulting in 250Hz reference frequency system performance would suffer badly: settling time (between alterations in frequency step) side-band noise, FM noise, etc would all be poor. Fig.7 gives the system.

A far better arrangement is to mix the VCO output with that of a multiplied crystal oscillator output. For instance, if the crystal oscillator output is exactly 3MHz below the lowest frequency which the system has to synthesise, then a 2MHz VCO frequency change to cover the 2m band for example will represent a frequency range of 3 to 5MHz for the programmable divider to deal with. It can therefore operate directly with reference frequency maintained at 25kHz.

Fig.8 shows the block schematic for the divider chain.



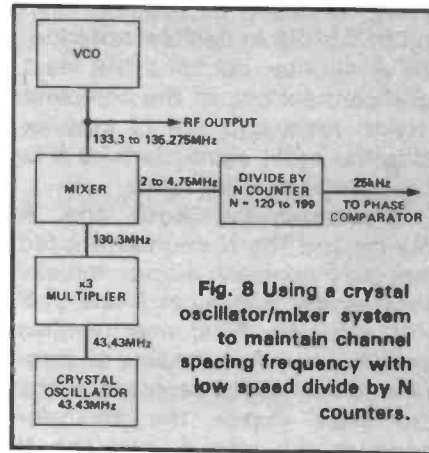
The arithmetic for a worked example goes like this:

Frequency to be synthesised - 133.3 MHz (RX LO for 144.000)
 Total division ratio required is $133300/25 = 5332$
 The crystal oscillator frequency of 130.3MHz represents a contribution to the overall division ratio of $130300/25 = 5212$.

The job to be done by the programmable divider is just 5332 (the required overall division ratio) - 5212 (the contribution of the crystal oscillator) + 120 (the actual division number programmed into the divider).

Similarly a frequency of 135.275 (LO for 145.975MHz) requires a division ratio of $135275/25 = 5411$. Therefore: actual division ratio is $5411 - 5212 = 199$. Thus a 130.3MHz crystal

oscillator mixed into the output of the VCO allows the entire 2m band to be covered using a program-



mable division ratio ranging from 120 to 199 (79 25kHz channels).

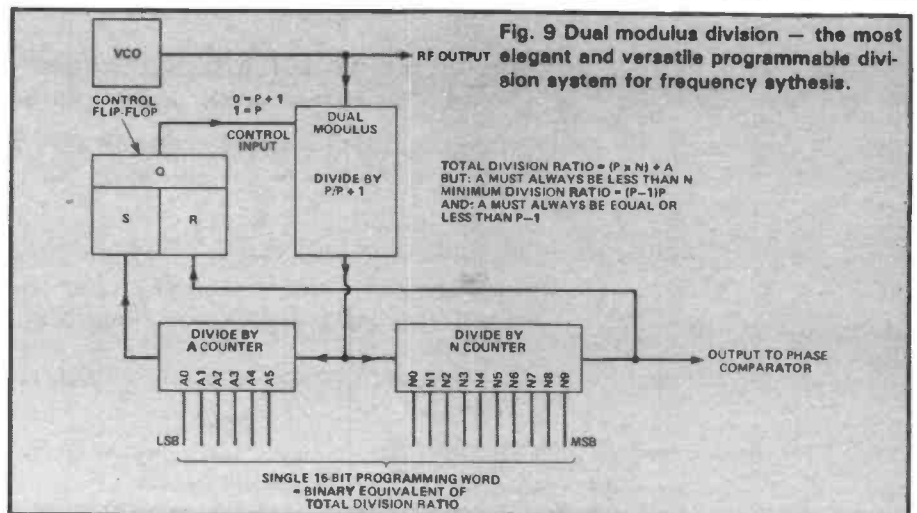
Dual Modulus Division

There is an even better way of implementing a high speed divider, which combines a dual modulus prescaler with a slow speed programmable divider while retaining the full channel spacing as the reference frequency. The expression 'better' relates to the fact that the system doesn't require a high frequency crystal oscillator, and that widely differing frequencies, for instance the difference between the receive local oscillator and transmit frequencies, can be programmed directly. The only proviso is that a) the VCO can cope with the programmed frequencies and b) the required division ratio is within the range of the dual modulus prescaler/programmable divider combination. This last point is important because a dual modulus synthesiser chip such as the

NJ8812 (to be covered in detail in the next article) will only divide over a limited range, in this case between 1600 and 11840 or 6720 to 16960.

The basic dual modulus division system is shown in Fig.9. It comprises a dual modulus prescaler, a small fully programmable divider known as the A counter, and a larger fully programmable divider known as the N counter. The dual modulus prescaler works in the same way as a fixed prescaler except that it can divide by one of two ratios P or P + 1 where typical values for P (depending on the device) are 10,40,100 or 256. It is possible to purchase devices with other values of P but the ones quoted tend to be the most useful. For instance the Plessey SP8793 has a value for P of 40. It can thus divide either by 40 or 41. I'm not going to go too deeply into how dual modulus prescalers combine with special programmable dividers, to make a fully programmable system which can work directly at VCO output frequency. It is quite a difficult topic to grasp and complete system understanding is not really necessary provided that the programming rules are known. There are also plenty of books on the subject (I recommend the 'Integrated Circuits Applications Handbook' by Arthur Seidman, published by Wiley). I am prepared to enlarge on the subject if enough people write in.

Essentially, it is like dividing up a pile of sweets equally among a group of children. Providing that the number of sweets is exactly divisible by the number of children present at the handout, then there will be none left over at the end of



distribution. There will always be *less* sweets left over than there are children present, otherwise you would be able to go another round. If you knew beforehand the number of sweets and the number of children, then it would be possible to deal yourself (*definitely!* — Ed) in for the number of rounds it would take to use up the surplus sweets. Thus, if you knew that the packet contained 103 sweets for division among a group of ten children, you could go around the group of children ten times, including yourself in the deal for three of them. Keep this example in mind while reading the programming rules for dual modulus division systems.

Programming Method

Assuming that the A counter and N counter of Fig.9 are straight binary programmable dividers (they could be BCD, but the P ratio would have to be a power of 10) then the bits of the N counter may simply be regarded as a continuation of the bits of the A counter. For example,

if the A counter had six bits and the N counter 10 bits, then the total divider system may be regarded as having 16 bits or a maximum division of 65535 in decimal notation. The A counter contains the least significant six bits of the complete division ratio and the N counter holds the most significant 10 bits of that total division ratio.

Electronically, both the A counter and the N counter are fed from the P prescaler output. Initially the prescaler divides at a rate of $P + 1$ until the A counter reaches zero. The counter remains at zero, but a control signal detected by the zero state makes the prescaler divide at the rate P until the N counter also reaches zero. A pulse passes to the system output (to the phase comparator input) both counters reset with their programmed values and the prescaler goes to the $P + 1$ state and the cycle restarts. Remember those sweets?

Rules

1) The fundamental division ratio P of the prescaler must always

be great enough so that the VCO output frequency divided by P is *less* than the maximum frequency limit of the programmable divider/control chip.

2) The maximum number programmed into the A counter must never be more than $P - 1$. Thus a $P = 40$ prescaler should never be more than 39 in binary value programmed into its A counter.

3) The number in the N counter must always be more than the number in the counter.

4) The minimum division ratio of a dual modulus system = $(P - 1) \times P$.

5) The maximum division ratio is $(P \times N_{max}) + A_{max}$.

Reference Divider

After some of the heavier concepts which I have tried to explain away as lightly as I can, I am pleased to say that this one is completely straight forward. Most of the synthesiser LSI building blocks have fully programmable reference counters so that the desired reference frequency can be obtained with a wide choice of crystals.

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Frank Ogden, G4JST, puts a tin of Coleman's to good use

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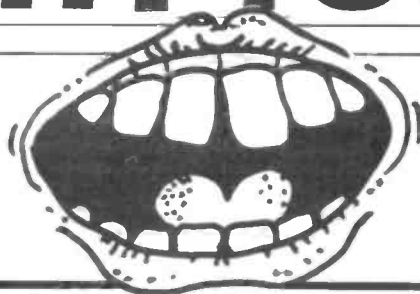
ATV

Andy Emmerson, G8PTH, looks at the current 24cm scene and reviews the latest in equipment from Wood and Douglas

MIGHTY MOUTH

Speech Processor

One of the failings of the human anatomy as far as communications is concerned is the variation in timbre of the human voice. If you listen around the bands you will discover a wide range of types, from the very bassy to the ultra high. That



Put some punch into your transmissions — FM, AM or SSB. Tony Bailey, G3WPO, tells how.

being said, the problem is that very often what actually comes out of the transmitter to be demodulated at your receiver very often bears little resemblance to what went into the microphone.

How many people do you know personally that you don't recognise over the air? The best example is the 'female' voice — virtually all communications transmit equipment is tailored for the lower 'male' voice with the result that most female operators tend to sound the same. The audio circuits are not matched to the different audio characteristics when the higher frequencies predominate ie in the female voice.

It's no secret that communications equipment is generally tailored to transmit only those frequencies lying between 0.3 and 3kHz, as this is where all the useful voice information lies. In fact, within this frequency range, there are smaller, narrower bands of frequencies which actually convey the critical information needed for intelligibility — you can remove all the other frequencies and still be left with a perfectly copyable signal, *albeit not sounding like the original modulation pattern.*

There are ways of actually filtering out these 'unwanted' frequency bands — those of you familiar with audio equipment will know of the 'graphic equaliser', a piece of gear which allows selective boosting or cutting of say 10 different frequency bands within the audio spectrum (the commercial designs usually cover up to

15kHz or so for Hi-Fi applications).

Without a graphic equaliser, there are still ways of getting over the most common problem with a voice, and that is a lack of modulation at certain specific frequencies.

If you take a look at the human voice on an oscilloscope, it is obvious that while the majority of the pattern is at low level, there are many peaks of high intensity but short duration. It's unfortunate that all the information most valuable for communications purposes is contained in the low level part. Of course, your transmitter doesn't know this and its output power is limited by the amplitude of the high intensity peaks. Although your output power may be 100W PEP (on SSB) the average level is very much lower than this — about 12.5%. Hence the reason why the duty cycle on a normal SSB transmitter is so low.

To bring up this average level, we need to amplify all the low level information up to somewhere near the level of the peaks. Of course, to do this you have to amplify everything at once, then reduce the level of the already high energy peaks back to that of the amplified low level parts. This is done by clipping the highly amplified signal to a level which will suit the transmitter, so that you end up with an audio signal with a much higher average energy content.

Nothing is that simple and the process of clipping, being non-linear, introduces lots of distortion products which weren't there in the first place. These have to be got

rid of if the audio quality isn't to suffer. This is where simple processors suffer badly and get themselves a bad name — all the 'rubbish' present shows up as distortion on the signal and this can be so bad as to make the transmission unreadable.

First, You Filter. . .

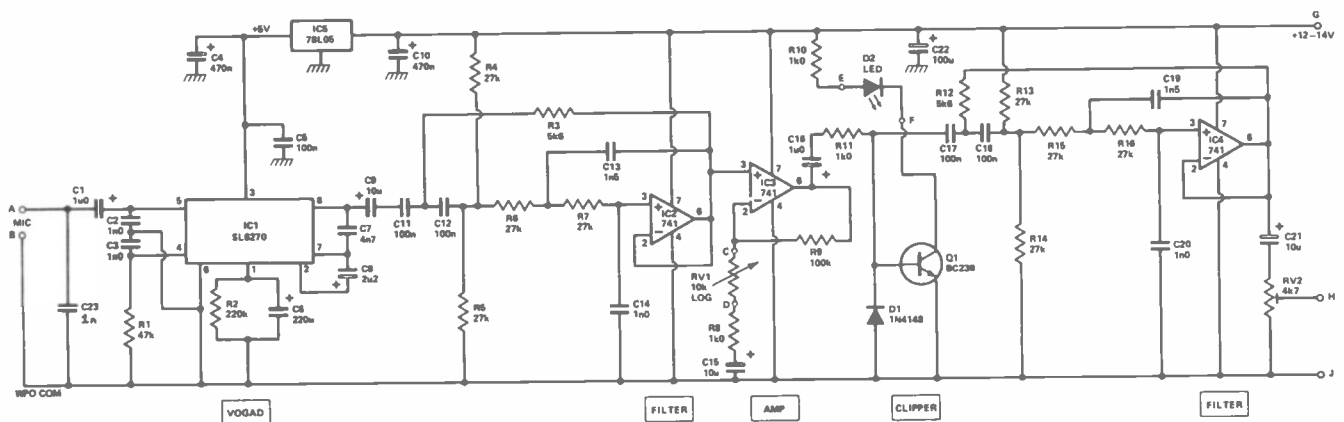
There is a solution — lots of filtering in the right places to remove these distortion products before they get to be a problem.

The first thing you have to do is to filter the microphone signal *before* any processing is done down to a bandwidth of 0.3 - 3kHz. If you don't, then the components at say 5 and 6kHz will mix to produce 11kHz (easy to filter off) and of course 1kHz (impossible to filter off). So, you have distortion products before you start.

Another way to improve the design is to introduce a special stage of amplification before any clipping is done so that the filters and clipper are presented with a reasonably constant level of audio to deal with. This type of circuit is known as VOGAD (Voice Operated Gain Adjusting Device) and has the advantage that you can speak at varying distances from the microphone and still maintain a constant level of modulation. While it is possible to design this type of circuit using discrete semiconductors, Plessey have kindly done all the work for us in the shape of the SL6270 IC, with only a few external components needed. This also has a bandpass filter incorporated into it so we now have *two* filters ahead of the clipper, helping to reduce the chances of unwanted distortion products.

Incidentally, speech processing is not only applicable to SSB — it can be used with any voice mode of transmission, FM and AM responding equally well to its advantages.

Having clipped our audio, we of course have lots of distortion pro-



Circuit diagram of speech processor

ducts outside of the normal wanted 0.3 - 3kHz range which have to be got rid of. Another bandpass filter is used for this and the audio which is presented to the transmitter audio circuit should by now be of much higher average amplitude but with little distortion.

How It Works

Input signals from the microphone (low impedance) are amplified to a constant level of around 90mV by IC1, a Plessey SL6270 VOGAD chip. The time constants of the AGC used here are substantially different to those given by Plessey in their data sheets — with the original values far too much AGC action was apparent on speech peaks, giving an unpleasant effect when in use.

A bandpass filter is incorporated, low frequency roll-off is set by C8 (300Hz) and high frequency by C7 (3kHz). This stage is followed by further filtering in a bandpass active filter, IC2 (741) — active filters are used as they are much more efficient than lumped tuned circuits at audio, and have specific characteristics which are repeatable. Minimum unwanted products are thus fed to the amplifier and clipper, leading to minimum distortion in the final output. IC3 acts as a variable gain amplifier whose output is clipped by D1 to increase the average level of the modulation waveform. The clipped signal is then filtered again through IC4 to remove distortion products outside the voice pass-band (0.3 - 3kHz). The output level to the transmitter is adjustable via preset VR2. Visual indication of

clipping level is given by the LED, driven by Q1 by the clipped audio waveform.

A simple IC voltage regulator feeds IC1 with +5V (limits for this chip are +4 to +12V). Total current consumption is around 15mA without the LED, or 25mA with it.

Construction

The processor is built on a small single sided PCB, and there is nothing particularly critical about its construction so a beginner could tackle this project with confidence. You will need a *small bit* soldering iron (1/4" bits are absolutely no use whatsoever for this sort of project).

1. Start by inserting the 9 x 1mm connection pins into the appropriate holes — these are pushed in from the underside before soldering.
2. Insert and solder all the resistors — these mount horizontally, flat against the PCB with 10mm lead spacing.
3. Insert all non-electrolytic capacitors, mounting them as close to the PCB as possible. The low value capacitors used in the filter circuits may be mylar or polystyrene and should have a tolerance of 10% or better. Mylar capacitors are usually green or yellow in colour — coding for 1n is 102, for 100n is 104. Polystyrene capacitors often have a red band on one end — this is not a polarity marking and they may be inserted either way round.
4. Insert the electrolytic and tantalum capacitors, taking care that the polarities are as marked on the layout diagram. Normally with

these types of capacitor, the longer lead is positive.

5. Insert the remainder of the components, making sure that the diode, ICs and transistor are correctly orientated (the banded end of D1 is the cathode or non-earthly end).

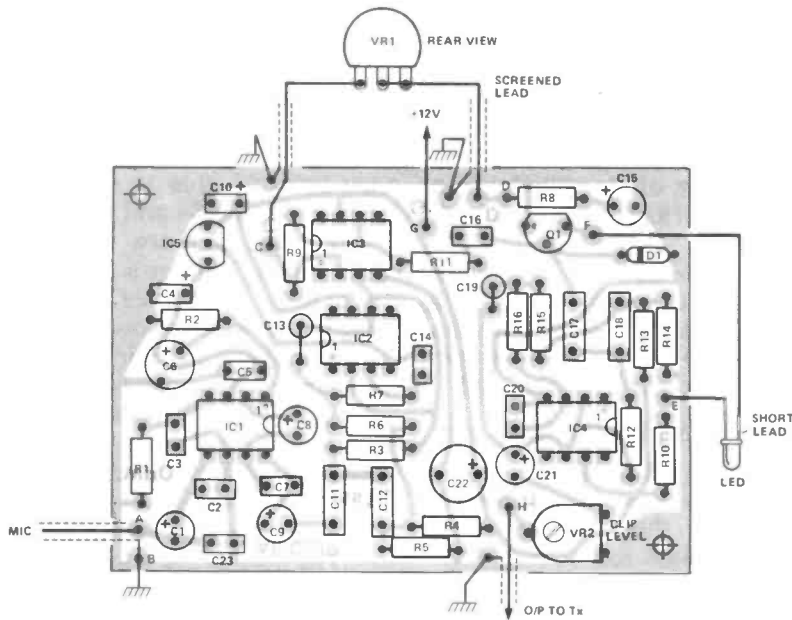
6. Double check your connections, and that you have no solder bridges on the PCB between tracks.

Using The Clipper

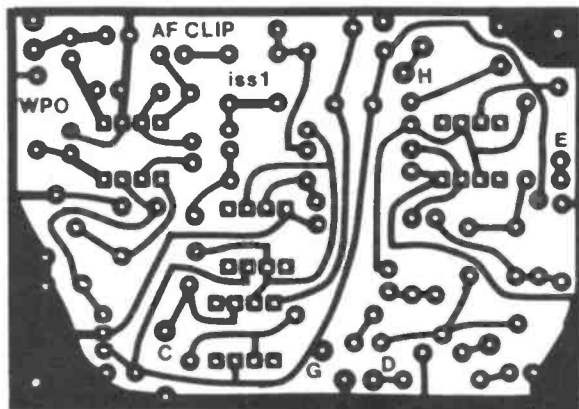
You should mount this unit inside a screened enclosure to prevent RF from possibly affecting its operation. The input lead from the microphone should have a ferrite bead threaded across the lead as a preventative measure, and the +12V supply should be decoupled with the 100n ceramic capacitor soldered between it and the case. The clipper will fit inside a standard diecast box, and will also allow the fitting of a Yaesu type mic connector. A phono plug and socket can be used for the power input connections.

If you wish, the unit can be bypassed with a double pole changeover toggle or slide switch, to allow 'in' and 'out' comparisons.

The connections to the 'Clipping Level' pot should be made with screened microphone cable, and the pot connected so that fully anticlockwise represents minimum resistance in circuit. Input and output connections should also be in screened cable. If your rig has a PTT switch, then a 3 or 4 pole mic connector will be needed to accept this extra connection, which can be run straight from the input connector to the output connector.



Overlay diagram



Foil pattern

Setting Up

There is no alignment as such and you should find that the processor works straight away. To set up the unit, adjust your transmitter mic gain to its normal level and connect the unit into circuit — use the shortest possible interconnecting lead between the unit and the transmitter to avoid RF pickup. Then, set the clipping control (VR1) pot to about 1/4 travel from its

least resistance end. Next adjust VR2 so that the modulation/deviation level is the same as with the unit out of circuit. Best results will depend on signal strength. When in QSO over short distances with strong signals there is little point in using the unit, (leave the pot near minimum travel), as it adds no advantage unless your existing modulation is 'thin'. As signal strengths deteriorate, the clipping level can be increased. About half

travel on the pot (about 10dB clipping) is probably sufficient for normal use, with maximum clipping (about 22dB) only being needed under really poor conditions.

The LED will give a guide to the clipping level. At minimum setting of the clipping, it will only flash on peaks, whereas at maximum clipping it will glow nearly continuously.

Note that between zero and 1/4 travel of the clipping pot, there is a slight (3dB) increase in the output voltage level from the unit — this is normal.

COMPONENT LISTING

Resistors

R1	47k
R2	220k
R3,12	5k6
R4,5,6,7, 13,14,15,16	27k
R8,10,11	1k
R9	100k

All resistors 5% carbon film 0.25W

VR1	10k log pot
VR2	4k7/5k lin preset

Capacitors

C1	1uF 16V min electro
C2,3,23	1n cer disc
C4,10	0.47uF 35V tant bead
C5	100n cer disc
C6	220uF 16V electro
C7	4n7 mylar
C8	2.2uF 16V min electro
C9,15,21	10uF 16V min electro
C11,12,17,18	100n mylar
C13,19	1n5 poly
C14,20	1n poly or mylar
C16	1uF 16V min tant bead
C22	100uF 16V min electro

Semiconductors

Q1	BC239 or BC238
IC1	SL6270 or equivalent
IC2,3,4	741N or 741CN
IC5	78L05 or 78L08
D1	1N4148
D2	3mm red LED

Kits

Full kits of parts for this project are available from WPO Communications including a drilled tinned printed circuit board at £13.90 inc VAT & post.

PCB is also available at £2.90 Plus 60p Post.

BOOKEND

A NEWCOMER'S GUIDE TO FM SIMPLEX AND REPEATER OPERATION ON TWO METRES

By Antony Askew, G4BPC.
Published by the UK FM Group.

This is really a booklet rather than a book. The 20 A5 pages are "aimed primarily at the newly licensed

This month we look at some books intended for the newcomer to radio and the newly licensed amateur — and at a rather unusual frequency listing.

operator" or at "the dedicated HF band enthusiast whose interest in mobile operation may have drawn him to 2m and FM" and thus covers, in simple terms, the operating techniques of 2m simplex and repeater operation. This may sound fairly obvious

of the repeater by the accessing signal. In the author's description of the scale, the reader becomes usefully aware of the relationship between signal strength and signal-to-noise ratio.

This technique of describing operational procedures and simply indicating the technical reasons

that underlie them is employed generally through the booklet with considerable success — without patronising the reader and with a sense of humour.

Shame about the rather small type but an essential purchase, along with the International VHF FM Guide, for the newcomer to 2m at £1.06 from the RSGB Headquarters at Potters Bar.

WORLD PRESS SERVICES FREQUENCIES

by T P Harrington, W8OMV.
Published by Universal Electronics USA 1983.

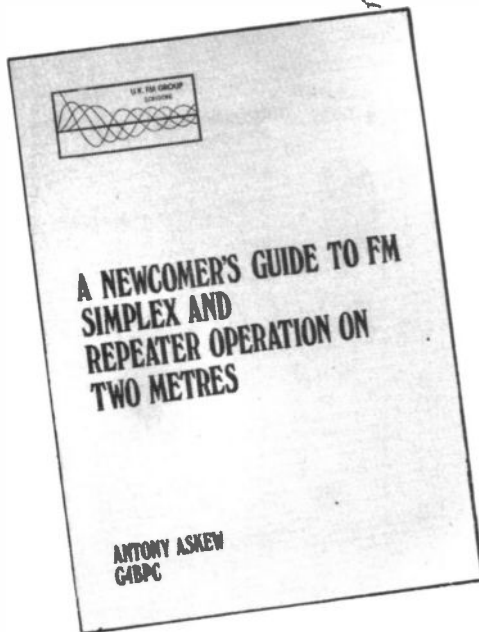
"In today's fast-moving world, the knowledge of world events hours and even days ahead of the regular press, TV and radio holds a great fascination for many shortwave listeners." So begins Mr Harrington's introduction to this novel book. W8OMV has apparently been logging the world news services broadcasts on RTTY for some years now and his listing certainly appears to be a useful source for information on a very wide variety of news services. You can thus get a number of different perspectives(!) on an international news story *before* you see Jan Leeming reading it on the box — and the chance to make some interesting comparisons after.

This is not merely a list of frequencies, times and places. The author begins the book with an explanation of the format of the lists and how they should be read, and then goes on to give some notes about reception, RTTY speed and location of the news services.

The second section goes into the equipment necessary to receive the RTTY signals from a beginners viewpoint — this is essentially a consumer's guide and no constructional details are given. He discusses various antennas, receivers, terminals, monitors, printers, new micro-processor units and suppliers including addresses (the latter are mostly American, I'm afraid). Finally, there is a short article by a somewhat mysterious chap called Eric Kern on "Common Reception Problems" as applied to RTTY ie Multipath reception etc.

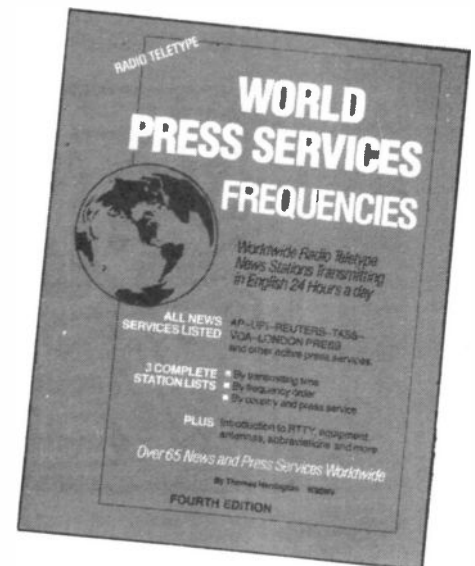
The bulk of the book is made up of the lists themselves; at first, the two main lists appear to be duplicates of each other.

The first listing, starting at 0000 UTC and progressing to 2359, gives a *chronological* listing of world press service transmissions, along with frequency and



stuff, but, as I shall illustrate shortly, the author cleverly relates operational procedures to the technicalities of today's 2m scene.

About five of the booklet's sixteen sections are devoted to repeater operation: an introductory section, the repeater 'K' break, accessing and tonebursts, jamming, input listening and giving signal reports on a repeater. This latter section puts forward a RL scale; that is to say, signal reports based Readability and Limiting or quieting



baud speed. You can listen to the Voice of America from Monrovia at 4am on 15875kHz (at a shift of 425kHz, 100 bauds speed). To hear the alternative version of the day's events, listen to the TASS transmissions at 5.30am on 17570 kHz (425Hz shift, 66 bauds). However, if you have a receiver with limited frequency coverage, or propagation is poor on some parts of the HF spectrum, the second listing comes into its own. In this, the news service transmis-

sions are ordered according to *frequency* — if the propagation to the area you desire to obtain news from seems good on a particular part of the spectrum, you can quickly check the listing to see if a news service transmission is available from there.

The third listing gives an alphabetical listing of the news services extant in each country, *by country*, known to the author, also giving the frequencies used for their transmissions *in English*.

At the end of the book, there is some further detail on RTTY reception, some information on RTTY and TOR 'codes' and a couple of forms — one for any update that readers can provide to the author on the information in the book, and the other for receiving updated world press frequency lists from the author.

The book goes for clarity of presentation and is printed in very large type — whilst this is excellent in principle, a side effect is the book is rather large, perhaps. It is available from Interproduct Ltd., Lynton, Stanley, Perthshire, PH1 4QQ for £5.75 plus 50p postage.

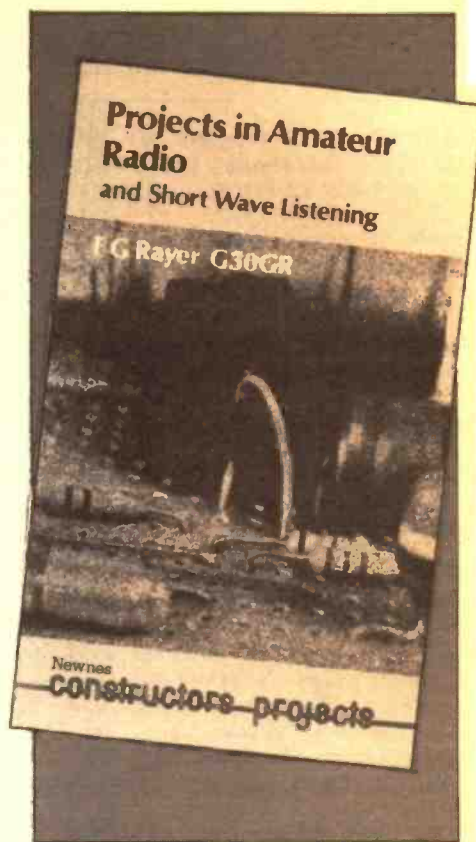
PROJECTS IN AMATEUR RADIO AND SHORT WAVE LISTENING by F G Rayer, G3OGR. Published by Newnes Technical Books, Butterworth Co. Ltd.

This book describes a number of simple constructional projects for reception only. It seems, therefore, quite suitable for someone just starting out in radio. The projects are graded, becoming more complicated as you work through the book.

There are nine projects in all, plus some information on building aerials. The projects include an 'artificial aerial' unit for 1350kHz - 22MHz, a carrier injector, or BFO, to resolve morse and SSB on short-wave BC receivers, a three band TRF receiver, a 144 - 146MHz pre-amplifier and a super-regenerative VHF receiver. The projects are well illustrated and clearly explained throughout. The earlier projects require a minimum of expertise, mainly using matrix board type construction, with a comprehensive components listing being given at the end of each project.

The book costs £3.80 and is

one of a series of books entitled 'Newnes Constructors Projects'.



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73's Dave Gadsden, G4NXV, Advertisement Manager.

Free Readers' ADS!

WANTED RTTY Program for UK101, Telephone Derby 511459 G3LTX QTHR.

WANTED circuit diagram and component listing for CR100. Tel: Huddersfield 23662.

IF you are looking for service information for your radio or television then I may have what you want in my private collection. SAE with requirements and I'll try and help. Maurice Small, 8 Cherry Tree Road, Chinnor, Oxon OX9 4QY.

FREE tape magazine for blind radio amateurs needs help reading articles onto tape in your own home. All materials supplied. Suit housebound amateurs. Contact G4MRB QTI-TNA. 79 Narrow Lane, North Anston, Sheffield S31 7BJ. Tel: (0909) 566301.

WANTED FRG-7700 or R1000 later model, cash waiting. Contact Steve Parry. Telephone: Colwyn Bay 33989 after 6 pm or weekends.

WANTED handbook for W.S.19 Mk3, also connecting plugs, leads, valves, any other accessories, complete station considered. Have for sale or exchange 1155N, 1155A Eddystone 840A, Codar 70A WHV. Pete G4LQZ QTHR. 0235 (Oxon) 34037. Evenings after 6 pm.

URGENTLY require alignment circuits, or anything at all, for TRIO JR60 (U). RX includes FM & 2m converter, built-in To Rx & covers 0.55-30MHz, 142-148MHz. Your price paid or to copy etc. Any costs refunded by return. Mr Parkes, 1 Silkstone View, Platts Common, Barnsley.

WANTED details circ. diags. etc for Sentinal dual gate Mosfet 2m converter. Also to buy any 2m convertor and a 3H choke suitable for KW 2000A PSU. Urgent your price or any costs refunded by return. Mr Parkes, 1 Silkstone View, Platts Common, Barnsley.

INFORMATION please Comark DC milli voltmeter type 120S circuit. Ian G3ROO Dover (0304) 821588.

WANTED frequency lists of VHF and UHF channels called "The listeners secret bible." Please send details and cost to Tom Valentine, 38 Grampian View, Montrose, Angus. Tel: 0674 76503.

WANTED information on Icom, ICB 1050 circuit diagram etc. Contact Stuart Baynes G6OUN. Tel 01-633 0943 evenings.

WANTED Eddystone EC10 MkII must be very good condition - no mods. Telephone John on Coventry (0203) 465328 after 5.30.

WANTED details of FM mod for FT200. G4WJX, 4 Harrington Drive, Parkhall, Weston Coyney, Stoke, Staffs ST3 5ST.

WANTED FC107 dark grey or FC102 high power. Ring Stuart 0642 211685.

CREED 444 Teleprinter. Complete with workshop manual, spare reperforator and printer, paper. Excellent condition: only £40. Contact Alex Reid G6BOP QTHR. Tel 0962 55405 (Buyer collects).

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MICROWAVE modules 2m to 10m transverter MMT 144/28 VGC, £65. Phone Peter G4WCE 061 980 5173.

YAESU FT290R plus Nicads charger and case only £200 complete. Phone Leigh (0942) 608069.

FDK 430 Expander £175, MML 432/50W linear/pre-amp £80, Jaybeam 2m 14 ele long Yagi horizontal 8 ele vertical £20 Jaybeam MBM 48/70cm £20. Phone Ken on Bloxwich 75057 (near Walsall) anytime.

YAESU FT-202R. Signal communication corp R537 air receiver. Harvard 410T CB. IC251E hardly used. No reasonable offer refused Telephone Chris 0525 220017 (Dunstable).

CBM 64 plus C2N cassette, VGC, 8 months old, £175. Or swop ham gear. Commodore PET 2001 series 32K. vgc £130. Or swop for ham gear. Canvey Island 697906 (Bob).

AMSTRAD TS89 stereo tower system. Belt driven record deck, twin-tape deck, remote control as new £160. Breml BRL200W linear, £45 ono. Yaesu YO 100 monitor scope needs slight attention, any offers over £15. Mr N Pugh, 5 Back Lane, Nomansheath, Malpas, Cheshire SY14 8DR.

Hammerlund HQ170a receiver with manual spare set valves. G8KW traps for dipole all vgc £120. Wilson Walton-on-Thames 243606.

Wood And Douglas 70cms 3W ATV Tx £59. Akai colour video camera, 1 year old as

new £220. Power supply £29. 70cms 48 ELE J Beam £20. VIC-20 tapes, QRA, checklog, morse, etc. G8 KOM QTHR. Tel Littlewick Green 2453. Berkshire.

REDIFON base station no mike. Power supply marshall 0-30V 1A two Pye reporters. Offers for any item, buyer collects. 0203 597411. 48 Sherbourne Crescent, Coventry CU5 8LE.

YAESU FT207R, NC3 charger AC adaptor. Helical and ¼ wave whip, external mike speaker. £159 ono. IC 740 internal PSU. 1 year old cost £900. Sell £675 ono. All as new. J. Mullany, 83 Cole Valley Rd., Hall Green, Birmingham, West Midlands.

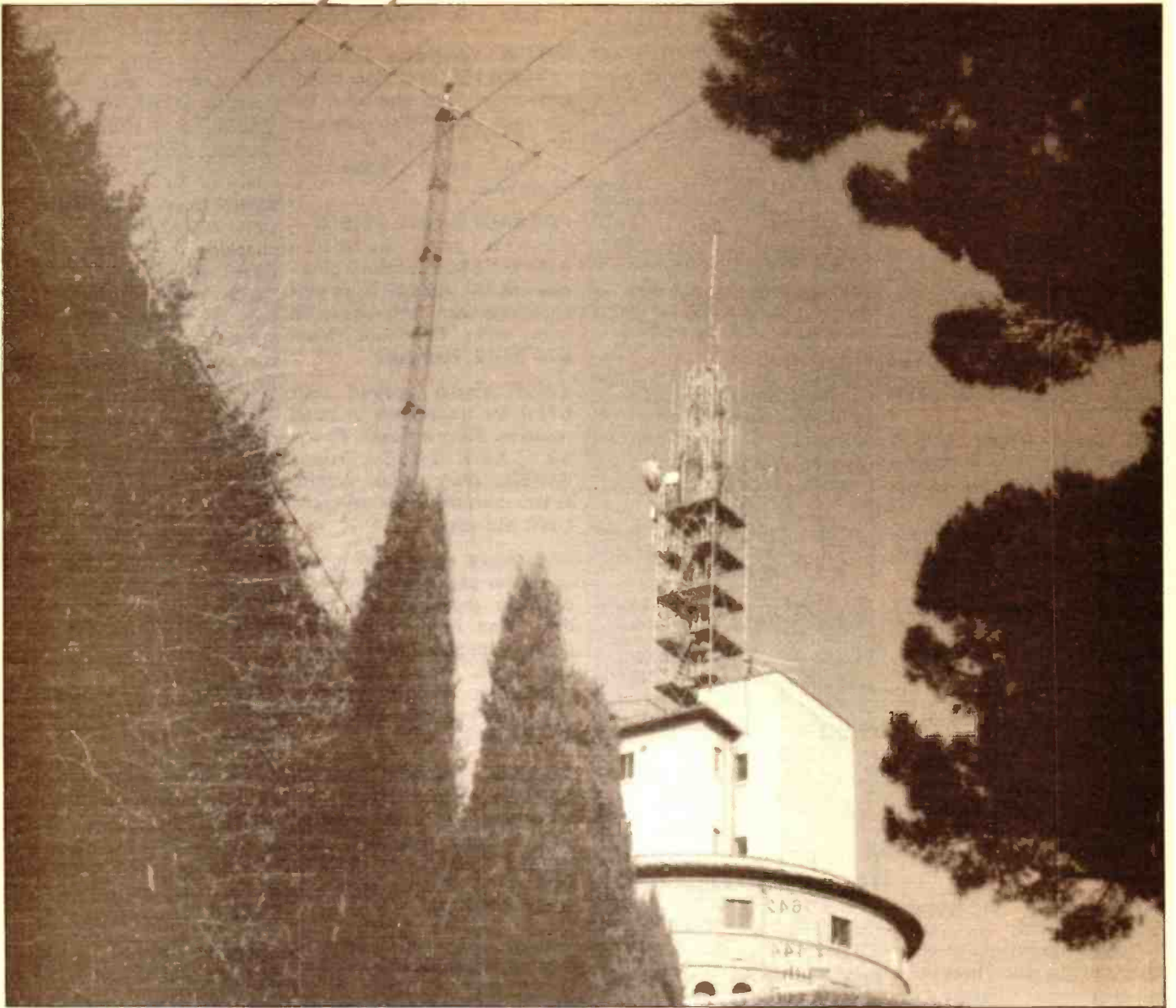
FOR SALE Lafayette 1200FM 120 channel 27MHz transceiver AM, FM, SSB with K40 processor mike. 3 crystal change and retune. Would make nice 10m rig conversion as in HRT August 84, £40 ono or swap working P.F.70. Ring Swansea 862919.

SALE 22ELE 70cms beam £10, HRO 9 coils PSU £50, piles of magazines £5, Boroughs L5000 keyboard £10, Boroughs disc boards £10, 500V PSU variable £20, Car radio cassette fault £5. G1JXI call Allan on work number. 01-748 3627 Ext 77.

ICOM IC R70: (0-30 MHz), all mode communications receiver with FM board fitted, 10 months old, mint condition and Yaesu FRT 7700 ATU, also in mint condition, £475 the lot. Genuine reason for sale. Ring Bob on Telford 52014.

YAESU FRT7700 antenna tuner £32 post paid. Yaesu FF5 low pass filter £8 cost paid. Both complete with instructions. Mr. Moore, 76 High St., Ide, exeter EX2 9RW

TRIO 9R59 general coverage receiver, very good condition



C & S Antennas Ltd of Rochester have recently won an order to install a broadcasting antenna system in The Vatican, Rome (!) which has its own local radio station for religious broadcasts. The antenna structure (RHS) overlooks St Peters, also overlooked (LHS) by a TH6DXX antenna for 20/15/10m, used by Father Ed, HV3SJ, The Vatican's resident radio amateur.

with manual £65 ono. Telephone 01-361 1666 after 7 pm.

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YAESU MD1B8 desk microphone, slight damage, underside of base, working perfect. £25. NiCad charger 13A style FT290-208 etc £5. HF linear abandoned project 4x150A, complete needs sorting. Buyer collects £50

ono. Toni-Tuna PCB unused with paperwork and mains transformer £7. 56-Sling Road Christchurch, Tel: Dorset 482074.

FREE dual auto base charger/power supply NC8, if you purchase both of my synthesised handhelds for £300 or individually FT708R. Ni-Cads charger £160. FT708R Ni-Cads £160 vgc. NC8 charger £40. Boxed with handbooks. G4MBZ Farnborough (0252) 837581 evenings.

YAESU FT790R 70cm Multimode, complete with NiCads and charger as new, bargain £230. tel: 0222 708336.

DAIWA CNW518 all in one antenna tuner 2.5Kw, PEP mint condition. Boxed cost £233, will accept £130. Adonis AM503 base compressor microphone, mint £25. Phone How Caple 205 evenings.

COLLINS: for those who never had one, or who would like one back KWM2A 312B5 516F2. last run military specification equipment, absolutely mint, DX engineering, processing. Please phone for full details and demonstration. By appointment. Dave Smith 0594 36017 Gloucester.

SOTA 100w, 2m linear amplifier. requires 10W input,

13.8v external dc. RF switched or via PTT. £65 ono. Tel G4ASL, QTHR, 01-668 3386.

BBC MOD. B with wordwise and Exmon ROMs plus data cassette, £100 worth of software and Joystick accept. £350 ono, might consider exchange for FT290R plus cash. Phone John Marshalls Cross 879453 (Merseyside).

SONY ICF-2001 digital keypad entry receiver. 150kHz-30MHz with power supply. Nearly new, perfect £90. Tel: Bury St. Edmunds. (0284) 704152 after 5.30pm.

TEST GEAR oscilloscope tele-equipment D83 with dual X/Y plug-ins, delayed timebase, 50MHz. £600 ono. (Cost new circa £2,500). avo TT160 transistor tester £15 ono. All in very good working order and complete with manuals. Tel. Stoneyburn (05016) 231. (Scotland).

YAESU FRG7 general coverage communications receiver 0-30MHz digital frequency display good condition £110. Address 34 North Avenue Abingdon, Oxon OX14 1QW. Tel. Abingdon (0235) 20760.

FOR SALE ICOM ICR70 receiver mint, only 4 months old, boxed £450 ono. Ear Trouble's forces sale. Mr Draper, 60 Enderley Road, Perry Common, Erdington, Birmingham.

FOR SALE — Clearance of DX rigs, DX200 realistic 150kHz-30MHz, 5 band rig, boxed, working order, just overhauled, 18 months old £60 ono. Buyer collects. HAC dx Mark 3 — Phones, transformer. All bands battery eliminator fitted, never assembled or used. £40 ono, buyer collects. Mr. Bartlett, 20 Broadlands Ave, Enfield.

HAMMARLUND HF receiver 150kHz-30MHz, ex-marine VHF valve transmitter-receiver Marconi type with handbook and spar value (QQU03-20), transformer mains to 250-0-250. Call Alex on 0875 20775 after 6pm. (Gorebridge, Midlothian).

COBRA 148 GTL DX SLO LO MID Hi split frequency, also BV131 linear converted professionally AM/FM 10W input 200 out. SSB input 20W in 400 out. Both above equipment, good condition £160. Dave on Lincoln 43642.

YAESU FRG 7700 general coverage receiver with FRT 7700 ATU mint condition £270. Buyer must collect. Phone Wellingborough 677269 after 5.30pm.

YAESU FT77 HF rig with matching PSU, mic brand new £475 ono. Contact E. Davis, Bognor (0243) 862395 after 6.00pm.

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mic cost new £870, immaculate condition, hardly used with 8 month guarantee £650. Reason for sale, need cash for TS930 G4WDZ 4 Buckley Road, Eynesbury, St. Neots, Cambs. Tel: 0480 218032.

COBRA 148 GTL multimode plus 200W Bremi linear £160, Tandy DX100L receiver £40, Tandy PRO53 UHF/VHF 8 channel scanner receiver, requires crystals £25. All items ono. Tel St. Albans 39333.

TRIO R1000 general coverage communication receiver, good condition £175. Also realistic patrolman scanning receiver for VHF, complete with 14 crystals for 2M band. £40. Datong DC/44/28 2M converter. Brand new £35. or £240 for the lot. Phone Martin 01-590 5490.

SELLING YAESU FRG 7700, £295, FRT 7700, £30, also Bearca 20/20 40 channel uncrystallised scanner, £180 and discone 65-520MHz RX antenna £15. Buyer collects, London NW10. Phone: 01-965 6677.

KENWOOD TS 520 SE vgc recently overhauled by Lowe Electronics, £280 ono. Yaesu FT480 R vgc recently overhauled by SMC, £300 ono. Tel E Hocking G4LKV 02372 5637.

HQI Mini beam £65 collins separate Tx-Rx 1.5-12MHz good QRP rig Ex RAF offers, Datong ASP speech processor, £68, Yaesu SP102 Extn speaker, £35 ono. Tel: Brighton 309127.

FOR SALE TR2300 VB2300 MB2 mounting MEX55 boom mic, Azdem AS006 speaker, packer, A145 47U Valor Magmount. Prefer not to split, £200 ono. TR2300 soft carry cape and rubber helical antenna, £6. Denis G8MRU QTHR. Tel: King's Lynn, 674015.

YAESU FT107M as new, with internal PSU and mic. Latest model with all new bands. Exchange for HF mobile rig W.H.Y. G3MXO 021 788 0518 (B'Ham).

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Telephone Dronfield 413413.

SWOP antique Tx/Rx T1154/1155 with two rotary converters 33B and 35A for any type 2m SSB transceiver. Bruce Z21A1/R, PO Box AC135, Ascot, Bulawayo, Zimbabwe.

FOR SALE Jumbo 2 26.515 — 28.315 good condition AM/FM/SSB includes 40 channels UK/FM, CB £215. or part exchange with cash for mobile home radio. Telephone Adam 874 2142. (London).

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BBC MOD B with wordwise and Exmon ROMS data cassette and voltmax joystick, plus software and books, £350 ono, might consider exchange for Yaesu FT290R plus cash. Phone John 0744 819453, (Merseyside).

EXCHANGE Racal Counter CT488, Ar 88 Receiver 3 Pye PF 70.s UHF, 2 Nolton AM transceivers with leather cases, Philips 2 Beam Oscilloscope, 1 PF.1 tran, and 1 PF1 receiver UHF. For Scanning Receiver to cover VHF and UHF.

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TELEQUIPMENT LABORATORY oscilloscope model D53 dual trace 15MHz delayed timebase twin plug-in amplifiers. Plus extra differential plug-in amplifier. Little used with manual immaculate. Will exchange for FT200 transceiver or similar. G4YKT Guisborough, Cleveland 33241.

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KW2000 recently serviced by makers, would exchange for Heathkit HW8. Phone (0594) 43329 after 6 pm.

REALISTIC DX200 receiver 0.4-30MHz. Good condition, boxed with handbook £60 ono, or swap 144MHz linear/preamp suitable FT290R, mobile antenna, or W.H.V. Alan G1IWQ Kings Lynn 829075.

TELEQUIPMENT servscope, new tube excellent condition £25 or exchange TU5B tuning unit. Wanted service manual for Marconi TF995/3 or loan to copy £5 offered. Tel: 26170 (Aldershot).

WELZ CP-5 trapped vertical antenna 80-10M (Now Warc) complete with radials £70, prefer buyer to collect or carriage extra possible exchange for Heathkit HW-8 or Surplus "Spyset" W5-128, WS-122, A-16, B2 or similar G4TMO Tel 0793 783461.

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We are substantial stockists of TRIO/KENWOOD equipment with full stocks of all major sets & accessories and have taken steps to see that our service & spares backup is as good as any dealer. What a pity the excellent ICOM products are often priced above the market. We are saving you some money this month on the 2M Base Station. (Backup on ICOM is very good indeed but we wish they would produce the excellent comprehensive technical manuals a bit sooner!

And now some NEWS

The new FT209R Handy from Yaesu has been around for a month or so by the time you read this. We took the first one home on 20th June (Yes that's how long we wait for the adverts to appear) and had excellent reports through our local GB3DR repeater which is only 3 miles from the shop at Hatfield Peverel.

Soon we expect to have the 70CM version FT709R and the companion to the FT203R for 70cm - Yes you guessed FT703R.

The new Yaesu receiver FRG8800 may be available by the time you read this. Send SAE for details. We hope by the time you read this to have stock of the NEW FT20700 F.M. 2M & 70CM Mobile station. Send us an SAE for details and a quote.

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R70

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R71E

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