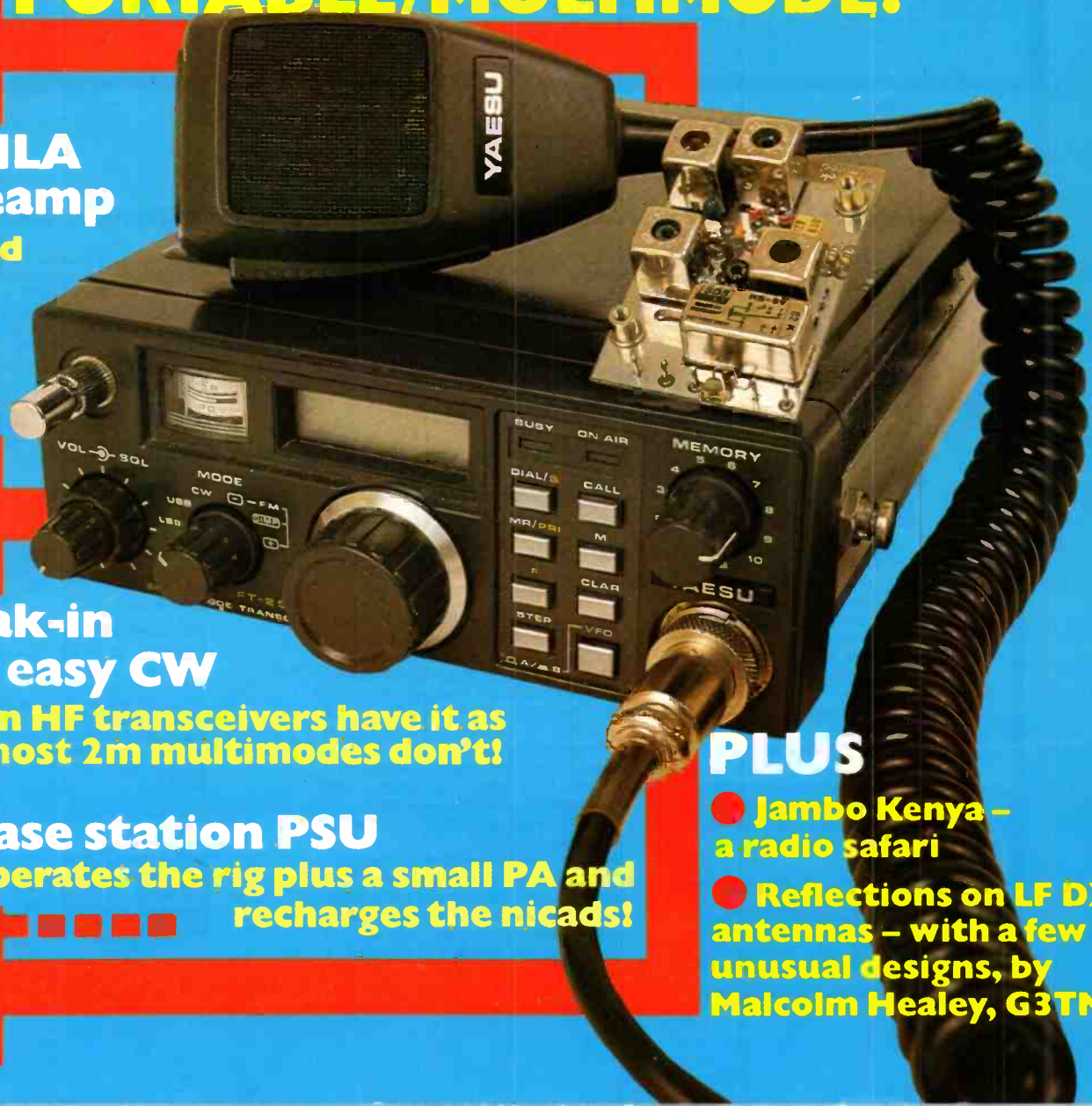
HAM RADIO TODAY
AN ARGUS SPECIALIST PUBLICATION
JANUARY '84
90p

UPDATE YOUR 2m PORTABLE/MULTIMODE!



Mutek SNLA 145sb preamp

Reviewed and fitted to the FT290R

Semi break-in keyer for easy CW

Most modern HF transceivers have it as standard – most 2m multimodes don't!

Base station PSU

Operates the rig plus a small PA and recharges the nicads!

PSU

PLUS

- Jambo Kenya – a radio safari
- Reflections on LF DX antennas – with a few unusual designs, by Malcolm Healey, G3TNO

PROP: A L BAILEY G3WPO 07918 6149
20 FARNHAM AVENUE HASSOCKS
WEST SUSSEX BN6 8NS

WPO COMMUNICATIONS

This month, we thought we would give a resume of all our products — if you want more data, please ring, or drop us an s.a.e. (9 x 4" or larger).

This project is now withdrawn, to be replaced by a new design with a matching 6 Channel 1 Watt transmitter. Full details will appear as a constructional feature in the February Issue of this magazine.

CAPACITY-ADD-ON UNIT — Whats this? A clever design which enables a Digital Frequency Meter to turn into a Digital Capacitance Meter. Measures from 1 pF to lots of uF's. Only two connections needed to your DFM. Complete kit with case & pcb only £14.50. Works off +5 — −15v supply.

VHF PRESCALER — the cheapest kit on the market @ £6.50! Divide by 10 prescaler which will raise the upper limit of your counter to 150MHz plus (typically 200MHz). Small, and comes with case.

ANTENNA MATCHING UNIT — the only kit on the market. Suitable for SWL's or QRP (up to 5 watts). Covers 1.5MHz, and intended for end-fed antennas or G5RV types. Match your aerial to your Rx and get more signals through. Easy to build and complete with case. £25.32.

SIX METER CONVERTER — this one isn't available until December, but to whet your appetite it has a 28MHz i.f., is very sensitive, 20dB gain (variable) and easy to align. All coils prewound. PCB and components mounted on it are £14.00, or complete with diecast box and BNC connectors @ £19.00

LOW COST TRANSCEIVERS — OUR MOST POPULAR kits with hundreds sold. Two versions — the DSB80 for 3.5-3.8MHz, and the DSB160 for 1.8-2.00MHz. Superb receiver (lots of people have been very complimentary about it) with on-board audio amplifier (1 watt). Double sideband (DSB) transmitter and CW with 3 watts or more output. VFO controlled and +12v operation. All built on one pcb and the kit is complete with slow motion drive, but no speaker or mic (crystal). Price for either kit is £37.45. We also have a punched case for the rig @ £21.65 including hardware, and if you want to go all the way, a Digital Readout (ready built and which will fit the case) @ £24.10 including mounting bezel. All three items for £77.00. IDEAL FOR BEGINNERS or QRP enthusiasts. comprehensive instructions are included. DISCOUNTS for Club purchases of 5 or more.

GET ON TO HF WITH OUR TRANSCEIVERS — if you have a 2 metre multimode transceiver, then you can use all its facilities (memories, scan etc) on the HF bands BOTH TRANSMIT AND RECEIVE. We have two versions, one for 160/80 & 40 metres, and the other for 20, 15 & 10 metres. Either version just plugs in to the VHF rig, and the unit converts to 2 metres on receive, and down to HF on transmit. Rf sensing for changeover avoids any mods to your rig. Very sensitive (average is <0.5uV at HF when used with most 2M rigs) and offers 2 watts minimum on Transmit — usually 3 watts (any mode your 2M rig has). compact unit built on 2 printed circuit boards. It also offers direct frequency translation from your VHF rig dial i.e. 14.213=44.213MHz. Kits come complete with the 3 crystals required. Priced at £72.75 for the 20-10M version, and £74.00 for the 160-40M type. (pcb pair only for either version @ £8.50).

PROJECT OMEGA — we have had an overwhelming response to these kits for a High Performance HF Transceiver, as being described in this magazine, and over 100 people are well into constructing it. Its a bit too complex to describe in full, but offers all HF bands in 1 MHz segments, and most of the facilities found on far more expensive rigs. Intended for full break-in CW, but SSB option also available. If you would rather know what goes on in a Black Box, then try building this project. We would not suggest that raw beginners attempt building it though! It is not cheap, but you should be proud of the result. Briefly, kits available so far are: Central IF Processing Unit (69.50), Preselector (11.00), Notch Filter (11.20), Active Filter (15.45), Synthesised VFO (104.00 inc crystals), Frequency Display (31.00), QRP PA (21.00), Logic/Antenna Switch (solid state — 15.45) and Low Pass Filters (29.50). To come are the SSB adaptor, 100W PA, FM and AM units, VHF transverter, In-Line SWR bridge, and a ready punched and screened case. Diecast boxes for modules are available separately. PCB's are also available separately for all modules. Full instructions and corrections included. We have a MAILING LIST/NEWSLETTER for this project — ask to be put on it if you are interested.

70CM PREAMP — a low noise, very small preamp which could be built into most rigs if needed. Either built @ £7.90 or a kit @ £5.90.

2 METRE PREAMP — again, very small and low noise. Kits at £4.50 or ready built for £6.50. Ideal for Phase III satellite reception.

All prices include VAT & Post/Packing. Allow 1-4 weeks for delivery if not ex-stock. All kits are complete with components, pcb's (drilled and tinned), wire and comprehensive instructions. Alignment/debug service available. EXPORT — please write for prices. CASH WITH ORDER — MAIL ORDER ONLY. Catalogue and more details on receipt of s.a.e. (large), or phone us.

HAM RADIO TODAY

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Ham Radio Today is normally published on the first Friday in the month preceding cover date. All reasonable care is taken in the preparation of the magazine contents, but the publishers cannot be held legally responsible for errors. Where mistakes do occur, a correction will normally be published as soon as possible afterwards. All prices and data contained in advertisements are accepted by us in good faith as correct at time of going to press. Neither the advertisers not the publishers can be held responsible, however, for any variation affecting price or availability which may occur after the publication has closed for press.

REGULAR COLUMNS

CONSTRUCTION

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LETTERS

LICENCE CONDITIONS

Sir, 1. One frequently hears the use of "static mobile" which gives the impression that the user is rubbing a piece of silk with his pen, or may even be using a Wimshurst machine *(what? — Ed.)* and your cartoon is correct in quoting the licence for /M Para. 9 1 (d) "in or on a vehicle or vessel . . " However you amend this to read "/M = mobile (in moving vehicle . . .)"

I cannot read into the licence the necessity for the vehicle to be moving, and even if you are sitting in your own drive, in your car, waiting for the wife or whatever, I feel that you are /M. Should you happen to be sitting in your car, using the rig, connected to the car battery, but using an aerial mounted on a separate pole, transportable mast, etc., you should then use /P.

2. With regard to the fact that for repeaters and special event stations the "country" prefix is not used, GB surely is intended to mean "Great Britain" i.e. the greater includes the lesser!!

3. My third point — intended to be helpful rather than over-critical — very few operators at temporary premises using /A observe the requirement to give the address in accordance with Licence Para 9. (4), — and it does say "address" and not nearest town.

Good luck with your Magazine.

RON LEDGERTON, G2ABC

SPECIAL EVENT STATIONS

Sir, I read with interest the article in the current issue of your magazine on Special Event Stations by G6LCC. On my retirement from business in 1968, I volunteered to help in the RSGB QSL bureau and was asked by Arthur Milne, G2MI. who was the QSL manager to take on the job of the GB calls as they were growing in number and getting a bit too much in addition to running the bureau. This I did until August this year when I decided after 15 years to make way for a younger person, Mr. Geoffrey Newman has now taken over.

In those 15 years the issue of GB calls has, to my mind got out of hand, and no longer is the contact with a GB station an 'event'. In fact, I protested when the GB prefix was issued to stations working in contests even though they themselves claimed no award. They do however cause a clamour for QSL cards and created a waste of time and money for cards that are often never collected and have to be destroyed! I have destroyed thousands of QSL cards, many from DX stations which I would have given my right arm to have worked! I maintain that if all the trouble is taken to set up a Special Event Station, surely the little extra could be employed to see that the QSL sub-manager gets a supply of SAEs with sufficient postage.

Yes, the issue of GB2BBC to two stations with dates close together has created a lot of extra work and I can assure G6LCC in that the last parcel I sent out prior to handing over to Geoff did contain some GB2BBC cards which I hope were for the BBC station. Sharon is not correct in saying that the BBC did not have the call G2BBC. This call, along with G6BBC is issued to the Ariel Group (Ham Radio Group) at Pebble Mill, Birmingham, who issue a very FB QSL with an aerial view of the Pebble Mill Studios. The London Group have the call G3BBC, and many more groups within the BBC and IBA have amateur call signs, many of the staff being active amateurs.

I enjoy your magazine and as an Old Timer still find much to learn even though "Ham" radio, like everything else, has changed and as far as I am concerned, not always for the better.

C. TURNER, G8NL.

144 MHz ATU

Sir, I have a small problem that I hope you may be able to help me with. Have you or your colleagues had any, or do you know of any ATUs for 144 MHz?

I have one for the HF bands with a 12-position switch, but I cannot seem to be able to find one for VHF. I am interested in making my own VHF aerial(s) and think it necessary to have an ATU for testing purposes. If you have any information that will be of use to me could you please let me have it, either homebrew type or factory made items.

H M C HALL

Please see 'Wire Antennas on 2m' in our December issue. Could readers please note that we do not have the resources to answer queries on topics other than articles that have appeared in the magazine. An exception to this is where we feel that a point is of sufficiently general interest to merit a reply through these pages.

SWL

Ed, I have brought the mag. since issue one, but I must express disappointment at the lack of info for the SWL. The beginner could use this info as could anyone else who is into SWL as his hobby.

Articles on tuners and aerials, converters and notch filters to build would help the SWL, as would information on how to get QSL cards, and how to contact other SWLs would also be most useful!

I feel that the mag. is for the A and B licence holders only — will there by anything for the SWL in forthcoming editions of the mag.?

W M RIGBY

Our Newcomer's Forum feature often gives information which is appropriate both to the newly licenced amateur and the SWL. In the future we hope to run more articles specifically for the SWL.

RAYNET

Sir, With reference to the letter from S. M. Richards re RAYNET November HRT if you would supply me with his address I shall be pleased to look into this situation, I enclose SAE for your reply.

W.J. COLCLOUGH, G3XC
Vice Chairman RAYNET Committee, RSGB

2m PREAMP LAB. TESTS

Sir, In a recent letter from Chris Bartram of Mutek, concerning the non-availability of his products, for review in my pre-amps survey, there were some criticisms of test methods implied. I would like to make it clear to readers that the methods which I chose to use for the pre-amp survey bore little or no resemblence to those which Frank Ogden discussed with Mutek.

Chris has told me further that he was quite satisfied as an impartial reader of the survey at all the results obtained, but queried one particular quoted figure, that of RF input intercept points. He states in a letter to me that this is normally calculated from one single measurement for a 60dB ratio between each carrier and one inter-modulation product, by adding 30dB to the input level required to produce -60dB. Whilst this may be an established means of quoting intercept point, I feel that it is only relevant in the context of low level performance. The Datong preamp would have had by this form of calculation a much higher apparent intercept point, but which is far more unrealistic than a normal intercept point already is. David Tong told me that he completely accepted my method, and that it seemed more realistic in giving an

idea of the high level performance of a preamp, which is what I intended my quoted figures to show.

For the record book, though, I quote the following intercept points calculated just from the -60dB point, and note the apparent dramatic improvement in the figure quoted for the Datong. Dressler VV200 -17.2 dBm, Moulding MPA-2 -8.7dBm, Wood & Douglas PA3 -9.7, Wood & Douglas PA4 -0.2dBm. It would be most interesting to see if any of your readers have strong feelings about how RF intercept points should be calculated to give readers a truer indication of performance which is relevant.

ANGUS McKENZIE, G3OSS

YAESU FT980

Sir, May I comment on G3WPO's statement on the back of RIT flexibility on the FT980 (Reviewed September 1983).

Initially, I too thought it was a pity the offset frequency could not be returned to. But it can! The technique is to press both RX and TX buttons. In this way you can key the offset frequency automatically after returning to the original and by pressing the button again, go back to the offset channel.

This provides the ultimate capability in DX hunting. First locate the wanted station. Press RX and TX and move up to find the calling stations. Then clear RX — which puts you back to the DX station. With TX still ON you key the offset frequency. To check if the pile up has moved and zero beat with the actual successful calling station, simply press again RX button, which puts you back to the original offset frequency — and tune. The TX frequency will automatically follow.

The above is not made clear in the Handbook and I only discovered it by accident after some few weeks use.

STAN CRABTREE, GM30XC

ALIAS SB-2X?

Sir, I was looking forward to seeing this review (of the Mizuho SB-2X). I recently purchased the Totsuko TR-2100M (the supplier advertises in your mag.) and this is very similar indeed to the SB-2X, the block diagram is virtually identical, except that there is a 2SC2102 10W PA which can be switch out of circuit for low-power operation or running off batteries. In fact, the rig is made by Mizuho, as I discovered when the Totsuko label peeled off to reveal a Mizuho one underneath. It has a slightly larger case, of the same style as the SB-2X, there are five 200kHz ranges, selected by push-buttons rather than a rotary switch, there is an additional switch for fixed channel/VXO and on the rear, switches for NB ON/OFF, SSB/CW (surely either of these would have been more use on the front panel than FIX/VXO?), 10W/1W, and dial lamp ON/OFF. Like the SB-2X, the TR2100M is designed to run with NiCads, unlike the smaller rig, not only is there no charging circuit, but there is not even any way of plugging in a charger, the NiCads must be removed and charged externally.

Like your reviewer, my transceiver had a fault on delivery. In my case, it was obviously oscillating on transmit, although it took some time to trace, and was found to be a maladjusted core in one of the pre-driver stage tuned circuits. Once this was cured, and all the other tuned circuit adjustments checked (all the others were more or less spot-on) power output on a whistle was 0.75W on low power and 7.7W on high power, both substantially lower than the specification of 1W/10W.

This is my criticism of your review — I would like to have seen some measurements of the rig. It interesting to read about its facilities, and to learn that the reviewer worked fifteen miles with the rig on the kitchen window-sill, but any amateur who knows what he is talking about and who has experience of a few different rigs can write that sort of review. Angus McKenzie is probably expensive, but he does find faults in RF performance of rigs which are important if you intend to use them under stringent conditions, such as during a contest.

To return to the TR-2100M, then, while testing power output at different supply voltages, to see what I would get out when running it from a car battery, for example, I found that I got 6W out on CW at 12V but only 3.5W out at 13.8V! Investigating further, gradually increasing the voltage with the key down, I found the output power would gradually increase to about 6W then suddenly drop to 3.5W at about 13V. This happened only on CW, and only on high power, so it must be something in the PA (which is switched out in the low power position).

Turning to the receiver, all the points your reviewer found found with the SB-2X applied equally with the TR-2100M. It seemed quite sensitive, but lacking in IF gain, in fact I could hear on it any weak station that I could hear on my transverter-with its coaxial change-over relay and BF981 front end, which means that I would be interested in an article by Angus McKenzie going into greater details on how the ordinary ham-on-the-air campaign VHF preamps for minimum noise figure without the aid of batteries of test equipment! But I digress.

The strong signal performance of this receiver was the worst I have ever come across, which again is another reason why I would have liked to see some measurements. Perhaps it is the old JFET mixer which is at fault, although my old IC201 uses a JFET mixer (come to that, I must think the FDK Multi 750E did) and they were both quite good receivers. Perhaps the problem is due to the back-to-back diodes across the first RF amp input. I have never seen these in any other circuit, but am reluctant to remove them in case they really are necessary — perhaps the isolation of the change-over relay is poor.

Nevertheless, I am very happy with the TR-2100M; I have had contacts well into Germany from a parked car using HB9CV, and get good reports on the transmitted audio. I am not afriad to delve inside, and at the price one is not detered from doing so. It offers better performance than a Liner 2 in a more versatile, compact package and at much less cost than I paid for the Liner 2 seven years ago. The TR-2100M, with 10W PA costs £115, compared with Lowe's normal price you quote of £165 for the SB-2X.

JULIAN V. MOSS

(Note that this letter has been shortened) You hit the nail on the head when you say that it's probably expensive to get Angus McKenzie to do full technical reviews; that sort of work requires a large, well-equipped laboratory and a lot of careful work to get accurate, repeatable results that are not going to land us in the libel court! (Or, if they do, ones' that can be reproduced elsewhere). So, what do we do — do we take a few measurements and hope that we've picked the right parameters to check, and do this on lots of equipment — or do we do, as we do at present: pick a few items of gear to give 'the works' and do essentially user-tests on the remainder? Our present opinion is that the latter is the better course — at least we don't give the false impression that we've checked everything on items that have only had a reasonably cursory 'inspection' — as might be the case in the limited technical tests.

BOOKS FOR BEGINNERS

Sir, I have been interested in Ham Radio for some time and became even more interested after reading the November issue of 'Ham Radio Today', but being a complete novice to ham radio I find it hard to understand the electronics and mathematics which go into it.

Could you please advise me on any books which may help me to learn about these aspects of amateur radio in layman's terms.

A J COX (Miss)

There is a problem in recommending books, and that is that one person may find a book superbly helpful while another may find exactly the same book too simple or much too difficult. Therefore, we suggest that you visit the local library to see what they have on offer first, as this won't cost you anything! Alternatively, try a book shop in a large town (towns with large technical colleges generally have at least one reasonably well-stocked bookshop) and spend some time looking through the books they have on offer to see which on suits you.

When you're choosing a book, do make sure that it has sections covering how all the basic components work — in particular resistors, capacitors, transistors and inductors. Avoid like the plague any book that devotes any great space to valves! (Heresy! — Ass. Ed) Also check that any maths is at a level you can handle, at least in the earlier chapters.

Please address correspondence to:
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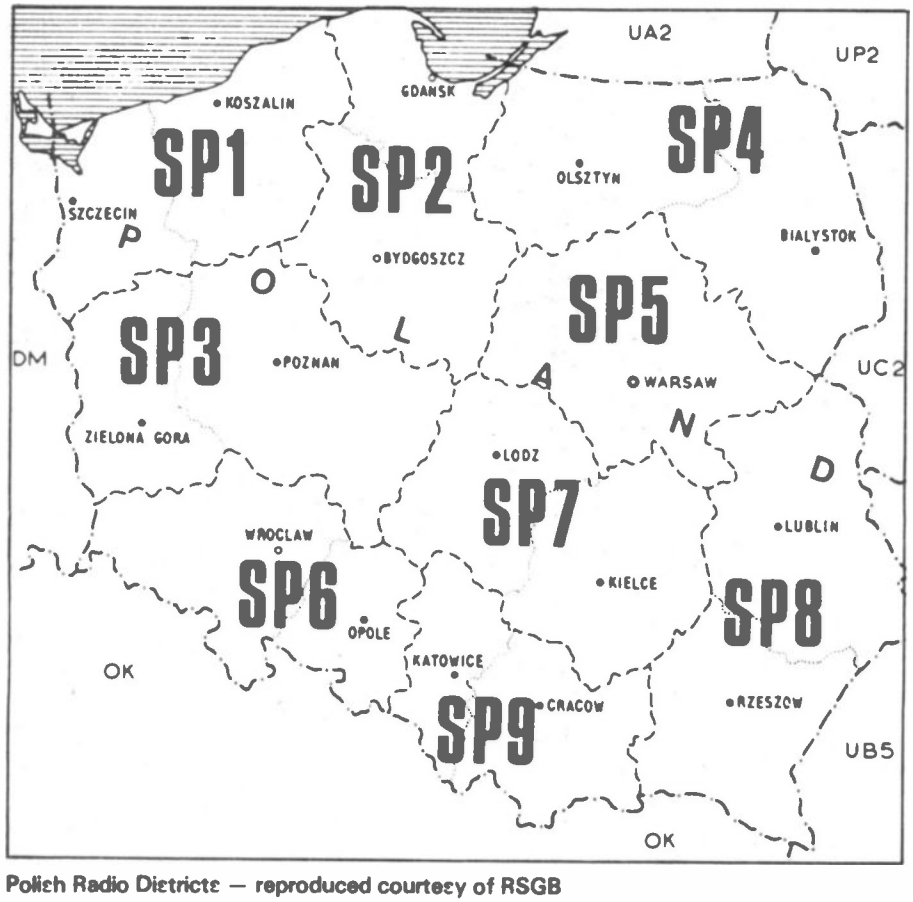
RADIO TODAY



Polish Radio Districts — reproduced courtesy of RSGB

Amateur Radio in Poland — a normal situation?

A recent item in the Australian magazine 'Amateur Radio Action' reveals that there are still only some 500 stations on-the-air in Poland. Although this may sound a reasonably large number, that is only 7% of the licenees before martial law was imposed. Licences have only been issued to approximately 10 stations in each of the 49 districts in Poland.

Far and away the most active areas before martial law were SP2 and SP9. There are now only 59 stations in SP2 and 86 in SP9. This is especially interesting when you realise that SP2 contains the large cities of Gdansk and Bydgoszu, and SP9 the main Polish manufacturing and mining centres.

Holdings Join Forces With AE UK

"If you can't beat them! . . ." Things can be difficult for the small independent amateur radio retailer, and some are finding it advantageous to associate themselves more directly with a major distributor.

Harry Leeming, G3LLL, of Holdings of Blackburn Ltd., advises us that his company will now be known as Holdings/Amateur Electronics North West, and, whilst still independently owned, will in effect become a branch of Amateur Electronics UK of Birmingham. Harry has a long association with Yaesu equipment and tells us that the deal allows him to more than double his stock of Yaesu plus adding TET aerials and numerous other items. The new shop is only 15 mins. from Junction 31 on the M6, parking is free and plentiful, and the address is: 45 Johnston Street, BLACKBURN, Lancs. BB2 1EF. Tel: (0254) 59595.

Cody Commemoration

On 16 October 1908, Colonel S.F. Cody made the first sustained powered flight in Britain. This historic event took place at the Balloon Factory in Farnborough, Hampshire, now known as the Royal Aircraft Establishment. To commemorate this event The Farnborough and District Radio Society will be holding a special event radio station.

The Farnborough and District Radio Society has been granted special permission to use the callsign GB2CDY (*CoDY*). The station will be on the air from 14 October until 22 October, on the following bands 80m, 40m, 20m, 15m and 10m both CW and SSB and on 2m and 70cms CW, SSB and FM. A rather attractive QSL has been produced for the occasion.

East Anglian Repeater Update

GB3PI, Britain's first ever repeater, is currently undergoing an overhaul. Deterioration in the receiver feeder, due to long term weathering, has led to work being undertaken with a view to single aerial working. The aerial will be fed with Heliax coaxial cable. The new system will give better reciprocity to stations using the repeater, in addition to providing a 3db improve-

The main exhibition hall at the recent Doncaster Amateur Radio Exhibition organised by the Amateur Radio Retailers Association. Photo by D. Rose, G4TZQ.

ment in overall receive sensitivity.

GB3PY on RB14 will shortly undergo a change, pending approval, to the Pye telecommunications establishment in Cambridge. Tests have indicated that this will give a better overall coverage, including superb coverage of Cambridge City centre, facilitating the use of very low power equipment. Dig out those 'Pocket-phones'!

Moves are underway to add data relaying facilities with a message and store and forward to form an 'Electronic Post Box' at GB3PT, the RTTY repeater on RB12. Standard European CCITT telephone MODEM frequencies will be used, at 300 baud, pending approval. The explosion of Home Computer usage could make this a busy repeater soon, muses CRG man Chris Lorek, G4HCL. There is no truth in the rumour that successful access will be only be obtained after zapping ten Klingons!

National Repeater Latest

It seems that things are moving again on the Repeater Licensing scene. However, there had been considerable criticism from Repeater Groups, awaiting their proposed repeaters to be licensed, at the Home Office's rather lengthy delays, 14½ months in the case of the recently approved UHF Phase 6. At the same time, however, licences have been issued for 12 repeaters in the VHF Phase 5 and it is encouraging to see some of these new units becoming operational, providing additional repeater coverage in many areas, and overlapping alternative coverage in others. Nearest to Scotland, GB3EV, situated on Great Dun Fell in Cumbria, serving the Appleby/Penrith area on R4 is a repeater of the Anglo-Scottish Group. Another new repeater is GB3HG, situated on a TV mast high on the N. Yorks Moors, filling in a previously unserved area of N. Yorks and a large patch of the A1 and operational on R1.

Another newly-licensed 2m repeater is GB3TY (Tyne Valley), to be situated at the Radio mast at Stagshaw, to the west of Newcastle. Unfortunately, there are presently site access difficulties but North Eastern repeater users can look forward to signal on R6 to cover Hexham, the Tyne Valley, Morpeth, Haltwhistle, Consett and surrounding areas in the near future.

Other 2M additions are two new repeaters for the Midlands; one on the spire of Lincoln Cathedral, courtesy of the Dean & Chapter, and another repeater for Manchester, GB3MB on R0. Finally, there are plans for a repeater located on Dartmoor, overlooking the prison (!!) which should serve most of Devon and a sizeable chunk of Cornwall and Somerset on R4 with the callsign GB3WD.

Wanted Urgently!

HRT urgently require the loan of a Yaesu FT101B in good working order for a period of approximately two weeks. We are offering TWO YEARS SUBSCRIPTION to HRT in return and will pay for Securicor delivery to, and from, these offices. We will also, of course, acknowledge the generosity of the person who assists us in the pages of HRT.

Western

It's **Western** *for YAESU and KENWOOD*

Since we first introduced the "Yaesu Musen" brand name to the UK market in 1970 and more recently the "Kenwood" name for Amateur Radio equipment, you can buy with confidence where experience counts. We maintain links with the factories for spares though we maintain stocks also. We also have extensively equipped service facilities with extensive (and expensive!) test equipment. It's gratifying to hear that more and more discerning prospective customers object to the "knocking and false rumours" put around by our competitors. Thank you Mr A. in Kent for your order for Kenwood TS-530S a few minutes ago. Remember, Kenwood is *THE* brand name throughout the world. It's only for UK that Trio is used. At 'WESTERN' we are not part of any illegal price ring and we are pleased to supply KENWOOD brand equipment known and recognised throughout the world.

Western – FOR VALUE FOR MONEY WITH

THIS MONTH'S SPECIAL CHOICE . . . YAESU PRICES (carr. paid)

YAESU FT-101Z £499 **FT-101ZD £569**

- ★ Digital frequency readout on 'D' model
- ★ QRM-beating Variable IF Bandwidth
- ★ High performance RF processor
- ★ Rugged 6146B PAs with RF negative feedback
- ★ Full band coverage 160-10 metres
- ★ Compatible with all '901 accessories

VHF/UHF EQUIPMENT

1234	FT-290R	2m all mode transceiver, portable	245.00
1242	FT-720RV	2m FM mobile transciever, 10W	189.00
1241	FT-720RU	70cm FM mobile transceiver, 10W	219.00
1263	FT-230R	2m FM mobile transceiver, 25W	230.00
1210	MMB-11	Mobile Mount for FT-290R	21.50
1202	CSC-1A	Carrying Case for FT-290R	3.25
1220	FP-80A	AC PSU, 4.5Amps	53.00
1595	C NICADS	Set of 8 Nicads for FT-290R	21.00
1205	FP-4	AC PSU, 4Amps	42.00
1211	NC-11C	Charger for FT-290R	8.00
1200	NC-1	Desk Charger for FT-202R	19.00
1201	PA-1	12V adapter for FT-202R	19.00
1258	NC-7	Base charger for FT-208/708R	26.00
1253	NC-8	Deluxe fast charger for FT-208/708R	42.00
1260	FBA-2	Battery sleeve for NC-7, NC-8	3.00
1262	NC-9	Compact trickle charger	8.00
	FT-208R	VHF Handie FM Transceiver	189.00
	FT-708R	UHF Handie FM Transceiver	199.00
	FT-726R	VHF/UHF multiband transceiver (2m installed)	649.00
	FT-730R	70cm 10W FM SSB Transceiver	250.00
	FT-790R	70cm SSB/FM Transceiver	290.00

KENWOOD PRICE LIST

1301	STS-1	Base stand/charger for TR-2400	43.00
1302	KB-1	Deluxe knob for TS-530/830 series	10.50
1307	PS-20	DC PSU for TR-9000	49.00
1308	PBK-24K	Spare battery pack for TR-2400	16.00
1309	MC-30S	Hand microphone, 500 ohm	13.00
1312	MC-50	Desk microphone, 500 ohm/50k	30.00
1313	MC-60	Desk scanning microphone, dual impedance	50.00
1317	MB-100	Mobile mount for TS-130S	18.00
1318	SP-100	Speaker for R-1000	26.00
1322	TS-130S	HF transceiver	525.00
1323	DFC-230	Digital remote frequency controller	130.00
1324	TS-430S	HF transceiver with gen. cov. receiver	705.00
1328	R-600	Receiver	240.00
1329	SP-930	External speaker	55.00
1330	TS-930S/ATU	HF transceiver with gen. cov. receiver & ATU	1263.00
1331	TS-930S	HF transceiver with gen. cov. receiver	1199.00
1332	R-1000	General coverage receiver, digital	279.00
1333	DCK-1	DC operating kit for R-1000	8.26
1335	R-2000	New general coverage receiver	389.00
1337	TR-2400	2m FM hand portable transceiver	195.00
1339	TR-9130	2m Multimode transceiver, 25W	419.00
1341	TR-9500	70cm FM/SSB/CW mobile transceiver	399.00
1343	TR-8400	70cm FM mobile transceiver, synthesised	250.00
1344	DS-2	DC converter for TS-830S	42.00
1319	SP-430	Speaker for TS-430S	30.50
1320	AT-130	Aerial tuning unit 100W	91.00
1321	MB-430	Mobile mounting bracket for TS-430S	12.50
1325	AT-230	Aerial tuning unit, all band, matches TS-830S	135.00
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1334	FM-430	FM option unit for TS-430S	33.75

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Our M.D. (He's spoilt! He just takes home what he fancies for a trial evaluation!) thought he'd try the top of ranges FT-1 and TS-930S. He promptly brought the FT-1 back to the stock-room (Mr Hasegawa, please note!). Then he took the FT-102. He hitched the FT-102 and TS-930S up together but brought the FT-102 back. Said he'd got too old and lazy to bother with controls like PA Tune, PA Load, Pre-selection tuning, when the TS-930S does the same job with less knobs. He's grown to like the 930S so much he hasn't tried it against the Yaesu FT-980 – although no doubt it's only a matter of time (The FT-102 is back in the demonstration room!). The 'Noise Blanker' really cuts old "Woody Woodpecker" down to size! UA's will have to find something new to annoy a TS-930S owner.

How often have you found a rare DX-station only to discover he has a good pile-up too! With the '930' you just press "M In" and store his frequency in the memory and carry on tuning round or QSO elsewhere. Then to come back smack onto the rare DX you just select 'Memory' instead of the VFO, and up pops your DX station. Since there are 8 memory channels there are more than enough for anyone!

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VK81F "Thought you were local"

The above are a few of the reports and comments received over the course of a few hours operating. They (or the antennal) speak for themselves. When you upgrade your antenna system to a quad, you'll only have one regret . . . and that's not having done it sooner! Send SAE for specification.

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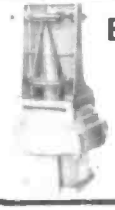

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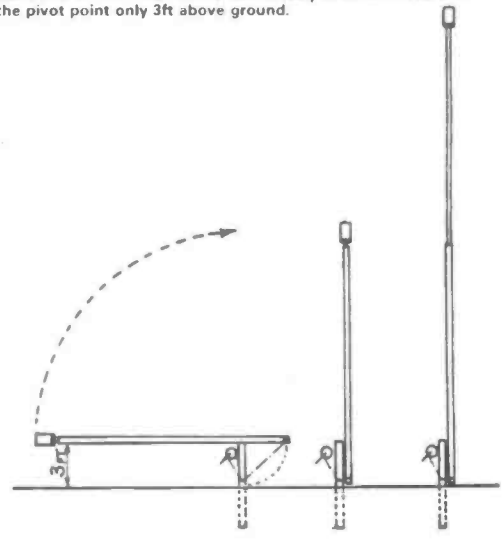

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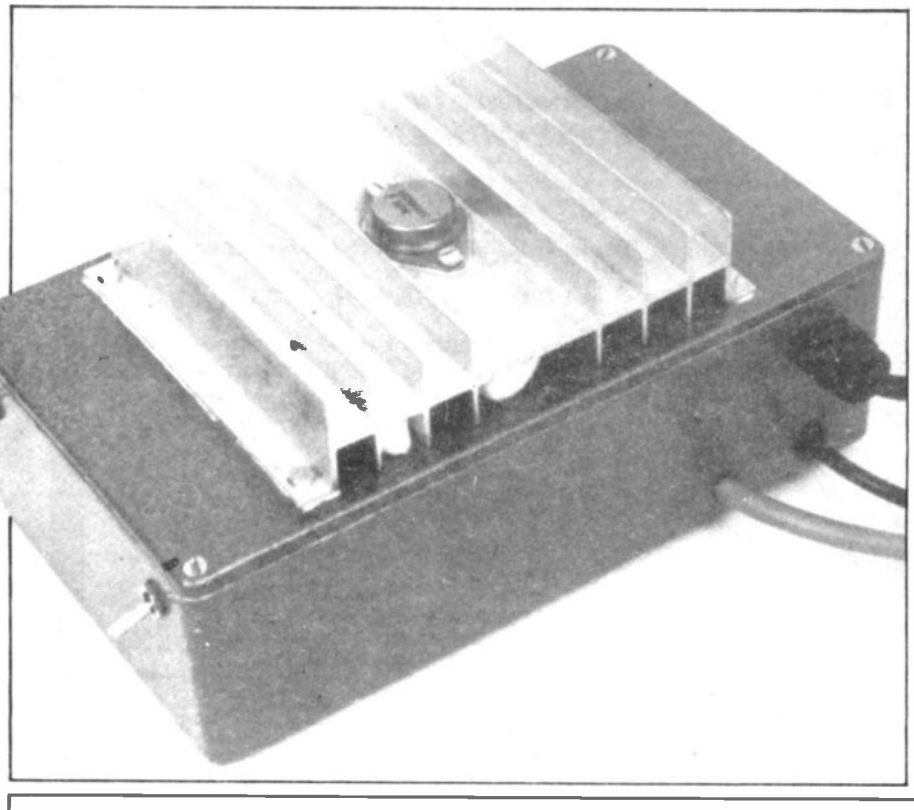
Power Pack for Portable Rigs

Many radio amateurs start by operating a small portable transceiver, such as the Trio 2300 or the Yaesu FT290. Whilst admirable for portable use, these suffer when used as a base station from the limitations of nicad rechargeable cells. The supply may become exhausted in the middle of a contact, and the need to recharge the cells for ten or so hours — for each couple of hours operating — can be very restrictive.

Got a new class B licence and a 2m portable rig? Find a soldering iron and build this project by P.M. Delaney, G8KZG, which will power the rig* plus *a small PA* and *recharge the nicads!

The solution to this problem is to build a mains power supply/nicad charger. In this design it is possible to operate the rig, and a small PA as well if you wish, whilst recharging the nicads from your latest /P expedition at the same time. Details are given as to how to adapt it for a variety of output voltages or charging currents.

The basic power supply consists of F1, T1, D1-4 and C1-3. A toroidal transformer is used for T1. This has the advantage of compactness and low radiated magnetic field. As the turn-on current with this type of transformer is large, F1 must be an anti-surge fuse of appropriate rating. The transformer windings are wired in parallel, and their output fed to a bridge rectifier and capacitance filter.



The operating power supply is built around IC1, an 78HG type regulator. The output voltage of this is set by R3 and R4, according to the formula.

$$V_{out} = \frac{5\,(R3 + R4)}{R4}$$

By altering R3 and R4 a variety of output voltages (from 5 to 15) can be obtained. Values of R3 and R4 for popular output voltages are given later. The output passes through RF chokes L1 and L2 (to prevent RF from the pa or rig passing back towards the mains) and output fuses F3 and F4.

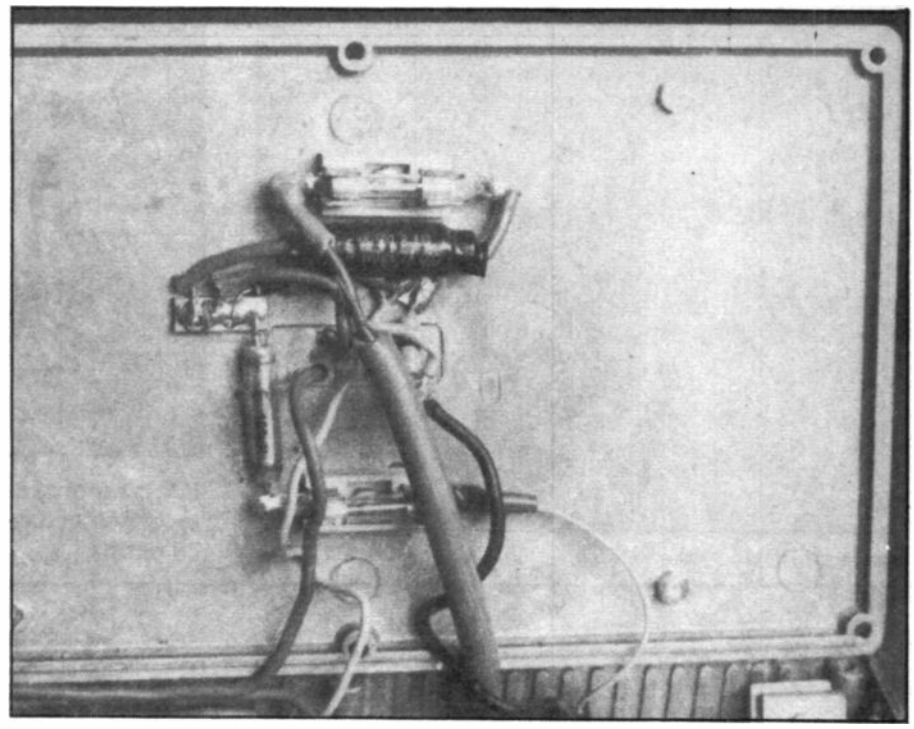
To protect the rig and power amplifier from the possibility of too high a voltage being applied to them, an over-voltage circuit (R2, R5, Z1, C4 and Q1) is fitted. When the voltage across the zener diode is exceeded, the triac Q1 is turned on, and the fuse F2 connected to ground through the limiting resistor R2. This blows the main fuse F2. In practice, the zener voltage should be about 0.7V — 1V higher than the regulator output, to prevent false triggering. The correct zener voltage can be made by putting zener diodes in series (never in parallel!). Resistor R1 serves to discharge the main capacitor bank C1-3 when the fuse blows or the rig is turned off. Without this, the capacitors hold sufficient charge to give a sizeable spark after several hours.

The nicad charging circuit is build around IC2, a 7805 regulator. By Ohm's Law $V = I \times R$. By keeping the voltage across R6 constant (which the regulator does), the current through it is stable. This constant current then flows to ground through the nicads, so charging them, provided that the voltage at the input to the IC2 is at least 7V plus the nicad fully charged potential. The charging current will be (approximately) 5/R mA, where R is the resistance of R6 in kilohm. Typical valves are given later.

Construction

The prototype was built into a diecast box 192mm × 113mm × 61mm, with a heat sink mounted on the lid for IC1. The rectifier diodes, IC2 and Q1 are all bolted to the bottom of the box for heat sink-ing. Each of these items should be smeared with silicone grease. Note that IC2 must be fitted with an insulating mica washer to isolate it from the box, and be secured with a nylon nut and bolt. The transformer should be mounted using the neoprene washers supplied with it. Take care that the securing bolt only contacts the box at the lower end — as it could otherwise form a short-circuit single turn on the transformer. The RF chokes L1 and L2 should be of very low DC resistance, so that the supply regulation is not impaired. All low voltage wiring should be of thick cable (such as is used for wiring house ring mains). The components fixed in the lid are either wired direct to the pins of IC1 (R3,4, C5,6), taking care not to overheat the IC, or are fixed to small pieces of printed circuit board laminate 'super-glued' to the inside of the lid. The lead from R6 and F3 to the rig should be terminated in a plug to match the transceiver power socket.

In use, this unit has been able to power a Trio 2300 and a Wood and Douglas PA, giving about 15W, without a noticeable rise in temperature. On-air reports indicate that no noise is generated by the PSU. It should be noted that the nicads should not be left on indefinite charge — but charged for the normal 10-15 hours. This section could, if wished, be omitted, of course.



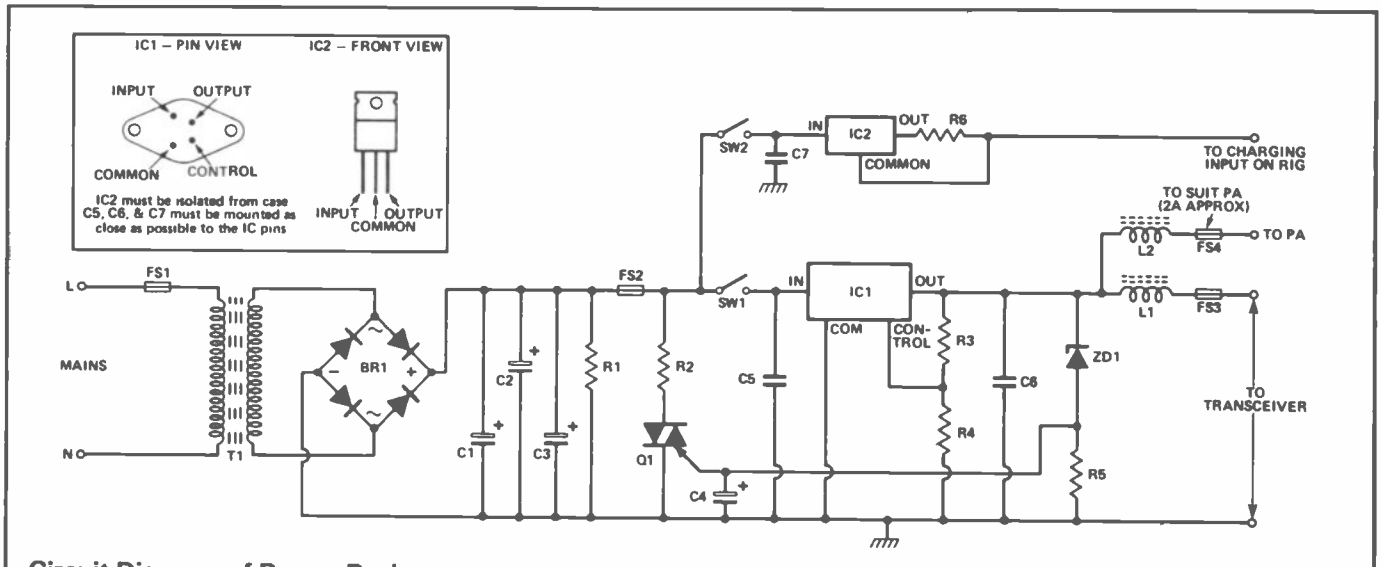
Lid of PSU (note pads of copper laminate super- glued to lid).

Table 1 — Zener diode and Resistor valves for various output voltages.

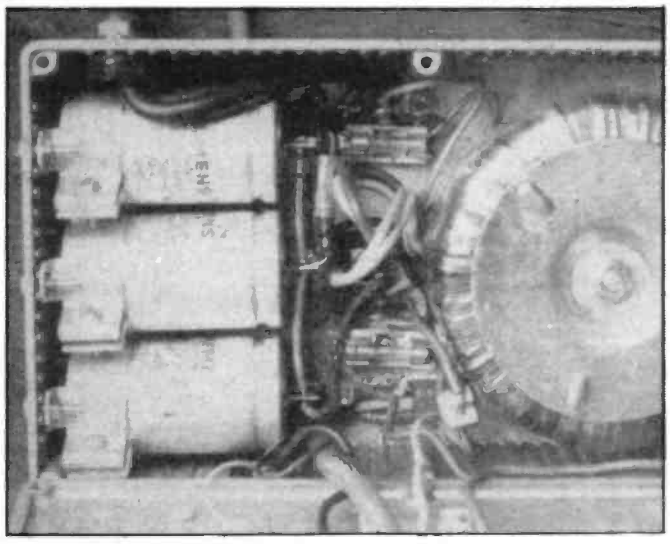
Voltage out (V)	R3	R4	Z1
6	1k5	7k5	6V8
9	2k4	3k0	10V
12	5k1	3k6	13V
13.8	6k8	3k9	15V

Table 2 — Charging current for various nicad cells

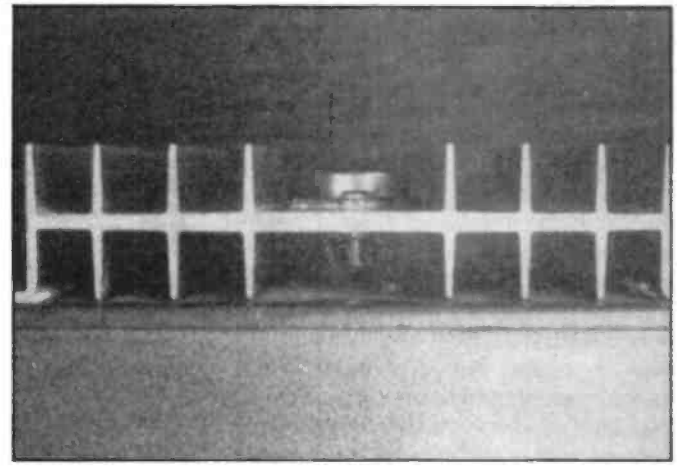
Cell type	Charging current (mA)	R6
AA	45	120R
C	180	27R
D	350	15R
PP3	15	360R



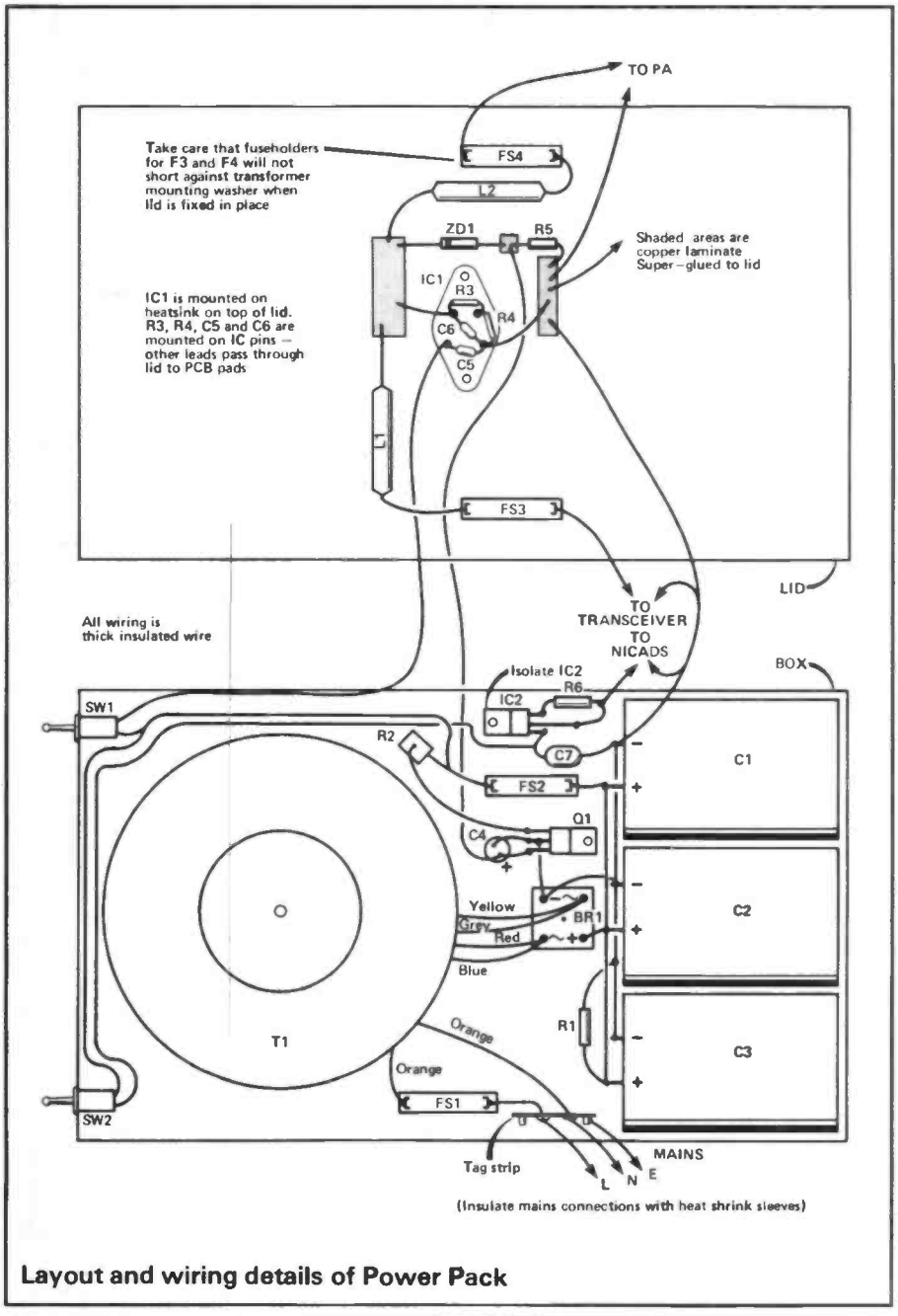
Circuit Diagram of Power Pack



Inside of PSU



IC1 is mounted on heatsink. C5, C6, R3 and R4 are mounted on i.c. pins, in space between heatsink and lid of box.



Layout and wiring details of Power Pack

COMPONENTS LISTING

R1	1k ⅓ watt
R2	0.47R 5 watt
R3	see table 1- ⅓ watt
R4	see table 1- ⅓ watt
R5	47R ⅓ watt
R6	see table 2- ⅓ watt
C1,C2,C3	4700uF, 40V
C4,	10uF, 25V tant.
C5,	0.22uF 100V poly.
C6,	0.47uF 100V poly.
C7,	0.22uF 100V poly.
S1,S2	S7101 SPDT miniature toggle.
IC1	78HGKC
IC2	7805
Q1	2N6397 or similar high current triac (12A)
Br1	200V 6A bridge rectifier
Z1	see table 1 — 400mW zener diode
T1	ILP Toroidal transformer, 120VA, 18V + 18V (12V + 12V if only 6V outputs required)
L1	100uH 1A (Siemens B82111EC25)
L2	120uH 2A (Siemens B82500BA10)

Case, 4 x 20mm plastic chassis mount fuseholders — fuses to suit loading, Heatsink (2.1°C per watt heatsink eg Electrovalue 10DNA), miniature tag strip, 2 small pieces copper laminate, Nuts and bolts, capacitor clips, rubber feet, grommets. Connecting cable.

All parts are available from Electrovalue, 28 St Judes Road, Englefield Green, Egham, except R2, which is available at Tandy stores.

The transformer may seem very generously rated, but needs to satisfy peaks of current, and maintain sufficient input to regulators. It also helps it to run cool.

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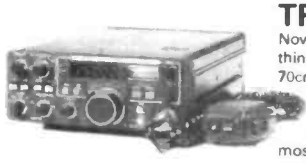


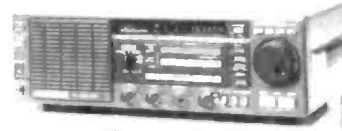
Now that OSCAR 10 is working, it's time to start thinking about working the world on 2m and 70cm. From our QTHs in and around Newport Pagnell, we regularly work through this satellite and the equipment that we use may surprise you. Although we have access to most makes, we still prefer to use a Trio 9130 and a Trio 9500. These radios are beautifully made and have all the facilities that you could wish for. You've seen them advertised before, so we are not going to fill the page with a list of all their features. Instead we are more than willing to demonstrate them to you in our showroom. Why not call in and see us and also see just how easy it is to use OSCAR 10, described by Karl Meinzer, DJ4ZC, of the European Command Centre, as '...the most perfect amateur satellite yet put into earth orbit'.

TR9130	TR5900
£433	£395

The Season's Greetings

Derek G3TGE–Roy G3TLE
Kerry G6IZF

The obvious thing you're going to need as an SWL is a decent HF receiver, so why not drop in to Photo Acoustics and listen to these, for a start . . .



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NEWCOMERS FORUM

By Tony Bailey, G3WPO

Tony Bailey, G3WPO, gives the low down on that sadly neglected band, 160m.

For subject matter this month I have chosen to talk about "Grandads Band", or "the DC band", as it is sometimes quaintly known. More usually known as 'Top Band' (or should it be 'Bottom Band'?) and covering 1.8 to 2.0MHz, it was once the starting ground for virtually all amateurs. However, with the advent of Class B licences, and the easy availability of commercial 2 metre equipment, its popularity has declined a lot over the last fifteen years or so.

This is a great shame, as the band offers good operating experience in many areas using simple equipment and aerials.

With winter upon us, now is the time to get on the band and enjoy the static-free conditions — in summer the latter can totally obliterate contacts, even at local ranges! Contacts can be had with the UK and Europe using relatively simple aerials, and of course the power is limited to 10 watts input on CW (around 26W pep on SSB), so equipment is not too taxing if you want to build it yourself. 160m is one of the few bands where AM can still be heard, and is acceptable to most people. A lot of commercial gear has provision for the band, usually with a means of reducing the input power to the UK legal limit — if not, mods have been published for some of the more popular rigs in various journals.

Plenty of Room

There is more room on the band than at one time — when the writer was licenced one of the navigational beacon systems (Loran), effectively obliterated most of the upper 100kHz, but this was removed some years ago. You should note that we share 160m with a number of other services, primarily the Coastal stations (known to all as "fish-fone") and Interference to these must be avoided. If you are asked to move frequency by such a station then you should comply. I well remember that during one cw contest on the band, the operator of our club station, who had been using one particular frequency for some time, was asked to QSY by an unknown station. Feeling rather upset, he let his feelings be known, then asked who was calling. The reply emanated from one of the Coastal stations, so he didn't argue further. Nowadays, Coastal stations are more easy to recognise as they transmit upper sideband, whereas the amateur convention is to use lower sideband.

Top Band is also one of the few bands where you can expect little problem with TVI, due to the low frequency and low powers used. The only problem you *may* find is with interference to broadcast radios on the medium wave band (usually through image response), but there is little that can be done about this. I have only experienced the problem once, and that was with a portable tranny. Fortunately the complainant accepted my explanation and didn't pursue the matter further.

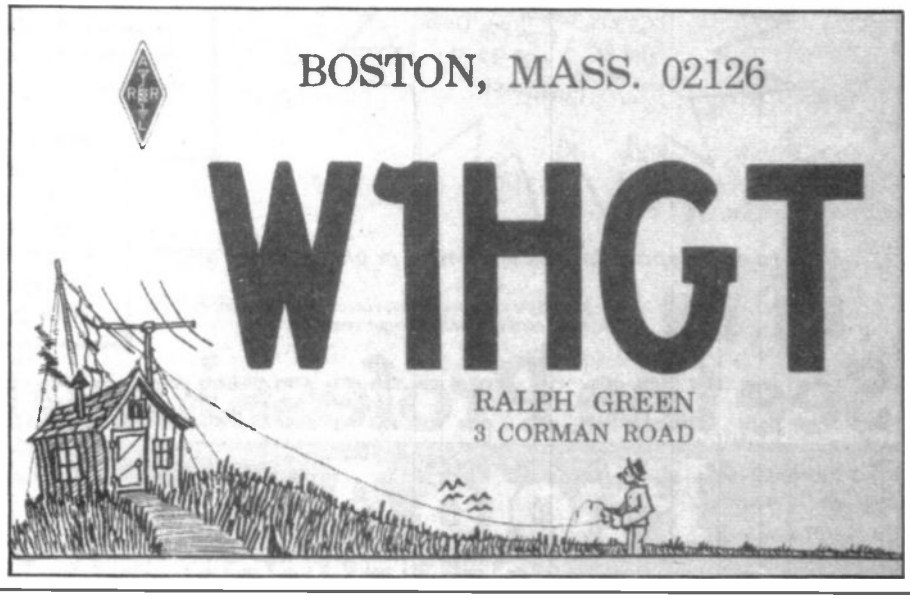
Local QSO's can take place at any time on the band, and 160 is ideal for local natter nets, a help in taking the pressure off 2 metres for class A licencees. QSO's usually lie around 1.9-1.95MHz in the upper half of the band, with the more distant and DX contacts taking place below 1.8MHz. On Top Band, one could define DX as being over about 4000km, but DX is relative, and a much shorter distance could well qualify depending on your aerial and equipment.

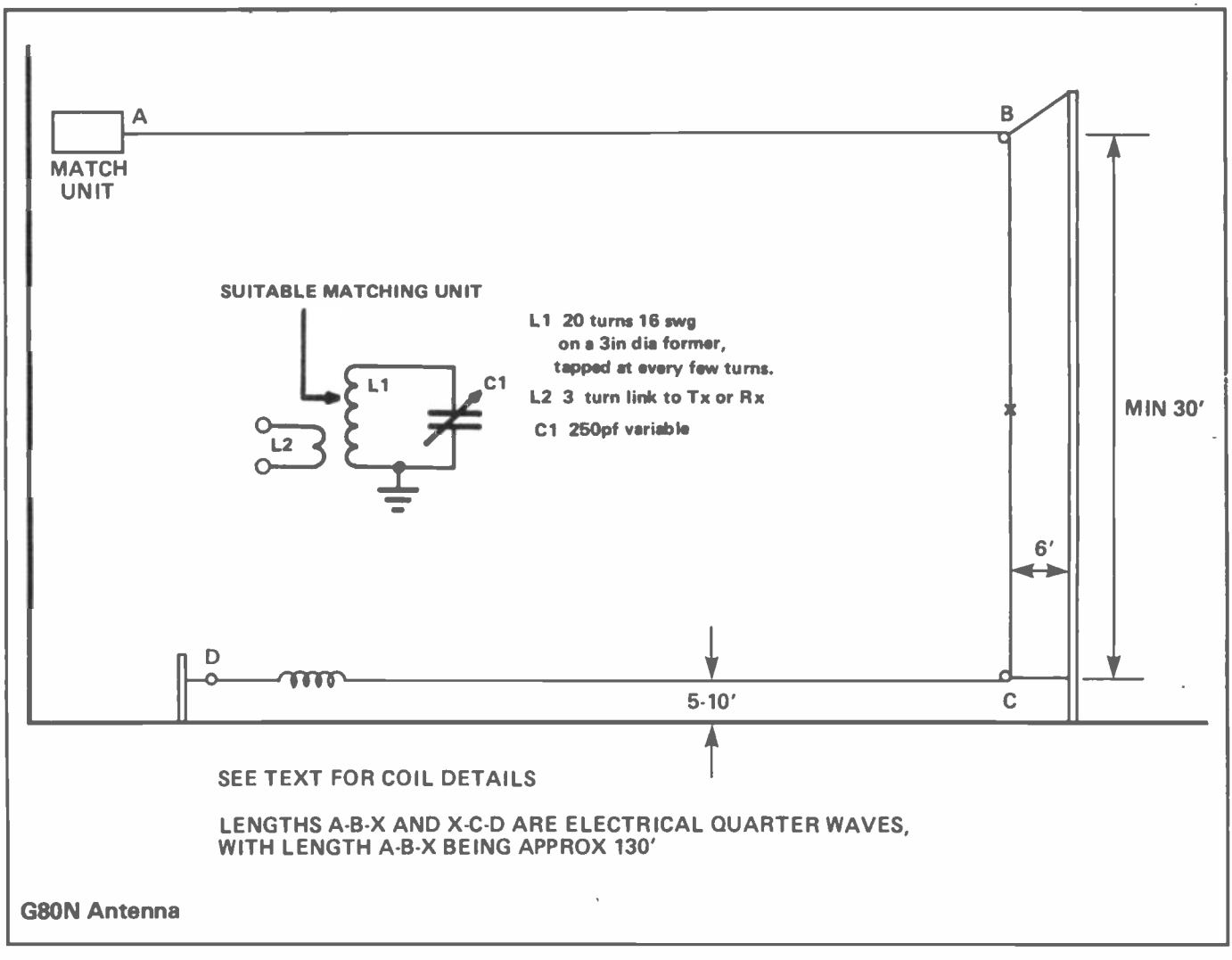
CW Working

It is important that you remember what frequencies to use when you are working CW in the lower half of the band. Most routine CW contacts take place between 1.825-1.84MHz. Below this is strictly DX-land, and woe betide anyone who ends up calling in the wrong place!

Never call CQ below 1.815MHz — this area down to 1.80MHz is used by DX stations to call us. G's and other Europeans transmit between 1.825 and 1.835MHz, working split-frequency and listening lower down.

An outstanding signal from the USA on 160m is W1HGT.





G80N Antenna

DX signals can be weak on the band (or S8+ sometimes), and it isn't much help if you have a 599+++ local calling CQ within a few kHz of that rare bit of DX. One problem here is that many commercial transceivers don't have the facility to operate at this sort of split, so you may have to use separate Rx/Tx combinations, or build something yourself.

Frequency Allocations

Some countries have restricted access to the band, and you need to become familiar with these. France is one, with a spot frequency of 1926kHz, whereas you will find the Russians between 1.85 and 1.95MHz. There are sufficient countries on to achieve the Worked All Continents award — some stations who have been around for a while have even managed DXCC!

Most stations cherish their first contact "across the pond", and there are many shacks with the familiar W1BB card on the wall.

What CW?

You will gather that most of the DX contacts are by means of CW, although SSB is often used when signals are strong enough. Don't be put off by needing to use CW — the speeds used are well within anyone's capabilities who has passed the Test *(and often within the capabilities of many who haven't — speeds used for DX working can be as low as 8-10wpm — Editor).* In fact, often TOO slow for comfort. But, you will usually only be looking for a standard exchange, so it isn't very difficult.

Considering the low power and often simple antenna systems used, working across the Atlantic is no mean achievement, and the feat is a prime example of amateur radio at its best. Why struggle to work the USA on this band when you could do it so easily on 20 metres? Because it is an achievement and a bit more of the 'self-training' aspect of the hobby.

The best times are during the winter, with static at its lowest, and during the hours of darkness. There are normally two main times for QSO's to the States — around midnight, and again around dawn, although you may find that contacts are possible all night long and well into daylight hours sometimes. The important thing is that one end of the contact should be at sunrise or sunset. (See our propagation article also in this issue — Editor).

Even nearer DX has taken on a new look in the past few years as more and more countries have been licenced for the band. The REAL DX, in the shape of Australia (VK) and New Zealand (ZL), is a much more difficult matter. These contacts are usually the result of prearranged "skeds" between the participating stations so that the very brief 'window' available for the contact is not missed. And it is brief — sometimes limited to a few minutes when the correct path conditions exist, although openings of up to half-an-hour are possible. The signal slowly rises out of the noise, peaks for a minute or so, and fades

away again. Quite thrilling to listen to, even if you don't actually make the contact.

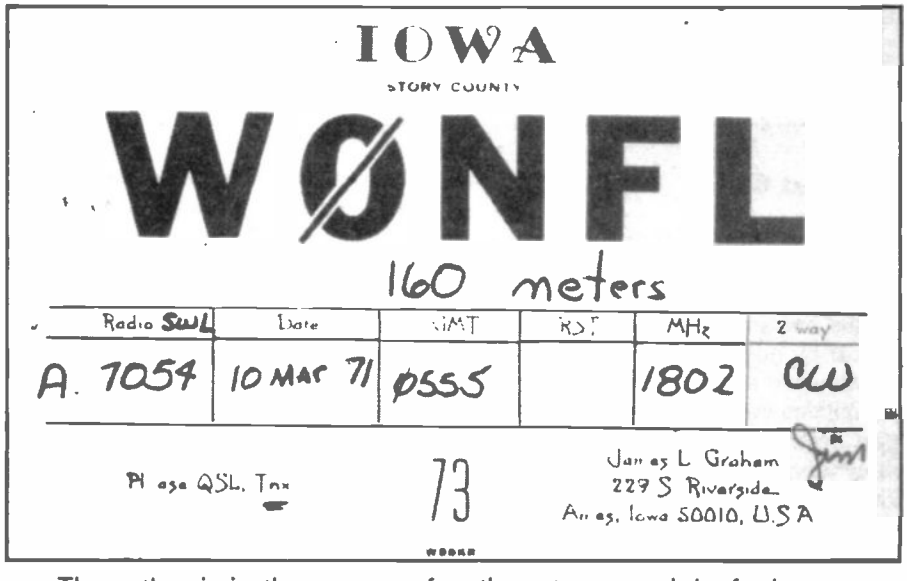
Aerials

For best results on 160M you need a lot of real estate. Those of you who take QST (the ARRL Journal) might remember an article which described how to set up a Rhombic for Top Band using a baseball stadium. I suppose in this country the local football ground is a possibility, but you might have difficulty setting it up on a Saturday, ready for Sunday morning DX time!

Progressing down the ladder, a little, many aerials are in use, from tall verticals, to loaded verticals, half wave dipoles, end fed wires, balloon supported verticals etc etc.

Compact Antenna

Most people have difficulty getting up any reasonable size aerial for 160 metres — the half wave dipole, or a decent sized vertical are usually out of the question, and the antenna all too often ends up as a random piece of wire with poor radiation characteristics.


IOWA

STORY COUNTY

WØNFL

160 meters

Radio SWL	Date	GMT	RST	MHz	2 way
A. 7054	10 MAR 71	0555		1802	CW

Please QSL. Tnx

73

James L Graham
229 S Riverside
Ames, Iowa 50010, U.S.A

The author is in the process of resurrecting an antenna which was found to be very efficient on Top Band, and seems to have been largely forgotten these days. It has the benefit of providing primarily vertically polarised radiation for best DX — but not needing a good earth connection unlike a short vertical.

The antenna is a slightly modified version of the G8ON, which is basically a folded half wave and arranged so that the vertical section is carrying the maximum current, giving us the vertical radiation needed so much for long distance traffic.

Folding the Aerial

From the diagram, you can see that the antenna is effectively folded back on itself, enabling a full half wave to be accomodated in a garden only around 60-80 feet long — or less if you want! During the time the antenna was in use, and after a lot of experimentation, it didn't seen to matter how much the lower horizontal section was reduced in length so that it would fit in the garden (within reason), or the manner in which the lower leg was taken round the garden, providing that a loading coil was inserted in the end furthest from the transmitter to get the high current portion back into the vertical part. To enable this to happen, the portion from the shack to the centre of the vertical section needs to be a quarter wave in length — if you can't get this in one straight run, then you can happily lose some of the length by running it round the loft — this part of the aerial near the shack contributes little to the radiated signal.

When erecting the antenna, the shack obviously serves as one end of the antenna, and the further support can either be a pole at the end of the garden (if so, keep the vertical wire at least 6 feet from the pole, and insulate the pole from earth if possible), or a suitable tree if one is available. With trees, it is vital to have some form of mounting device that will allow for the fact that the tree is likely to move in the wind! A rope passing over a pulley, the latter tied to the tree, with the free end of the rope weighted will do the trick nicely and ensure that your antenna stays up in the air.

Pruning

Getting the current maximum into the vertical section is fairly easy — if you break the antenna at the midpoint of the vertical, an RF ammeter, or a car headlamp bulb can be inserted at this point, and the loading coil adjusted until either the bulb is glowing brightly, or the ammeter shows maximum current. If the latter option is used, a pair of binoculars/telescope will come in handy to read it!

The actual loading coil should have a fairly large diameter and be wound from 18 swg wire to keep losses down. 2" would be about the minimum — try starting with about 30 turns and work from there. The coil is best inserted about 15 feet from the far end — doing it this way also means that you can adjust the length of the wire to shift the current around if you want to.

Earths

As the antenna is about a half wavelength electrically, the feed impedance is very high. This has the advantage that a good earth connection is not called for, and this gives the antenna a great advantage over a short loaded vertical, which would have a very low feed impedance and therefore require an extremely good earthing system. With the high feed impedance, the current at the shack end is small, so the loss involved in passing this through the average earth connection is small.

Matching

Any matching unit capable of transforming a high impedance down to 50 or 75 ohms will be satisfactory. The author ended up using a 'Transmatch', which also allows the aerial to be used on other bands.

80 Metres

For 80 metre use, the antenna can of course be scaled down by a factor of 2. Alternatively, it will work on 80 metres as it stands, although the vertical section will no longer carry the current maximum — as it will now be a point of maximum voltage instead. The feed impedance is still high, as we are now dealing with two halfwaves when on 80 metres. It still works satisfactorily however, and is capable of reasonable DX from a limited garden space.

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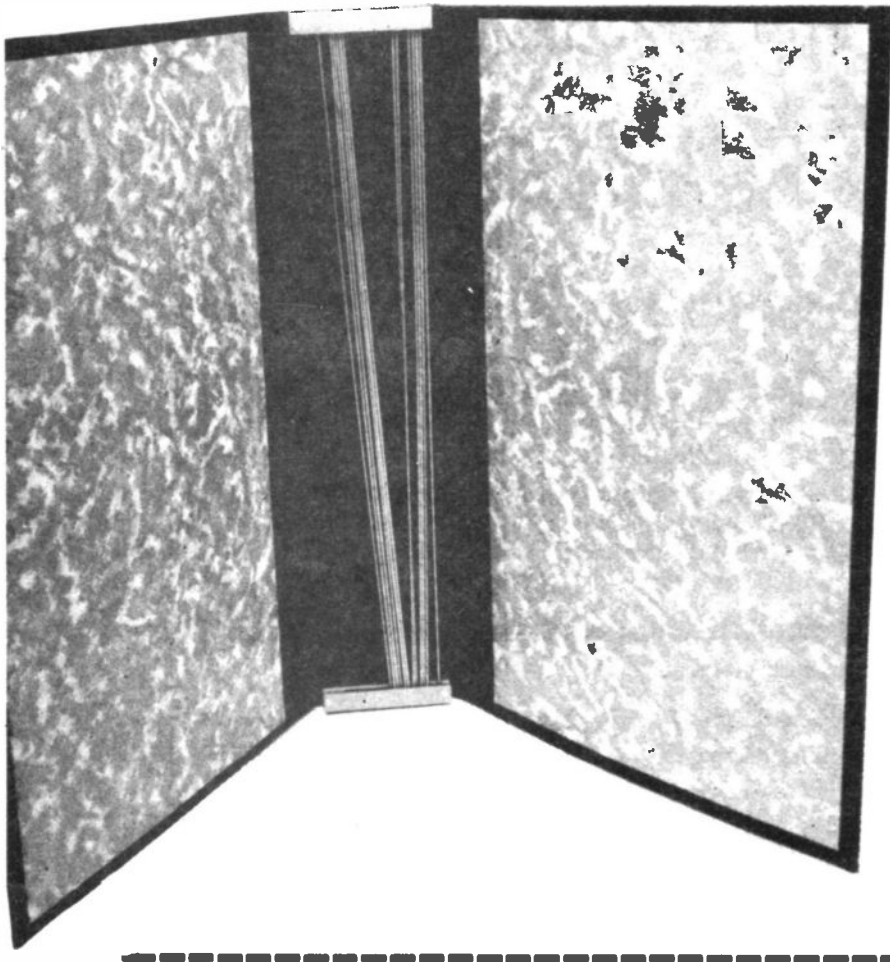

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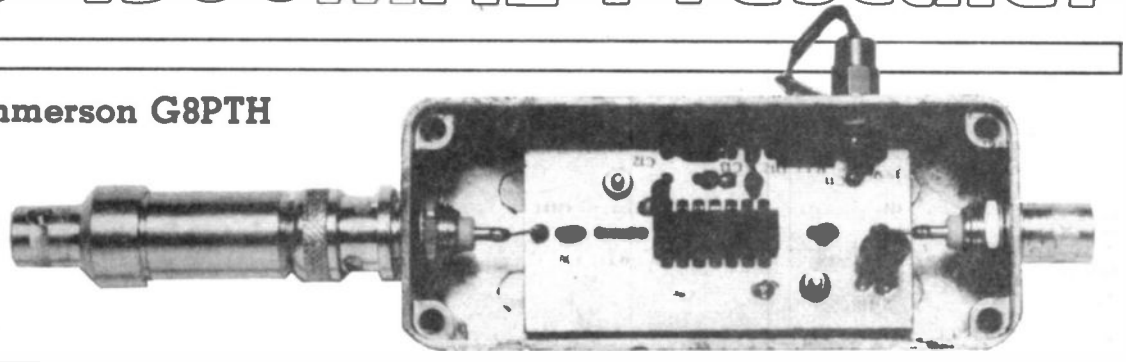
REVIEW:

Research Communications 9056 1500MHz Prescaler

By Andrew Emmerson G8PTH



Many people are exploring the delights of 23 centimetres and higher bands these days, and sooner or later the need for some kind of frequency counter crops up. For some purposes a cavity wavemeter will suffice, though even these are becoming less easy to find these days. However, for tuning up transistor oscillators, checking small signals and so on an electronic frequency counter is not a luxury, it is essential.

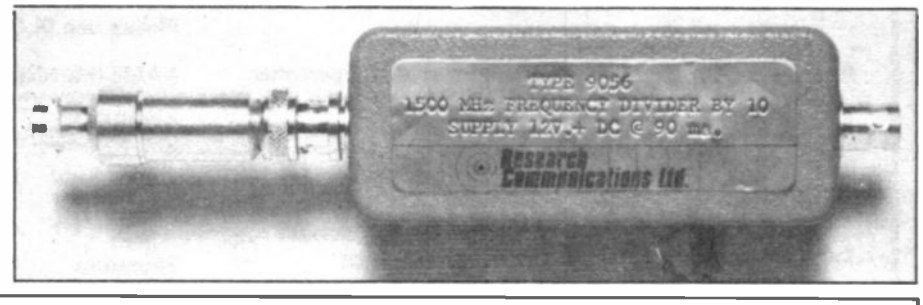
Frequency counters covering a Gigahertz and beyond do not come cheap, however, nor are they to be found in the average ham store. So the resourceful amateur has to find a cheaper means to the end, which has to be a prescaler. This is an add-on device connected between the frequency source to be measured and the actual counter and divides the frequency by a factor of 10, 64, 100 or whatever. Until now prescalers have been awkward things to build: although there are some integrated circuits around (particularly some Plessey devices) they have not been cheap. Things may change now that more and more TV tuners use synthesiser techniques, and in fact some lower cost divider ICs are now available. The snag is that they divide by 'silly' factors such as 64, so that to use them with an existing counter you have to break into your counter's timebase and make that switchable. Life seems too short for that so the search was on for a genuine divide-by-ten prescaler which needed no alterations to the counter.

The quest ended when I discovered Research Communications Ltd. This is a small specialist firm which makes a number of amplifiers and preamps to very high specifications, the proprietor being ex-G3JXK. The type *9056* prescaler is described as a 1500MHz divide by ten device: it is guaranteed to work over a range from 100 to 1500MHz and in fact should normally work up to 1.8GHz. It costs £59.50 plus £2 for postage and packing; VAT is extra.

So a cheque for £70.73 went off and back came a tiny diecast box containing a Plessey IC and a few voltage regulation and protection components. The finish and construction is extremely neat, the box being finished in a pale grey sand paint. BNC connectors are fitted and an external 12 volt supply is required. The sensitivity is quoted as 100mV and maximum input signal 1.0 volt. I have had my unit in regular use for several months now with excellent results. I use a Thandar 200MHz counter, so this prescaler is very useful for checking 70cm and its harmonics as well as 23cm. No problems have been experienced, although the unit does get quite hot (I am told this is normal and a unit has been on soak test for over a month at the factory).

The manufacturer recommends connecting a 50 ohm through termination (available from RS Components) between the prescaler and the counter. For a probe he suggests a metre length of 50 ohm coax terminated in a single turn loop of insulated bell-wire about 5mm diameter. These arrangements work well for me and I can recomment this prescaler without reservation.

Research Communications Ltd., Unit 3, Dane John Works, Gordon Road, Canterbury, Kent, CT1 3PP. Telephone Canterbury (0227) 56489.



A Simple Amateur Television – Part 4

This month Trevor Brown, G8CJS, describes the vision switching unit and suggests a code of practice for 432MHz users.

Having now mastered the techniques involved in Electronic Generation of test patterns and teletype, we can now move along to our next building block — which is an electronic vision switcher. With this, we can select which of any four video signals is routed to our transmitter. Our electronic test generator being one of the sources, **Fig 1** shows how we can generate a black source very simply from one transistor. It is important to radiate black when we do not wish to display video for example when changing a caption or arranging and focusing a camera scene. If we simply cut to a spare input on the mixer and radiate no video then sync information is lost to your TX monitor-and all your viewers monitors. When you then restore video the monitors will take a little time to settle and spoil your presentation. Using two of our video inputs in this way, there is still two spare inputs for your home video recorder, personal computer, TV camera etc.

Fig 2 shows the circuit of the switcher where the four video inputs are fed to the base of four one transistor amplifiers all sharing a common 470ohm load. The transistors are switched on and off at their emitters — to switch on any one of the four transistors we simply take its emitter down to logic 'O'. The video signal then present at its base will appear inverted across our common load resistor and pass to our two stage amplifier where it is inverted back and fed to the video input. The logic 'O' states required at the emitter are supplied from our SN 74139 IC. This chip will only allow one of its outputs to assume logic O at any one time. The 74139 is fed with a two wire logic signal from our push button selector.

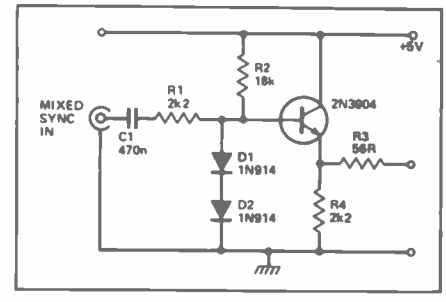


Fig.2 – Circuit of the Vision Switcher

Fig 3 shows a push button selector using momentary contact push buttons. The buttons being encoded using a priority encoder the information being retained in the 7475 latch. **Fig 4** shows a simpler system using the mechanical latching type of

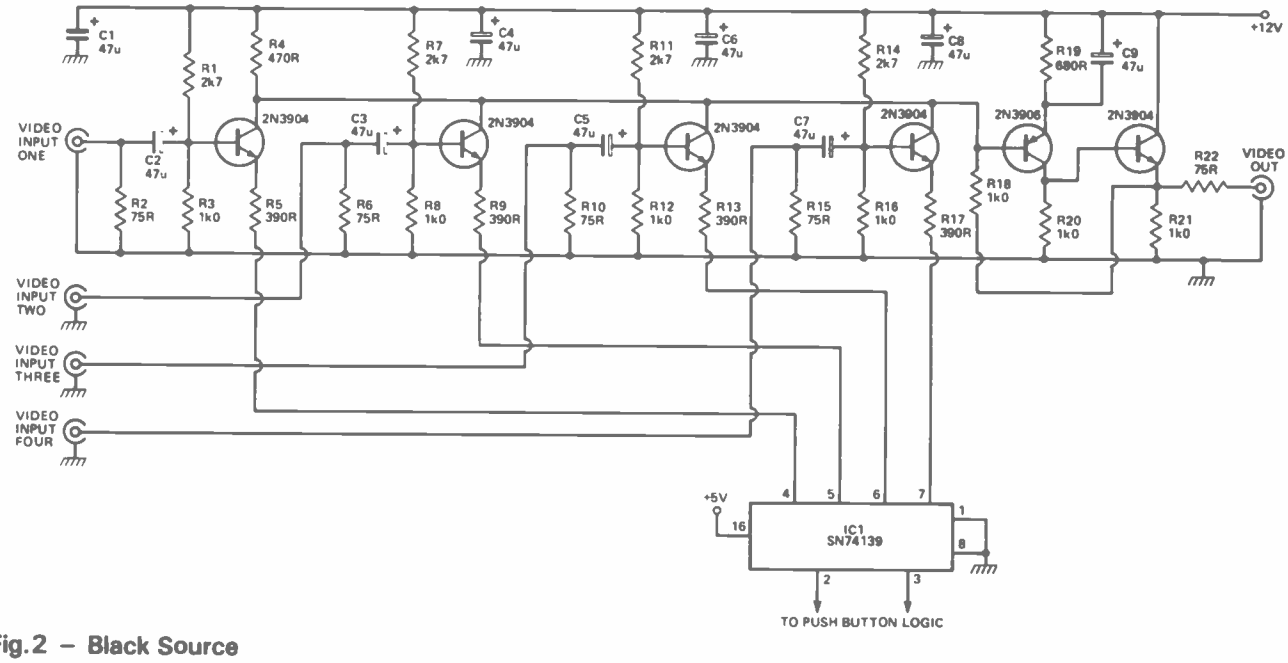


Fig.2 – Black Source

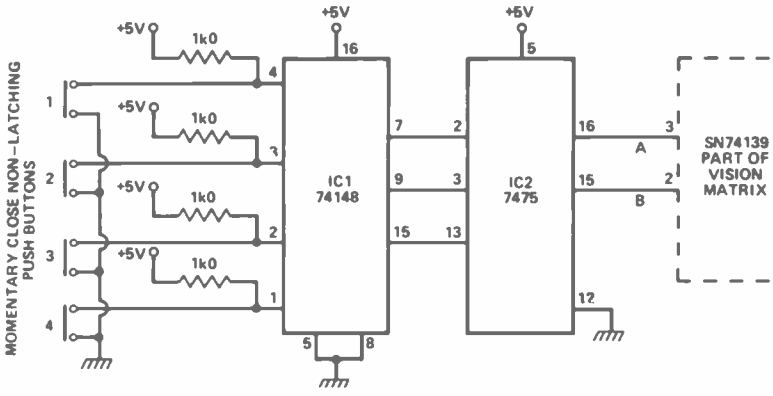


Fig.3 – Push Button Selectors (momentary contact)

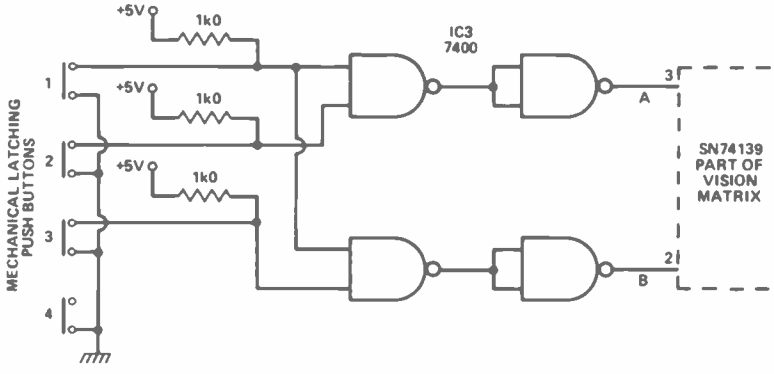


Fig.4 – Push Button Selectors (mechanical latching)

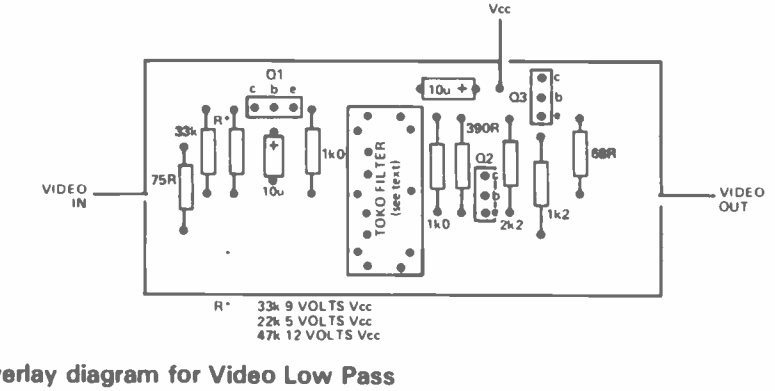
push buttons. **Fig 5** shows the PCB layout which has its ground plane on the component side. Only the circuitry of Fig 2 is assembled on the PCB as it is envisaged the push button coder chips be mounted adjacent to the push buttons. The push button codes generated should be

button one A Logic 0, B Logic 0,
button two A Logic 0, B Logic 1,
button three A Logic 1, B Logic 0,
button four A Logic 1, B Logic 1,

Having now selected our video source it is most important to filter it prior to transmission.

Video Filters

Most simple TV transmitters radiate both side bands — a black and white video signal can be about 4MHz wide and a colour signal more than 5MHz — and if you are not careful you could consume all of the 70cms band, all by yourself! The way around this problem is to filter your video signal and if done correctly the quality does not suffer much. It is very important to filter video that has been derived from logic circuitry as TTL can produce very sharp edges to the signal and give it products beyond 10MHz. *This applies particularly to home computers.*



Overlay diagram for Video Low Pass Filter

The filter used should be of a linear phase characteristic; fortunately, Ambit market such a filter made by TOKO, as making and aligning a linear phase filter is not easy.

The TOKO filter is pre aligned and requires a source and load impedance of 1k. **Fig 6** shows how we can achieve this. TOKO make 3 different linear phase filters, all are low pass. The 237 LVS 1109 is 2.3MHz at its 3db point and should be used in contest times and in parts of the country where 70cms is well populated by repeaters. If you do not live near a repeater and or operate low power then the 237 LVS 1110 which is 4.5MHz at its 3db point, may be viable. The 237 LVS 1070 which is 3dbs down at 10.5MHz is *only* suitable for the 24cms operators where band space is not a problem.

A 432MHz Code of Practice

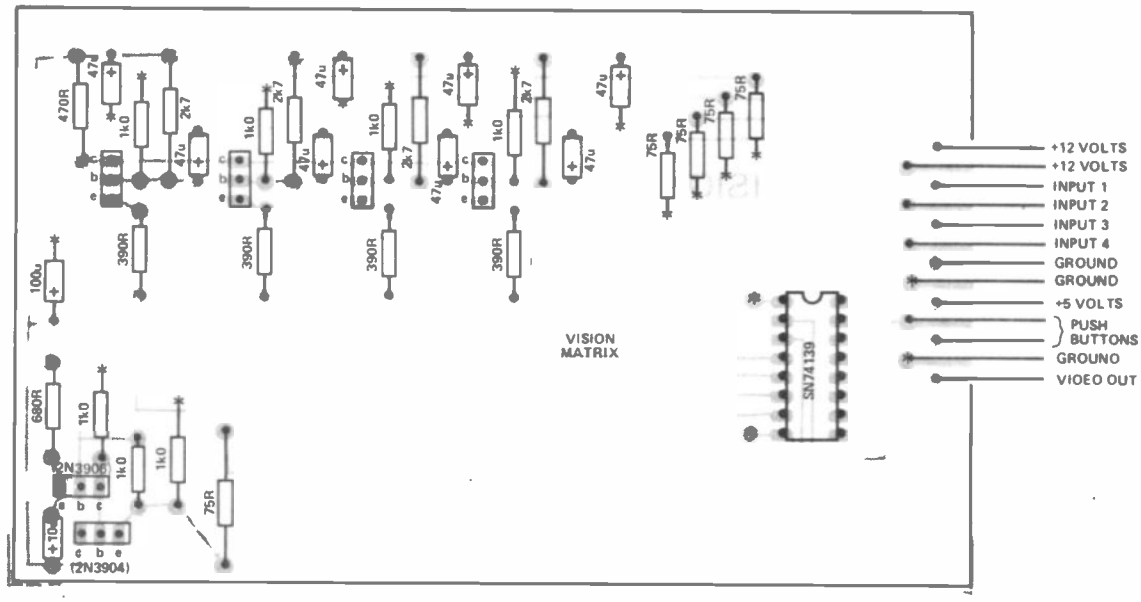
Repeaters and Amateur Television signals on the 432MHz band overlap each other because, following the removal of the top 10MHz of the band, there is really not enough room for both activities to have exclusive frequencies. The same is true of the Satellite band and ATV signals, but there is little evidence of terrestrial and extra-terrestrial contacts conflicting with each other.

Mutual interference does exist between ATV and repeaters, but it can be coped with, given an appreciation of each other's problems. Unfortunately, an increase in both activities is leading to more areas of conflict.

Co-existence can be assured by adherence to the following:-

ATV OPERATORS should operate as high in the band as they can, and use the minimum necessary bandwidth. Particular attention should be given to the bandwidth of digitally generated signals. ATV operators should be aware that their long overs may be keeping several repeaters open for long periods. They should be able to adjust the fine frequency of their rigs to reduce this effect. Polarisation should *always* be horizontal.

REPEATER USERS should always use vertical polarisation (this applies to all non-TV terrestrial transmissions above 433MHz, and repeaters will always use vertical aerials. Repeater periodic callsigns should be kept to a maximum of one

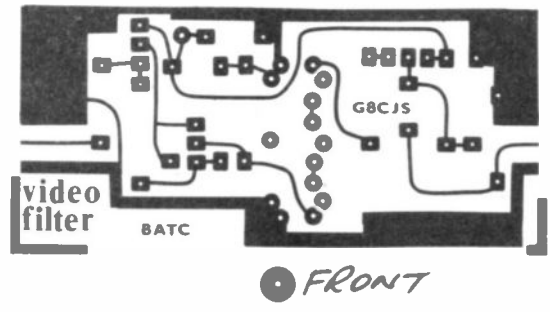


* DENOTES CONNECTION TO GROUND PLANE (TOP SIDE)

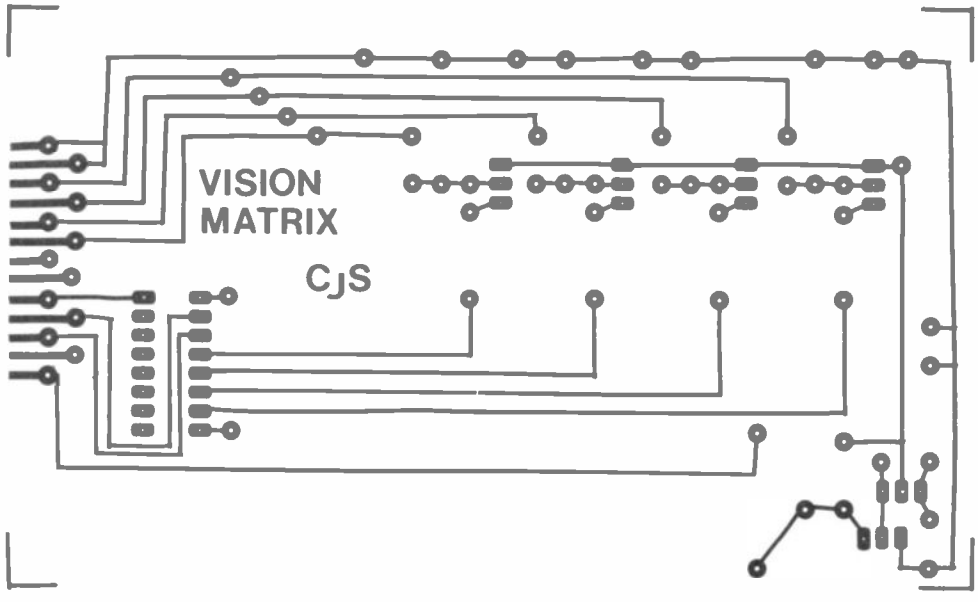
Fig. 5 – Overlay diagram of Vision Switcher PCB

every five minutes when the repeater is not in use. Care should be taken by repeater groups to prevent the repeater locking-up for long periods when not used for FM traffic. It should be appreciated that the UK repeater frequencies are deliberately non-standard in an attempt to avoid interference to ATV operators. There seems no reason why individual repeaters cannot be switched off during an ATV contest by prior arrangement with the repeater group and the RSGB.

It is felt that publicity of these 'codes of practice' and of the need to be aware of each others existence will



Foil Patterns for the Video Low Pass Filter and Vision Switching PCBs.



help to reduce the interference problem.

COMPONENTS LIST

Vision Switcher

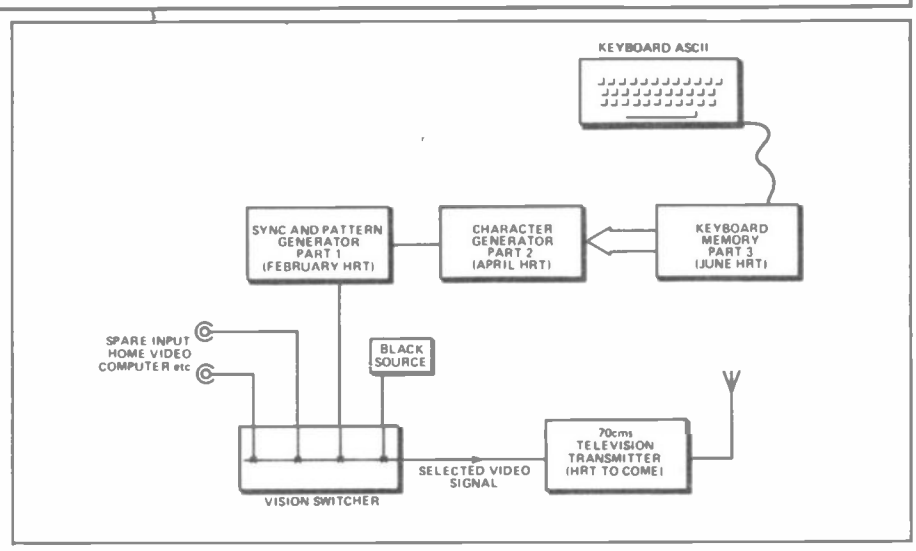
R1, 7, 14,	2k7
R2, 6, 10, 15, 22	75R
R3, 12, 16, 18, 20, 21	1k
R4	470R
R5, 9, 13, 17	390R
R19	680R
C1-C9	47u
IC1	SN74139

Push Button Selectors

R1-7	1k
IC1	SN74148
IC2	SN7475
IC3	SN7400
S1-8	Push Buttons; momentary close, non-latching.

Black Source

R1, 4	2k2
R2	18k
R3	56R
C1	0.47u
Q1	2N3904
D1, 2	1N914



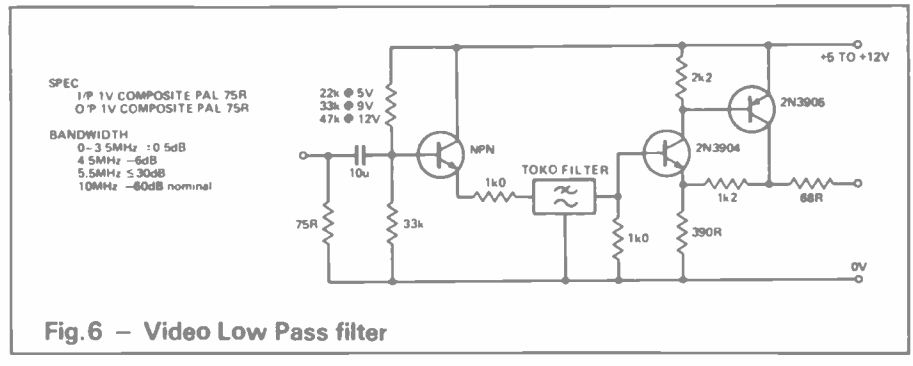


Fig.6 – Video Low Pass filter

Jambo Kenya

Vic Copley-May, G3AAG, tells how he went on Safari in Kenya — and found himself hunted by the DX!

It all started whe the XYL began making enquiries about going on a safari to Kenya. That was more than two years ago. We had several friends who had been already and one or two who had lived in Kenya for a number of years. The advice was often conflicting but always welcome. She had soon collected a thick file of notes, maps and brochures. The OM was hesitant. "Tents are for Boy Scouts — I'm nearly sixty". Ideally the party should be eight but four minimum. Who could we find amongst our friends who would want to go on a Safari and whom we knew well enough to be sure that we were still good friends when it was over — whatever the problems we might encounter?!

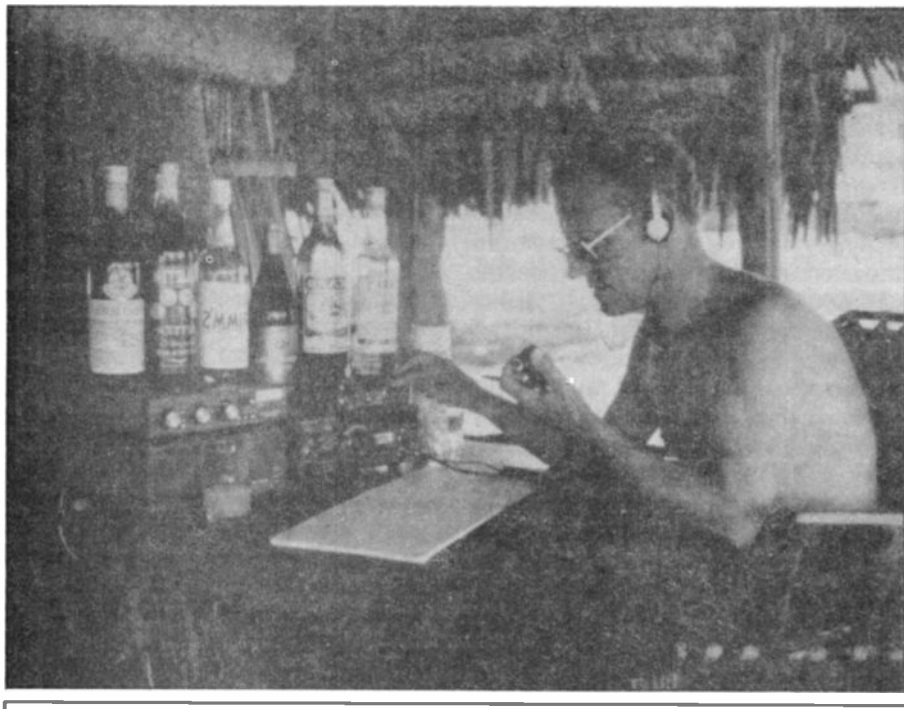
After a year of false starts we had pretty well shelved the idea. Then, we were dining in London with some good friends and the idea came up in conversation. Maurice, a recently retired senior banking official who had lived for many years in Kenya, and his wife Sue immediately latched onto the Safari idea and were very enthusiastic. This was going to simplify matters! Maurice was appointed 'Ober-Fuhrer' and left to organise the programme. We committed ourselves to go in October 1981, just before the 'short rains' which normally start in November and out of the usual tourist season.

I'm not all that mad about animals. What was I going to do when everyone was getting exciting about having seen a dik-dik for the first time? I got it! Work some DX from an exotic QTH.

I started my preparations for the expedition by putting a classified ad. in the June '81 Radcom requesting information about the radio scene in Kenya. 'G3AAG planning photographic safari in Kenya...' The response was encouraging and immediate and I wish to thank all those who replied in the true ham spirit. This was getting exciting. There were only about fifty licenced hams in Kenya and I was told that probably only half of them were active. I soon received lots of advice, much of it from hams who had already operated from Kenya and knew the form. A call to the RSGB confirmed that there were reciprocal licencing arrangements with Kenya and a letter from the Kenyan High Commission in London put me in touch with the Radio Society of Kenya. Bill Smith, G3HHZ, had written a most informative letter putting me in touch with several ex-5Z4s. He finished the letter with the advice 'Do not order prawn curry in Nairobi, you will be poisoned'. We didn't.

A letter from the Managing Director of the Kenya Posts and Telecommunications (Mr SM Challo) requested a copy of my passport and current amateur licence. On the 18th September, Mr Challo wrote to say that my application had been approved, subject to providing the names of two Kenya residents as referees and paying a fee of 195/50 shillings (about £10 UK). Time was however running out. The only thing to do was to take the paperwork with me and visit the post office in Nairobi on arrival.

5Z4AC plus essential supplies on the beach at Malindi — antenna height 15' and first QSO Hawaii!



Equipment

Everything had to fit into one relatively small suitcase and I was

anxious to avoid buying special equipment — the safari was already expensive enough! I knew that I would be operating from either very high locations or on the edge of the Indian ocean and that probably a simple balun fed dipole would suffice. This was made up in the UK and carefully 'tuned' to 14.220 MHz. We would only operate 20 metres, the propagation forecasts being quite good for the band and our guiding principle being 'lets not make things too complicated'. The equipment consisted of a Trio TS130S transceiver with the DFC-230 frequency controller. The latter proved to be invaluable. We carried a Yaesu FP707 power supply and the FC707 tuner. The case was filled with a few accessories, assorted old and new type mains plugs, two eight foot lengths of 40 amp cable with jumbo clips, some small hand tools, mike, 'phones and a multimeter. Some 100 feet of terylene cord and 50 feet of RG-59 co-ax completed the package which, together with wads of foam packing, nicely filled the case measuring 60 × 42 × 20 cms. This weighed in at 30 kilos (10 kilos overweight), even without allowing for clothes, cameras, etc! Needless to say the rig was thoroughly air tested before departing the UK — which was as well as a couple of minor faults showed up and were corrected before final packing.

I would like to pass on two good tips about packing radio equipment. 1. Don't use foam packing. Use only expanded polystyrene blocks and cut out 'frames' to ensure that there is no pressure on the controls. 2. Even when the case is locked and appears to be secure, wrap 2" PVC tape around the seams (to keep the dust out) and 3" carpet bonding tape over the locks to prevent the case opening if the locks break. One did.

Final Preparations

Just before 'D' day two other friends decided to join us. Shauna was coming. Her husband phoned me 'see whether you can get her eaten by a lion'. And Heather was coming too — to keep an eye on Shauna — or was it Shauna was coming to keep an eye on Heather? We were all old friends and the party of six would be more fun than four. We could not all travel out on the same plane. Three of us departed Swiss Air, Maurice carrying almost as much photographic equipment as I had radio equipment. They were tolerant about our overweight and did not charge for the excess baggage. Thank you Swiss Air. Clearing customs was no problem although the 'Ober-fuhrer' was temporarily demoted when he had difficulty in finding his passport and money. I estimated he had a pocket for everything and at least six spares. Maurice indeed knew the form and I soon learned that I was over kitted-out. Half the clothes I took were never worn. One needs very little and the 'dhobiing' facilities were excellent wherever we went.

First site of operation 5Z4AC.

Upon arrival in Nairobi we were met by a car and whilst Maurice contacted our agents I hot footed it to the General Post Office and found my way to the Managing Directors office. There was no problem except that they had not got the licence ready. After plenty of handshakes and smiles they verbally authorised me to use the call 5Z4AC but said it would take a week to type the licence. I gave the QTH as a PO Box number in Nairobi but was told that I could not operate portable. In the event everyone was co-operative — they eventually decided I was not a spy — just a mad ham. Next came a very important trip to the bank — one cannot take Kenyan currency into or out of Kenya. In the afternoon we left for the equator. Mount Kenya Safari Club, QTH, Latitude 00° 00' Longitude 37° 7' east and at 7000 feet AMSL. We decided to rest up after the arduous journey. What a location! The amenities of this luxurious club left nothing to be desired. Twenty miles from Mount Kenya, towering to 17,058 feet, snow-capped and on the equator! We were allocated a three room bungalow and next morning, as soon as it was light, I wasted no time in surveying the surrounding trees for suitable forks over which to throw the halyards for hitching up the antenna. I soon became expert at selecting the right sized stone and achieved 'double-top' with most throws. A 13 amp. UK square pin socket was found behind the bar *(How fortunate — Ed.)* — 221 volts 48 Hz — Good enough — and we went on the air at 1200 GMT, 1500 hours Kenyan local time.

Powering Up

Operating hours were somewhat limited as usually the camp generators would run from dusk to about 0030 local. We occasionally requested an extension when we had a schedule with the UK. The heavy leads came into their own when I was forced to 'float' a 12 volt battery across the FP707 output. The governor of the generator had been giving trouble and the frequency and voltage fluctuations were too much for the TS130S without the float! Be warned, there is an awful mixture of mains sockets in Kenya. Most of the time I wired direct into a suitable line — when the generators were not running.

On The Air

'CQ from Five Zulu Four Alpha Charlie on the equator' (three times). '5Z4AC from A4XGJ you are 5 and 9 plus, this is the Oman net and the handle is Allen'. A five way QSO with the net of A4X's proved that all was working O.K. And then I found out, for the first time in my life, what it was like to be rare DX. 'The VU2 only please'. 'The JA0 only please'. 'The VK2 only please'. 'Please gentlemen, one at a time'. In no time at all we had worked ten countries around the globe.

Statistics

In the three weeks we travelled in Kenya, I was able to set up shop on sixteen days for a total 'on the air' time of 26 hours 47 minutes. 276 QSO's and 74 countries worked on 20 metres SSB. An average of 1hr 40m per day or 21.7 minutes per country. The rest of the time we were either eating, sleeping or travelling out on 'big game' drives plus the unforgettable experience of an ascent in a hot air balloon. Amateur radio was not the object of the safari but I found time to operate from eight different locations and my companions displayed a keen interest in 'ham radio'. Maybe it was the total lack of any other means of communication in many of the camps which helped to keep up their interest. The idea was to keep in touch with home, enjoy the hobby and hopefully learn something about operating techniques from a DX QTH. It became evident that 5Z4 would be in demand so it seemed only fair to allocate a proportion of the operating time giving the new country to DXCC chasers. Although first licenced in 1946 and on the air from the UK, France and the USA, I learned more about operating techniques in those sixteen days than in the previous 35 years.

DX Working

Despite my efforts to orientate the dipole to favour the U.K. we had difficulty in maintaining schedules. Generally speaking the UK stations were buried beneath the 'European QRM'. We worked into the UK with reasonable reports but were seldom able to give as good as we got. An active audio filter would be a useful addition next time round. I must single out Rae, the lady operator holding the call G4JMT. Although I worked 19 G's, she stood out as the best operator. Her technique was ideal under extreme QRM. Rae's 'overs' were crisp, often just 'roger roger' and she used the correct phonetics, and answered my questions briefly and precisely, dropping very short comments in the momentary holes in the QRM. No waffle — would be Dx-ers take a lesson! Several other G's were most helpful but one or two don't seem to have learned the difference between communication and broadcasting. Never having worked 'lists' before, I let, G4HMP, Norman, take me in hand on the Round Table DX net for some 70 minutes whilst we were at Lake Naivasha. It was rather a pointless exercise although I picked up two new countries and gave a new country to some ten other stations. If one is 'into' lists then Norman handles the Round Table DX net very well. But '5Z4AC YB2BJM 5 and 7 QSL?' — '5 and 9 QSL?' — '73's' is not my idea of a QSO although I suppose it counts.

One G3 station I heard called CQ DX 20 nineteen times. I thought this one was worth checking out. He was on the air for about 16 minutes and listening for about 3 minutes. If he wants to work DX he's got it the wrong way round. To be fair the operating standards of G stations were above average, in particular those with fairly ancient callsigns.

Contests

At first I tried to turn a blind eye to the CQ WW DX phone contest. The 'lost week-end' for the DXpeditioner, I thought. Not the true ham spirit however — I would have to give zone 37 to a few of the contesters. I do feel there are arguments in favour of restricting contests to segments of the bands and I hope at least the RSGB Contests Committee will give serious consideration to such a recommendation one day. All we wanted to do was talk to the folks back home! After all, we were twenty miles from the nearest telephone. During that contest week-end I found it almost impossible to pass any traffic and it was only through the good and competent offices of a VE2, that I was able to relay some urgent messages. Even when I announced after calling CQ that I was only listening 2KHz high or low of my frequency I still received many calls co-channel.

Another Kind of QRM

There was an occasion when I was subjected to a rather unusual form of interference. We were tented in the Samburu Game Reserve north of Mount Kenya. I had spent ten minutes listening and getting the feeling of the band. Four spots were put into the DFC230 memory being reasonably clear of QRM-with WA6MWP Aeronautical Mobile in memory one. Patience. A break. 'WA6NWP Aeronautical Mobile Five Zulu Four Alpha Charlie Go'. He came back with a 5 and 9 plus in the clear. We chatted. Sid told me that they had just taken off

What! Knickers drying on the feeder!

from LA and was at 25,000 feet enroute for Singapore in a 747. After a time I had to ask Sid to QRX whilst I investigated some rather loud and persistent noises outside the tent. A passing elephant was trying to uproot my ground wire! The 'Ober-fuhrer' had advised me that I should shine a powerful torch at them if I had any trouble during the night. I did so and it worked. I tried to direct the elephant in the direction of the 'Ober-fuhrers' tent. Back on the air I explained the unusual QRM problem to Sid. 'O.K. Vic. That's really something special. Boy. I just have to announce that one to our passengers'. I wonder if airline captains get points for entertaining the passengers?

Thoughts for the future

Yes we are going again — maybe next year. We learnt a lot, are still friends and enjoyed the holiday of a lifetime. But we also learned what not to do. So far as equipment is concerned there would probably be only three changes I would make — first, to construct a special shock-proof suitcase inside which the station is already set up and ready to switch on. Setting up, dismantling and repacking used to take at least 15 often precious minutes of operating time. Next time I would take a 'mini-beam' for 10, 15 and 20m and a portable tubular mast at least 16 feet long. They did not seem to put the trees in the most convenient places. A directional aerial would have made a lot of difference with QRM troubles. I would also carry a random length of wire to cope with the LF bands. In the meantime I shall re-read the RSGB Amateur Radio Operating Manual to try to develop more sophisticated operating techniques. I came home with one lasting impression. Ham radio can indeed be improved. The improvement should come from the operating techniques rather than the equipment.

Go to 5Z4 if you get the chance. The hospitality is tremendous and the natives are delightful. Asante Sana Kenya, kwaheri.

Metre wave

The Repeater story: Part 2 — Usage and Abusage.
By Jack Hum, G5UM

This page last time took a look at the 'Why' of the repeater concept (in order to help VHF mobile stations maintain communications over difficult terrain) and the 'How' (how repeaters have been brought into existence by enthusiastic groups all over the country). And now, after the 'Why' and the 'How', the 'Do', in other words, when you have designed, licensed and commissioned your repeater station, in what way do you expect it to be used?

Note those three words "to be used". Add one syllable to them and you can change them into "to be abused". Some of them are. Hence the word "abusage" in our title-line.

Let us dispose straight away of the unsavoury business of the abuse of repeaters the more readily to move on to the more positively orientated matter of their normal and proper use. Abuse of repeaters takes two forms. Deliberate jamming, countered by the passive tactic of ignoring the jammer and the active of one DF-ing him, is one of them. Loose talk is the other, perpetrated by legitimate operators whose style of through-repeater conversation is no credit to their callsigns ("There was so much rubbish on the repeater tonight it was painful to hear" remarked a man on the local 2m net on the very evening when this article was being drafted).

Enough of that: on now to the "positive orientation".

High Technology Invention

A VHF/UHF repeater-transponder is an ingenious invention derived from high technology. Like many other development of the technological twentieth century — the motor vehicle, atomic power — it should be used with some respect.

Its purpose is to provide two-way communication between 'the disadvantaged' who without its aid would not be able to talk to one another at all. Every mobile operator comes within this category of 'the disadvantaged'. There he/she is with a few quarter-wavelengths of antenna perched only a few feet above basic ground level on the top of his vehicle and waving around in the slipstream of his passage along the highway. Girt about by high buildings and by vehicles much taller than his own, he has every reason to believe that communication on the metre-wavelengths is a practical impossibility. His is the station most in need of the services of a repeater. To him, through-repeater priority should be given at all times.

There is another, slightly less imperative-priority operator who comes within the description of 'the disadvantaged'. It is the one who can communicate with a companion so far distant that only the through-repeater process will provide a link, assuming that all other avenues of communication have been explored, such as SSB or CW or the use of a 'gainy' beam antenna, and all have been found wanting.

"What Channels Should I Carry?"

Right, then: you are one of the disadvantaged. You are a mobile operator who for most of your driving time will be unable to set up direct contacts at VHF/UHF and will be compelled to use a repeater or repeaters.

Which repeaters? If your daily driving pattern is a moderately unchanging one within a given radius from home you will know by custom and practice which your local repeater is and therefore which channel will provide you with the best talk-return. But, if your driving pattern takes you farther afield, then make sure your transceiver is channelized for all the repeaters in whose areas you will appear.

Identifying Repeaters

How do you know which these repeaters are likely to be? Answer: by using the RSGB Repeater List obtainable for 32p (including postage) by RSGB members or 35p by non-members from RSGB HQ at Potters Bar, Herts EN6 3JW. However, remember that the RSGB Repeater List, like many others which have been published in the amateur radio press, must be regarded as obsolescent from the day it appears. Any directory is. A repeater directory, especially, becomes outdated quickly, simply because so many new repeater projects are in the proverbial pipeline at any one time that all the mobile operator can do to keep reasonably abreast is to update his printed list himself, as information about additions to it become known.

On 70cm in particular new repeater schemes are proliferating to the extent that the even-numbered channels are virtually all taken in areas of high amateur radio activity. Odd-numbered channels are now being increasingly assigned on 'Seventy'.

And what are these channels? They were tabulated here last time; but the information they give is so important to mobile users that we make no apology for reprinting here the two Repeater Channel tables for

the benefit of any new readers who did not see them before — and with the added suggestion that if you do not mind mutilating your copy of *Ham Radio Today* you could with profit cut out these tables, paste them on a small card and hang them near the transceiver in the vehicle — or keep them readily to-hand in the glove box.

But Which Band?

With both the 2m and the 70cm tables before him the mobile operator may be in a state of some doubt about which band to use. There is a simple answer: If your funds allow, use both.

In practice, a 70cm installation in the vehicle will produce more rewarding contacts than on 2m because, for one thing, the population on 'Seventy' is at present lower than on 'Two' and there is thus more repeater time available. For another, many fixed stations on 432MHz use multi-element vertical beam antennas that present to any repeater a signal enormously stronger than anything offered up on 'Two' by those exiguous omni-verticals which are still so widely used (and more's the pity).

An additional bonus arises from all this: because there are many very loud beamed signals available from fixed stations on 70cm the chance of arranging a simplex contact from a mobile installation is very promising for much of the time.

To equip oneself with both 70cm and 2m means of course having two antennas on the car roof, with the consequent need to separate them from one another — as far as is mechanically possible. Always use magnetically mounted antennas: they are easier to remove when the vehicle must be left unattended and the presence of several conspicuous 'skyhooks' might attract the attention of would-be thieves.

Table 1 — the repeater channels on 2m

Channel No	FM repeater input at	Repeater output at
R0	145.000MHz	145.600MHz
R1	145.025MHz	145.625MHz
R2	145.050MHz	145.650MHz
R3	145.075MHz	145.675MHz
R4	145.100MHz	145.700MHz
R5	145.125MHz	145.725MHz
R6	145.150MHz	145.750MHz
R7	145.175MHz	145.775MHz

Note: At 2m inputs are *low* and outputs *high*.

Table 2 — the repeater channels on 70cm

Channel No	FM repeater input at	Repeater output at
RB0	434.600MHz	433.000MHz
RB1	434.625MHz	433.025MHz
RB2	434.650MHz	433.075MHz
RB3	434.675MHz	433.075MHz
RB4	434.700MHz	433.100MHz
RB5	434.725MHz	433.125MHz
RB6	434.750MHz	433.150MHz
RB7	434.775MHz	433.175MHz
RB8	434.800MHz	433.200MHz*
RB9	434.825MHz	433.225MHz
RB10	434.850MHz	433.250MHz
RB11	434.875MHz	433.275MHz
RB12	434.900MHz	433.300MHz**
RB13	434.925MHz	433.325MHz
RB14	434.950MHz	433.375MHz
RB15	434.975MHz	433.375MHz

* At present widely used for simplex: not yet allocated to repeaters.

** Designated for use by RTTY repeaters.

Note: At 70cm inputs are *high* and outputs *low*.

Practicalities

Having equipped himself/herself with a transceiver for either 2m or 70cm (or preferably both), the mobile operator new to the repeater scene and setting out for the first time to see what it looks like will, if wise, do a lot of listening first to ascertain how other local 'mobileers' are going about gaining access to the local 'box'.

What will be discovered is that the majority of repeaters in the UK are opened by offering them a tone-burst (and before you buy a rig for mobile use make sure it wears a button labelled 'Tone' or 'Access' or something similar). When offered a tone, the repeater identifies itself perhaps by sending its callsign in the morse code, perhaps by a single long dash, perhaps by a single 'dit'. There is no standard method of telling the mobile to go ahead and transmit. Perhaps this is a good thing: at least repeaters (or some of them), possess their own distinctive personalities apart from their callsigns (which they are obliged by licence to radiate at regular intervals).

Many repeaters after receiving a tone-burst require a few words of speech from the interrogating station. This syllabic access is intended to dissuade 'phantom bleepers'. By and large it does. A phantom bleeper *(A term given to people(?), often without a transmitting licence, who attempt to 'access' a repeater by a tone burst merely in order to deny access to others. Thus, by introducing additional syllabic access everyone is required to speak before fully gaining access — and is thus at least somewhat identifiable — Ed.)* attempting syllabic access may be readily tape-recorded and its voice identified.

Operational Procedure

Having opened up the required repeater the user demonstrates his/her expertise in amateur radio communication by swiftly passing whatever information needs to be passed — and then shutting up (or down). The preliminary listening will have indicated how long the time-out period is — which is no excuse at all for using all of the time which a repeater makes available. Waffling through 'the box' is selfish and denies its use to others who maybe waiting, who may indeed be anxious to ask their way through your own town. One person's

waffle is another person's lost route.

What to do if the repeater of your choice is engaged? If the people talking through it are reasonably experienced they will leave a five second pause between their overs "for any other takers". This is the moment at which the waiting operator jumps in quickly with call-sign only. It identifies you at once. To say "Break from G8LM stroke mobile" is quite acceptable but takes longer than "G8LM mobile".

If you are diffident about using "break" remember that the technique of break-in is as old as amateur radio itself. It derives from the earliest days of telegraphy technique when one cw operator wishing to attract the attention of another cw operator in contact with somebody else would simply diddle on his morse key "Bk de G6AY". The other party would be alerted straight away to the fact that someone was waiting for him.

To sum up the practicalities of through-repeater working the experienced user would tell you: Listen first to hear how it's done locally, muscle in when you feel ready — and keep it short. Above all, check the input to ascertain if a direct contact is possible and thus to initiate a real QSO instead of a by-proxy one.

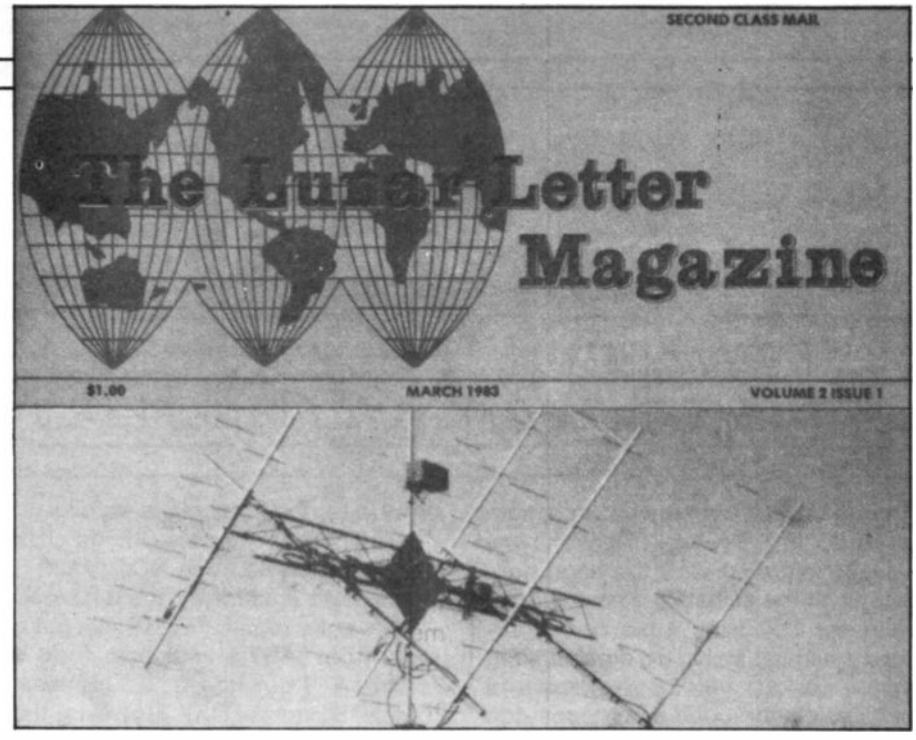
Now, having distinguished real QSOs from through-repeater contacts, is the moment for a discussion on the effect of anomalous propagation on repeater communication.

Anaprop and all that

From time to time the metre-wave bands enjoy what is popularly known as a 'lift'. Repeaters never before heard will come to life at high signal levels from many hundreds of miles away both on 70cm and on 2m. Much excitement will be generated among metre-wave operators who quite literally may have never heard anything like it in their lives.

The excitement is understandable: if you have been stuck for most of your VHF existence on a handful of S-channels (which to many is the limit of their ambitions), to hear a station from Baden-Baden or Oosterbeeke or wherever actually uttering your callsign (even if via a repeater) gives a lift to the spirit occasioned by the 'lift' in the radio propagation.

Anomalous propagation at VHF/UHF ('anaprop' is the acronym) produces an anomaly of another kind:



Lunar Letter is a monthly American magazine devoted to the VHF/UHF enthusiast and covers all forms of weak signal propagation from 50MHz up with a special interest in EME. Available in the UK from D. Parker, G4DZU, at 14 Moorside Crescent, BRADFORD, West Yorks BD11 1HS — all enquiries should be accompanied by an SAE. HRT will shortly be running a major article on EME working with simple equipment.

you hear British repeater users begging Hans or Pieter to send a QSL card". . .to confirm this QSO". A few moments' thought should bring the realization that it wasn't a genuine QSO at all: the repeater was doing the work. If any QSL were to be sent it should truly be in logic be addressed to the repeater(!) and not to the owner of the voice at the other end.

"What I do with my QSL cards is my own business" is the answer that comes whenever the above argument is deployed, and quite rightly so. But the QSL card from Germany or Denmark or wherever that eventually trickles through the QSL bureaux many months later represents no more than a pleasant memento of an anomalous metre-wave event — and a reminder how effective a repeater-transponder can be. Such QSL cards are not valid for any claim that may be made for a metre-wave operating award, for they do not refer to real QSOs.

One direction in which a through-repeater contact under anomalous propagation conditions is valuable is this: It can serve as **the prelude** to a real one. A Cornish repeater at both ends that a direct contact would be worth trying — on an FM or SSB frequency to be agreed before the "QSY simplex" is made. Rare counties, countries and squares are thus added to the log only because the repeater helped in the first instance.

A Final 'Why?'

To close I'd like to take a look at that sad topic of our third paragraph, the 'clobbering' of repeaters:

Is it possible to penetrate the minds of a few misguided people who go out of their way to spoil the pleasure of the many by wantonly jamming their repeater contacts? Would they approve of others, say, invading their gardens and pulling up their vegetables? The analogy is not entirely inappropriate. I can see no genuine reason as to why such things are done. Logic suggests that if a ham is sincerely 'anti-repeater', as some admit to be, then there is no need for him to use the things. There are megahertz to spare elsewhere in the metre-wave spectrum where he can go away and do his own thing. These persons are in a minority: it is the others that represent the problem, those who derive some peculiar satisfaction in sabotaging the signals from one of the cleverest devices to be built by the ham radio fraternity, built to be used by all when in need and essentially free. *(Repeaters unfortunately cost money to install and maintain. If you use a repeater regularly please join the appropriate repeater support group — details are often given in our Radio Tomorrow contact panel — Ed.)*

Some Reflections on LF DX Antennas

Malcolm Healey, G3TNO, assisted by Anne Lambert, G6CXF, gives some practical advice on constructing LF antennas — to suit your favourite bands and fit your back yard.

During the last two sunspot-minimum periods, my DX-ing interests have usually migrated with the band conditions to the LF bands. I have tried to raise the DX using a number of different aerials, including dipoles, long wires, various vertical systems and single-element quad-type loops (on 7MHz only). The comparison in the performance of my own aerials on the LF bands may be seen in **Table 1.**

Initially, on 80 and 40 metres, dipoles were tried at fairly modest heights, around 45 feet. The results obtained were rather disappointing, particularly on 80 metres. A typical entry in my log book reads as follows: "Called V01FB after his CQ, on clear frequency, his RST 579. NO REPLY!". V01FB calls again. I try again (twice). A later entry reads: "Eventually got a reply from V01FB with help from a friendly G. I got RST 339! This aerial (dipole) is poor for DX!" However, the dipole worked well around Europe.

At about this time, my thoughts turned to vertical aerials, so a simple quarter-wave long inverted-L was tried on 3.5MHz, the vertical section of the L was 45 feet in height, and the dipole was left up as a reference.

The initial tests on this new aerial looked good, but as these took place during daylight, no long-distance stations were worked. A CQ on SSB raised a GM/M who gave me 58-9 on the vertical and said I was about S1-2 on the dipole. I spent the whole of the next night until about 08.30 in the morning trying the vertical. I may be mad, but the results in the log-book made it all worthwhile: two pages of W and VE contacts, also ZS, PY, YV and, at around dawn, VK and ZL.

A problem with this aerial was that it was a single-band only set-up, and, as the feed point was about 150 feet from the shack, it would not have been an easy task to try an ATU at the feed point. In order to make it possible to work other bands, the fan-of-wire inverted-L shown in **Fig.1** was made.

This new set-up was tried out on 80, 40 and 20 metres, giving really very good results as may be seen from **Table 1.**

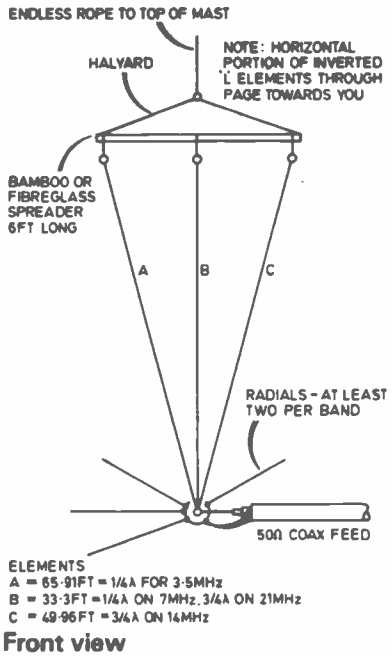
I tried adding a quarter-wave inverted-L for 160 metres, but I was unable to raise any of the transatlantic DX that I could hear using it; however, it did work around the UK and Europe reasonably well.

Eventually, the aerial in **Fig.2** was evolved; this consists of quarter-wave inverted-L sections for 80 and 40 metres and three-quarter wave sections for 20, 15 and 10 metres. Constructional details are given in **Table 2.**

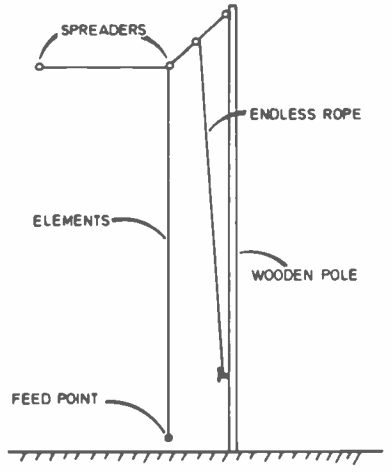
This aerial was used in conjunction with a QRP Tx of only 6 watts output for about three years, during which time it gave a very good account of itself. As a result, I feel able to recommend this aerial to HRT readers who are short of horizontal space but wish to work all the bands from 80 to 10 metres. I would also mention that although I found the dipole rather poor for DX it was very useful in pile-ups at the top-end of 80 metres to raise the European stations who seem to 'supervise' most of the SSB DX operation in the evenings.

TABLE 1

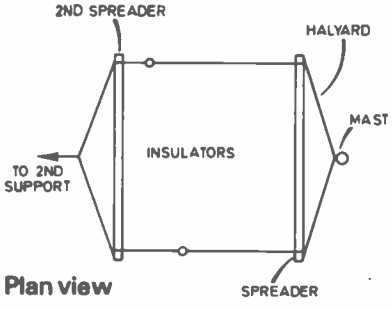
BAND	DIPOLE	VERTICAL ('L')	COMMENTS
80	Raised two W1 on SSB. My Report 43.	Same two W1 on SSB. My report 5-7-8.	European QRM noticably weaker on vertical.
	UL7GW heard at 449. Unable to raise him.	UL7GW heard at 579. Received 579 from him.	Band noise much lower on vertical. Complete absence of TV time base sprogs.
	DL Net Controller for ZL3GQ came back to my first call.	DL Net Controller for ZL3GQ unable to raise DL.	I had to switch aerial to dipole to get into EU pile-up and back to the vertical to hear and work DX.
40	Fine for working EU during daylight but not too good for DX.	Worked two JA's at lunch time 559 and 549. Both inaudible on dipole.	This is typical of the odd notes written in my log book whilst trying the vertical aerial out.
	W5VA report 229 on dipole.	W5VA report 579 on vertical.	W5VA signals nearly buried in noise from B/c stations on Dipole. In the clear on vertical.



Front view
(Note. As much of elements as possible to be vertical).



Side view



Plan view

Fig.1. — 3/4 band 'inverted-L'

Tee Time

In the amateur press over a period of years there has been mention of high impedance fed vertical aerials. The "Tee" and the "Bobtail Curtain" are just two of these aerials that I have tried. One of the main advantages of this type of aerial is that, as the feed impedance is pretty high, the losses in the earthing system become much less important in comparison to a conventional ground-plane type. The maximum current point in the aerial is elevated above ground level. This can assist in lowering the angle of radiation.

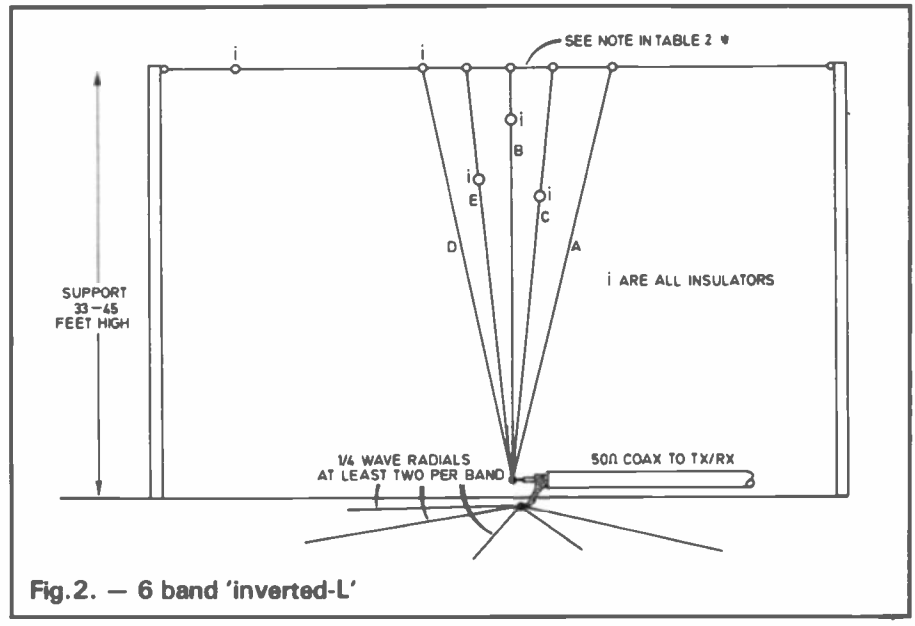


Fig.2. — 6 band 'inverted-L'

The "Tee" consists of a quarter-wave vertical section connected to the centre of a flat-topped half wave section. The major part of the radiation is from just below the junction of the horizontal and vertical parts of the array, and that is the point of maximum current too. As already mentioned, the feed impedance is rather high, so some means of matching the aerial to the co-ax is needed. I used a parallel-tuned ATU coupled by a link winding to the co-ax feeder: **Fig.3** shows the arrangement. The actual dimensions of the aerial are not terribly critical, and a few inches either way seems to make little or no difference to its performance.

I constructed two separate Tee verticals, one for 21MHz and the second for 14MHz. The results I obtained were very satisfactory. One notable point was that, compared to a dipole at 45 feet high or a conventional quarter wave ground plane, under marginal conditions (particularly as a path was opening or closing) the Tee seemed to be able to make contact for rather longer periods.

The Tee appeared to have an omni-directional pattern, much like a conventional ground plane antenna. Weak signals off the ends of the dipole and apparently unworkable, were often at good strength and workable on the Tee.

The Bobtail Curtain

The basic 'Bobtail Curtain', is like the Tee, a high impedance fed array. It differs, however, in that it has some directivity and is in fact a broadside array (that is to say that it is directive *broadside on* to the direction the antenna runs in; for example, if a broadside array is running from north to south it will fire mainly in an easterly/westerly direction).

It consists of three quarter-wave vertical elements, the upper ends of the vertical elements being joined to a horizontal wavelength long phasing section. Three elements are equi-spaced along the length of the phasing section and the array is fed at high impedance from the lower end of the centre vertical section (see **Fig.4**).

Due to space restrictions, I made up a Bobtail curtain for 28MHz only (for 28MHz, the antenna will occupy a span of sixty six feet!). In its preferred directions, the Bobtain well out-performed the reference dipole, sometimes by as much as 2-3 'S' points. The feedpoint of my Bobtail was about

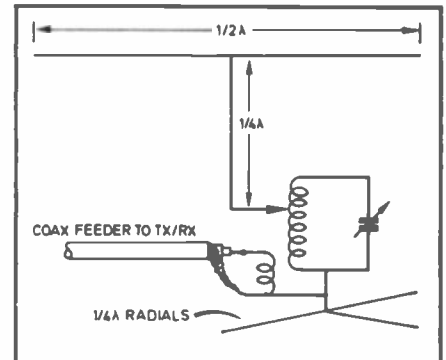


Fig.3. — The Tee

TABLE 2

BAND	ELEMENT	MODE	COMMENTS	LENGTH
80	A	¼ WAVE	USE HEAVY GAUGE WIRE	65.91 ft.
40	B	¼ WAVE	CAN BE LIGHTER GAUGE WIRE	33.3 ft.
30	C	¼ WAVE	CAN BE LIGHTER GAUGE WIRE	23.11 ft.
20	D	¾ WAVE	USE HEAVY GAUGE WIRE	49.96 ft.
15	B	¾ WAVE	USES 40 METRE ELEMENT ON 3rd HARMONIC	See "B" above
10	E	¾ WAVE	CAN BE LIGHTER GAUGE WIRE	25.02 ft.

— ITEMS MARKED 'i' on Fig. 2 are lightweight insulators.

— * USE LIGHTWEIGHT ROT-PROOF CORD, AND **NOT** WIRE. WIRE WILL CAUSE DE-TUNING.

ALL ELEMENT LENGTHS ARE FOR CW END OF BANDS. PRUNE ELEMENTS FOR BEST V.S.W.R. STARTING ON *HIGHEST* BANDS *FIRST.*

thirty feet above ground level. Like the Tee, the Bobtail is not very critical regarding the lengths of its elements being *exactly* a quarter wavelength long.

And For 160m. . .

Once I had got the vertical aerial for 80-10 metres going I did not feel inclined to disturb this set-up in trying to get back on 160 metres, so a separate 160m aerial was made, initially just to keep in touch with some local friends who had decided to use '160' as their local natter-band. By now I was beginning to run out of horizontal space so I thought: 'How about an enormous sort of mobile whip?' Well not exactly that, but something along those lines, especially as I had heard G5PP/M doing some amazing things with his mobile set-up on 160.

Anyway, out came the tape measure. I had a space where I could just get a 66 foot horizontal span with a 40 foot vertical section feeding into the centre of the horizontal 66 foot span, with a loading coil between the two sections (see **Fig.5**). The whole contraption was fed via an ATU and, as a counter-poise, a large amount of wire was buried under the lawn before putting the turf down.

The results obtained on the local net were much better than I had dared hope for. During the following two-year period, a number of W and VE stations were worked with this simple aerial, the only draw-back being that I had to tune the ATU to the part of the band I wished to use. I ended up with two pencil marks on the tuning scale of my ATU (which was hidden in the garage): one mark for 1910KHz, the other for 1827KHz.

To tune the aerial in **Fig.5**, initially do not connect the ATU. Connect a three turn link approximately 1" dia. between the bottom of the vertical part of the aerial and the earthing system you propose to use. Couple a GDO or similar to the link and tune the GDO around 1.8MHz. By adjusting the number of turns of L2 you should be able to achieve resonance at your favourite frequency. The exact number of turns on L2 is dependent on a number of variables, including height, length of horizontal top, and proximity of near-by objects.

However, I found that 80 turns was a good starting point with the dimensions given. Having obtained resonance at the frequency of your choice, connect the aerial to the ATU and by adjusting the position of the tap on L1 and tuning of C1, tune for the maximum current into the vertical section which is consistent with reasonable VSWR at the co-ax input to the ATU. Do not adjust the tapping on L1 with the TX radiating, as you can get a nasty burn doing it. I found out the hard way! It's darned painful!

It is possible to reduce the height of the vertical section at the expense of

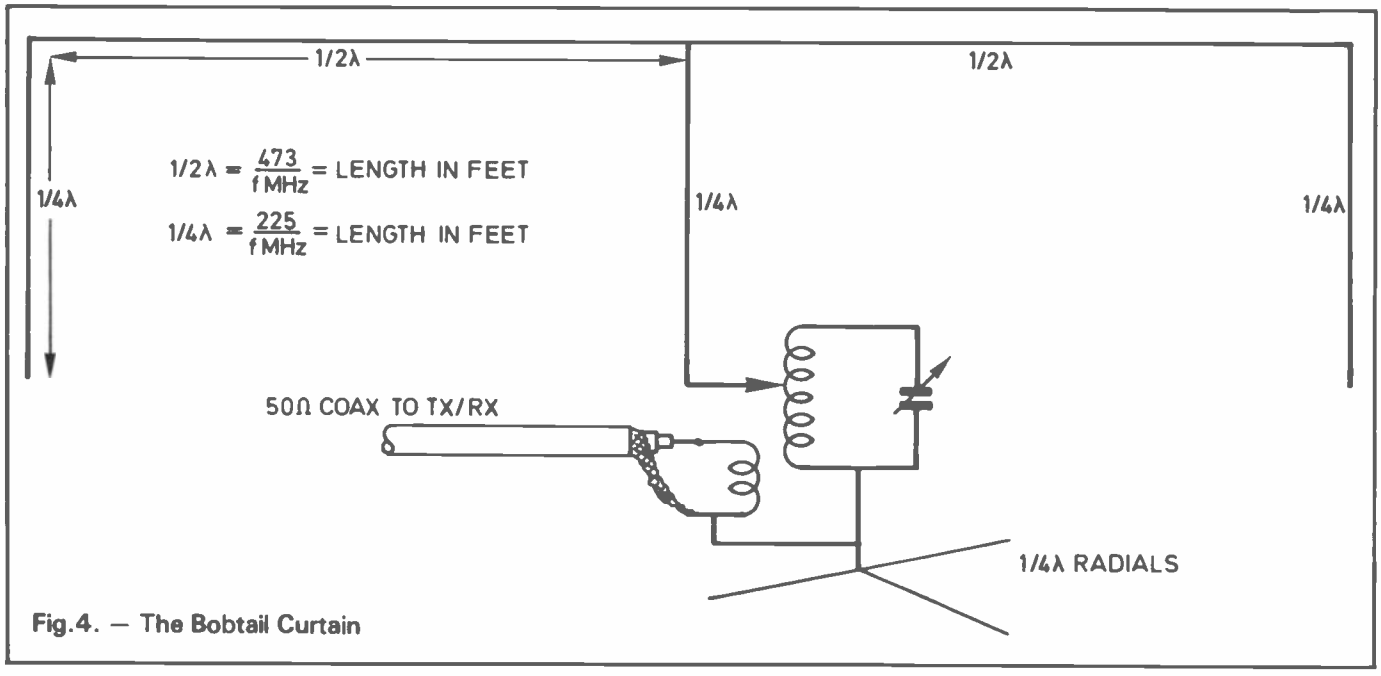


Fig.4. — The Bobtail Curtain

radiation efficiency. I found that about 30 feet was the minimum that worked in a worth-while manner. If you reduce the dimensions of either the horizontal top-loading section or the vertical section you will probably have to increase the number of turns on L2. As the inductance of L2 is increased, the losses of L2 unavoidably increase, so radiation efficiency drops.

Long Wires End Fed

At present I am using a long-wire, end fed on all bands 160-10 metres. The lay-out of the present QTH is such that the end of the long-wire is about 120 feet from the shack. This presented the problem of how to feed it. So, after a bit of thought and a few trials, I ended up with a 252-feet long inverted-L, with the horizontal portion at about 35 feet high. At the feed-point there is a step-up transformer with taps on the secondary. As the aerial presents a fairly high impedance at the feed point, a tolerable match can be achieved on all bands to the co-ax feeder. Also an ATU is used at the shack end of the co-ax to let the TX 'see' a good match on all bands (see **Fig.6**).

I was at first rather apprehensive that the losses in the transformer and co-ax might be rather high. I used some 69 ohm UR39 because I had a long enough piece (bought in a club junk-sale) and anyway it looked as though its losses and power handling would be good enough for the job. I compared results using an ATU at the feed point with those obtained using the step-up transformer and ATU and I could detect no noticeable difference between the two arrangements.

With this one doubt cleared up I was content; the present set-up gives good flexibility in band changing — without having to wander about the garden in the dark with a torch to re-set the ATU each time I wish to change bands! (The neighbours think I'm mad as it is, without giving them even more cause!)

I have used this set-up from November 1982 till now (April 1983). It seems to work reasonably well on all the bands except 18 and 24MHz, where I have not tried it (see licence Conditions HRT October). The arrangement has a number of advantages over end-feeding a multiple of half waves with the actual feed point in the shack, the most important of which was the reduction of RF level in the shack.

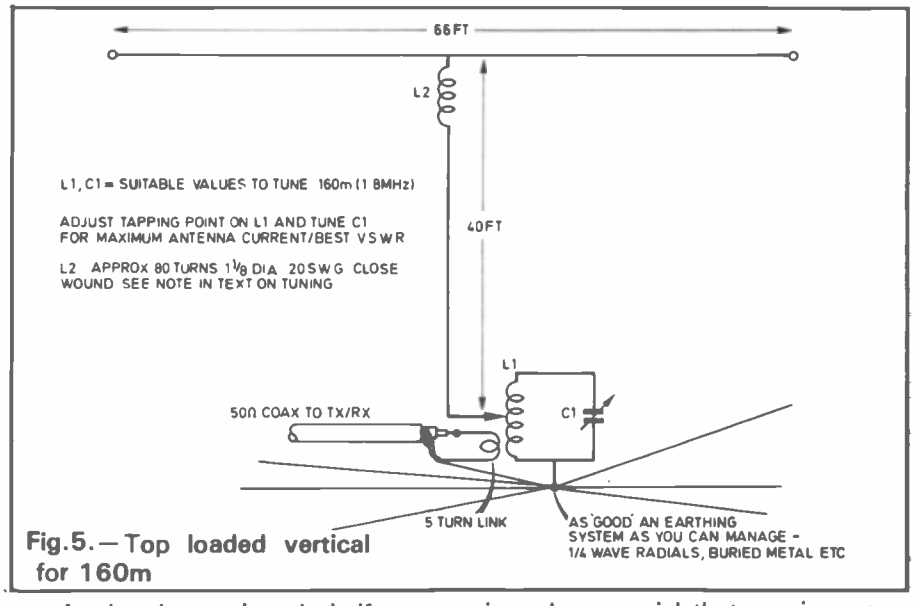


Fig.5.— Top loaded vertical for 160m

As already mentioned a half wave or a multiple of half waves has a rather high feed impedance. This varies from a few hundred to a thousand or so ohms, depending on the number of half waves. As a result the RF field, when running reasonably high power is quite high at the feed point. This high level RF field, unless you are very lucky, can get into the microphone stages of SSB transmitters, and in my case my home-brew CMOS keyer went absolutely barmy, sending dots and dashes at random all by itself. (I think it was trying to tell me something!) With the feed point remote from the shack, the feeder to the transformer is at low impedance and the effect of RF in the shack completely disappears.

Another advantage with a high impedance aerial that requires some sort of ground connection, is that the losses from having a less than perfect earth system are reduced considerably over an aerial of multiple odd quarter waves. If you can't manage a 252 foot top and still want to use 160, 132 feet works well 80-10 metres with the arrangement of **Fig.7**. However on 160, it is now approximately ¼ wave end-fed and requires a low impedance feed on 160 only. The 252 foot top that I use has worked a lot of DX on all bands, ZL, VK etc, except on 28MHz where it works well in other directions. I am sure this is due to the orientation of the aerial itself, and of course on 160 works pretty well considering its relatively low height (36 countries on 160 including SSB to W and VE plus Russians including UA9, UL7).

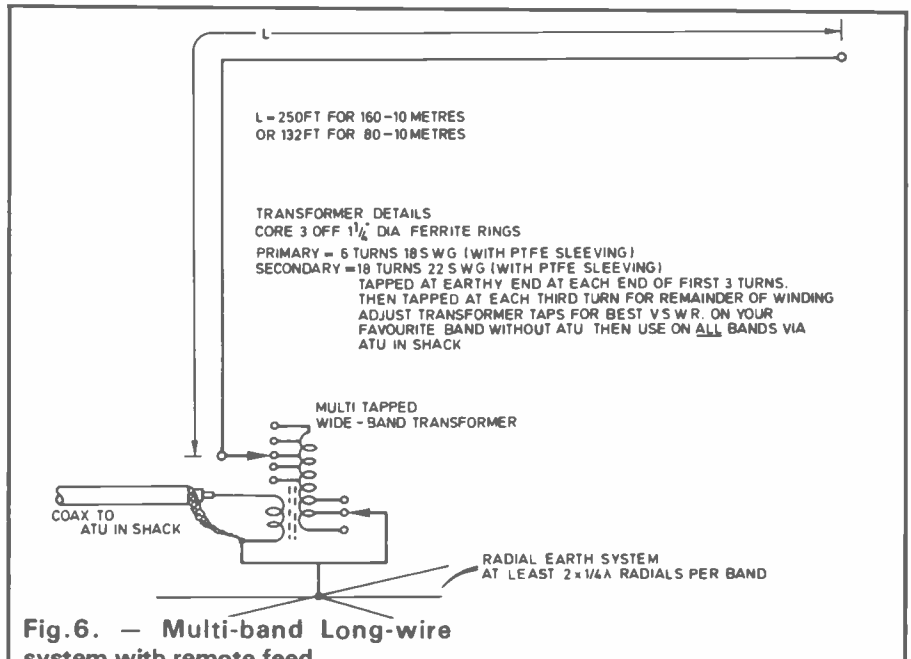


Fig.6. — Multi-band Long-wire system with remote feed

AUTUMN 1983

ambit INTERNATIONAL

MARKETPLACE

AUTUMN CLEARANCE SALE
£10 WORTH OF VOUCHERS

NEW SALES COUNTERS OPEN

Portsmouth, Broxbourne & Brentwood all benefit from newly fitted sales counters

Ambit's unique range of electronic components, kits, tools, test equipment and modules is now available to industry and enthusiast from two new regional sales counters — as well as Brentwood. The Portsmouth sales counter is installed in Solent Components Supplies building, at 53 Burrfields Road where Mark Goulty will be pleased to assist with your requirements, and also offer products from Solent's own extensive stocks of Cooper tools, Multicore solder, Bulgin connectors, panelware and hardware, C&K switches and Alpha Wire.

The Broxbourne sales counter is operated under the auspices of David Scott from the premises of Broxlea Limited, at Park Lane Broxbourne.

If the product you want is not available in stock at the sales counter, then leave your order with our manager: either for direct delivery from our central stores (no post charge), or for later collection. We're here to serve you, so get to know your local Ambit sales facility.

Inside this Issue

BATTERY ADAPTORS —

— never be caught without a suitable battery !

These novel adaptor sleeves will allow 'AA' to fit in 'C' or 'D' slots, and 'C' into 'D'. Use our generously priced NiCads and chargers (Page 11) for a complete solution to all your battery problems.

4 SETS FOR £2.00 96-02001

AUTUMN SAVER

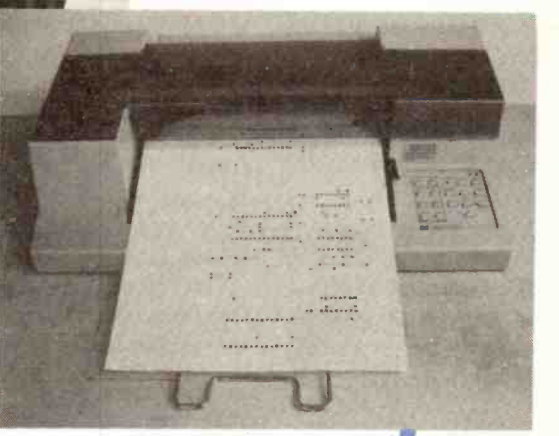
Introducing BROXLEA MANUFACTURING

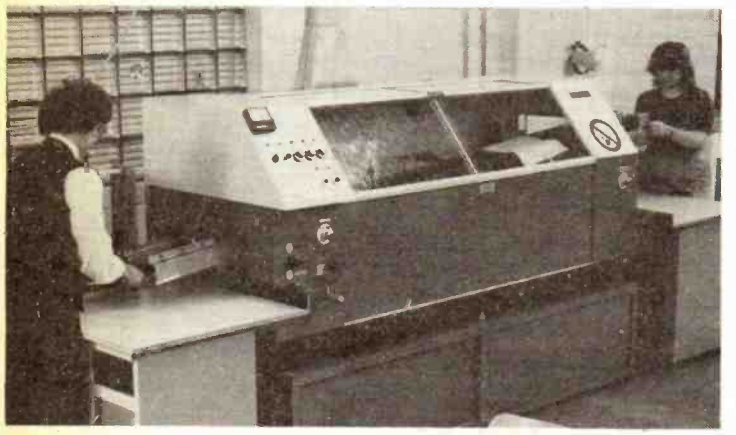
Problem solutions for hire

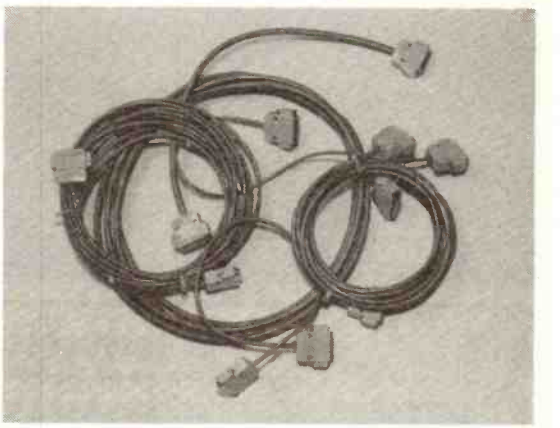
Broxlea, of Park Lane Broxbourne is the home of our North London sales counter, and the site of one of the industry's longest established manufacturers.

Broxlea specialises in providing experience in a range of manufacturing and product 'management' services that many new idea-based electronics companies find virtually impossible to locate when setting out to manufacture a new product. Things like where to source parts (at the right price), what standards apply, how to optimise a design for the best ease of manufacturing.

Broxlea's energetic MD, Peter Telling, can provide on-site assessment of your requirements







and a solution to your manufacturing problems. Let your firm explore the benefits of a partnership that enables you to specialise in your own field, and not suddenly find yourself bogged down in the intricacies of production techniques, soldering at the right temperature, and simply sticking the right parts in the right places on the PCB.

The manufacturing facilities controlled by Clifford Bulgin include the most modern flow solder plant, a team of conscientious and thorough staff, experienced in electronic and electrical assembly techniques, test and QA.

Apart from supplying manufacturers' services, Broxlea specialises in supplying a range of top quality standard and custom 'D' series cable assemblies and accessories based on universally approved and accepted cables from Alpha Wire. Hand soldered, crimped and IDC terminations are available to order.

A. F. BULGIN INVEST IN THE FUTURE

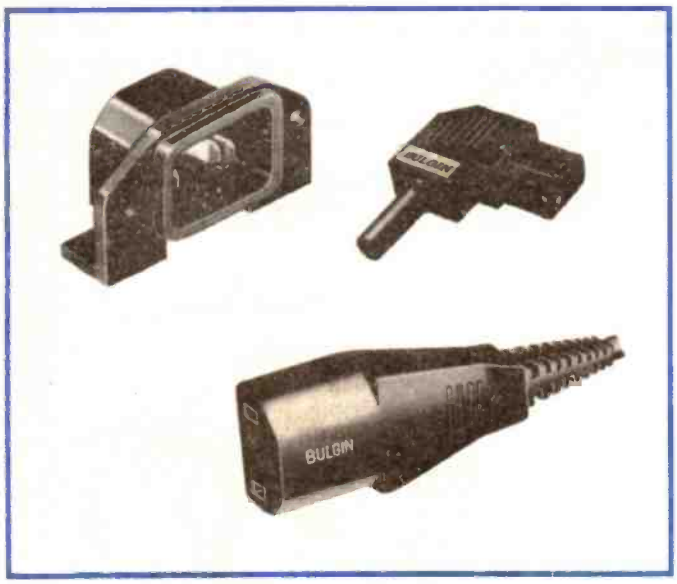
The long established component firm consolidates its subsidiary activities.

There are few participants in the electronics business who will not have come across some of the many different connectors, fuseholders, plugs, sockets, knobs etc., that are made by A. F. Bulgin & Co. PLC, of Bypass Road, Barking. 60 years in the business is unusual in electronics, and in order to establish plans that ensure the name of Bulgin will be carried forward through the next 60 years, Chairman Ronnie Bulgin and his board have decided that diversification is one of several moves to be made.

The distributive activities and associated skills of Ambit have been acquired to preceed the formal consolidation of AFB's external business interests in Portsmouth (Solent Component Supplies), Croydon (Projex Distribution Ltd.) and Broxbourne (Broxlea Limited) into a separate holding group.

The new group combines established experience in many aspects of the industry with the drive and enthusiasm of a relatively young management team. The in-group facilities include all the necessary resources to design, develop, source, manufacture and distribute a very large range of electronic products.

Ambit's innovative REWTEL direct order placement system caused quite a stir in the distribution industry, since it demonstrated the first keyword index information and bulletin service, combined with direct on-line order interrogation facilities.



Hardware versatility

The product range for which A.F. Bulgin & Co. PLC has become most famous over the past 60 years is probably its range of connectors, fuseholders and panel hardware.

The popular IEC connector range is continually being updated. There are now PC mounting types, filter inlet sockets and many other variations on the theme. Although now largely replaced in mains voltage applications by the IEC families, the round plug and socket series has been brought right up to date with the "Buccaneer" range of water resistant housings, offering a wide variety of connection options, including BNC coaxial, 3 and 6 pole types.

As with all the mains rated components, the fuseholders comply to the latest BS safety specifications to ensure acceptability of equipment and freedom from the unexpected shocks that can arise from the use of improperly designed parts.

ambit® REPORT

OPENING HOURS

Consumer admin:

(0277) 230909 - 4 lines

Availability of goods
Credit card orders

Ask for (credit card sales)	9-5.30
Customer Service problems with deliveries	10-12.30

Ask for 'Customer Service'

Industrial sales, admin & progress:

(0277) 231616 - 4 lines

Availability, price, telesales

Keith Collins	9-5.30
Claire Mackessy	9-5.30
Carol Lawton	9-5.30

Shop Sales

Brentwood Mon-Sat	9-5.30
Lunch	1.30-2.30
Broxbourne Mon-Fri	9-5.30
Sat	9-12.30
Portsmouth Mon-Sat	9-5.30

Apart from "own brand" products, A.F. Bulgin handle a number of agencies on behalf of overseas manufacturers of complementary products — most notably the superb range of control knobs from Ritel of Switzerland, a very large selection of which are available from Ambit stock and detailed in the current catalogue.

Many lines are custom manufactured, taking advantage of Bulgin's unrivalled experience, extensive in-house tooling facilities and automatic injection molding plant. If your firm requires either a variation on a standard theme, or a completely new type of small plastic/metal component, then let us quote you for supplying it from one of the few remaining sources of British component manufacturing expertise.

Telephone Timing

Help us to help you!

When calling our central sales and service departments at Brentwood, it would help us a great deal if you would observe the following timing. At present we tend to get all the calls arriving at peak periods, when other times the lines are deserted.

We get many reports of difficulty in getting through, but it's not for lack of incoming lines! Please use the numbers designated for the nature of your enquiry, it is sometimes not possible to transfer between industrial and consumer sales due to the volume of telephone traffic.

The peak time for consumer telesales is 10.15—10.45 and 2.30—4pm. If you can avoid these, then so much the better for you and us. Telesales operate Monday to Saturday, 9.00am to 5.30pm — although you can frequently place an order outside these 'official' times.

Industrial sales calls tend to arrive (understandably) in the 2.30—4pm slot as well: remember that telex is a particularly useful medium as our telex is situated in the middle of the IM department.

We like to deal with customer service problems during the morning (10am-12.30pm) so that we have all afternoon to sort the problems out and 'catch the post'.

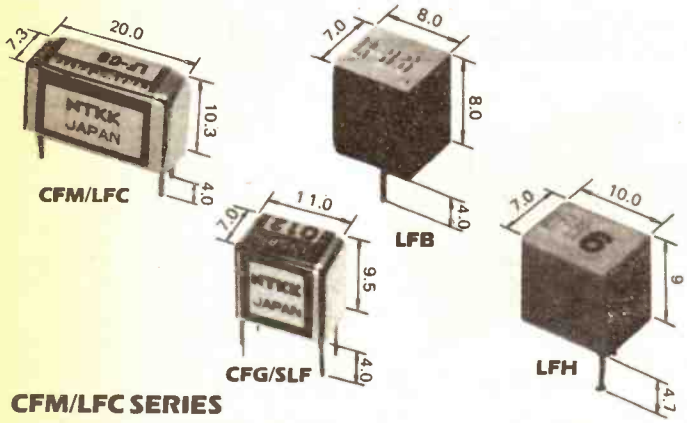
REWTEL provides on-line sales and stock enquiry facilities. (0277) 232628, a 300 baud modem and any one of a wide selection personal computers can be used to check stock and place orders, 24 hours a day, 365 days a year (less downtime!). Send an SAE marked 'REWTEL info' in the bottom left corner for more details.

ambit for communications components

The most comprehensive selection of coils, filters and components for all types of radio communications

CERAMIC FILTERS FOR 455kHz IFs

Ambit's range of ceramic filters cover most applications for communication and high quality broadcast reception. As far as we are aware, we hold the widest range of ceramic and crystal filter products anywhere in the world, and we will always do our best to assist if the type you want isn't immediately obvious from checking this section. We regret that we cannot generally assist in supplying replacements for imported equipment, unless the manufacturer's type number is available in addition to any 'house' numbers used to identify the parts.



CFM/LFC SERIES

A medium priced hermetically sealed ladder filter, suitable for most communications applications and high quality broadcast receiver equipment. Similar to the types used in receivers such as the FRG7

Type No.	-6dB BW	-50dB BW	In/Out Impedance (k ohm)	Stock No	Price
CFM455H/LFC6	6	16	1.5	16-45520	5.20
CFM455G/LFC8	8	20	1.5	16-45521	5.20
CFM455F/LFC12	12	24	1.5	16-45522	5.20
CFM455E/LFC15	15	28	1.5	16-45523	5.20
CFM455D/LFC20	20	38	1.5	16-45524	5.20

A high performance filter, similar to those used in the R1000 and FRG7700. Ideal for all low cost SSB filter requirements, and suitable for upgrading existing equipment

CFM455J1	2.6kHz min	8kHz max	2k	16-45513	9.00

CFG/SLF SERIES

A miniature high performance filter. Possibly the highest selectivity/size ratio available. Supplied in shield and hermetically sealed case, and recommended for use with designs involving the MC3357/9 and ULN3859 families, due to the excellent stopband performance.

Type No.	-6dB BW	-80dB BW	In/Out Impedance (k ohm)	Stock No	Price
CFG4551/SLFD4	4	10	1k5	16-45542	5.20
CFG455H/SLFD6	6	15	1k5	16-45542	5.20
CFG455G/SLFD8	8	18	1k5	16-45544	5.20
CFG455F/SFD12	12	25	1k5	16-45546	5.20

LFB/LFH SERIES

Probably the most popular types of low cost ceramic ladder filter — found in most types of CB transceiver, and an increasing number of designs for commercial mobile radio systems. These filters possess excellent bandpass characteristics, although watch the stop band if you are not using them with some form of 'roofing' selectivity, such as a 2 or 4 pole crystal filter at 10.7MHz/10.695MHz. The impedances of these filters (and most of the other ladder series) is directly matched by such devices as the ULN3859, so extremely compact designs can be achieved at minimum cost. Miniature 455kHz filters. I/P and O/P impedance 2k.

NTK/Murata	-6dBW (Min)	-40dB (Max)	Stock No	1-24	25-99	100+
LFB4	4kHz	15kHz	16-45511	1.95	1.45	1.10
LFB6/CFU455H	6kHz	18kHz	16-45512	1.95	1.45	1.10
LFB8	8kHz	21kHz	16-45529	1.95	1.45	1.10
LFB10	10kHz	23kHz	16-45514	1.95	1.45	1.10
LFB12/CFU455F	12kHz	26kHz	16-45515	1.95	1.45	1.10
LFH6S/CFW455HT	6kHz	14kHz	16-45525	2.45	1.95	1.55
LFH8S	8kHz	18kHz	16-45526	2.45	1.95	1.55
LFH12S/CFW455FT	12kHz	22kHz	16-45528	2.45	1.95	1.55

CERAMIC RESONATORS
Low Cost, Small size alternative to Quartz Crystals

These resonators provide an excellent alternative to costly LF quartz crystals, and are especially suited to use with MPUs, rate generators, remote control systems, dial tone and dial pulse clocks etc. There are two basic types as with crystals — series and parallel resonant types. The majority of 'clock' applications will require the parallel resonant types (CRM), whereas 'bypass' and 'trap' circuits will usually call for the series (CFE) types.

Type	Frequency	Mode	Stock No	1-24	25-99	100+
CRM455	455kHz	parallel	16-45573	0.60	0.48	0.40
CRM460	455kHz	parallel	16-46073	0.60	0.48	0.40
CRM500A	500kHz	parallel	16-50073	0.60	0.48	0.40
CFE455	455kHz	series	16-45575	0.60	0.48	0.40
CRM560	560kHz	parallel	16-56074	0.60	0.48	0.40
CSA1.0MK	1000kHz	parllel	16-10003	0.94	0.84	0.76
455D	455kHz	NBFM Disc	16-15455	1.20	0.90	0.60

CRYSTAL FILTERS

We are pleased to be able to extend our range of crystal filters to include the popular 10.695MHz frequency that seems to be universally adopted in the first IF of CB receivers. A transplant of the 2 pole filter in place of the usual ceramic filter can perform the single most significant improvement in blocking and cross mod in most circuits and the popularity of the modification has spurred us to include an 8 pole version for the purist. The 90dB adjacent channel attenuation of the 8 pole series effectively removes all responsibility for blocking and IM related problems from the subsequent stages, and places emphasis on the RF and most crucially the mixers. The 10.7MHz 8 pole SSB filter is featured in the R&EW HF transceiver add-on for the R1000 or FRG7700 receivers and is at last managing to dispell the mystique that surrounds 9.0MHz.

2 POLE TYPES

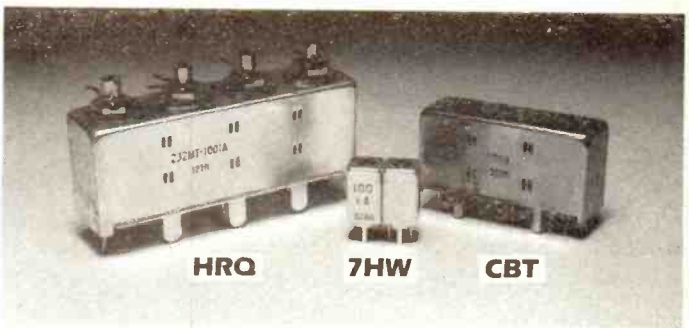
Model	Centre Freq.(MHz)	Band Width(kHz)	Ripple (dB)	Stop Band (kHz)	Term Imp(kR)	Case	Stock No.	Price
10M15A	10.7	15(3dB)	0.5	±25.0(18dB)	3.0	FS12	20-10152	0.99
21M15A	21.0	15(3dB)	0.5	±25.0(17dB)	3.0	FS12	20-21152	3.45
10M08AA	10.695	8kHz	0.5	±25.0(18dB)	1.8	FS12	20-11152	3.49

8 POLE TYPES

10M22D	10.7	2.2(6dB)	2.0	±2.4(60dB)	0.5	FS23	20-10028	17.20
10M8D	10.7	8(6dB)	2.0	±11.0(80dB)	3.0	FS22	20-10088	15.50
10M8DB	10.695	7(3dB)	2.0	±12.5(90dB)	3.3	FS22	20-11088	14.50
10M15D	10.7	15(6dB)	2.0	±20(80dB)	3.0	FS22	20-10158	14.50
21S08DA	21.4	7(3dB)	2.0	±12.5(90dB)	.850	S2	20-02108	15.65

Case Code	L	W	H
FS22	18.5	12	15
FS23	23.0	12	15
S2	11.0	8.5	11.5

HELICAL FILTERS
Low cost filters for VHF/UHF



STOCK TYPES 7HW — 2 CHAMBER

Toko Part No. 7HW	Freq. MHz	Z in/out	1dB BW	Atten./MHz off centre	Ins loss (max)	Stock No.	Price
252MT1001A	435	50	12MHz	23dB/+30 29dB-30	4dB	17-10011	1.85
252MT1090A	470	50	8MHz	23dB+30 27dB-30	5dB	17-10901	1.85
252MN1127A	463	50	12MHz	15dB Min±30MHz	2dB	17-11271	2.25
252MN1111A	432	50	7MHz	18dB Min±30MHz	5dB	17-11111	2.25

STOCK TYPES HRQ — 4 CHAMBER

Toko Part No. HRQ	Freq. MHz	Z in/out	3dB BW	Atten./MHz off centre	Ins loss (max)	Stock No.	Price
232MT1001A	435	50	10MHz	28dB+15 31dB-15	4dB	17-10010	7.90
232MT1021A	470	50	6MHz	28dB±15 31dB-15	8dB	17-10210	7.90

STOCK TYPES CBW — 2 CHAMBER

Toko Part No. CBW	Freq. MHz	Z in/out	1dB BW	Atten./MHz off centre	Ins loss (max)	Stock No.	Price
271MT1006A	145	500	3.0MHz	25db Min±15MHz	4.5dB	17-10062	3.15
271MT1007A	170	500	3.5MHz	20dB Min±15MHz	4.5dB	17-10072	3.15

STOCK TYPES CBT — 3 CHAMBER

Toko Part No. CBT	Freq. MHz	Z in/out	3dB BW	Atten./MHz off centre	Ins loss (max)	Stock No.	Price
272MT1006A	145	500	2.8MHz	25dB Min±6MHz	8dB	17-10063	3.15
272MT1007A	170	500	4.0MHz	30dB Min±6MHz	6dB	17-10073	3.15
272MT1019	160	500	3.5MHz	20dB Min±6MHz	6dB	17-10193	3.15
272MT1008	145	50	1.2MHz	30dB Min±6MHz	8dB	17-10083	3.15

SEE THE COMPLETE CATALOGUE FOR DETAILS OF

- ★ **Coaxial relays — PCB and connector types**
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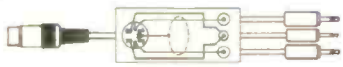
- ★ **TOKO block filters for video/radio**
- ★ **Fixed Inductors**
- ★ **Quartz crystals**

ambit for computer components

COMPUTER LEADS

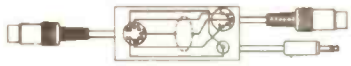
To connect BBC/Acorn computer to cassette etc. 7 pin DIN plug to 2 x 3.5mm jack plugs and 2.5mm jack plug. Length approx. 1m.

Stock No	Price
03-10001	2.05



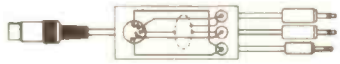
Also for BBC/Acorn. 7 pin DIN plug to 3 pin DIN plug and 2.5mm jack plug. Length approx 1m.

Stock No	Price
03-10002	2.05



5 pin DIN plug to 2 x 3.5mm jack plugs and 2.5mm jack plug. Length approx. 1m.

Stock No	Price
03-10003	1.90



Co-ax plug to phono plug. Length approx 1.2m.

Stock No	Price
03-10004	0.65

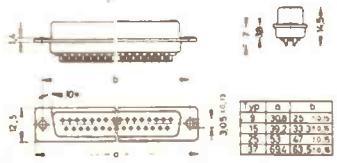
MIN 'D' SERIES CONNECTORS

A range of high performance connectors available in 15 and 25 ways, all contacts are hard gold-plated on copper alloy. Mouldings are thermoplastic resin, glass-fibre filled and metal parts are galvanized and chromatized.

SOLDER CUP

Male and female connectors with solder cup termination max 0.5mm.

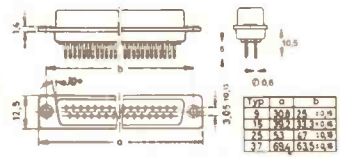
Type/Way	Stock No	Price
Plug/15	10-15100	1.30
Plug/25	10-25100	1.98
Socke/15	10-15200	1.80
Socket/25	10-25200	2.44



SOLDER PIN

Male and female connection with solder pin terminations. Max. 0.6mm. Suitable for vertical PCB mounting. Lead length 6mm.

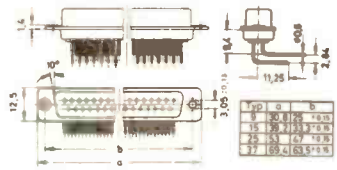
Type/Way	Stock No	Price
Plug/15	10-15110	1.42
Plug/25	10-25110	2.15
Socke/15	10-15210	1.89
Socket/25	10-25220	2.55



RIGHT ANGLE

For PCB mounting right angle version with supporting bracket. Max. lead length 4mm.

Type/Way	Stock No	Price
Plug/15	10-15111	2.55
Plug/25	10-25111	3.40
Socke/15	10-15211	2.90
Socket/25	10-25211	3.80



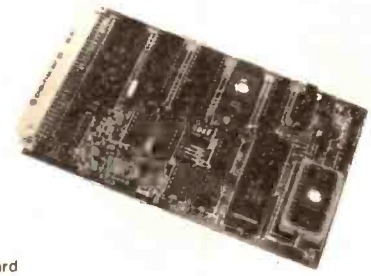
MOULDED COVER

Side entry cover with cable clamp. Moulded in thermoplastic resin, glass fibre filled.

Ways	Stock No	Price
15	10-15122	0.76
25	10-25122	0.80

Z-8 TBPDS

Beware of immitations. Jon Burchell's versatile BASIC development system, based on the Z-8 basic/debug CPU is the most adaptable and *understandable* entry to the design on MPU based control systems. The Z8 TBPDS provides 8k x 8 RAM, 4k x 8 EPROM, containing utility software, and EPROM programming. The Z-8 TBPDS needs only to be connected to an RS232 terminal (or a home computer configured as one) to provide complete program development/support. Supported by regular features in *Radio & Electronics World* magazine, and now a line assembler and CPM based cross assembler is available for fast and versatile applications and development. Further enhancements include an autostart board, to run the BASIC programme held in EPROM power-up.



	Stock No	Price
Built	40-00802	160.00
Built autostart	40-00811	6.50

Z-8 Interconnect cable connects Z8 to PSU cassette interface, and RS232 terminal.

Stock No	Price
40-00810	8.00

Z8 Datapack, very complete documentation of Z8 BASIC, and Z8671 CPU. Refundable against purchase of a Z8 TBDS kit, (or built version)

Stock No	Price
02-00800	10.00

Z8 LINE ASSEMBLER

A 2732 EPROM, contains a Z8 line assembler, permitting the use of Z8 code in programme developments. The enormously enhanced speed of development and operation offered by this software tool places the Z8 well ahead of the rival single chip MCUs for speed and versatility. The EPROM includes revised utilities written in code, and comes complete with extensive documentation to plug into your TBPDS.

	Stock No	Price
EPROM	49-07861	40.00

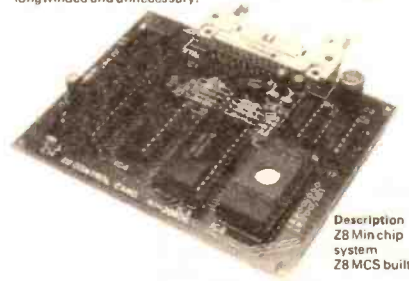
Z8 EXEC

An operating system, in BASIC for the Z8 Tiny Basic Development System. Z8 Exec helps you create, save in an EPROM filing system, load and run programs with its 15 versatile commands. A real time clock and scheduler will allow programs to run at pre-selected times. Supplied in 3 EPROMS.

Stock No	Price
49-07863	45.00

Z8 MCS

From Jonathan Burchell's cornucopia of microprocessing delights comes the Z8 single board computer: a 4 IC design capable of running BASIC/MC programs of up to 4K Bytes from switch-on. It is designed specifically to run the programs developed with the Z8 TBDS, and rejoices in the usual features of the Z8: 16 parallel I/O lines, serial I/O etc. An approach that makes any other method of developing single-chip MCU's seem rather longwinded and unnecessary.



Description	Stock No	Price
Z8 Min chip system	40-00812	30.95
Z8 MCS built	40-00813	36.78

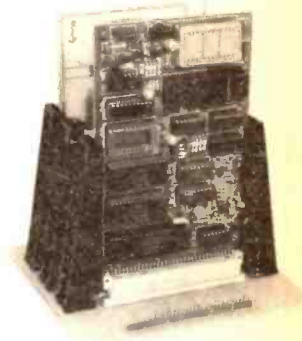
Z8 POWER SUPPLY

Available built-only a boxed version of the power supply with cassette interface for the Z8 TBDS computer development system. ±12V at 500mA, +5V at 1 amp, +25V 100mA. TTL data input, audio out to recorder.

Description	Stock No	Price
Z8 PSU	40-00814	33.00

Z8 BACKPLANE

As described in July '83 R&EW. Enables up to 2 Eurocards to be used in conjunction with the Z8 TBDS. Easy connections to I/O, RS232 ports and power supplies.



	Stock No	Price
Kit	41-00601	19.13
Built	41-00600	25.74

RS232 ADA

A serial interface A/D and D/A converter that provides easy communication with any RS232 port.

	Stock No	Price
Kit	40-90232	41.40
Built	40-99232	52.00

LOW COST A/D

Another conversion (September 1982) for the faithful from Jon Burchell, but this time a low cost approach with parallel interface. A good place to start when you want to explore the world outside your personal computer.

	Stock No	Price
Kit	40-42700	14.50

MICROPROCESSOR AND MEMORIES

6800 SERIES

Type	Stock No.	Price
6800P	26-06800	2.25
6810P	26-06810	1.15
6820P	26-06820	1.75
6821P	26-06821	1.00
6840P	26-06840	3.75
6850P	26-06850	1.10
6852P	26-06852	2.00
68488P	26-68488	4.50
6809	26-06809	8.00
6802	26-06802	3.20
68A00P	26-16800	3.90
68A21P	26-16821	2.10
68A40P	26-16840	4.55
68A52P	26-16852	2.75
68B00P	26-26800	4.65
68B21P	26-26821	2.25
68B40P	26-26840	4.65
68B50P	26-26850	2.13
68B52P	26-26852	2.95

Z80 4MHz DEVICES

Type	Stock No.	Price
Z80A	26-18400	3.40
Z80APIO	26-18420	2.95
Z80ACTC	26-18430	2.90
Z80ADMA	26-18410	7.30
Z80DART	26-18470	6.10
Z80AS1012	26-18441	9.50
Z80AS1012	26-18442	9.50
Z80AS1019	26-18149	8.90

Note. The Z80A family may be used as higher speed replacements for the standard speed Z80 (2.0MHz) Devices.

Z80B 6MHz DEVICES

Type	Stock No.	Price
Z80B	26-28400	8.85
Z80BPIO	26-28420	8.45
Z80BCTC	26-28430	8.45
Z8671	26-08672	17.50

8080 1MHz SERIES

Type	Stock No.	Price
8080AP	26-08080	2.80
8212	26-08212	1.65
8224	26-08224	1.90
8251	26-08251	3.40
8255	26-08255	2.58

MEMORIES

Popular static and dynamic RAMs and EPROMs. All are first grade types from well known manufacturers — Hitachi, Texas etc.

STATIC

Device	Stock No.	Price
6116-3	26-36116	3.50
2114-L2	26-02114	1.20
2112	26-02112	2.30
2111	26-02111	2.30
2102	26-02102	1.20
Z6132-6	26-06132	15.00
MCS1L01P45	26-05101	3.15

DYNAMIC

Type	Stock No.	Price
8264	26-08264	3.80
4116-2	26-24116	0.90
4116-3	26-34116	0.85

UV EPROMS

Type	Stock No.	Price
2764	26-02764	6.39
2732	26-02732	4.00
2716	26-02716	3.00
2708	26-02708	2.00

IDC and many other types in the catalogue.

OEM's ask for details of our custom cable and termination facilities.

See our broad selection of computer books!

ambit for audio

100W PA MODULE

All parts for the best 100W complementary amplifier yet published

Kit

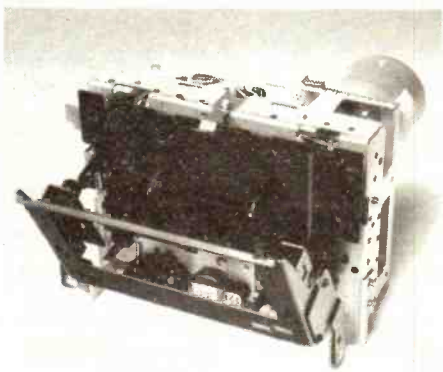
41-00504 **36.48**

HEATSINK (2 required)

21-08035 **8.60**

ELECTRONIC CASSETTE

A fully solenoid operated cassette mechanism, featuring front loading and simple electronic control. Complete with Canon permalloy stereo head — although various others can be fitted if required. This is the current stock deck — OEM's can obtain details of the broader range available by contacting Ambit Industrial Marketing. Full specification and drawings on request, together with alternative head options for large volume users. Position counter available soon. See August R&EW for details of logic drive circuit.



SPECIFICATION:
Rated Operating Voltage: Motor +12VDC ±10%, Solenoids +12V DC ±10%. **Installation:** Vertical or Horizontal. **Wow and Flutter:** >0.08% WRMS (>15)(Test Tape: TEAC MTT-111). **Spooling Time:** FF or REW >115 seconds (TDK DC-60). **Tape Speed:** 3,000Hz±2%. **Motor Consumption:** (Play, FF, REW)>100mA. **Heads - REC/REP:** Canon H3332-0202 (2 channel sendust). **Erase:** Canon H53211-02 (2 channel, double gap, metal capable)

Description	Stock No.	Price
TN3600 deck	72-03600	28.00
BA843 Cassette deck control IC	61-00843	1.95
LB1288 Darlington Driver (for solenoids)	61-01288	1.35

LOUDSPEAKER/AMPLIFIER PROTECTION

Very substantial 20A relay driven by the multifarious HA12002 amplifier monitor IC Protects against overload, temperature offset etc.

41-00505 **£8.39**

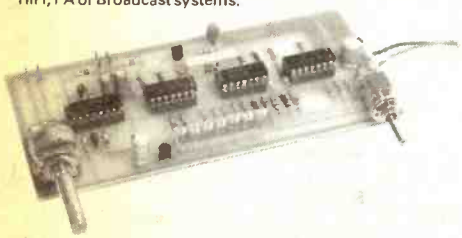
PSU — 250VA FOR PA

A multi primary toroid designed specifically for the above system with substantial reservoir capacitors

	Stock No.	Price
110/240V PRI 15-0-15V 42-0-42Vsec	57-07110	24.45
22000μF/63V	05-22400	7.84
200V PIV/ 25A Bridge Rectifier	90-00564	2.20

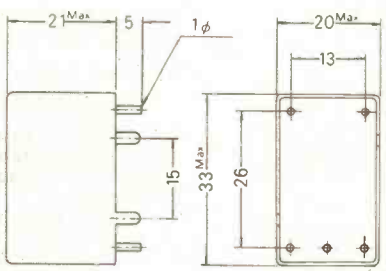
AUDIO LIMITER

A high quality means of preventing amplifier overload in HiFi, PA or Broadcast systems.



Kit 41-00501 **£13.82**

TAPE OSCILLATOR BLOCK TBP23



Pre-aligned oscillator block for bias and erase use in cassette and tape decks. High stability push-pull oscillator, with shielded case.

SPECIFICATION:
Supply Voltage: 16V DC. **Current consumption:** <50mA. **Osc Frequency:** 100±5kHz. **Recording Bias Current:** 600uA per head. **Erase current:** 80mA. **Erase current distortion:** <0.6%. **Impedances: Erase Head:** 300R @50kHz. **Rec/Play Head:** 800R @1kHz. **Temperature Range:** −20° to +70°C.

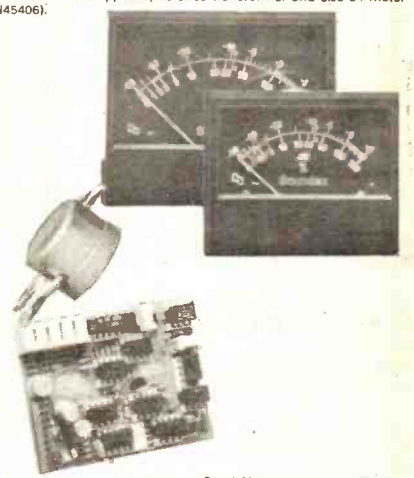
Type	Stock No.	Price
724BOR1018N	99-01018	2.75

PPM SYSTEMS

Professional ballistic sound measurement systems

PPM SYSTEMS TO DIN45406

The PPM 302 is a Meter Movement and Drive amplifier combination complete with 1:1 isolating transformer, forming a sophisticated peak programme meter system within BS 5428 type 1 and DIN 45406 specifications. The response time is exceptionally fast and the dynamic range −50 to 5dB. The drive card, incorporates a sharp cut off low pass filter, full wave rectifier, separate attack and decay time constants, and logarithmic meter drive amplifiers. The gain of the card is adjustable. The drive card and meter are sold as a pre-aligned pair and are issued with a calibration certificate. There are two meter sizes available and the size should be stated when ordering. PPM302/24 drive amp, card, balance transformer and size 24 meter (DIN45406). PPM302/34 drive amp, card, balance transformer and size 34 meter (DIN45406).



Type	Stock No.	Price
PPM302/24	50-30201	114.92
PPM302/34	50-30202	119.12

LOW COST PPM SYSTEMS

The PPM402 is a meter movement and Drive Amplifier card combination forming a cost effective peak programme meter of high quality and reliability. The driver consists of a variable sensitivity input stage, precision full-wave active rectifier and output stage with a transfer characteristic suitable for the meter scale. Each driver and meter is individually aligned to be within published data so that repeatability of response is guaranteed. In operation this means that peaks are not only captured, but also valued closely to what the ear may perceive. PPM402/24 drive amp, card with size 24 meter. PPM402/34 drive amp, card with size 34 meter. PPM402/K drive amp kit with size 24 meter.

Type	Stock No.	Price
PPM402/24	50-40201	55.13
PPM402/34	50-40202	59.73
PPM402/K	50-40203	45.98

DRIVE AMPLIFIERS

PPM 121 (ENCAPSULATED)

Features: ★ BS5428 compatibility. ★ Small external component count. ★ Maximum opportunity for user options. ★ Two-point line-up. ★ Small size 30 x 20 x 15mm. ★ Wide supply variation tolerance. ★ Wide supply variation tolerance. ★ Low current consumption.
The full wave rectifier, piece-wise processor and drive amplifiers, make this small module ideal for achieving Peak Programme Metering in a wide variety of applications. The module is sufficiently accurate to perform BS4297 and BS5428 processing with negligible thermal drift and wide supply tolerance. A minimum of external components are needed which allow dynamic and static parameters to be user-adjusted.

Type	Stock No.	Price
PPM121	50-00121	28.35

PPM 131 (CARD)

PPM 131 is a small, high quality meter drive amplifier, ideal for incorporation into mixers and other equipment where unbalanced signals are present. There is adequate gain to cope with non-standard levels. Power supplies present no problem to the PPM 131, since apart from being protected against reverse biasing, the amplifier may be operated from either single or dual rail power — the 0V generator onboard can be linked in or out of use. Each PPM 131 leaves the Soundex factory having been aligned, both statically and ballistically, to the BS5428 specification and because only high stability close tolerance components are used, alignment is achieved in two steps.

Type	Stock No.	Price
PPM131	50-00131	36.75

Card to affix to meter

PPM 181 (CARD)

A high performance peak programme meter amplifier card of small size for mounting directly onto the rear studs of meter movements. The input is electronically balanced with a high input impedance and large common mode rejection. An unbalanced output is available for sum and difference measurement, where two PPM 181 cards are used as a stereo pair. The gain of the PPM 181 may be selected as unity (0dBm = 0dB indicated) or varied by appropriate linking. Realignment is a simple one pass procedure. The PPM 181 is supplied with 10 way edge connector, certificate of calibration and full data.

Type	Stock No.	Price
PPM181	50-00181	69.35

Card to affix to meter

Autumn/Winter '83 supplement. All prices subject to VAT & P&P (60p per order) correct at time of going to press

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THE ZX SPECTRUM — YOUR PERSONAL COMPUTER
By I McLean, S. Rushbrook Williams and P Williams
1983, 240pp, Paperback
Stock No: 02-00100 Price: £5.95

Z80 MICROCOMPUTER DESIGN PROJECTS
By W Barden Jnr
1981, 208pp, 210 x 280mm, paperback, Sams, ISBN 0-672-21682-5
Stock No: 02-21682 Price: £12.70

Z-80 MICROCOMPUTER HANDBOOK
By W Barden
1978, 304pp, 135 x 215mm, Paperback, Sams ISBN 0-672-21500-4
Stock No: 02-21500 Price: £11.85

Z-80 MICROPROCESSOR PROGRAMMING AND INTERFACING BOOKS 1 & 2
By Nichols et al
Book 1 — 1979, 304pp, 155 x 245mm, paperback, Sams, ISBN 0-672-21609-4
Stock No: 02-21609 Price: £11.00
Book 2 — 1979, 496pp, 155 x 245mm, Paperback, Sams, ISBN 0-672-21610-8
Stock No: 02-21610 Price: £14.40

Z8000 MICROPROCESSOR: A DESIGN HANDBOOK
By B K Fawcett
1982, 308pp, 175 x 230mm, Paperback, Zilog (P), ISBN 0-13-983734-5
Stock No: 02-37345 Price: £14.40

16-BIT MICROPROCESSOR HANDBOOK
By A Osborne & G Kane
1981, 600pp, 175 x 235mm, Paperback, McGraw-Hill, ISBN 0-931988-43-8
Stock No: 02-88438 Price £14.50

68000: PRINCIPLES AND PROGRAMMING
By L J Scanlon
1981, 238pp, 155 x 235mm, Paperback, Sams, ISBN 0-672-21853-4
Stock No: 02-21853 Price £12.70

8080/Z80 ASSEMBLY LANGUAGE
By A R Miller
1981, 328pp, 170 x 255mm, Paperback, Wiley ISBN 0-471-08124-8
Stock No: 02-81248 Price £8.50

6809 ASSEMBLY LANGUAGE PROGRAMMING
By L A Leventhal
1981,600pp, 160 x 235mm, Paperback, McGraw-Hill, ISBN 0-931988-35-7
Stock No: 02-88357 Price £12.95

6809 MICROCOMPUTER PROGRAMMING AND INTERFACING with experiments
By A C Staugaard
1981, 272pp, 135 x 215mm, Paperback, Sams, ISBN 0-672-21798-8
Stock No: 02-21798 Price £12.70

68000 MICROPROCESSOR HANDBOOK
By G Kane
1981, 114pp, 175 x 235mm, paperback, McGraw-Hill, ISBN 0-931988-41-1
Stock No: 02-88411 Price £7.95

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HITACHI PORTABLE OSCILLOSCOPES

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DC to 20MHz
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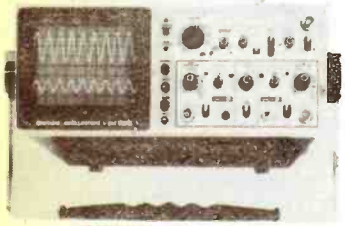
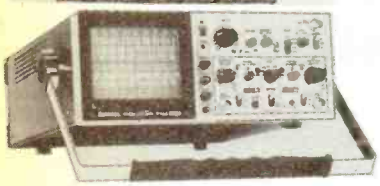


V222
DC to 20MHz
56-10222 £350



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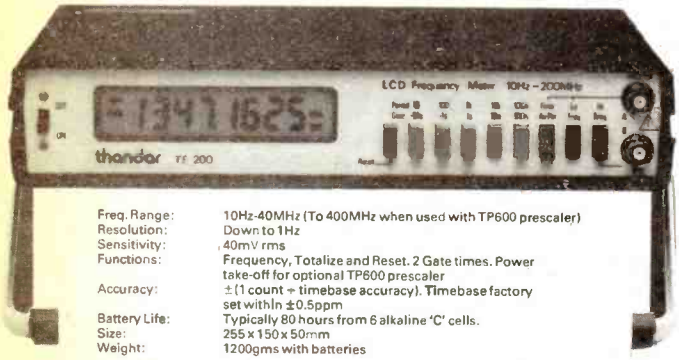

Freq. Range:	10Hz-40MHz (To 400MHz when used with TP600 prescaler)
Resolution:	Down to 1Hz
Sensitivity:	40mV rms
Functions:	Frequency, Totalize and Reset. 2 Gate times. Power take-off for optional TP600 prescaler
Accuracy:	±(1 count ÷ timebase accuracy). Timebase factory set within ±0.5ppm
Battery Life:	Typically 80 hours from 6 alkaline 'C' cells.
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Price:	71.00

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A range of low cost but superb quality handtools that feature best Japanese steel and box-joint construction (other than 54-30510). The cutter range includes slant and oblique types which are considerably better suited to trimming component leads through PCBs than standard diagonal types. We have no hesitation in recommending these as excellent value for money. Hardened bench engineers have been known to prefer these to other better known Swedish-made types costing twice as much.

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Stock No. 54-30501 Price 5.15

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Stock No. 54-30507 Price 5.15

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Stock No. 54-30504 Price 5.44

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Stock No. 54-30510 Price 2.95

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WORTH £1.15

Against an order for 4 × 01-12004
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CHRISTMAS DISCOUNT VOUCHER NO.2

WORTH £3.29

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CHRISTMAS DISCOUNT VOUCHER NO.3

WORTH £1.50

Against an order for 1 × 01-84059
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CHRISTMAS DISCOUNT VOUCHER NO.4

WORTH £1.01

Against an order for 1 × 56-05020
1 × 01-12001

CHRISTMAS DISCOUNT VOUCHER NO.5

WORTH £9.00

Against an order for 1 × 56-00901
AD901 Multimeter

CHRISTMAS DISCOUNT VOUCHER NO.6

WORTH £2.50

Against an order for 1 × 40-20001
LCD Stopwatch

CHRISTMAS OFFERS

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4 × **01-12004**	AA Full Spec NICAD 4 × 80p =	£ 3.20
1 × **01-00409**	AA Charger	£ 4.95
	CATALOGUE COST	£ 8.15

Less **£1.15 CHRISTMAS DISCOUNT**

Means you pay **ONLY** **£ 7.00**

No.2

4 × **01-12004**	AA NICADS 4 × 80p =	£ 3.20
4 × **01-12034**	Sub 'D' NICADS 4 × £1.60 =	£ 6.40
1 × **01-84054**	PP3 NICAD =	£ 3.70
1 × **01-02204**	CH4/RX4 Universal NICAD Charger =	£ 7.49
	CATALOGUE COST	£20.79

Less **£3.29 CHRISTMAS DISCOUNT**

Means you pay **ONLY** **£17.50**

No.3

1 × **01-84054**	PP3 NICAD =	£ 3.70
1 × **01-00159**	PP3 NICAD Charger =	£ 4.30
	CATALOGUE COST	£ 8.00

Less **£1.50 CHRISTMAS DISCOUNT**

Means you pay **ONLY** **£ 6.50**

No.4

1 × **56-05020**	X-8 Battery Tester	£ 3.95
1 × **01-12001**	Battery Adaptors	£ 0.96
	CATALOGUE COST	£ 4.91

Less **£1.01 CHRISTMAS DISCOUNT**

Means you pay **ONLY** **£ 3.90**

No.5

Features

Full Autoranging digital multimeter with 3.5 digit LCD, range change and continuity bleeper.
Input impedance: 10MΩ
DC Volts: 200mV-2-20-200-1000V
AC Volts: 2-20-200-600V
DC Current: 0-200mA, 10A
AC Current: 0-200mA, 10A
Resistance: 200Ω-20kΩ-200kΩ- 2000kΩ
Accuracy: DC; 1% of reading +0.4% of full scale
Dimensions: 160×80×30mm
Weight: 250g
Supplied with batteries and spare fuse.

1 × **56-00901** AD901 Digital Multimeter £49.00

Less **£9.00 CHRISTMAS DISCOUNT**

Means you pay **ONLY** **£40.00**

No.6

Features:
Stopwatch with 1/100ths of a second, normal time with seconds display and selectable European/US data formats, pace maker 'bleeper' for joggers etc. Complete with neck cord.

1 × **40-20001** LCD Stop Watch £12.50

Less **£2.50 CHRISTMAS DISCOUNT**

Means you pay **ONLY** **£10.00**

No.7

★ LCD Digital Quartz
★ Game and Watch in one
★ Normal Time function (hour, minute, second, date)
★ 12/24 hour system
★ Automatic digital scoring and sound effect

1 × **90-00187** Plane & Tank Battle Game Watch

SPECIAL CHRISTMAS PRICE **£5.50**

No.8

1 × **90-00188** Sea Ranger Game Watch

SPECIAL CHRISTMAS PRICE **£5.50**

Autumn/Winter '83 supplement. All prices subject to VAT & P&P (60p per order) correct at time of going to press

TRANSISTORS
Small Signal/Low Frequency

Device	Stock No.	Price
BC182	58-00182	0.10
BC212	58-00212	0.10
BC237	58-00237	0.08
BC238	58-00238	0.08
BC239	58-00239	0.08
BC307	58-00307	0.08
BC308	58-00308	0.08
BC309	58-00309	0.08
BC327	58-00327	0.13
BC337	58-00337	0.13
BC413	58-00413	0.10
BC414	58-00414	0.11
BC415	58-00415	0.10
BC416	58-00416	0.11
BC546	58-00546	0.12
BC550	58-00550	0.12
BC556	58-00556	0.12
BC560	58-00560	0.12
BC639	58-00639	0.22
BC640	58-00640	0.22
MPSA13	58-04013	0.30
MPSA63	58-04063	0.30
ZTX108	58-01108	0.10
ZTX212	58-01212	0.10
2N2904	58-02904	0.25
2N2905	58-02905	0.25
2N3905	58-03905	0.10
2SB646A	58-03646	0.30
2SB648A	58-03648	0.40
2SD666A	58-03666	0.30
2SD668A	58-03668	0.40
2SA872A	58-02872	0.19
2SA1084E	58-01084	0.25
2SA1085E	58-01085	0.25
2SC1775A	58-01775	0.19
2SC2646E	58-02546	0.24
2SC2547E	58-02547	0.24

TRANSISTORS
Small Signal RF Devices

Device	Stock No.	Price
BFY50	58-06500	0.22
BF241	58-06241	0.18
BF273	Use BF241	
BF274	Use BF241	
BF362	58-06362	0.49
BF440	58-06440	0.21
BF441	58-06441	0.21
BF479	58-06479	0.66
BF679S	58-06679	0.55
BFR91	58-07091	1.33
BFR96	58-07096	1.45
BFT95	58-10095	0.99
BFW92	58-08092	0.60
BFY90	58-09090	0.90
NE21936	58-21936	5.00
ZTX323	58-06232	0.60
2N2369A	58-02369	0.38

TRANSISTORS
Small Signal RF FET/MOSFET

Device	Stock No.	Price
BF256	59-00256	0.38
BF960	60-06960	0.99
BF961	60-06961	0.70
BF963	60-06963	0.99
BF981	60-06981	1.20
J310	59-02310	0.80
J176	59-02176	0.65
MEM680	60-05680	0.75
2SK55	59-01055	0.32
2SK168	59-01168	0.37
3SK45	60-04045	0.49
3SK51	60-04051	0.54
3SK60	60-04060	0.58
3SK81	60-04081	1.32
3SK88	60-04088	0.99
40673	Replaced by 3SK51	
40822	Replaced by 3SK45	
3SK112	60-04112	4.60

TRANSISTORS
Audio Power

Device	Stock No.	Price
BD139	58-15139	0.29
BD140	58-15140	0.31
BD165	58-15165	0.46
BD166	58-15166	0.48
BD179	58-15179	0.38
BD180	58-15180	0.41
TIP31A	58-15031	0.35
TIP32A	58-15032	0.35
MJ2955	58-12955	0.68
2N3055	58-13099	0.58
2SB720	58-15720	0.60
2SD760	58-17600	0.60
2SJ49	60-01049	3.10
2SJ50	60-01050	4.25
2SJ83	60-01083	3.55
2SK135	60-00135	4.25
2SK227	60-00227	3.55
2SD753	58-03753	2.34
SM3159	58-03159	5.95
SM3160	58-03160	5.95

TRANSISTORS
RF POWER DEVICES

Device	Stock No.	Price
MRF237	58-14237	3.20
MRF238	58-14238	16.50
MRF245	58-14245	40.00
MRF449A	58-14449	16.50
MRF472	58-14472	1.25
MRF475	58-14475	4.60
MRF629	58-14629	4.99
PT8811	58-18811	9.50
2SC1945	58-01945	2.60
2SC1971	58-01971	2.49
2SC2053	58-02053	0.63
2SC2097	58-02071	14.75
TP2320	58-12320	10.24
VN66AF	60-02066	0.95
ZTX3866	58-03866	0.45
2N3866	58-13866	1.20

DIODES
Signal, Rectifier, etc.

Device	Stock No.	Price
BA244	12-02447	0.17
BA379	12-03797	0.35
ND4981-7E	12-49817	0.51
OA91	12-00916	0.07
OA47	12-00476	0.10
TDA1061	12-10617	0.95
PW02	12-62006	0.75
SO4	12-24006	0.45
W005	12-10506	0.28
IN4001	12-40016	0.06
IN4002	12-40026	0.07
IN4004	12-40046	0.07
IN4148	12-41486	0.05
IN5404	12-54046	0.16
IN6263	12-62637	0.62

DIODES
Varicap

Device	Stock No.	Price
BA102	12-01025	0.30
BA121	12-01215	0.30
BB105B	12-01055	0.30
BB109B	12-01095	0.27
BB204B	12-02045	0.36
BB212	12-02125	1.95
ITT210	12-02105	0.30
MVAM115	Use KV1235	
MVAM125	Use KV1225	
KV1210	12-12105	2.45
KV1211	Use KV1236	
KV1225	12-12255	2.75
KV1235	12-12355	2.75
KV1236	12-12365	2.55
KV1310	12-13105	0.40
KV1320	12-13205	0.40

INTEGRATED CIRCUITS
LINEAR

Device	Stock No.	Price
LM10CN	61-00010	3.88
MF10	61-00011	5.05
L149	61-00149	1.86
ZNA234	61-02340	8.50
U2378	61-00237	1.28
U247B	61-00247	1.28
U257B	61-00257	1.28
U267B	61-00267	1.28
LM301AH	61-03010	0.98
LM301AN	61-03011	0.44
LM308CN	61-03081	0.65
LM311CN	61-00311	0.46
LM324	61-03240	0.48
LM339N	61-03390	0.68
LM346	61-00346	3.72
LF347	61-00347	1.82
LM348	61-03480	1.26
LF351	61-03510	0.49
LF353	61-03530	0.76
LM380N	61-00380	1.00
LM381	61-00381	1.81
LM382	61-00382	1.81
ZN419CE	61-00419	1.98
ZNA423	61-02430	1.40
ZN425E/8	61-04250	4.50
ZN426E/8	61-04260	3.48
ZN427E/8	61-04270	6.80
ZN428E/8	61-02480	5.50
ZN429E/8	61-04290	2.50
ZN432CJ10	61-04320	29.90
ZN433CJ10	61-04330	24.79
ZN450E	61-04500	7.61
NE542	61-05420	1.20
NE544	61-00544	1.80
NE555N	61-05550	0.21
NE556N	61-05560	0.50
SL560C	61-05600	2.24
NE564	61-00564	4.29
NE565	61-00565	1.00
NE566	61-00566	1.40
NE567	61-00567	1.30
NE570N	61-00570	3.85
uA709HC	61-07090	0.64
uA709PC	61-07091	0.52
uA710HC	61-07100	0.64
uA710PC	61-07101	0.59
uA711CN	61-07110	0.85
uA741CH	61-07410	0.66
uA709PC	61-07411	0.22
uA741CN	61-07470	0.70
uA748CN	61-04780	0.40
uA758	61-00758	2.35
TBA820M	61-00820	0.78
TDA1028	61-01028	2.11
TDA1029	61-01029	2.11
ZNA1034	61-01034	2.10
LM1035	61-01035	4.50
TDA1054M	61-01054	1.45
TDA1062	61-01062	1.95
TDA1072	61-01072	2.69
TDA1074A	61-01074	5.04
TDA1083	61-01083	1.95
TDA1090	61-01090	3.05
HA1196	61-01196	2.00
HA1197	61-01197	1.00
TDA1220	61-01220	1.40
LM1303	61-01303	0.99
MC1310P	61-01310	1.90
MC1330	61-01330	1.20
MC1350	61-01350	1.20
HA1370	61-11370	1.90
HA1388	61-01388	1.75
LM1458N	61-14580	0.45
MC1496P	61-01496	1.25
SL1610	61-01610	2.10
SL1611	61-01611	2.60
SL1612	61-01612	2.10
SL1613	61-01613	2.55
SL1620	61-01620	2.17
SL1621	61-01621	3.50
SL1623	61-01623	3.50
SL1625	61-01625	1.90
SL1630	61-01630	1.62
SL1640	61-01640	3.50
SL1641	61-01641	3.50
MC1648	61-01648	3.25
TDA2002	61-02002	1.25
ULN2240	61-02240	3.25
ULN2242	61-01090	3.05
ULN2283	61-02283	1.00
CA3080	61-03080	0.96
CA3089	61-03089	1.84
CA3123	61-03123	1.40
CA3130E	61-31300	0.80
CA3130T	61-31301	0.90
CA3140E	61-31400	0.46
CA3189E	61-03189	2.20
CA3240E	61-32400	1.27
MC3357	61-03357	2.85
MC3359	61-03357	2.85
ULN3859	61-03859	2.95
KM3701	61-03701	85.53
KM3702	61-03702	74.84
LM3900	61-39000	0.60
LM3909N	61-39090	0.68
LM3914N	61-03914	2.80
LM3915N	61-03915	2.80
KB4400	61-04401	0.90
KB4412	61-04412	1.95
KB4413	61-04413	1.95
KB4417	61-04417	1.80
KB4420B	61-04420	1.09
TDA4420	61-14420	2.65
TDA4421	61-14421	2.65
KB4423	61-04423	2.30
KB4424	61-04424	1.65
KB4430	61-04430	2.30
KB4431	61-04431	1.95
KB4432	61-04432	1.95
KB4433	61-04433	1.72
KB4436	61-04436	1.53
KB4437	61-04437	1.75
KB4438	61-04438	2.22
KB4441	61-04441	1.35
KB4445	61-04445	1.29
KB4446	61-04446	2.75
KB4448	61-04448	1.65
NE5044	61-05044	2.28
MC5229	61-05229	9.80
NE5532	61-55320	2.20
KM5624	61-05624	4.35
SD6000	61-06000	3.75
SL6270	61-06270	2.00
SL6310	61-06310	2.00
SL6600	61-06600	3.75
SAS6610	61-06610	1.48
SL6640	61-06640	2.30
SL6690	61-06690	3.75
SL5700	61-06700	3.20
SAS6710	61-06710	1.48
ICM7555	61-75550	0.98
ICL8038CC	61-08038	4.50
MSL9362	61-09362	1.75
MSL9383	61-09363	1.75
TK10170	61-10170	1.87
TK10321	61-10321	2.75
HA11223	61-11223	2.15
HA11225	61-11225	1.45
HA12002	61-12002	1.22
HA12017	61-12017	0.80
HA12402	61-12402	1.95
HA12411	61-12411	1.20
HA12412	61-12412	1.55
LF13741	61-13741	0.33
MC14412	61-14412	6.85
MK50366	61-50366	3.36
MK50375	61-50375	3.85
MM53200	61-53200	3.90

PRESCALERS, FREQUENCY DISPLAY AND SYNTHESISERS

Device	Stock No.	1-24
U264	61-02640	2.27
U265	61-02650	3.16
U266	61-02660	2.43
11C90DC	61-01190	12.95
MSL2312R	61-02312	3.94
MSM5523	61-05523	11.30
MSM5524	61-05524	11.30
MSM5525	61-05525	7.85
MSM5526	61-05526	7.85
MSM55271	61-55271	9.75
ICM7106CP	61-07106	9.55
LC7137	61-07137	7.50
ICM7216B	61-72161	23.95
ICM7216C	61-72162	23.95
SP8629	61-08629	3.85
SP8647	61-08647	6.00
SP8793	61-08793	7.70
HD10551	61-10551	2.45
HA12009	61-12009	6.00
MC12016	61-12016	6.90
HD44015	61-44015	4.45
HD44752	61-44752	8.00
MC145151P	61-14151	6.00
MC145152P	61-14152	12.30
MC145156P	61-14156	4.60

VOLTAGE REGULATORS

Device	Voltage	Stock No.	Price
7805	+5V	27-78052	0.40
7806	+6V	27-78062	0.40
7808	+8V	27-78082	0.40
7812	+12V	27-78122	0.40
7815	+15V	27-78152	0.40
7818	+18V	27-78182	0.40
7824	+24V	27-78242	0.40
7905	−5V	27-79052	0.49
7906	−6V	27-79062	0.49
7908	−6V	27-79082	0.49
7912	−12V	27-79122	0.49
7915	−15V	27-79152	0.49
7918	−18V	27-79182	0.49
7924	−24V	27-79242	0.49
78L05	+5V	27-78050	0.40
78L06	+6V	27-78060	0.40
78L08	+8V	27-78080	0.40
78L12	+12V	27-78120	0.40
78L15	+15V	27-78150	0.40
78L24	+24V	27-78240	0.40
79L05	−5V	27-79050	0.55
78GKC	+adj.	27-78993	3.95
78GUIC	+adj.	27-78992	1.10
78H05	+5V	27-78054	4.25
78H12	+12V	27-78124	5.45
78HG	+adj.	27-78994	7.45
79HG	−adj.	27-79994	7.45
LM317MP	+adj.	27-03175	1.75
LM337MP	−adj.	27-03175	1.75
LM317K	+adj.	27-03173	2.35
LM317U	+adj.	27-03172	2.15
L200	+adj.	27-02006	1.95
uA723	+adj.	27-07230	0.85

ALL PRICES SHOWN FOR 1 OFF QUANTITY DISCOUNTS IN THE COMPLETE CATALOGUE

The concise Ambit Component Listings!

CMOS/74LS TTL

400 SERIES CMOS

Device	Stock No.
4000UB	22-04000
4001	23-04001
4002	23-04002
4007	23-04007
4008	23-04008
4009UB	22-04009
4011	23-04011
4011UB	22-04011
4012	23-04012
4013	23-04013
4015	23-04015
4016	23-04016
4017	23-04017
4020	23-04020
4021	23-04021
4022	23-04022
4023	23-04023
4024	23-04024
4025	23-04025
4027	23-04027
4028	23-04028
4029	23-04029
4035	23-04035
4040	23-04040
4042	23-04042
4043	23-04043
4044	23-04044
4046	23-04046
4049UB	23-04049
4050	23-04050
4051	23-04051
4052	23-04052
4053	23-04053
4060	23-04060
4066	23-04066
4068	23-04068
4069UB	23-04069
4070	23-04070
4071	23-04071
4072	23-04072
4073	23-04073
4075	23-04075
4076	23-04076
4077	23-04077
4078	23-04078
4081	23-04081
4082	23-04082
4093	23-04093
4099	23-04099
4175	23-04175
4502	23-04502
4503	23-04503
4506	23-04506
4507	23-04507
4508	23-04508
4510	23-04510
4511	23-04511
4512	23-04512
4514	23-04514
4515	23-04515
4516	23-04516
4518	23-04518
4520	23-04520
4521	23-04521
4522	23-04522
4526	23-04526
4527	23-04527
4528	23-04528
4529	23-04529
4531	23-04531
4532	23-04532
4534	23-04534
4536	23-04536
4538	23-04538
4539	23-04539
4543	23-04543
4549	23-04549
4553	23-04553
4554	23-04554
4555	23-04555
4556	23-04556
4557	23-04557
4558	23-04558
4559	23-04559
4560	23-04560
4561	23-04561
4562	23-04562
4566	23-04566
4568	23-04568
4569	23-04569
4572UB	23-04572
4580	23-04580
4581	23-04581
4582	23-04582
4583	23-04583
4584	23-04584
4585	23-04585
4702	23-04702
4703	23-04703
4704	23-04704
4705	23-04705
4706	23-04706
4720	23-04720
4723	23-04723
4724	23-04724
4725	23-04725
40014	23-40014
40085	23-40085
40098	23-40098
40106	23-40106
40160	23-40160
40161	23-40161
40162	23-40162
40174	23-40174
40192	23-40192
40193	23-40193
40195	23-40195

STOP PRESS: Please call for current CMOS price and availability due to world shortages etc.

74LS SERIES TTL

74LS00	31-07400	0.12
74LS01	31-07401	0.12
74LS02	31-07402	0.12
74LS03	31-07403	0.12
74LS04	31-07404	0.15
74LS05	31-07405	0.15
74LS08	31-07408	0.15
74LS09	31-07409	0.15
74LS10	31-07410	0.15
74LS11	31 07411	0.15
74LS12	31-07412	0.15
74LS13	31-07413	0.35
74LS14	31-07414	0.35
74LS15	31-07415	0.15
74LS20	31-07420	0.15
74LS21	31-07421	0.15
74LS22	31-07422	0.15
74LS26	31-07426	0.15
74LS27	31-07427	0.15
74LS28	31-07428	0.20
74LS30	31-07430	0.15
74LS32	31-07432	0.15
74LS33	31-07433	0.15
74LS37	31-07437	0.20
74LS38	31-07438	0.15
74LS40	31-07440	0.20
74LS42	31-07477	0.33
74LS47	31-07447	0.72
74LS48	31-07448	0.44
74LS49	31-07449	0.88
74LS51	31-07451	0.15
74LS54	31-07454	0.15
74LS55	31-07455	0.15
74LS74	31-07474	0.23
74LS75	31-07475	0.23
74LS76	31-07476	0.23
74LS78	31-07478	0.21
74LS83	31-07483	0.36
74LS85	31-07485	0.48
74LS86	31-07486	0.16
74LS90	31-07490	0.26
74LS91	31-07491	0.40
74LS92	31-07492	0.35
74LS93	31-07493	0.26
74LS95	31-07495	0.40
74LS107	31-74107	0.34
74LS109	31-74109	0.27
74LS112	31-74112	0.23
74LS113	31-74113	0.23
74LS114	31-74114	0.23
74LS115	31-74122	0.30
74LS123	31-74123	0.40
74LS125	31-74125	0.30
74LS126	31-74126	0.30
74LS132	31-74132	0.30
74LS133	31-74133	0.26
74LS136	31-74136	0.22
74LS138	31-74138	0.33
74LS139	31-74139	0.33
74LS151	31-74151	0.33
74LS153	31-74153	0.37
74LS155	31-74155	0.33
74LS156	31-74156	0.36
74LS157	31-74157	0.30
74LS158	31-74158	0.30
74LS160	31-74160	0.37
74LS161	31-74161	0.40
74LS162	31-74162	0.40
74LS163	31-74163	0.40
74LS164	31-74164	0.44
74LS165	31-74165	0.66
74LS166	31-64166	0.84
74LS170	31-74170	0.89
74LS173	31-74173	0.53
74LS174	31-74174	0.41
74LS175	31-74175	0.44
74LS181	31-74181	0.96
74LS190	31-74190	0.43
74LS191	31-74191	0.43
74LS192	31-74192	0.43
74LS193	31-74193	0.43
74LS194	31-74194	0.43
74LS195	31-74195	0.43
74LS196	31-74196	0.43
74LS197	31-74197	0.53
74LS221	31-74221	0.55
74LS240	31-74240	0.66
74LS241	31-74241	0.66
74LS242	31-74242	0.80
74LS243	31-74243	0.80
74LS244	31-74244	0.66
74LS245	31-74245	1.10
74LS251	31-74251	0.40
74LS253	31-74253	0.40
74LS257	31-74257	0.40
74LS258	31-74258	0.40
74LS259	31-74259	0.56
74LS260	31-74260	0.29
74LS266	31-74266	0.22
74LS273	31-74273	0.77
74LS279	31-74279	0.38
74LS283	31-74283	0.44
74LS298	31-74298	0.59
74LS365	31-74365	0.37
74LS366	31-74366	0.44
74LS367	31-74367	0.33
74LS367	31-74367	0.33
73LS368	31-74368	0.33
74LS373	31-74373	0.78
74LS374	31-74374	0.78
74LS375	31-74375	0.34
74LS377	31-74377	0.66
74LS378	31-74378	0.48
74LS379	31-74379	0.48
74LS386	31-74386	0.30
74LS390	31-74390	0.56
74LS393	31-74393	0.53
74LS399	31-74399	0.71
74LS490	31-74490	0.66
74LS670	31-74670	1.25

FIXED RESISTORS: All E12 values sold in packs of 10 per value only

⅛W 5%	30p/10 pack
¼W 5%	15p/10 pack
¼W 1%	35p/10 pack

Order by value & type

VARIABLE CARBON TYPES

Supplied with PC/wire on tags. Round shafts 6mm dia. with 7mm bush. M8 × 0.75 washer and fixing nut supplied.

VM10R Style (K16110)

Value	Stock No.	1-24	25-99	100+
500R Lin	48-50113	0.33	0.30	0.27
1k Lin	48-10213	0.33	0.30	0.27
5k	48-50213	0.33	0.30	0.27
10k Lin	48-10313	0.33	0.30	0.27
20k Lin	48-20313	0.33	0.30	0.27
50k Lin	48-50313	0.33	0.30	0.27
100k Lin	48-10413	0.33	0.30	0.27
500k Lin	48-50413	0.33	0.30	0.27
1M Lin	48-10513	0.33	0.30	0.27
5k Log	48-50214	0.33	0.30	0.27
10k Log	48-10314	0.33	0.30	0.27
50k Log	48-50314	0.33	0.30	0.27
100k Log	48-10414	0.33	0.30	0.27
500k Log	48-50414	0.33	0.30	0.27
1M Log	48-10514	0.33	0.30	0.27

VM11R Style (K15111-5M1222)

Single gang with DPDT rotary switch. Switch rating 1A/16VDC.

Value	Stock No.	1-24	25-99	100+
5k Lin	48-50217	0.67	0.55	0.50
10k Lin	48-10317	0.67	0.55	0.50
25k Lin	48-25317	0.67	0.55	0.50
5k Log	48-50218	0.67	0.55	0.50
10k Log	48-10318	0.67	0.55	0.50
25k Log	48-25318	0.67	0.55	0.50
50k Log	48-50318	0.67	0.55	0.50
100k Log	48-10418	0.67	0.55	0.50

GM70R Style (K162BO)

Value	Stock No.	1-24	25-99	100+
5k Lin	48-50215	0.60	0.54	0.49
10k Lin	48-10315	0.60	0.54	0.49
25k Lin	48-25315	0.60	0.54	0.49
100k Lin	48-10415	0.60	0.54	0.49
250k Lin	48-25415	0.60	0.54	0.49
1M Lin	48-10515	0.60	0.54	0.49
1k Log	48-10216	0.60	0.54	0.49
5k Log	48-50216	0.60	0.54	0.49
10k Log	48-10316	0.60	0.54	0.49
25k Log	48-25316	0.60	0.54	0.49
50k Log	48-50316	0.60	0.54	0.49
100k Log	48-10416	0.60	0.54	0.49
250k Log	48-25416	0.60	0.54	0.49
1M Log	48-10516	0.60	0.54	0.49

VM13R Style (K161C3—5M3121)

Single gang, pull push DPST switch. Switch rating 3A/30VDC.

Value	Stock No.	1-24	25-99	100+
5k Lin	48-50219	0.94	0.83	0.75
10k Lin	48-10319	0.94	0.83	0.75
25k Lin	48-25319	0.94	0.83	0.75
100k Lin	48-10419	0.94	0.83	0.75
55k Log	48-50220	0.94	0.83	0.75
10k Log	48-10320	0.94	0.83	0.75
25k Log	48-25320	0.94	0.83	0.75
50k Log	48-50320	0.94	0.83	0.75
100k Log	48-10420	0.94	0.83	0.75

GM80ER Style (K162BO)

Dual gang 41 detents primarily for volume controls.

Value	Stock No.	1-24	25-99	100+
10k Log	48-10322	0.68	0.62	0.56
100k Lin	48-10421	0.68	0.62	0.56

GM70ER Style (K162AO)

Dual gang with click, for tone and balance controls.

Value	Stock No.	1-24	25-99	100+
50k Lin	48-50323	0.65	0.59	0.53
100k Lin	48-10424	0.65	0.59	0.53
100k Balance	48-10425	0.65	0.59	0.53

AB47

Miniature preset 100k diode low, 22 turn.

Knob	Stock No.	1-24	25-99	100+
20mm	48-10405	0.50	0.40	0.30
20mm thumb	48-10407	0.50	0.40	0.30

3W Rated Ten Turn Pot — 534

A high quality ten turn 3W potentiometer, rated at 3W/40°C. Tolerance 5% 0.25" diameter shaft.

Value	Stock No.	1-24	25+
10k	48-10310	4.45	4.05

Low Cost Carbon Track Multiturn — MB20

A low cost alternative multiturn pot. Based on a 300° pot with a 5:1 epicyclic reduction drive built into the shaft. Tolerance 20%. Rated at 0.33W at 50°C.

Value	Stock No.	1-24	25+
20k	48-22326	1.06	0.96

Additional Data:
Mounting hole required for VM, GM series 7mm, for MB, 534 series 10mm. All ports are supplied C/W one washer and fixing spindle size VM, GM 23mm log × 6mm dia.

CAPACITORS

ULTRA MINIATURE ELECTROLYTICS

Value	Voltage	Stock No.	Price Pk of 4
1uF	50V	05-10514	0.32
2u2	50V	05-22514	0.32
4u7	35V	05-47514	0.32
10u	16V	05-10613	0.32
10u	35V	05-10614	0.32
22u	6.3V	05-22612	0.32
22u	16V	05-22613	0.36
22u	35V	05-22614	0.40
47u	10V	05-47612	0.40
47u	16V	05-47613	0.40
100u	6.3V	05-10712	0.40
100u	16V	05-10713	0.48
220u	6.3V	05-22712	0.48

ULTRA LOW LEAKAGE ELECTROLYTICS

Value	Voltage	Stock No.	Pk of 5
0.1uF	50V	05-10210	0.40
0.22uF	50V	05-10404	0.40
0.47uF	50V	05-47404	0.40
1uF	50V	05-10504	0.40
2u2	50V	05-22504	0.40
4u7	50V	05-47504	0.48
10uF	25V	05-10604	0.40
22uF	25V	05-22604	0.48
33uF	16V	05-33604	0.48
47uF	10V	05-47603	0.48
47uF	16V	05-47604	0.56
100uF	10V	05-10703	0.64

SUB MINIATURE CERAMIC PLATE

Working voltage 63V

Value	Stock No.	Pk of 10
2.2pF	04-22901	0.40
2.7pF	04-27901	0.40
3.3pF	04-33901	0.40
3.9pF	04-39901	0.40
4.7pF	04-47901	0.40
5.6pF	04-56901	0.40
6.8pF	04-68901	0.40
8.2pF	04-82901	0.40
10pF	04-10001	0.40
12pF	04-12001	0.40
15pF	04-15001	0.40
18pF	04-18001	0.40
22pF	04-22001	0.40
27pF	04-27001	0.40
33pF	04-33001	0.40
39pF	04-39001	0.40
47pF	04-47001	0.40
56pF	04-56001	0.40
68pF	04-68001	0.40
82pF	04-82001	0.50
100pF	04-10101	0.50
120pF	04-12101	0.50
150pF	04-15101	0.50
180pF	04-18101	0.50
220pF	04-22101	0.50
270pF	04-27101	0.50
330pF	04-33101	0.50

MEDIUM K CERAMIC PLATE

Working voltage 63V

Value	Stock No.	Price Pk of 10
390pF	04-39102	0.50
470pF	04-47102	0.50
560pF	04-56102	0.50
680pF	04-68102	0.50
820pF	04-82102	0.50
1000pF	04-10202	0.50
1200pF	04-12202	0.50
1500pF	04-15202	0.50
1800pF	04-18202	0.50
2200pF	04-22002	0.50
2700pF	04-27202	0.50
3300pF	04-33202	0.50
4700pF	04-47202	0.50

MONOLITHIC CAPACITORS

Value	Stock No.	Price Pk of 3
1n	04-10204	0.39
4n7	04-47204	0.42
10n	04-10304	0.42
47n	04-47304	0.45
100n	04-10404	0.45

LOW VOLTAGE DISC CERAMIC

Value	Stock No.	Pk of 5
1n	04-10203	0.20
10n	04-10303	0.20
22n	04-22303	0.25
47n	04-47303	0.25
100n	04-10403	0.40

LOW VOLTAGE DISC CERAMIC

Value	Stock No.	Price
1nF	04-10212	0.10
10nF	04-10312	0.22

CERAMIC FEEDTHROUGH CAPACITORS

Value	Stock No.	Pk of 5
1000pF	04-10210	0.35

LEADLESS CERAMIC CAPACITORS

Working voltage 50V

Value	Stock No.	Pk of 5
18pF	04-18011	0.40
22pF	04-22011	0.40
180pF	04-18111	0.40
470pF	04-47011	0.45
1nF	04-10211	0.45

MYLAR

Working voltage 100V

Value	Stock No.	Price Pk of 5
1n	04-10206	0.25
2n2	04-22206	0.25
3n3	04-33206	0.25
4n7	04-47206	0.25
6n8	04-68206	0.25
10n	04-10306	0.25
22n	04-22306	0.30
33n	04-33306	0.30
47n	04-47306	0.30
68n	04-68306	0.30
100n	04-10406	0.40
220n	04-22406	0.55
330n	04-33406	0.60
470n	04-47406	0.70

SILVER MICA CAPACITORS

Working voltage 350V

Value	Stock No.	Price Price
2.2pF	04-22908	0.22
4.7pF	04-47908	0.22
10pF	04-10008	0.22
22pF	04-22008	0.22
33pF	04-33008	0.22
47pF	04-47008	0.22
56pF	04-56008	0.22
68pF	04-68008	0.22
100pF	04-10108	0.22
120pF	04-12108	0.22
150pF	04-15108	0.22
220pF	04-22108	0.24
330pF	04-33108	0.36

SEMCO

Working voltage 350V

Value	Stock No.	Price
10pF	04-10014	1.05
22pF	04-22014	1.05
47pF	04-47014	1.05
100pF	04-10114	1.05
220pF	04-22114	1.05
470pF	04-47114	1.05
1000pF	04-10214	1.05

CERAMIC TRIMMER CAPACITORS

5mm Diameter Types

Value	Colour	Stock No.	Pk of 3
1.8-6pF	Red	06-60903	0.42
2.8-12.5pF	None	06-12003	0.42
3.5-20pF	Blue	06-20003	0.42
5-30pF	Yellow	06-30003	0.42
9-50pF	Green	06-50003	0.42

10mm Diameter Types

Value	Stock No.	Pk of 3
5-30pF	06-30005	0.45
8-50pF	06-50005	0.45
16-100pF	06-10005	0.45

ULTRA MINIATURE CERAMIC TRIMMERS

CTZ31 — 3.7mm

Value	Colour	Stock No.	Pk of 3
3-10pF	Brown	06-10007	0.45
4.5-20pF	Red	06-20007	0.45
6.3-30pF	Orange	06-30007	0.45

CTZ51

Value	Colour	Stock No.	Price Pk of 3
2.5-6pF	Blue	06-06008	0.45
3-10pF	Brown	06-10008	0.45
4.5-20pF	Red	06-20008	0.45
5.5-30pF	Orange	06-30008	0.45
7.5-50pF	Green	06-50008	0.45
9-70pF	Purple	06-70008	0.45

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1.5-10pF	7.5	06-10001	0.57
2-22pF	7.5	06-22001	0.57
3-36pF	7.5	06-36001	0.66
5-60pF	10	06-60001	0.66
3-90pF	10	06-80001	0.99

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Plain	21-30000	0.30	21-30091	0.34	21-30781	0.42	21-30280	0.49	21-30381	0.51
With line	21-30001	0.35	21-30092	0.40	21-30184	0.47	21-30281	0.56	21-30382	0.65
Wing + line	21-30003	0.35	21-30094	0.41	21-30187	0.49	21-30283	0.59	21-30384	0.69
COLLET SHORT										
Plain					21-30190	0.43	21-30300	0.50	21-30390	0.60
With line					21-30194	0.48				
STANDARD PUSH FIT										
Plain			21-30100	0.15	21-30200	0.20	21-30310	0.30		
With line			21-30102	0.20						
Nut covers	21-30060	0.06	21-30160	0.06						
plus pointer	21-30102	0.20								
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Plain	21-300XX	0.05	21-301XX	0.05	21-302XX	0.05	21-303XX	0.06	21-304XX	0.08
With line	21-300XX	0.08	21-301XX	0.08	21-302XX	0.09	21-303XX	0.11	21-304XX	0.12
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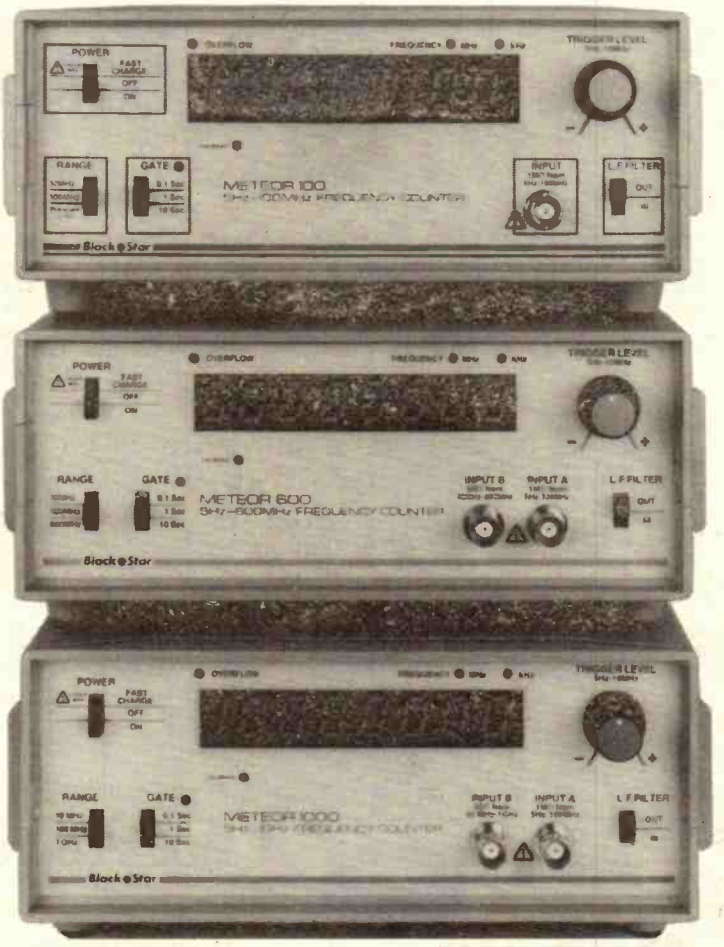

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ALL MODE TRANSCEIVER Project

PROJECT

OMEGA

Part 5

Project Omega grows month by month – this time its the SSB Generator, designed by Frank Ogden, G4JST, and Tony Bailey, G3WPO.

There is nothing particularly out of the ordinary about the Omega SSB generator. It provides the following facilities: 1. SSB generation at 10.7MHz in the transmit mode for injection into the CIFPU double balanced mixer; 2. processed mic audio for both the SSB generator and the AM/FM signal boards (to be described in a future article); 3. VOX control and anti-VOX sensing; and 4. carrier insertion for SSB receive.

Speech Processor

The majority of microphone signal conditioning is carried out by a single chip, IC1. This comprises a low noise VOGAD (voltage operated gain adjusting device) a limiter and a couple of buffer amplifiers. The functional blocks of IC1, a KB4417, are shown in **Fig. 1**.

The VOGAD nature of the microphone pre-amplifier block produces a virtually constant AF output for widely varying signal input levels. In practical terms the pre-amp produces the same level of output regardless of the type of mic in use and the way the operator uses it. The speed at which the amplifier can respond to changes in input level depends on the values of C40 and R39. Note that this part of the circuit provides linear control of the signal. Speech clipping, the mechanism central to speech processing, is handled by subsequent parts of the circuit.

In baseband (i.e. not RF carrier) types of speech processor, the most important contribution to their effectiveness is made by ensuring tight control of the input frequency content to the limiter to within the band 300 to 3000Hz. The reason for this is simple. Chopping off lumps of the speech envelope introduces intermodulation distortion, the classic overprocessed sound of Italian and Russian stations. The incidence of in-band and so audible distortion products is a function of the spectral content of the input signal. Thus high-level speech components at 4 and 5kHz mix together in a simple limiter to generate distortion products at 1kHz which are just as horrible as those of components at 2 and 3kHz.

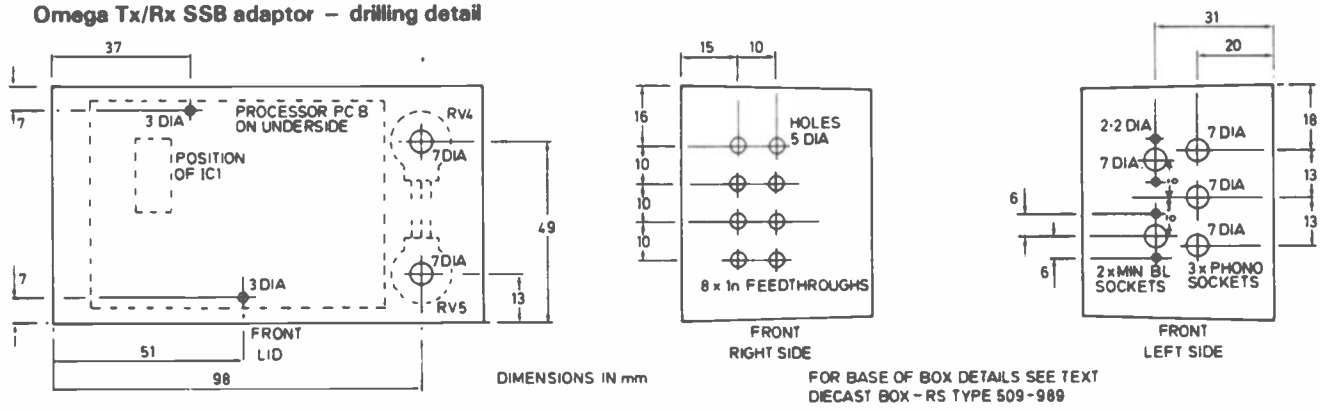
IC2 and IC3 provide the all-important band-pass function. These two chips are fed with constant amplitude mic signals which are then frequency conditioned and passed to the limiter block within IC1. The precise amount of speech processing on the output signal is controlled by RV3. Out-of-band distortion products produced by IC1 limiter circuitry are removed from the output signal by the active filter configured between pins 9 and 7 of the same chip. Pin 7 also provides processed and filtered AF takeoff for the AM and FM modulator circuitry via the Tx audio buffer (point J).

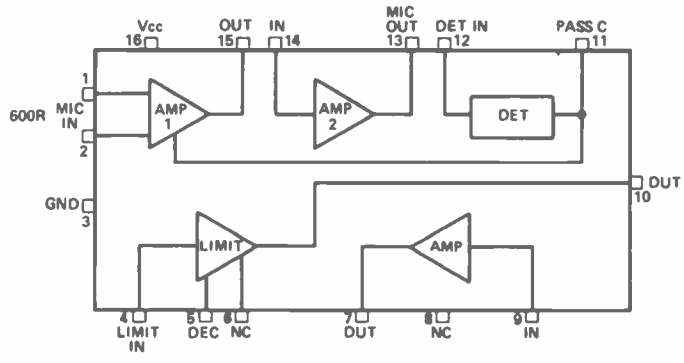
As an aside, the Omega speech processor and VOX section can operate 'stand alone' for use with other transceiver systems.

SSB Generator

Q1 and Q2 provide carrier generation (for Tx) and carrier insertion (for Rx) on both upper and lower

Omega Tx/Rx SSB adaptor – drilling detail





SPEC:
LIMITER THD 3% MAX
LIMITING 80% MIN
AMPLIFIER S/N RATIO: 55dB
MIC AMP DISTORTION: 1% TYP

OUTPUT AMP DISTORTION: 0.8% TYP
CURRENT CONSUMPTION 15mA TYP QUIESCENT
Vcc +16V MAX
P_{tot} 500mW MAX

KB4417 block diagram

sideband. Q3 acts as a buffer on receive and an isolation switch on transmit. Q5 provides carrier drive for the balanced modulator, T1, D1 and D2. The modulating signal is applied to the centre tap of T1 and the resulting double sideband modulation delivered to the SSB filter through the impedance matcher, Q6. SSB output from the filter is amplified and buffered by Q7. TR9 acts as a solid state relay in the supply rail to the generator circuitry.

Note that RF buffering to the CIF-PU circuitry is performed by transistor amplifier stages with collector load RF chokes. These offer high impedance current injection points (RF signal current that is) while imposing virtually no external circuit loading.

VOX Control

For optimum operating conditions on SSB, any modern rig requires the VOX (Voice operated Transmit/Receive) facility. In the past, many such circuits have had the distinct disadvantage from an operator's point of view that VOX control was always accompanied by much clanking away of the changeover relays. Consequently, many people won't use the facility!

VOX is a very helpful feature and gives the equivalent of CW break-in operation for phone – you can listen between words, or short sentences, and know when you are being blotted out by another station; and of course, it enables a more natural conversation to take place.

Not wanting to re-invent the wheel, we used VOX ciruitry that has been around a while, with a few changes to suit OMEGA. It uses only two ICs and a handful of other components, and gives all the usual features of VOX gain, delay, and anti-VOX – plus silent Tx-Rx operation by means of the CW break-in control circuit.

The input to the unit is paralleled with the microphone input to the audio processor chip, and amplified by op-amps IC4a and IC4b – RV4 controls the gain so that the sensitivity can be adjusted to the correct level for the microphone in use. Output is then rectified by the two germanium diodes to provide a DC voltage.

Anti-VOX

A similar amplifier using only one op-amp section (IC4c) also amplifies any signal coming from the Rx loudspeaker for the anti-VOX function. Why is Anti-VOX needed? Its purpose is to prevent loudspeaker signals from activating the mic amplifier circuit, otherwise you would have a nice oscillator which will switch from receive to transmit and back again on received signals. In use, the anti-VOX gain is adjusted so that the output from its rectifier circuit (which gives a DC voltage of opposite polarity to the mic circuit) is just slightly greater than the rectified voltage caused by amplification of signals from the speaker via the mic circuit.

These voltages are then summed by R64/65 and applied to the inverting input of IC4d. A small bias voltage (about 0.2V) is applied to the non-inverting input of IC4d, so that the output of the op-amp will remain high while there is no voltage present form the amplifier circuits. Once this latter voltage exceeds 0.2V, the op-amp output goes low. This will occur only when there is output from the mic amp, or the output from the mic amp exceeds that from the speaker amplifier. The VOX circuit will therefore only switch when you are actually talking into the microphone (or you shout at the dog or kids).

Interfacing

Now that we have a control voltage, this is applied to an NE555 timer, configured to provide an adjustable delay via a front panel control (RV6). Q10 resets the delay by discharging C68 while there is no speech present, giving a constant switching period after each pause in speech. The output of the timer on pin 3 goes high while active – this is then inverted by Q11, and used to activate the Tx/Rx control input on the logic switching unit, point E normally connected to the key for CW (the logic switching unit was described in the November issue).

Construction

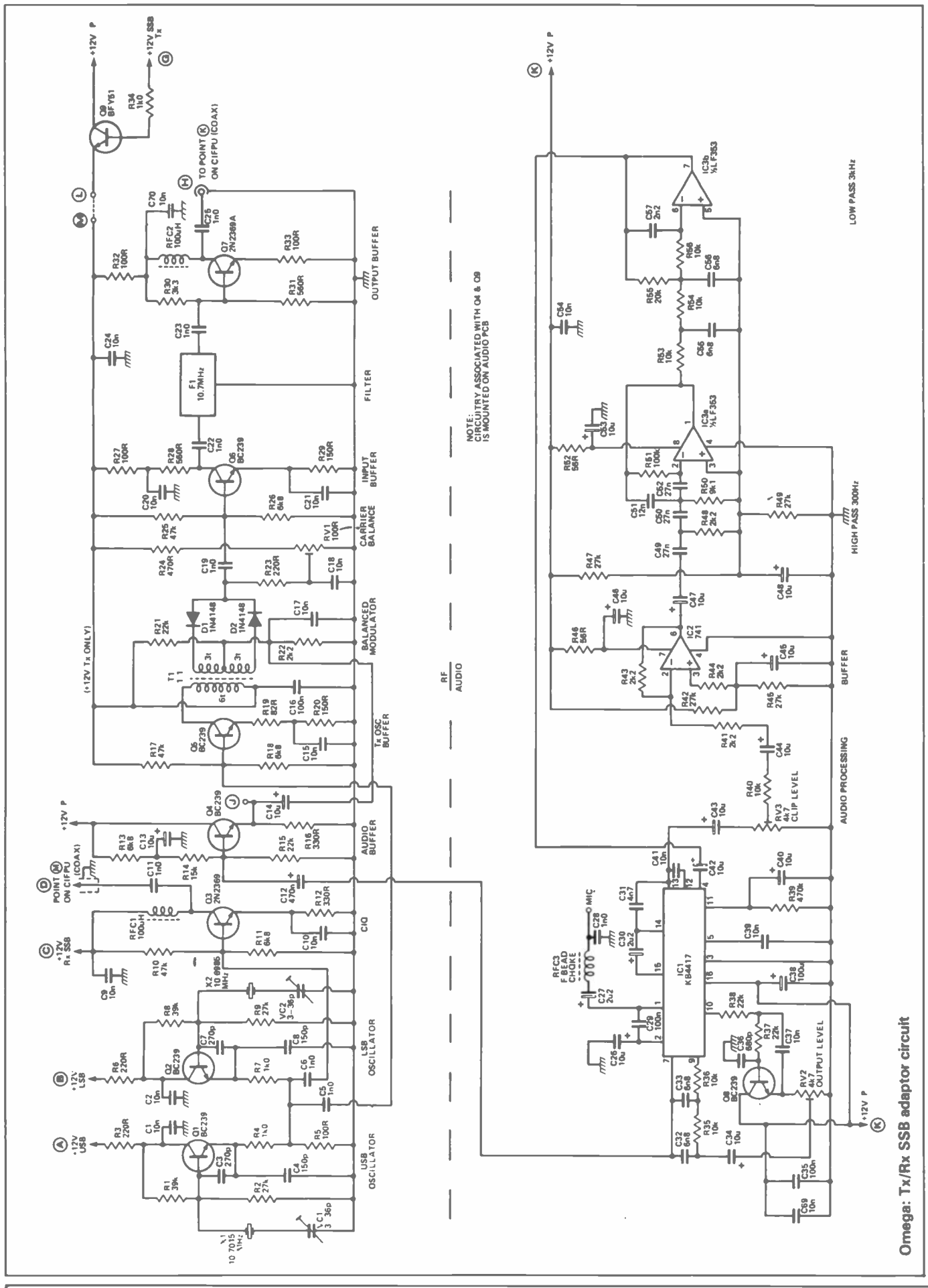
The rest of this article describes the construction and testing of the above unit, plus details of the mode switch wiring which will now be required for CW/SSB switching.

The Tx/Rx SSB adaptor is built on two printed circuit boards and housed in a diecast box which also carried the VOX and Anti-Vox gain controls. These controls are normally required to be adjusted only once, and are not front panel mounted, but are accessible from under the lid of the case.

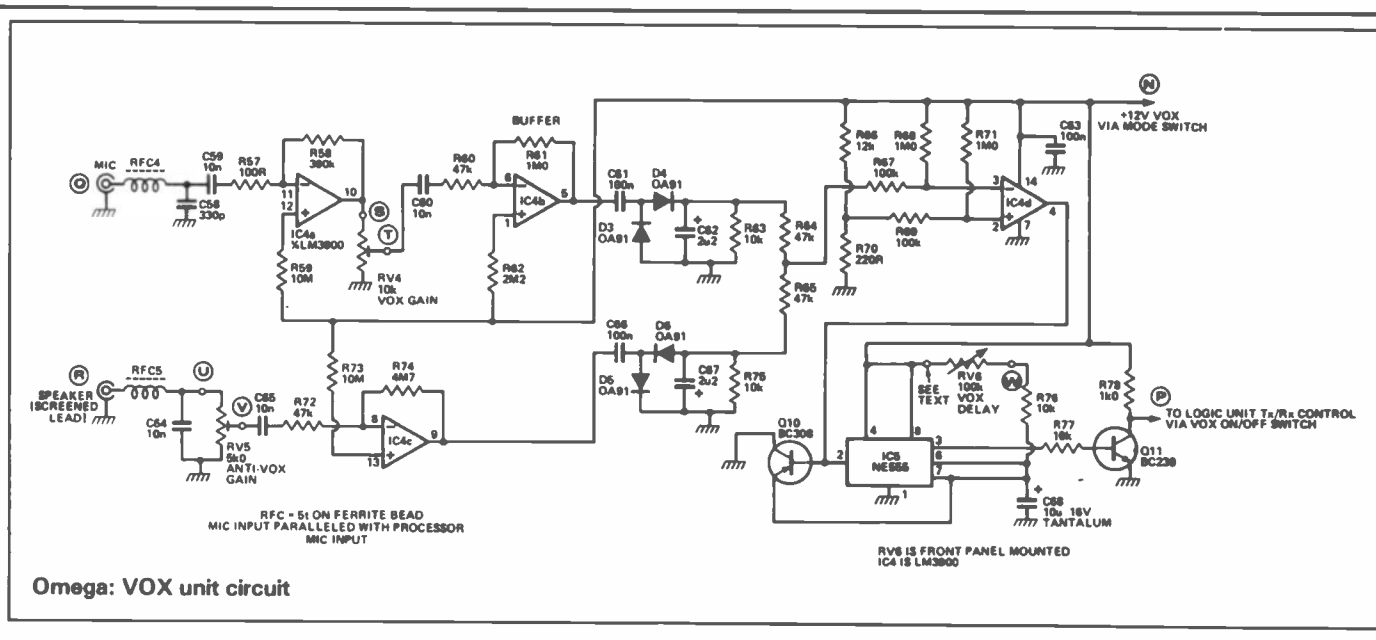
AF PCB

We suggest you start by building the audio processor board, which also has the Tx audio buffer (Q4) and DC switch (Q9) mounted on it. The PCB is single sided. Note that with both PCBs, the component density is rather higher than previous boards – by now you should be well practised in assembling these!

1. As usual, check the PCB for unwanted bridges etc. Then inset and solder the 9 connection pins.
2. Insert and solder all fixed resistors, plus RFC3 (this needs 10cm of wire for winding). Take care that the metal oxide precision resistors are used where needed in the filter, and not elsewhere.
3. Insert and solder all capacitors.



Omega: Tx/Rx SSB adaptor circuit



Omega: VOX unit circuit

Note that some of the mylar capacitors use two values in parallel to get the required capacity. This applies to the 27n (22n + 4n7) and 12n (10n + 2n2) capacitors – the two are marked as 'a' and 'b' on the layout diagram. Watch polarity of electrolytics. For Tantalum capacitors (usually in blue or red encapsulations), if the polarity is not marked, then either the longer lead is +ve, or the right hand lead with the identification facing you is +ve. Reversing these capacitors can have all sorts of strange effects (other than possible explosion!).

4. Finally, insert and solder all semiconductors, noting orientation of ICs and cases to agree with the layout.

Finally check out everything again to avoid later problems.

Testing

The unit can be partially tested at this stage if you have an AF Oscillator and scope, otherwise it's best to wait until the whole unit is finished. Testing at this stage is accomplished by:

1. Connect the two points K together, and power up with +12V. Current consumption should be around 45mA. Apply +12V to point G – point L should go to +11.5V.
2. Connect an AF generator at 1kHz to the mic input and a scope to point J (AC coupling on the scope). Set RV2 and 3 to mid travel. Inject a few millivolts of AF signal, and check that the scope output amplitude limits very quickly as the input voltage is increased. Leave the input voltage at about 25mV. Adjust RV3 so that the circuit just starts to limit – as shown by the peaks of the sine wave just starting to flatten. This sets the processor to minimum distortion conditions. You can also check that the output falls off rapidly above 2.5kHz, and below 300Hz.

If you have none of the above equipment, just leave the two presets set to mid travel for the moment, after checking Step 1.

RF/VOX PCB

This is a double sided PCB, with the top foil acting as the earth plane. As usual with all our RF circuits, keep the leads as short as possible.

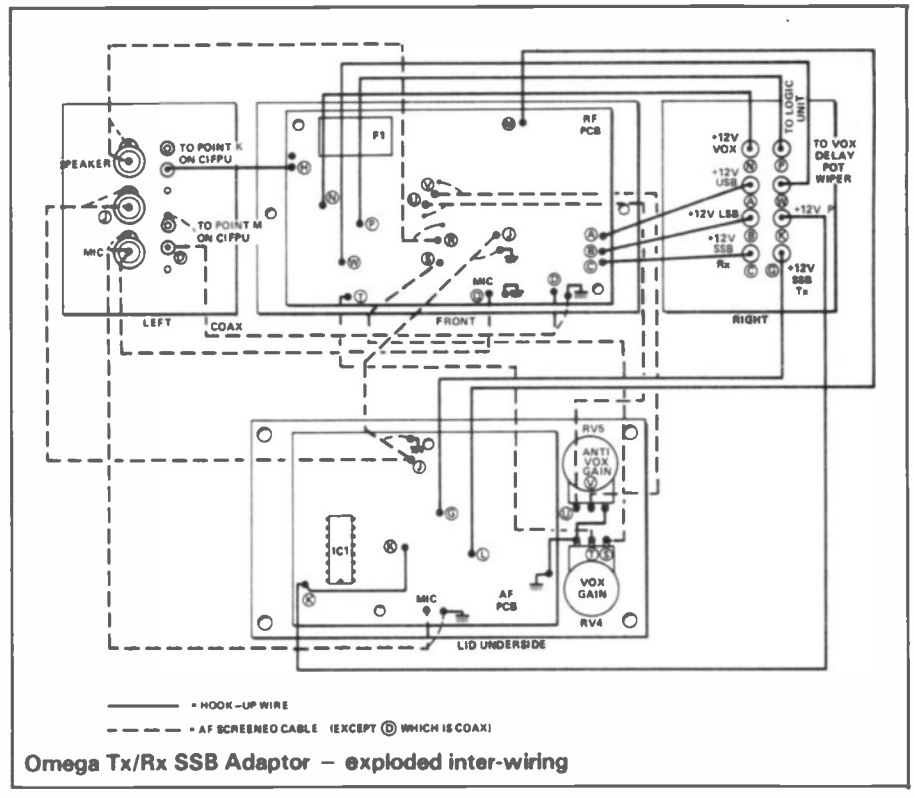
1. Insert and solder the 22PCB connection pins, noting that two of them are acting as earth connections to the underside (adjacent filter, and VC1/2).
2. Insert and solder IC4 & 5, watching orientation.
3. Starting at the top left hand corner of the PCB, work round the board with the components. This should make it easier to insert components where space is tight, providing you look ahead all the time, noting where earth connections have to be made. Watch the following points: C67 has its *positive* lead connected to earth; the four diodes are slightly fragile, so take care when bending their leads; RFC1 and 2 are green and coded 101 + a letter; T1 needs 12cm of wire for the 6 turn primary, and twice 8cm for the secondary (see July HRT if you are not sure of how to wind these cores) – try to wind this transformer as symmetrically as possible to aid carrier balance; RFC4/5 need 10cm wire each.

Testing

You are advised to check this board out, and its use with the AF board as far as possible before mounting it all into its box, as this could save a lot of problems later. For full testing, a scope suitable for 10.7MHz is needed – otherwise the RF side will have to be checked 'on-air' later. Proceed as follows:

1. Connect +12V to point C. Current consumption should be around 5mA. Add +12V to point A,a and the current should rise to about 9mA, showing the USB oscillator is working. Likewise, power to point C should also give 9mA. If you have a counter available, connect it to point D and set the USB oscillator to 10.7015MHz, and LSB to 10.6985MHz. If you have no counter, you should set these on frequency at this stage with the unit connected to the CIFPU. Disconnect the link between points N & P on the latter, and connect D on this unit to M on the CIFPU via coax. Then adjust the trimmers for correct reception of the appropriate sidebands. The trimmers will be about ⅔ meshed although this will vary.

2. Remove all power and interconnect the AF and RF boards. Connections are needed between points K and 12V, either A or B and +12V, L and M, and point J on each board (the latter using screened AF cable).
3. Here is the point where a 10MHz+ scope is really needed – if one is not available go to step 4. Apply +12V and monitor the output of Q7 at point H. Adjust RV1 (carrier balance) for minimum output with the scope at maximum sensitivity – balance should occur fairly near mid-travel. To check RF output correctly needs a two-tone oscillator connected to the mic input when you should find 300 to 400 mV of RF available at point H (dependant on setting of RV2). Plus, of course, a nice two tone pattern (with a very small amount of limiting from IC1). Failing two-tone testing, a single tone should give some idea of output, or you can connect the mic (low impedance) and whistle/talk it up. RV2 is used to set the output level form the unit, best adjusted when connected to the PA. Now go to Step 5.
4. If you have a diode probe, connect this to point H, and apply +12V. Adjust the carrier balance control, RV1, for minimum reading. With a microphone connected, whistling into it should give an increased reading of several hundred millivolts at point H (dependant on the setting of RV2 and your probe). This will establish that RF output is present, and the rest of the setting up procedure will have to be done with the PA connected.
5. VOX – connect up the three variable pots as shown in the diagram using screened cable. Note that the +12V end of RV6 is connected directly to point N. Connect a voltmeter (+20V) to point P, and +12V (not switched on) to both points K and N (this leaves only the processor and VOX circuits working). Parallel up the VOX-mic input with the processor mic input using screened cable. Parallel the anti-VOX input to the CIFPU speaker connections (you will need the CIFPU working in any receive mode – CW will do) and then apply +12V to the circuit. Current should be about 55mA, with point P at about 12V. With no output from the speaker, talk into the microphone and adjust RV4 (VOX gain) until point P reliably switches low as soon as you speak. The current should rise by about 10mA.



Omega Tx/Rx SSB Adaptor – exploded inter-wiring

Now set the speaker audio to normal level on any received signal. Adjust RV5 until the VOX is no longer tripped by audio from the speaker. If you put this setting too high, you will find that you cannot actuate the VOX while there is audio present at the speaker – this is a question of judgement as it can prevent inadvertant transmission over another station, but can also prevent deliberate transmission! The VOX turn off delay is set by RV6 – this is adjusted later when actually transmitting.

If any of the above tests result in failure, logical checking of each circuit should trace the fault.

At this point, before casing up, you can check the operation of the unit by connecting up to the rest of the modules described so far, following the mode switch wiring diagram shown later, using just those connections needed to get into SSB mode. If the unit is connected to the CIFPU/preselector/logic switch only (without the PA) the output can be checked at low level on another receiver, and this would be a good opportunity to set up the carrier balance if this has not been done. Alternatively, this could be tested with the PA if you want to at this stage. If you are sure the unit is working OK, then it can be cased up immediately.

Housing

Both PCBs and the various pots (except VOX delay) are built into a diecast box for RF screening. Again, any similar enclosure can be used – it eventually mounts on top of the VCO box.

All DC connections are brought in via screw-in feedthrough capacitors (see parts list for source of these) on one side of the box, with the RF and AF input/outputs on the other. For this module, the RF connections are made via miniature Belling Lee sockets, due to space considerations, and the AF by single-hole fixing phono sockets. The two variable pots mount on the underside of the lid, together with the AF processor board, while the RF PCB sits in the bottom of the box.

Comprehensive drilling and wiring diagrams are provided for this unit to ensure you get it all to fit in. They are fairly self-explanatory but a few points need to be made.

The mounting holes for the RF board are made by dropping the PCB into the box, and then marking through before drilling; also, drill two holes midway between each side of the PCB and the walls of the box for

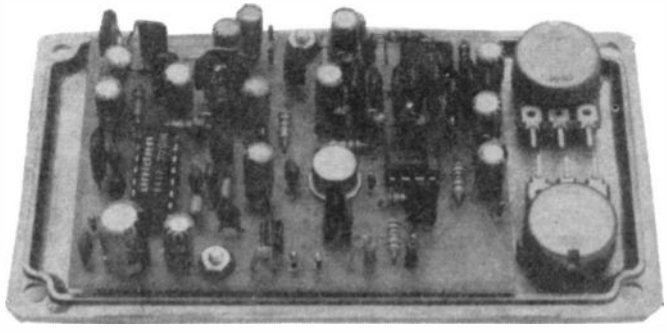
later mounting. The PCB sits on two 6BA half-nuts as spacers – use countersunk screws for mounting so that the heads are flush with the underside of the box.

The AF processor PCB is mounted unde the lid – it will be necessary to use nuts as spacers so that the PCB just clears the raised edges on the lid underside. With both PCBs in place, screw in the various connectors and feed-throughs, and then wire up following the diagram. Leave the leads long enough to make it possible to lift up the lid later for access without breaking anything. Both the output level and set-limit presets are accessible by lifting the lid. The VOX delay pot +12V end is connected to the +12V VOX feed-through or to the 'Mode' Switch.

If it hasn't been done already, the operation of the unit should now be checked out in conjunction with the other modules. It should be possible to drive the PA to about 3 watts PEP on all bands. To set up the drive levels again requires a two-tone oscillator and scope for best results. The PA drive control should be adjusted for maximum, then adjust RV2 on the AF processor board for maximum undistorted output. As there is bound to be some variation in gain from the PA across the whole 9 bands, carry out this adjustment on the band which requires most drive. Then, for the other bands, the drive control should be adjusted by whistling up the unit while monitoring the PA output via its metering circuit and adjusting the drive level for a reduction of about 5% of the reading on peaks. The audio processor will then take care of variations in speech level.

Without test oscillators, adjust the PA following a similar procedure, but setting the processor output level to the point where the monitor meter just reaches a maximum before limiting out.

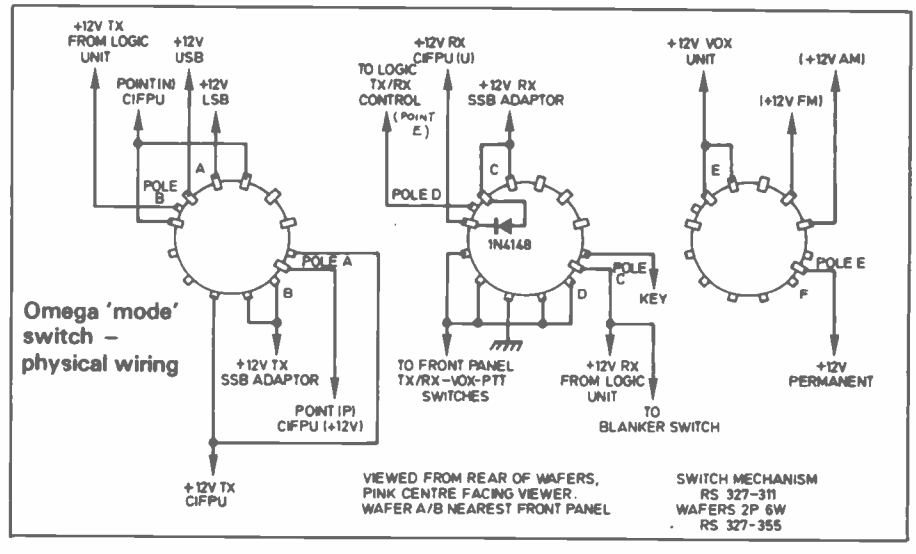
AF PCB

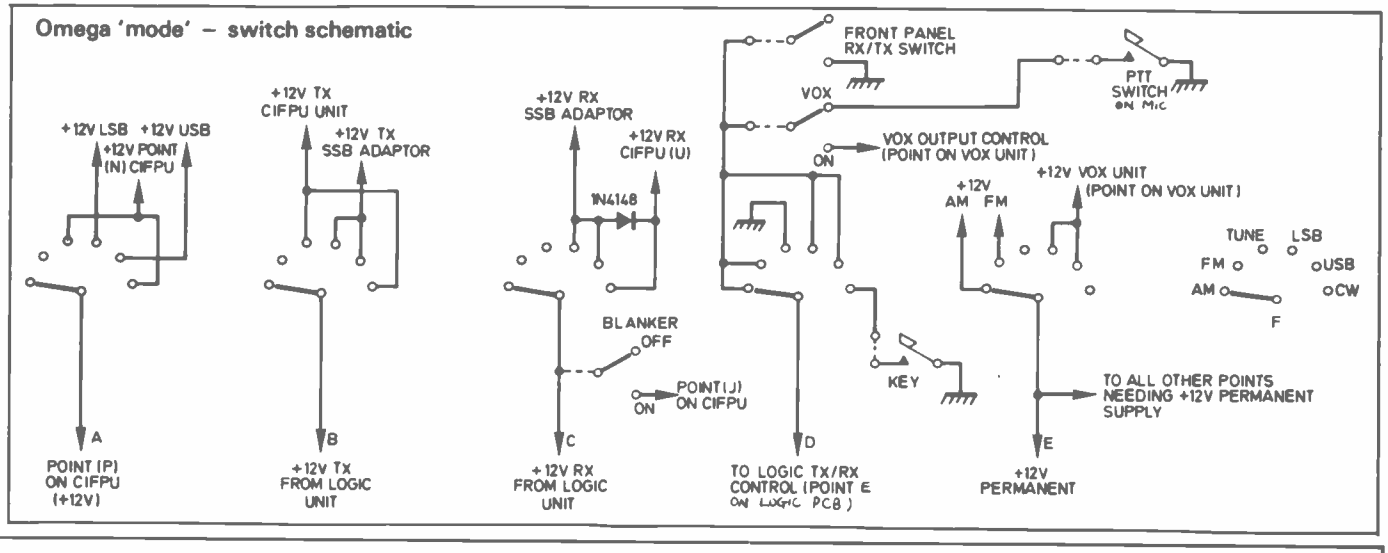


Mode Switch

The point has now come where we need to describe the switching necessary to change between various modes. This is achieved using 5 poles of 6 way switching with a RS miniature switch mechanism and wafers. Other switches can be used, but the front-to-back depth is critical when mounting in the intended cabinet. One spare wafer is left, which may be required at a later stage. All switching is of DC voltages only.

The switch allows selection of CW/USB/LSB/TUNE/FM and AM modes, which are the intended operation of OMEGA. If you have need for something else, such as RTTY, this can be selected by re-allocating one of these positions for the mode. For instance, if AM is not to be used, then an RTTY function can be achieved by wiring the AM position for either USB

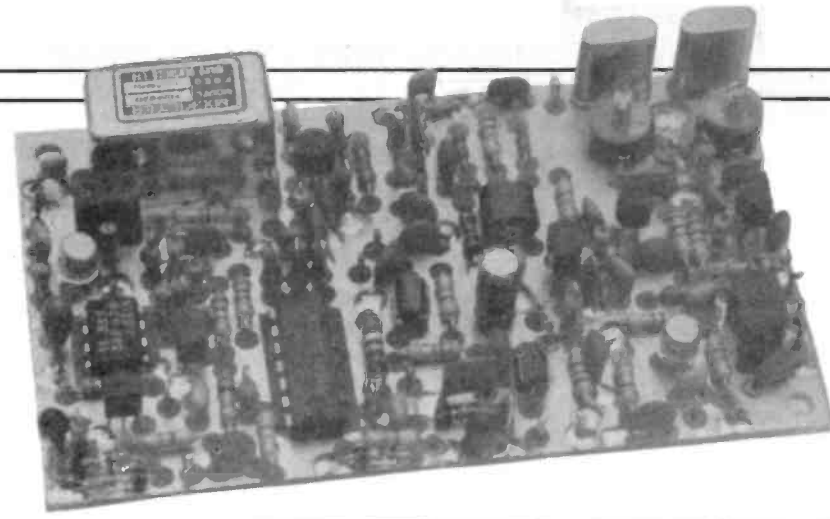


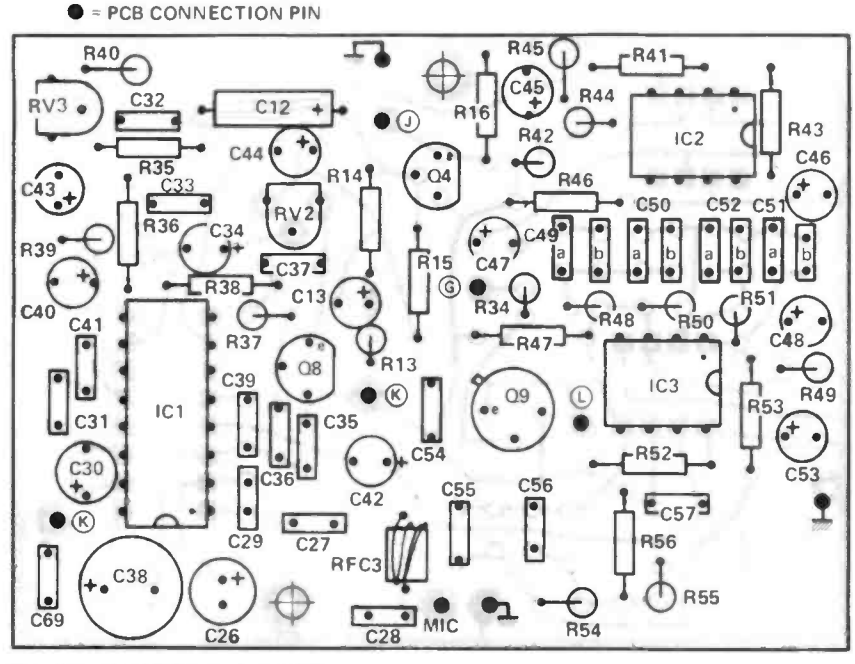


or LSB reception, and then using the other wafers to switch in an appropriate Tx AF oscillator – it would also be necessary to arrange for the logic control input line to be held low all the time the AF oscillator was running.

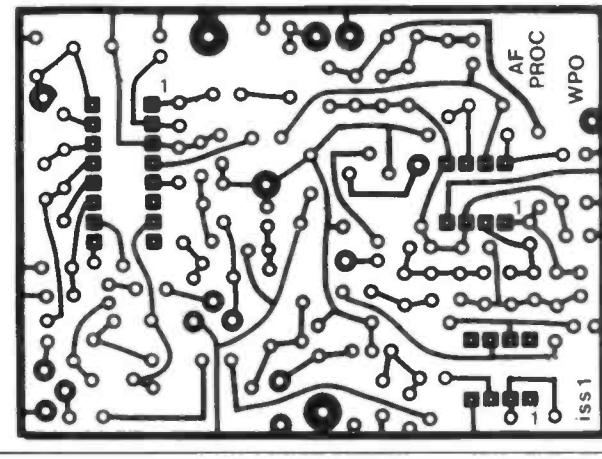
The switch routes the necessary control voltages to the correct points for each mode both in transmit and receive. Note that the front panel switches for VOX/PTT and manual Tx/Rx are arranged so that the PTT cannot be used while VOX is in use, nor can any of the manual Tx selectors be used for CW – this being controlled by the key alone. While the former wiring can be re-arranged if needed, the latter cannot due to the way the CIFPU operates on CW (there will be a spacer wave while the key is up).

When assembling the switch unit, be careful that the wafers are orientated with the pink centre part facing you, looking at the back of the mechanism with all the wafers the same way round, otherwise the switch will not work properly (check that it selects properly before doing any wiring). With all wafers in place (no spacers are needed between the wafers) the excess studding and shaft should be measured and removed. It would be prudent to leave space for another wafer – future developments may need additional poles available and this will avoid replacing the switch mechanism.





Overlay for AF Processor PCB

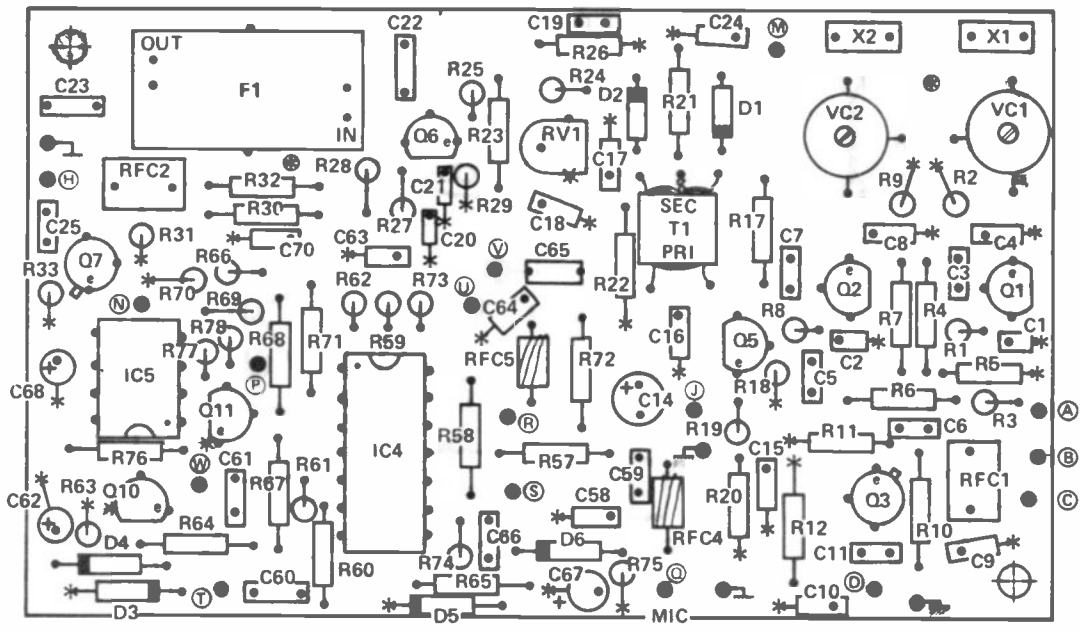


COMPONENTS LISTING

R1,8	39k
R2,9,42,45,47,49	27k
R3,6,23,70	220R
R4,7,34,78	1k0
R5,27,32,33,57	100R
R10,17,25,60,64,65,72	47k
R11,13,18,26	6k8
R12,16	330R
R14	15k
R15,21,37,38	22k
R19	82R
R20,29	150R
R22,41,43,44	2k2
R24	470R
R28,31	560R
R30	3k3
R35,36,40,63,75,76,77	10k
R39	470k
R46,52	56R
R48	2k2 2% metal oxide
R50	9k1 2% metal oxide
R51	100k 2% metal oxide
R53,54,56	10k 2% metal oxide
R55	20k 2% metal oxide
R58	390k 2% metal oxide
R59,73	10M0
R61,68,71	1M0
R62	2M2
R66	12k
R67,69	100k
R74	4M7

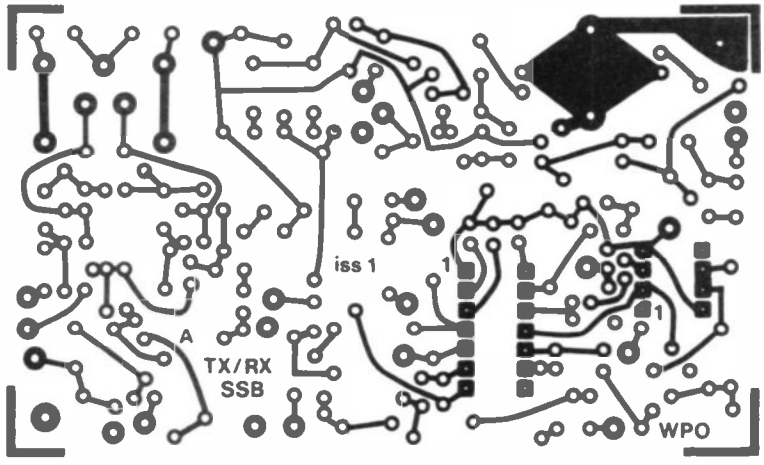
All resistors 5% carbon film 0.25w unless stated otherwise

RV1	100R 10mm vert. preset
RV2,3	4k7 10mm vert. preset
RV4	10k ALPS Lin VM10R pot
RV5	5k ALPS Lin VM10R pot
RV6	100k ALPS Lin VM10R pot
C1,2,9,10,15,17,18,20,21,24, 37,39,41,54,59,60,64,65,69	10n ceramic disc
C3,7	270p ceramic plaquette



● = CONNECTION PIN
⊛ = CONNECTION PIN SOLDERED BOTH SIDES
* = LEAD SOLDERED TO TOP OF FOIL

Overlay for Tx/Rx SSB Adaptor PCB



C4,8 150p ceramic plaquette
C5,6,11,19,22,23,25,28 1n0 ceramic disc
C12 470n or 1u axial electro 16v
C13,14,26,34,40,42,43,44,45, 46,47,48,53 10uF/16V radial electro
C16,29,35,61,63,66 100n monolithic ceramic
C27,30,62,67 2u2 tantalum bead 16v
C31 4n7 mylar
C32,33,56,55 6n8 mylar
C36 680p ceramic plaquette
C38 100uF/16V radial electro
C49,50,52 27n mylar (22n + 4n7)
C51 12n mylar (10n + 2n2)
C57 2n2 mylar
C58 330p ceramic plaquette
C68 10uF/16V tantalum

VC1,2 3-36pF 7.5mm film trimmer

Q1,2,4,5,6,8,11 BC239
Q3,7 2N2369A or BSX20
Q9 BFY51
Q10 BC308

IC1 TOKO KB4417
IC2 741 (8 pin DIL)
IC3 LF353
IC4 LM3900
IC5 NE555

RFC1,2 TOKO 100uH 7BA (marked 101)
RFC3,4,5 5 turns on F Bead

T1 6 turn primary, 6 turn CT secondary on Fair Rite balun core 28-43002402 wound using 0.2mm en Cu wire.

F1 Nikko Denshi 10.7MHz SSB filter type 10M22D

X1 HC/18U 10.7015MHz
X2 HC/18U 10.6985MHz

Miscellaneous

8 off 1n0 screw-in FT capacitors; 1 off diecast box RS 509-989; 3 off single hole phono sockets; 2 off min. Belling Lee sockets. 1mm PCB connection pins.

Mode Switch

1 off RS miniature switch mechanism 327-311; 3 off RS 2p 6w wafers 327-355.

Kits of Parts

A kit of parts for this unit is available from WPO Communications for £59.50 inc VAT and P&P. It includes both PCBs, all components, pots and phono/Belling connectors. Diecast boxes are £3.75 ea. inc, and the Mode switch is £6.90 inc. PCBs alone are £5.00 a pair.

Screw-in Feedthrough Capacitors are available from AJH Electronics (20 Barby Lane, Hillmorton, Rugby – 0788 76473) @ 40p each + 60p P&P.

A suitable case for the whole project is to be made available later. It will include a punched and screened front panel.

OTHER PROJECT OMEGA NOTES

OMEGA CIFPU Unit

It appears we were a bit remiss in not publishing full drilling details of the diecast box! These are now given here, with a few additions that will save work later. All of the connections given originally are used plus additions as follows.

a) An additional RF output connector is added in parallel with the VFO input – this provides VFO output for the FM and AM units. If preferred, this connector can be mounted on the VCO box near the existing output.
b) An additional phono socket is provided. Unfortunately we forgot to provide any access to the audio circuits for the FM and AM modes and this makes amends. A screened lead should be connected between this new socket, and the top end of the AF gain control potentiometer.
c) There are three feedthroughs marked +12V. In the original prototypes, each of the +12V connections on the CIFPU PCB had its own feedthrough, then all three were linked round the outside of the box. This was mainly to provide access to each of these points should this be required later, but this does not look necessary now. It also provides better isolation between the supply rails. We suggest you use these two extra connectors if you can, but it is not vitally important should you already have the box drilled.
d) There is a spare feedthrough for possible future use.

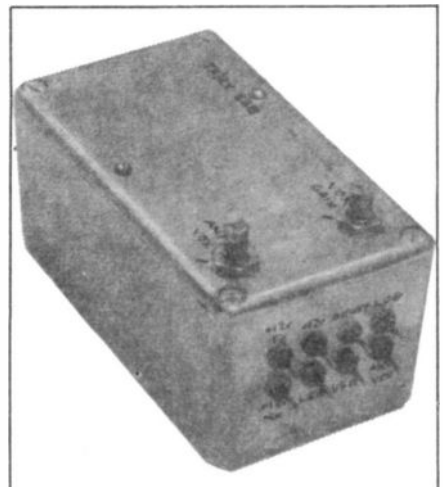
Tx/Rx Switching

Since the mods were made to increase the RF drive, it appears we have some leakage of carrier through Q10. In practice, when running CW break-in operation, this has no effect due to the rapid switch between the point at which the oscillator comes in, and point L going low, which take about one millisecond or so. There will be no output from the PA until the bias is applied after this delay, nor will there be any effect on actual sidetone operation. It does mean that some of the tests described do not function properly on the CIFPU and QRP PA units, and allowance should be made for this. We will try to devise a mod to overcome this that does not involve removing the CIFPU PCB from its box.

CW Tx Crystal Oscillator

The original text gives incorrect instructions for setting up this oscillator on the CIFPU unit. The CIO oscillator should be set to USB for CW use (10.7015MHz), and the Tx oscillator to 10.7008MHz – this gives an 800Hz beat note. It is important that the Tx oscillator is not on the other side of the filter as you won't then get any replies (easily got right by adjusting VC2 from minimum capacity until the beat note peaks in the Active filter in one of the CW positions). Tuning for an 800Hz beat note on receive will then ensure you are netted correctly.

It is possible to have a 'spot' (or 'net') control on OMEGA by inserting a switch in the QRP PA bias line, so that when the switch is active, the transceiver can be put into Tx mode without radiating a carrier. The sidetone can then be used to accurately net. Provision for this will be made on the case.

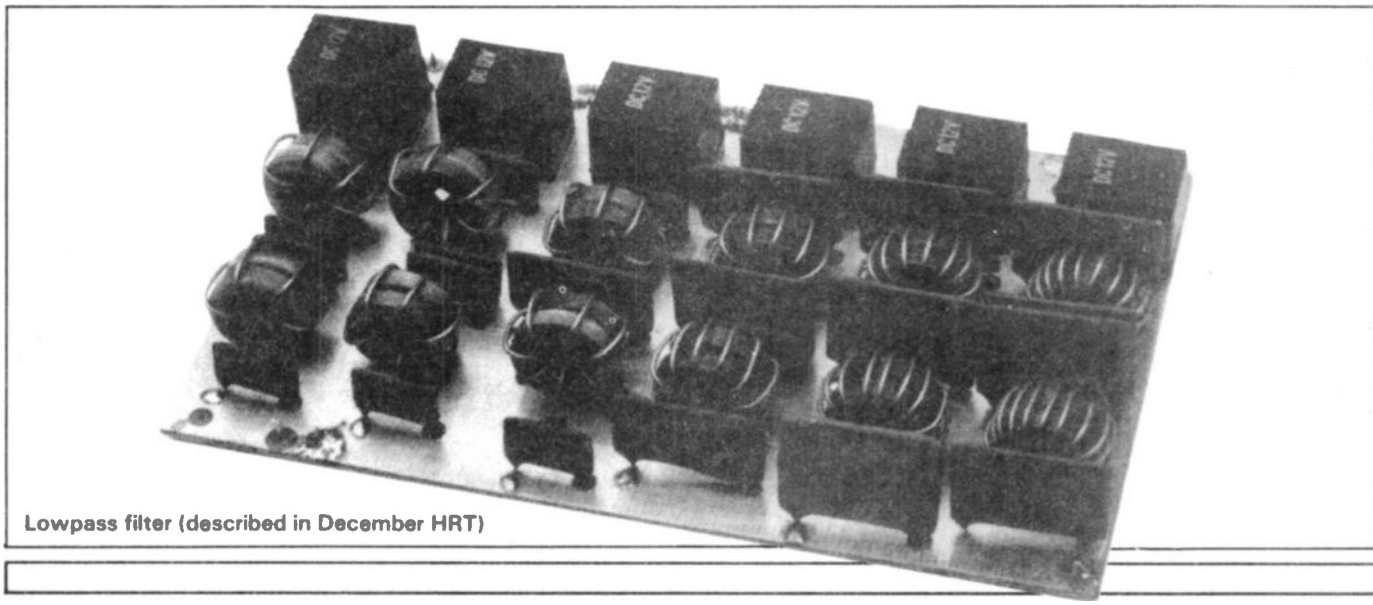


TX/RX SSB adaptor unit

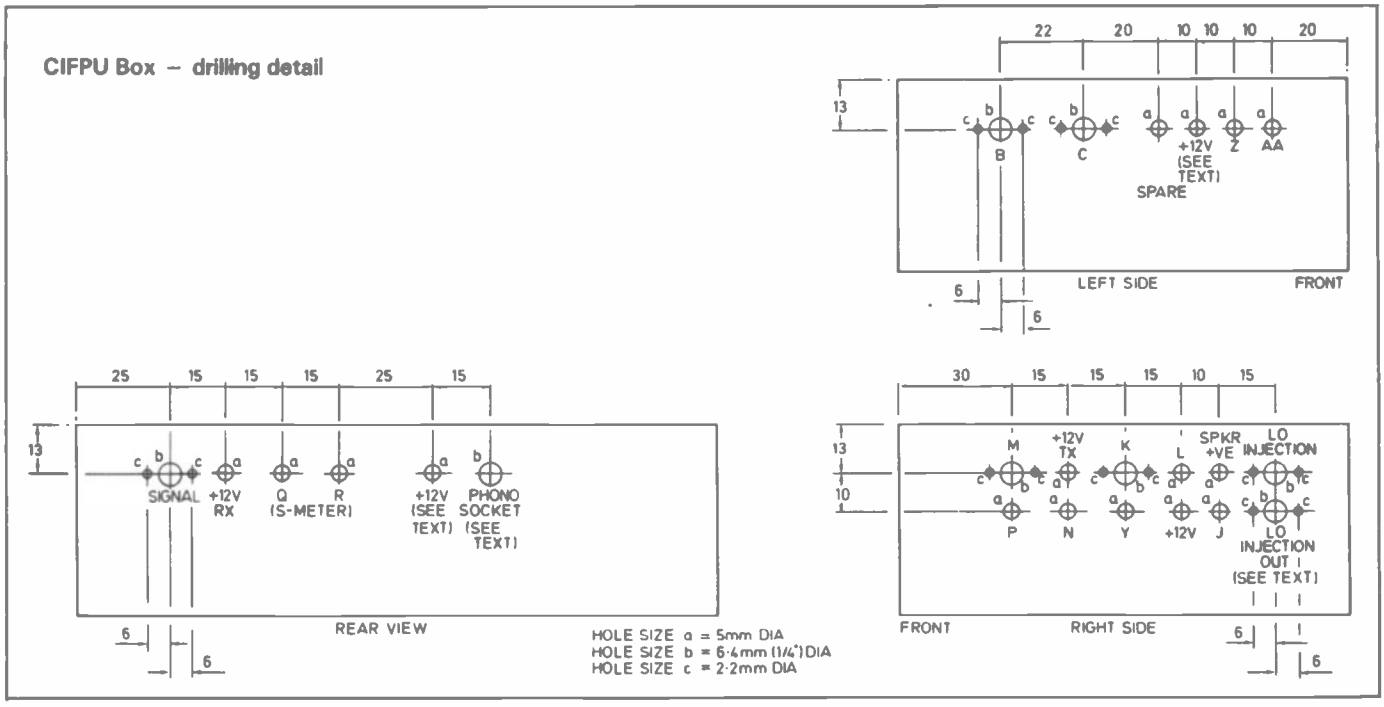
Sensitivity

At the time of writing, many OMEGA receivers are now running and many people have commented that 40 metres has at last turned into an amateur band (i.e. you can actually hear signals without the crud). However, there appears to be a lack of sensitivity on many at the upper end of the HF spectrum. This varies around 0.2 - 0.4uV minimum usable signal which is rather less than optimum. This is more than likely due to a combination of component tolerances inthe CIFPU, and losses in the various filters and switches.

To overcome this without impairing the dynamic range of the CIFPU unit on the lower bands, a simple high performance wideband preamplifier will be published shortly. This will be



Lowpass filter (described in December HRT)



switch selectable using a pair of J310s in push-pull, and diode switched Tx/Rx. It will also be usable with other transceivers which need extra gain.

Preselector

When using OMEGA on the 10MHz band, it is **vitally** important that the two 10.7MHz traps are correctly set up, otherwise you could be radiating a signal at 10.7MHz as well! To do this, set the VFO to exactly 10.7MHz (you will hear a beat note in the receiver). Then go to CW Tx and peak the preselector (on dummy load – there are probably a lot of domestic receivers near you that won't like 10.7MHz RF!) for maximum output. Now very carefully adjust both the transformer cores on the preselector for minimum output, until you cannot improve matters. With the Tx now in the normal band, you will have a rejection of over 75dB of any 10.7MHz signal (measured 35dB from the traps plus 40dB rejection by the balanced mixer in the CIFPU).

PLL VFO

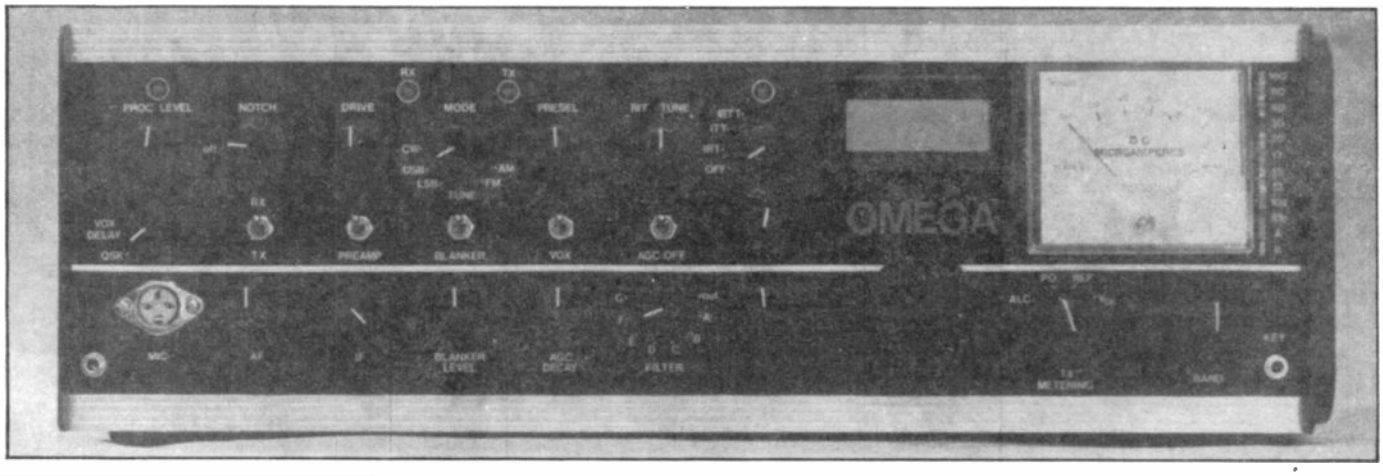
There are a number of corrections to this section. All kits and PCBs have these enclosed – anyone not already having these can obtain a copy from WPO Communications for an SAE. This also applies to corrections to previous units.

OMEGA Case

Due to enormous demand there will be a case for the OMEGA project. This is primarily aimed at those who have limited metal bashing facilities, and has been kept as simple as possible, with attention mainly to a good looking screened and punched front panel. It houses all the published and forthcoming modules, but is not intended to house the power supply.

The case is made from sheet steel /aluminium, finished in black with a black anodised front panel and is simply assembled (a special similar to the Centurion DX range). While the front panel will be punched and screened with legends, the remainder of the case will be undrilled. A photo of the prototype panel appears in this article (subject to some changes since photographing). Details of the case will appear in an early issue, together with copious photos and drawings. Approximate availability date will be given by WPO Communications in the OMEGA Newsletter. All controls and knobs etc will also be made available.

Prototype Omega front panel (please note that production arrangement may differ considerably as regards number and location of controls – G3WPO)

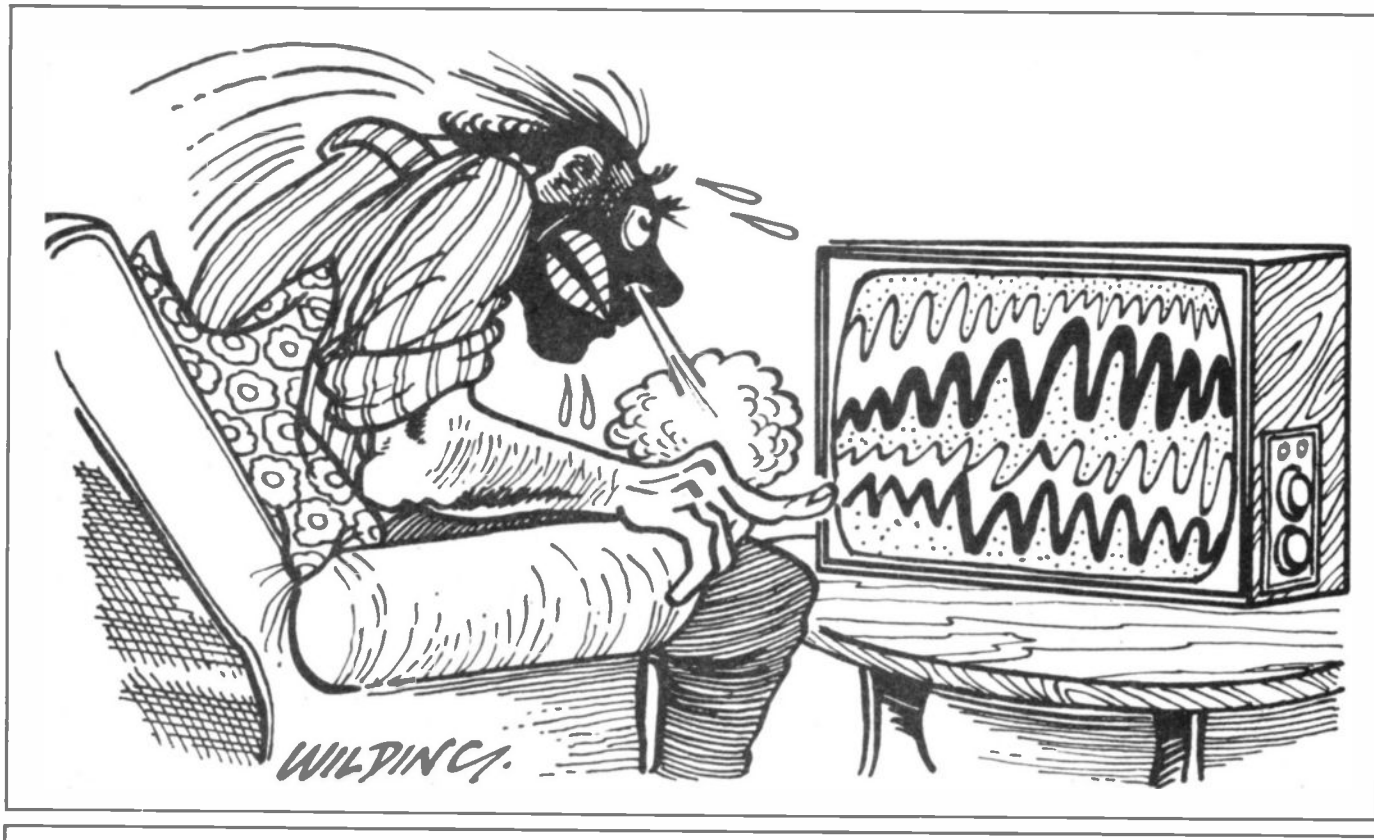


More Ripping Yarns

Angus McKenzie, G3OSS, provides a few more anecdotes from the back pages of his logbook...

One of the funniest incidents that happened to me some years ago, came a the result of two or three evenings worth of concentrated activity on 10m when I had been beaming south. The following morning after this activity, I had gone abroad on business, but during the day my wife was visited by a very irate and rather large builder who claimed to have been doing some work in the next road. In a bruiser type of voice he asked if there was a radio ham transmitting in the place. My wife quite politely said that there was, to be followed by a command to ---- stop transmitting. My wife maintained her cool and asked what the problem was. She was told that an automatic garage door opener had been fitted in a house some days earlier, and his customer had complained that two evenings before he had come home in his car and opened the doors automatically from it, had parked the car inside and then closed it to find it open the next morning. The following evening, after the same process, the 'builder' gave the following description, as from his client:- ''Up, down, up , down, up, down, every ------ five minutes with ---- grinding noises,'' etc etc. Quite clearly, the equipment was using the 27MHz band which was then completely illegal, and uncomfortably close to 28MHz! Can you just see the garage door opening and closing every five minutes which corresponded to my overs on 10m!! This really did happen, and I am not inventing it. Indeed, on mentioning the fact to the Home Office, I think they laughed more than I've ever heard them laugh before, finally commenting that they would fix the householder concerned if and when they filled in the Radio interference form which my wife had suggested should be filled in as a parting shot to the enormous bruiser!

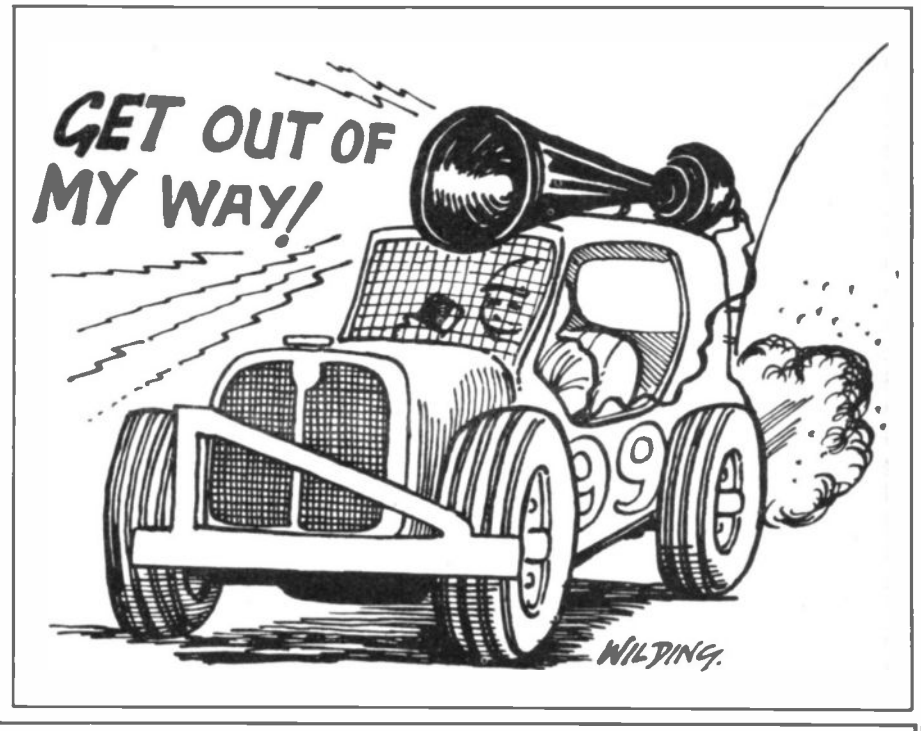
There are some stories that may appear very doubtful, but which are completely true, and perhaps one of the most amazing ones, is the time that I broke into my neighbour's burglar alarm. Just



how can an amateur radio transmission get into a burglar alarm and create a problem? At one o'clock in the morning, I had a QSO on 80m with a friend, and had just finished when my wife came through to say the whole place was surrounded with police . . On looking through our bedroom window, a black maria and two police cars could be seen, together with hairy police dogs and coppers everywhere. One came to the back door, and explained that the whole area was surrounded and that they were looking for an intruder, as a result of a 999 call. We were both very puzzled, and frankly, rather scared, particularly when the policeman requested a search of our premises, finding nothing of course. After perhaps half an hour, the pandemonium died down and there was just my neighbour remaining looking incredibly puzzled, in his dressing gown by the back door telling my wife that he couldn't understand it. He had been in bed with his wife upstairs, and their very young child had been fast asleep in another room, when they all woke up as they heard some noise. The child later claimed that there had been a large doggy in her bedroom, while my two friendly neighbours had heard burglars' voices downstairs. The husband got out of bed, and looked for the nearest blunt instrument, and crept to the top of the stairs whilst his XYL disappeared under the sheets with the telephone and whispered to Scotland Yard that they had intruders. The police asked her to speak up, so she whispered louder, giving her name and address which resulted in the police arriving. They must have thought they were a house of lunatics, but I knew them to be very level headed folk and so I suggested that it might have been my amateur radio. The following morning, I discovered that indeed it was, for the alarm had a minute audio IC in it feeding a very small loudspeaker which was designed to make a hooting noise when the system had been set, properly, but not completely turned on. The problem was that the audio IC and miniature speaker (only around 2cms) was always live, and only the hooter section was muting, and so my voice was picked up on 80m, rectified in the normal way at the input and a garbling noise came out of the miniature speaker at full volume, thus sounding like an intruder downstairs to sleepy people upstairs! Of course I was incredibly embarrassed, but both the police and the Home Office thought it a huge joke, although the burglar alarm people did get fairly cross. The large dog in the bedroom will still remain a mystery!

Going mobile

Mobile operators are always having interesting experiences, and in the days of AM on the HF bands one heard the most amazing tales of amateurs passing a gymkhana and hearing their voices booming out over the tannoy system and making various remarks which greatly disturbed the gymkhana organisers! I suppose the funniest incident that happened to me though, while mobile, was when my wife and I were trying to find a very high point in the old Welsh county of Montgomeryshire in 1961. We had found an old disused farm with gates either end of it, with a track going right through the farm, but we realised that we were completely lost and time was running a little short. After many calls, we eventually raised G4LU, Stan, in Oswestry, Shropshire, who took bearing on us and who was able to give us an approximate position. He contacted two other friends on 2m, and with the help of an ordnance survey map, managed to locate our exact position using normal direction finding methods. He was able to tell us that we should drive north through the farm and then immediately turn left, and at the top of a track turn right onto an unclassified road which eventually led up to a very high point. We were fairly sure which was North, and so my wife drove as directed, but the ground was getting soggier and more grassy, eventually with no sign of a track at all. We stopped our Standard Companion estate car in the middle of a field of cows, scratched our heads, and drove all the way down again, while remaining in contact with G4LU, who eventually twigged that we had indeed got South and North mixed up. After this rather hair raising adventure, we eventually did find the correct way, and managed to work many stations who had not heard anyone in Montgomeryshire before, on 2M.



My early mobile installation on 2M included a Withers halo on the top end of a metal rod which used to slide down behind the hinges of the back doors of the estate car. It always struck me as amazing how Tom Withers' halos seemed to remain shiny and bright, and looked brand, spanking new for years. It was not for 10 years or so that I eventually found out what in reality had been happening, surprisingly regularly. Every few weeks my wife would forget that the halo was up, and would drive into our garage, and just before coming to a halt would hear once again the expensive crunching noise heralding the destruction of yet another halo. This was invariably followed by my wife making a fast trip to Withers' original factory in North Enfield, where apparently she got a good exchange deal of new for old, being easily Withers' best customer for halos. At the time, rather a strain on the housekeeping!

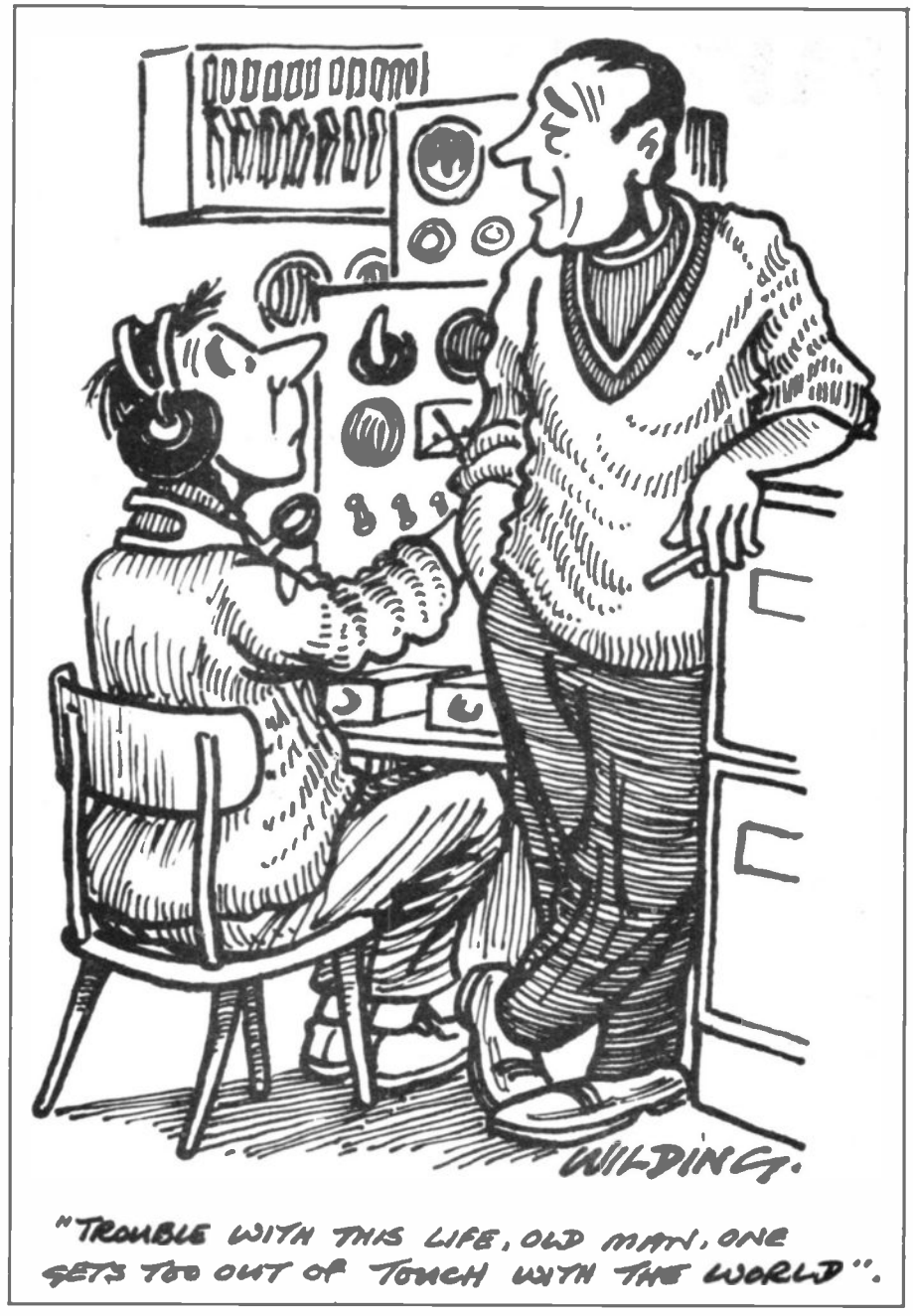
Accidents can happen

There are some occasions when it can be very embarrassing to be transmitting inadvertently. I can well remember twenty years ago one amateur who had very bad asthma as well as an incredibly loud parrot (which used to over-modulated like hell) and who was given a bottle of scotch on New Year's Eve. He drank the entire bottle over a three hour period, as all good Welshmen do, followed by the loudest final I have ever heard, his speech becomming more and more slurred and wheezy followed by a bump and happy snoring. The following morning, he was discovered still snoring by his rig which was still transmitting happily.

My own terrifying moment came when twenty years ago, my lovely fluffy white cat switched on my transmitter with her back left foot, and when I came home I proceeded to have a slight disagreement with my mother-in-law just outside the shack, not realising the rig was on! Before long, my telephone rang and a friendly local amateur warmed me to what was happening, amid much loud laughter from his end.

We can all do quite ridiculous things at times, and I can be as stupid as anybody. So now you can all have a laugh at my expense if I admit to something really crazy. I used to have a Withers crystal controlled valve converter for 2m whose output used to be plugged into my normal receiver. One day I commenced loading up on 14MHz, into what I thought was my aerial, but the anode load and tune controls seemed to be in very strange positions indeed. After a short while, there was a most expensive smell coming from the gear which turned out to be my Withers converter going up in smoke as I was attempting to tune up 100W of RF into its output stage, back to front as it were. The manufacturer said he had never seen one of his converters in such a mess before but perhaps a few readers have even more crazy stories to tell! Has anyone heard of anybody loading up the overhead power cable of a disused tram line anywhere on top band yet?

On one Scottish holiday, while mobile near Loch Lomond, we stopped to transmit in a village, attracting the attention of a couple of small boys. Soon they were sitting in the back of the car, eating our toffees. It was a good location, and I decided to amaze them with a tour of the furthest points of the globe. No reaction from the lads, so when the toffees were finished, I said brightly, "well, what did you think of that?". A pause for reflection, and the more talkative of the two said, "Can ya no get France?".



An Auto-Powered Semi 'break-in' Keyer

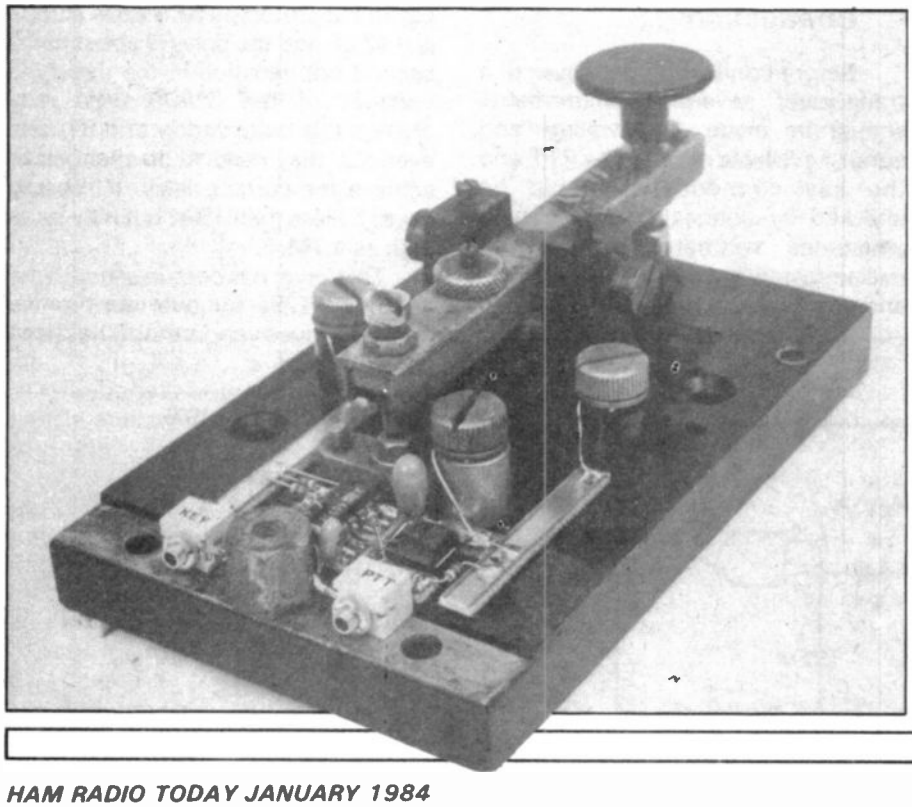
By James Bryant, G4CLF, MIERE.

With the recent growth in the use of CW at VHF and UHF there is a need for a simple circuit which can provide 'break-in' facilities for VHF/UHF transceivers which do not have it.

Most modern HF transceivers are equipped with semi break-in keying as standard — most VHF transceivers are not.

In a transceiver equipped with break-in keying the receiver is active whenever the key is not closed — the operator can thus listen for responses in the short intervals between dots and dashes. The design of receivers capable of working in this way is very demanding since they must respond to weak signals within milliseconds of the transmitter ceasing to generate very high powers at the same frequency — this places great constraints on the strong-signal performance and the operation of the agc. With semi break-in keying the receiver switches off when the key closes and remains off until the key has been open for a predetermined period — normally of the order of a few hundred milliseconds — the demands on receiver design are correspondingly less stringent. The operator can still monitor while transmitting but must make an infinitesimal pause to do so. Transceivers fitted with semi break-in keying normally use the VOX (voice-operated transmit/receive) circuitry to perform the function.

The present design does not use VOX circuitry but instead uses a CMOS logic arrangement driving a VMOS output transistor to switch the PTT (push to talk) line of the transceiver. The use of MOS allows the keyer to run from the small current which may be taken from the PTT and key lines without keying and the circuit needs no other power supply. This is particularly convenient during contests since keyer batteries are notorious for failing when no replacements are available.



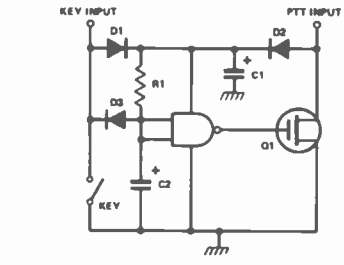


Fig. 1 Simple keyer circuit

The Circuit

A circuit which will perform the function is shown in **Fig 1.** It consists of a single schmitt input CMOS gate and an N-Channel VMOS transistor. There are also three diodes, two capacitors and a resistor (which may be variable).

Its operation is simple — when first powered the capacitor C1 is charged via D1 and/or D2 (whichever is at a higher potential) and then this capacitor powers the CMOS circuit, which draws well under 1 microamp of current from its supply. When the key is open C2 is charged, the input to the gate is at logic 1 and hence its output and the gate of Q1 are low so that Q1 is turned off.

When the key is closed C2 at once discharges through D3 and the output of the gate rises, turning on Q1, which grounds the PTT line, switching the transceiver to 'TRANSMIT'. Being a VMOS device Q1 draws no gate

current so C1 holds charge for many seconds.

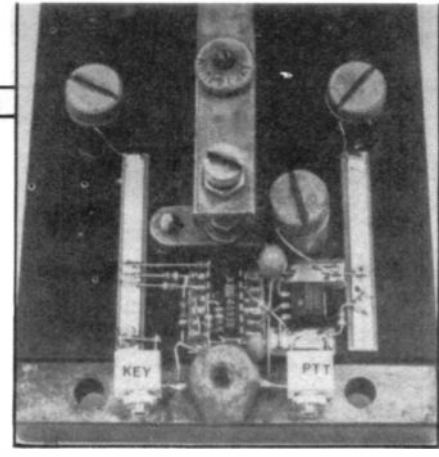
Before C1 can discharge the key will be opened and it will recover charge from the key line of the transceiver via D1. C2 will start to charge slowly through R1 but Q1 will remain on until the voltage on C2 reaches the threshold of the gate's switching action (taking several hundred mSec, depending on the value of R1). During normal transmission the key will close again before this can happen and C2 will be discharged. Thus the PTT line will be grounded steadily during CW transmission.

If the key remains open for more than the time taken for C2 to charge to the gate's switching threshold the gate will change state, Q1 will be turned off, and the PTT line will revert to 'RECEIVE'.

A drawback of this circuit is that as well as powering the gate, C1 is also discharged through R1. Since CMOS schmitt input gates normally come in DIL packages of four (4093) or six (40106) it costs nothing to use a few extra gates to reduce the current drawn from C1. The final circuit, shown in **Fig 2**, does this.

The final circuit uses two more CMOS gates to isolate the timing circuitry from the key and also requires two diodes and a resistor (D4, D5 & R2) to keep the logic voltages within the permitted range. R1 is connected in parallel with D3 instead of to the "power line" and an extra diode is incorporated to protect Q1 if the system is used with an inductive load (such as a relay) in the PTT line.

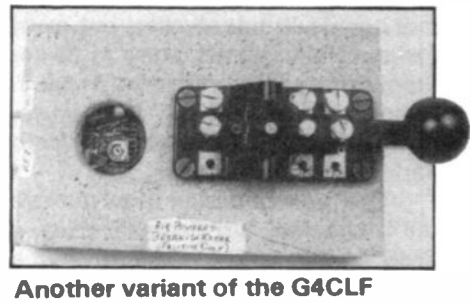
This circuit uses three gates so that a 4093 quad schmitt NAND which contains four gates is ideal for the application. The pin numbers indicated apply to this part although any other CMOS schmitt input gates (such as the 40106) could equally well be used. The capacitors C1 and C2 should be low-leakage types so it is



Construction of the G4CLF keyer

worthwhile using bead tantalum types rather than aluminium — the extra cost is only pence. The diodes are silicon small-signal types such as the 1N914 or 1N4148 and are quite non-critical, and the VMOS transistor, Q1, is an N-channel type such as the Siliconix VN66AF.

The circuit may be constructed in any suitable manner — it is very simple and component placing is not at all critical. The author's prototype uses Wainwright Minimount PC breadboarding strip mounted on the base of the morse key itself.



Another variant of the G4CLF keyer.

Connection

Before connecting the keyer to a transceiver several measurements should be made. The voltage and current available at both the PTT and the key connections should be checked by connecting first a high resistance voltmeter and then a milliammeter between these points and ground (note that the connection of the millimeter will cause the rig to transmit so a suitable power source and antenna should be connected).

This circuit will work with PTT and key line voltages of between 5 and 18 volts positive and will NOT work with transceivers having negative PTT or key lines. If the PTT line has a voltage above 18 the keyer must be modified by removing D2 (which causes the keyer to be powered from the key line only) and replacing D6 with a higher voltage part. Above 60 volts the VMOS device must also be replaced by one capable of withstanding the necessary voltage. If the key line has a voltage of over 18 volts the keyer cannot take its power from the key line but must be battery powered by a PP3 battery connected in parallel with C1. In addition, D5 must be removed, the grounded end of R2 connected to the battery positive and D4 replaced with a device capable of withstanding the necessary reverse voltage.

Provided the PTT and key currents are more than 100 microamps and less than 250 milliamps the circuit should work correctly (PTT currents of over 250 mA may be accomodated by using a higher powered VMOS device).

The keyer is connected to the transceiver by connecting the PTT and key lines to the appropriate sockets of the transceiver — when the key is closed (provided the transceiver is set to 'CW') the rig will switch to 'TRANSMIT' and remain that way until the key has been open continuously for a time set by R1 and C2. In the prototype R1 is 220K and C2 is 0.47 uF and the delay is about half a second but variation in the threshold voltages of the CMOS used may change this quite widely and R1, and even C2, may need to be changed to achieve the correct delay. R1 should never be less than 180K but may be as high as 4.7M.

This keyer has been in use with the author's FT290 for over six months and has proved very useful. It has been widely copied.

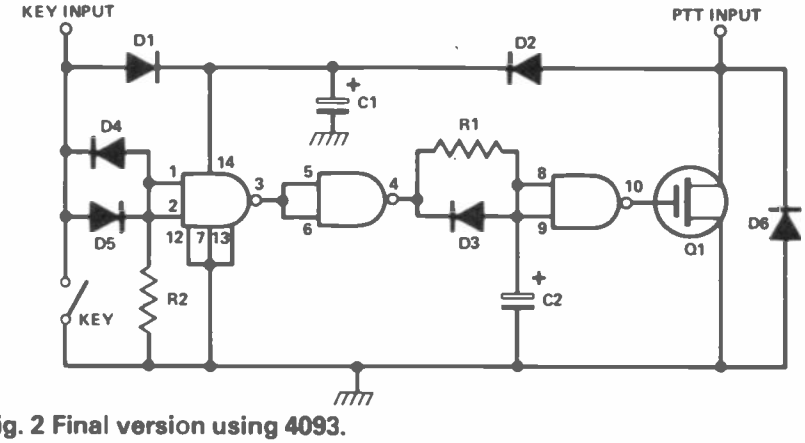


Fig. 2 Final version using 4093.

COMPONENTS LIST

R1 220K (see text)
R2 1M

C1 100u 25V tant.
C2 0.47u 16V tant.

D1-6 1N914, 1N9148 (see text)

Q1 VN66AF
IC1 4093 CMOS

HAM RADIO TODAY

NEXT MONTH

WINTER TIME IS CONSTRUCTION TIME!

A rugged low-cost 2m FM 'Talkbox' project

Designed by Tony Bailey, G3WPO, suitable for both newcomers and experienced amateurs. Chat cross-town and country – talk it walking, 'fox hunting' or even shopping.

40m Yagis don't have to be big!

Build this design for a super-compact helical beam antenna – to fit the average suburban plot. Seriously!

PLUS

RTTY with the BBC model 'B' computer and the G3LIV interface

Semiconductors explained for the RAE examination

Mobile antenna multiplexer – 2m, 10m and LW/MW from one antenna

Addendum

G4DHF TRANSVERTER
2m to 160,80 and 40m

The following are corrections and after-thoughts to this design: L1,L2: to guarantee sufficient coupling between L1 and L2 on 160m, extra capacitor, C55/47pF should be connected between the two non-earthy ends of L1 and L2; on the PCB this is probably best achieved by simply attaching the capacitor across the two pins adjacent to L1 and L2. More times than not, the transverter will work normally without this mod, but on those that don't work, the symptom will be lack of output, on receive and transmit, on 160m.

Oscillator/LPF PCB (p13) 160 and 80m oscillators have low inductance (blue) coils.

Misprint The paragraph near the top of colum two P13 should begin: "Two of the six-turn coils and four five-turn coils are required."

Filter overlay diagram (P14) Please ignore the coil reference numbers given in the note.

Driver PCB(p15) Three faults here: first and VERY IMPORTANT, D1 is shown the wrong way round – the cathode (banded end) should be to D2, C2, etc. Secondly, the two point As on the overlay diagram should be joined, but the dotted line from the A on the left is a screen and is not attached to the point A.Finally, the source of Q5 should be soldered directly to the top foil of the PCB.

Components Listing Q5 is 3SK45; the switch listed under Miscellaneous should read "Switch 4 pole 3 way rotary"; C52 is 1n5 polystyrene and C53 is 3n3 polystyrene; finally, the note at the very end should read "Note that all the components marked with a * are for just *one* oscillator...." (our tripesetter was having fun that day!).

Coil Data L3 and 4 for 160 and 80m: L3 is Toko type 301KN0600 (blue - 6.5 turns). For 40m L3 is 301KN800 (white – 8.5 turns). For 160, 80 and 40m L4 is 301KN0800 with two cores used inside. L5 and 6 for 40m are six turns 18 swg; for 80/160m they are five turns 18swg, in both cases wound on 7/32"diameter. T5 has a four-turn primary, centre-tapped, and a four-turn secondary. L10,11 use 0.56mm diameter wire.

Practicalities

Very often one sees people construct very complicated RF projects and they apparently work first time. This is unlikely to be true as most circuits require a lot of hard work to optimise them and get them working reliably all the time, and to remove the spurious operating modes (ie oscillation — when it is not required) which always seem to appear especially when RF is involved.

This month, tips on successful RF construction, brewing your own PCBs simply — and an HF SWR meter for £7!
By Ian Poole, G3YWX.

The major factor in getting these circuits working satisfactorily is experience; knowing what one can and cannot do, how to lay out the circuit for example — as the layout of a circuit will greatly alter its operating characteristics. One way to improve the operation of many RF circuits is to use a 'ground plane' earth on a printed circuit board, and one of this month's ideas, covered later, is about "brewing" one's own PCBs. Also important when constructing RF circuits is the provision of plenty of decoupling in the appropriate places so that supply rails and the like do not act as RF 'feedback' lines. A few strategically placed decoupling capacitors will go a long way to improving the operation of most RF circuits. One further point to watch is that large value capacitors will become inductive at high frequencies and therefore it is often a good idea to use two capacitors, one large and one small, to decouple a particular point. It is quite common practice to decouple screen grids in valves using a 1000pF and a .1uF capacitor and this technique can be employed well elsewhere.

Homebrew PCBs

There are probably many occasions when the home constructor wants to make up his own printed circuit boards but finds that he has not got the facilities required. Admittedly very few of us have access to all the equipment for making double size taped PCB artworks, together with all the photographic equipment for reducing this and producing positives, or all the facilities for making the board from these with photoresist and ultraviolet light! I was in this position and had to seek a simpler and more down to earth way of making up boards. Firstly, I dispensed with all ideas of using photography and simply traced out the outline of the tracks with pencil onto the copper clad board itself. We are now ready to apply our 'etch resist'. In my case I used model aircraft coloured 'dope', but if the wife or girlfriend has some old nail varnish that she does not want then this can be used equally as successfully. A solution of ferric chloride is then made ready to do our etching. This can be obtained as a ready made up solution or made up from the crystals which can often be obtained from the local chemist. If not, I have seen it on sale at some mobile rallies. Care should be taken with this as ferric chloride does stain and can cause skin irritation. The solution should be made fairly strong but it is difficult to give the exact amounts of ferric chloride and water required. *(about 500 grammes per litre is a rough guide — Ed.)*

In practice, probably the best method is to make up the solution and if the etching is taking too long then add some more ferric chloride crystals. Normally it takes about half an hour for the etching to be complete, and when this appears to have happened then the board should be removed immediately from the solution — otherwise the

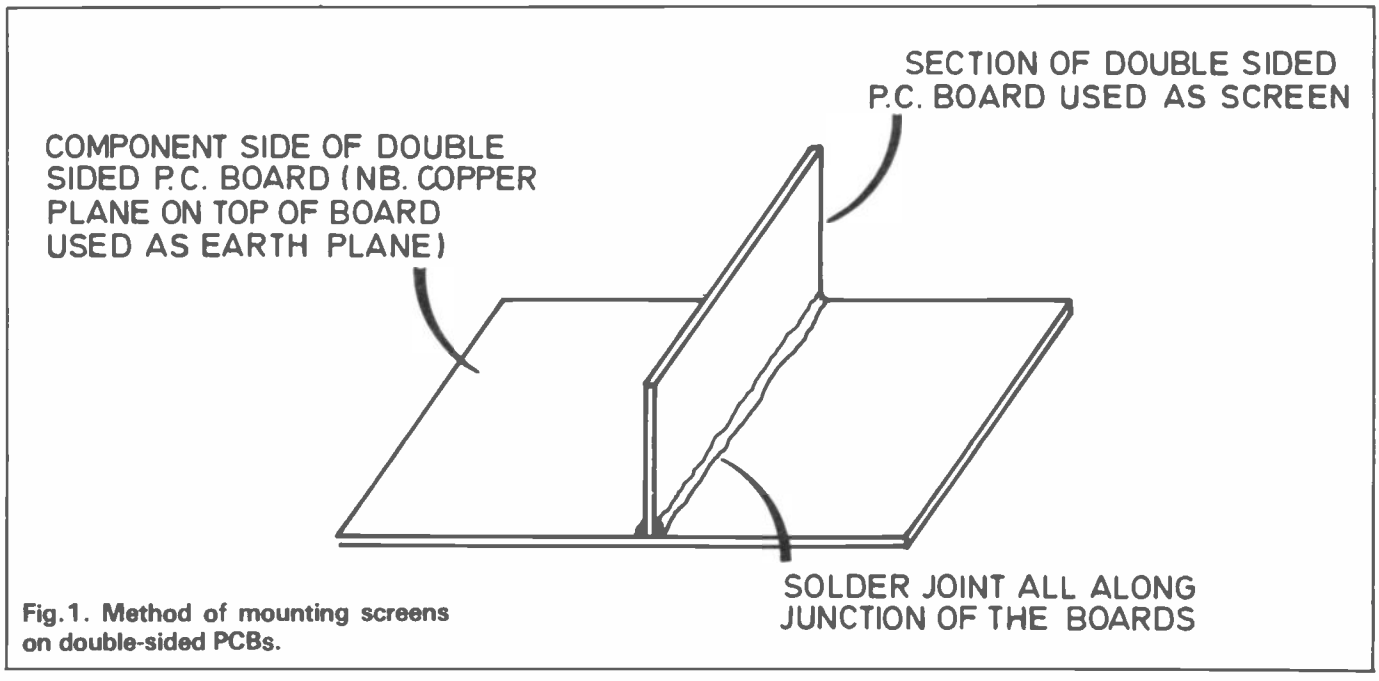


Fig.1. Method of mounting screens on double-sided PCBs.

ferric chloride will start to etch under the etch resist! The etch resist or 'dope' can then be removed by gently using a Brillo pad, which will also clean the surface of the copper. If there are any areas that cannot be cleaned using a Brillo pad then nail varnish remover may be used. The board is now ready to be drilled and then used. For most component locating holes a 1mm or number 60 drill is suitable.

If a double sided board is used then the upper side can be used as an earth plane. If this is to be done then the whole of the upper surface must be protected from being etched. When the component holes are drilled they should be countersunk slightly on the earth plane side so that the component leads do not short onto it. Very often when one is to use a double sided board the circuit will involve RF and screening between the different stages becomes advisable. Screens can very easily be put onto a double sided board as shown in **Fig.1.** A section of double sided board is cut to size and soldered onto the main board. The screen should be soldered both sides and along the total length of the joint. This provides a screen which is both electrically well bonded to the board earth and mechanically strong.

The results I have obtained using this method have been quite satisfactory, especially when constructing VHF equipment — when the earth plane is especialy useful. It should be said that the results will not look quite as pretty as if the 'professional' photographic method had been used but it does make a very good second best — and at a fraction of the equipment outlay.

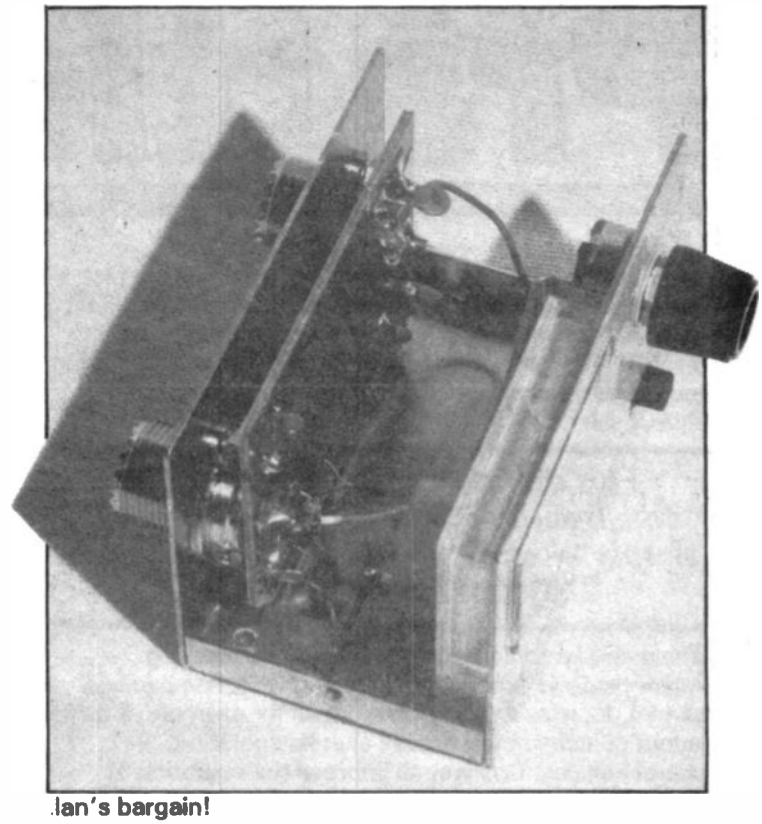
Economy SWR Meters

Some time back I was looking for a cheap SWR meter just to get my HF station up and running. The cheapest ones that I could find from the amateur outlets were around the £10 mark or more. However I did notice in a CB shop one day a meter for around £7. A quick look at the specification showed that it would work satisfactorily on all the HF bands and so I bought it. Since then, I have used from 10 metres down to 80 metres with my 100 watts output passing through it with no problems, although I would not like to pass much more through it. Therefore, it is worth bearing in mind that some CB equipment can be pressed into amateur service — if a little care is taken to ensure that the specifications are suitable.

It is probably worth mentioning at this point some of the limitations of the cheaper SWR meters. The most obvious limitation will be the sensitivity. Owing to the fact that the cheaper SWR meters are of the 'reflectometer' type of design their operation will be found to be very frequency dependent. As the sensitivity of SWR meters falls off with decreasing frequency trouble may be experienced, on 160 metres for example, when trying to obtain full scale deflection whilst remaining within the legal limit!

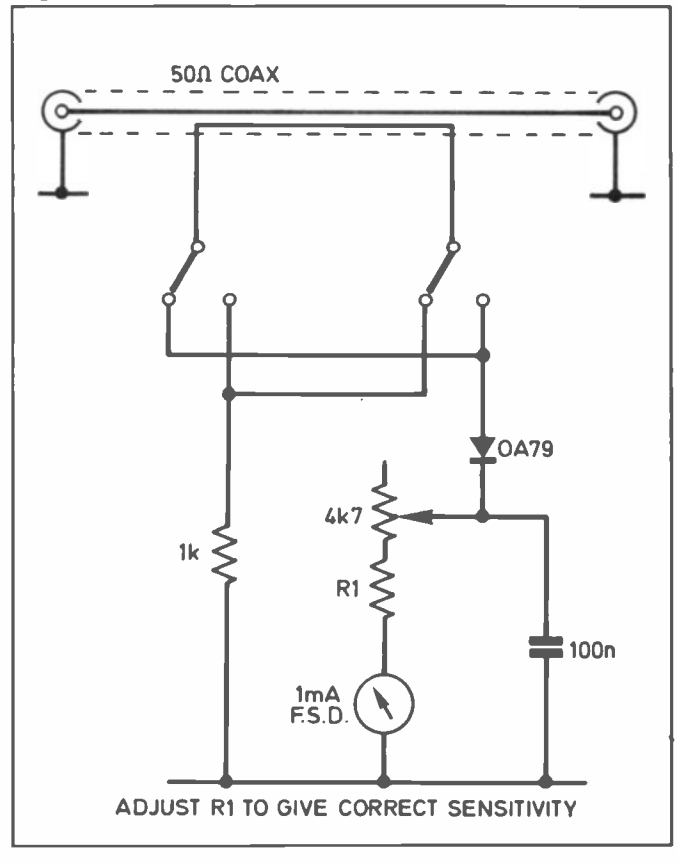
The second and less obvious limitation will be the accuracy. A typical circuit for an SWR bridge is shown in **Fig.2** and this particular circuit provided good service a few years back when I used it at VHF. However, without delving into the operation of these meters which is quite complicated, they do become very inaccurate at SWR levels of greater than 2 or 3 to 1.

Despite these disadvantages a cheap SWR meter can be put to very good use, as their accuracy is sufficient for most uses especially if their limitations are known. I have not found the need to spent £40 or more on one of the deluxe models. If however one is interested in greater accuracy a type of meter which is frequency independent and known as a "reflected power meter" should be used, but these are considerably more expensive to buy.



Ian's bargain!

Fig.2. Circuit of a simple VSWR meter.



MORE ON HF PROPAGATION

All in all, our amateur signals have a very rough time in what can only be described as a very hostile environment once they leave our antennas. It's a wonder they ever come back at all. If we wish our radio signal to travel to the destination, we must first take into account the changes that take place during each 24-hour period as the earth turns through 360 degrees relative to the sun. We must remember, also, that the ratio of night to day is constantly changing at any point on the earth's surface giving rise to our seasons as we move in our orbit round the sun.

Winter is pretty much upon us and the higher HF bands are more or less dead by tea-time. However, 160,80 and 40m are pretty lively and some very long distance stations can be worked — if you choose your times carefully. We explain the 'how and why' of the propagation situation — with special emphasis on the lower bands.

Seasonal and Diurnal Changes

An interesting fact that is seldom appreciated, and hard to believe at first, is that we are nearer the sun in the winter than in the summer! If it were otherwise the summers would be infinitely hotter and the winters many times colder than at present. In fact, man would probably find a large part of the earth to be uninhabitable owing to the extremes of temperature. But, then again, man would have no doubt adapted himself after a few million years.

The daily or "diurnal" changes are themselves affected by changes linked to the seasons, already mentioned, when the sun's altitude runs from its lowest in mid-winter to maximum in mid-summer. Just to add to the confusion, we should remember that opposite seasons occur in the northern and southern hemispheres at any one time. When it is mid-summer in the southern half of our world it is mid-winter in the northern half, so a radio signal travelling half way round the world, on an essentially north/south path, will be subject to completely different propagation conditions at the reception point compared to the transmitting point.

To the diurnal and seasonal changes we can now add a third ingredient to the propagation "pudding", the oft-mentioned changes on the surface of the sun, the violent storms that involve the eruption of millions of tons of material many thousands of miles into the sun's photosphere and seen by us on earth as small spots on the sun's disc: sunspots. Their eventual effect on radio is to change the degree of ionisation in the various layers of our upper atmosphere and hence the propagation of radio signals. For reasons which we still do not understand, these eruptions vary in intensity and frequency over a remarkably well-defined period or cycle of, from maximum to the next maximum, around 11 years. Remarkable indeed for what, as far as we can understand, should be an entirely random phenomenon.

Sunspot maximums are seldom of the same magnitude. Not only that, but it is difficult to predict more accurately than a year or so *when* they will occur. We only safely say when the peak occured *after* the event by looking at the curve of sunspot numbers.

Just for flavour, we can also add a final dash of magnetic field, itself caused by solar activity, and thus varying enormously in intensity with sunspot numbers. It is manifested to the delight of VHF addicts as an auroral curtain in the neighbourhood of the earth's magnetic poles.

Getting down to the nitty-gritty of propagation and our endeavours to predict what is going to happen to our ionosphere in the immediate future it would be very nice if we had a network of radio transmitters all over the earth's surface sending out signals from, say, 1 to 30 MHz, and measuring the frequency at which the signal was barely being reflected back to earth. We would then know that it would be a waste of time transmitting above that critical frequency over a particular path.

Such ionospheric sounding stations do actually exist. It is thus possible to produce a chart that shows the highest or maximum usable frequency (MUF) at a given time of a given day of the year. To cut a long story short, such charts enable the communications engineer to predict the best frequency for maintaining radio communication over a set path for any time of the day, any day of the year. The benefits of such predictions are enormous and, of course, overflow into the field of amateur radio. The amateur, following the day-to-day activity of the HF bands in preparation for a contest, or just for the fun of it, is merely confirming these findings.

Propagation Predictions

The making of the actual predictions is still far from being a precise business. Published MUFs are usually more of an average value which is likely to be reached on only *half* the days of a month over a predetermined path. This is at least better than having nothing at all.

Even though everything may seem set fair for a contact over a DX path, one final hurdle has to be cleared by our poor, battered signal. In passing up to and down from the particular reflective layer the signal will be subject to absorption, an effect that varies from being almost negligible, giving excellent DX conditions, to

heavy absorption with the consequent loss of all DX signals. The effect is very noticeable on the 80m band with the disappearance of DX signals as dawn arrives and the absorption becomes intense, only to decrease towards dusk and let the DX through again.

Periods of minimum absorption may be very short indeed and on the LF bands may be only a matter of minutes. Attempting to work Australia on 1.8MHz may mean months of listening for just the right conditions coupled with minimum absorption before success is obtained — even if there is a VK actually listening at the right time! So now we must look at the peculiarities of the lowest frequency bands, 80m and 160m, with the emphasis on the former.

80m Conditions

Those amateurs who are successful on the 80m band at working DX need to take into account other factors which are not quite so important on the higher frequencies. The DX does not come in fairly steadily for a matter of hours but often for just a few minutes, as we have just discussed, and a careful watch must be maintained not to miss the all too brief 'window'. Times of sunrise and sunset at both the transmitting and receiving points are all important as is the position of the line at the boundary of the light and dark hemisphere, sometimes referred to as the terminator or 'grey line'.

On east-west and reciprocal paths there are two very definite peaks in signal strength — when the eastern end of the path is enjoying the sunrise and at sunset at the western end of the circuit. The peaks also exist on north-west and south-east paths (and their reciprocal paths, of course) but do not have the same amplitudes.

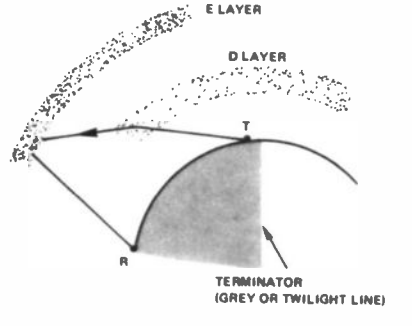


Fig.1 Here the D layer is shown established to the right, but not yet formed to the left, over that part of the earth's surface still in darkness. The signal from station T on the grey line is refracted rather than reflected by the D layer, travelling on to be reflected by the E layer and so on to point R

	Sun's angle	Length of day	MUF	D layer activity	QRN	Propagation possibilities
February-April	Inter-mediate	Approx equal night/day	Average	Inter-mediate	Average	Transequatorial NW/SE SE/NW
April-August	High	Long	High	High	Bad	N.Hemisphere bad (S.Hemisphere good)
August-October	Inter-mediate	Approx equal night/day	Average	Inter-mediate	Average	Transequatorial NW/SE SE/NW
October-February	Low	Short	Low	Low	None	N.Hemisphere E/W W/E (S.Hemisphere bad)

General summary of propagation possibilities over a period of a year on the 80m band for the northern hemisphere

Under these conditions the aforementioned paths are effectively in darkness and thus radio communication over them can take place. Propagation under these conditions is often referred to as being by the 'short' or direct path, particularly in the case of communication between Europe and Australia — the shortest distance from Europe to Australia being in a north *easterly* to south *westerly* direction around the globe (*if in doubt, look at our Great Circle Map in November's issue — Ed)*

If the opposite conditions exist, that is sunset at the eastern end or sunrise at the western end, then this implies the 'long path' possibility of a contact. It should be fairly obvious that suitable conditions for such a DX contact only exist for a short time, the twilight ring round the earth being the grey line. In recent years school-type globes of the earth have become available to radio amateurs which enable the grey line to be shown and greatly simplifying the task of determining the times when a particular DX path may be open.

The D ionospheric layer plays a big part in successful DXing on 80m. It comes into existence daily with the onset of daylight and solar activity and virtually absorbs signals on this band. With the approach of sunset the D layer starts to dissipate, allowing the 80m signals through to reach the E layer and be reflected back to earth allowing longer distance communications. From this it can be seen that during the local summer, when the daylight period is longest, the D layer persists longer and DX time is at a minimum. The converse conditions occur in local winter time when the sun's rays are weakest, persisting for only a comparatively short time when D layer absorption occurs.

This is illustrated in **Fig.1.** Here the D layer is shown established to the right, but not yet formed to the left, over that part of the earth's surface still in darkness. The signal from station T on the grey line is refracted rather than reflected by the D layer, travelling on to be reflected by the E layer and so on to point R.

The question of natural static (QRN) is very important on 80m, caused mainly by thunderstorm activity in that portion of the earth enjoying the summer season. Thus a UK station in winter may have little or no QRN while the station at the other end in, say, the southern hemisphere, may be suffering heavy QRN from summer storms, and be unable to copy Europe although propagation predictions may be favourable for that path.

UK amateurs have long envied the excellent DX conditions enjoyed by the amateurs in northern Scandinavia above the Arctic circle on the LF bands due to the almost 24 hours of darkness they enjoy in mid-winter time and the consequent absence of the D layer.

A summary of propagation conditions over a year on the 80m band is shown in the accompanying table. Much the same conclusions can be made for Top Band (160m) except that the successful DX communication is considerably more difficult! Openings are fewer and of shorter duration over DX paths, especially on the NW/SE and reciprocal paths, and the transmitter power that amateurs are permitted to use, particularly in the case of those in European countries, is consideraly lower than on 80m.

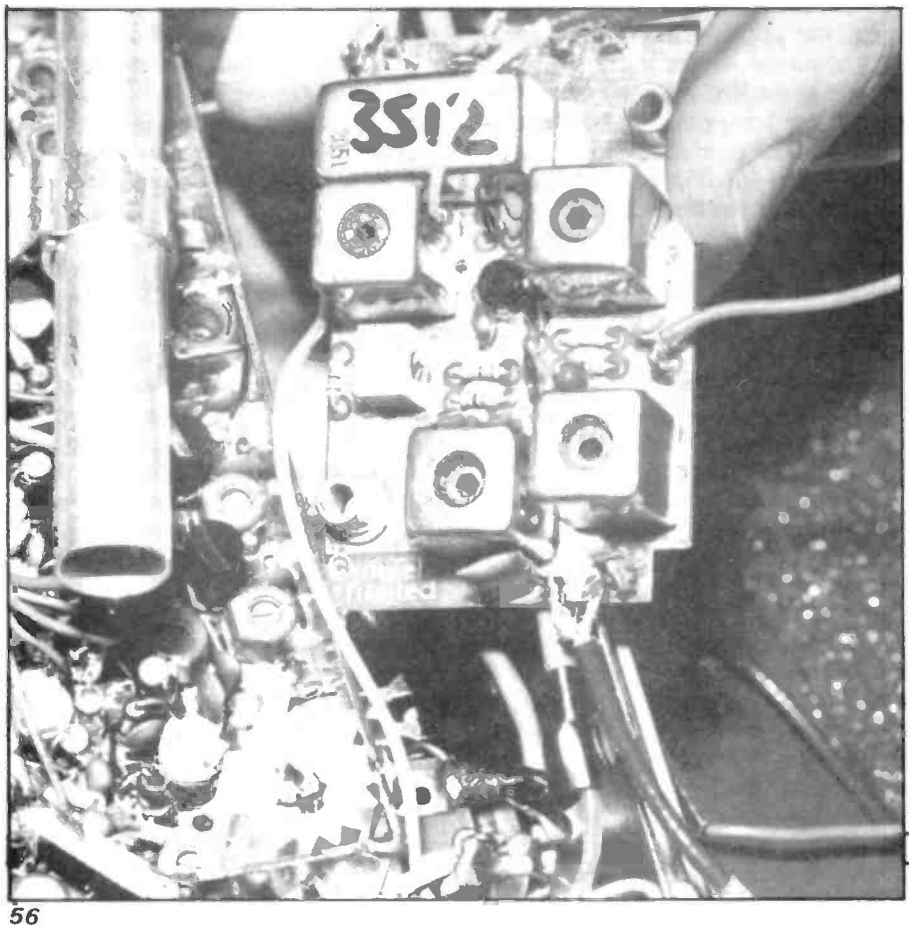
muTek SLNA 145sb – reviewed and fitted to the FT290R

Following the review of the Yaesu FT290R 2-metre multi-mode transceiver (see *Ham Radio Today,* May 1983) it was thought that the performance and overall sensitivity of the receiver could be improved on somewhat. One suggestion put forward was to replace the front-end mosfet with a 3SK88, although cross-mod problems were encountered and SMC, who imported the transceiver, advised against such a modification — so a different solution was sought.

Recently Mutek, that well-known West Country company, have produced an optimised preamplifier on a board that is specially designed to fit the FT290R; our purpose here is to see if it does indeed improve the performance without degrading the overall dynamic range.

The FT290R is probably the most popular 2m portable ever made. Trevor Butler, G6LPZ, looks at the MuTek SLNA 145sb 'transceiver optimised preamplifier with antenna c/o switching' intended for the FT290R. A happy couple?

The unit comes complete and pretuned, with mounting screws and a trimtool, all wrapped in silver foil for protection. The unit is well constructed with average duality soldering to the board which measures some 53 × 35 × 15 mm.



Why is a preamplifier needed in the first place, though? Well, there are two reasons why the sensitivity may be below par, firstly the dynamic range specification has to weigh large signal handling capabilities with good sensitivity. Manufacturers, of course, need to keep within financial constraints which can lead to a common noise figure of some 4dB with some 70dB intermodulation-free dynamic range within typical SSB bandwidths. These financial considerations also mean that antenna switching expenditure is often cut by using diodes instead of a relay. However, diodes can add considerable insertion losses: up to 4dB, which can mean an overall noise figure of 8dB!

At 144 MHz, however, the maximum usable sensitivity can be quoted at about a 2dB noise figure because a figure any lower would not make signals any more audible. It is, nevertheless, an advantage to use a very low noise preamp to minimise the degradation of the dynamic range. The overall figures depend on the noise figure of the preamp and the noise figure of the transceiver. Adjusting the preamp can allow the system to be set until an optimum setting is obtained. The SLNA145sb has a rated noise figure of typically 1dB.

Centre Point

The SLNA145sb is centred on a nitrogen-filled relay with low-noise performance for antenna changeover and a BF981 MOSFET in an input noise-matched, output conjugately-matched configuration for a very good noise figure. The BF981 has excellent figures for VHF applications, typically 0.7dB noise at 100 MHz. The full circuit diagram is shown in **Fig.1.**

A variable attenuator after the

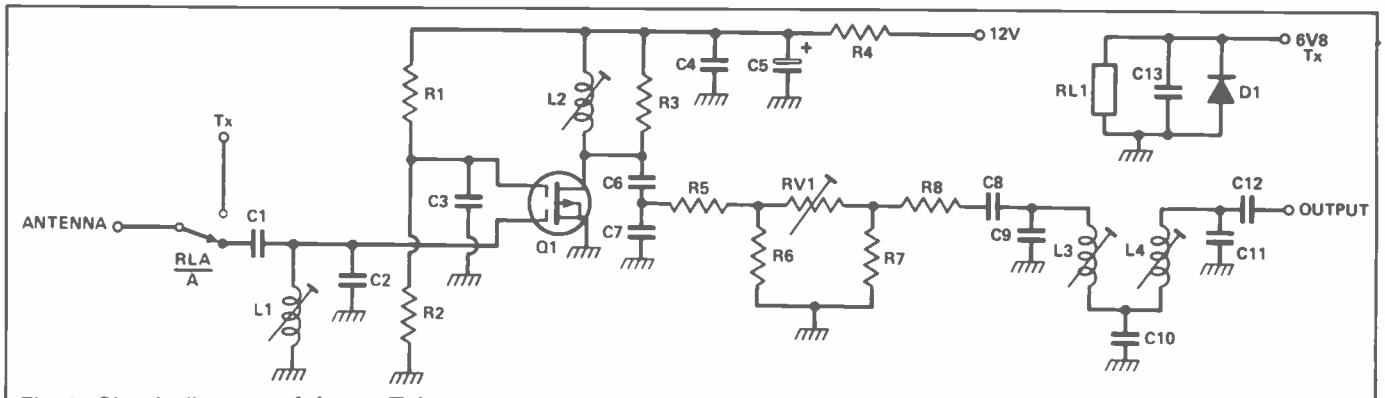
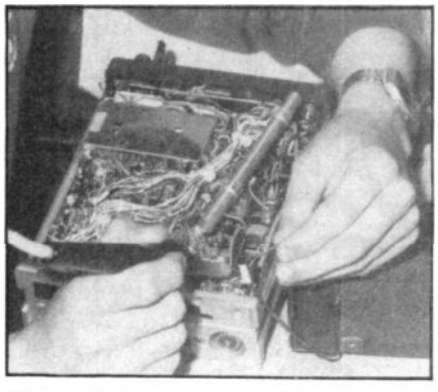


Fig. 1. Circuit diagram of the muTek 145sb

output matching allows for a variable gain control without compromise to the dynamic range. The unit also incorporates a Butterworth bandpass filter which provides substantial rejection of out-of band signals. Typical characteristics are shown in **Fig.2.**

Installation

It was found to be a simple operation to install the preamplifier and full instructions with diagrams were supplied, although the author found two labelling errors which MuTek have promised to correct on future editions. Three colour-coded petrotetra fluoretheylene (PTFE) co-axial wires and two single wires have to be soldered to various points within the FT290R, and two original components, C101 and L02, removed completely. The preamplifier, built on a very small epoxy fibreglass board, then in effect sits across the space left by L02, which should be connected between the antenna and a stand-off within the PA compartment. Bushed



The author getting to grips with the simple installation.

mountings are provided and allow the unit to be fixed where the tone encoder/tone squelch assembly would otherwise be installed.

The instruction leaflet suggests that in order to successfully remove C101, it should be "crushed with a pair of long nosed pliers and then repeatedly bending the leads until they break flush with the PCB." A simpler way to achieve this was to take a soldering iron and solder sucker to the rear of the board — thereby leaving a neater finish and saving the component intact. One of the PTFE co-ax

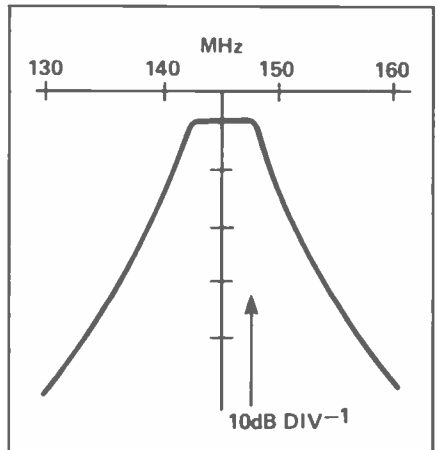


Fig.2. Typical frequency response of 145sb

cables was, in the author's opinion, slightly too short and was replaced so that improved routing of the cable could be achieved.

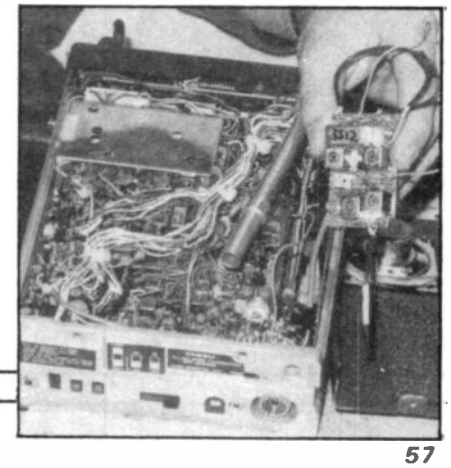
Having successfully installed the device it is necessary to adjust the gain, which ranges from 0 to 15 dB, so that the best noise figure is achieved whilst insuring that maximum performance is obtained. This is a simple task of tuning to a weak FM signal and adjusting the attenuator on the board with the trimtool supplied until the slightest degradation in signal-to-noise ratio is noticed and then backing off the adjustment slightly. There is no need for expensive and sophisticated test equipment, apart from the human ear!

Conclusions

The device performed very well indeed off-air. Comparisons made in respect of beacons suggested a considerable increase in signal strength and an improved noise factor. As the preamplifier becomes on installation an integral part of the FT290R, preamplifier in/out tests were not possible. In order to provide a further indication of the efficacy of the preamplifier, laboratory tests were conducted upon the FT290R + SLNA 145sb unit and a definite improvement in the signal-to noise ratio over that of the original FT290R specification was noted.

The MuTek SLNA145sb essentially provides the claimed goods but does seem rather 'pricey' when compared to other commercial preamplifier units. We should not forget, however, that the unit also provides a new antenna c/o switching circuit which plays a substantial part in the improvement of the noise factor of the modified FT290R.

Priced at £27.40 plus £1.20 postage and packing, the unit is available from MuTek Ltd., Bradworthy, Holsworthy, Devon, EX22 7TU or from stockists including ARE in Ealing whom we thank for a speedy response to our request for a sample.



RADIO Tomorrow

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

2nd Dec
Maltby ARS: Novelty Electronics
Harrow RS: Practical Evening
Sutton and Cheam RS: *Light Bulbs by G4SQG*

4th Dec
144MHz Fixed Contest (RSGB)

5th Dec
Stourbridge DARS: Informal
Leighton Linslade RC: *Thru-line Power Measurement by G4ASH*
Braintree DARS: *Swept Frequency Testing by G3OLU*
Southdown ARS: AGM
BARTG Cumulative RTTY Contest – Part 2 (2000-2200)
Rhyl DARC: ring PRO for details
RAE EXAMINATION DAY

6th Dec
Stevenage DARS: Social Evening
Mid-Warwickshire ARS: *Satellite Working by G4ROA*
Fylde RS: Christmas Party
Chichester DARC: ring PRO for details
Vale of White Horse ARS: Christmas Social
Fylde ARS: Christmas Party

7th Dec
Geminids Meteor Shower. 7 - 15th Dec (Max 13/14th Dec)
Cheshunt DARC: Junk Sale
Fareham RC: *Tests on Your Radio by G8GNB*
Nene RC: closing date for Construction Trophy
Stockton DRS: ring PRO for details

8th Dec
Edgware DRS: Junk Sale (provisional)
Harrow RS: Junk Sale
Smiths Industrial RC (Cheltenham): Antenna Talk

9th Dec
Abergavenny ARC: Christmas Dinner at Llanwenarth Arms, (on A40) Abergavenny
Spalding DARS: Annual Junk Sale

10th Dec
Colchester RA: Annual Dinner at Wivenhoe House, 7.30pm
Three Counties RC: Christmas Dance

11th Dec
Leeds Christmas Rally, Civic Centre, Pudsey, Nr Leeds. Opens 10.30am. Admission Free

12th Dec
Stratford-Upon-Avon DRC: Activity Night
Plymouth RC: Christmas Quiz

13th Dec
Exeter ARS: *Computers* (special venue)
Bury RS: AGM (followed by wine and cheese)
Biggin Hill ARC: Surplus Equipment Sale
Stevenage and DARS: Constructors Evening
Wakefield DARS: Christmas Social

14th Dec
Cheshunt DARC: Natter Nite

	Fareham RC: Natter Nite
	Farnborough DARC: Christmas Social
	Nene Valley RC: *GB3PI by G8HVV*
15th Dec	Greater Peterborough ARS: Informal at 'The Windmill', Orton, Waterville at 7.30pm
	Colchester RA: *St John Ambulance Brigade*
16th Dec	Medway AR&B: Christmas Social Evening
	Cheshunt DARC: Christmas Dinner
	Cambridge DARC: Informal
17th Dec	Ursids Meteor Shower (Max.22 Dec)
	Chichester DARC: Christmas Social
	Plymouth RC: Christmas Social
19th Dec	Stourbridge DARS: Ring PRO for details
	Leighton Linslade RC: Christmas Party
	Braintree DARS: Christmas Party
	Rhyl DARC: ring PRO for details
20th Dec	Mid-Warwickshire ARS: Christmas Dinner
	Stevenage DARS: Natter Night
	Fylde ARS: Informal
21st Dec	Cheshunt DARC: Video Show by G8NDA
	Hastings E&RC: Christmas Social
	Nene Valley RC: Christmas Social
22nd Dec	East Kent RS: Christmas Party
23rd Dec	Sutton and Cheam RS: Christmas Party
27th Dec	Aylesbury Vale RS: Annual Dinner
	Wakefield DARS: Natter Nite
1st Jan	Edgware DARS 'Straight Key Night' on 2m. (CW activity night with 'pump handles' only – strictly no el-bugs!!!) 1900 hours onwards
	YOUR NEW YEAR'S RESOLUTION! RAE applications must be in by 14th January. Check with your local Radio Society for whereabouts of nearest examination centre.
2nd Jan	Stourbridge ARS: Informal
	Rhyl DARC: ring PRO for details
3rd Jan	Stevenage DARS: ring PRO for details
	Fylde RS: AGM
5th Jan	East Kent RS: Natter Nite
9th Jan	Stratford-Upon-Avon DARC: *Maritime Radio Services by G3MXH*
10th Jan	Mid-Warwickshire ARS: Natter Nite
	Stevenage DARS: Constructors Evening
12th Jan	Edgware DARS: AGM
14th Jan	CLOSING DATE FOR APPLICATIONS FOR RAE MARCH '84
16th Jan	Braintree DARS: *DX Operating by G3OLU*
	Stourbridge DARS: Annual Constructors Contest
	Rhyl DARC: ring PRO for details
17th Jan	Fylde ARS: Informal
	Stevenage DARS: Grand Auction
19th Jan	East Kent RS: Talk on Crime Prevention
23rd Jan	Stratford-Upon Avon DARC: Construction (Bench facilities available)
24th Jan	Mid-Warwickshire ARS: 'What have you made?' Bring along your homebrew (and radio gear!)
	Biggin Hill ARC: AGM
26th Jan	Greater Peterborough ARS: AGM
5th Feb	Ham Feast (a rally with a difference!) at the Mosses Centre, Cecil Street, Bury, Lancs. Doors open 11am. Talk-in on S22. Bring and Buy. Food and drink available

Will Club Secretaries please note that the deadline for the February segment of *Radio Tomorrow* (covering radio activities from January 7th – 1st March '84) is 15th December '83.

Contacts:

Abergavenny ARC	D. Ffestin Jones	0495-79617
Biggin Hill ARS	Ian Mitchell	0959-75785
Braintree DARC	Pat Penny	0376-26487
Bury RS	Brian Tydesley	Bury 25454
Cambridge Repeater Grp	Chris Lorek	0354-740672
Cheshunt DARC	Roger Frisby	0992-464795
Edgeware RS	Howard Drury	01-952-6462
Fareham RC	Brian Davey	0329-234904
Fylde RS	F. Whitehead	0253-737680
Hastings E&RC	Tony Masters	0424-51569
Kelso ARS	Andre Saunders	0573-24664
Leighton Linsdale RC	Pete Brazier	05253-270
Maltby ARS	Ian Abel	Maltby 814911
Mid-Warwickshire ARS	Carol Finnis	092681-4765
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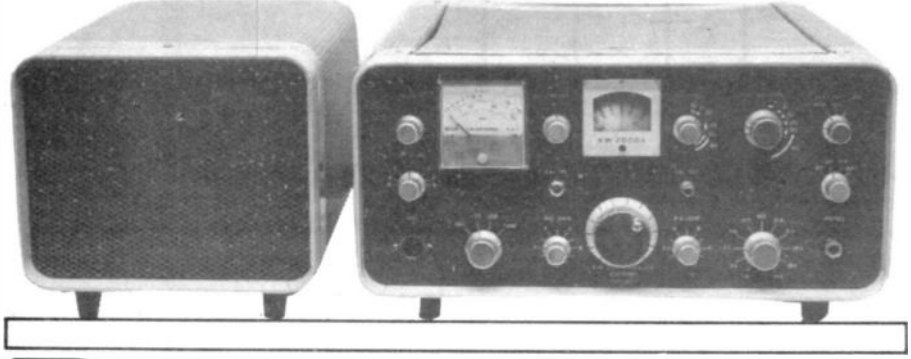

Part 7

Simple RF attentuator design plus switching circuitry for an 'outboard' receiver and seperate 'transmit' and 'receive' aerials.

By Malcolm Healey, G3TNO, and R. Charles.

After the foregoing articles in this series, a number of small refinements remained on the list of desirable extras worth incorporating in our KW2000 series of transceivers update. These were (1) To be able to use a separate outboard receiver for split frequency operation; (2) To be able to use separate aerials on 'receive' and 'transmit'. For example, when operating on 160 metres it is useful to use a loop aerial on 'receive' in order to null out QRM, particularly when chasing DX; (3) To have the facility to switch in an RF attenuator on 'receive' when using large aerials. This is particularly useful on the lower frequency bands ie 7 and 3.5 MHz where the receiver front end on the KW 2000 has been found to be prone to RF overload on largish arrays such as Vee beams or very long wires.

The above modifications can be achieved very simply. All or part of the modification may be readily incorporated, depending on your own needs.

Fig. 5000 shows the circuit details. Switch 5000 is fitted inside the case of the KW 2000 an approximate 2¼ inches to the left of the IRT/ITT switch and in line with the existing cab/set control. Switch 5000 is the attenuator control switch. The user must select the value of the attenuator to be fitted as this largely depends upon the type and size of aerials in use. **Fig. 5000** gives resistor values and attenuation values up to −40dB which, unless you have stolen the aerial system at BBC Daventry, should more than cover most amateur uses!

The switching circuitry for alternative aerials and an outboard receiver has been fitted outside the KW 2000 itself, as this gives greater flexibility. At G3TNO this was incorporated in the station control and switching unit, which also controls the switching of the station aerials. Only the circuitry relevant to the modification is shown (see **Fig. 5001**).

After incorporation of the above modifications, in particular that of the RF attenuator, it is really amazing to hear the improvement in reception on, say, the extremely crowded 7MHz band after dark. Much DX that just

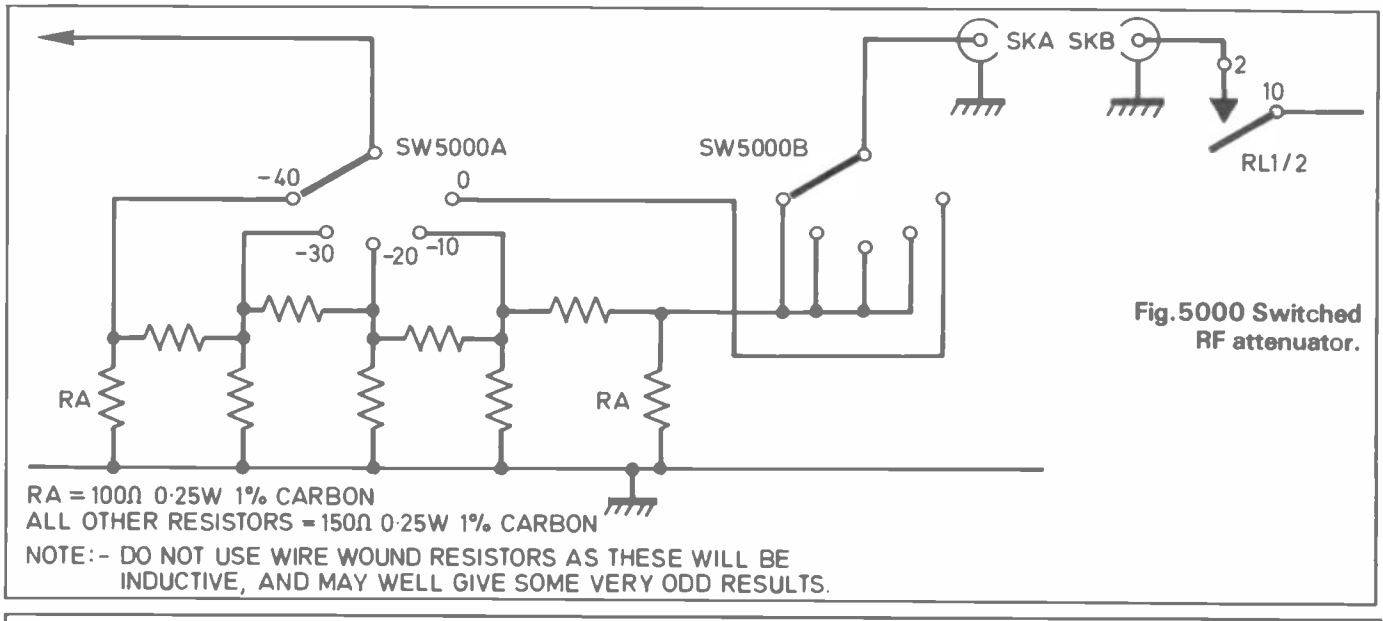

Fig. 5000 Switched RF attenuator.

RA = 100Ω 0·25W 1% CARBON
ALL OTHER RESISTORS = 150Ω 0·25W 1% CARBON

NOTE:- DO NOT USE WIRE WOUND RESISTORS AS THESE WILL BE INDUCTIVE, AND MAY WELL GIVE SOME VERY ODD RESULTS.

could not have been resolved before the above modification was now easily readable, with much reduced interference, because of the reduction in RF 'cross-modulation' of the KW 2000.

Extra CW Selectivity

Extra selectivity has been added to the KW 2000 A in use at G3TNO and has been found worth while in *very* heavy QRM conditions. This was made up as a 'plug in' extra and generally used only during contests. A shorting link replaces the extra xtal (see **Fig. 5002**) for less heavily occupied band conditions.

A Few Conclusions

Since the start of this series of articles a number of people have contacted the writers and asked for practical help in getting their defunct KW 2000s going. So far, in most cases, the problems have been rapidly resolved. We have usually found that a step in the procedure of checking through the KW 2000 has been missed; sometimes a voltage has not been checked, or an alignment stage incorrectly carried out or even not done at all!

However, a few rather more obscure problems have arisen and are well worth a mention in these pages. Two cases of severe instability, on both 'transmit' and 'receive' were found to be due to the owners of the rigs concerned having used rather obscure (!) manufacturers equivalents to the valve types listed. In both cases although the correct type number was on the envelope of the valve, there was actually no manufacturers name. At a guess the valves probably came from eastern Europe. Replacement with the correct types from well known manufacturers (Brimar and Mullard) cured the problem. So, be careful of the pedigree of your replacement components! The second problem encountered was slight chirp on CW, even after the CW note modification, combined with FM on SSB at full drive levels on 80-10 meters. This was found to be due to a non-standard mains transformer being fitted in the PSU and in one case was with a 'home brew' PSU. In both cases the problem was essentially a lack of HT 'stiffness' and two actions have been taken to effect a 100 per cent cure. Firstly, the 250V HT decoupling in the PSU was increased in value to 250uF, and then a 32uF capacitor was fitted across the thermionic (valve) voltage stabiliser in the KW 2000 itself. These modifications completely cured the chirp and FM on SSB and I believe are worth fitting to apparently trouble free KW 2000s.

Whilst the modifications described in this series are by no means the ultimate as to what can be done with an original KW 2000 it is hoped that the articles will encourage a few to be brought out of those dusty corners, re-vamped, and used on the bands instead of rotting away. I must say that judging from your letters this appears to have happened. As a final thought from the writers: how about making the VFO solid state? and also adding a digital read-out of frequency? Well, you write the articles and we will give them a try! (How about this?)

The writers would like to thank the countless number of people who have given reports on our signals both before and after our modifications.

Some correspondence has been received at HRT regarding various aspects of the KW 2000 update series. Malcolm has kindly written answers to these and they will be published along with the original correspondence in the 'Letters' section of the February dated issue.

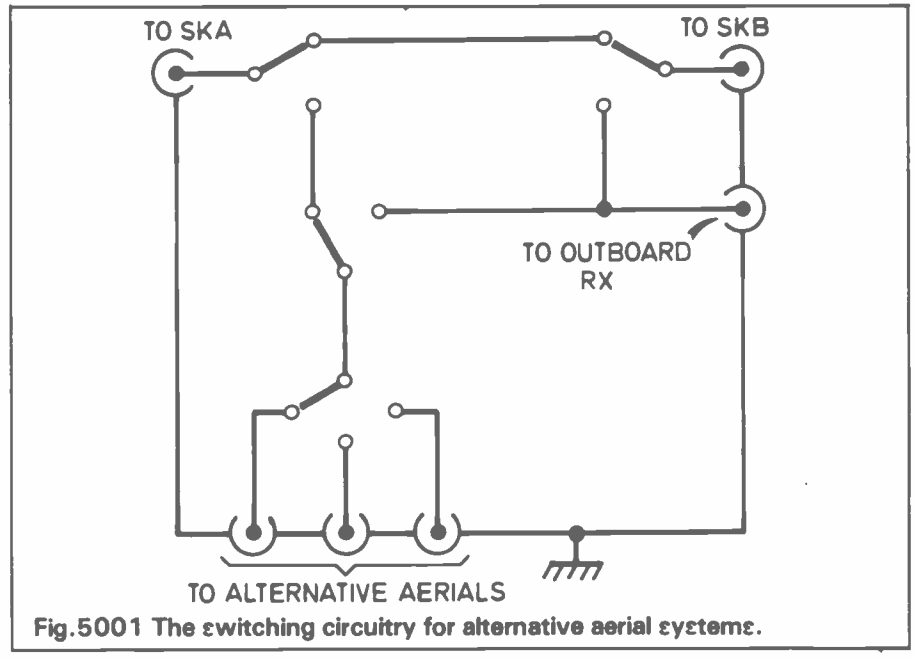

Fig.5001 The switching circuitry for alternative aerial systems.

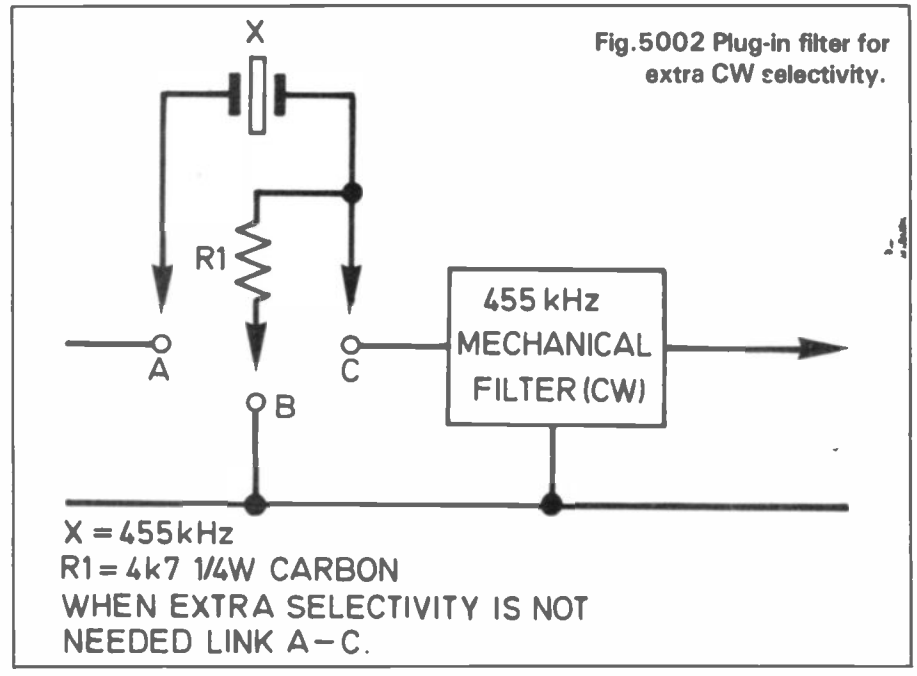

Fig.5002 Plug-in filter for extra CW selectivity.

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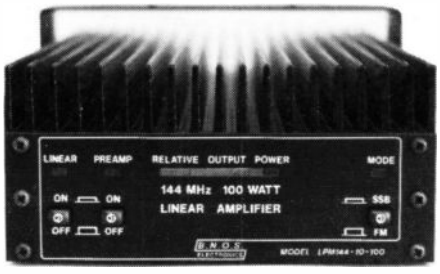

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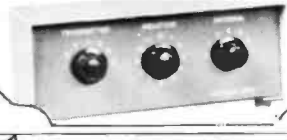

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