

HAM

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DECEMBER 1986 £1.20

RADIO

TODAY



JEWELS AMONGST JUNK

OUR GUIDE TO USED HF GEAR

- REVIEWS- MODIFIED FRG9600 SCANNER ■ HOWES 20M CW QRP TX KIT
- CHEAP ATV - CHOOSING A TRANSMITTER
- TRANSVERTER PROJECT — 2M TO 80M

HAM RADIO CONTENTS

TODAY

VOLUME FOUR NO 12 DECEMBER 1986

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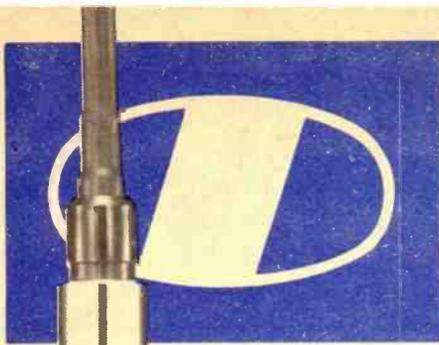
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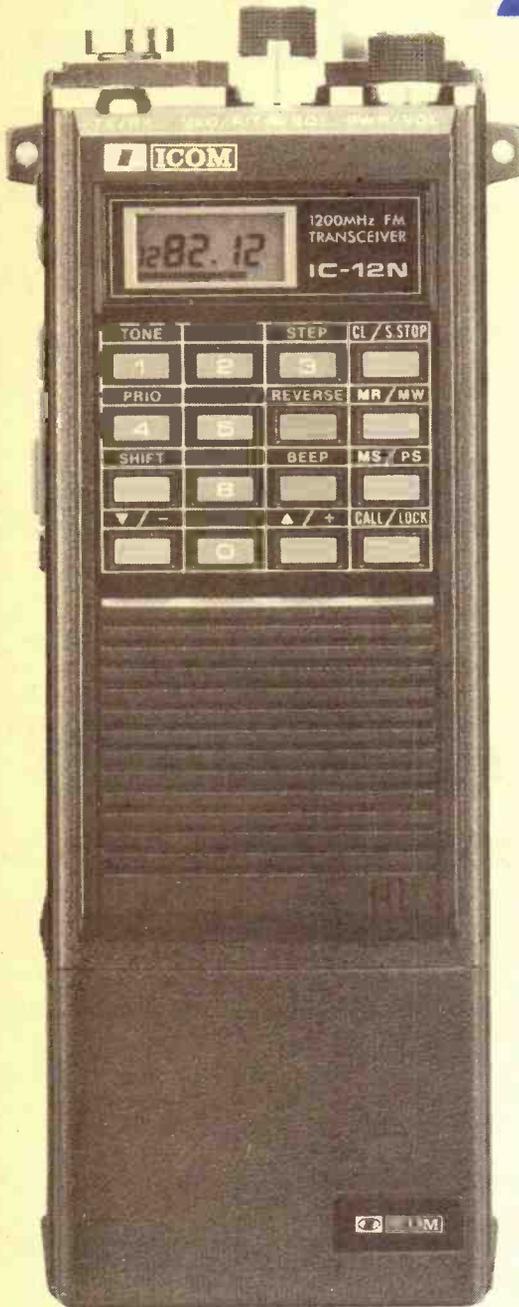
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NEW! IC-12E, 1200MHz FM Handportable.

ICOM technology is on the move again, continuing to explore the Amateur Radio field, as a result ICOM present the IC-12E, 23cm. Amateur band, handheld transceiver.

The IC-12E has a 16 button keypad allowing direct access to frequencies, memories and scanning facilities. Ten memory channels store operating frequency as well as simplex/duplex and duplex offset frequency. A priority function allows another frequency such as a repeater or calling frequency to be monitored for activity. The memory scan function continuously scans all ten memories in sequence whilst a programmed scan searches between two limits.

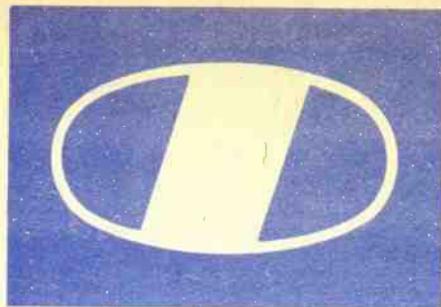
The IC-12E is equipped with a 1750Hz tone generator for initial access to a repeater. Frequency coverage 1260-1299.9875Mhz with 5 frequency step rates. An internal power module provides 1 watt or LOW 100mw. as standard. This handheld is supplied complete with an IC-BP3 nicad battery pack, flexible antenna, A.C. wall charger, belt clip, wrist strap, personal earpiece and full operating instructions.

Also available for the IC-12E and other ICOM Handportables are a large range of optional extras including a variety of rechargeable nicad power packs, dry cell battery pack, desk charger, headset and boom mic, speaker mic, leatherette cases and mobile mounting brackets.

For more information on this handportable and other ICOM Amateur Equipment contact your local ICOM dealer or Thanet Electronics Limited.

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NEW! IC-MICRO TWO, Mini-handportable.

This is the smallest handportable transceiver from ICOM. The MICRO-TWO, 2 metre FM measures only 148 x 61 x 31mm. with BP22 battery pack (not shown here). The MICRO-TWO is a hand-size transceiver which will equally fit most pockets.

On the top panel a clear LCD readout gives frequency and memory channel number. Tuning is made easy using up/down toggle switches to select 1MHz, 100kHz or 12.5kHz steps as well as the 10 memory channels. Full repeater and reverse duplex operation facilities are featured including repeater access tone. An automatic power saving function reduces battery power consumption when in receive mode. Output power is 1 watt or 100 milliwatts (low) with the BP22 nicad pack.

The ICOM MICRO-TWO is the ultimate in 2 metre miniature handheld transceivers, yet despite it's small size the receiver sensitivity and performance has not been compromised. This handy transceiver comes complete with the BP22 nicad pack (not shown here), A.C. wall charger, helical antenna. Most existing ICOM accessories can also be used.

An optional extra, the BC50 desk charger will rapidly charge the BP22 battery in just one hour. Other options include the BP23 long-life, low-power and BP24 medium-life, high-power nicad battery packs. Contact us or your local ICOM dealer for more details on this exciting new product.

Actual Size Photograph.

This shows the non-standard low capacity battery pack. N.B. Standard battery pack is normally the higher capacity BP22 as mentioned in text.



ret ICOM
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Surprisingly long distances can be covered with simple QRP (low power) equipment! Many of our customers have worked over 30 countries in their first couple of weeks on the air with our **CTX80**, 80M CW transmitter. Some have worked most of the USA call areas in the same period! The CTX80 runs up to 5W RF output (adjustable) and comes complete with one crystal. The transmitted "note" is very clean, in fact superior to many expensive transceivers. We also have CW transmitters for 40 and 20 Meters in the form of the **CTX40** and **MTX20**. The MTX20 with its 10W RF output has no trouble in working around the globe.

You can use our transmitters with your existing receiver, or with our **DcRx** Direct Conversion Communications Receiver. This receiver is a good example of how effective simple equipment can be, if it is well designed. Try running a DcRx side by side with the most expensive receiver you can lay your hands on, you will be amazed how well our little set stands up to the comparison! These receivers have also been an introduction to shortwave listening for hundreds of newcomers to the hobby. Add a **CVF** VFO to the DcRx and CTX/MTX and you have the full transceiver facilities of single knob tuning and IRT (clarifier). **HOWES** equipment is great for holiday and portable use, as well as for the fun of QRP operating from home!

	Kit	Assembled PCB
DcRx Direct Conversion Receiver (versions for 160, 80, 40, 30 or 20 Meters)	£15.30	£20.90
CTX80 80M QRP CW Transmitter (up to 5W RF)	£13.40	£19.40
CTX40 40M QRP CW Transmitter (up to 3W RF)	£13.40	£19.40
MTX20 20M QRP CW Transmitter (up to 10W RF)	£21.90	£27.70
CVF VFOs for above TXs (one version per band)	£9.90	£15.90
CTU30 Antenna Tuner for all HF bands up to 30W RF	£24.90	£29.90

Tuning capacitors for the DcRx receiver (except 160M version) are available at £1.50 each, you need two per receiver. One of the same devices can also be used for the CVF.

All the above kits are to build PCB modules. They include a circuit board, full instructions and all board mounted components. For more information on the above, or the rest of our range, simply drop us a line enclosing an SAE. We will send you a copy of our catalogue, and an information sheet on any kit you are particularly interested in.

P&P is 90p per order. Export prices are as above, but add £2.00 per kit for airmail delivery outside Europe. UK delivery is normally within 7 days.

73 from Dave G4KQH, Technical Manager.



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AA	0.50	1.23	1.17	1.11
AA (Super)	0.60	1.35	1.28	1.22
AA*	0.50	1.25	1.19	1.13
1/2A*	0.45	1.40	1.33	1.26
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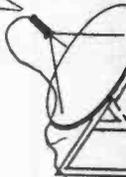
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TRANSMIT CONVERTERS, 2, 4 or 6 M, aerial output with 10 M, IF, 1025mW to 1W drive 500mW output, matches receive converters. Types TC2-10, TC4-10, TC6-10, PCB kit £16.50, PCB built £25.75, Boxed kit £36.50, Boxed built £50.00.

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TRANSCEIVE CONVERTER, single board version of receive & transmit converters, 500mW output, with repeater shift facility. Types TRC2-10, TRC4-10, TRC6-10, PCB kit £39, PCB built and tested £54, Boxed kit £54, Boxed built and tested £83.25.

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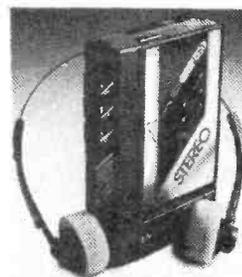
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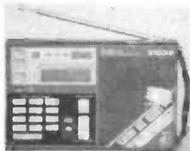
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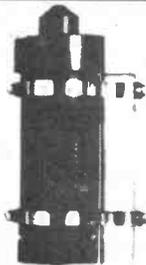
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EVV2000FB	144-146	0.6-0.9	16-18dB	1000KW PEP	£105
EVV200FB	144-146	0.6-0.9	16-18dB	700W PEP	£95
EVV2000GAAS	144-146	0.6-0.8	16-18dB	1KW PEP	£105
EVV200GAAS	144-146	0.6-1	16-18dB	700W PEP	£95
EV2GAAS	144-146	0.6-0.9	15-18dB	100W PEP	£66

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MODEL	FREQUENCY	NOISE	GAIN	PRICE
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IP3 order	+18dBm			
ERPA 1296	1.25-1.30	0.8	17-18dB	£88
ERPA 435	430-440	0.5	15-18dB	£75
ERPA 144	144-146	0.7	16-18dB	£75

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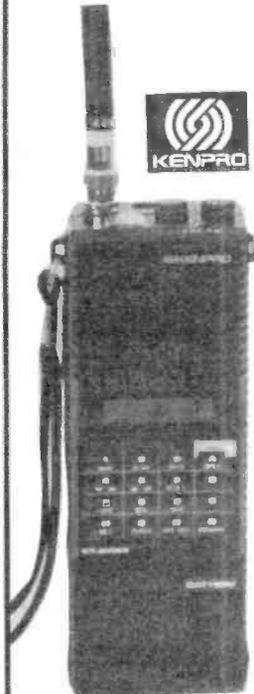
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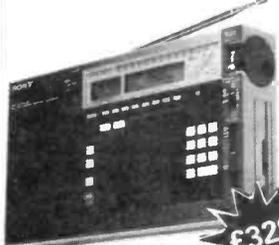
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LETTERS

A CASE OF SLACK MATHS?

Sir, I would be interested to know the basis upon which your correspondent, Mr Slack, makes his observations (Letters, October 1986).

When writing about the percentage of amateurs who are RSGB members this gentleman has fallen into the trap which has claimed various malcontents before him, namely he confuses the long lists in the Callbook with those who are active amateurs on a daily basis. Mr Slack must realise that a very large number of licences are renewed annually even though, for a variety of reasons, the holders are not "on the air". In addition some are interested purely in construction rather than the communication side of the hobby — these people may not think it necessary to join. In a survey carried out a couple of years ago, which presumably is as reliable as G3GFE's estimate, it was considered that over 2/3rds of the active amateurs are Society members.

I too have been a member for well over 40 years and was licensed before him, and my experience has been contrary to his. The RSGB *must* represent *all* amateurs — the non-members are not slow in taking advantage of any new facilities which the Society negotiates! Even allowing for the fact that he has an axe to grind, Mr Slack's figure of 2% or 3% representation is patently ridiculous, which I feel sure, upon reflection, he will agree.

Whilst I agree that all letters to Council members and officials should receive an acknowledgment, one should realise that the former are not full-time salaried staff members but very busy people and of course circumstances alter cases.

Perhaps Mr Slack has been "calling wolf" too often? One should not assume that, because the world does not change overnight after writing a letter, that the matter has been ignored. These things are usually noted and discussed (assuming they merit same), this being as true in other walks of life as it is in amateur radio.

Unfortunately, as in most critical letters, we are not given "chapter and verse" nor any detail. Perhaps Mr

Slack could let us know which aspects of RSGB are not supported by 97 to 98% of the membership (surely this is either a mis-print or paranoia?). Also he could tell us his ideas, suggestions and opinions, together with the help he hoped for. We could then judge for ourselves whether he is being realistic and reasonable, or is this just another letter from someone claiming to speak for the majority?

Mr Ian Abel is also mentioned and Mr Slack may be interested to know that this gentleman re-joined the Society some time ago — one really should ascertain the facts before becoming too critical! Will Mr Slack now have the courage to resign or will he remain a member of RSGB with whatever its faults — like everything else in life it is not perfect.

I suppose a seemingly responsible publication such as yours is duty bound to publish letters covering all shades of opinion, but one cannot help wondering what the writers of some of them hope to accomplish, if anything, or are they just rabble rousers?

Surely the time is approaching when you and your contemporaries will rule that all letters concerning the internal workings of other organisations should be forwarded to *them* for attention, in the same way that no doubt RSGB would pass you a communication referring to, say, your editorial set-up or advertising policy.

Please do not echo the few children of all ages who use 2m and to a lesser extent 80m, to expound their theories and opinions, usually without any past experience or knowledge of the subject in depth. Free speech is fine but when people claim without any sound evidence, that the majority agree, or should agree, with them, it is a mockery of democracy. What these people should do is resign from, or take no part in, anything which they disagree with or are not interested in, provided of course alterations cannot be made from within.

Contrast Mr Slack's outburst with the reasoned letter from Mr Buck in the same issue — thank goodness real "ham spirit" is by no means dead.

G S Moss

WANTED: A LIBERAL SOCIETY

Sir, I must be one of Mr Buck's loony fringe element. After some considerable correspondence with the RSGB (the subject is irrelevant to my present theme) I became aware that, whether that body is directed by Council or the Secretary and General Manager, it is directed to the satisfaction of those who, having been brought up on the reaction condenser and having had the world at their fingertips ever since, are mainly concerned to see that no lesser breed gets its sticky fingers on too much of the action. While I did not consider Council or Mr Evans obliged to have total regard to my particular concerns or views I felt that to deny them any airing in "Radcom" over a period in which room was found for much trivia indicated a slightly paranoid state of mind probably inspired by a fear of my finding support. I am most interested that Mr Slack, among others, has formed a very similar view of the RSGB from, I think, a dissimilar standpoint. This is a serious matter, not least when not only does the Society represent that it speaks for all to DTI, but DTI for convenience goes along with that fiction and attends to none other.

So, what is to be done? It can now be seen that much as the Society wants more subscriptions it will not deign to widen its appeal to that end; it disregards present members; how is it to be shaken? I had long decided that I could dispense with the magazine and QSL Bureau; it has now occurred to me that however essential the Society considers itself to the survival of amateur radio, if it defines that as an entity which excludes me I need not be concerned. If English is understood at all at Lambda House my membership has terminated. One swallow is not a summer, and I ask members with similar feelings to think what other than their combined sanction will change anything.

There is room and need for a liberal amateur radio society and should such arise from whatever existing or new root, it will have my unstinted support (I do not resign lightly); and I submit, the support of



many others now estranged from the hobby.

Alex L Dick, GM6KKP

AN EDUCATIONAL CRITIC?

Sir, I did take the advice of Ham Radio Today and re-joined the RSGB. However I shall not be staying a member. I have found that nothing has changed and given the present apathy of the membership nor will it, for the time being.

The informed quality of the letters sent out by Heather Norman, the General Manager's Personal Assistant, leaves a lot to be desired. She is not even licensed and it shows, yet she writes authoritatively on amateur radio matters. What a farce.

My £18.50 will be better spent on educating people what the society is up to.

Ian Abel, G3ZH1

A personal assistant is only writing on behalf of their employer and so is not required to be qualified.

AMATEUR RADIO vs PARTNERS

Sir, I must agree with KB9XV (Letters, October 1986) as it is a difficult decision whether to 'ham' or go out with the girlfriend on a Saturday night during a worldwide contest! It is important to get the radio before this stage because girlfriends go mad when they realise how many bunches of flowers can be bought for the price of a radio.

M Zatman, G0CNO

DEATH TO ALL TV SETS!

Sir, Ref. the letter from the Director Radio Investigation Service DTI in

October issue. Having served for 14 years as a Radio Interference Investigation Officer with the GPO, I notice the glaring omission of any mention of the real offenders in the EMC, Radio Amateur problem — the domestic TV and radio manufacturers and the importers of Oriental made equipment. Why no mention? For 14 years I noticed that Official policy always leaned toward he who was strongest ie the set manufacturers. No mention of the real offenders in the DTI letter! it seems to me that their leaders' (Mrs Thatcher) usual "get to the bottom of it and put it right" policy (she can be right sometimes) has not yet permeated into this part of the DTI.

However, today I have been uplifted out of my gloom and anger by the arrival of the September issue of RADCOM and the 11 point proposal by the RSGB to tackle the EMC problem. Will everyone even remotely interested in Amateur Radio please read the RSGB proposals and above all, join the RSGB, our only hope at survival. I have enjoyed this hobby as a licensed Amateur for over 40 years and I am still enjoying it!

Neville R Paul, G3AUB

WINDING UP 10UK

Sir, Due to various business and personal changes of circumstances, the organisers of 10UK have been forced to give up any involvement in the now defunct organisation. On investigation, it has been found that an amount of £230.17 remains as a balance of the 10UK funds. Provided that no objections are received by 1st January 1987, it is proposed that the above sum less any expenses (postage etc) will be donated to the RAIBC. If there are any objections, kindly advise G3LWM as soon as possible.

J D Harris, G3LWM

MORE CONTEST KNOCKERS

Sir, I am writing to express my total agreement with the comments of G4WRV (August 1986) regarding contest operation.

I have been a radio enthusiast for many years and hope to take the RAE in the not too distant future, but when I listen on the amateur bands, I sometimes wonder if it is worth bothering. The arrogance of some of the operators is unbelievable and then they have the nerve to belittle and criticise CB operators. Operating standards on illegal 11m SSB is of a far greater standard than is sometimes heard on the amateur bands especially 2m and during contests.

Surely, the whole point of amateur radio is to talk to people whether they are in the next street or the other side of the world. Whether you use 10mW or 400W, SSB, AM, FM, RTTY or whatever to achieve this, the object is surely still to talk with other operators. This does not seem to be the philosophy of the contest operators. They use as much power as they can whether conditions warrant it or not, just as long as they get over the top of other operators. Whether they were on the frequency first seems to be irrelevant. Their entire contact consists of callsign and maybe signal report, they may as well be speaking to the dog next door as they seem to show as much respect.

This is not true of all amateur contest operators, but the few that do occupy the whole band for hours on end using ridiculous power give a very poor impression to newcomers tuning across the band for the first time. This is not amateur radio. Something has to be done so that people not wishing to participate in contests should not be affected by them as whilst I appreciate the challenge involved, it is just not fair on other band users.

C R Walkup

RADIO TODAY

The Verulam Clubs Contest 1986

For those of us who are always bemoaning the lack of activity on Top Band, Saturday 15th November should provide a rare treat. At 22:00GMT the first part of the Verulam Clubs Contest gets off the ground with the Top Band section which runs until midnight of the same day. The main purpose of the contest will be to encourage the use of 160m amongst the amateur fraternity by getting Class B licence holders onto the band using club callsigns, giving them the chance to work what is probably their 'lowest frequency yet' and offering a taste of MF operation. In both this and the second (VHF) section of the contest, SSB, CW and AM (you remember — that's SSB with none of the bits missing!) are the approved modes and scoring is arranged so that SWLs, individuals and club stations are in with a chance of winning. If you are not able to get embroiled in the 160m section there is a second part to the contest specifically intended for 2m operators. This starts on Sunday 23rd November at 09:00GMT and runs through to 13:00GMT the same day. As with the first section, portable, mobile and fixed stations are all welcome to take part.

Certificates will be awarded to the overall top three individual entrants and there will also be awards for the leading club station in both the 2m and 160m sections. There will be a further award for the top SWLer and a certificate will be given to the leading Verulam club contestant. As if that wasn't enough we should also mention that Ham Radio Today advertisers are providing a variety of prizes in addition to the contest awards.

Verulam 'Clubs' Contest 1986 Rules

Date/Time

Section 1: 20:00 — 00:00GMT Saturday 15th November

Section 2: 09:00 — 13:00GMT Sunday 23rd November

Eligible Entrants

The contest is open to all licensed amateurs and short wave listeners. Portable, mobile and fixed stations may take part.

Contacts

Mode SSB, AM or CW

Frequency

Section 1 1900 — 1990 kHz

Section 2 144.150 — 144.400 MHz

Exchange RS(T), Serial Number (commencing 001), Name of your club (or 'none' if not a club member), and 'Club Station' if you are operating a club station.

Scoring 3 points per contact.
A bonus of 5 points for the first member worked from each new club.
A bonus of 25 points for working any station using their Club Callsign.
A bonus of 50 points for working the Verulam Club station G3VER.

NOTE: The valid score for any contact is therefore 3, 8, 28 or 53 points.

Logs: Logs must include GMT, Callsign of station worked RS(T) / serial number sent, RS(T) / serial number received, club name received (or 'none'), bonus claimed (eg 5, 25, 50) and points claimed (eg 3, 8, 28 or 53 points).

Definitions Members of more than one club may claim membership of whichever club they prefer, but must use the same one throughout. Club names exchanged should be brief, eg use 'Rotherham', rather than 'Rotherham and District Amateur Radio and Computing Club'!

Any competing club may nominate one station to represent the club. This station is allowed to call itself the 'Club Station'. Individual members of clubs should not call themselves 'Club Stations' unless they are sure they are entitled to do so. Only 1 club station per club is allowed. Clubs need not be affiliated to the RSGB, but should be *bona fide* Amateur Radio clubs.

Entries On RSGB contest log sheets or a similar format. Entries should include a cover sheet giving the following information; Callsign and station address, entrants address (if different), equipment used and a signed declaration that the rules and spirit of the contest and the terms of the entrant's license were observed.

Entries should be sent to:

Mr G. Wimpenny, G4OHB

30 Faircross Way

St Albans

Herts

Tel: St Albans (0727) 52003

Entries should be postmarked not later than 8th December. Please include an SAE if you would like your result by post.

SWL Entries Scoring will be the same as the transmitting section, with the following differences:

(a) Only stations taking part in the transmitting sections of the contest will count for points.

(b) Logs must include GMT, callsign of station heard, callsign of station being worked, report, serial number and club name sent and points claimed. A particular station may only appear once in the 'station heard' column. Specially endorsed certificates will be awarded to the top three individual entries and to the leading club station in each contest section. There will also be a certificate for the leading Verulam contestant and the leading SWL.

Award

Amongst the prizes for the Verulam Contest will be a 12A PSU and 9 element crossed Yagi for 2 metres (donated by R Withers Communications), an 80m CW QRP TX kit (courtesy C M Howes Communications) and a selection of frequency guides for marine, air-band, ham and short-wave bands supplied by Waters & Stanton Ltd.

BARTG RTTY Awards Book Launched

The British Amateur Radio Teleprinter Groups' Awards Manager, Ted Double, G8CDW has produced a reference manual which lists most of the operating awards run by national societies across Europe and the rest of the world. The requirements for each award are detailed and are frequently accompanied by illustrations of the various certificates and endorsements which may be obtained. The book, priced at £6.75 is available from: Mr P Adams (G6LZB), 464 Whippendell



Road, Watford, Herts WD1 7PT — the price covers postage and packing costs within the UK and Europe.

The Catalogue Season is Upon Us...

The distant rumbling of presses has resulted in the appearance of the latest versions of two old favourites on any home brewers bookshelf, namely the Winter 1986 edi-

tion of the Cirkit catalogue and the 1987 Maplin Electronics Component Buyers Guide. The Cirkit catalogue features a number of new items across their usual range plus a free readers competition for a Hameg 20MHz Oscilloscope and a variety of runner-up prizes too. Maplin on the other hand are offering a free battery condition tester to all catalogue purchasers which can be obtained direct from their mail order address or any of the Maplin stores.

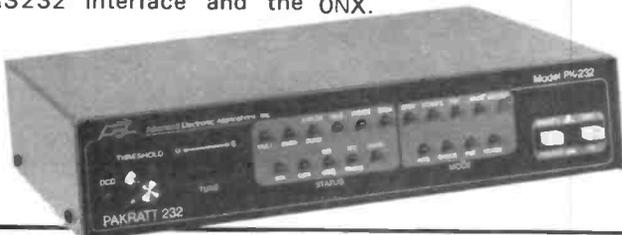
The Cirkit catalogue costs £1.20 in the shops or can be ordered direct from: Cirkit Distribution, Park Lane, Broxbourne, Herts EN10 7NQ. Maplin's catalogue costs £1.50 in the shops but is £1.90 if you send off for it. Maplin's address is: Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 8LR.



New Intelligent Terminal Unit from ICS

ICS Electronics has launched the new PK-232 terminal unit which is capable of packet, AMTOR, RTTY, CW and ASCII transceive operation in combination with any computer which has a serial RS232 interface and the

appropriate ASCII terminal emulator software. The unit is made by AEA Inc of Seattle and is designed in such a way that changes of mode etc can be made from the computer keyboard itself. The PK-232 is priced at £263.00 (plus £3.50 p&p) and is available from: ICS Electronics Ltd, PO Box 2, Arundel, W Sussex BN18 0NX.



More Repeater News...

The RSGB Repeater Management Group has informed us that a number of repeater channel changes are currently being considered by the DTI. These are:
 GB3HO (Horsham) to move from RB14 to RB1
 GB3HU (Hull) to move from RB10 to RB3
 GB3NH (Northampton) to move from RB14 to RB3
 GB3NM (Nottingham) to move from RB6 to RB8*
 GB3NX (Crawley) to move from RB2 to RB8*
 GB3TH (Tamworth) to move from RB13 to RB15
 Those repeaters whose details are followed by an asterisk will not move prior to 1st January 1987.

Site changes are also currently being considered by the DTI for: GB3's HO, KB (Biggin), KN (Maidstone), LN (North London), WS (Horsham), DT (Dorset), VR (Worthing), VS (Bridgewater) and PD (Peterhead). VHF licence and site change approvals have been given for the following repeaters:
 GB3NG R1 Licensed

GB3SA R3 Licensed
 GB3EL R0 Site change
 GB3SR R7 Site change.

Packet repeater plans have been submitted for the following repeaters. The DTI has been asked to approve both 144.650 and 145.275MHz allocations so that changes can be made more quickly in the future.

GB3AP Dudley; GB3BP Bristol; GB3DB Honiton; GB3DP Weymouth; GB3CD Crewe; GB3EP Exeter; GB3HP Winchester; GB3HQ Potters Bar; GB3JP St Helier; GB3KP Kingston-upon-Thames; GB3NP Norwich; GB3UP Guildford; GB3XP New Malden; GB3YP Harrogate.

These repeaters will constitute a packet experiment lasting until the end of 1987, at which time the use of alternative bands will be considered.

HF Repeaters

Proposals are being submitted to the DTI for experimental 10 metre repeaters. The experiment will last for 12 months with a final cut off date of no later than 31st December 1988. All repeaters will use 29.580/29.680MHz allocations.

GB3CC Cannock
 GB3EY Emley Moor
 GB3HF Daventry



New Multi-band Radio Launched in UK

The Pan Crusader-X is a 12 band AM/FM and SSB receiver covering LW/MW, with four short-wave bands, five VHF bands and UHF coverage. FM only is available on VHF and UHF, with the exception of VHF airband which is AM (yes aircraft are still on AM!). Shortwave is covered with AM and SSB and all bands (except UHF) make use of a digital frequency readout. The usual VHF, Medium and Long wave broadcast bands are also covered. Priced at £198 further details are available from: Dave Taylor, 8 Emmerson Street, Crook, County Durham.



More Scanners from Tandy

Three new scanners have been launched by Tandy UK in their (free) 1986/87 catalogue. The handheld PRO-32 covers 68-88, 108-136, 138-174 and 380-512MHz, sports an LCD frequency and channel display and offers up to 200 memories with lock-out and scanning between ranges for £239.95. If you don't need a handheld scanner there is a physically larger 'base station' version called the PRO-2021, the coverage and specifications are the same but the price is only £199.95.

Where Credit's Due

It's nice to be appreciated: in the product announcement for their Ibsonscan II slow-scan transceiver system, Ibsonmain pay tribute to the pioneering work carried out by radio amateurs on SSTV. Not that the new system they're marketing is intended for the amateur market, though — the use they anticipate seems to be mainly security, with the relaying of pictures of shop interiors over telephone lines. They also see applications in the remote direction of, say, hospital operations or bomb defusions, images being passed to 'experts' via slow scan TV links over phone lines.

If this sounds the sort of thing you need, contact Ibsonmain Ltd, 34 Rockingham Road, Uxbridge, Middlesex UB8 2TZ (tel 0895 57971).

RSGB HF Convention

A dull and rather dreary start gave way to a sunny and pleasant afternoon at the RSGB's HF Convention held just outside Oxford at the Belfry Hotel on 28th September. Outside there was the usual car boot sale whilst inside a day of lectures running from 10:30 through till 17:30 covered HF antennas, HF receiver design and DX slide shows.

The RSGB's hour-long question and answer session was primarily devoted to members' concerns regarding the recent changes to the organisation of the Radio Investigation Service and DTI announcements concerning variations being made to Ham licences. From the floor, D Whittaker (G4ZER) referred to certain stations who had 28 day bans imposed upon them and there was concern regard-

ing the advice given to the general public on a recent 'Jimmy Young Show' regarding suspected Ham-derived TVI. Despite a suggestion that David Evans, the RSGB's General Manager, should counter the adverse publicity by appearing on the 'Wogan' show(!), the discussion moved on to licensing revisions in the shape of third-party traffic and the CEPT 'Euro-licence'.

David Evans stated the position at government level was that agreement had been reached whereby "... amateurs can visit other countries without reference to the host country..." and whilst some agreements were being unilaterally applied "... to some extent, the (UK) government is dragging its feet..." so arrangements were not yet in force. There was mention made of the government's

reluctance to implement the CEPT system prior to the UK licence revision and Julian Gannaway (Licensing Committee) said that the RSGB was "... looking to simplify log-keeping, especially for fixed stations..."

In relation to the actual style of the document itself, David Evans said that they "... would prefer the American card system..." instead of the rather unwieldy paper document we have at present. N Roberts (G4IJF) suggested that the DTI be encouraged to make the card tri-lingual, given that we are now a part of Europe.

Overall a very pleasant day with none of the 'blood and guts in the aisles' which recent correspondence concerning the RSGB would have suggested!

(G4IRQ, Asst Ed)



L to R: J Gannaway(G3YGF) — Licensing, D Evans(G3OUF) — General Manager, P Chadwick(G3RZP) — Tech & Publications, J Greenwell(G3AEZ) — EMC, J Kay(G3AAE) — Chairman, M Atherton(G3ZAY) — HF Committee, R Glashier(G6LX) — HF Contests, R Flavell(G3LTP) — Propagation Studies.



Venue for the RSGB HF Convention — the Belfry Hotel, Oxford.

New Yaesu Rigs

Yaesu Musen have launched a series of new rigs, namely the FT727 2m & 70cms handheld, the FT767 100W all band HF rig with integral PSU and the FT290 MkII. It is interesting to note that the new FT290 is not just a simple revamp of the earlier model but employs totally different PCBs, surface mounted components and an external battery pack. With the battery pack fitted, the dimensions of the rig are 150(W) x 57(H) x 194(D) — the pack can be replaced with the optional 25W PA which is the same size as the battery pack.



The new £250 Yaesu FT23 handie, 2 to 5W (depending on battery pack option). Die-cast case and rain-proof construction.



Yaesu photos courtesy of Amateur Electronics

Three Counties Award

A new award is being offered by Three Counties Amateur Radio Club to both licenced amateurs and short wave listeners alike.

The award can be gained at one or both of two levels: HF for contacts on frequencies below 144MHz, and VHF/UHF for contacts above 144MHz. While all contacts must be made from the main address of the applicant, any band or mode (except via repeaters) will be accepted, and the award will be endorsed for any single band and/or mode if appropriate and requested.

For the basic award work or hear 10 stations in Surrey, 10 in West Sussex, 10 in Hampshire plus two on the Isle of Wight, the county borders being as defined on the Ordnance Survey map. In addition there are three upgrades available to the basic award,

represented by County Council coats of arms in colour. These may be gained by working or hearing 10 additional Surrey stations for the Surrey upgrade, additional Hampshire stations plus two more from the Isle of Wight for the Hampshire upgrade. Stations may not be duplicated.

Applications for the basic award or its upgrades should be accompanied by a full log extract, countersigned by two currently licenced amateurs and forwarded to: TCARC Awards Manager, c/o D. Hughes, (G4PDR), 3, Clandon Court, Farnborough, Hants. The basic award costs to UK applicants is £1.00 (payable to the Three Counties Amateur Radio Club), to non-UK applicants 4IRCs, while upgrades require an SAE for UK applicants and an addressed envelope plus 1 IRC for non-UK applicants. All contacts after 1st December, 1985 are valid and further details may be obtained from the Awards Manager.

Joined AMRAC Yet?

The Amateur Radio And Computer club was founded in April 1985 with the aim of encouraging the use of computer technology in Amateur Radio. Since that time the club has grown rapidly and now has members throughout the U.K as well as in Europe and the Middle East.

The club produces a professionally printed bi-monthly newsletter of some 40 pages, as well as a 'hot news sheet' in intervening months. The magazine covers all aspects of computer communications including Packet Radio, ASCII, AMTOR and RTTY. All popular makes of computer are catered for. In addition the club has arranged special members discounts with selected companies, as well as importing Packet Radio TNCs at



advantageous prices.

Membership is £5 per annum and further details may be obtained from the secretary: Phil Bridges, G6DLJ, 9 Hollydene Villas, Southampton Road, HYTE, Hants, SO4 5HU, or on Prestel mailbox 703847754.

Metal Supplies

Express Alloys Ltd, of 24a Southwall Road Industrial Estate, Southwall Road, Deal, Kent can supply small quantities

by post of their range of non-ferrous metals, stainless steel, engineering plastics and fasteners. Send them an SAE for a price list if any of the above might be of interest!

LATE NEWS

OOPS! Sorry, SMC....

In the November edition, we spelt the name of Yaesu's founder, Mr Hasagawa, wrongly. Our apologies to Mr Hasagawa (the fact that we spelt it Shigura is something only the editor and his creative spelling consultant can explain adequately....).

Rumour Control Reports

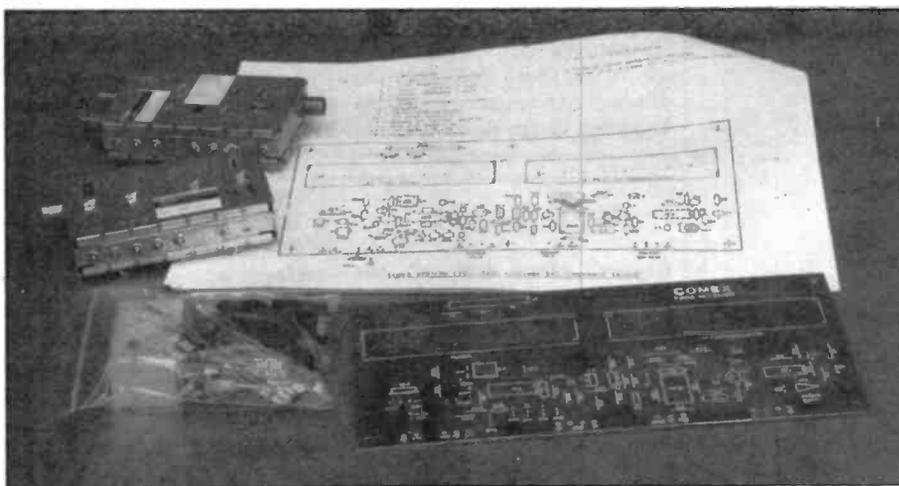
Up in the dales around Matlock, our usually reliable sources report that Lowe Electronics are working on a new British HF receiver, due to be launched onto the world early in the new year. Covering 30 kHz to 30 MHz, the unit is said to be able to go where the Japanese designs frequently cannot go, ie into exotic DX stations between high-power broadcast stations. The HRT review team will be cleaning its test-probes in anticipation.

C M Howes Communications

Another piece of creative typesetting occurred in the ad for the above company in our November issue, and many of the prices in the ad were wrong. To set the record straight they should have been as follows: CTX80 £13.40; CTX40 £13.40; MTX20 £21.90; CVF40/CVF80 £9.90; HC220 £52.50; HC280 £52.50; TRF3 £14.50. These prices are all for kit form (ready made prices available on request from Howes Communications on 0732- 823129).

AMATEUR TELEVISION

In this Part of his ATV series, Chris Lorek, G4HCL, shows how to improve receiver performance and reviews the options for TV transmitter construction.



The Comex receiver kit

Last month I introduced the first of a pair of modules from Astec Components Ltd, the AT 1020 Tuner head which downconverts 23cm signals to a fixed IF of 612MHz. As stated, this is fine as a low cost introduction for local signals, however if you want good quality and better DX capability, a purpose-designed FM demodulator will offer you a significant advantage.

The Astec AT 3010 IF/Demodulator

This is the same size as the AT 1020, operates from the same +18V rail, and plugs directly into the 1020, what could be easier? The same minute construction techniques are used internally, with chip components and a liberal sprinkling of trapezoidal capacitors for good low-inductance decoupling. The use of a module such as this should remove that dreaded 'why doesn't it work' feeling from first-time 'build it all from scratch' constructors.

For the technical boffins amongst us, the block diagram of the inner workings is shown in Fig. 1. The 612MHz input signal passes through a switchable narrow-band filter with a bandwidth of approximately ± 10 MHz to the -6 dB points and

into two 3SK124 amplifier stages. A SAW (Surface Acoustic Wave) filter follows, which defines the ultimate selectivity limits of ± 13 MHz with steep slopes, then into an IF demodulator IC to provide baseband output.

A relative signal strength output voltage line is provided at pin 3 which normally rests at around 17V, decreasing to 1V during strong signal reception. A further useful output line is at pin 4, which is designated 'signal sense'. Here a sharp peak in voltage occurs, going from the 0.4V no-signal level up to approximately 2.2V when a signal is correctly tuned in.

The output level is around 50mV per MHz of signal deviation, so with, say 5MHz deviation which is commonly used on 23cm you can expect 250mV p/p output. You may sometimes be able to get away with applying this directly to the 1V p/p composite video input of a monitor and turning the contrast control up to receive an acceptable picture, but for the perfectionist read on...

Receiver Kit

Comex Systems (who are the

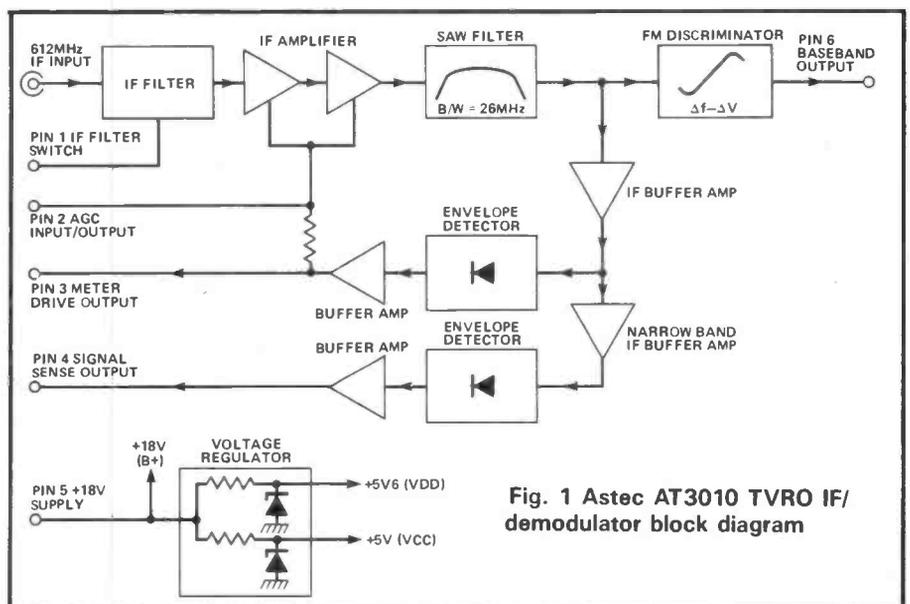
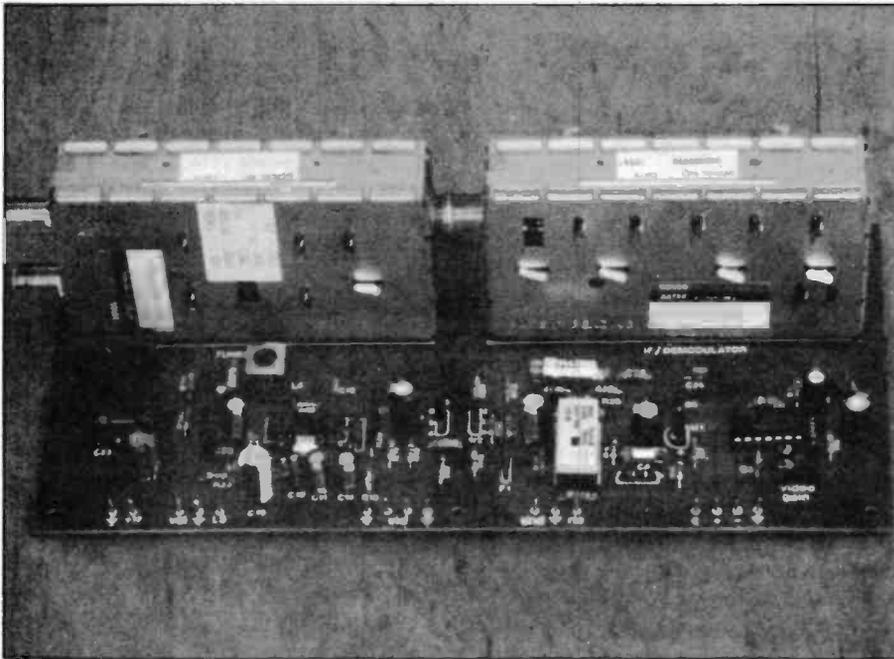


Fig. 1 Astec AT3010 TVRO IF/demodulator block diagram



The Comex receiver, built up

Astec distributors in this country) also market the PCB and complete kits of parts to make a 23cm receiver with video processing plus sound demodulation and amplification circuitry on-board. This in my opinion is by far the easiest way for a beginner to set themselves up with a receiver that requires the minimum of alignment and will hopefully work first time. No test equipment is required, just the ability to identify component types and to solder reasonably. The basic kit, sold as a TVRO receiver, operates from an 18V supply for the modules together with a 12V supply for the baseband circuitry, these supplies must be provided by the builder although an extra PSU kit is available. The block diagram of the unit is shown in Fig. 2.

From a 23cm input signal, a 75 ohm 1V p/p baseband video output is available with switchable CCIR de-emphasis and demodulated 6MHz intercarrier sound, amplified to drive a 15 ohm speaker. You may of course feed the output to a small ready built

UHF modulator to couple to the aerial connection of a standard TV receiver. For those preferring a ready-built receiver, Comex Systems can provide built-up boards and 'DC to Light' also produce a boxed receiver based on these modules with the addition of a tunable sound IF and a video line clamp.

Construction

The review kit arrived in a large padded envelope together with a reprint of the CQ-TV article it was based on, a component list and a layout diagram. The ability to identify resistor colour codes was required, but apart from that I believe that a total novice would have no difficulty in building it up. All components were well spaced out and fitted easily into their positions and the PCB itself was also silk-screened with component placings. Note that three fixed inductors are used, which look just like 0.5W resistors so don't get caught out!

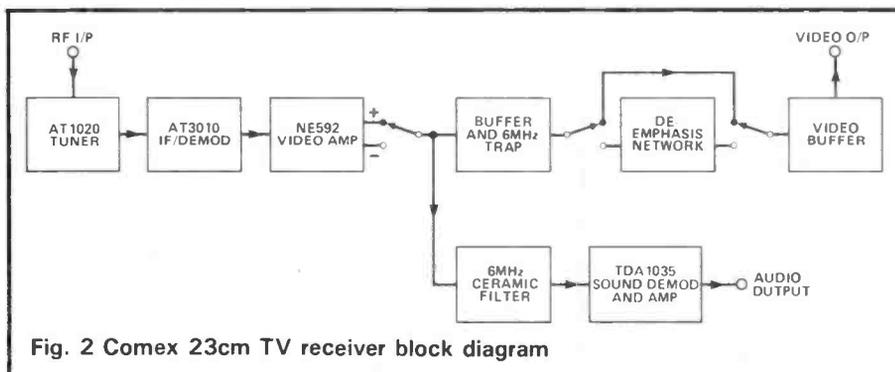


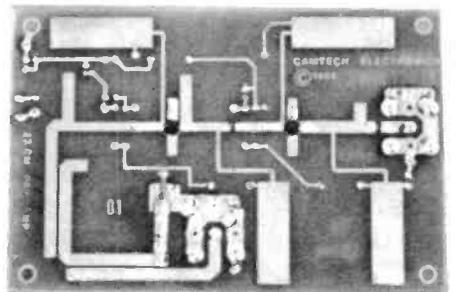
Fig. 2 Comex 23cm TV receiver block diagram

It took me about one hour to build the unit up, following a careful read of the instructions and circuit description. Apart from the volume control there are only two adjustments to be made, these being the video gain potentiometer and the sound demodulator coil. The instructions recommend finding an RF signal and adjusting the preset potentiometer for 1V p/p as displayed on an oscilloscope. However, due to the variation in deviations used by 23cm ATV stations, I would suggest a front panel mounted 4k7 potentiometer be used instead so that the output level can be adjusted when in use to obtain a satisfactory picture. There are no instructions on alignment of the sound IF coil, but if you adjust this (using a non-metallic tool) for maximum noise from the speaker with no input signal, you will then be virtually spot on.

A 5V regulator circuit is fitted to the receiver board but if you do not wish to use the prescaler output for an add-on synthesiser or whatever you may leave out the 7805 regulator and save on your power supply current requirement.

In Use

After connecting up the required tuning potentiometer, links, input/output and power leads, I'm pleased to say that it did indeed work first time! The F-connector supplied



The Camtech 23cm preamp

for the RF input was of a type that required the coax inner conductor to be used as a centre pin, which initially caused a little confusion on my part. Reception of 23cm video was excellent and good quality was achieved with moderately weak off-air signals, there being very little difference between perfect quality full-limiting video and no signal at all, showing a fast limiting response. Field synchronisation, that is a locked picture not rolling up and

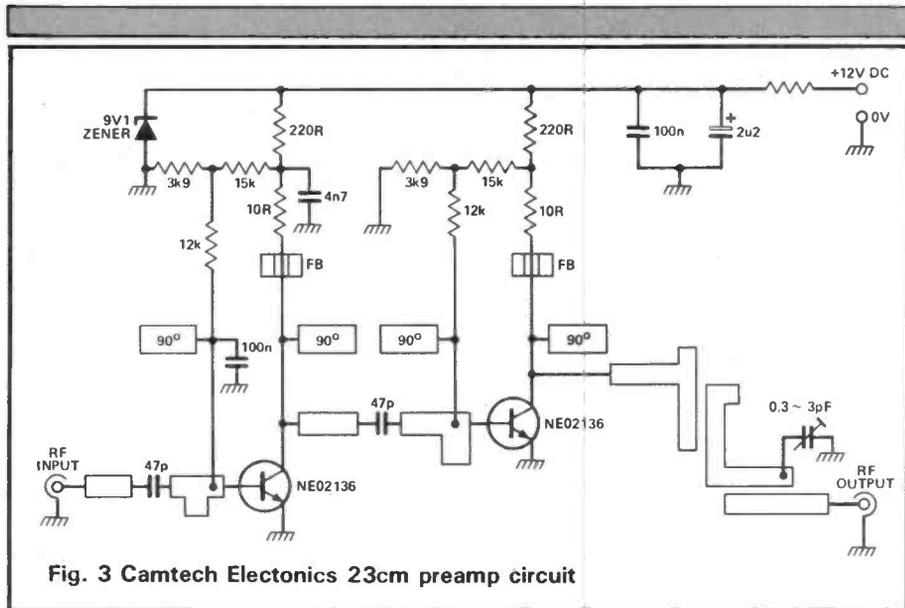


Fig. 3 Camtech Electronics 23cm preamp circuit

down, was achieved right on the threshold of being able to detect any signal at all on the video monitor.

I did find that the sound IF circuitry could pick up HF broadcast signals if I did not mount the receiver in a metal box, this was caused by the input track to the TDA1035 acting as a small aerial. When no sound signal was received the generated white noise swamped this, but do bear this in mind if you find your contact appears to have the BBC World Service on quietly in the background!

When tested on a signal generator running 5MHz deviation of a test card signal input with the receiver IF filter switched in, a P3 signal (a watchable picture) was present with a -87dBm signal level. Around 2dB degradation occurred on removing the IF input filter but this allowed signals with a higher deviation to be received satisfactorily without distortion.

Preamplifiers

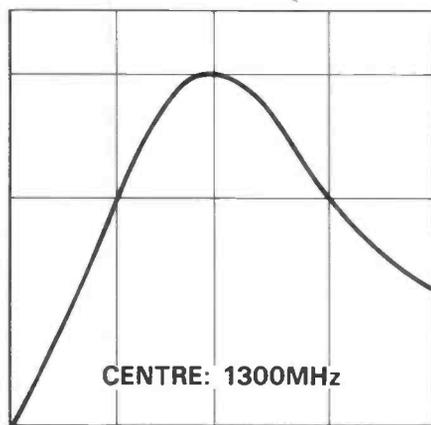
The Astec AT 1020 tuner (reviewed last month) was not designed to operate as a stand-alone off-air receiver, but as the second stage in a receiving system, hence the sensitivity is not exceptionally good. A useful improvement may be obtained by the use of a single or preferably dual stage preamplifier.

Several types of preamps are available ready-built or in kit form. Microwave Modules produce a ready boxed version and LMW Electronics sell a selection of kits. In searching for a low-cost high performance unit for this series, a firm local to myself who are involved in 1.69GHz

weather satellite receiver equipment had their arm twisted and came up with a custom designed two stage preamplifier to complement the Astec tuner for 23cm operation.

Camtech Electronics Preamp

The basic requirements were low cost, a repeatable design, a bandwidth sufficient for 23cm ATV but not extending beyond our band limits and of course providing a good sensitivity when used with the ATV receiver. Fig. 3 shows the circuit diagram, a pair of cascaded NE02136 transistors are used in a stripline design. This minimises adjustments required by the constructor, the only trimmer being a 0.3-3pF trimmer on the output bandpass filter. The board allows



Camtech Electronics preamp wideband response
Horizontal scale - 100MHz per div
Vertical scale - 10dB per div

coax lead input/output connections or alternatively PCB mounting BNC or Belling-Lee connectors may optionally be fitted.

Construction

Providing care is taken in soldering, no problems should be met apart from two tiny chip capacitors which are top soldered, a pair of tweezers come in useful here! A low inductance ground plane at the transistor positions is achieved by the top and bottom soldering of a thin strip of copper tape connecting the two sides of the board, naturally this must be done before fitting the transistors. It is important to follow the supplied instructions most carefully, especially the requirement to keep component lead lengths to a minimum, even two or three millimetres of excess resistor lead length may present quite an impedance at 23cm frequencies.

On connecting the unit, again I was pleased to find it worked perfectly first time. The only adjustment to be made was tuning of the rear mounted multi-turn capacitor for maximum signal strength. This was not very critical and because it is connected in line with the output bandpass filter, the maximum S-meter reading coincides with the best sensitivity. When tested with the Comex receiver a weak signal that was just recognisable was brought right up to P4 quality, ie just a trace of noise present on the video.

BNC connectors were fitted to the board, and I then subjected the preamplifier to laboratory tests. The gain was just under 14dB centred on 1296MHz, with the -3dB points occurring at a bandwidth of 85MHz. Rejection of out-of-band signals was quite good, 2m and 70cm bands for instance being suppressed by at least 50dB. The 1dB compression point was found to occur at +5dBm output, which is perfectly adequate for 23cm operation. When connected to the ATV receiver, the overall sensitivity improved by 5.5dB.

In use you may fit it next to the receiver or, more efficiently, at the aerial mounting point with 12V DC fed to it. This would give a better overall system receive sensitivity but would require extra wiring and changeover switching to be used. A forthcoming HRT constructional

article describing a complementary 23cm FM voice receiver from Camtech will expand on this.

Transmitters

There have been several 23cm ATV transmitter designs published and if you fancy building one from scratch then the BATC's publication 'The Best of CQ-TV' will give you a few ideas. I must stress that these are certainly *not* for the beginner. Apart from limitations in PCB and component tolerances, few



The DC 1G3 FMS transmitter, external view

amateurs will have the required test equipment such as a 23cm 50ohm power meter and frequency counter, to get the gear operational correctly as a first time project. Yes, I know from experience as well!

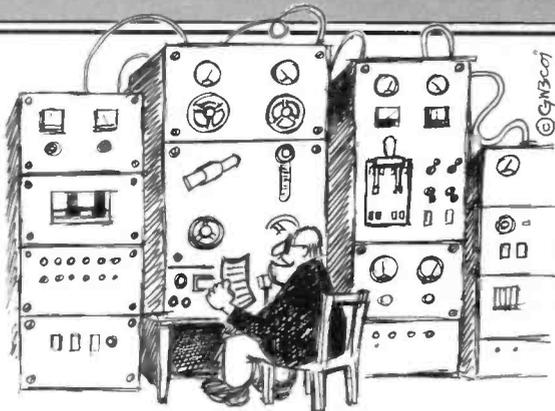
Once you have a simple transmitter operational however, it is easier to expand on this by comparison and with this in mind a further search was made for a low-cost starter transmitter for 23cm. The suppliers of the receiver kit, Comex, have a 1W transmitter available in a smart case and both they and LMW Electronics can supply power amplifiers to suit.

'DC to Light' produce an equally smart-looking four channel transmitter with 2.5W or 6W outputs and they also produce an interesting 'basic' 100mW transmitter. The latter appeared ideal and within a few days a sample appeared at my QTH for evaluation.

The DC 24FMS Transmitter

This is a small, single board PLL (Phase Locked Loop) controlled transmitter which is housed in a die-cast box; the only connectors being RF output, video input, and tags for the 12V supply. The internally generated RF power level is around 250-300mW but this is attenuated immediately before the output connector using a resistor network

"... would try amateur TV but the gear is too bulky..."



to give a guaranteed 100mW for accurately driving amplifiers.

A VCO (Voltage Controlled Oscillator) generates a low level 23cm signal and applied baseband video is fed to a varicap to obtain FM. A 1.8GHz single IC synthesiser is used to lock the output to a direct x256 multiple of an internal crystal, which of course gives excellent stability.

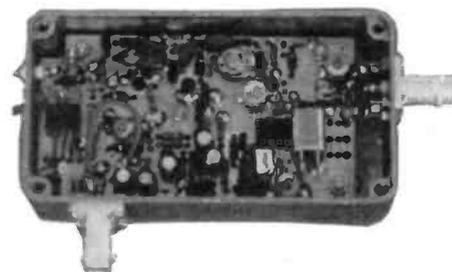
I believe this unit is a very useful starter on the band because if you wish to run it 'barefoot' you can remove the output attenuator to obtain higher power and it will also make a good portable transmitter for budding roving reporters at local events. There is no built-in intercarrier sound facility, ie no microphone input, although this is available as an option together with multi-channel switching. Note however that cameras similar to the VK4901 (which we will be looking at in part four) already generate a superimposed 6MHz sound carrier onto the video.

Results Achieved

Applying 1V p/p video directly to the input connection gave around 4.5MHz output deviation at 1255MHz. If a 470 ohm preset potentiometer was inserted between the input socket and the board connection it would provide a simple (if crude) deviation control. The output was fed to a spectrum analyser to test for any spurious outputs. I would have expected to find signals at ± 4.9 MHz which is the internal reference crystal frequency, but I was pleasantly surprised to find the output very clean. Apart from harmonics which were reasonably well down in level, the only other spurious was around 105MHz at -45 dBc. In practice this would be reduced by aerial

resonance as well as any successive amplifier selectivity.

On the air, using a small portable aerial and a portable video source, good signals were received for over half a mile from base so who needs a portable video recorder! When used as a fixed station transmitter ten or twenty miles range could be easily achieved.



The DC 1G3 FMS transmitter, internal view

Suppliers

The Astec modules, receiver motherboard and complete kits of parts are available from Comex Systems Ltd, Comet House, Unit 4, Bath Lane, Leicester LE3 5BF (0533 25084).

Members of the BATC may obtain receiver PCBs at low cost from the Membership Services Dept.

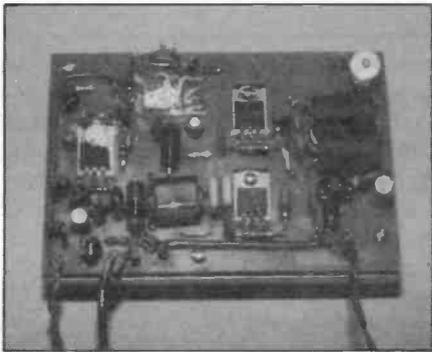
The 23cm TV preamp kits are available from Camtech Electronics, 8 Wortham Place, Haverhill, Suffolk CB9 0HP (0440 62779). Kit price £22.50 + £1.00 p/p.

The DC 24FMS transmitter is available from DC to Light, 15 Brusley Way, Bradwell, Newcastle-Under-Lyme, Staffs ST5 8JQ (0782 639406).

Next month — generating video using a camera, a computer and a dedicated test card generator.

OMEGA

ANOTHER QRP PA



I built 'Omega' with many modifications mainly to accommodate the components on hand and must congratulate Tony, G3WPO, and Frank, G4JST, on an excellent design. However I met one major snag — I was unable to produce an entirely stable QRP PA.

Having failed with my own PCB, I bought one from WPO and rebuilt using fresh components to the exact design. Almost identical results were obtained. Apparently working when drive was applied, the unit oscillated at VHF when the drive was removed. Various modifications including ferrite beads on the VMOS device leads and gate stopper resistors ap-

Remember Project Omega the all mode transceiver and one of our most talked about projects? John Case, GW4HWR, describes some of the troubles that he encountered with the QRP PA and offers an alternative unit.

peared to stabilise it but when used to drive the QRO PA caused the BUX87 to fail as maximum power was approached. Spectrum analysis showed a high level of 45-55MHz to be present. This, I think, is due to the use of inductive coupling. This, with the input capacitance of the VN66AF and the high gain available at VHF, produces an inherent oscillator.

After much work, I decided to cut my losses and to try a different circuit and finally settled for the one shown in Fig. 1. This uses a conventional driver and push-pull pair employing bi-polar devices, with the low level amplifier almost the same as in the original QRP PA. The final unit is very stable, because of the heavy negative feedback and devices whose gain falls rapidly above 30MHz. After a screen had

been fitted, the unit was installed in the space between the LPF and the QRO PA with no feedback problems at any output level. Considerable thermal protection must be provided from the PA accessory circuit.

Construction

Etch and drill the PCB using the foil pattern shown in Fig 2. If you have a UV light source and do not wish to prepare your own transparency, one can be supplied; see address at the end. Do not mount any components at this stage as this is the best time to mark out the heatsink plate.

Carefully cut out the four rectangles which allow the larger transistors to be mounted directly on to the heatsink which is a piece of ¼" aluminium plate cut and drilled

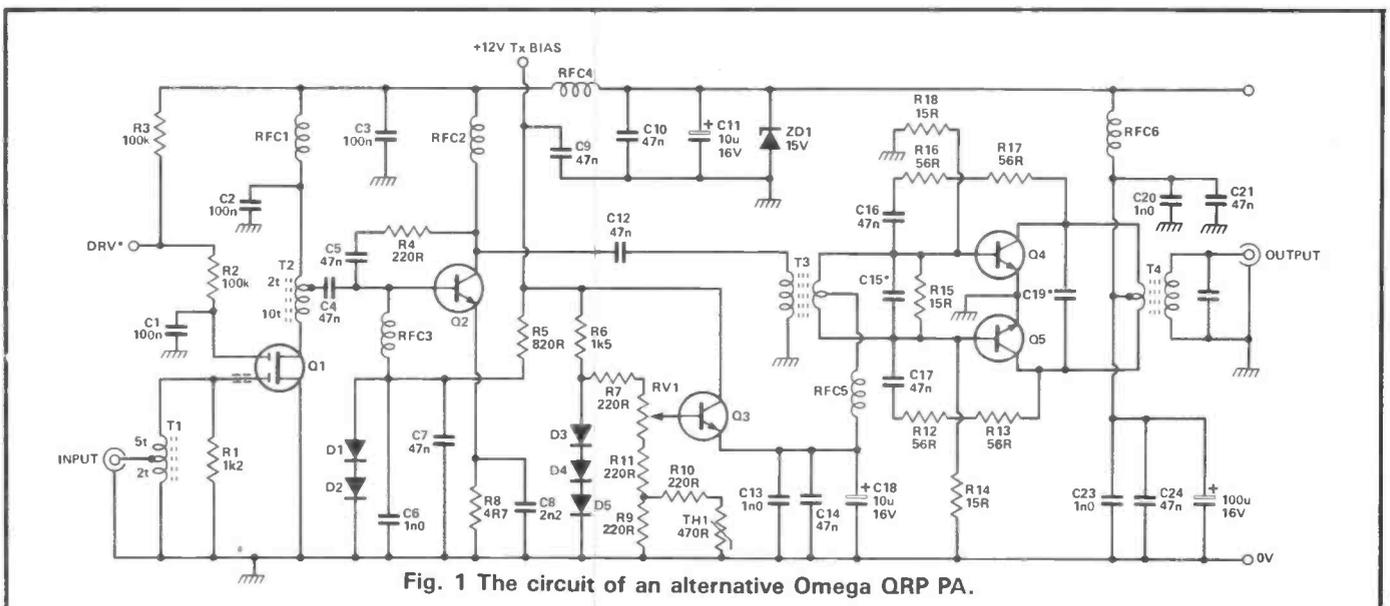
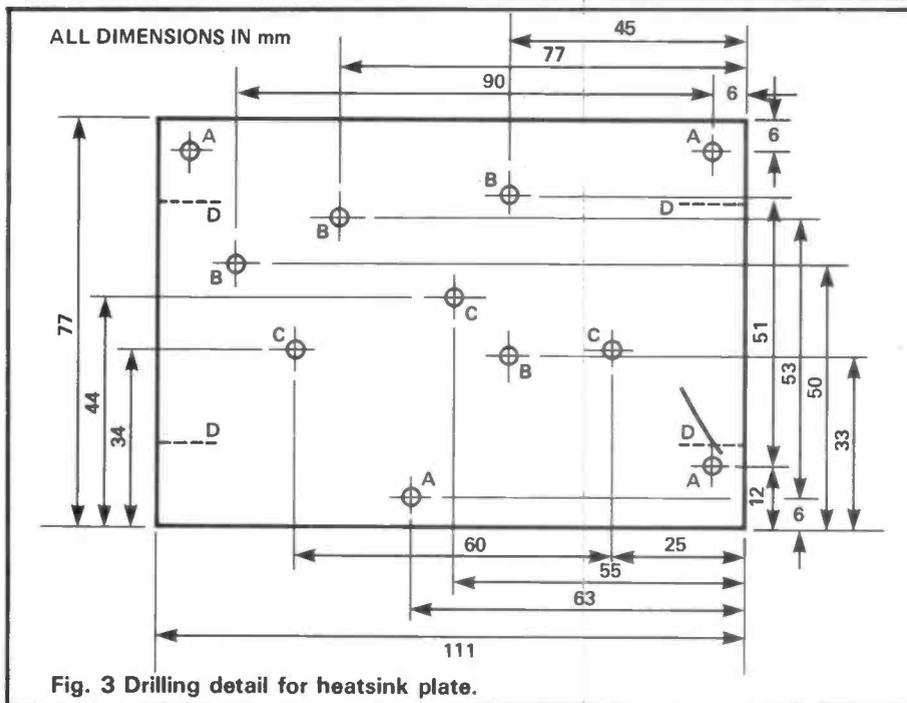


Fig. 1 The circuit of an alternative Omega QRP PA.



cutting fluid. Again remove any burrs from both plate and heatsink.

Four further holes need to be drilled into the edges of the plate at the positions indicated by the dotted lines 'D', using a 44 drill and 6BA tap. These are used to fix the screen and secure the unit in position in the rig so that the heatsink fins are vertical. Remember that when tapping blind holes the depth of the hole needs to be greater than the required depth of thread. If you have no taps it should be possible to use suitable self tapping screws, but make several test drillings into an odd piece of aluminium to check that the screws will cut their own thread. This is most important because if a screw should break off it will be almost immovable. Once again take care to remove burrs as self tappers tend to pile up the metal around the edge of the hole.

to the dimensions given in Fig. 3. Be sure to remove the dotted lines marking the outlines.

Mark the position of the four PCB fixing holes by offering the PCB to the plate. The holes marked 'A' on the plan are drilled with a number 44 drill and tapped 6BA. Drilling and tapping aluminium can be quite difficult because of the tendency of the drill or tap to 'pick up'. This can be reduced by the use of a little penetrating oil such as Lusol which makes excellent cutting fluid.

With the four transistor fixing holes now temporarily marked with a ball point pen, the PCB can be bolted to the plate and the position of the holes checked. Make sure that the transistor can sit in the rectangles and that there is room for the heads of the fixing screws. Remove the burr using a fine file or carborundum block. Do not countersink. Re-enter the 6BA tap to clear the thread.

The heatsink is bolted to the aluminium plate by three 4BA bolts. The position of these is indicated by the letter 'C'. Drill them with a number 34 drill then hold the heatsink to the reverse side of the plate so that it is centrally placed on the plate. Hold in position with a small G-clamp and mark the position of the holes on to the heatsink using the drill. Remove the clamp and tap the holes in the plate using a 4BA tap. The holes in the heatsink may now be drilled using a number 26 drill (4BA clearance). Don't forget the

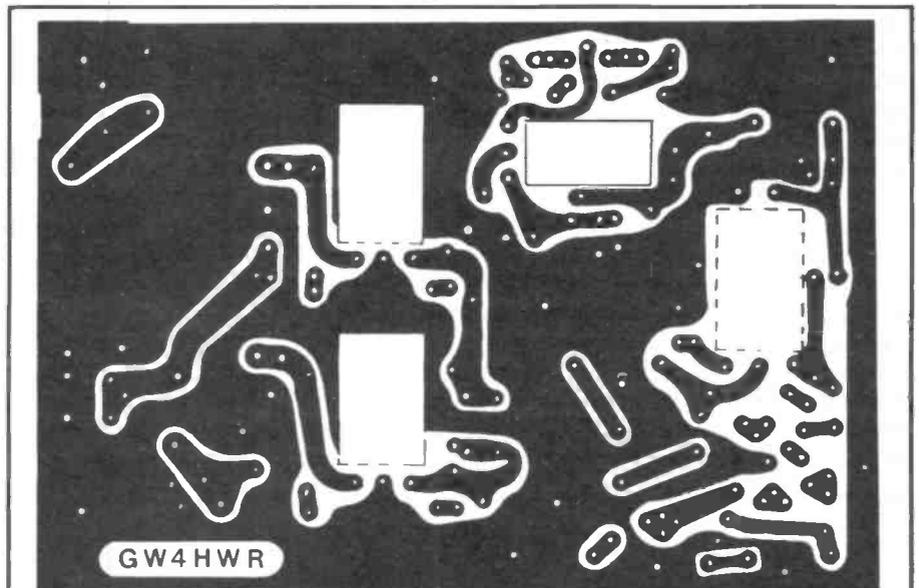
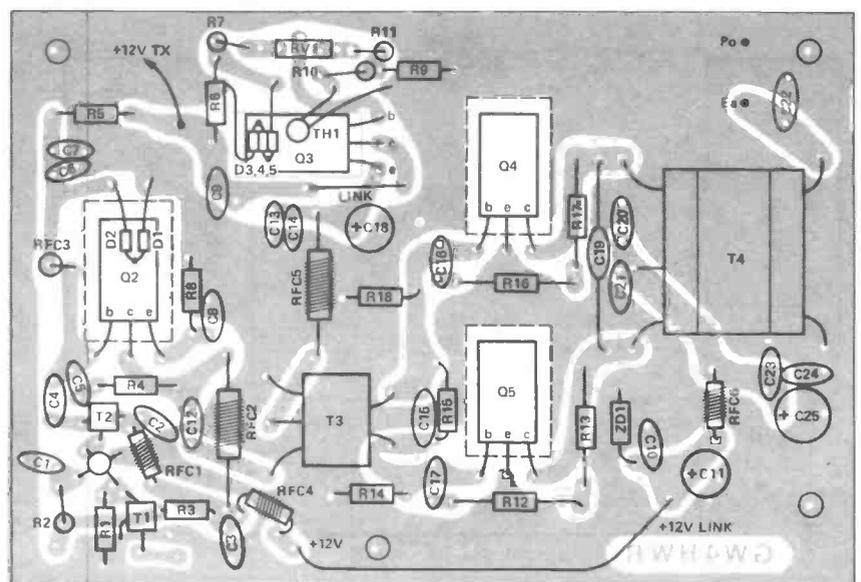
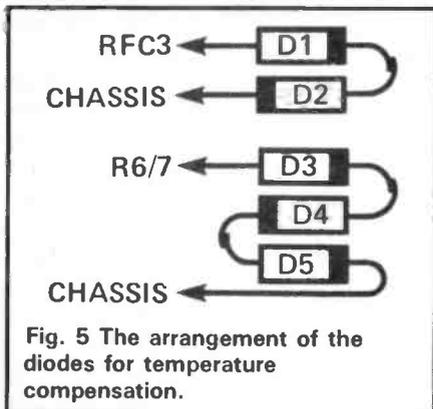


Fig. 2 The PCB foil pattern for the QRP PA.

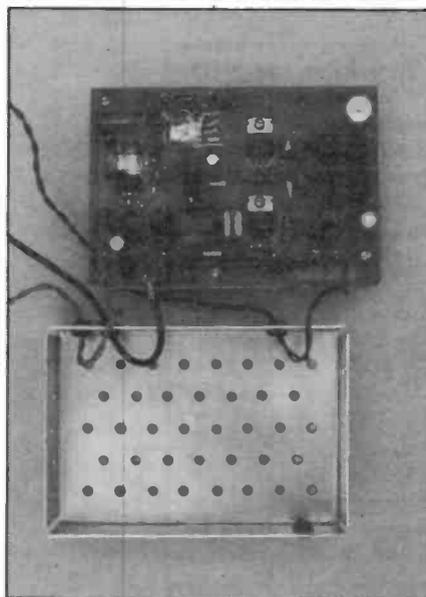




It may appear that the heatsinking is rather generous, but it should be remembered that the PA will deliver up to 15W.

Completing the PCB

Insert single sided terminal pins into the 12 holes for the connections to Q2-5, from the component side of the board. Cut the pins to leave 0.5-1.0mm on the copper side and solder. These connections allow the leads of the four transistors to be soldered after they have been fixed in position on the heatsink. The remaining 20 pins are inserted in the normal way from the copper side. Note that T3, C15, C19 and C22 are connected by means of pins. This enables adjustments, especially to the capacitors, to be carried out without necessitating the removal of the board from the heatsink. Insert all resistors, capacitors and TH1. The holes for RV1 may have to be



enlarged slightly. Two positions for each of the fixed contacts are available on the board as there are two sizes available with 5mm and less commonly 10mm spacing.

D1 and D2 are made up as shown in Fig. 5 and covered with a thin coating of quick setting epoxy cement. D3, 4, 5 are similarly connected and coated. When set these are connected to the PCB with the leads adjusted so that D1, 2 will lie approximately over the fixing screw of Q2 and D3, 4, 5 over Q3. TH1 is similarly fitted so that it will lie on top of Q3. Leave all three standing vertically on their leads until after the transistors have been fitted.

RFC1 and RFC4 are made up by

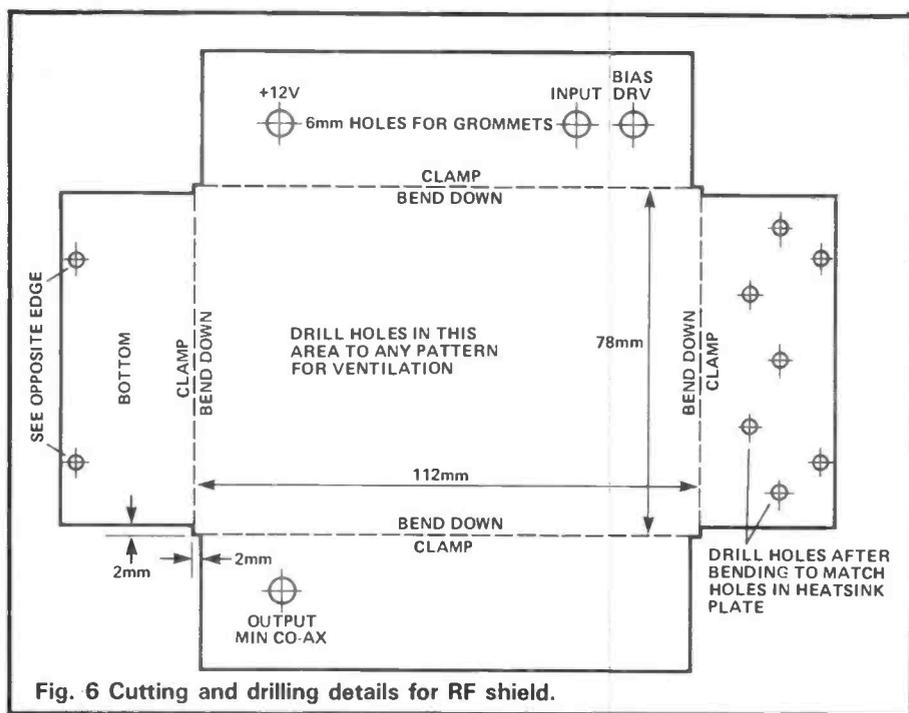
winding ten turns of 0.35mm enamel covered wire or if you prefer it 30 swg, it's not critical, through an FX1115 ferrite bead. The enamel is stripped back and the chokes fitted horizontally in the positions shown.

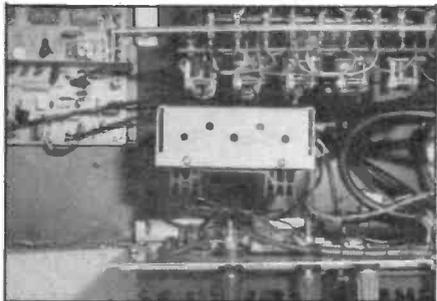
RFC2 and RFC5 are wound with a single layer of 0.2mm (38 swg) enamelled wire on to a high value 1W resistor. Any resistor or former with axial wire ends, about 15mm long and 5-6mm in diameter will be suitable. It is fairly easy to wind the coils if one of the wire ends is cut back to about 15mm and pushed completely into the chuck of a twist drill (which is held in a vice) so that the body of the resistor is tight against the jaws of the chuck. Solder the wire to the outside lead as close as possible to the body. A small nick in the edge of the body will stop the wire sliding around when winding starts. One tight layer will be close to 80 turns and gives an inductance of about 5uH. Wrap a small piece of PVC tape around the winding to hold the turns temporarily in position while the chuck is removed and the wire soldered to the other lead of the resistor. A light coating of epoxy will hold the winding in position.

RFC3 is a Toko 7BA or 7BS, 33 or 47uH, whichever is available and sits upright on the board. RFC6 is a toroid, wound with 0.8-1.0mm enamel wire. Pass the wire through the centre of the ring eight times and space the turns evenly.

T1 is wound as a 1:4 step up auto transformer as in the Omega QRP PA. Wind two turns of 0.35mm (30 swg) on a small balun core. Leave the starting end long to indicate the ground connection. Twist the outer end to form a loop about 30mm long and wind six more turns on to the core. Strip the insulation to within about 2mm of the core and insert into the board in a vertical position. T2 is wound in the same way as T1 but with two turns of 0.5mm wire then ten turns of 0.2mm (38 swg), take care not to damage the insulation while winding. Again mount vertically on the PCB.

T3 is a 2:1 step down double wound transformer wound on to a twin hole balun type core; Siemens A0001X001. Take two 50mm lengths of 0.6mm PVC covered wire, bare the ends, twist and solder. Pass the long ends through the two holes of the core. Using a 100mm length of similar wire (a different colour makes life easier), wind two turns





through the core so the ends come out of the core at the same end as the centre tap of the first winding. Pull both winding tight and make sure that the centre tap is positioned centrally between the holes of the core. Solder to the five pins on the PCB.

T4 is wound on six toroids, FairRite 59-61001101. Using super glue, fix three cores together to form a tube, carefully aligning the cores before the glue sets. Repeat with the other three cores. When dry, fix the two tubes side by side to produce a large twin hole core. Take two 100mm lengths of 0.6mm PVC covered wire, bare the ends, twist and solder together. Pass the ends through the two tubes and then each

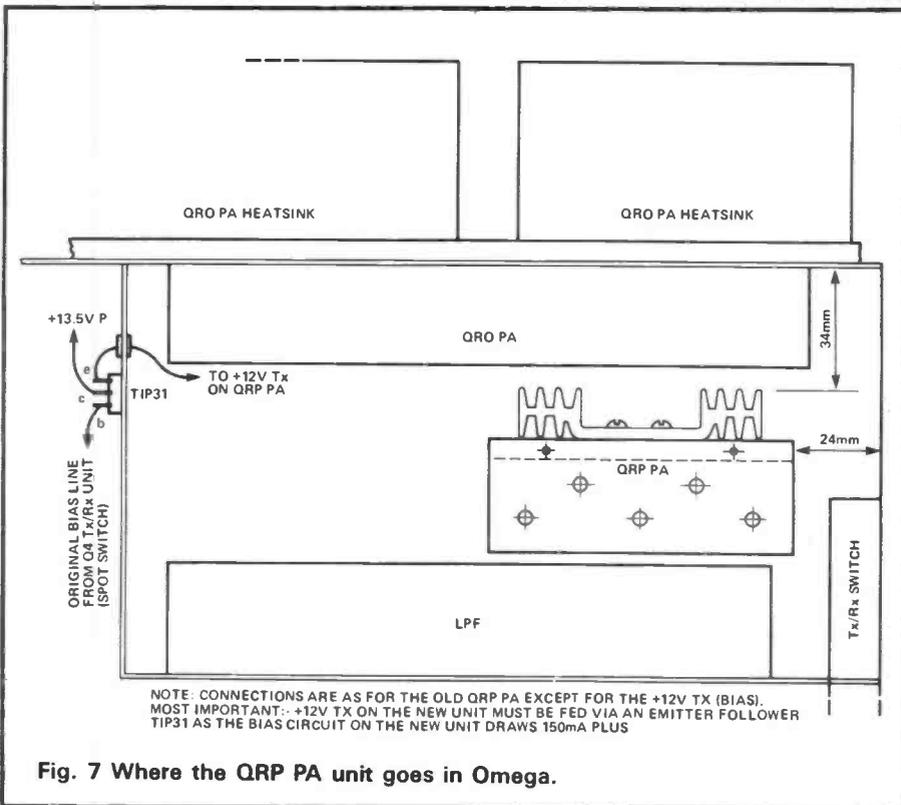


Fig. 7 Where the QRP PA unit goes in Omega.

one back through the other tube to produce two complete turns, centre tapped. All three ends of the winding should now be at the same end of

the core. With a 150mm length of similar wire, wind three complete turns so that the ends come out at the opposite end of the core to those of the primary. Solder to the PCB in the position shown.

The PCB can now be fixed to the heatsink using four 6BA round head screws and four 4BA whole nuts as spacers. Q2, 3, 4, 5 can be bolted to the heatsink again using round head 6BA screws and a little heatsink compound or vaseline. Note that Q2 requires a mica washer and bush, Q3 only a mica washer. Q4, 5 are bolted directly to the heatsink. The leads should be carefully bent and trimmed so that they line up with the pins on the PCB and soldered. The leads of D3, 4, 5 and TH1 are carefully bent so that the components lie as close

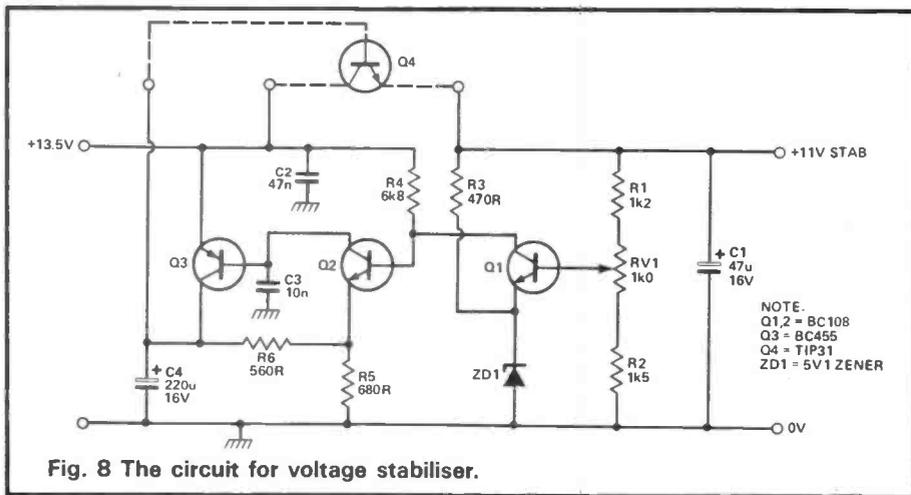


Fig. 8 The circuit for voltage stabiliser.

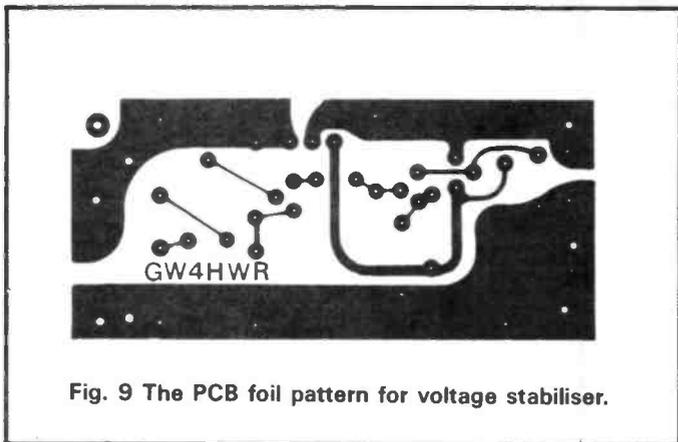


Fig. 9 The PCB foil pattern for voltage stabiliser.

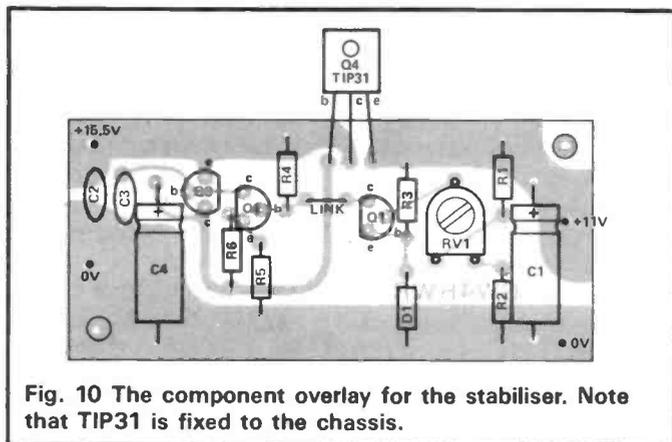


Fig. 10 The component overlay for the stabiliser. Note that TIP31 is fixed to the chassis.

Component List

RESISTORS

R1	1k2
R2,3	100k
R4,7,9,10,11	220R
R5	820R
R6	1k5
R8	4R7 0.5W thick film or composition
R12,13,16,17	56R 0.5W carbon composition
R14,15,18	15R
RV1	470R miniature vertical preset
TH1	Siemens K164 470R (Electrovalue)

All 0.25W carbon film unless otherwise stated.

CAPACITORS

C1,2,3	100n cer
C4,5,7,9,10,12,14,16,17,21,24	47n cer
C6,13,20,23	1n0 cer
C8	2n2 cer
C11,18	10uF 16V electrolytic
C15,19,22	See text, silver mica
C25	100uF 16V electrolytic

SEMICONDUCTORS

Q1	3SK45, 3SK51
Q2	2SC2075*
Q3	BD131, BD135

Q4,5	2SC2509*
D1,2	1N4148
D3,4,5	1N4001
ZD1	1N5352 or similar 15V 5W

INDUCTORS

T1,2	Wound on twin hole balun core Cirkit 55-02402
T3	Wound on twin hole Siemens A0001X001 core (Electrovalue)
T4	Wound on 6 FairRite cores 59-61001101. Cirkit 55-01101
RFC1,4	10 turns on FX1115 ferrite bead
RFC2,5	80t 38swg on a high value 1W resistor
RFC3	33uH Toko 7BA/7BA Cirkit 34-33004/34-47014
RFC6	8t on T50-6 Fair-Rite Cirkit 55-00506
Heatsink	Radiospares 401-497 4.0°C/W

* These or pin compatible equivalents from:— Universal Semiconductor Devices, 17 Granville Court, Granville Road, Hornsey, London N4 4EP.

The PCB foil pattern transparency is available if you send 30p plus stamped & addressed envelope, to E J Case, 2 Abbey Close, Tyrhiw, Taffswell, Mid-Glamorgan CF4 7RS.

then be removed and the value measured on a capacity bridge. The nearest preferred value, silver mica or high voltage disc ceramic should be put into the appropriate position.

Drive Control

If, like me, you like to be able to reduce the output to zero by means of the drive control, another small modification is necessary. The existing circuit does not do this because dual gate FETs like the 3SK45 give some gain until gate 2 is driven about 4-5 volts negative. Disconnect the earthy end of the 47k drive control from chassis, connect a 56k or 68k in series and take the remote end of the resistor to the negative side of C27 in the Tx Rx switching panel. This point is at -10V and the voltage enables Q1 to be completely cut off. You can now operate QRP with the QRO PA in position.

SSB Operation

One final problem arose when using SSB with the QRO PA operating near maximum output. A considerable 'ripple' at the output frequency in the supply (not surprisingly), irrespective of supply type and if this is applied to the SSB unit, it causes a peculiar feedback effect due to the beat between the 'ripple' and the 10.7MHz SSB signal in the unit. Feeding the SSB unit from a PP9 battery completely cured the effect and I now use an efficient voltage stabiliser fed from the main PSU which provides a highly stable +11V for the SSB unit.

The circuit and PCB foil pattern are shown in Figs. 8 and 9. Note that the TIP31 is not mounted on the board but is bolted to the side of the cabinet opposite to the speaker using a mica washer and bush with the PCB mounted just below. The current available is very much greater than that required but I thought that it might be necessary to supply other circuits from the stabilised line but so far that has not been necessary.

Finally, I would be pleased to hear from other Omega builders who have met similar or in fact any problems. It is such a good design that I would not like to think of anyone having an unfinished rig.

as possible on to Q3. A generous blob of heatsink compound will assist the heat transfer. D1, 2 are similarly positioned against Q2.

Setting Up and Testing

Fit C15, C19 and C22 using temporary values in the region of 680pF, 150pF and 47pF respectively. Silver mica or 400V disc ceramics are required. Set RV1 fully anti-clockwise and connect a 50 ohm dummy load and output meter to the output. Connect the positive of a 12V supply to the +12V pin adjacent to RFC4 and also to the +12V Tx pin. Connect a DC mA meter set to 200mA range between supply positive and the +12V pin adjacent to C11. If possible use a current limited supply and set the limit to 300mA.

Switch on the supply. The meter should read zero. The DC voltage measured at the emitter of Q2 should be a little less than 1V, which indicates that the quiescent current drawn by Q2 is about 200mA. If all is correct, advance RV1 until the meter indicates 100mA, the quiescent current for Q4 and Q5.

Switch off and connect the DRV pin to the drive rail on Omega or to a separate 47k variable with the lower end to chassis. Set the control to minimum (zero ohms), switch on and apply drive at 3.6MHz. Some output should appear in the output meter. Progressively increase drive and the PSU current limit while monitoring the temperature of Q2, 3 and 4 until a maximum output of 10W is obtained. The heatsink will show a considerable increase in temperature. Note that there is no overdrive protection until the Omega QRO PA and/or the accessory board is in use, so watch that drive control!

Check on the other bands, the output will almost certainly fall on the top three bands. If optimum performance is required the three capacitors C15, C19 and C22 should be removed and replaced by suitable trimmers. The first two need to be of the compression type and may be made by means of a lower fixed value plus a trimmer in parallel. The other (C22) can be a small rotary type — 65pF max. Apply drive in the region of 29MHz and carefully adjust each trimmer for maximum output. Each capacitor or combination can

Transverter Eighty Metres from TWO

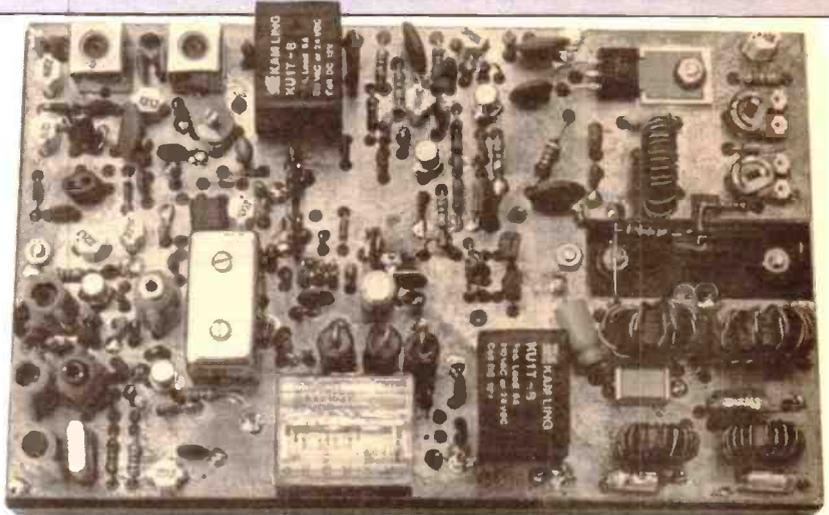
There must be many owners of 2 metre multimode rigs who would like to get on to the HF bands, but cannot afford the expense of purchasing a new or even secondhand HF transceiver. This project will enable them to get inexpensively on to the popular 80 metre band on both receive and transmit with an RF output power in excess of 15W. The transverter is designed for an input power at 2 metres of 1 to 3 watts, making it suitable for rigs such as the FT290R.

A complete kit of parts to build the transverter is available from Cirkit, taking the headache out of finding all the parts yourself.

Circuit Description

A transverter is basically a normal receive converter, but with the addition of a transmit path as well, together with suitable RF power amplification. The same local oscillator is used for both paths and by choosing carefully the frequency of the crystal, a direct kilohertz frequency readout at 80 metres on the 2 metre rig is available. For instance, 144.567MHz becomes 3.567MHz after transverting, relieving much mental juggling. As the design is linear, all modes available on the 2 metre rig become available on 80 metres — in effect the 2 metre transceiver can be used as an 80 metre rig instead.

To take the receive path first, signals from an 80 metre antenna pass through RL3 and RL2 to a bandpass filter consisting of C17-C21 and L6/7. This has a bandwidth of around 300kHz, attenuating signals outside the desired 80 metre band. This filter is followed by a JFET RF preamplifier (Q6) with a gain of approximately 10dB to make up for circuit losses in



Moving from VHF to HF? Here's a project from the Cirkit design team to make the move less costly.

various filters. PIN diode switches are used in the preamplifier as the transmit signal also has to pass through this part of the circuit — in receive, D12 and D13 conduct via a voltage applied from RFC3 and D11 is reverse biased off. In transmit, D11 is biased on and D12 off, thus bypassing the preamplifier itself.

The receive signals, still at 80 metres, then pass to a balanced Schottky mixer (T1/D1/D2). Also fed to the mixer is the local oscillator signal at 141.000MHz, which when mixed with say, a 3.601MHz signal, will produce a wanted output at 144.601MHz and an unwanted output at 137.399MHz. Both signals are passed through a prealigned helical filter F1 (144-146MHz at -3dB), which rejects the unwanted output and also reduces mixer leakage from the local oscillator at 141MHz. The signal passes direct to the 2 metre receiver via RL1.

In order to provide some control over the gain, an adjustable attenuator network based around

D5/D6 is used to divert a proportion of the signal to earth when the gain has to be reduced. As the voltage to D5 and D6 is increased via preset RV2 the diodes begin to conduct, bypassing part of the signal at 2 metres via C47 — around 10dB of adjustment is available.

Local Oscillator

A 70.5MHz 3rd overtone crystal doubled to 141.000MHz and amplified to about +6dBm provides the drive for the mixer. L1 in conjunction with the self capacity of the crystal allows its frequency to be pulled so that the calibration at 2 metres coincides exactly with 80 metres. Q1 and L2 comprise the basic 3rd overtone oscillator with L3/L4 selecting the 2nd harmonic, which is subsequently amplified by Q2.

Transmit

As the mixer only requires a drive level of the order of a few

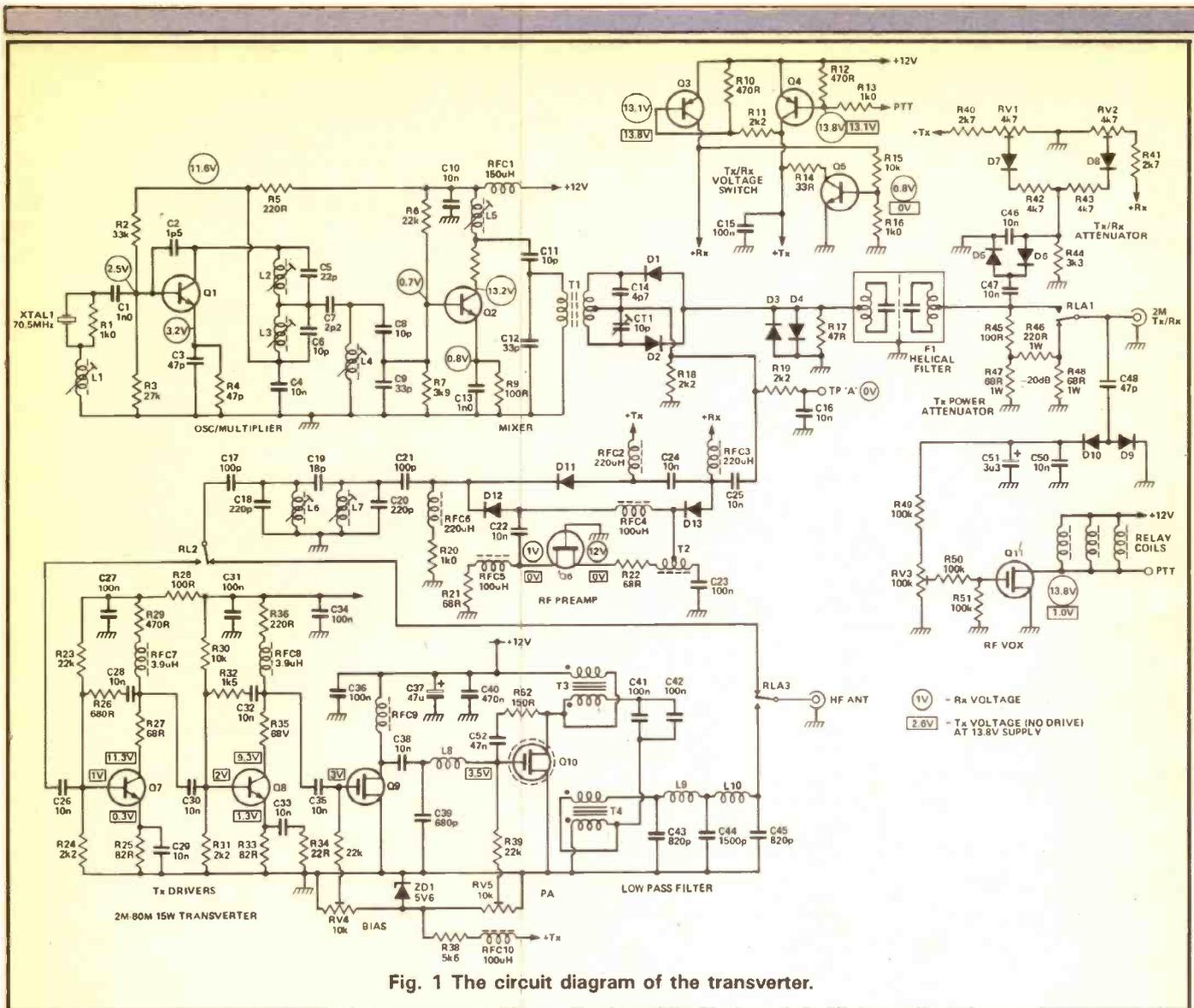


Fig. 1 The circuit diagram of the transverter.

milliwatts, the incoming transmit signal at 2 metres which will be at a relatively high level, has to be attenuated down to this low level. This is achieved by the pi-network attenuator R46-48 which reduces the level by approximately 20dB and by R45 which reduces it still further. Fine control over the drive level is possible by using the input attenuator network used on receive, but the controlling voltage comes from RV1 in this case (rather than RV2, on receive).

An RF VOX circuit provides the means to automatically switch the transverter from receive to transmit when using SSB, although manual control is possible via a PTT switch. As RF is applied to RL1 from the 2 metre transmitter, a small amount is sampled via C48, rectified by D9/10 and used to switch on Q11 which then conducts and switches over the three relays. C51 charges up during this operation allowing the circuit to

hold on whilst talking, with the drop out time controlled by preset RV3. D3 and D4 provide protection for the mixer at the instant RF is applied before the relays change over.

The circuit is designed for an input drive level of between one and three watts at 2 metres. Higher drive levels cannot be used directly on the board as there would be so much RF about that leakage coupling around the board would prevent any control over the drive level. A miniature low-cost coaxial relay is used for RL1 to provide sufficient isolation between contacts — an ordinary relay has too high an inter-contact capacitance to be used satisfactorily.

The attenuated signal then passes through F1 (again with a small 3dB loss) and thence to the mixer. This time a signal at say 144.601MHz will mix with 141.000MHz to produce the wanted 3.601MHz signal and an unwanted

product at 285.601MHz. These two signals then bypass the preamp through D11 and the wanted signal is selected by the same bandpass filter as used on receive.

A linear, four-stage, essentially broadband amplifier chain then follows, taking the low level signal up to 15W or so. The driver and power amplifier circuit both use power MOSFETS which give very good service at this frequency. Standing current for these two devices is set via presets RV4/RV5, with the driver at 100mA and PA at 300mA for good linearity. L8/C39 are broadly resonant at 80 metres and T3/4 transform the low impedance of the MOSFET PA stage up to 50 ohms.

The high level signals then pass through a low-pass filter to remove harmonics and finally pass to the antenna via RL3. For best performance and power output, a good 50 ohm match is required although the PA device will

withstand mismatches but gives a lower power output. Into a well matched system, an output power of 10W should not be exceeded for continuous carrier modes such as RTTY without increasing the size of the heatsink used in this design.

Automatic solid state switching of the low current voltages required is achieved with Q3/Q4/Q5, controlled via R13 and the voltage present at the drain of the relay switch, Q11. To avoid the need to switch the high current PA supply, +12V is applied permanently to both driver and PA, but no current is taken in receive mode as no bias is present.

Construction

The whole transverter is built on one double sided PCB, the top acting both as an earth plane and RF screen. The T03 packaged PA transistor is fixed to a heatsink on top of which the PCB mounts, with the PA pins connected to the PCB via a cut-out in the board.

It is recommended that the order of construction described below is followed. Try to keep all leads short especially around the 2 metre section and mount components flat

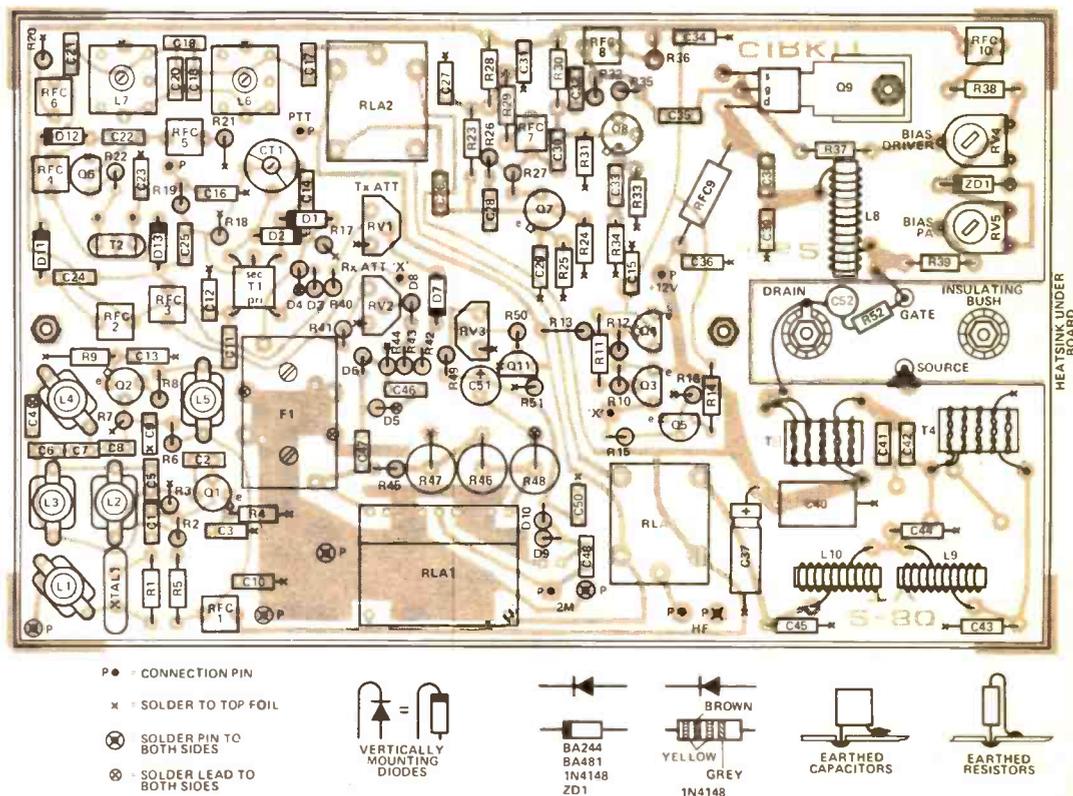
against the PCB in the case of horizontal mounting resistors and diodes, etc. The body position of vertical mounting resistors should be exactly as marked. Some earthed leads are soldered directly to the top foil, others pass through a hole in the PCB and are soldered both sides; these are marked on the overlay diagram.

1. Insert and solder the 10 connection pins at the points marked with 'P'. Where necessary, also solder to the top copper foil of the PCB.
2. Insert and solder RV1, 2 & 3. It is easier to solder the earthy pins to the top foil if they are bent over before inserting.
3. Insert and solder RV4 & 5.
4. Insert and solder all fixed resistors, soldering to the top foil where marked.
5. Insert and solder all fixed value capacitors.
6. Insert F1 and solder all lugs on the underside and the case to the top foil at the two positions indicated. It will be easier to do this if the area around the case to be soldered is tinned with a hot iron before inserting.
7. Insert and solder all diodes taking care to select the correct type and polarity. Those diodes which mount

vertically should have one lead bent as shown in the drawing before insertion (ie, they are all mounted with cathodes uppermost). Don't forget to solder both sides of one lead on D4, D5 and ZD1 to provide earth returns for tracks on the underside.

8. Insert and solder CT1 and all RF chokes.
9. Take the five S18 prewound coils and remove the side lugs projecting from the sides of the base of the coils with wire cutters. Insert each into place and solder.
10. Insert and solder Q1-Q8, taking care that the orientations are correct. Try to keep the base of the transistors about 3 to 4mm above the PCB foil. Don't forget to solder the earthy leads of Q5 and 6 to the top foil.
11. Next, Q9 is fixed in place — note that this is an unprotected gate VMOS FET and that it can be damaged by static charge. Therefore, handle it by its metal tab until it is soldered in place. Carefully insert it into the PCB holes with the legend facing RL1 position and bend it over, adjusting it so that the hole in the tab will line up with the hole in the PCB. Smear some heatsink compound (or silicon grease) on both sides of the

Fig. 2 The overlay diagram of the transverter.



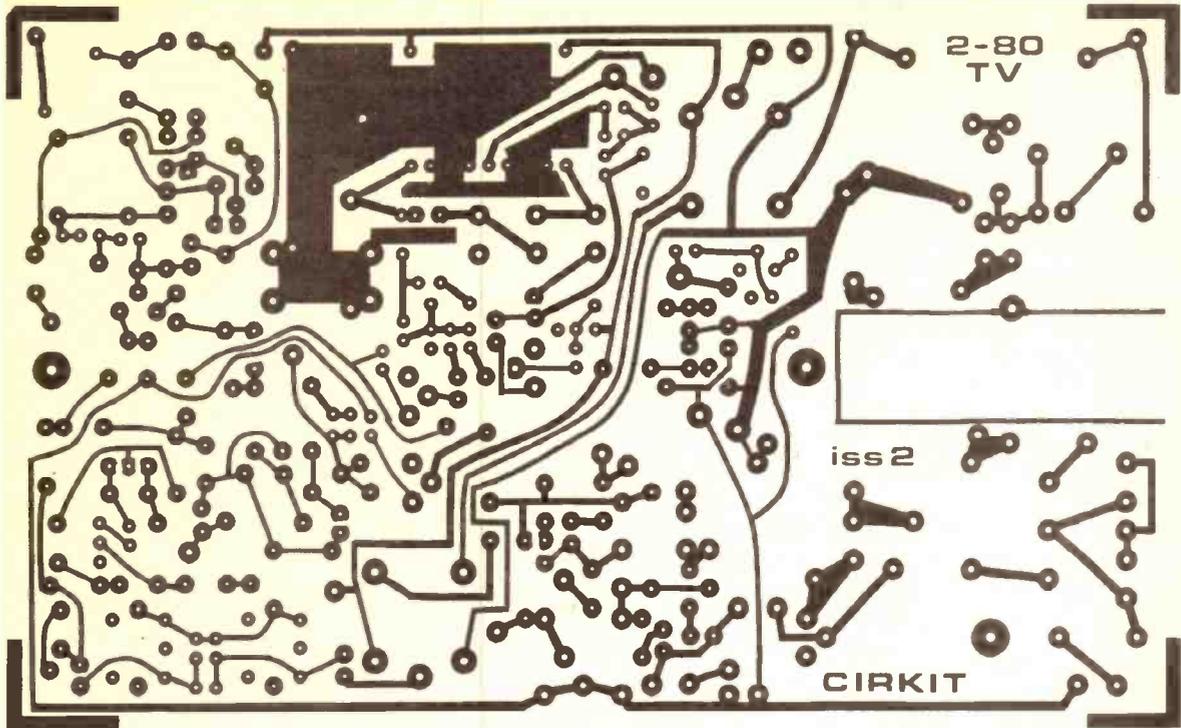
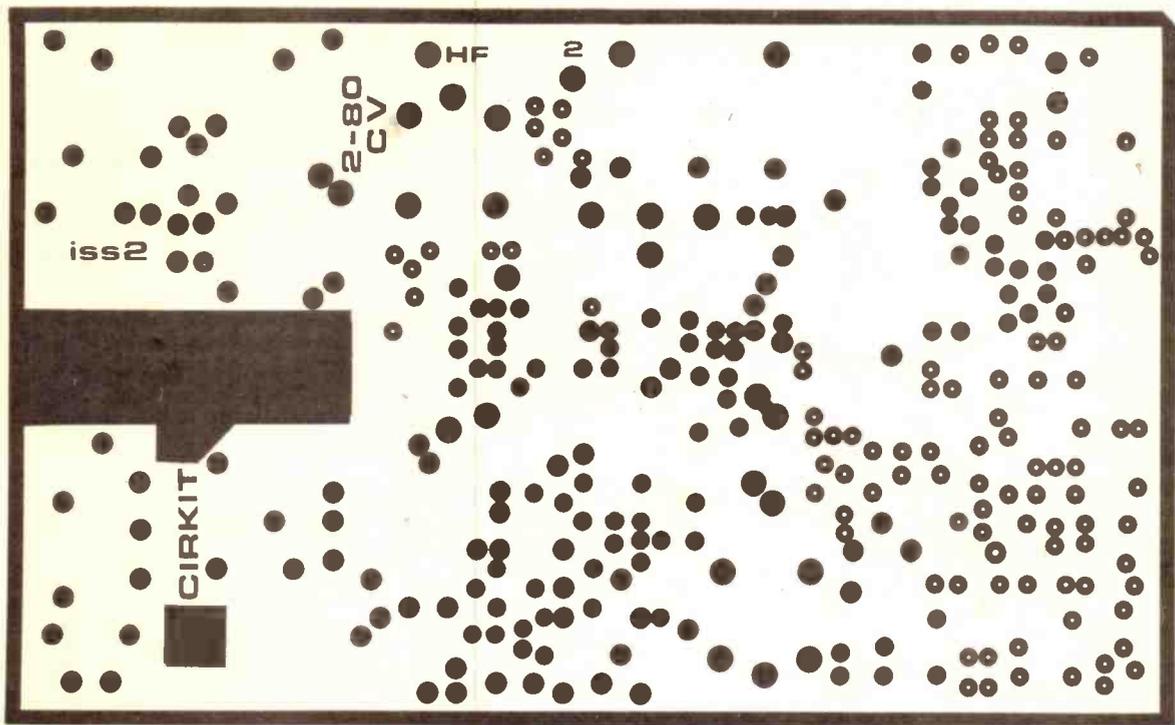


Fig. 4 The foil patterns for the PCB.



insulating washer and metal spacer and place under the tab of Q9, with the insulating washer against the PCB. Fix in place with a 6mm 6BA screw, lockwasher and nut, then solder the source to the top foil and the other two leads on the underside. 12. Insert and solder L6 and L7, soldering all lugs on the underside and also the cans themselves to the top foil where shown.

13. Insert and solder RL1, 2 & 3. 14. Take a 46cm length of 0.56mm dia. enamelled copper wire and wind 21 turns, evenly spaced over the T68-2 toroid core (larger red coloured) — 1 turn is defined as 1 turn of wire visible on the outside of the core. Insert and solder as shown. 15. Take two 40cm lengths of 0.56mm dia. enamelled copper wire and similarly wind L9/10 on the two smaller T50-2 cores (red coloured) with 20 turns each. Insert and solder.

16. T3 and T4 are bifilar wound transformers. If you have wound these before they are easy to do — if not then here is the method in detail for beginners.

A bifilar winding is one that has been made from two pieces of closely twisted wire, wound as a single winding, to give very close coupling between the two wires as well as providing a transforming action depending on the method of connection. A hand drill will make life easier. Take two lengths of 0.8mm dia. enamelled copper wire, each 30cm long and fix one pair of ends in a vice. Clamp the other ends in the drill and then rotate, keeping the wires taut until you have about 5 twists per inch. Then repeat the process with another pair of wires.

Take one of the 13mm diameter ferrite cores and pass one end of the wire through the middle and wind on until you have eight turns. Untwist the free ends of the pairs, shorten to 15mm each and scrape off the insulation to within 3mm of the core. Using a multimeter on its ohms range pick one wire and then find out which wire at the other end does *not* conduct and loosely twist these two together. What this has done is to connect the start of one winding with the finish of the other. Following the drawing, solder these two wires together. Using this coil at T3, insert it into the PCB, making sure that the joined pair go in the correct hole (the orientation of the other two doesn't matter). Then

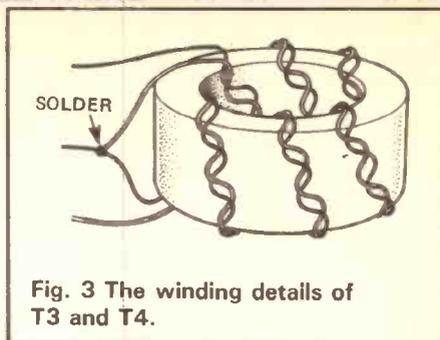


Fig. 3 The winding details of T3 and T4.

repeat the process with T4. 17. T2 is a centre tapped winding made on a small two hole balun core. One turn is a wire passing up one hole and back down out the other end. The coil is wound with two lengths of 0.2mm enamelled copper wire, with 6 turns to each half made from an 18cm length and the centre tap formed from the junction of the two wires. Be careful not to strip the insulation off the wire while winding. After winding, shorten the free ends to 10mm in length and insert into the PCB and solder.

18. T1 is made by firstly winding the centre tapped secondary from two 5cm lengths of 0.2mm diameter enamelled copper wire — each half is one turn, made again with the junction as the centre tap. The primary is a single 5cm length of one turn, wound through the core in the opposite direction to the secondary. Insert and solder in place after stripping the wire of insulation with the core resting against the PCB.

19. Insert and solder the crystal, X1. 20. Solder a link of insulated wire between the two points marked 'x' on the *underside* of the PCB, avoiding running the wire in the area between RV3 and RL1.

Testing

All components on the PCB should now be in place and before the PA is wired up on the heatsink, it is recommended that the following tests are carried out.

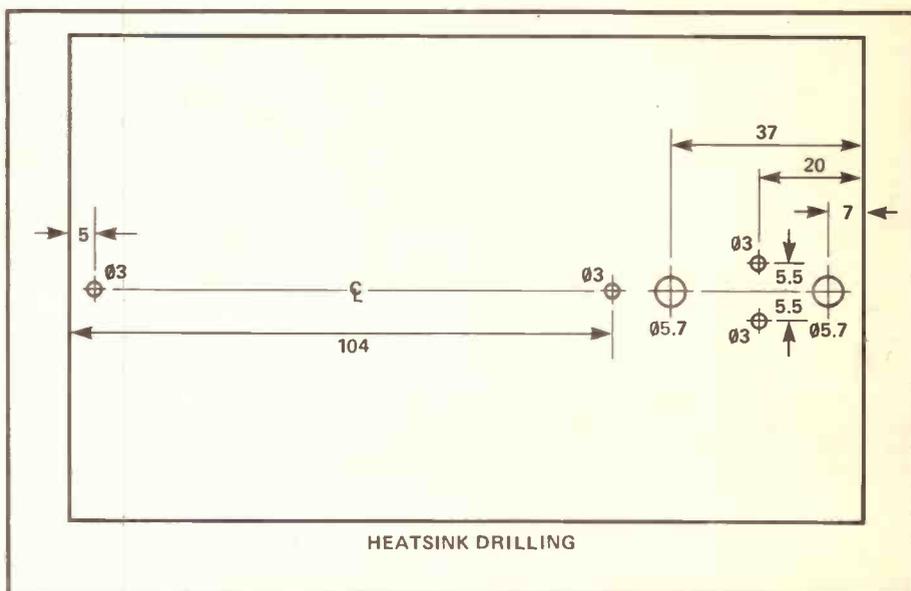
1. Turn all five presets fully towards their earthy ends. 2. Preset the cores of the inductors as follows:

- L1 1mm out of former;
- L2 3mm out of former;
- L3 3mm into former;
- L4 2mm into former;
- L5 2mm out of former;
- L6 & L7 2mm into former.

3. Check first with an ohmmeter that there is not a short circuit between ground and the +12V pin, then apply between +12 and 14V and an earth and check that the current consumption does not exceed 80mA.

4. Check that slightly less than the supply voltage is present on the non-banded end of D13 (to check the Rx+ voltage) and that there is less than 1V present on the non-banded end of D11 (checks Tx+ voltage). Apply an earth to the PTT pin — the relays should change over, then check that the voltages on D11 and D13 have reversed. If these checks are wrong, suspect a fault around Q3/4/5 and Q11 or a short circuit.

5. Connect up the 2m transceiver and an HF antenna. With a bit of luck you should hear signals between 144.5 and 144.8MHz. If not, adjust the core of L2 until the oscillator starts and signals are heard. If still nothing, connect a frequency counter to C11/12 and see if there is



HEATSINK DRILLING

output at 141.0MHz. If so, then the fault is somewhere other than the oscillator circuit and checks should be made for components not soldered to the top foil, incorrect insertion, or missed soldering on the underside. If still no luck, then use the voltage checks to see if these indicate a fault. Another guide would be to see if applying the aerial direct to the centre tap of T1 produces signals — if so then the fault must be either in the bandpass filter, preamp or switching circuits (have you got the two RF inputs the correct way round?).

6. Having obtained signals, peak L6/7 at 144.650MHz on a weak signal. L1 can be adjusted to get the

LO exactly on 141.000MHz, either using a known frequency on 80 metres, or with a frequency counter at C11/12. Then peak L3-L5 on a signal at mid-band. Switch the power on and off and check that the oscillator starts reliably each time. If not, unscrew L2 core about ¼ turn and try again until it does start reliably. If it still doesn't start every time, remove C2 from the PCB and try again. Those of you with diode probes can peak all cores for maximum volts across the primary of T1.

7. Using a multimeter on a low voltage DC range (less than 1V), use the pin at test point 'A' and adjust CT1 for a reading of zero volts (a DC

null to show the mixer is balanced). If you can't get a balance and there is always a small positive or negative voltage then either the transformer is wound incorrectly, one of the diodes is faulty or the wrong way round, or CT1/C4 is damaged/wrong value.

8. DO NOT ADJUST THE HELICAL FILTER!

9. Check that RV2 will reduce the gain of the receive section when rotated (over about the middle third of travel of the preset). The current consumption in receive mode should be around 60mA at 13.8V. This completes alignment of the receive section. Next month: final assembly and transmitter testing.

Components List

RESISTORS

R1,13,16,20	1k0
R2	33k
R3	27k
R4,10,12,29	470R
R5,36	220R
R6,23,37,39	22k
R7	3k9
R8,21,22,27,35	68R
R9,28,45	100R
R11,18,19,24,31	2k2
R14	33R
R15,30	10k
R17	47R
R25,33	82R
R26	680R
R32	1k5
R34	22R
R38	5k6
R40,41	2k7
R42,43	4k7
R44	3k3
R46	220R 1W
R47,48	68R 1W
R49,50,51	100k
R52	150k 0.5W
RV1,2	4k7 10mm horizontal preset
RV3	100k 10mm vertical preset
RV4,5	10k 10mm horizontal preset

(All fixed resistors 0.25W carbon film unless stated otherwise)

CAPACITORS

C1,13	1n0
C2	1p5
C3,48	47p
C4,10,16,22	
24,25,26,28,	
29,30,32,33,	
35,38,50	10n
C5	22p
C6,8,11	10p
C7	2p2

C9,12	33p
C14	4p7
C15,23,27,31,	
34,36,41,42	100n
C17,21	100p
C18,20	220p
C19	18p
C37	47uF 16v axial electro.
C39	680p
C40	470n block polyester
C43,45	820p 160v polystyrene
C44	1500p 160v polystyrene
C49	not used
C51	3.3uF 25v radial electro
C52	47n mylar
TC1	10pF 10mm film trimmer

(All fixed capacitors ceramic disc types unless stated otherwise)

SEMICONDUCTORS

Q1,2,7,8	2N2369A
Q3,4	BC327
Q5	BC237/8/9
Q6	J310
Q9	VN66AF
Q10	IRF120
Q11	VN2222KM
ZD1	5V6 400mW Zener
D1,2	BA481 Schottky
D3,4,7,8,9,10	1N4148
D5,6,11,12,13	BA244 PIN

MISCELLANEOUS

X1	70.500MHz 3rd overtone HC-18/U
L1	TOKO S18 8½ turns Fe core
L2	TOKO S18 5½ turns Fe core
L3	TOKO S18 2½ turns Fe core

L4	TOKO S18 3½ turns Fe core
L5	TOKO S18 3½ turns Al core
L6,7	TOKO KANK3334R
L8	21 turns 0.56mm en Cu wire wound on Amidon T68-2 core
L9,10	20 turns 0.56mm en Cu wire wound on Amidon T50-2 core
T1	1 turn primary, 2 turn CT secondary wound on Fair-Rite core type 28-43002402 using 0.2mm en Cu wire
T2	12 turns CT wound on Fair-Rite core type 28-43002402 using 0.2mm en Cu wire
T3,4	8 turns 0.8mm en Cu wire, bifilar wound on Fair-rite core type 59-61001101
RFC1	150uH TOKO type 7BS (151)
RFC2,3,6	220uH TOKO type 7BS (221)
RFC4,5,10	100uH TOKO type 7BS (101)
RFC7,8	3.9uH TOKO type 7BS (3R9)
RFC9	4.7uH axial choke
F1	TOKO 271MT 1008A
RL1	OMRON G4Y-152P 12V minature coaxial relay
RL2,3	KUIT-B 12V

Heatsink: Cirkit Ref 21-08616.

A complete kit of parts for the transverter is available from Cirkit Distribution, Park Lane, Broxbourne, Herts EN10 7NQ priced at £59.70 inc VAT and post. It includes a ready drilled/tinned PCB and all components required, including heatsink.

THE NEW TX-3 RTTY/CW/ASCII TRANSCIVE PROGRAM

RTTY has selectable auto CR/LF with user-defined line length, LTRS/FIGS force and selectable Unshift-on-Space.

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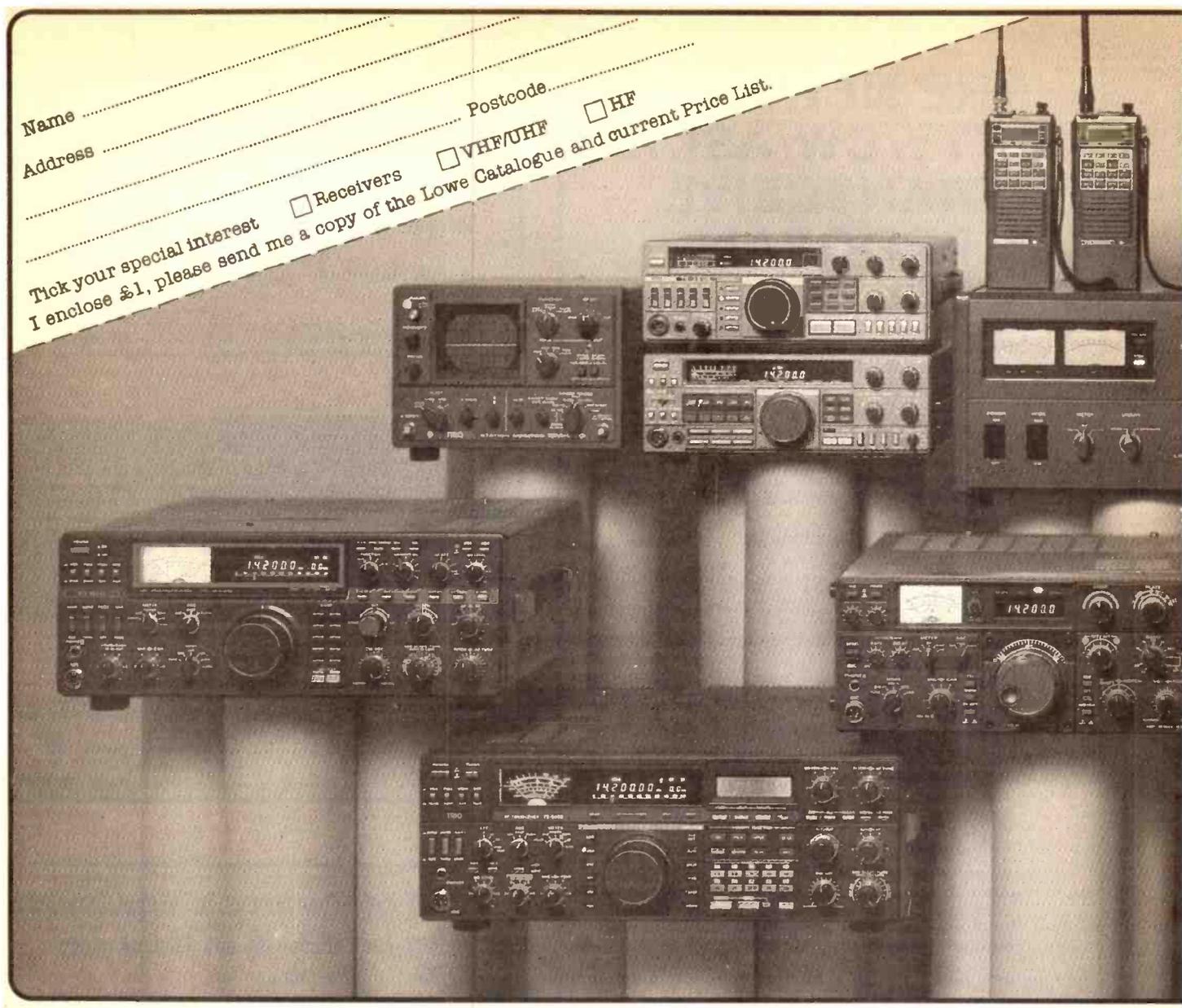


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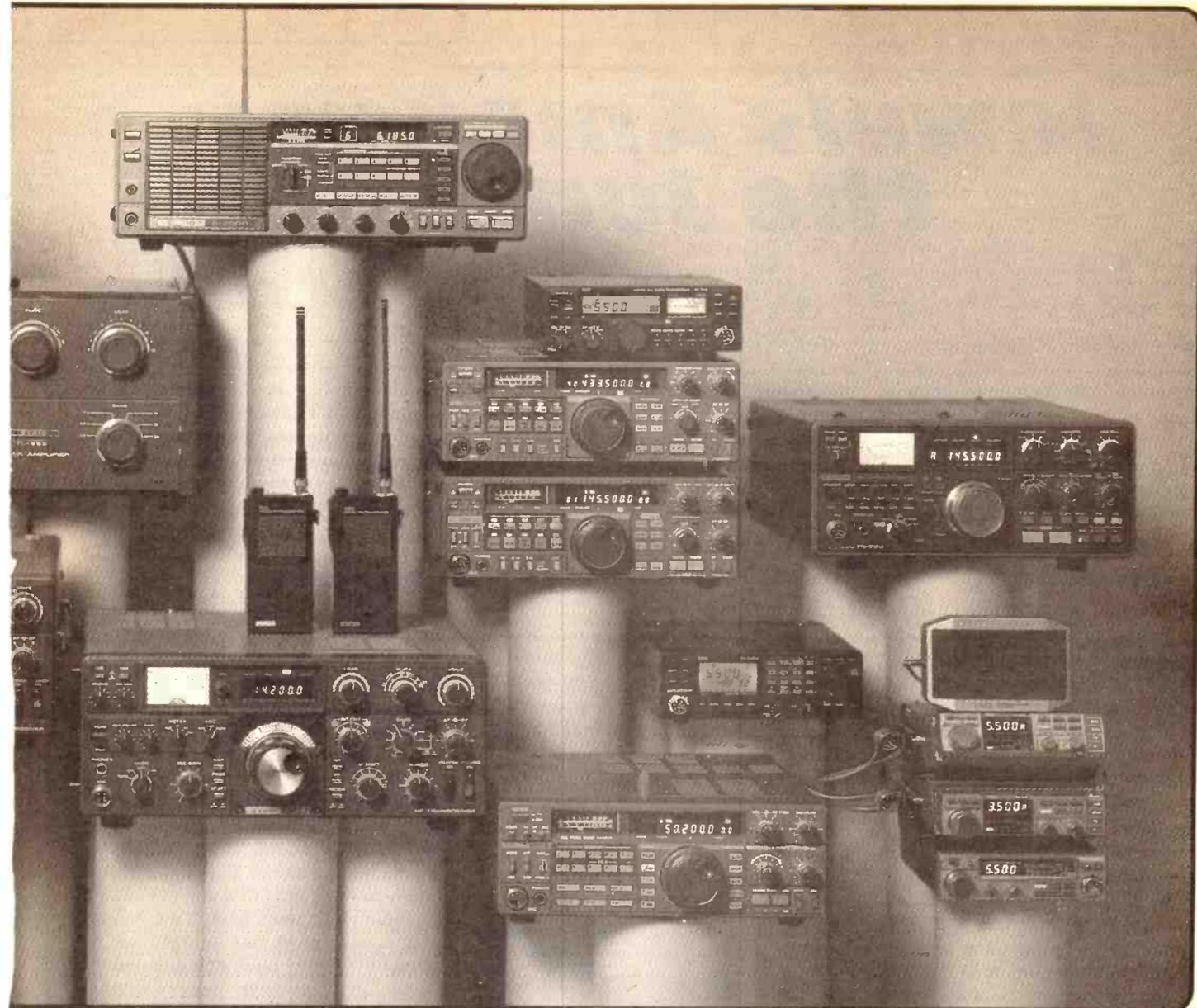
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- 1 TS940S HF transceiver.** Modes > USB, LSB, CW, FSK, FM, AM. Frequency range > transceive 160 to 10 metres, receive 150 kHz to 30 MHz. Power input > 250 watts PEP, AM 140 watts. Power supply > internal psu, 240 VAC. Features > 40 memories, 2 VFOs, provision for internal ATU, keyboard frequency entry, SSB IF slope tuning, CW variable band width, CW full break-in, IF notch filter, Audio filter, variable CW pitch, optional voice synthesizer etc.
- 2 TS930S HF transceiver.** Modes > USB, LSB, CW, FSK, AM. Frequency range > transceive 160 to 10 metres, receive 150 kHz to 30 MHz. Power input > 250 watts, AM 80 watts DC. Power supply > internal psu, 240 VAC. Features > 8 memories, 2 VFOs, optional internal ATU, CW full break-in, SSB IF slope tuning, CW variable band width, IF notch filter, audio filter etc.
- 3 TS440S HF transceiver.** Modes > USB, LSB, CW, FSK, FM, AM. Frequency range > transceive 160 to 10 metres, receive 100 kHz to 30 MHz. Power input > 200 watts PEP, AM 110 watts DC. Power requirement > 13.8 VDC, transmit 20 amps. Features > 100% duty cycle, optional internal ATU, CW full break-in, IF shift, notch filter, 100 memories, keyboard frequency entry, manual or automatic bandwidth selection optional voice synthesizer etc.
- 4 TS450S HF transceiver.** Modes > USB, LSB, CW, AM and optional FM. Frequency range > transceive 160 to 10 metres, receive 150 kHz to 30 MHz. Power input > SSB 250 watts PEP, CW 200 watts DC, FM 120 watts, AM 60 watts. Power requirement > 13.8 VDC, transmit 20 amps. Features > 8 memories, 2 VFOs, memory and programmable band scan, IF shift, notch filter etc.
- 5 TS650S HF transceiver.** Modes > USB, LSB, CW. Frequency range > 160 to 10 metres. Power input > 220 watts PEP, CW 180 watts DC.

- Power requirement > 240 VAC. Features > pair of 6146B valves in PA, variable band width tuning, notch filter, IF shift, RF speech processor etc.
- 6 TS830SP HF transceiver.** Modes > USB, LSB, CW. Frequency range > 160 to 10 metres. Power input > 220 watts PEP, CW 180 watts DC. Power requirement > 240 VAC. Features > pair of 6146B valves in PA, IF shift, notch filter etc.
- 7 SM220 station monitor.** Features > TX and RX waveform monitoring, trapezoid linearity check, two tone test generator, wide band oscilloscope, panoramic display (band scan) with optional BSB unit having 40 kHz/200 kHz sweep width. Versatile and invaluable station accessory.
- 8 TL922 HF linear amplifier.** Modes > SSB, CW, RTTY. Frequency range > 160 to 10 metres. Power input > SSB 2000 watts PEP, CW 1000 watts DC. Drive > 80 watts or more for full output. Power requirement > 240 VAC, 14 amps. Features > class AB2 grounded grid amplifier using a pair of EIMAC 3-500Z valves.
- 9 TS670 Quad band transceiver.** Modes > USB, LSB, CW, AM and optional FM. Frequency range > 40, 15, 10, 6 metres. Power output > USB, LSB, CW, FM 10 watts, AM 4 watts. Power requirement > 13.8 VDC, 4 amps. Features > 80 memories, 2 VFOs, keypad frequency selection, optional general coverage receive board etc.
- 10 TMS01A two metre mobile.** Mode > FM. Frequency > 144 to 146 MHz. Power output > 25 watts. Power requirement > 13.8 VDC, 5.5 amps. Features > compact, 2 VFOs, 5 memories, priority alert, memory and programmable band scan, full repeater facilities, includes external speaker, mobile mount and up/down microphone.
- 11 TM411E seventy centimetre mobile transceiver.** Mode > FM. Frequency > 430 to 440 MHz. Power output > 25 watts. Power

- requirement > 13.8 VDC, 6.9 amps. Features > digital code squelch, tilting front panel, 2 VFOs, 5 memories, priority alert, memory and programmable band scan, full repeater facilities, includes external speaker, mobile mount and up/down microphone.
- 12 TM211E two metre version of TM411E mobile transceiver.**
- 13 TM2850E two metre mobile transceiver.** Mode > FM. Frequency range > 144 to 146 MHz. Power output > 45 watts. Power requirement > 13.8 VDC, 9.5 amps. Features > large display, illuminated keypad, optional digital channel link, high output power, optional voice synthesizer etc.
- 14 TH41E seventy centimetre handheld transceiver.** Mode > FM. Frequency range > 430 to 440 MHz. Power output > 1 watt or 150 mW. Power requirement > 7.2 VDC from supplied nicad pack. Features > compact, slim and lightweight, thumbwheel switch frequency selection, full repeater facilities etc.
- 15 TH21E Two metre version of TH41E.**
- 16 TR600E two metre handheld transceiver.** Mode > FM. Frequency range > 144 to 146 MHz. Power output > 2.5 watts or 0.3 watts in low power position. Power requirement > 8.4 VDC from supplied nicad pack. Features > compact and lightweight, 10 memories, memory scan, programmable band scan, keyboard frequency selection, digital code squelch, full repeater facilities etc.
- 17 TR600E Seventy centimetre version of TR600E.** Note, does not include nicad or mains charger.
- 18 TS711E two metre base station transceiver.** Modes > USB, LSB, CW, FM. Frequency range > 144 to 146 MHz. Power output > 25 watts. Power requirement > internal



power supply 240 VAC or 13.8 VDC at 6.5 amps. Features 10 Hz step dual VFOs, IF shift, auto mode selection, 40 memories retaining frequency, mode, simplex or repeater shift, tone burst. Programmable band scan, memory scan, free running or stepping VFO, digital code squelch etc.

19 TS811E seventy centimetre version of TS711E.

20 TR751E two metre mobile/base station transceiver. Modes 1 USB, LSB, CW, FM.

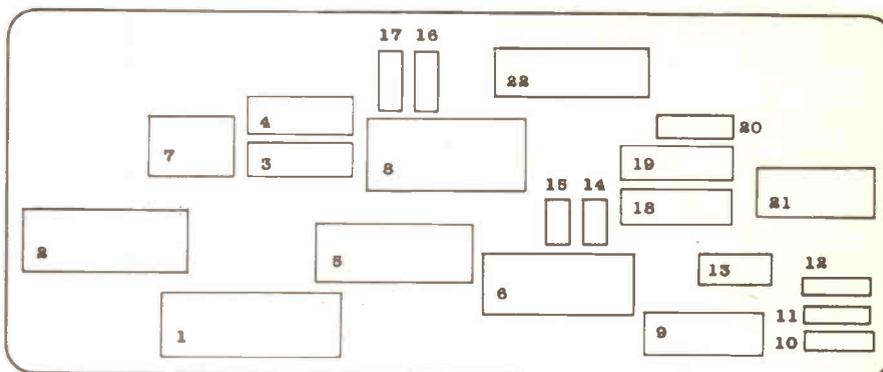
Frequency range 144 to 146 MHz. Power output 25 watts. Power requirement 13.8 VDC at 6 amps. Features auto mode selection according to band plan, excellent receive performance, 2 VFOs, 12.5 kHz steps on FM, alert channel, all mode squelch, memory frequencies can be transferred to VFO, optional digital channel link, optional voice synthesizer, full repeater facilities etc.

21 TS780 dual band base station transceiver. Modes 1 USB, LSB, CW, FM.

Frequency range 144 to 146 and 430 to 440 MHz. Power output 10 watts. Power requirement 240 VAC or 13.8 VDC at 5 amps. Features full coverage of two metres and seventy centimetres in one transceiver, 10 memory channels, 2 VFOs, memory scan, band scan, IF shift, full repeater facilities, VOX operation, free running or click stop VFO etc.

22 R2000 general coverage receiver.

Modes 1 USB, LSB, CW, FM, AM. Frequency range 150 kHz to 30 MHz. Power requirement 240 VAC or 13.8 VDC. Features optional internal VHF converter covering from 118 to 174 MHz, 10 memories storing frequency, band and mode. Memory scan, programmable band scan, all mode squelch, tone control, slow or fast AGC, high and low impedance serial terminals, remote switching from internal clock (tape recorder), receiver muting etc.



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Buying Secondhand

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renovate your equipment on a commercial basis. If you have the skills and spare time, renovating commercial equipment for your own use can be very rewarding. If you

the rig you buy is 15 years old and in good working order it is unlikely to need major spares immediately just because you start to use it. As with most things in life, you have to take some risk but make sure this is reflected in the price you pay.

If you are buying secondhand it pays to stick your nose in the rig — at least that's what Harry Leeming, G3LLL, recommends!

SSB amateur radio equipment gets older (and perhaps vendors get less honest?) I have to leave an increasing number of people disappointed and disillusioned.

Modern mass produced SSB equipment took over the UK amateur market with the Japanese invasion from about 1970. Perhaps it is a sign of personal desperation in trying to hang on to perpetual youth that I have found it difficult to admit that some of the early samples which I sold are now so old! But in the last few years much wasted and unprofitable time has been spent trying to revive what were, in retrospect, obvious cases of senile decay, bringing me face to face with the commercial realities of life.

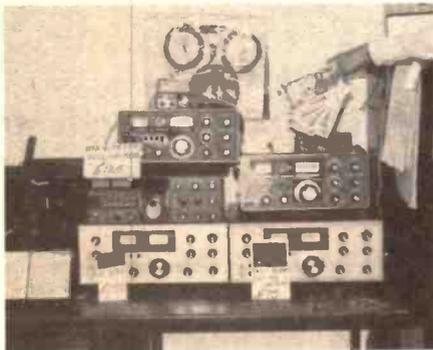
How old is too old?

There is no simple answer as to how long equipment can be expected to last as this very much depends on the conditions of use, storage, lay-out, design and the cost and difficulty of repair. The famous RCA AR88 communications receivers were made in the early 1940s, but many that have been well looked after are still going strong, are worth repairing, and will run rings round many units produced 30 years later.

DIY or pay to have it done?

Time is money in a commercial service department and you are likely to pay around £10-£20 per hour if you want someone else to

build a DIY design, you end up with something which costs you quite a lot of money and which you would have great difficulty in ever selling. If you purchase a worn and tired commercial unit and spend your time overhauling it, the cost is likely to be very much less and providing that



you have done a good job you will end up with something which is quite likely to be saleable in the future. Do, however, ensure that you have the necessary skill or at least some good friends who can help you out before jumping in with both feet.

Cost and Availability of Spares

"Cost of new mains transformer £35. Carriage, handling, documentation and insurance £60." One-off orders for spares from Japan or the USA can be very expensive, if the parts are obtainable at all. Difficulties arise when distribution changes occur, for example the TS510 and JR310 were not sold by the present Trio importers. On the other hand if

No Smoking

I have had several transceivers brought to me which have been purchased from the estates of silent keys. A friend with a somewhat macabre sense of humour looked at one and said "I see you have another cancer sufferer on the bench". The health hazard of nicotine, or come to that it's electrical properties and dielectric constant does not come within my sphere of knowledge, but I can confirm that it is a wrecker of amateur radio gear. Switches, relays and controls all get coated as it remains sticky and attracts dust. Once all the coils and variable capacitors have become impregnated alignment drifts off and there is really no way of completely getting rid of the stuff. The standard layout of many ham rigs and the users mode of operation does nothing to protect against damage from nicotine. The rig is switched on from cold and clouds of smoke are puffed at it whilst the user has a good look round the bands, whilst the fan at the rear draws the air through the entire rig and the nicotine condenses on the cold chassis and components. After a



few hours operation, things get really hot and the mess is baked on. Dust and dirt come in the same way, stick to the gooey mess and after 10 or 15 years of this the rig finally cries "enough".

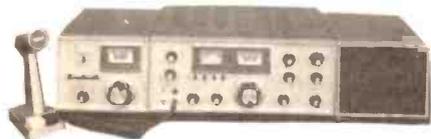
I would not pretend that rigs are regularly written off solely by smoking but it is often one of the main contributory factors in their early decease. Do therefore have a good look at any equipment you are offered, is the metalwork yellow? Can you read the value of resistors or are they covered with sticky goo? At least you can use this as a factor to bring the asking price down.

Heat

Receivers with valves get quite hot, transmitters with valves get very hot. Amateur gear is built down to a price and if used by keen contest types tends to overheat, as also do some of the contest operators! Resistors go high value, electrolytic capacitors dry up or blow up and components generally do go darker in colour. Look inside and judge the amount of "cooking" that has taken place, use your nose (not with the rig connected to the mains!) and check for any signs of burning before parting with your money.

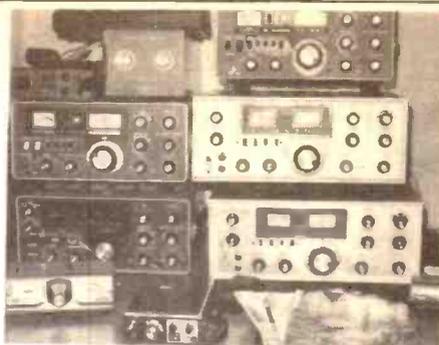
Botched Repairs and Modifications

If a half watt resistor gets hot or a three amp fuse blows, you will always find someone who will cure the problem by fitting a higher rated



Yaesu FTdx401

replacement. Provided that not too much damage has been done (I have just made out a £160 bill as a result of too large a fuse) it is not too difficult to fit the original parts and to ascertain the real fault. Less obvious troubles are caused by the 'peak it for maximum' brigade or the 'if it is loose tighten it' mechanics. I once had a domestic radio in which the complaint was 'very weak'. It's owner was a lorry driver who had given it a routine service by tightening all the tuning cores and slugs! Once again let your eyes be your guide, are the hexagonal holes



in the tuning slugs cracked or have all the seals on the trimmer capacitors and pre-set resistors been broken? Note any components which do not seem original and ask why, after all if you are paying good money you have a right to an answer to some questions.

The same goes for any modifications, some improve equipment but they must be properly documented. Equipment with unrecorded modifications becomes uneconomical to repair. Many popular rigs have been crystallised for the illegal CB bands, so do check that the standard amateur bands are covered, particularly when buying rigs such as the FT101ZD and the FT707. To convert equipment back to amateur band operation at the very least requires some new crystals, and many entail re-alignment.

History Known or Unknown

An FT101ZD was brought in with the comment 'Don't think it will be much'. There had been a short on an RTTY unit and it seemed to have blown the rig. Tests did not seem to make any sense until at last the penny dropped as a few burnt out bits of PCB were noted. What had happened was that 240 volts had



Yaesu FT-200

been injected into the PTT line. A few spot checks were made and almost every transistor and IC in the rig had gone. It looked immaculate and could have sold for at least £450 on a bring and buy stall, but it was scrap. Thunderstorms can produce some very unpredictable results. One customer had his hi-fi antenna system struck and the co-axial down lead vaporised together with the mains lead, leaving only a plating of copper on the wall where they had

been. The outside case of the receiver was blackened and inside the co-axial lead from the tuner head to the antenna socket on the rear had unsoldered itself at both ends and was loose in the bottom of the box. A few tests were made, the antenna lead was re-soldered, the mains lead replaced and very much to our surprise, it worked perfectly! Another receiver was put out of action after a much milder nearby strike and despite the fact that it did not have a mark on it the unit was a complete write-off as almost every transistor and diode in it had blown. Appearances can be very deceptive, so unless you really know who you are buying from, insist on some kind of operational tests. The old legal maxim being — let the buyer beware.

Hot Rigs and HP

It does not matter what you pay for equipment, if it has been stolen or belongs to a hire purchase company, it is not yours and can be re-possessed by it's true owner. Obviously suspect in this direction, is equipment that is too cheap or



Yaesu FT-101 (Early Version)

which is almost new but minus instruction book and normally supplied accessories. Remember that buying equipment that you could reasonably be expected to know is stolen is, in itself, a criminal offence. If caught, you lose the goods and the money paid and may even end up in court yourself. As a trader when buying secondhand items I always insist on paying by cheque and mark the cheque *A/C Payee*. This means that if the guy is not who he says he is, he cannot cash the cheque. I also keep a polaroid camera handy as a double check and take a mug shot, it works



Yaesu FT-101ZD

wonders at stopping people giving me dud cheques as well. You cannot be in the retail business for 30 years without developing a suspicious mind!

A Test Run

The use of an unknown antenna in unfamiliar surroundings can cause confusion. To avoid this, the best way to judge performance is by comparison. Try and enlist the help of some friend who has a fairly good receiver or transceiver and see how the unit you are interested in compares on the various bands. Obviously, you cannot expect something old and cheap to equal the best modern equipment, but at least most of the stations which are receivable on the new rig should at least be heard on the old one. If nothing is available for comparison



Trio JR-599

try removing and refitting the antenna and peaking the pre-selector on all bands. A set which is reasonably sensitive will produce more noise when the antenna is connected and this should peak up with the pre-selector. Calibration can be roughly checked by tuning to the LF end of the 80-10m bands. Even if you cannot read morse you should be able to identify stations calling CQ (DA DI DA DI, DA DA DI DA) as this always occurs near the band edges when any band is open.

SSB Reception

Single side band reception on some of the older receivers can be very difficult. Try turning the AF gain flat out, controlling the volume with the RF gain with the AGC switched off. Turning the BFO to the point of deepest pitch of hiss and then slightly one way will be correct for the upper side band and slightly the other way should bring in lower side band — which is which you will only find by trial. If the deepest pitch of hiss does not coincide with the control in the centre, the BFO could need re-aligning — quite a simple job.

Testing Transmitters

The best simple test of a transmitter is to tune it up via a watt meter into a dummy load. It should then produce its rated power *output* (usually just over half its rated *input*) if you hold the key down or whistle into the microphone. It would be nice to hear the signal on a separate receiver to assess audio quality as well but if the measured output is OK on all bands on CW and it jumps up and down nicely on SSB when you speak into the microphone you can probably risk taking this as read. It is very easy to damage a rig when tuning it up so unless you are familiar with the equipment you are testing, get the owner to do the tuning.

The following are items which the writer has had some experience of, other equipment, not mentioned may be better, but it just has not crossed my path. Values are approximate and assume that the unit is in working order and that no unobtainable parts are needed to bring it up to full performance. The price ranges shown take account of the varying condition of equipment.

Receivers

RCA AR88 (USA)

This is about 45 years old and was used in World War II by the British and US forces. Two versions, AR88LF covers 75kHz-550kHz plus 1.5-30MHz and the AR88D covers 550kHz-31MHz. Both perform well on the amateur bands and repair usually consists of replacing by-pass capacitors and feed resistors which have deteriorated with age. Recommended for the DIY type with experience of electronics servicing.



Trio TS-510

These receivers weigh about 100 lbs, but are readily accessible. Prices from £20 to £85.

Eddystone Receivers

The UK firm of Eddystone now seem to only be interested in the

commercial market but did at one time produce a range of equipment for the keen short wave listener and radio ham.

Eddystone 840C

About 25 years old, 500kHz-30MHz, AC/DC series heater circuit. Looks very nice and impressive, gives reasonable performance on lower frequencies but is difficult to tune on



Trio 9R-59DS

SSB and rather poor on the 20, 15 and 10 metre ham bands. Value around £60.

Eddystone 750

Double superhet 500kHz-30MHz. A bit older than the above but much better performer *if* in good condition. Depending on condition, which could be pretty ropey by now, price would be £50-£100.

Eddystone 680

500kHz-30MHz. Single superhet with two RF stages, can be quite a good performer but many deteriorated with age. £50-£100.

Eddystone 888

Ham band only (160-10m). Quite a good performer if in good condition. Probably around 20-25 years old now. Worth around £80-£100.

Eddystone EA12

A later and more upmarket version of the 888, can be very good. Tends to develop a leaky capacitor in the RF stage which is extremely difficult to replace. Value around £100.

Eddystone EC10/EC10 Mk 2

500kHz-30MHz. This is a 13-16 year old, early design all transistor receiver. Mk 2 version has a fine tune control and a rather crude tuning meter. Can be used on SSB on all bands with very careful tuning, suffers from drift and image problems on higher frequencies and overload on 40 and 80 metres. Value about £40-£60.

Trio/Kenwood

9R59DE/DS

12-18 years old. 500kHz-30MHz. Drifts rather a lot and has image problems on 20 metres. Has a proper

SSB product detector fitted but tuning is a little difficult. Reasonable for £30-40.

JR 500

Ham band only (80-10 metres) around 18 years old but quite a good performer, reasonably easy to tune on SSB and fairly stable, worth around £50.

JR 559

160-10 metres ham band only, solid state, about 15 years old. Fitted AM, FM, SSB and CW filters together with a 2 metre converter. Quite an upmarket set in its day and still pretty good although a little noisy. Worth £100-130.

JR 310

Ham band only 80-10 metres (but some modified to 160 metres) about 15 years old, a good receiver, very stable and easy to tune on SSB. Value around £90.

Yaesu/Sommerkamp

FR 100

Ham band only. 80-10 metres (may have 160m). 15-20 years old but can be very good depending on condition. Value around £70-80.

FRY50B

Economy ham band only Rx, 80-10 metres (covers only half of 10 metre band). About 15 years old, drifts a little but quite good on SSB. Value around £45.

FR 400/FR 400 Deluxe

160-10 metres ham band only, about 15 years old. Deluxe version fitted with CW Filter, FM, 2 metre, 6 metre or 4 metre converters. A very good performer on all bands. Depending on options fitted, value £80-140.

FR 101/FR 101 Deluxe

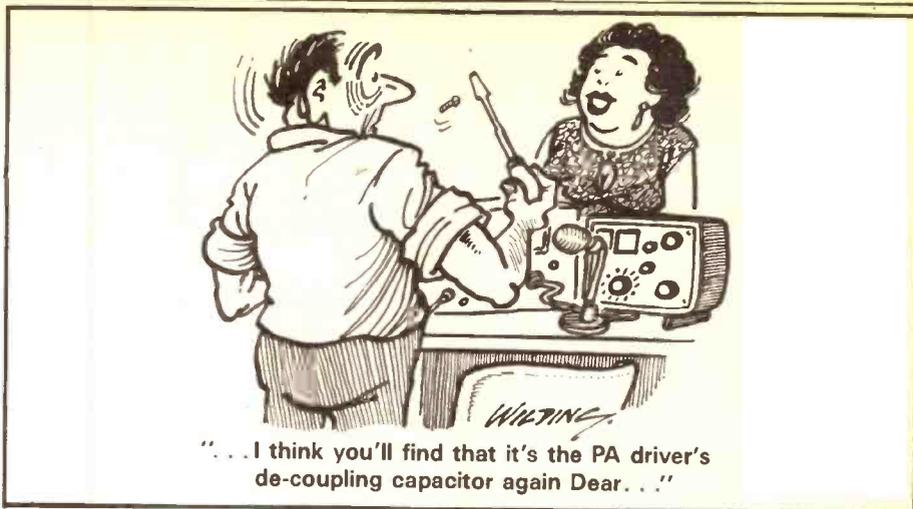
Matching solid state Rx for the famous FT 101 transceiver. 160-10m ham bands, Deluxe version also fitted some broadcast bands, FM, CW filter, and 2 and 6m converters. About 10-12 years old. A very nice receiver and excellent on all bands. Value up to £250, dependent on options.

FRG 7

500kHz-30MHz. 6-10 years old, solid state. Barlow-Wadley loop for accurate read-out to within 5kHz over range. A little short of selectivity but a stable and good performer. Value £130-160.

FRG 7000

250kHz-30MHz. An upmarket version of the FRG 7, giving better selectivity and digital read-out. Worth around £200.



“... I think you'll find that it's the PA driver's de-coupling capacitor again Dear...”

FRG 7770

150kHz-30MHz but will go down to 25kHz at reduced performance. Replacement for FRG 7 and FRG 7000 about 1980. Much in demand up to £330, without memory unit or a little more with.

Tranceivers Trio/Kenwood

TS 500

80-10m 100W PEP output, approximately 16 years old. Works quite well, VFO tends to drift. Value £100-130, dependent on condition if complete with separate AC PSU.

TS 510

Improved and more stable version of above, somewhat short of drive and receive sensitivity on 10 and 15 metres. When complete with separate AC PSU sells for £125-150.

TS 520

100W PEP output similar to Yaesu FT 101, was in production many years hence price varies considerably according to age.

Yaesu/Sommerkamp

FTDX 400

Up to 300W PEP output (with new valves!) 80-10m. This rig was very good except that it flogged the output valves far beyond their ratings and left no room for user error in tuning up. About 16-17 years old, with many now past economical repair, one in good condition would be worth over £150.

FTDX 401

Later version of the above with fan and CW filter. Still over 13 years old, but a good one could be worth over £200.

FTDX 560/FTDX 500

Alternative versions of above usually without fan and CW filter.

FT 101/B/E/EE

Early units covered 80-10 metres,

later versions covered 160-10m, 150W PEP output. Receiver not too good on the original 1971 version but later versions are very popular. Value from about £150 for a tired mark 1 to £350 for a mint (1977) FT 101E. All FT 101s from 1971-1977 can easily be modified to the new WARC bands.

FT 200/FT 200B

80-10 metres. 140W PEP output. Now 10-16 years old but very nice if in good condition. Some earlier units now definitely getting *past it* but later models are a good buy when in good condition and complete with Yaesu AC PSU — price would be up to £220.

FT 901/FT 902

160-10 metres, 100W PEP output. Several versions were made, the top one being the DM model which was fitted with FM in addition to a memory, AM, CW and SSB. A super rig introduced about 1978. Later versions FT 902 incorporated new WARC bands. Value, dependent on version, options and condition, £400-£600.

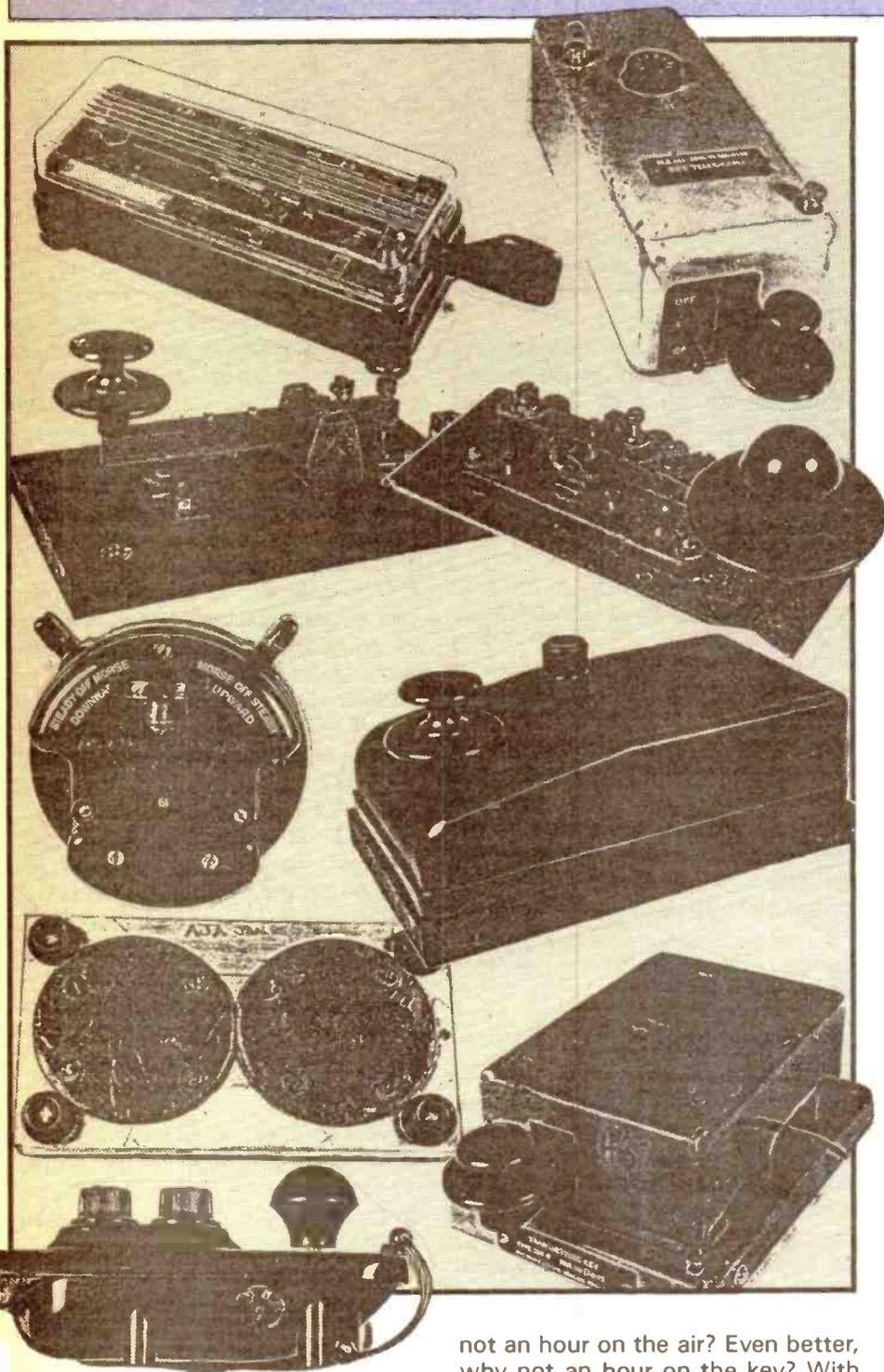
FT 101/ZD

A very popular unit which is basically an economy version of the above. Various versions available with and without FM and WARC bands, value £300-£500.

Please note that the back issue covering the FT101ZD is available for £1.70 (inc p&p) and photo-copies covering the FT200, FT101 and FT401 are also available for £1.50 from the Ham Radio Today office.

G3LLL has asked us to point out that he is not able to supply back copies and would appreciate all correspondence being sent (together with an SAE please) to: 45 Johnston Street, Blackburn, Lancs BB2 1EF.

MORSE KEYS



Hugh Allison, G3XSE, browses around his amassed keys and chooses his pet loves and hates whilst offering a few tips on buying and using.

rallies, had asked me to look out for a decent key at a reasonable price. I bought one for him for £1 and tried it out prior to handing it over. I was so surprised to find it completely different in feel and action to my grandfather's family heirloom, which had always been the shack key until then, that I kept it for myself. From then on no key at a rally was safe, well, no key below £3 was anyway. I've never bothered to count them, but the collection must now be about the hundred mark, and they're all different.

The Technicalities

The knob that you push up and down on a straight key is called the knob, and the bit that is under the knob that goes up and down with it is called the fingerplate. Unlike many CW fanatics, to me the fingerplate is important. I know that my sending position is all wrong, but I am happiest sending with the right hand, index finger on top of knob whilst thumb and middle finger rest gently on the fingerplate.

What, you may ask, about the many keys you see for sale without fingerplates? Here GW Morse Keys come to the rescue. They sell a very desirable key that, unfortunately, does not fall within my £3 limit. However, they have at all the rallies they attend the various bits of their keys, including spare knobs and fingerplates available for a few pennies. I have probably bought dozens of fingerplates and fitted them to old keys. Since I am not preserving keys for the nation or trying to build up an important historical collection, if I wish to screw a fingerplate on under the knob I do so — even if it never had one 50 years ago. If I find keys with chipped or scratched fingerplates,

It had been a perfect day. The morning was spent flying whilst the wife had relaxed with a pile of washing, the afternoon saw me in a deck chair supervising her cutting the grass and now, in the cool of the evening, I suddenly realised that there was an hour for me to kill. Why

not an hour on the air? Even better, why not an hour on the key? With 'four pack' in hand I wandered into the shack, flicked the HF rig on and just couldn't decide which key to use.

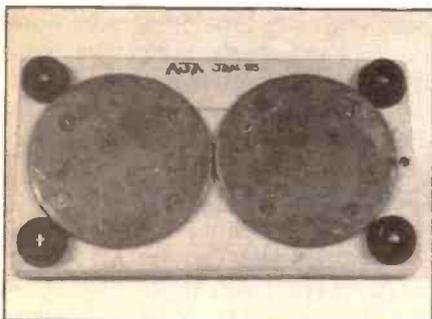
I never made a conscious decision to start collecting morse keys. I suppose it all stems from an amateur who, knowing I attend a lot of radio

which are tiring to use after a half hour or so, they normally get changed too.

Staying put

A morse key that wanders around the bench whilst in use is really annoying. Either your morse suffers or you have to hold the key down with your free hand. This isn't possible if you are filling in the log, adjusting the rig or cracking open another can. The drastic solution is to screw the key to the bench. Go ahead if you like, but there wouldn't be much room left for the rigs if I bolted all of mine down!

Alternatively put rubber pads under the key, either the equipment feet type or the sucker sort. This can be quite successful for an up and down key mounted on a chunk of wood, but I find it difficult to work for a mechanical bug. Send a word like 'book', ie with lots of dashes, and the key will end up an inch to the right. A lot of Vibroplex bugs come with rubber sucker feet and these are a success, but this is mainly due I feel, to the sheer weight of the base.

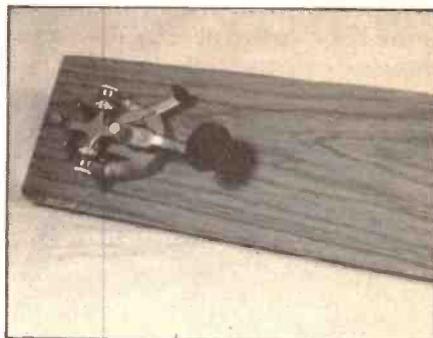


The third method is to mount the key on a chunk of wood and put felt on the bottom. This is surprisingly effective and for the few pence that a scrap of felt will cost, it's well worth trying. Don't go round asking if anyone knows where you can get felt cheap!

The problem is, of course, weight. Quite a lot of old keys are intrinsically heavy and these really do stay put. Your 'cheap'n'nasty' key was probably designed so that a hundred could be shipped over in a matchbox. Screwing these to a chunk of wood would help, rubber feet will improve but a lump of old scrap iron or lead between the feet will provide perfect results as you can see nearby. I bought a key that someone had lovingly mounted on a heavy chunk of slate. This was a disaster because

a very slight distortion in the slate caused the key to rock in use. A square of thick felt on the bottom made it one of my favourites, yet an identical key on a lightweight wooden base is useless.

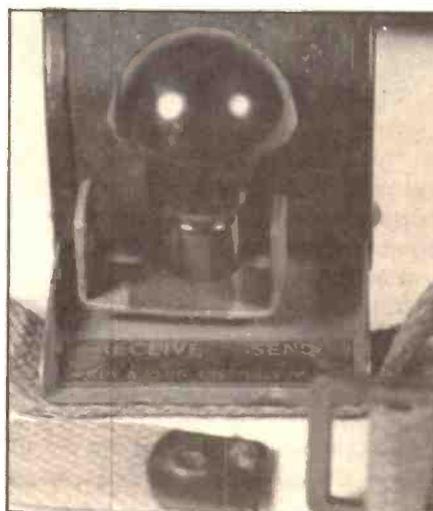
The final technique looks terrible but works well. I bought a very secondhand 'speed key' at the Old Warden car boot sale for 20p. This was mounted on the end of a long lump of melamine shelving (about 18" x 6" x 3/4") with the key, surprisingly, pointing inwards. My



intention was to throw away the melomine but I tried the arrangement and it is surprisingly stable. The secret is of course, that in use you rest your whole arm on the melomine and that, plus the weight of key and melomine, keeps it in place.

Shorting Bars

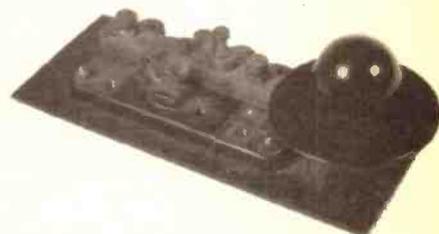
Quite a few keys have a permanently 'on' facility, either by way of a lever or a separate switch. I find this a fairly useful feature, especially when playing with an oddball transmitter since it leaves both hands free to tune up. Some keys have this facility and their owners never know. The stubby little tags below the knob on "key and



plug assembly No.8" (see nearby photo) are examples of this type. The permanently on facility is often not used and the lever system ceases up in the key position, or, over the years, someone takes it off. The clear plastic covered mechanical bug, originally sold under the 'Eagle' trade name, but also under others, also has this facility. If you lean it over to the left it will balance on its side, the weighted moving arm moves down and shorts it out!

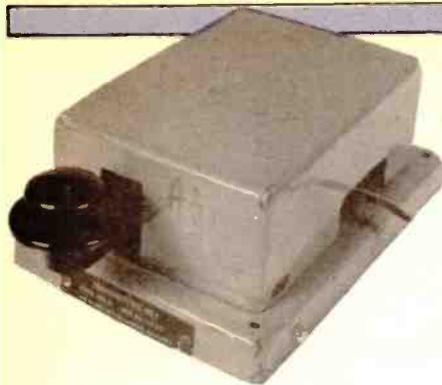
Personal Choice

Grandfather's key, actually a type WT 8A No2 MkII is a firm favourite. I have been using it on and off for over 25 years and I suppose that would be enough to make it fall easily to hand. But it also came



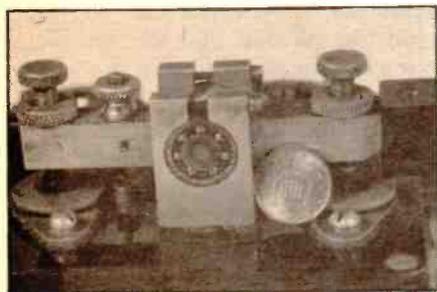
complete with the largest fingerplate of all, about 2" across and as you know, I like something to rest my fingers upon. Grandad didn't know what seed he was sowing when he gave it to a grateful eight year old all those years ago! These keys are freely available on the 'junk' market and are quite excellent.

The key with the best action of the lot has got to be a transmitting key type 365B. Note the superb roller bearing on the pivot point. You can set the tension on this key so light that it will transmit if you sneeze whilst looking at it! This key was built to withstand a direct hit with a nuclear bomb and its sheer weight means its not going anywhere whilst in use. I also hesitate to tell the following story for fear of ridicule, but I swear it is true. I once caught a mouse in it!



Funny Keys

Quite a few keys were designed for use by RAF aircrew in flight. A lot of these, mainly ex second World War, were made to be strapped to the operator's leg. I dislike using them like this, as it's uncomfortable and you are coming at it from a funny angle with your hand. It's also embarrassing when you turn the rig off and walk out the shack. Not only do you look a prize 'twerp' opening the front door with the thing strapped to your leg, but walk far enough and crash, the rig plummets to the floor, pulled over by the cable between key and rig!



The rodent in question had moved into the shack and was grieving me greatly with its presence. Droppings on the rigs were bad enough but chewed through cables — including expensive coax runs — were the limit. Traps and poisons met with no success but one day I flicked on the light in the shack and saw it running up the lead to this key and disappearing inside. Quickly I closed off his entrance hole (the cut out for the lead) with a chunk of scrap aluminium and took the key outside.

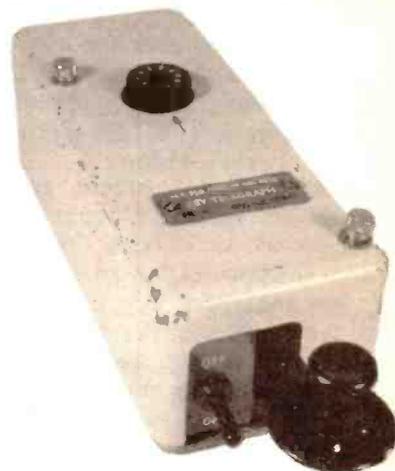
Another firm favourite, for no particular reason, is the key, morse, type D. I actually own two of these. I bought the first one without the cover and was surprised when I bought the second and, opening it up to connect the wires, found it was the same as one I already had!



A real weirdo was the Type B. This was, apparently, designed to be bolted to the wall in an aircraft, some experts tell me they were in Spitfires. The height of the knob above any bench that you care to bolt it next to makes it a real pain to use. I'd be interested if any reader would care to send in details of its use in its service days.

action and are surprisingly light to use. Well worth looking out for and often available for a quid or so.

One key I had always fancied getting my hands on was type 5805-99-580-8558. These are freely available at rallies, but unfortunately normally at about £20-£25. When I saw one at Longleat this year for £1 I'd given the man the money and was off. That



night I couldn't wait to try it out, and they are horrible! The big adjuster on the top varies the gap and you have to open it up to adjust the tension. Even with the tension at minimum they are extremely tiring. I've tried others since and they are all the same. I'd rather send morse on a light switch.

Sources of Supply and Prices

Rallies are your best bet for old ex-service keys. I would like to make a plea though. Let's not all go rushing out and spend silly money on them. If we all walk away from keys over £3, in the end we will benefit from low prices. Mechanical bugs are the same but with £12 as a maximum. New, £3 restricts you to only the speed key and it's quite good.

Common cheap and usable ex WD types are the old types No 2 (all marks), the SKK, the 1056 and the 'bathtub' — always a couple of quid a throw and all quite acceptable. A 'new' ex WD (WD equals War Dept) release that several traders seem to have vast stocks of recently at £3 is both the 5805-99-652-6572 and 5820-99-102-5319. These fairly whizz along at great speed with a positive action and a light feel if well mounted. You will have to dig around for the rarer types and I wish you luck if you are starting your own collection.



The famous RAF 'bathtub' key, actually 10A/7741, is of metal construction internally yet completely covered in a bakelite or somesuch case to insulate it. This is extremely useful if you design rigs with disgusting keying circuits like I do, such as keying the HT on a valve rig or high voltage negative current grid bias supplies. The total insulation means that you don't get a belt if you touch it! These odd looking keys have quite a pleasant



Design and Make Your Own PCBs

The drilling of PCBs is a subject in itself. Fibreglass blunts standard high-speed bits in no time at all, so if you're doing more than a very small amount of drilling, a tungsten-tipped bit will rapidly pay for itself. You will also require a miniature drill,

than the component lead since this helps proper and easy solder flow all around the lead and also provides some mechanical stability. If you drill all the holes out to 0.8mm first say using a tungsten drill, you can then drill the larger holes with ordinary

well as fingers. However, it is safer than other etchants which could be used. Ignore anyone who tells you that ammonium bifluoride is a better agent: it is, but if you get it on you and don't notice, you can get horrific damage to your skin which will need medical attention.

Ferric chloride crystals can be bought from most component suppliers in packs with instructions on how much water to add. You must follow the instructions for mixing carefully. Use a non corrosive container that is not likely to melt as the mixing process, especially with the anhydrous version, is exothermic, ie it gives off a considerable amount of heat. It could even result in a violent explosion of material!

The etching process must be done in a plastic container because it will of course attack metal (violently in the case of aluminium) and glass. If you don't intend etching very often, plastic photographic trays are a good idea. The kitchen and bathroom sinks are not the best places, but if you do use them, ensure that you have lots of paper around and a wet, spare rag to instantly mop up any spillages.

The next problem with the etching process is that you will have to continually rock the container to 'agitate' the solution. If this is not done, etching will be very patchy and slow. There are ways of automatically agitating the bath including some rather ingenious methods. One uses a small DC motor with an eccentric wheel mounted above the tray and connected to it by a piece of string to pull the tray up and down slowly. Etching will also proceed faster if the solution is warmed to between 30° and 40° C — below about 15° C and you will wait all day for something to happen.

Whatever you do, don't go away and forget about it. Keep an eye on progress using a pair of plastic photographic tongs to hold the board up for examination. Once all

"Come up and see my etchings", said the old hand to the beginner, "but don't bring that high speed steel bit with you..." Tony Bailey, G3WPO, reveals how its done.

as the bearings on standard hand-drills are just not up to the precision work of PCBs.

You can obtain a miniature drill for around £10 and a benchstand will cost £17 or so. The benchstand is a necessity when using tungsten drill bits because they are brittle and at around £2 a time, not cheap to replace. In any case, you'll get much better results using a bench stand. Finally, you can get sets of drill bits and other tools (burrs, polishers, etc) for a variety of prices — but do check what sort of bits are included in the kit.

If you are going to do a lot of PCB work, you could spend several hundred pounds on a special drill complete with vacuum swarf extraction but this is not necessary unless you want the best.

Most modern drill stands are provided with a clear perspex safety screen for the operators protection. If you buy one that hasn't got a screen, invest in a pair of plastic safety spectacles for use when drilling. Getting a piece of fibreglass swarf in your eye, or worse a piece of broken drill tip, is not a pleasant experience.

Hole Sizes

The usual hole size for general component mounting is 0.8" or 1.0mm dia, with larger holes where appropriate. In general, the hole should only be fractionally larger

HSS ones to keep the cost down. Used in this manner, they last a lot longer.

Once your holes are drilled, the PCB should be cleaned up and keyed (or 'roughed up') for marking with the pen. The best way I have found of doing this is to use one of the household liquid cleaners applied directly to the board with a nylon scourer and rubbed in a circular fashion. Don't make it wet with water while doing this as it destroys the abrasive action which gives a good key for the pen. Once clean, avoid touching the copper surface with your fingers and dry off with some kitchen towel.

The tracks can now be drawn on with the pen, following your layout. If you end up with some tracks touching where they shouldn't, wait till everything is dry and then use a scribe to remove unwanted etch resist. Finally, before going any further, *double check your layout!*

Etching

The standard etching fluid is ferric chloride, which is obtainable as a made up liquid or more cheaply, by buying packs of the anhydrous or hexahydrate crystals and dissolving these in the correct amount of water. Remember ferric chloride is poisonous and corrosive and will make one hell of a mess if it gets where it shouldn't! It is very good at staining sinks, baths, trousers and carpets as

unwanted copper has gone remove the board and rinse under cold running water for several minutes. If left for too long, the etchant will start getting under the resist and removing the tracks you patiently drew in.

For a club or a regular PCB maker, it is worthwhile setting up a more elaborate etching bath. You can purchase a pukka bath with built in agitation and temperature control for an outlay in the region of £100+, but there is an easier way. Many years ago I made an etching bath, which is still being used, from a plastic fishtank and an air-pump, also intended for fishy use. The pump supplied agitating air via plastic tubing running down the sides of the tank and glued to the bottom to keep it in place. The amount of agitation can be controlled by an adjustable air valve bought at the same place as the pump for a few pence! PCBs are held for etching by a shelf arrangement which dips into the solution, made from perspex.

To keep the etchant at a suitable temperature, I used one of the flat heaters intended for 'home-brewing' beer and wine and on which the fish tank sits. With a bit of adjustment to the positions of the tubing in the solution for even etching, PCB preparation becomes very easy.

Remember to keep an eye on the time. At first it takes about 8-30 mins to etch with fresh solution and lots of agitation. Once this has risen to about 60 minutes, complete with loads of sludge at the bottom, it is time to replenish the etchant. This is especially the case if marker pens are used for the track pattern. These do not have indefinite resistance to the etch process and after a longish immersion, the tracks will start to be eaten away. If it takes more than an hour and a half, the etchant really needs to be replaced, otherwise etching becomes very patchy. Leave the lid on the bath when it is not in use to avoid evaporation. You may need to add a little fresh water from time to time to keep the level up.

The variation in time for etching is dependent on the board size and how many large areas of copper there are to remove. Etching takes place much more rapidly along the edges of tracks and the edges of the board compared with the centre, and slowly in large expanses of copper. Hence the reason for keeping an eye on progress.

Another Method

There is a commercially available 'kit' for home etchers which keeps everything safely packaged during the process and can be used many times before it is exhausted. This is the 'Seno' system and it consists of a long plastic bag which can be sealed at various points by means of plastic clips.

Initially the bottom of the bag contains ferric chloride crystals with a plastic clip used to seal the bag just above them. Warm water is added above in the correct quantity. The top of the bag is then sealed and the lower clip removed to allow the water and crystals to mix. The bag is then held upright and sealed again with the clip just above the solution. Remove the top clip, drop in the PCB, reseal the top, remove the lower one and lay the bag flat so that the board can be etched while rocking gently.

Once etching is complete, the bag is again held vertically, and the PCB retained at the top while the etchant solution is again sealed off at the bottom with the clip. Remove the top clip and wash the PCB clear of etchant solution. In theory, you shouldn't get etchant on anything but the PCB. Once the solution is exhausted, a special chemical is added which turns it into a solid lump which can be thrown in the dustbin safely. There should be sufficient etchant to clear about ten Eurocard (100 x 220mm) sized boards.

Cleaning Up

With the board etched and thoroughly washed, the etch resist can be removed with meths and the board cleaned again with a scourer. It is important that the board is well washed after etching — if you leave any ferric chloride behind, it can still react over a long period of time and eventually weaken tracks and cause failure.

You now have a clean PCB ready for populating and soldering. Most professional boards are roller tinned before assembly — and may well have a resist coating screen printed on for automatic soldering — but this is not easy for an amateur. Trying to tin all the tracks with a soldering iron may well make the copper lift from the substrate and is not recommended, except for small areas.

There is also the problem of the



copper tarnishing through oxidation. There are two methods of preventing this; either with a solder flux coating or to electrochemically deposit a thin layer of tin onto the copper. Both these methods are available from certain component suppliers. The second method is better but is more expensive. There is also an aerosol protective lacquer which can be soldered through.

The Photocopy Way

An alternative to manual track marking, comes where you have a printed magazine layout and access to a photocopier (it has to be the type that fuses the toner to plain paper for this to work). It is possible to obtain a material called TEC 200 film (from Technibond Ltd, Lisle Road, High Wycombe, Bucks HP13 5SH — Tel. 0494 448891 — this is a special plastic material which is put into the copier instead of paper and produces something resembling a projection transparency. This is then transferred onto the copper clad board using a hot iron, whereupon the toner material melts and forms a varnish-like, acid resistant coating. The carrier film is removed and the PCB may then be etched as normal, after which a solvent such as acetone can be used to remove the resist.

The only thing to watch here is the photocopier itself — very few reproduce what they are copying at exactly 1:1 for copyright reasons. It is unlikely to affect most PCB designs but anything using very dimensionally conscious long components such as 40 pin DILs or DIN connectors may have a slight overall sizing error when the board is made.

Metre wave

There have been signs lately among increasing numbers of VHF operators of withdrawal symptoms in respect of the two-metre band. These symptoms appear to take three forms.

First of all a fascination with bands other than 'Two' begins to develop, more especially with 4

Jack Hum, G5UM, investigates the two-metre withdrawal syndrome.

metres and 6 metres, where every contact is an event and a sense of the old pioneering spirit of ham radio still prevails. This migration to other bands tends in turn to induce the second symptom of 'Two metre withdrawal', and it is this:

When a new band is introduced into a metrewave operator's station the need for a new aerial to go with it is obvious. What is also obvious is that if the new aerial happens to be a 'big bedstead' like the beams needed for Four and Six then something has to give. Often it is the two-metre aerial which must be surrendered in order to make way for the new. In many installations there just isn't enough mast space (or chimney stack capacity) to take any more aerials.

What of the third 'Two metre withdrawal symptom'? This is a compound one expressed in the phrase: "Oh, I don't have any time for Two any more". Sometimes the term is used literally in the sense that the speaker is so preoccupied with the new bands that there are not enough hours left to continue to remain active on Two. But there is sometimes a psychological (sociological?) reason for quitting the two-metre band: "I don't have any time for Two because I don't like it any more". Asked why this dislike has developed the speaker will probably tell you that it is the overcrowding on the band or the idiot behaviour to be heard on it — or both.

Listening to this point of view it is easy to imagine that the speaker is adopting a slightly holier-than-thou attitude to Two tinged with a touch of that snobbishness which doesn't get anybody anywhere. Even so, there is an increasing disenchantment with the two-metre band and it is worth spending a few paragraphs to analyse why this should be happening: in other words, why Withdrawal Symptom No 3 (I haven't any time for Two) is now so much in evidence.

Straight away it may be said that some of the

things to be heard on the band are enough to drive one off it for good. Yet the inanities and profanities poured forth come from a tiny minority.

More Spacious Days

In more spacious days the idiocies to be heard on Two would rarely occur. For one thing, there was a vigilant monitoring service capable of uttering a warning (the 'pink ticket') to the miscreant and if that went unheeded, of unceremoniously removing his right to transmit. For another thing, the average ham felt he was privileged to be allowed to make use of that rare commodity called frequency spectrum and he took good care not to abuse that privilege. Apart from that, he possessed such pride in his unique callsign that he would never allow it to fall into disrepute in other people's ears.

Those spacious days are gone. If the monitoring service is still vigilant the results of its labours are rarely evident in the prompt removal (or indeed court appearance) of offenders. Underfunding and undermanning of many essential Government services are accepted by all and the monitoring service may be suffering like the rest.

All of which suggests that the Amateur Service must be its own monitor even though it lacks the force of law to support it. Although it cannot issue 'pink tickets' it *can* influence trends by the force of example on the air. Good operating is infectious

Maintaining Standards on Two

1. Always identify yourself clearly. In a quick-fire QSO always give your callsign at the beginning and end of each over.
2. Never use names as callsigns: they are not.
3. If you use a repeater always check the input, remember there are many in the queue waiting to use "the box" and it's anti-social to hog it.
4. Don't laugh at your own jokes.
5. Always state your location when making a CQ and do so regularly throughout a contact to assist others to turn beams on to you.
6. Use accepted phonetics within a reasonable degree of flexibility.
7. Imagine you are talking to the other party face to face, and therefore avoid long-winded monologue overs.
8. If you have two-band capability engage your QSO partner in a cross-band duplex contact (instant-talk each way), taking care to identify frequently and to check both frequencies in use.
9. Never be inhibited by that "Mustn't advertise" superstition: no objections can possibly result from your saying that you are using a particular rig or saying where you bought it. It's the way that you do it that's crucial.

and others will tend to follow suit. Even before would-be hams clear their RAE they can be well and truly indoctrinated by their instructors on how to comport themselves on the air when the magic call sign is obtained.

But setting examples over the air and in RAE classes has its limitations: some of the anomalous operating to be heard on Two comes from persons so thick or so intransigent that all the pleading and example-setting in the world will not wean them from their errant ways.

CB Influence

One school of thought holds the view that it is largely the ex-CB operators who are the culprits, "Two metres is getting just like Citizens' Band" is a complaint heard many times a week over the air. yet thousands of CB people come to ham radio fully conversant with communications procedure and simply need a few weeks' experience on the amateur bands to learn that the jargon is somewhat different from that on 27MHz (see HRT, November 1985 when 'CB speak' and 'Ham speak' were compared).

It might also be added that those same thousands of ex-CB people would have belonged to CB clubs which were quite as fraternal and instructive as many an amateur radio one. So may we have cease to the complaint that "Two metres is becoming like CB"? The term is used in a

pejorative sense as if everything heard on the CB channels was rubbish, which it isn't; plenty to be heard in the two-metre spectrum is rubbish. Indeed, many a CB-er listening to it might be put off ham radio for good!

Best Band We've Got

Far from decrying 'Two', many tens of thousands of today's operators would claim that it is the best VHF band they have available. "Best band we've got because it always gives you a contact either direct or via a repeater wherever you happen to be": this is a widely held view. Should you happen to run into an idiot on it you can take two courses of action: you can avoid calling him if you hear him again, or you can point out to him the error of his ways in the most diffident manner possible to obviate any suggestion that you are preaching at him.

If you feel that the word 'idiot' in the preceding paragraph is a little too strong, never forget that there are enough 'IQ-zeroes' and exhibitionists around on Two to give it a bad name. Yet there are plenty of other operators on the band who sound and behave like decent types but seem to have much to learn, even though they won't always admit it! You, the experienced HRT reader, may be able to suggest a few more. If you do, then a Letter to the Editor enumerating them might be no bad thing to write.

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Up, Up and Away!

My garden is large and approximately 400 feet long but without any natural antenna supports such as trees. Fate has arranged that these grow in abundance on the adjacent property to the north side on steeply rising ground. The best of those trees rises to about 80ft over the mean level of my garden. This tree has become the unfortunate target of my attentions and this is the culmination of many attempts at placing a line over that tree without killing myself or anyone else.

Chuck A Half Brick

My first SWL antenna was a nondescript affair attached to a limb of one of those trees. The anchor point was obtained by hurling a hammer head attached to a length of baler twine over the chosen limb. The hurling was alternated with 'whirling' in the manner of a hammer thrower and releasing the line at the optimum point of the cycle. This technique served the immediate purpose but cannot be endorsed since the dangers to life and limb are considerable. The line which is strong enough to withstand the whirling weight had too much friction and inertia to be taken over successfully. Retrieving failed attempts is most dangerous; an extra hard pull to dislodge the weight from twigs causes the weight to fly directly at the puller.

My then 5 year old son was quite taken by this new game and privately resolved to have his own antenna farm. He bored a hole in a large potato, climbed into his tree house and repeatedly threw potatoes over the greenhouse whilst I was at work. At this point, I decided that we needed a trials ground which turned out to be a particular, much decorated tree in a grassy field nearby.

DIY Archery

The technique of bow and arrow involves using the services of your local archery club. However, if you want to go to this extent you might as well buy a mast or hire a tree

surgeon. Instead I took to the woods and fashioned a bow from 6ft of hazel and a length of upholstery twine. The arrows were 4ft lengths of dowel with a twist of plumbers lead and plasticine attached to one end.

Do you want to get your antenna airborne but don't want to ruin your chimney or buy a mast or tower? Trees can be a natural antenna support but as Malcolm Kirk, G4XMK, realised they do have their problems...

This contraption managed to shoot a free arrow 80 metres! Rather than trying to measure the range I found it was much easier to time the flight of the arrow. Half the flight time is spent falling and if the flight time is x seconds then the height was $4x^2$ ft.

The best line to use is monofilament nylon available from any fishing tackle shop. I use mine on a spinning reel attached to a fishing rod for convenience. Having tried the bow and arrow in free flight it was necessary to prove its ability when tied to the nylon line with respect to range estimation and safety. I fired arrows repeatedly tied to 20m of line before being satisfied that the arrow never broke free. Initially, the line was dispensed directly from the reel with the bale bar aside. However, I found having loose loops on the ground gave noticeably better range but can only be used on very clean ground.

Further experimentation led to the finding that it is much easier to get good results with deciduous trees in winter since the leaves are surprisingly effective at deflecting arrows. Furthermore, the exact route followed by the nylon line is visible

in winter using binoculars but quite impossible with full leaf cover. Using this technique, it was possible to get a line up 50 or 60ft into most trees relatively easily. However I have largely abandoned archery in favour of the catapult.

Catapult

One day after a rare burst of extravagance I returned home with a 'black widow' catapult. After an excellent and well fortified lunch, I decided on what is known in my working life as 'big bang testing'. As the 1oz of lead soared over the highest tree I mentally added several 1000km to my best 80m DX. My thoughts quickly turned to some panic as the weight carried on towards the next parish with 20m of nylon in train. Some days later, I heard of a neighbour's dog dying in strange circumstances which caused a sharp twinge of conscience. Fortunately the dog was later proved to have been several miles away at the crucial time.

I have now settled on using hard rubber balls from the local toy shop. Do buy several as you will certainly lose some. If you buy lurid colours to see them easily, do consider that several are likely to end their days dangling on the very highest twig of the tallest tree in your neighbourhood. This tendency to snag is the single disadvantage of the catapult since the arrow almost always falls through cleanly.

At odd moments at home and now after several JA sorties I have tried almost every ballistic method as well as kites. The catapult with monofilament nylon is easily the best. I am currently considering the possibilities of those jointed canes used for sweeping chimneys. The possibilities of trees at the QTH are now fairly well covered and I am presently speculating on is a wind up 80m vertica for the winter. I have located a possible source of helium I now need the borrow of a balloon. I wonder what the local PYO strawberry field do with theirs in the winter?

Practicalities

Amateur radio can be a very costly hobby, just looking through the advertisement pages of any radio magazine will confirm this very quickly. Transceivers, receivers, scanners, handie talkies and all the gadgets to go with them can cost a packet. This is fine for anyone with a big bank balance, but for lesser mortals most of this nice equipment is simply right out of the question.

Ian Poole, G3YWX, reassesses the use of simple current limiter circuits and stopper resistors for unwanted oscillation.

There are at least two ways round this problem. One is to buy second hand equipment which is a few years old. If one takes a good look at what is available it is possible to acquire a very good station relatively cheaply. It is also surprising to find out how well designs which are 10 to 15 years old perform in today's conditions. In fact the main improvements have been in size reduction and increasing the number of facilities available.

Even second hand equipment can be expensive and this can be one of the many reasons why people turn to building their own. Whilst it is usually out of the question to build an all band HF transceiver it is possible to consider some of the QRP designs around. Not only are these projects

reasonably easy to construct but they are also quite cheap, especially if a lot of components can be found in the junk box, often the case. Another advantage is that these projects are great fun, I have found that I get far more pleasure from using equipment I built myself than using commercially made equipment. For me, building and operating much of my own equipment is what amateur radio is all about.

A Simple Current Limiter

Power supplies are always prone to having their output short circuited. It only takes a screwdriver to be dropped and it invariably comes to rest across the power lines, or a probe to slip causing a short to earth. Fortunately virtually all regulator ICs, as well as commercially made power supplies, have various forms of current limiting built into them. However the simple regulator circuits that often find their way into home-brew equipment occasionally have no current limiter and tend to blow if their outputs are shorted. In many cases it is unlikely that they would ever require a current limiter but in others it can be very useful.

Recently, I came across a very easy, oft used, way of adding current limiting to an emitter follower circuit, shown in Fig. 1. It is very simple using only three extra components, namely two diodes and a resistor. The way in which it operates (Fig. 2) is also very simple. Under normal operating conditions there is a voltage drop of 0.6V across the base emitter junction of Q1 plus a small drop of less than 0.6V across R2. As each of the two diodes require 0.6V to turn on, under normal conditions they will not conduct and have no effect on the circuit. However as the current drawn from the circuit increases and the voltage across R2 increases to 6V, then the two diodes start to conduct and pull the base voltage down,

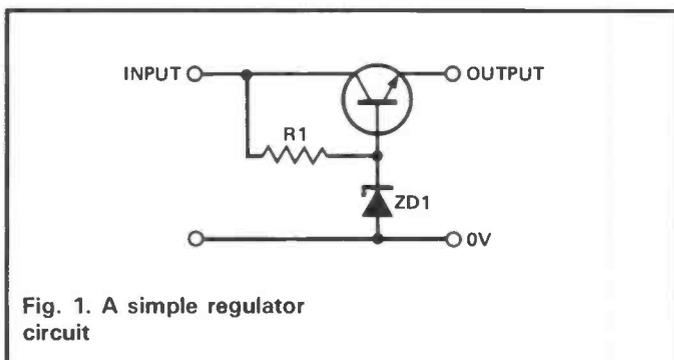


Fig. 1. A simple regulator circuit

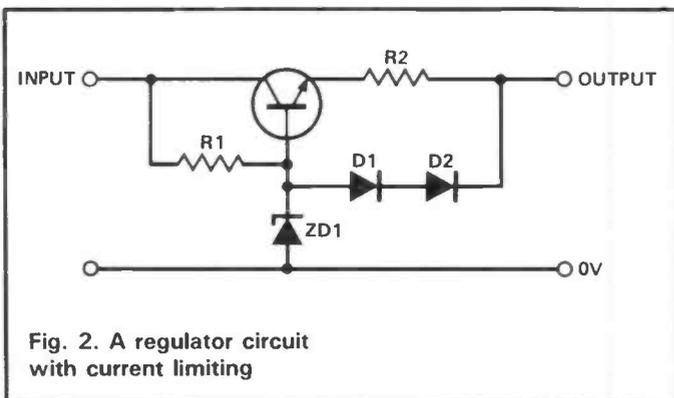


Fig. 2. A regulator circuit with current limiting

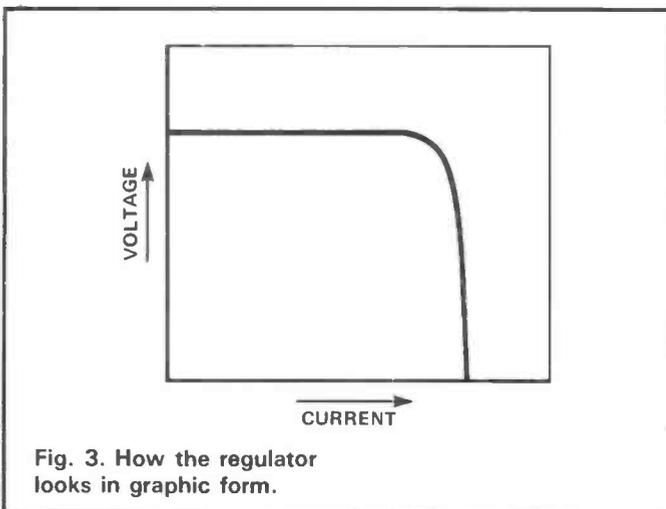
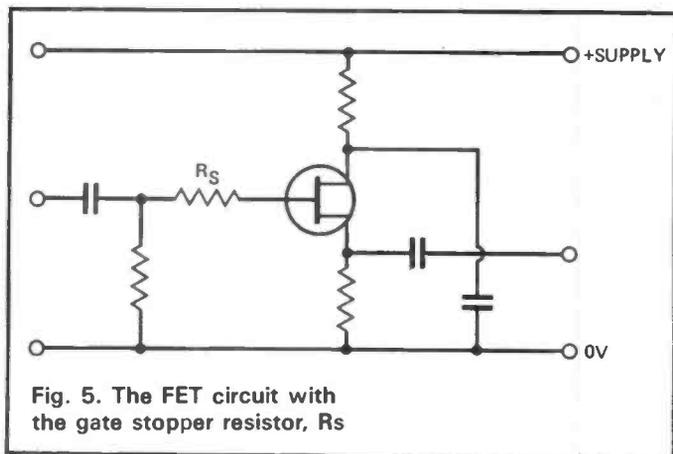
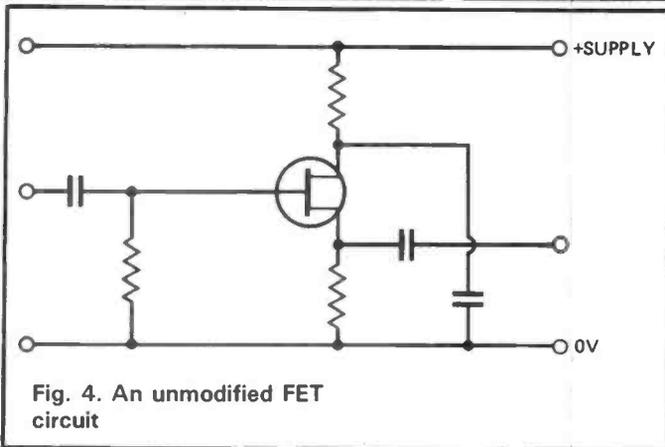


Fig. 3. How the regulator looks in graphic form.



thereby reducing the output voltage and limiting the current. This means that the value of R_2 should be chosen so that it develops 0.6V across it when the maximum permissible current is drawn from the circuit.

However, it does have one drawback. As R_2 is placed in series with the output and has a voltage drop across it, this has to be tolerated by the load circuit. Fortunately this is not a problem in typical amateur radio applications.

Stopper Resistors

Many of the problems encountered when building circuits revolve around stopping things from oscillating. In fact it is an old joke that when you want something to oscillate it won't and when you don't want it to oscillate, it will! The snag is that it isn't just a joke and the problem is encountered by home constructors and professionals alike.

In these days of high technology silicon hardware there are still a few lessons which can be learnt from the days of valves. One of these was brought back to me only recently when I was trying to sort out an RF circuit using an FET. As you might guess, the circuit was oscillating.

The solution to the problem was simple. All it required was one extra resistor to completely stop the oscillation. If the circuit had used valves it would have been called a grid stopper resistor, but with today's devices it is a gate stopper. The resistor was inserted as close to the gate as possible and its value of 47 ohms was large

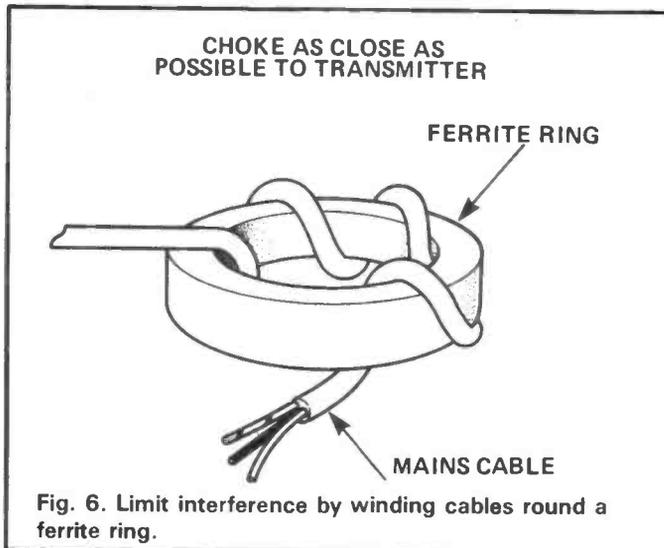
enough to stop the oscillation without noticeably impairing the frequency response of the circuit. Obviously if the value of the resistor was increased it would cause the gain of the circuit to fall, especially at high frequencies where the gate channel capacitance has to be taken into consideration.

The resistor proved to be a simple solution showing that some techniques can still be just as effective today as they were in the days of valves, heaters and HT.

A Simple Mains Filter

Interference on any form of domestic equipment can be a very annoying problem for radio amateurs. Unfortunately most transmitting amateurs will have experienced it in one form or another from time to time and it is often difficult to cure. Neighbours are not always understanding about their new video, hi-fi or TV being *got at* even though the problem is often caused by direct pickup of the radiated signal. However, this is not always the case as sometimes the RF can be carried along the mains cabling in the area. This tends to happen more often if an unbalanced aerial such as a long wire is used, because the mains wiring then acts as an earth or counterpoise.

If RF is being carried along the mains then there are various methods for filtering it out. One way is to build a proper low pass filter, but this can be time consuming and fairly expensive. A much quicker and cheaper way is to use a toroidal choke. One of these can easily be made up by simply winding the mains lead round a suitable ferrite ring. Although different types of ferrite ring will possess different properties probably the most important factor will be its size, as the centre hole will have to be large enough for the mains lead to pass through three or four times. If several rings are available then each one can be tried to see which gives the best performance. In any case, if RF is getting onto the mains lead and a ferrite ring is available then it is well worth spending a few minutes winding the cable round the ring to see if it does make a difference.



BV2A — No1 in Taiwan

Around 2500 years ago Confucius moralised on the relationship between a ruler and his subjects. Although 20th century Tim Chen bears little physical resemblance to the ancient sage, he has carried a

boasts a membership in excess of 4,000 enthusiasts. Of course, very few of these are actual amateur radio enthusiasts as 99% of the membership is drawn from the military, aeronautical and naviga-

1985, most of which has been under strict control with virtually no chance for the licensing of additional stations. Strict control is still very much part of the amateur scene in Taiwan with BV2A/BV2B having to observe a number of regulations, including:

- operation on 7, 14, 21, 28 MHz only, although permission is being sought for 80 metres which should help the five band DXCC award hunters.
- spot frequencies only of 14.025, 14.040, 14.218 and 14.250 to be used on 14 MHz.
- no communications with either mainland China or the Soviet Union although QSOs with eastern European stations are permitted.

"There is official monitoring on the bands," said Tim Chen, "but I don't know what the punishment is, because I've never infringed any rules."

Strict controls are likely to remain, though a thaw began in September 1983 with an Italian amateur radio group making a direct application to the Ministry of Communication for permission to operate a DXpedition for five days. Having assisted previous unsuccessful applications, this time Tim simply and quietly asked, "Are you going to approve this application?"

"Why not?" was the startling government reply.

After the Italian group came a seven day team from Finland and the Netherlands in April 1984. Then in July 1984 a team of ten Japanese amateurs visited for ten days and included the first woman to operate in Taiwan, Michiaki Watanabe, JH1KRC, who with her husband Miwako, JP1LAB, were also the first DXing couple. The group were also the first amateurs to operate on 144/430MHz satellite mode. These

Up until a year ago, there was really only one amateur radio operator in the whole of Taiwan — Tim Chen. However, Tim, using the callsigns BV2A and BV2B, has seen some considerable changes in attitude towards amateur radio from the government. Tom King, VK2ATJ, has been to Taiwan to see what has been happening.

slightly modified version of that discussion into the modern era. Instead of philosophising on a monarch's conduct, Tim Chen has, for the past 25 years, been involved with the more concrete issue of government action and its effect on the people. The issue, of course, is the full and unrestricted introduction of amateur radio in Taiwan, Republic of China.

Tim Chen has been involved with amateur radio for some 45 years, during which time he has held the exotic calls of XU6A and C3YW. Since 1960, he has been the lone voice using the callsigns BV2A and BV2B. These are not privately licensed amateur stations, as both calls are actually held by the club station of the China Radio Association. BV2B is the call sign for the Taipei club station which is located in a 12 storey building in the heart of the capital; while BV2A is located in southern Kaohsiung. Tim acts as director of the club stations and as the sole operator has consequently become known as Taiwan's number one.

The China Radio Association

tional industries plus railway personnel and equipment manufacturers.

Stringent Regulations

BV2A/BV2B's 25th anniversary as a club station was celebrated during



Tim Chen at the club station, BV2A, no longer a solitary voice emanating from Taiwan.

first three DXpeditions were a great success for the many amateurs they contacted around the world. The total of DXpeditions to date is nearing the dozen, all using BV2C as well as other designated callsigns.

Media Impressions

Perhaps of greater importance was the amount of media publicity generated in Taipei and around Taiwan. Newspapers and magazines carried major items to the extent of front page coverage and radio and TV had broadcasts involving on the air contacts. These favourable stories showed the public and government what unique friendships can be developed through amateur radio, and officials finally realised how it could easily assist in the process of enhancing the Taiwan image overseas.

Government machinery moved rapidly. In late October 1984 the first Taiwan amateur radio exams were given to 81 applicants. Only Chinese nationals over 18 were allowed to

apply. Just one woman from the Technical Institute sat for the day long exam of electrical and electronic theory, international rules and regulations, English communications and geography and morse at 13 wpm. The exam was administered by the Department of Licensing and Regulations, although Tim's 25 years of amateur experience in the Republic were called upon in preparing the test papers.

25 applicants passed all elements of the exam, only 12 applied for a licence. The first four new amateurs in Taiwan have been licensed as BV2BA, BV2FA, BV7JA and BV7KA. The remaining eight were expected to receive calls in late 1985/early 1986. By then it will nearly be time for the next exams which were scheduled for the spring of 1986.

The 30th anniversary of the China Radio Association was celebrated with the first special call sign of BVOCRA, which was used until 30th December, 1985.

Even with the new private stations BV2A/BV2B will continue to operate as CRA club stations. In

addition, BV2C has been set up on a permanent basis for DXpeditions and foreign operators, although DXpeditions generally have special callsign allocations. These have included BVOAA for the Finland/Netherlands group and BVOJA/BVOYL for the first husband/wife team from Japan.

Although some of the new amateurs may homebrew part of their stations, the financial difficulties experienced in many Asian countries will not be a problem. Because of the island's high standard of living — second only to Japan in East Asia — not even the 25% duty rate will deter new BV amateurs from purchasing the latest black box from Hong Kong or Tokyo.

Taiwan's affluence was quite noticeable as I walked the streets and lanes of Taipei. Even though the 2.3 million strong metropolis is a "world capital", it's a safe city to independently explore. Armed with a detailed map and a few suggestions from the Taiwan Visitors' Association I set out for the highlights of the sprawling city...

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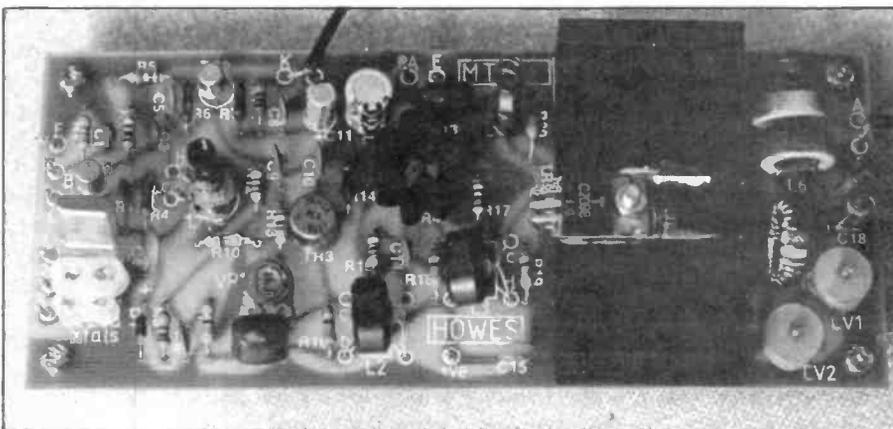
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REVIEW:

HOWES TX20 KIT

Sometimes newcomers to the hobby ask me about the cheaper ways to become an active radio amateur on the HF bands. My general advice is that if they must spend hard earned money, then spend it on a good receiver. The receiver is the starting point of radio communication, hence the oft quoted, "... if you can't hear 'em, you can't work 'em". Armed with a decent receiver, it is a relatively easy matter to build a transmitter for CW operation on the HF bands — and without a doubt CW is where they ought to start. It



One of the cheapest ways of getting onto HF is to build a CW transmitter from a kit and use a secondhand receiver. But how good are the kits? George Dobbs, G3RJV, assesses the Howes MTX20 to see if it would get him onto 14MHz.

keeps the morse going after the morse test is over... and they may cause less harm!

The good receiver need not be all that expensive. There are many good buys on the secondhand market and for my money, most of the older receivers are better than the contemporary models. Some amateurs fight shy of buying a valved receiver but they can actually be a better investment than a modern solid state model. In many recent receivers, designers have fought — and sometimes failed — to make solid state do what thermionic electronics does with ease. I well remember a well-known RF design engineer being asked what mixer IC he would use in the front end of a receiver if he had the choice. "If I had the choice," he said, "I would use a valve." A lot of good valved receivers are still available at very reasonable prices.

A Good Option

In my early days in amateur radio everyone used 'separates': a

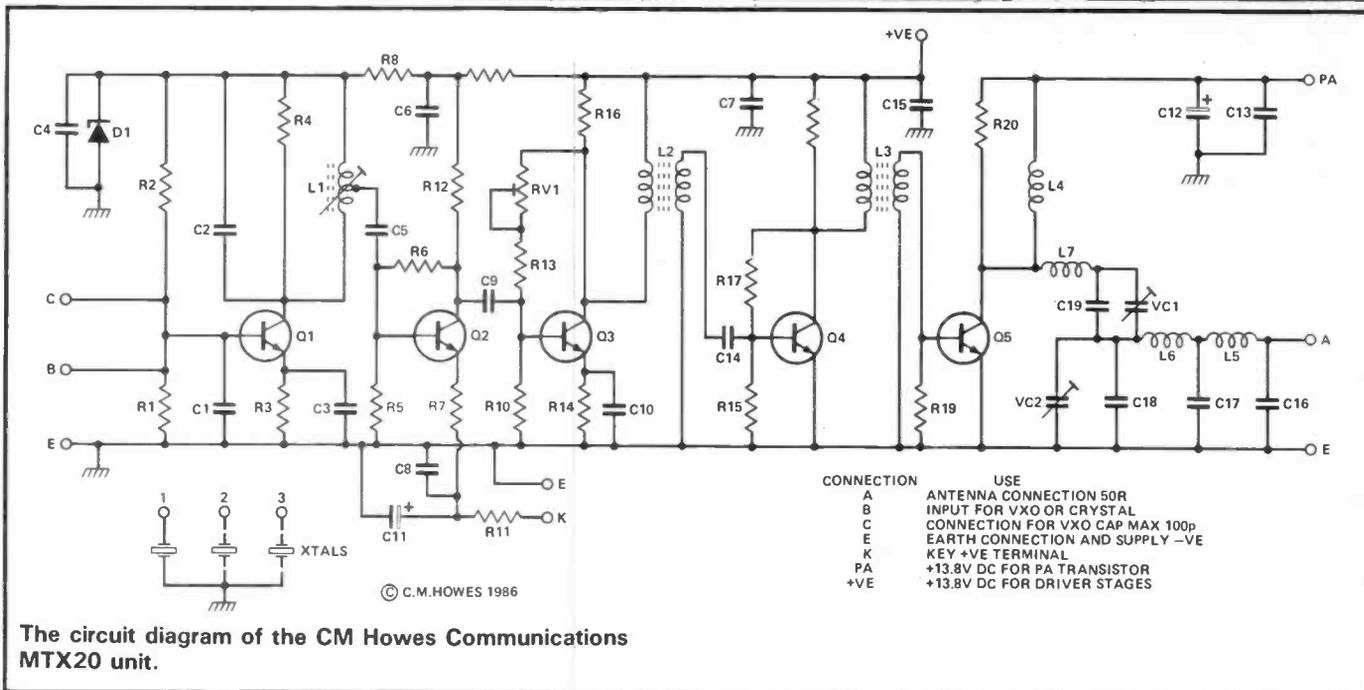
separate receiver and transmitter. The operator had to net his transmitter to the same frequency as the receiver to effect a contact. In

MTX20 Brief Specification	
Output power:	2 to 10 watts RF output (adjustable)
Spurious outputs:	Harmonics, better than 50dB down. Keyclick filter.
Crystal frequency:	QRP calling frequency 14.060MHz provided, provision for VXO operation and external VFO (or 2 other crystals on PCB).
Output conditions:	50 ohm unbalanced output, VSWR better than 1.5:1, PA will survive severe mismatch.
Power supply:	Nominal 13.8 volt DC supply capable of 3A is recommended.

these days of transceivers with a common VFO for both transmit and receive, this may appear to be a cumbersome operation. However, I think it is a good idea for beginners to start with separates or even for more experienced operators to have a little practice in the technique. It does teach the operator the importance of the relationship between the transmitted and received signals. It also dispels the mistaken idea that if an integrated transceiver is in use, the station must be transmitting and receiving on exactly the same frequency. Just listen to a few QSOs on the bands! The use of separates is not a bad option.

Another useful option is to build the transmitter to go with the existing receiver. Transmitters for CW operation are not difficult to build, and they are cheap. Then there is that unique satisfaction of making contacts with some equipment that is homemade. Do not be put off by the sophistication of modern transceivers, a simple CW transmitter with a decent receiver makes a very useful amateur radio station.

The problem for many radio amateurs these days is that they may have little or no experience in construction of equipment. One way ahead for such an amateur is to consider building from a kit. The increase in the number of kits for the



The circuit diagram of the CM Howes Communications MTX20 unit.

amateur radio constructor in recent years suggests that this facet of the hobby is growing. Recently I noticed that CM Howes Communications had begun to sell a 20 metre (14MHz) CW transmitter kit called the MTX20. Perhaps this would be the sort of thing I could advise a newcomer to build to put alongside his receiver?

The MTX20 Kit

Although, in the past, I have been critical of electronic construction kits, I have had previous experience of kits from CM Howes Communications and that experience was good. When reviewing their sidetone oscillator kit some time ago, I decided to test out their claim that beginners could build their kits by giving it to my wife to build. She had never built anything electronic before, but I gave her a good lesson on how to solder and set her loose. She succeeded in building it . . . and it worked.

The MTX20 kit contains all the parts, with printed circuit board (PCB), to build a CW transmitter for 20 metres. The transmitter has an output power which is adjustable from 2 to some 10 watts RF. Not exactly a high powered transmitter but it is capable of an output three times higher than the maximum allowed for G-QRP Club awards. A casual listen to some of the Eastern European stations on 20 CW will show that 10W is commonly used with very acceptable results.

The transmitter is crystal

controlled which may seem a severe disadvantage although 20m is not a bad band to work crystal controlled. There is simple provision for VXO operation: tunable offsetting of the operating frequency. This allows some frequency variation and since there is now on the market a range of crystals in 10kHz steps across most of the CW end, most of the band could be covered with crystals and the VXO control. The MTX20 also provides for an external VFO (Variable Frequency Oscillator) to give full coverage of the band. A kit for such a VFO is to follow. A crystal on 14.060MHz is provided with the kit. This is the international QRP calling frequency.

The kit requires very basic hand tools which should be available in any amateur radio shack. It contains all the components needed for the PCB but not switches or hardware. This is quite a good idea since many amateurs may have suitable items, if

not they can be easily and cheaply obtained. This allows the individual constructor to build up the unit into a form acceptable for his particular shack arrangements. If the VXO facility is to be used, a variable capacitor will be needed. This can be an existing shack item or CM Howes will supply a suitable type.

Building the Kit

Building the kit is very simple. From a set of parts on the bench, I was having my first contact on 20 metres with the transmitter in just over an hour. The components are of good quality and identified well in the brief but adequate text which comes with the kit. All the components are shown by overlay printing on the topside of the printed circuit board. It is simply a case of identifying the components, dropping them into the board and making the solder connections.

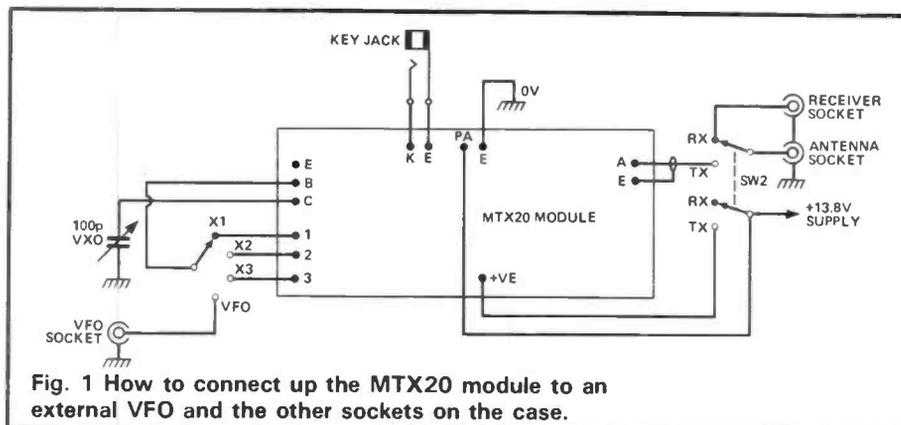
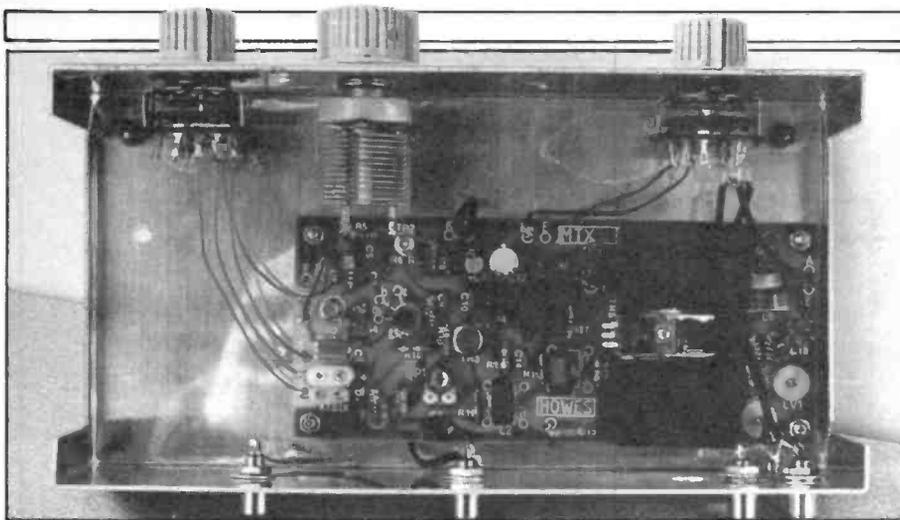


Fig. 1 How to connect up the MTX20 module to an external VFO and the other sockets on the case.



The assembled PCB.

Perhaps, thereby hangs the only likely problem. The text with the kit emphasises the importance of good soldering techniques. I can only amplify this warning. To be assured of success in electronic construction, good soldering is essential. Over the years, 95% of all the faults I have been asked to sort out in home constructed equipment have been caused by poor solder joints. So learn to solder first!

The most difficult part of building the kit is probably winding the inductors. The formers and wire are provided and the instructions for winding the coils are clear but do read them all through carefully before making a winding. The enamelled ends of wound coils are also the most likely place for making bad solder joints. Ensure that the enamelling is scraped off the end of the wires, the bare ends must then be tinned (coated with solder) before they are added to the board.

Housing the Kit

Although I had my first few QSOs with the naked board laying on the bench, it does require mounting in a metal case. I choose to mount my MTX20 in a J8 equipment case made by Minffordd Engineering. This case is 8" wide x 4" deep x 2½" high and provides plenty of space for the transmitter.

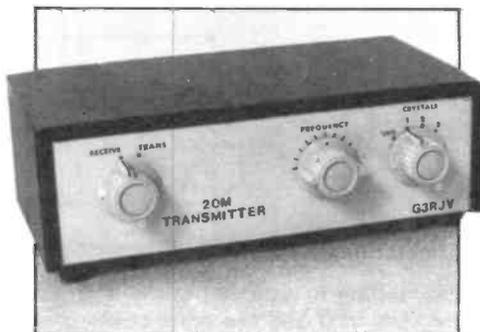
The MTX20 board is connected as shown in Fig.1. It took me twice as long to mount the MTX20 in the case and to wire up the connections as it did to build the whole board. I used a wafer switch for the changeover (transmit/receive) switch, although a toggle switch would be more usual. I also added the VXO facility using the 100pF

variable capacitor recommended by Howes. I suspect that this value is probably a little too high, as I find it possible to stop the oscillator by using the full swing on this control. A 75pF or even a 60pF variable if available, would probably be a better value. The crystal choice/external VFO switch is one pole of a 3 pole, 4 way wafer switch. I used phono sockets for all my terminations but that is just a quirk of my station. Individuals will use their own station standard terminations.

Getting It Going

The only test equipment required is a power/SWR meter which should be a common item in an amateur radio shack. For setting up a 50 ohm dummy load (a non-inductive resistance of 50 ohms) capable of handling 10 watts is also required. Following the instructions supplied, the setting up took very little time and the MTX20 gave me just a little over 10 watts of RF output power on full drive. Keying the MTX20 into the dummy load and listening on the station receiver showed that even with the overloading of the receiver front end, the keying sounded very acceptable.

I throttled back the output of my
How it looks in the case.



MTX20 to 3 watts output — the limit set by the G-QRP club for low power operation. At this sort of output the PA should survive quite a severe mismatch as the transistor is good to 13 watts output. The MTX20 does like to operate with a VSWR better than 1.5:1 but that is usual for solid state transmitters. Either a dipole or an antenna of this impedance should be used or the transmitter matched to the antenna with an ATU (Antenna Tuning Unit).

It does work . . . and works well. With the board still unmounted and laying on the bench I called CQ on 14.060MHz and a Polish station came back to me with a 589 report. I was using my full size G5RV antenna via a Z match ATU.

After the MTX20 was mounted into the case, I enjoyed many QSOs on the band. With the exception of a UA9 station, these have all been in Europe, but that merely reflects the very limited amount of time I have spent on the band with the little transmitter. My receiver in all these QSOs was the Drake R2B.

Conclusions

I like this little transmitter. The quality of the components is good, the building instructions are well written and it performs well. I could recommend the kit to any radio amateur for use with a receiver to provide a cheap and viable option for 20 metre CW operation.

Sources

The MTX20 transmitter kit is available from CM Howes Communications, 139 Highview, Vigo, Meopham, Kent DA13 0UT. Telephone (0732) 823129. The kit costs £19.95 or the assembled PCB is £26.95 (please add 80p postage). Full information on CM Howes kits is available, send an SAE to the above address.

The J8 equipment case came from Minffordd Engineering of Sun Street, Ffestiniog, Gwynedd. Telephone (076676) 2572. Order as a J8 equipment case, which costs £2.30 (plus 80p postage).

The crystals for 20m (the CW section) namely 14.030, 14.040, 14.050 (and 14.060) MHz cost £4 each (inclusive of postage) and can be obtained from PR Gollidge Electronics, Merriott, Somerset TA16 5NS. Telephone (0460) 73718.

Free Readers' ADS!

YAESU 726R 2m 70cm HF satellite units, narrow cw filter, boxed manuals, excellent condition, £1000 ono. Consider exchange HF radio with cash adjustment. Tel Epsom 42476.

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

SANYO RD222 stereo cassette deck with Dolby B, and "metal" tape facility. A Sanyo JA222 semi automatic turn table, Sanyo JT22L, LW, MW, FM tuner, needs 18 volt supply. Sanyo stereo amp, 20 RMS, needs attention (no left channel), offers? (061) 7374015.

FOR SALE, Yaesu FRG7, general coverage receiver, 0-30 MHz, hardly used, also ATU, no mods, £150 ono. 01-574-7887.

FT290R with Mutek front end, when new, case, boxed, £235. **FV901DM** remote VFO, boxed, £95. Eric (Cornwall) 0726 63081.

XTALS, 22MHz, HC18/U, £1. 38.6666MHz, HC18/U, £2. 1.843MHz, HC6/U, £1. Post paid. P. Smith, 3 Raven Avenue, Tibshelf, Derbyshire DE5 5NR.

TELETYPE, Data Dynamics, with paper tape system and RS232 interface, ideal for RTTY or as printer, with stand and technical manual, £25. ZX microdrive, with manual and Trans-Express tape copier, only £25. Waltham cassette deck, £20, offers? Phone Bookham 56327.

HEATHKIT HW101, working order, RIT home made PSU, £80 ono. 0582 872407 (Luton).

SELLING SEM Z-match with Eezitune (.160-10) £45. G4BMK software and interface for CBM64 & RTTY £45. KW PA coil C/W switch and choke (unused) £15; pair new 5763's £6; pair new 6AQ5's £6. G3PXV, phone

Mereside (073129) 403 (Cambs). Postage extra.

SX 200N converted to BNC aerial connector, excellent condition, face unmarked, £160 ono. Garsington 562, Oxon, after 6pm.

FOR SALE, Cobra 142 GTL home base, freq range 25.8775-27.475 plus power pack, offers over £100. Contact Mark, 27 Castlewarren Road, Donemana, Co Tyrone BT82 OPJ, N. Ireland.

TOR AUDIOLONE car stereo, eclectic autoreverse, metal Dolby, seek, 18 station presets, 20+20 WPK, scan, clock, etc, with remote control, unused CO21, £237; would exchange for 2m multimode, or as part exchange with cash for multimode TR9130, etc. All considered. Turo 572547.

MICRODOT 2 RTTY/CW keyboard built in monitor. As new, £150; Antennas 70cm beam £10; 70cm/2m mobile and duplexer £20; 70cm % £5; Rotorator £20; Liner 2 transmit fault £15; Welz power meter 1.8-500MHz SP380 £20. Stewart, 2 Eastdale Road, Burgess Hill, Sussex.

JAYBEAM 4 metre and 6 metre four element beams, new, boxed, not now required, 4Y6M £32; 4Y4M £25. Buyer collects. (0420) 82739, Hampshire.

SELLING UPI IC735. SM10 desk microphone, 757MD PSU, SEM tranzmatch with Ezitune 1/S 60 PWR SWR, PEP meter, 2kw. All equip mint and boxed, £950, Tel 021 422 9506, evenings only.

SCARAB Systems RTTY receive or transmit system for Spectrum 48K, includes terminal unit, interface and program with instruction book. Will sell for £80 ono. Cost £120 when new. Phone Cummertrees (04617) 324.

SALE TS520 HF 100w transceiver, internal 120/240v and 12 volt DC power supply. Excellent condition, manual, leads, boxed, £345 ono or part exchange for recent solid state rig and PSU. Contact Roy,

GOBZT, on Sedgley (09073) 78792.

SCANNER, Fairmate AS32320 digital 110-162 296-368 MHz, AM/FMd, 20 memories lockout 13.8v, bracket, handbook, SMC, VHFL, discone antenna, £95. Receiver, HF, realistic DX200, hardly used, boxed, handbook, .15-30 MHz.; AM/SSB/CW, suit SWL, £70 ono. Phone 01-337 7735, evenings.

FOR SCANNER users, Revco VHF-UHF trap dipole broadband antenna. New £45. Datong broadband pre-amplifier, 5-200MHz, £25. Datong 370 receive antenna, 200-kHz-30MHz, with PSU, as new, £40. T Ridgway, 15 South Road, Aberystwyth, Dyfed, Wales, 0970-4271, after 6pm.

ICOM 720A with PS15, PSU, as new, original packing. 4CX250B USA QQV06-40A. Both new un-used, first sensible offers for any of above secures. Phone Worcester (0905) 830164.

FOR SALE, 70cm PA assembly comprising 2X QQV03-20A plus tuning assy, ex-Govt, offers. WKS1001 SSB transceiver digital readout 28.365-28.805, excellent condition, £45. Wanted R1155 receiver and/or T1154 transmitter plus plugs and cables. Telephone 0380-830428 (Bratton, Wiltshire).

48K SX SPECTRUM, Alphacom 32 printer, tape recorder, all leads, manuals and books. Over 50 games, joystick and interface. All as new and boxed. only £120. Ham Int. 26.505-28.001MHz in 10kHz steps, only £100. 10m 40cm FM set, 29.300-29.690MHz, nice received quality, only £45. Call (0646) 685079 and ask for Daren.

WRASSE SC1 SSTV/FAX Tx/Rx unit, perfect, latest model, £700 ono; SSB 2 metre gasfet m/head preamp with control unit, as new, £100; also 70cm version, £100; Datong SRB2 'Woodpecker' blanker, £62; NEC 12" green screen

monitor, perfect, £35. Paul, G4XHF, (0293) 515201.

TWO GEC Worcester 10 channel mobile radio telephones, type RC620; two Pye Europa mobile radio telephones, model MF25FMS/3. Offers or WHY. Wanted Yaesu FRG9600; convertors FRV7700A FRV7700C. Telephone Kings Lynn (0553) 763428.

SHARP PC1500 computer, new, unused with handbooks, £100; marine receiver 150kHz-4MHz, AM/USB/LSB, speaker, mains powered with handbook, 8 xtal channels, switchable, needs xtals, £65. Army manpack TRX-BCC30 with ATU phones, boom-mic, 2-8 MHz, needs 12v DC, £65. Mamiya press camera £150. 01-660 0794.

SALE, KENWOOD TS440S with auto ATU 270Hz filter and remote control mic £950. 3 months old, reason for sale, want a simpler rig. Phone Keith GOCGB QTHR 0322 70073.

DX400 GENERAL coverage Rx-SSB/CW AM plus FM broadcast, digital readout, 12 memories plus Datong active antenna. Cost £300, accept £180. Mark 01-870 4977, evenings.

TEN ELEMENT Jaybeam parabeam, six months old, £10. Heavy duty rotator, when new £126, will accept £30, with controller. Buyer collects. K40 mag mount, £10. 051 727 4250.

AERIAL SALE, Hilomast, 70 foot pneumatic telescopic mast with topguys. Eddystone professional discone aerials 1.27-100MHz, 3.230-500MHz, 4.470-870MHz. Jaybeam professional UHF log-periodic, 50 ohm. Bantex 36 foot, 100kHz-30MHz marine aerial. I am moving house, best offer secures. Phone Karl, 01-582 8738.

EDDYSTONE EA12 HF Rx, covers, all ham bands, between 1.8MHz and 28MHz inclusive, plus Alpha 2 tr mobile crystallised for S20 to S23 and R6+7. Both good working order, £200, Tel. 061

personal finance. Portable computing, disk superscript for TRSDOS £6. Broken Sendata acoustic coupler thrown in. Exchange for FRG7700 and FRT7700 in good condition. 01-272 7651, evenings.

CP-1 TERMINAL unit by AEA of America. A best seller with software for CBM-64 PSU and leads, wired for FT-1. Boxed and with manuals, AMTOR, RTTY, CW, auto tracking, beacon, etc. New price £245, sell for £125. Exchange. (0709) 554665.

AMTOR RTTY CW Rx/Tx on the CP-1 TV with software for CBM-64. Manuals, leads, PSU, etc. Will sell for £125 or exchange for VHF/UHF scanning Rx or quality freq counter. Tel Brian on (0709) Rotherham 554665 or write QTHR.

FOR SALE, unused Nevada PA7-E 934MHz base station antenna, £25 ono. Telephone Nigel on Rugby (0788) 67734, after 6pm.

RACAL RA17L triple conversion communications receiver, C/W manual, vgc, £200 ono; or swap for 2 metre 100w solid state linear. Tel. 0792 894282.

ICOM IC210 2m 10w FM transceiver, excellent condition, boxed with manual. Yaesu FT730 70cm FM mobile mic, mobile mount, manual, £160 each. Jaybeam 48 element 70cm beam, new unused, £30. Tel Jerry 01-553 7094 daytime; 01-536 0267, evenings and weekends.

DX-300 RECEIVER, 10kHz to 30MHz. Mains, batteries of 12-volt. Morse practice facility incorporated. £105, Phone 0274-309334.

FOR SALE, Megger as new, £40; Mitutoyo Combimike 0-1' 0.001 (thimble) 0-25mm 0.01' (Digital) little used £25; Yashica TL Electro SLR f2.8 Zeiss Jena lens plus flash gun £45; Fuji DL50 fully automatic compact camera £50, as new. 0282 867681. Lancs.

FT290R MUTEK Auto toneburst Nicads charger, vgc, £250; 50MHz (6mtrs) multimode plus 3 ele beam £150; FR50B 160-10 plus 5m RX, manual, excellent condition, £85; RSGB books, as new, WHY?; cordless phone and intercom, approved standard, WHY?. Haggle. Martyn. Tel 0924 495916.

FOR SALE, Trio 7625 25W mobile 144-146 with remote microprocessor unit, £165. Tel 0476 70887, evenings.

YAESU VHF MOBILE CPU2500 RKS 25 watts FM £160; 50MHz (6m) multimode .5 watts plus 3 ele beam, £150; Mirage VHF linear 160 watts Hawk cordless phone 100' range, swap for IC2E or WHY?; 20 amp PSU switch mode want 10m rig hf linear amp 2m colinear, £20; Ferguson B/W mains/battery TV, WHY?; Yaesu FR50B hf and VHF RX with manual, £85; RSGB books, new editions, VHF/UHF Man HF Ants(moxon) test equipment for radio amateur TVI handbood, offers. Tel 0924 495916. Martyn G4SUI.

TRIO TS830S, immac, as new, hardly ever used, reason for sale, gone homebrew QRP. Boxed, ready to go for £650. G4OWH, QTHR. Tel 0373 812274, North Somerset.

TS830S, MIC+, £650; TR2600E, 2PB26/BC2, 6AA pack, SMC30, case/clip, strap/GP, etc, £280; PK80 packet £170; AMT2 £170; Datong PC1 £90; MC60 preamp, Pip/K tone £40; 9 amp PSU £40; FX-1 wavemeter, £20; Himound Key, marble, £15; SWR/PWR meter £10. Dave (07356) 5185, Basingstoke.

YAESU FT290R, boxed, mint, £200. (0922) 22867 (West Midlands).

K2RIW LINEAR built by GJ4ICD, 432MHz, 1kw amplifier, twin 4CX design with fully metered and protected power supply unit. Very good condition. £515 ovno. Best DX is Austria. Buyer collects, local delivery available. Phone G6CSY after 7.30pm, Orpington 0689 29230.

FOR SALE, ATU contains dummy load plus RF meter, SWR bridge and meter, will tune end fed wire £25; 50MCS linear 50W 2x807 self contained relays, power supplies, £30; 12 hard back valve Manuals £10. G3OXV, Daventry 702265.

AR30 3 ELEMENT Mini Beam for 10 & 11 metres, adjustable gamma match and element length, plus Rotator, Control Box, poles, control cable, coax and wall mounting brackets, £60. Telephone 0380 830428 (Wiltshire).

YAESU FL2100Z linear amplifier. 1200 PEP, two hours use only, very good condition, £475; Phone George 0292 268055.

WANTED

WANTED, Yaesu YO-901-P bandscope panadaptor in vgc, good price paid. G3LUL 0622 681294.

WANTED, Workshop Manual for Yaesu FC102 ATU. Buy or loan; your price paid. George, 092572 8253.

WANTED, Handbooks, Manuals on Kymar signal generator type 1525 and Dana exact function generator model 519; all costs paid. Contact G4NVT, Basildon 0268 46428.

WANTED, A Sony TV.511UK, or a Sony KV.9000UB; must be in excellent condition. Phone (0206) 394336, Essex.

WANTED, Plug-in SSB adaptor for Grundig Satellite 2100. Ring 01-979 3591.

WANTED, Pye PF2UB or similar for 70cms, must be complete and working. Channels immaterial; will collect; top price paid. Phone Reading (0734) 668532.

SONY ICF7600D wanted. Leeds (0532) 675489.

WANTED, EUROPA 'B' or Magnum 2 2-metre transverter. Have for exchange, microwave modules transverter plus Vic20+ data-recorder + PSU + manual. Sorry no cash, as unemployed. 163 Milnafua, Alness, Ross-shire IV17 0YT.

WANTED: Electronic equip. II WW: AP13-TBY-BC545-W522-W521-TR1143-R109 and others. Giuliano Vigarani 14VGG, Via Bottego 36, 41010 Modena. Tel. 059-341134, Tlx. 510557.

PYE WESTMINSTER, W15V manual handbood required, buy or borrow. Great care will be exercised. G3EKM, Dowgas, Coombe, St Austell 365.

WANTED, FL2010 10W linear amp for Yaesu FT290R. Phone (0782) 44237.

WANTED URGENTLY, Circuit plus handbook for Army C.11 T/RX for Photocopying. Will be returned within one day. The C.11 is solidstate with valve PA. All costs refunded. Gerard Fiz-Gerald, EI6DP, 40 Maigue Way, John Carew Park, Limerick, Ireland. Tel. 061-43584, EI6DP.

WANTED, any info on the Standard 5-ch handheld model SR-C146A, circuit diagrams, etc, is required. Will return after taking needed details. Dave Green, G6ZBT, 33 Arthur Street, Withernsea, Hull, North Humberside, HU19 2AB.

WANTED, National Company Malden receivers in good condition plus manuals for NC100A, NC33 copies, manuals for Scarab systems MPTU-1, interface SP RTTY-3 for Spectrum. Details how to use Futaba LCDs 6-LT-062. 7-LT-02, 5-LT-03 Radio Electronics World Man 1982. Tel St. Albans 393333.

WANTED, Telford Communications 2 metre receiver matching unit to Telford communications TC10 2 metre transmitter. Details to G1GGX, 03632 4865.

SWL AMATEUR wants to exchange QSL Card and Tapes. Spec interest in tropical bands. No need to send letter, make a short tape instead. Mogens Petersen, Hvidovrevej 130 B 2650, Nvidovre, Denmark.

WANTED, YAESU FT290R, must be good condition, preferably with Nicads, charger, case, etc. Portsmouth area, but will travel. Tel. (0705) 266179.

WANTED: 1980 Callbook International (DX) listings. Keith, G4LXZ. Tel. Witchampton 840 893, after 6pm.

WANTED, VALVE receivers: Collins 51J, R338, R390A/B2, BC312, B342, BC348, BC779, BRT400. Hammerlund: SuperPro, SP400, SP600. Hallicrafters: S27, SX28, S36, S42. RCA AR77, AR88. Early National: HRO, HRO50, HRO60 etc, in clean condition. Early Hi-Fi: Tannoy and dual concentric sepader units, Lowther, Garrard 301, Thorens TD124 MkII, Ortofon, SME, Decca, Quad, Valve Amplifiers, Western Electric audio equipment, EMT, etc. Please telephone: John Baker (Kings Cross) 01-833 3008.

WANTED. Practical Wireless No 1, fair price paid, also 1960 to 1970 Practical Wireless required. John Savage, 18 Bideford Close, Pk North, Swindon, Wilts.

FTV901R transverter, frame only (perhaps with 70cms or 6m); reimburse your expenses for copy Mirage B1016 instruc-

tion booklet; Icom HM10 scanning mic. Tel: Philip (0232) 702528.

WANTED Belcom LS20XE hand-held or any similar hand-held. Write with details and price to Simon, 75 Pennine Road, Glossop, Derbyshire, SK13 9UL.

HELP Can anyone tell me the name and possibly the address of the trader selling Pocketfone car adaptors at the Alveson Castle rally. Tel: (09952) 3988, Bob Gant, 25 Worcester Ave, Garstang, Preston, Lancs PR3 1FJ.

WANTED Information, manual/brochure for Eddystone 730/1A communications RX, especially for availability of parts for Xtal calibrator. Phone: (0783) 480453.

WANTED Manuals Ham-band 8000. Hoover A3006 wm. Emerson F.U.424. £8 each. Circuit diagrams £4 each. Frank Mathieson 4 Vickers St, Motherwell, Lanarkshire ML1 3RF, Scotland. Tel: Motherwell 66381.

WANTED FT102. Good condition, please give full description. Cash payment. FT101 for sale. Plant (G5CP), The Cottage, Milltown, Ashover, Chesterfield, S45 0EX. Tel: (0246) 590253.

WANTED. Any 2M synthesized mobile rig, IC240 or similar, up to £100. Tony Cox, 66 Royal Mint Street, London E1 8LG.

WANTED URGENTLY. Require Yaesu FV50 VFO in working order, all letters answered, good price paid. G.R. Woodley, 16 Albert Street, St Barnabas, Oxford OX2 6AY.

WANTED. Circuit diagram for Icom IC215 2 meter rig. Will repay any expense. G.A. Green, 44 The Roods, Warton, Carnforth, Lanc's LA5 9QQ. Phone: (0524) 735296.

WANTED. Copy of HF Antennas for all Locations and World at their Fingertips, any edition any condition. Please contact — Hudson, 29 Priors Road, Canterbury, Kent CT2 8NX. Phone: (0227) 458464.

WANTED. FT780 Eimac 610 620 bases, any large ceramic valves, triodes, tetrodes, HT transformers, high voltage electrolytics and ceramic capacitors, feed thru's, etc. IC402 for sale, ceramic tetrode capable of 1.5kw 2m — offers. Work 051 342 6441,

Home 051 428 2448 — Mike. **WANTED.** FM unit for FT101ZD also tranverter FTV901R. Phone Chris (0628) 781559, after 6 pm please.

WANTED. Yaesu accessories YO901P monitorscope, prefer Pan-adaptor FC107M, ATU, FTV107M, WHY? Have plenty to swap, P/X — lets haggle. Martyn Bolt, 112 Leeds Road, Mirfield, WF14 0JE, West Yorks. Tel: (0924) 495916.

WANTED. Hand held scanning receiver to include the 2 meter 144MHz band. Ring (0934) 20911.

WANTED. Hand held plug in crystal scanners, anything considered. Phone Pete at (0932) 67569.

WANTED. Commercially produced or ready constructed video sync processor, price, illustration, full technical details, also what are the dimensions. D. Oliver, 100 May Lane, Kings Heath, Birmingham B14 4AG.

WANTED. Ham Radio Today, Dec 1984 or photocopy. Money will be refunded. T. Barfield, 91 Ollerton Road, London N11 2JY.

SHIMIZU SS105S HF transceiver wanted. Cash waiting for good example. Brian 051-625 5781.

TUNING UNITS good TU10B, spares TU8B. Have spare TU5B, TU6B, TU9B. — Wanted, T1083 amp, coil, range C. Also T1115. For sale, mint Collins ART-13 TX, W1117, Jones Plugs, Jay Switch. R1355 converted to 250v. WHY WWII Airborne 52, Bramble Lane, Mansfield, Notts.

WANTED. USA and European editions call books 1984, 1985 or 1986. Contact EI2W. Tel: Dublin 804645.

WANTED. Sony TV-511UK, a Sony KV-9000UB, also a electronic keyer MK1024. All must be in excellent condition. Phone 0206 394336. (Essex).

EXCHANGE

EXCHANGE MY Sony ICF2001 and Sony AN1 active aerial kit. All with original manuals and boxes, for a Yaesu FRG7700 or Trio R1000 or AOR2001 or something suitable. S.P. Kelly, 5 Westhill Avenue, Castletown, I.O.M.

EXCHANGE 48K SPECTRUM, full size keyboard, monochrome, datacoder, Alphacom printer, amateur

software, Inc RTTY, etc, plus books, plus possible cash adjustment for FT225RD or similar 2m multimode base station. Phone David (0229) 56816, between 6pm and 8pm weekdays, QTHR.

EXCHANGE TS430S, PS430, new, boxed, for Icom TCVR for AMTOR. For sale AMTI software VIC20 cartridge interface, RX400 Fax copier, 3" disc drive, new; Siemens PT88 ink jet printer; MZ80K RTTY interface. Reasonable offers accepted. System has fault. Reasonable offers accepted all items. Tel 53775. **20X50 MARK SCHEFFEL** Binoculars; Toshiba stereo music centre, matching speakers; 48K Spectrum power supply, interface base unit, word processor, copy tape, lots software, joystick, cassette recorder. Exchange: transceiver, scanning receiver or WHY? Tel. Oxford 772370. 57 Windrush Tower, Cowley, Oxford.

EXCHANGE REALISTIC PRO-31 UHF-VHF 10 channel handheld scanner, 68-88MHz, 138-174MHz, plus scope SG-30/UP in GWO with 110V 0.2kVA transformer, for 2mtr rig. Small cash adjustment possible, recently passed RAE, unfortunately unemployed. Alan, 113 Dickinson Ave, Low Hill, Wolverhampton, West Midlands WV10 9JE.

EXCHANGE OKI Microline 182 8 bit Centurion type primer, brand new, never used, for 2 metre rig or HF transceiver. G1SOK, (0272) 650585.

ASTRONOMERS. EXCHANGE my Bresser 4" catadioptric Newtonian reflector with equatorial mount, immaculate, for any 2m multimode covering 144MHz-148MHz, except FT290 or may sell. Value £390 when new. G6HHV. 051 327 5804.

EXCHANGE SOMMERKAMP FT290 multimode, 144-148MHz, professionally fitted Mutek FE and auto tone burst, Nicads and charger, mobile mount and carry case, unused MM 144/30LS linear, all vgc and GWO. Exchange for best offer in 934MHz system, preferably Cybernet. Phone Gordon (04675) 339.

EXCHANGE VTX5000 modem, fits Sinclair Spectrum, as new, for a Pye Westminster 12 volt lowband,

but be in good working order. Paul Goodrum, 9 Royston Close, Downham Market, Norfolk PE38 9BD. Tel (0366) 388615.

SHARP PORTABLE FM, LW, MW, SW, 1.6 to 26.5MHz AC & battery, BFO, FAC, excellent cond, exchange for Valve Communication receiver, Eddystone 840C or EC10 etc, must be excellent cond. Grundig Concert Boy portable AC or battery, FM, LW, MW SW 5.9 to 18MHz. Exchange for good ATU receiving only. Tel 01-794 9790.

EXCHANGE HEATHKIT Lab-Osc 5 inch mode, 10-12 with leads and manual; also Hallicrafters short wave radio, model S38C, 6 valve. Old but works well, four new valves fitted. For a green screen Monitor or could come to some arrangement. S Deacon, G6HVS, 25 Moseley Road, Bebington, Wirral, Merseyside L63 9NT.

EXCHANGE CLASSIC Hi-Fi Record Deck, Transcripator Saturn with Goldring Cartridge, excellent condition, for R1155 receiver/T1154 transmitter or additional items to complete installation, such as plugs, cables, indicator unit, rotary PSU, loop antenna, etc. Tel. (0380) 830428 (Wiltshire).

EXCHANGE REALISTIC DX100L general coverage RX 0-30MHz 2 MW-LW for general coverage RX, valved, ie Eddystone or similar 0-30MHz RX. Wanted channel Selection Switch for HY-gain 5 Mk1 2795. Contact Adrian, 19 West Tynning, Marksbury, Nr Bath BA3 9HW, Avon.

SWAP or sell Chart Recorder made by Record. GWO, large transformer 12V 28A, 3x28V 7A and 168V 100MA outputs, PSU fan, 115V AC GWO. Offers or swap for SSTV TxRx, condition not important but must be working. Phone Steve 0635-42424 (Newbury), after 6.00pm.

EXCHANGE, SANYO RP8880 9 band FM/LW MW/MB 5SW receiver for FT290R. Tel. (0424) 892062, E Sussex.

GRUNDIG CONCERT Boy 220, FM, LW, MW, SW 5.8 to 18MHz, AC or battery, mint cond, against ATU, must be working and good condition. H.C. Bach, 52 Tudor Close, Belsize Ave, London NW3 4AG. Tel. (794) 8790.

RADIO Tomorrow

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

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|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1/2 Nov | Felixstowe DARC: Suffolk Scouts Corroborae. | | Farnborough DRS: 21st AGM. |
| 2 Nov | Eastbourne ARC: meeting, morse & RAE. | | Crawley ARC: junk sale (without the real junk please!). New venue: TS Cossack, London Road, Crawley. |
| 3 Nov | Basingstoke ARC: constructors competition.
Chester DRS: return quiz vs Ellesmere Port.
Sheffield ARC: annual construction competition.
Welwyn & Hatfield ARC: 80m QRP CW construction.
Braintree ARS: junk & jewels sale. | | Stockport RS: lecture by G3LX.
White Rose ARS: Microwaves for Beginners by G3PYB.
Cheshunt DARC: Radio control. |
| 4 Nov | Todmorden DARC: Video & aerial circuits.
Worksop ARS: quiz night.
Dartford Heath DFC: pre-hunt meeting.
E Lancs ARC: home construction.
Fylde ARS: equipment sale.
Wakefield DRS: talk by G4JKH.
Stevenage DARS: organising for the New Town 40 year Festival.
Warrington ARC: Martin Wells on Fibre Optics. | 13 Nov | N Wakefield RC: lecture/visit.
Salop ARS: on the air night.
Bredhurst RTS: A Packaging Problem by GODCA.
Pontefract DARS: on the air from S Kirkby Town Council HQ.
Southgate ARC: homebrew contest. |
| 5 Nov | Fareham DARC: RFI vs EMC.
Central Lancs ARC: visit to Red Rose Radio. | 14 Nov | Aberdeen ARS: president's address.
Maltby ARS: A 100W linear using the QQV0640A.
Nunsfield House ARC: junk/surplus sale.
N Bristol ARC: talk and demo on sporadic E. |
| 6 Nov | N Wakefield RC: talk by G4OOC.
Salop ARS: PAL TV systems by G1TFQ.
Pontefract DARS: AMTOR by G1BLT. | 15 Nov | Verulam Club: Section 1 of contest, 20:00 to 00:00 GMT. SSB, AM & CW 1900-1990kHz. |
| 7 Nov | Aberdeen ARS: 40th AGM.
Maltby ARS: activity night.
Nunsfield House ARG: Blowing Hot & Cold by Ken Smith. | 16 Nov | BATC Slow Scan (SSTV) Contest: from 00:01 to 23:59 local time on HF & 2m.
Eastbourne: meeting, morse & RAE.
Pooler ARC: special event station GB4PRS. |
| 8 Nov | Stourbridge DARS: OK DX contest. | 17 Nov | Stourbridge DARS: surplus sale.
Felixstowe DARS: visit to Gaumont cinema, Ipswich.
Welwyn & Hatfield ARC: construction competition.
Central Lancs ARC: visit to Microwave Modules.
Todmorden DARS: Peter Sheppard, RR2 rep.
Stourbridge DARS: surplus sale. |
| 9 Nov | Dartford Heath DFC: DF Hunt.
BATC Autumn Vision: new ATV contest from 00:01 to 23:59 local time. Contact Mike G6IQM for details.
Bridgend DARS Rally: at the Recreation and Leisure Centre, Angel St, Bridgend. Opens at 10.30 am, 10 am for disabled. Talk-in on S22, free parking, bring & buy and special event station. Ring GW1OUP on (0656) 723508 for details. | 18 Nov | Worksop ARS: video night.
Chester DRS: Electrostatics by G4JYQ.
Biggin Hill ARC: surplus equipment sale.
Midland ARS: homebrew competition.
Wakefield DRS: film night.
Warrington ARC: power regulation by op-amps.
Chichester DARC: junk sale. |
| 10 Nov | Eastbourne EARC: meeting, morse & RAE.
Milton Keynes DARS: junk sale.
Borehamwood & Elstree ARS: RTTY demo and lecture by GODDJ. | 19 Nov | Hastings ERC: 2m & 70cm linears by Ken Willis, G8VR.
Fareham DARC: QRP update by G3CCB.
White Rose ARS: visit by J Birkett.
Burton upon Trent DRS: DF hunt.
Louth DARC: AGM. |
| 11 Nov | 11-17th Stevenage DARS on the air to celebrate New Town Festival.
Chester DRS: Amateur Radio on a Shoestring by G3RJV.
Wakefield DRS: talk by G3WWF.
Warrington ARC: Dave Yorke on Contesting. | 20 Nov | Salop ARS: bring & buy (not junk!).
Pontefract DARS: RSGB video. |
| 12 Nov | Three Counties ARC: HF mobile antennas by G3NDI. | | |

".. OUR TALK WILL COMMENCE AFTER
RANDOM BREATH TESTS ..."



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|--------|--------------------------------------------------------------------------------------------|--------|----------------------------------------------------------|
| | Solihull ARS: surplus sale. | | Navigation Aids. |
| | Spenn Valley ARS: open computer evening. | | Sheffield ARC: Christmas social. |
| 21 Nov | Aberdeen ARS: Do You Believe Your 'S' Meter? by Frank Dinger. | | S Cheshire ARS: annual social. |
| | Maltby ARS: RSGB video. | 9 Dec | Dartford Heath DFC: pre hunt meeting. |
| | Loughton DARS: The History of Laser 558. | | Midland ARS: Christmas party. |
| | Dunstable Downs RC: Aspects of the Weather by John Kettley. | | Chester DRS: Your Questions Answered. |
| | N Bristol ARC: HF activity night. | | Wakefield DRS: Mastermind Quiz. |
| 23 Nov | Eastbourne EARC: meeting, morse & RAE. | 10 Dec | Warrington ARC: Computer Security by G3NFB. |
| | Verulam Club: Section 2 of contest, 09:00 to 13:00 GMT. SSB, AM or CW. 144.150-144.400MHz. | | Crawley ARC: fish and chip supper. |
| | | | Stockport RS: AGM. |
| 25 Nov | Keighley ARS: films. | 11 Dec | N Wakefield RC: on the air. |
| | Dorking DRS: EMC interference by G3AEZ. | | Edgeware DRS: grand junk sale. |
| | Chester DRS: surplus sale. | 12 Dec | Maltby ARS: a direct conversion receiver for 80m. |
| | Wakefield DRS: amateur satellites by G4JJ. | | N Bristol ARC: Region 20 reps visit. |
| | Verulam ARC: amateur radio and emergency planning. | 13 Dec | Three Counties ARC: Christmas party. |
| | Warrington ARC: Noise Blankers by Bill Green. | 14 Dec | Dartford Heath DFC: DF hunt. |
| 26 Nov | Three Counties ARC: Bonsai Aerial Farm by G3OLM. | 15 Dec | Milton Keynes DARS: Long Range Navigational Aids (USAF). |
| | Crawley ARC: magazine production. | | Felixstowe DARS: family social. |
| | Stockport RS: construction competition. | | Welwyn & Hatfield ARC: Christmas social. |
| | Chiltern ARC: lecture. | | Braintree ARS: Christmas social. |
| | Cheshunt DARC: AGM. | 16 Dec | Worcester DARC: Christmas skittles night. |
| 27 Nov | Glossop DARG: AGM. | | Worksop ARS: computer night. |
| | Edgeware DRS: film show. | | Dartford Heath DFC: EGM at the Horse & Groom. |
| | Bredhurst RTS: construction contest. | | Biggin Hill ARC: Christmas dinner. |
| 28 Nov | Aberdeen ARS: RSGB video. | | Chester DRS: construction contest. |
| | Maltby ARS: three in a row mini lectures. | | Wakefield DRS: Bermuda by G4JMT. |
| | N Bristol ARC: CW activity night. | 17 Dec | Chichester DARC: Christmas social. |
| 30 Nov | Eastbourne EARC: morse and RAE. | | Hastings ERC: Christmas social. |
| 1 Dec | Basingstoke ARC: Clandestine Radio by G3VA. | | Fareham DARC: lecture. |
| | Felixstowe DARS: computer evening. | | Burton upon Trent DRS: DF hunt. |
| | Welwyn & Hatfield ARC: AGM. | | Cheshunt DARS: Cheese & Wine & Video Evening. |
| | Braintree ARS: film show. | 18 Dec | Louth DARC: test gear demo. |
| | Central Lancs ARC: Christmas junk sale and 2m contest planning. | | Bredhurst RTS: Christmas 'booze up'. |
| 2 Dec | Worksop ARS: junk sale. | | Solihull ARS: Christmas social. |
| | E Lancs ARC: AGM. | 19 Dec | Spenn Valley ARS: Anti-Christmas anti-social. |
| | Fylde ARS: equipment construction competition. | | N Wakefield RC: Christmas dinner. |
| | Wakefield DRS: on the air. | | Maltby ARS: annual junk sale and Christmas buffet. |
| 3 Dec | Fareham DARC: Decoding Morse with a Micro by G6TJT. | 23 Dec | N Bristol ARC: VHF activity night. |
| | | | Chester DRS: Christmas buffet. |
| 4 Dec | Salop ARS: Wartime Army Signals by G3KYU. | | Wakefield DRS: Christmas social. |
| | Spenn Valley ARS: The Breathalyser(!). | 29 Dec | Felixstowe DARS: social. |
| 5 Dec | Maltby ARS: activity night. | 30 Dec | Wakefield DRS: on the air. |
| | Dunstable Downs RC: junk sale. | | |
| 8 Dec | Southdown ARS: AGM. | | |
| | Milton Keynes DARC: Radio and Radar | | |

Will club secretaries please note that the deadline for the February segment of Radio Tomorrow (covering radio activities from 1st January to 1st March) is 5th December.

Contacts

Aberdeen ARS	Don	04676251	Maidstone YMCA ARS	GOBUW	0622 30544
Abergavenny & NH ARC	GW4XQH	0873 4655	Maltby ARS	Ian Abel	0709 814911
Aberporth ARC	GW0DPR	023987 274	Medway ARTS	Tony	0634 578647
Alyn and Deeside ARS	GW4RKX	0244 660066	Midland ARS	G8BHE	021 422 9787
Amateur Radio & CC	Trevor	04895 81032	Mid Sussex ARS	G1FRF	0791 82937
Armagh DARC	J. A. Murphy	0861 522513	Mid Ulster ARC	Sam	0762 22855
Atherstone ARC	Roy	0203 393518	Mid Warwickshire ARS	G4TIL	Southam 4765
Axe Vale ARC	Bob	029 74 5282	Milton Keynes DARS	Dave	0908 501310
Ayr ARG	GM3THI	Ayr 42313	Morecambe Bay ARS	G3PER	Heysham 52659
Barking RES	R. Woodberry	01 594 4009	N. Cornwall RS	J. West	0288 4916
Barry College RS	John	065679 710	N. Staffs ARS	G6MLI	0782 332657
Basingstoke ARC	Dave	07356 5185	N. Wakefield RC	Steve	0532 536633
Bath DARC	G4UMN	Frome 63939	Newbury DARS	G3VOW	0635 43048
Biggin Hill ARC	GOAMP	0689 57848	Norfolk ARC	Andy	Norwich 610874
Borehamwood Elstree ARS	Tony	01 207 3809	Oswestry DARC	Brian	0691 831023
Braintree ARS	Pub Sec	0376 28714	Peterborough RES	Peter	G4PNW QTHR
Bredhurst RTS	Kelvin	Medway 376991	Plymouth ARC	G4SCA	0752 337980
Brighton DARS	Peter	0273 607737	Pontefract DARS	GOAAO	0977 43101
Bristol ARC	G4YOC	Bitton 4116	Preston ARS	George	0772 718175
Bristol (Shirehampton) ARC	Ron Ford	0272 770504	Rhyl DARC	GW1AKT	Nantglyn 469
BT (Reading) ARC	G4MUT	0734 693766	Salisbury RES	Neil	0980 22809
Bury RS	Allan	0204 706191	Salop ARS	Simon	0743 67799
Cambridge DARC	D. Wilcox	0954 50597	Sheffield ARC	John	Sheffield 581766
Chesham DARS	Liz	09278 3911	Shefford DRS	G4PSO	Hitchin 57948
Cheshunt DARC	G4VMR/G4VSL	092084 250	S. Bristol ARS	Len Baker	0272 834282
Chester DRS	Dave	0244 336639	S. Cheshire	Chris	07816 73185
Chichester DARC	C. Bryan	0243 789587	S. Lakeland ARS	Dave	0229 54982
Clifton ARS	RA Hinton	01 301 1864	S. Manchester RC	Dave Holland	061 973 1837
Conwy Valley ARC	GW4KGI	0745 823674	S. Tyneside ARS	G4XWR	S. Shields 543955
Coulson ATS	Alan	01 684 0610	S. E. Kent (YMCA) ARC	John	0304 211638
Coventry ARS	Robin	0203 73999	Southdown ARS	P. Henly	0323 763123
Crawley ARC	Jack	0293 28612	Southgate ARC	Dave	0992 30051
Darenth Valley RC	Sec	0322 63368	Stevenage DARS	G4ISO	0462 892765
Dartford Heath DFC	Pete	0322 844467	Stockton DARS	John Walker	0642 582578
Denby Dale DARC	G3SDY	0484 602905	Stockport RS	Mel	061 224 7880
Derwentside ARC	G1AAJ	0207 520477	Stourbridge DARS	G3ZOM	K/ford 288900
Donegal ARC	E13BOB	074 57155	Stowmarket DARS	M. Goodrum	0449 676288
Dorking DRS	John	0306 77236	St Helens DARC	A. Riley	051 430 9227
Droitwich DARC	G4HFP	0299 33818	Surrey RCC	John	01 657 0454
Dudley ARC	John	0384 278300	Swale ARC	B. Hancock	0795 873147
Dunstable Downs RC	Phill Morris	0582 607623	Telford DARS	Tom Crosbie	0952 597506
Eastbourne EARC	G1BRC	0323 29913	Three Counties ARC	Keith, GOBTU	0730 66489
East Kent ARS	Stuart	0227 68913	Tiverton (SW) RC	Alan	0392 881569
East Lancashire ARC	Stuart	0254 887385	Todmorden DARS	G1GZB	070 6817572
Edgware DRS	John	Hatfield 64342	V White Horse ARS	Ian White	Abingdon 31559
Exeter ARS	Roger Tipper	0392 68065	Verulam ARC	Gerry	St Albans 52003
Fareham DARC	Alan	0329 288139	WACRAL	G4NPM	0795 873147
Farnborough DRS	Mr Taylor	0252 837581	Wakefield DRS	G4VRY	0532 820198
Felixstowe DARS	G4YQC	0473 642595	Warrington ARC	Paul	0925 814005
Fishguard DARS	Bernard	0348 872671	Welland Valley ARS	J. Day	0858 32109
Fylde ARS	PRO	0253 737680	Welwyn Hatfield ARC	Dave	07073 26138
Galashiels DARS	GM3DAR	0896 56027	West Kent ARS	B. Guinnessy	0892 32877
G. Peterborough ARC	Frank	0733 231848	Westmorland RS	G. Chapman	0539 28491
Halifax DARS	D. Moss	0422 202306	White Rose ARS	G4ATZ	0937 842790
Harpenden ARC	G1BJC	0582 72455	Willenhall ARS	G4LWI	0902 782036
Harrow RS	Tony	01 861 0419	Wimbledon DARS	G3DWW	01 942 1418
Hastings ERC	Dave Shirley	0424 420608	Winchester ARC	Gordon	0703 772191
Haverhill DARS	Rob Proctor	0787 281359	Wirral DARC	Peter	051 677 7376
Havering DARC	GOBOI	04024 41532	Wolverhampton ARS	Keith	0902 24870
Hornsea ARC	Richard	0401 62498	Worcester DARC	D. Batchelor	0905 641733
Horsham ARC	Pete Head	0403 64580	Worksop ARS	G4ZUN	0909 486614
Inverness ARC	Brian	0463 242463	Wythall RC	G1MEE	0546 824705
Keighley ARS	G1IGH	0274 496222	308 ARC (Surbiton)	Bob	01 391 0788
Kidderminster DARS	Tony	0562 751584			
Kingston DARS	G3ODH	Epsom 26005			
Lagan Valley ARS	Jim	0846 682474			
Leeds DARS	G1EBS	0274 665355			
Leighton Linlade RC	Pete Brazier	052 523 270			
Lothians RS	Robin	0506 890177			
Loughborough ARC	Philip	0509 412043			
Maidenhead DARC	John	0628 28463			

Could club secretaries please check the current contact details and let us know if they should be updated. Owing to the popularity of 'Radio Tomorrow' and limitations on space we are now having to omit meeting details if they are of the 'matter night' or 'informal gathering' type.

The Modified FRG9600 - A Reassessment

Back in the October 1985 issue of HRT, we looked at the Yaesu FRG9600 VHF/UHF communications receiver. There is now a

modified version available, supplied by R Withers Communications. It is claimed to have improved sensitivity over the standard model plus the very major advantage of internal modifications to enable its frequency coverage to be extended to an upper limit of 950MHz minimum, from the original 905MHz. This extra span brings the 934MHz CB band and Cellnet telephones into its coverage — this missing bit of spectrum having been a bone of contention in the past. The 'S' meter has also been re-calibrated.

channel number. The S meter is a bargraph type with the colour changing from green to red over S9.

The FRG9600 comes with a comprehensive glossy manual running to 40 pages in A5 format with the sort of instructions that are ideal for beginners. It doesn't contain any technical section describing the circuit operation of the receiver nor any circuit diagram.

In his first review of the FRG9600, Tony Bailey, G3WPO, had one or two moans. These have now, apparently, been remedied by a couple of modifications, so Tony now assesses the value of the modified version.

Extra Coverage

The method by which the extra coverage is achieved requires an additional antenna socket on the rear of the rig. Instead of a single SO239 socket for the whole range, the SO239 now covers 60-459.999MHz and an additional BNC takes another antenna for 460-950MHz, via the external converter supplied. As most people will probably be listening around the 900MHz+ region in this part of the spectrum, it does mean that you can use a separate dedicated antenna in this extra socket. For the lower spectrum coverage, a discone or nest of dipoles would be a good choice, although of course you will get much better results from a gain antenna at the frequency band of interest.

One of the unusual features is an audio scan button whereby the scan can be selected to stop only when there is audio present on the carrier. This is very useful when you have a lot of blank carriers about and it will bypass some of the sprogies which exist, mainly around 70MHz coming from the 35.06MHz crystal associated with one of the conversion oscillators. The comprehensive selection of scanning and other control features can all be used with a home computer via the Yaesu CAT

modified version available, supplied by R Withers Communications. It is claimed to have improved sensitivity over the standard model plus the very major advantage of internal modifications to enable its frequency coverage to be extended to an upper limit of 950MHz minimum, from the original 905MHz. This extra span brings the 934MHz CB band and Cellnet telephones into its coverage — this missing bit of spectrum having been a bone of contention in the past. The 'S' meter has also been re-calibrated.

What It Does

The FRG9600 is a general coverage synthesised receiver covering (in this version) 60 — 950MHz. Using a 45MHz IF and a wideband front end — which is basically a TV tuner — it was intended originally as a low cost monitor receiver but has ended up somewhat more expensive in the UK. The standard receiver coverage is continuous over the whole range, in a variety of possible step rates (dependent on mode selected) and allows reception of USB/LSB/CW/FM narrow/FM wide/AM over this range. SSB is only specified up to 460MHz due to the poor recovered audio above this

via a front panel tuning knob, up/down buttons, through the 100 possible memory channels, and by keypad direct entry.

A variety of scanning options are provided starting with the normal memory scan; but although there are 100 memories possible in total, they are grouped in banks of ten, and you can only scan one bank of ten at a time, eg numbers 00-09 or 40-49. Total scanning over the whole range or over any nominated section within the coverage is also possible. The latter is achieved by using the frequencies stored in two adjacent memory channels, the higher numbered one being the upper limit and the other channel the lower scan limit (the upper channel memory number has to end in '1' ie 11 or 21.

As this rig covers the UHF television band, a facility is provided for the TV enthusiast. Unfortunately, it is an extra module that goes in the IF unit and only allows reception of NTSC format pictures on a video monitor.

Frequency display is via a green fluorescent type, which is easily readable under most conditions unlike an LCD variety. The display has a resolution of 100Hz with the addition of various annunciators for mode and step rate plus memory



system interfaces (FIF232C and FIF65A). With such a wide frequency coverage this does open up a lot of possibilities for the scanning enthusiast.

Sensitivity

In the original unmodified version, the sensitivity hovered around 0.5-1uV on most modes with some frequencies being better and others worse. Most modern band dedicated rigs can better this considerably and sensitivities of 0.2uV pd would not be unusual. The 9600 is thus not exactly the most sensitive of receivers around. However, you have to offset this against the massive spectrum coverage and the original concept of low cost in areas where strong signals abound.

Another problem also arises from the wideband nature of the front end. Without banks of switched filters, image rejection limitations and unwanted IM products from strong stations outside of the monitored band (especially using a wideband antenna) are bound to give problems. A first IF of only 45.75MHz, (compared with say, 750MHz for the AR2002) and the LO running high of signal, means that the image response occurs at +91.5MHz to the signal. At worst — according to the manual — this will be only around 40dB down on the wanted signal.

The Modified Rig

The sensitivity on the modified rig is much better now — at the bottom end it bettered 0.2uV pd for

12dB Sinad on FM. For most of the range up to 300MHz, 0.2/0.3uV was easily achievable and from then on, the sensitivity dropped slightly to 0.5uV at 450MHz. On the higher range, the figure stayed at 0.5uV at 460MHz, and maintained this all the way up to 950MHz. The 950MHz top limit is a minimum but this unit did go up a few MHz past the limit.

The S meter response is still very peculiar — although this is not unusual in the world of receivers. On SSB with the 'S1' LED always alight, S2 came on at -99dBm, S5 at -98dBm and S9 at -96dBm (rather than about -75dBm)! Full scale with all LEDs lit was at -90dBm giving a total range of 9dB for what should be about 90dB+. The response on NBFM was totally different — S2 was -102dBm, S5 at -101, S8 at -97, then a 7dB rise to get to S9, then a further 28dB to get a full scale, or a total range of 40dB. The AM response was similar to FM. So the meter isn't really much use for measuring anything seriously. There is also some hysteresis in the response which made measurement awkward.

No Attenuator

Incidentally, due to the change in the internal circuitry from 460MHz up, the attenuator doesn't work when using the 9600 on the 460MHz+ range as signals in this region are no longer taken through the PCB circuits (to avoid losses) but directly to the front end input. This may or may not be a problem to you. In my case, I do have some very strong local signals up around

900MHz+ and it would have been nice to use the attenuator on occasions to get over some adjacent channel problems. The ceramic filters used in the 9600 for AM and NBFM are not particularly high specifications and the skirt attenuations could easily be bettered for a few more pounds manufacturing outlay. The image rejection was measured at better than 50dB at 300 and 800MHz which is in accordance with the specification.

Conclusions

If you fancy getting hold of one of these rigs — rather than say the AR2002 which goes all the way to 1.3GHz or you need SSB/CW facilities — then the modified receiver will give you all you want. It also offers an extra 45MHz+ of coverage to get in CB and Cellnet, with improved sensitivity across the whole frequency range for the same full list price (at the moment) as an unmodified rig. (Or you can get your own 9600 modified for a reasonable charge). I personally prefer the appearance and general operational ease of this receiver over the AOR series. The mods are very inconspicuous internally although the S meter doesn't seem much better than the unmodified version.

There are also a range of converters available for receivers such as the 9600 which will extend the coverage up to the GHz region, and also down to the low MHz spectrum as well. Now you don't have to go out and buy another rig if your interests change or you want the extended coverage.

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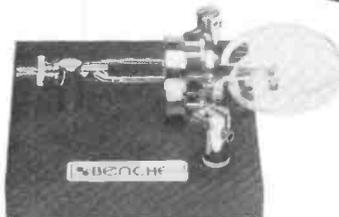
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