

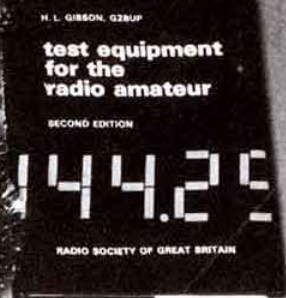


December 1979

radio communication

journal of the Radio Society of Great Britain

RSGB BOOKS FOR CHRISTMAS



A STAR IS BORN ANOTHER FIRST FROM Catronics

70cms SYNTHESIZED TRANSCEIVER



PHILIPS TYPE FM321



HAVE A HAPPY
CHRISTMAS ON 70cms
WITH PHILIPS FM321



THERE ARE NOW
74 X 70cms REPEATERS
PLANNED OR OPERATIONAL

Catronics are proud to announce the availability of the world's first 70cms 40 channel FM mobile transceiver in the UK. Especially made to our own specification by Philips—Europe's largest manufacturer of Radiotelephone equipment.

Just look at its star packed features:

- ★ Full 40 channel coverage RBO to SU39
- ★ Direct LED display of channel number
- ★ Electronic Channel change up or down from front panel
- ★ Remote Control channel change on microphone
- ★ 3 position squelch control for ease of operation
- ★ "Auto switch on" to channel 20
- ★ "Nominated Repeater Position" may be preprogrammed to your local Repeater channel for instant access
- ★ Crystal controlled Toneburst operates in Repeater Mode
- ★ Receiver sensitivity 0.3µV for 12dB SINAD
- ★ Transmitter output power 5W minimum, gives typically 25W e.r.p. with Jaybeam U5 mobile antenna
- ★ Supplied complete with mobile mounting bracket, microphone with P.T.T. and channel change, operating manual etc

The Philips FM321—We want you to have the best
IN STOCK NOW

at only £247.50 inc. VAT—Free delivery if ordered in 1979

70cm mobile aerials available: 8' whip, £8.65; 3dB colinear, £10.55; Jaybeam U5, £17.25

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EDITOR

A. W. Hutchinson

Assistant editor

Mrs M. J. Collins

Draughtsman

D. E. Cole

Editorial secretary

Mrs J. D. Brown

Contributions (including Members' Ads) and all correspondence concerning the content of *Radio Communication* should be addressed to:

**The Editor, RSGB,
88 Broomfield Road,
Chelmsford,
Essex CM1 1SS**

Tel 0245 84938

Office hours: 0845 to 1645

Correspondence concerning the distribution of the journal and all other Society matters should be addressed to:

**RSGB Headquarters,
35 Doughty St,
London WC1N 2AE**

Tel 01-837 8688

Office hours: 0915 to 1715

ADVERTISING

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**Mr C. C. Lindsay,
2 Leyburn Gardens,
Croydon,
Surrey CR0 5NL**

Tel 01-686 5839

Hours: 0915 to 1715

EDITORIAL PANEL

J. P. Hawker, G3VA
R. F. Stevens, G2BVN

radio communication

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PAUL
G3VJF



IT'S HERE!!

GET HER (OR HIM) TO BUY YOU ONE FOR XMAS!



THE MOBILE OF CHOICE FROM THE WORLD FAMOUS

ICOM STABLE — THE IC-255E



**25 Watts—5 Memories—Scanning—600kHz AND User Selectable Repeater Shift—
Full Coverage in 5kHz or 25kHz Steps**

We have had a poke around one of these little beauties and are certain that ICOM, yet again, have come up with a winner. As you can see it has the expected smart ICOM appearance. Features include:-

- ★ Crystal controlled Tone Burst
- ★ Full band coverage—extendable to 148MHz if required
- ★ Four digit LED display
- ★ 25 Watts output or 1W low power.
- ★ A superb receiver using grounded gate FET front end
- ★ Scanning over a user programmable range
- ★ Memory scan
- ★ Stop on empty or busy channels
- ★ Tuning in 25kHz or 5kHz steps
- ★ 5 Memories—retained while the power is connected to the rig
- ★ Built-in 600kHz Repeater Shift
- ★ Alternative programmable shift
- ★ Reverse Repeater facilities
- ★ RIT (± 3 kHz) for those off channel stations
- ★ Scan control from the microphone (an optional mic available shortly)
- ★ Good loud audio
- ★ Optically coupled tuning between control knob and CPU
- ★ Multiway 24 pin socket on back for touchpad, computer, or external control (note the current RM3 cannot be used but a new version is to be introduced)
- ★ Rugged modular PA (Guaranteed of course!)
- ★ Mobile mount which can be padlocked

At £255 including VAT these are such value for money that demand may exceed supply for a while—but they are worth waiting for! (Delivery is free of course by Registered First Class Letter Post.)

FROM **THANET** OF COURSE

INTRODUCING A SELECTION OF OTHER PRODUCTS AVAILABLE FROM THANET



"NEW" 747 AIRCRAFT BAND SCANNING RECEIVER

Features:

- 16 channel capability
- Scanning or manual selection
- Operates from either 240V ac or 13.8V dc
- Includes built-in swivel telescopic antenna. Socket for connections to external antenna
- Built-in speaker and jack for connection to external speaker
- Delay facility to ensure that the whole of the conversation is received
- Swivel car mounting-bracket supplied

Price £119.00 including VAT fitted with 4 channels.
Additional channels £2.00 each.

"NEW" TSI VHF FM AUTO SCANNER

Features:

- 10 channel capability
- Covers Marine or Amateur or High Band—state which
- Very small pocket sized
- Telescopic antenna (removable)
- External antenna socket
- Earphone that can serve as an antenna too
- Nicad rechargeable batteries 4.8V included
- Carrying case

Price £51.10 inc. VAT. Charger and holder/antenna coupler available £9.20
Crystals Marine and Amateur £1.84

LESON MICROPHONES

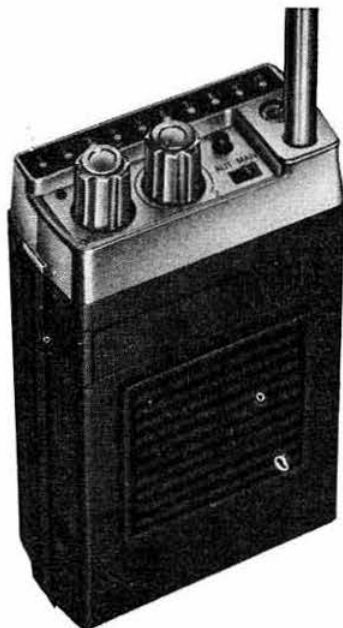
TW23 Desk mic ceramic 0-30dB variable compression	£25.00
DH18 500 Ohms Hand mic moving coil	£5.10
CH229 Hand mic ceramic 0-35dB. var. compression	£15.40
DH233 Hand mic moving coil 0-15dB preamp	£9.20
Vicom noise cancelling mic, moving coil very effective	£8.00

MORSE KEYS

BK semi-automatic bug key	£20.35
HK706 Hand Key	£12.15
MK704 Manipulator Key	£12.25
GB Key	£10.00

TYPE APPROVED MARINE EQUIPMENT

ICOM ICM25D Synthesized 24 channel 25 Watt	£299 incl.
SMC Mariner 1 Watt portable 6, 8, 16 fitted + nicads and base charger	£199.00
V8001 1 Watt portable 6-16 nicads, charger + H.D. case	£189.75



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There's not much more you can say!

It's over five years since we started to represent ICOM in the UK—and since then thousands of UK amateurs have bought it, tried it, and liked it. We are proud to represent Icom here and do our best to provide the back-up service which a product of this quality deserves. We have a service department to be proud of, with up to date (and expensive) test equipment, plus engineers whose job it is to know Icom equipment. If you can get over to see us, we will be pleased to demonstrate the range and let you operate our station (if you are licensed). If you find Kent too far away and would like to see before you buy then why not visit one of our agents and dealers scattered throughout the country.



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WE ARE CLOSED
FOR XMAS
23 DEC to 1 JAN**



AGENTS (PHONE FIRST—All evenings and weekends only, except Barnsley and Burnley)
Scotland—Jack GM8GEC (031-665 2420) Wales—Tony GW3FKO (0222 702982)
Burnley—(0282 38481) Midlands—Tony G8AVH (021-329 2305)
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THE ICOM® RANGE



1 IC-215

The highly popular portable which gives out a healthy 3 watts of RF and runs from sensibly sized batteries. With 15 channel capability it comes fitted with 12 pairs of crystals—All 10 repeaters + S20 and S22.
Less VAT = £140.87 Inc VAT = £162.00

2 IC-202S

The popular little SSB/CW portables which make the ideal rigs for portable or /A use when used barefoot with 3W out, or alternatively, as the signal from them is so clean, can be used as a prime mover for something bigger. The IC-202E ran USB and CW only, while the new IC-202S runs USB, LSB and CV.
IC-202S Less VAT = £173.03 Inc VAT = £199

3 IC-402

ICOM's new portable in the same style case as the IC-202 which runs 3 watts of SSB on 70cm! Again ideal as either a portable or as a prime mover for the base station. Continuous tuning of the second oscillator gives coverage over ranges 432.0-432.2 and 432.2-432.4 using a stable VXO circuit—see page 560 of July RADCOM for specs.
Less VAT = £255.65 Inc VAT = £294

4 IC-701

The ultimate in HF base station transceivers which is becoming very popular across the whole world. It uses a synthesizer to produce one of the nicest signals to be heard on HF. All solid state, with 200w DC input and complete with an electret desk mic. The ideal mobile rig—see our separate advertisement on page 561 of July RADCOM.
Less VAT = £695.65 Inc VAT = £800

5 IC-701PS

Mains PSU for the IC-701 complete with extra forward facing matching speaker.
Less VAT = £86.09 Inc VAT = £99

6 IC-SM2

A superb quality electret desk mic with a built-in pre-amp. Can be powered without modification from all ICOM equipment having a four-pin mic socket. Can also be used with other makes of equipment.
Inc VAT = £26

7 IC-211E and IC-245E

The fully synthesized two metre multimode which is now well known and very popular. Using the ICOM patent LSI chip, this rig, and its mobile partner the IC-245E can be interfaced with the microprocessor-controlled IC-RM3 to provide facilities just not possible with other rigs.
IC-211E Less VAT = £477.39 Inc VAT = £549 IC-245E Less VAT = £346.96 Inc VAT = £399

8 IC-RM3

The new and very popular remote controller for the IC-701, IC-211E and IC-245E. Using a microprocessor it provides facilities for scanning (the whole band or user selectable portions of it) and has four memories for frequency storage. Sorry about the waiting list, demand is greater than supply at the moment.
Less VAT = £86.09 Inc VAT = £99

9 IC-280E

The mobile transceiver introduced by ICOM for the man who wants the best and finds it difficult to mount most mobile rigs in his car. Gives full coverage of 2m in 25kHz steps with digital readout of frequency. Has all the qualities and virtues expected of ICOM equipment. The front panel can be removed and mounted elsewhere in the car using the special remote mounting kit which is available as an extra. Also available with scanner for £10 extra.
Less VAT = £226.09 With VAT = £250.

10 IC-255E

The new 25W super mobile to beat them all using the latest microprocessor technology to provide full band coverage, 5 memories, memory or user selectable band sections. See our separate ad for more details.
Less VAT = £221.74 With VAT = £255.00

Phone—or put a message on the ansafone for a colour catalogue and price lists

ALSO AVAILABLE FROM OUR SHOP IN HERNE BAY

MICROWAVE MODULES

ANTENNA SPECIALISTS

J-BEAM

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**THE STAFF OF THANET WISH ALL THEIR CUSTOMERS
A MERRY CHRISTMAS AND A HAPPY NEW YEAR**



AMATEUR ELECTRONICS UK

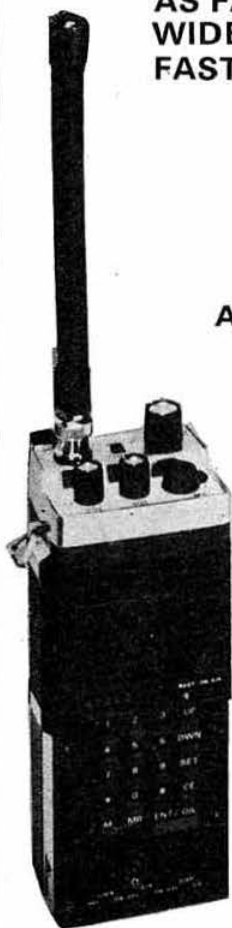
AEUK – Your number one

AS FACTORY APPOINTED DISTRIBUTORS WE OFFER YOU—
WIDEST CHOICE, LARGEST STOCKS, PROMPTEST DEAL AND
FAST, SURE SERVICE RIGHT THROUGH—

FT-207R

THE LATEST FROM YAESU'S 2M STABLE

All-new microprocessor-controlled
front panel keyboard
Four channels of memory
Digital display
Keyboard lock

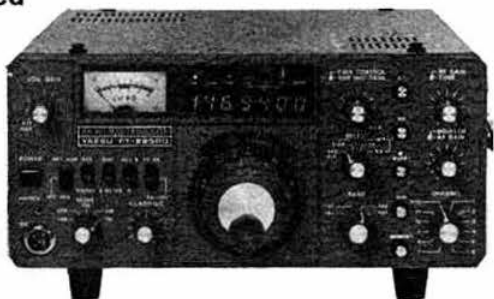


THE SUPER FT-225RD ▶

THE 2m BASE STATION THAT HAS
EVERYTHING, DESIGNED FOR THE
MAN WHO INSISTS ON THE BEST.



THE WIDEST CHOICE FROM 2-10
THE YAESU RANGE IS NOW SO GREAT
THAT IT SIMPLY CATERS FOR EVERY
TASTE – THIS MAKES IT A *MUST* TO
BROWSE THROUGH YAESU'S MAIN
CATALOGUE—PLEASE SEE OUR OFFER
ON FACING PAGE.



THE FT-901DM IS THE HF BASE STA-
TION *PAR EXCELLENCE* AND ITS
RECEIVER PERFORMANCE ALONE
IS SIMPLY OUT OF THIS WORLD.
TOGETHER WITH THE RANGE OF
MATCHING ANCILLARY UNITS—
WHICH ARE GROWING ALL THE
TIME—THIS BUILDS A STATION
WHICH FULFILLS EVERY CON-
CEIVABLE REQUIREMENT FOR THE
OPERATOR WHO DEMANDS THE
ULTIMATE.

HOW TO REACH US (EASY PRIVATE PARKING ON OUR 70ft. FORECOURT)

FROM SOUTH AND EAST. We are located approximately two miles from Junction 5 of the M6 from which follow signposts to Birmingham. Within 1 mile turn right at Clock Garage and proceed towards city. After one mile look for traffic lights at Fox & Goose and immediately over the lights take minor left fork into Alum Rock Road. We are located one mile from this point.

FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway complex. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100 yds. veer again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.

FROM THE WEST AND SOUTH/WEST. Follow M5 then M6 to Spaghetti Junction (see above). Alternatively, leave M5 at junction 4 or 3 and proceed to inner ring road. Turn South on ring road and leave on A47 (East). We are located three miles from this point.

Hours: 9.30-5.30 Continuous including Saturdays—Early closing Wednesday, 1 p.m.



**AMATEUR ELECTRONICS WISH ALL THEIR
CUSTOMERS A VERY HAPPY CHRISTMAS
AND A PROSPEROUS NEW YEAR**



AMATEUR ELECTRONICS UK

source for **YAESU MUSEN**



THE SUPERB FT-101Z AND FT-101ZD TRANSCEIVERS ARE NOW APPEARING IN LARGE NUMBERS ON THE H.F. BANDS FOR THE SIMPLE REASON THAT THEY REPRESENT THE BEST VALUE FOR MONEY AVAILABLE TODAY BUT PRICE NOTWITHSTANDING MANY OPERATORS ARGUE THAT THE RECEIVER PERFORMANCE IS SUPERIOR TO ANYTHING THEY HAVE HANDLED BEFORE—CALL, 'PHONE OR WRITE (PLEASE SEE FACING PAGE) FOR FULL DETAILS.



FT101ZD Series High Performance Transceiver

FULL COVERAGE

Full band coverage is provided on the FT-101ZD: 160 through 10 meters, plus WVV/JJY reception on 5MHz. Teamed with the FTV-901R transverter, operation can be extended to 72, 144, and 430MHz from your desk top.

CLEAN OUTPUT SIGNAL

With today's crowded bands, we all have the responsibility to keep our transmitted signal free of spurious radiation. YAESU engineers have included RF negative feedback, for a clean output signal.

STATE OF THE ART NOISE BLANKER

The all-new noise blanker is extraordinarily helpful in reducing the level of impulse noise. The blanking level may be adjusted from the front panel.

RF SPEECH PROCESSOR

A high-performance RF speech processor is built into every FT-101ZD, providing an increase in your average talk power of approximately 6dB. The processor level can be adjusted from the front panel, for optimum signal enhancement.

WORLD-WIDE POWER CAPABILITY

The FT-101ZD has provision for operation from a variety of AC voltages, from 100 to 234 volts. When you're travelling, you'll never need a heavy, bulky transformer for operation with your FT-101ZD. A DC-DC converter is an available option, for mobile operation. The FT-101ZD is small enough to qualify as carry-on baggage on most airlines, and is equipped with a strong, side-mounted handle for ease of carrying.

VARIABLE IF BANDWIDTH

Using two 8-pole crystal filters with superior shape factors, the FT-101ZD variable bandwidth system is a valuable tool on today's crowded bands. With the turn of a dial, high-pitched SSB "buckshot," or unwanted CW signals, can be eliminated from the IF passband.

Compare for yourself: other systems use a single filter in the IF; though you can move away from one interfering signal, you may move into more QRM. The YAESU design actually varies the bandwidth, eliminating the QRM. Other manufacturers would have you spend hundreds of pounds on different filters for 2.1kHz, 1.8kHz, 1.5kHz, 800Hz, 500Hz, etc. With the FT-101ZD, you have continuously variable bandwidth—from 2.4kHz down to 300Hz.

DIGITAL PLUS ANALOG READOUT

The FT-101ZD features digital plus analog frequency readout. The display features big, bright LED digits, for maximum readability. For extra savings, the economy model FT-101Z gives you the same precision analog display, at a significantly reduced cost. You can add the digital display later, if you wish.

INTERFACE WITH 901 SERIES COMPONENTS

Your FT-101ZD may be used with all of the exciting FT-901DM series accessories. The FV-901DM synthesized, scanning VFO provides storage and recall of up to 40 frequencies, in addition to its 3-speed scanner and auto scan function. See for information on other accessories.

36p IN STAMPS BRINGS YOU THE LATEST YAESU GLOSSY CATALOGUE WHICH GIVES FULL SPECIFICATIONS TOGETHER WITH DETAILS OF THE EVER-GROWING YAESU RANGE—AND AS AN ADDED BONUS YOU WILL GET OUR CREDIT VOUCHER VALUE £3.60—A 10-1 WINNING OFFER!



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LOWE ELECTRONICS Ltd



THE ALL NEW TS 180S



Digital Frequency Control* ... a TRIO innovation for maximum HF operating enjoyment!

Trio's TS-180S with DFC is an all solid-state HF transceiver designed for the DXer, the contest operator, and all other Amateurs who enjoy the 160 through 10-meter bands. The following features prove, beyond doubt, that the TS-180S is the finest rig available!

Digital Frequency Control (DFC), including four memories and manual scanning. Memories are usable in transmit and/or receive modes. Memory-shift paddle switches allow any of the memory frequencies to be tuned in 20-Hz steps up or down, slow or fast, with recall of the original stored frequency. It's almost like having four remote VFOs!

All solid-state . . . including the final. No dipping or loading. Just dial up the frequency, peak the drive, and operate!

High power . . . 200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters. Also covers more than 50kHz above and below each band (28-30MHz,) WARC, etc.), and receives WWV on 10MHz.

Improved dynamic range.

Adaptable to all three proposed (WARC) bands.

Single-conversion system with highly advanced PLL circuit, using only one crystal with improved stability and spurious characteristics.

Built-in microprocessor-controlled large digital display. Shows actual VFO frequency and difference between VFO and "M1" memory frequency. Blinking decimal points indicate "out of band." Monoscale dial, too.

IF shift . . . Trio's famous passband tuning that reduces QRM.

Selectable wide and narrow CW bandwidth on receive (500-Hz CW filter is optional).

Automatic selection of upper and lower sideband (SSB NORM/SSB REV switch).

Tunable noise blanker (adjustable noise-sampling frequency).

RF AGC ("RGC"), which activates automatically to prevent overload from strong, local signals.

AGC (selectable fast/slow/off).

Dual RIT (VFO and memory/fix).

Three operating modes . . . SSB, CW, and FSK.

Improved RF speech processor.

Dual SSB filter (optional), with very steep shape factor to reduce out-of-passband noise on receive and to improve operation of RF speech processor on transmit.

13.8 VDC operation.

Also available is the TS-180S without DFC, which still shows VFO frequency and difference between VFO and "hold" frequencies on the digital display.

Full line of matching accessories, including PS-30 base-station power supply, SP-180 external speaker with selectable audio filters, VFO-180 remote VFO, AT-180 antenna tuner/SWR and power meter, DF-180 digital frequency control, YK-88 CW filter, and YK-88 second SSB filter.

Those operators who are fortunate enough to now own a TS180S are sending back reports that it's the best HF transceiver they have ever owned. We happen to agree with them but if you need more convincing, why not come to Matlock to try one out on the air—or see it at Leicester this year—or send for full details right now.

With Trio's design capability and the Lowe Electronics back-up, how can you go wrong?

TS180S without DFC
—£712, including V.A.T.
TS180S with DFC
—£825, including V.A.T.
PS30 12V 20A supply
—£98, including V.A.T.

**SEND 50p IN STAMPS FOR COMPLETE CATALOGUE AND ANTENNA BOOK
PLEASE SPECIFY ANY PARTICULAR INTEREST AND WE WILL SEND FULL INFORMATION**

LOWE ELECTRONICS Ltd

TS-120—The system approach by **TRIO**



What do we mean by the "System Approach"? Well, take the TS120V at **£408**, including V.A.T. and you have the finest 20W PEP mobile HF transceiver you could buy. Consider the single conversion, PLL derived, top performance transceiver; the passband tuning; the digital readout; the noise blanker; the superb engineering; THEN maybe add the matching mains PSU for home use: PS20 **£52**, including V.A.T.; and you have an equally great fixed station; OR maybe add the extra VFO, or the external speaker and the 100 Watt ATU: SP120 **£25.50**, including V.A.T.; AT120 **£69**, including V.A.T.; OR maybe take a look at the new TS120S at **£495**, including V.A.T. What's the TS120S?

It's a compact, up to 200 watts PEP input, all solid-state HF transceiver with such standard features as built-in digital readout, IF shift, new PLL technology . . . and requires no tuning!

Exciting and perfect for car or ham shack use! But, there's more to say about the TS-120S! This unique all solid-state HF, SSB/CW transceiver produces a hefty signal and also offers a lot of other great features in a very attractive, compact package.

FEATURES:

All solid-state with wideband RF amplifier stages. No final dipping or loading, no transmit drive peaking, and no receive preselector tuning! *Just dial your frequency and operate!*

Five bands, plus WWV. Transmits and receives on 80/75, 40, 20, 15, and all of 10 meters . . . and receives WWV on 15MHz.

200 watts PEP (160 watts DC) input on 80-15 meters, 160 watts PEP (140 watts DC) input on 10 meters. LSB, USB, and CW.

Digital frequency display (standard). 100-Hz resolution. Six digits. Special green fluorescent tubes eliminate viewing fatigue. Analog subdial, too, for backup display.

IF shift (passband tuning), to remove adjacent-frequency interference and sideband splatter.

Advanced PLL circuit, which eliminates need for heterodyne crystal element for each band. PLL lock frequency, CAL marker signal, and counter clock circuit use single reference frequency crystal. Simplifies circuitry, improves overall stability. Also improves transmit and receive spurious characteristics.

Attractive, compact design. Measures only 3½" high x 9½" wide x 13½" long, and weighs only 4.9 kg (11.7 lbs.) A perfect size for convenient mobile operation and rugged enough for either mobile or portable use. Also has all the desired features for optimum ham-shack operation at home.

Noise blanker. You'll wonder where the ignition noise went.

See the big little TS-120S rig and matching accessories (VFO-120 remote VFO, SP-120 external speaker, PS-30 AC power supply, MB-100 mobile mounting bracket, AT-120 antenna tuner and YK-88C CW Filter) at the centre for all that's good in Amateur Radio—LOWE ELECTRONICS in MATLOCK. Or—send for full details right now.

TRIO + LOWE = SATISFACTION.

LOWE ELECTRONICS Ltd

NEW! R 1000



Stand by to receive the World!

It's goodbye Wadley loops and hello to the new, true up-conversion, PLL system HF general coverage receiver from Trio.

The new R-1000 is going to turn the general coverage receiver world upside down since it combines professional performance with a really attractive price, thanks to Trio's commitment to using advanced technology to simplify operation rather than make complex gimmicky.

The R-1000 uses an advanced PLL system in an up-conversion scheme to a high (48MHz) first IF to remove any possibility of image responses. The receiver covers the entire frequency range from below 200kHz right up to 30MHz in 30 bands, each 1MHz wide. The bands are selected, not by ambiguous knob twiddling as in receivers using the Wadley loop but by a 30 position band switch which controls the PLL system.

The band switch also electronically selects the appropriate band pass filter network in the RF stages of the receiver so there are no "preselector" or "antenna trim" controls to twiddle—simply set the band switch to the range required—that's it!

A highly stable VFO tunes each 1MHz range and its linear, back lit scale makes readout easy. However, in addition to this dial, Trio have also provided 5 digit true frequency digital readout so as to guarantee spot on accuracy on any frequency. As a further feature, the digital display can also be switched to read time, this being derived from a quartz standard. Marvellous for accurate log keeping. The display uses high intensity readout units which can be dimmed for use in low light conditions.

As for what else is inside this superb instrument—selectivity is catered for by three custom made IF filters; a 12kHz wide AM filter; 6kHz nar-

row AM filter; and a new 2.7kHz SSB filter with a shape factor of better than 1:2 6:60dB. Selectable sidebands are available at the touch of a switch.

For the first time in a mid price receiver, a true noise blanker is provided to remove pulse type ignition noise.

To minimise front end overload, a step RF attenuator is included which gives 0-60dB attenuation in four steps.

All the rear panel connectors are recessed on a sloping panel so that you can stand the receiver either on its back, or pushed hard against a wall when used in conventional shelf mounting. The antenna inputs allow the use of either a high impedance wire aerial or a 50ohm balanced input so that the proverbial long lump of wire will work really well with the R-1000.

Almost forgot—the R-1000 will work from either 12V dc or any mains supply from 100-240V 50/60Hz so you can really take it anywhere with you.

We're not too convinced about the carrying handle but the people we asked were divided almost 50:50 on this aspect so—leave it on. After all, the design allows it to be folded away out of sight!

How big? 300mm wide x 115mm high x 218mm deep

How heavy? 5.5Kg (about 12lb)

How much? Not yet decided but about £295.00, including V.A.T.

How soon? Get thi' name down now. Demand will outstrip supply.

The basic features of the R-1000 do not tell the full story, because you cannot explain the superb "feel" of the receiver until you can handle it in the flesh. So, the advice is to see it soon at Lowe Electronics in Matlock.

ASK ABOUT OUR NEW CREDIT CARD — DETAILS ON OPPOSITE PAGE

LOWE ELECTRONICS Ltd

HF5

**5 BANDS
8-10 METRES
SELF-SUPPORTING
VERTICAL**

The new HF5 vertical aerial is a real answer to the problem of fitting a five-band aerial in a small space.

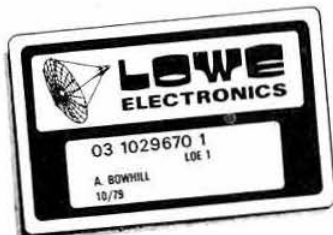
Needing only a metal ground post, and being only around 15 feet high, the Lowe HF5 gives you real DX performance at a surprisingly low cost.

The HF5 is made from strong alloy tubing with stainless hardware and unlike some other verticals currently on the market, gives a 50 ohm match at the base so that any length of coaxial feeder may be used. Beware the vertical which needs a critical feeder length, it's simply a disguise for a feed line with a high SWR.

If you need to mount the HF5 up at roof level or on the top of a pole, a matching five-band radial system is available. This system comprises a loading coil and alloy radial elements so as to reduce the space taken up by the aerial system. The cost of this radial kit is lower than the HF5 and certainly a lot more convenient than trying to stretch out long wire radials across the roof.

The HF5 system gives you coverage from 80 to 10 metres, a good 50 ohm feed impedance and a reasonable power rating of 200W on 80 and 40, rising to 500W on 20, 15 and 10 metres. Weight of the assembled aerial is around 3kg (which means that you can lift it with ease).

THE HF5, A WINNER ALL ROUND (IF YOU WILL EXCUSE THE PUN) £41.40 inc VAT



THE WAY TO HAVE TOMORROW'S EQUIPMENT TODAY

Everyone is talking about the new Lowe credit card scheme, following its introduction at Leicester. This is the new, easy way to have the rig you wanted right away and avoid any future price rises. How does it work? You simply agree to pay a fixed amount each month and you then get instant purchasing power of 24 times the payment. For example, a payment of £20 gives you £480 of credit, more than enough to buy that TS120V, aerial and accessories. No fuss and no hefty deposits needed. A further advantage is that as the payments continue, your credit is automatically extended to allow further purchases. Why not send for full details right away and join the growing numbers who hold the Lowe blue card—the way to have tomorrow's equipment today. A major advance to your purchasing power.

WE WOULD LIKE TO TAKE THIS OPPORTUNITY OF THANKING ALL WHO MADE THE TRIP TO MATLOCK IN 1979 AND TO WISH ALL OUR CUSTOMERS, PAST, PRESENT AND FUTURE A VERY HAPPY CHRISTMAS AND A PEACEFUL, PROSPEROUS 1980. BILL G3UBO · ALAN G3MME · JOHN G3PCY · BARRIE G8OTY · ROB G8MPT · THE OTHER ROB G8MBO · THE OTHER JOHN · STEVE · DAVID, AND OUR LOVELY LADIES (in alphabetical order) ANNE · BRIDGET · DOROTHEA · PAULINE SUE

NOW FOR THE COMMERCIAL BREAK

BY THE TIME YOU READ THIS ADVERTISEMENT, WE SHOULD BE MOVING UP THE ROAD TO OUR INCREDIBLE NEW OFFICES IN CHESTERFIELD ROAD. WHY NOT COME AND SEE US SOON? REMEMBER THE FREE RAFFLE FOR A TS180S!

SPECIAL OFFERS FOR THE CHRISTMAS PRESENT

AR240 synthesised 2 metre handheld **£165 inc VAT**
HC1400 synthesised 2 metre 30W mobile **£199 inc VAT**
LS707 70cm high performance multi mode **£495 inc VAT**

NEW AERIAL RANGE

2m $\frac{7}{8}$	£11 inc VAT	*
2m $\frac{1}{2}$	£6.50 inc VAT	SEND FOR
70cm $\frac{1}{2}$ + $\frac{1}{2}$	£10 inc VAT	DETAILS
6.5dB base station colinear		*
£22 inc VAT		

HOW ABOUT GETTING 70cm FM GOING! TRI0 TR3200 NOW ONLY £140 inc VAT

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For equally helpful attention in Scotland contact Sim, GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. 041-771 0364.

FOR ALL THAT'S BEST IN HAM RADIO CONTACT US AT MATLOCK ANYTIME



Waters & Stanton

TWO SUPER POWER HOUSES . . . IMPORTED DIRECT BY US



IN STOCK NOW!

**DenTron
MLA 2500
160-10m 2kW PEP
£695 inc. VAT
and delivery**

Send 25p for complete
DenTron HF Catalogue

- * 1kW DC continuous
- * ALC circuit
- * 3 speed cooling
- * Military specifications
- * 234v/117v AC
- * 2 of EIMAC 6875 tubes

- * R.F. Wattmeter (incl. p8p)
- * Size 5 1/2" x 14" x 14"
- * Weight 47lb.
- * Ideal for SSTV/RTTY
- * 3rd order down 30dB +
- * 40 watts drive for 1kW

160-10m ATU's also in stock

**144 MHz!
NAGAI
2200 LINEAR
£429**

**inc. VAT
(Securicor £4.50)**

See for colour brochure



- * 240v AC
- * 4CX-350F tube
- * Receiver pre-amp
- * 10-13 watts drive
- * SWR meter built-in

- * 500W PEP input
- * 400W FM/CW input
- * Fan cooled
- * 12v DC output—3 amps
- * Covers 144-148MHz



PALMSIZER

**40 x 25kHz Channels 145-146MHz
BULK SHIPMENT AT SUPER PRICE!
£149 inc. VAT buys this**

- * Cigar lighter plug
- * External DC cord
- * Over one watt output
- * AC charger included
- * 40 channel capability
- * Simplex or ± 600 kHz switch
- * BNC aerial socket
- * Flexible whip supplied
- * Xtal controlled tone-burst
- * Ni-cad battery pack supplied



The Palm II and IV offer truly amazing value for money in the field of hand-held transceivers. Certainly they are the most compact units currently available and fit easily into the pocket. The built-in condenser microphones make for a really superior quality of audio that would do credit to many base stations. Accessories such as ni-cads, AC chargers and helical whips are all included in the basic price and additional channels will cost you a mere £3. Repeater operation is fully catered for with the built-in crystal controlled tone-burst and both the 2 metre and 70cms models have plus and minus repeater shifts. Don't miss these amazing prices—just think, you can have both 2 metre and 70cms hand-helds for less than £260 inc. VAT—can't be bad!



HAND-HELDS PII & PIV

**PII 145MHz £99.50. PIV 432MHz £159
GREAT VALUE—GREAT PERFORMANCE
Compare their features:**

- * External DC cord
- * Over one watt output
- * AC charger included
- * 6 channel capability
- * Simplex or ± 600 kHz switch
- * BNC aerial socket
- * Flexible whip supplied
- * S20/SU20 supplied
- * Extra channels cost £3.00
- * Xtal controlled tone-burst
- * Ni-cad battery pack supplied
- * High quality condenser microphone



A complete station in one package. Over one watt of FM capable of operating on any frequency in the FM band-plan. The convenience of changing frequency in 25kHz steps and selecting any frequency either simplex or repeater wherever you happen to be in the U.K. Surely a must for the travelling man. It's as much at home in a hotel bedroom as it is in the home QTH on the main aerial. If you want the added convenience of an external microphone, this is available at £11 and the matching case with external battery pouch is £9.75. Whichever way you look at it you have to admit that a synthesized 40 channel hand-held with ni-cads charger and helical whip for £149 has to be an absolute bargain—plus over 12 month parts and labour guarantee—send for yours now.



**TM 56B
VHF MONITOR**

The TM56 is one of our most popular models, combining great performance with modest price. The TM56B has the basic receiver design of our mobiles and includes its own 230 volt AC supply, plus external 12v DC input. 12 fixed channel positions are included, plus 4 autoscans positions. Any one of the Autoscans channels can be cancelled. Price includes 10 channels, R3, R4, R5, R6, R7, S0, S20, S21, S22 and S23, necessary leads, etc., and 12 month guarantee. At £106 it is unbeatable! 10 channel marine version £115 inc. VAT.

**MOSLEY MINI-BEAM
10-15-20 metres, little
larger than a 10m beam!**

600 watts £99.00
2k watts £129.00
British built and
designed by us. We
guarantee DX with
this one!



Christmas Present Time?



MULTI-3000

THE ULTIMATE 2m ALL-MODE!

LOOK AT THE PRICE! £495 inc. VAT

FEATURES

FDK's dual vfo facility is employed using a separate flywheel drive with direct digital readout. Thus the switched synthesizer may be left on ones favourite FM channel and the vfo used to tune around the band. In the FM mode two tuning rates can be selected. The "rate of tuning" switch gives either 10kHz or 1kHz steps. The former for rapid QSYing and the latter for final tuning to the desired frequency exactly on any 1kHz multiple. On SSB and CW the same tuning control gives steps of either 1kHz or 100Hz. In this mode the digital display reads accurately to the nearest 100Hz. Tuning has never been easier! And that's not all, a memory button enables one to lock the last frequency (even down to 100Hz on SSB) and then carry on tuning around the band. At any time the memory button can be pressed to return to the original stored frequency and pressing it again returns you to the frequency you had just QSY'd from. In all, three frequencies can be stored, one on the switched synthesizer and two on the manual digital dial. Furthermore the memory is not lost when the equipment is disconnected from the supply cord.



Repeater operation is taken care of by a pre-wired 600kHz shift and this also operates an automatic crystal controlled tone-burst.

All the usual features you are likely to need are also included: tone-burst defeat, VOX, Mic gain, AF and RF gain, noise blanker, receiver incremental tuning, fast and slow AGC, High/Lower power switch, squelch, also internal pre-sets for VOX, gain, delay and anti-vox. The power supply is designed for 240 volts AC or 12 volts DC operation. Another superb piece of engineering at a very reasonable price—FDK of course. £495 inc. VAT and delivery.



LOOK! 12½kHz or 25kHz

M700E 25 WATTS FM

When a transceiver has so many more features than its rivals and yet sells for less than most, then surely it can be rightly described as the "best buy" for 1979. Truly a concept of design that looks to the future as well as the present. Its powerful 25 watts makes it twice as powerful as its competitors and ensures more solid QSO's. 2 RF stages in the receiver ensure that the high power is matched by the most sensitive receiver on the market. No more xtals to buy, the Multi 700E comes 144.75 to 145.975 MHz in 25kHz click tuned channels. And for the 1980's 12½kHz channels can be interspaced at the touch of a button. Repeater operation is taken care of at the flick of a switch for either normal repeater mode or reverse mode for listening on the input channel. Automatic xtal controlled tone-burst is built in and the power output is continuously variable down to 1 watt. Altogether a remarkable transceiver at an amazing price. Included in the package is a quick release mobile bracket, matching microphone, mounting hardware kit, DC fused lead and English operating manual. Send SAE for full details of the "PERFECT" rig. Price £299 inc. VAT.



**M800D
25 WATTS FM
ELECTRONIC
TUNING**



The Multi-800D is a 25 watt FM transceiver with 800 synthesised channels 144-148MHz. Tuning is manual or automatic with 3 speeds from 5kHz second to 500kHz second. Tone burst is automatic and power is infinitely variable from 1 to 25 watts. A remote digital display is available and reverse repeater is obtainable at the flick of a switch (no need for re-tuning). There is a memory for two programmable frequencies, both are retained even after switch-off. The memory facility also enables other shifts to be programmed in (1.6MHz for 70cms) and the LED readout always reads true transmit and receive frequencies.

PRICE £289 inc. VAT
REMOTE DIGITAL DISPLAY £21 inc. VAT

**HERE'S OUR TIP FOR THE TOP...
IN ROTATORS!**



**ALL JAYBEAM
AERIALS
IN STOCK**



JAYBEAM KR400 supports ½ ton
costs £105.80 inc VAT (£2.00)

JAYBEAM 9502 ideal for VHF
£55.80 (only needs 3-core cable) (£1.75)

**HUGE DISCOUNT! 2B2M
2m SSB/CW PORTABLE
Fitted 144.2-144.6MHz £135**



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WATERS & STANTON ELECTRONICS

TRIO HAS COME TO THE SOUTH EAST



We wish our Customers and Trade Friends a Happy Xmas and Prosperous New Year



ALL PRICES INCLUDE 15% VAT

TRIO TS120V £408
TS120S £495

SOLID STATE RIG
RELIABLE AT LAST

Up until now there has been a natural reluctance to accept solid state HF rigs as anything but a second rig or mobile unit with dubious reliability of the PA devices. Now at last the new TS120 series gives you 80-10 metre coverage at either 10 watts output or 100 watts output. Digital readout and variable selectivity are just two features that put them in a class above any other solid state rig we know of (apart from the TS180S)—even those costing nearly £1,000. The TS120 will put to shame many of the older valve PA designs and can confidently be regarded as a good reliable base or mobile station—and no tune-up means instant QSY from band to band at the flick of a switch.



TRIO TS820S £832

THE DX OPERATOR'S
EXECUTIVE RIG

The Trio TS820S must be the HF operators dream come true. Many superlatives have been used to describe it and all are justly deserved. It's the transceiver that you'll hear from about every corner of the World with its distinctive, clean, crisp audio. A most effective RF processor ensures a remarkable improvement in readability under QRM conditions without any degradation of quality and RF negative feedback produces just about the cleanest signal you'll find anywhere. 160-10 metres, 200 watts PEP input and 0.2uv for 10dB S-N all add up to an enviable package. Add to this the digital readout display and unique selectivity obtained by "bandpass tuning" of the IF section produces a transceiver that is today's DX operator's No. 1 choice. For further information or credit terms, just drop us an S.A.E.

NEW

TRIO TS770

£775

If you're a VHF or UHF enthusiast, this must be the transceiver for you. The Trio TS770 is the ultimate, all-in-one station for 144-146 and 432-440MHz operation. A complete "state of the art" package, embodying many unique features, including digital readout, dial braking, dual speed tuning, dual VFO control, split frequency working, electronic band changing, eight memory channels, scanning of 1MHz segments or the eight memory channels, 100kHz search switch for CW/SSB, frequency lock switch, plus all the more usual features that you have come to accept as standard from Trio. The net result is a one package station that costs little more than 2 metre base station plus 70cms transverter—but it is a lot more flexible. No wonder everybody has been waiting for this one—it's simply the ultimate!

NEW

TRIO R-1000

£275

At last the Trio R1000 has been announced—a real purpose-built receiver for the serious short wave listener. 200kHz to 30MHz in 30 bands. This receiver has many features that are not available on other models and, of course, has the technical backing of the world's largest manufacturers of amateur communications equipment. Features include: 1kHz digital readout and separate analogue dial, large high quality speaker, digital 12 hour clock—AM and PM, three separate filters for razor sharp selectivity, noise blanker (try finding this on any other receiver!), automatic preselector tuning via the 1MHz band switch, three-stage attenuator, dimmer control, tone control, timer circuit, and all this in a diminutive package measuring 12½ x 4½ x 8½ in. Trio have now solved the problem of choosing a receiver—there is no choice—it's got to be Trio!

STOP PRESS!

Have you seen the new Trio TR7400?—it will cost you approx. £235 but at that price you get the ultimate that is available from Japan.



TRIO TR7625 £273

The TR7625 is the complete 25 watt mobile package for 2 metres. The whole of the band, 144-146MHz is covered using a coaxial type switch and enabling any frequency in 5kHz steps to be selected. A bright LED display gives true frequency readout and power output can be switched down to 5 watts. A memory switch enables one to also programme into the transceiver one priority channel. A lowered powered 10 watt model is also available designated TR7600. Of particular interest to many operators will be the microprocessor that is available as an extra at £74. This plugs into the rear of the transceiver and gives up to six memory channels that may be scanned, touch pad frequency selection, multiple scanning and lock-on busy or empty channels. Quite a unit!

THE MOBILE RIG
WITH 80 CHANNELS

THE IDEAL
STARTER RIG!

TRIO TR2300 £199

The TR2300 is a remarkable package which combines all the advantages of a portable station with those of a mobile transceiver. In many ways it's the ideal "starter rig" in amateur radio. Full band coverage from 144-146MHz in 80 x 25kHz channels plus 600kHz repeater shift and 1750Hz automatic tone-burst complete its versatility.

The dial is directly calibrated in frequency and has illumination for night use. The transmitter is exceptionally clean with an output power in excess of 1 watt. Receiver sensitivity is every bit as good as the best mobile rigs and either internal batteries or an external DC source may be used. Fits easily into a suitcase or on the corner of a desk and makes a really compact mobile rig. Price includes carrying case, shoulder strap, battery charger, external DC cord and, of course, the Waters & Stanton 12 month warranty. An absolute bargain—we even sell them to our staff!



WATERS & STANTON ELECTRONICS

NEW PREMISES!

When you read this, our new premises should be fully operational and we will have on show the largest selection of new and used amateur radio equipment in the South East. And if you are a Trio fan, don't forget that we not only stock their amateur products but also their Hi-Fi. In fact, if you are at all interested in electronics, we have probably got something to interest you; so why not pay us a visit and see everything that's good in amateur radio. And remember, there's no parking problems—we have a large car park at the rear. Whether you're new to amateur radio or an old timer, we'll be happy to assist and advise you as to your needs. We don't employ high pressure sales techniques so if you simply want to come and browse or show the XYL what you want for Christmas, you'll be more than welcome.

TRIO

TS820S 160-10m transceiver 200w digital	£832.00 (3.75)
TS820 160-10m less digital	£710.00 (3.75)
SP820 External speaker	£39.00 (1.50)
TS520SE 160-10m transceiver 200w	£485.00 (3.75)
SP520 External speaker	£18.00 (1.25)
VFO520S External VFO	£103.00 (3.75)
TS120S 80-10m Solid state 200w	£495.00 (3.75)
TS120V 80-10m Solid state 10w	£408.00 (3.75)
PS20 AC PSU (TS120V)	£52.00 (3.75)
PS30 AC PSU (TS 120S & TS 180S)	£98.00 (3.75)
MB100 Mobile mount	£17.00 (0.75)
AT200 1-8-30MHz ATU	£95.00 (1.50)
MC50 Desk microphone (Super!)	£27.50 (1.50)
MC30S Noise cancelling hand mic.	£13.30 (0.50)
TS770 2m/70cm all mode transceiver	£273.00 (3.75)
TR7625 2m FM mobile 25w 80ch.	£199.00 (3.75)
TR2300 2m FM portable 80ch.	£18.90 (1.00)
MB2 Mobile mount (2300)	
TS180s 160-10m solid state transceiver	£825.00 (3.75)
TR3200 70cm portable 3 ch. fitted	£140.00 (3.75)

YAESU

FRG-7 General coverage receiver	£214.00 (N/C)
FRG-7000 Digital readout receiver	£375.00 (N/C)

LOWE RECEIVER

SRX300 0.5-30MHz AM/SSB/CW	£178.00 (N/C)
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ICOM

IC215E 2m FM 3 watt 12 chs	£162.50 (N/C)
IC202S 2m SSB 3 watt portable	£199.00 (N/C)
IC240 2m 22 ch's 10 watts	£183.00 (N/C)
IC280E 2m FM 80 ch's 10 watts	£250.00 (N/C)
IC211E 2m All mode transceiver	£549.00 (N/C)

MICROWAVE MODULES (NEW PRICES)

MMT 432/28-S transverter	£136.75 (N/C)
MMT 432/144-R transverter	£173.50 (N/C)
MMT 144/28 transverter	£90.75 (N/C)
MMC 144/28-30 converter	£21.85 (N/C)
MMC 144/28 LO converter	£24.15 (N/C)
MMC 70/28 converter	£21.85 (N/C)
MMC 70/28 LO converter	£24.15 (N/C)
MMC 432/28 S converter	£29.90 (N/C)
MMC 432/144 S converter	£29.90 (N/C)
MMC 1296/144 or 28 converter	£32.00 (N/C)
MMC 28/144 10m up converter	£20.70 (N/C)
MMD 050/500MHz counter	£69.00 (N/C)
MMA 144 2m pre-amp	£14.90 (N/C)
MMD 500P 500MHz pre-scaler	£23.00 (N/C)
MMV 1296 varactor tripler	£34.50 (N/C)
MML 144/100w linear amplifier	£142.50 (N/C)
MML 432/100w linear amplifier	£228.00 (N/C)
MML 144/25w	£48.30 (N/C)
MML 432/50w	£113.75 (N/C)

SEM

2m converters	£23.00 (N/C)
70cms converters 144 IF	£23.00 (N/C)
2m pre-amp	£14.95 (N/C)
2m auto switching pre-amp	£19.50 (N/C)
70 cms auto switching pre-amp	£22.63 (N/C)
2m PA3 pre-amp	£8.00 (N/C)
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2m 48 watt linear pre-amp	£66.70 (0.95)
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HF auto pre-amp 2-40MHz
HF pre-amp 2-40MHz
HF Z-MATCH ATU 80-10m

£16.68 (N/C)
£11.73 (N/C)
£45.00 (1.00)

VHF MONITOR Rx's

TM56B 12v/240 AC auto scan 10 ch's	£106.00 (N/C)
TM56B Marine model	£115.00 (N/C)
SR9 12v DC Marine model	£48.00 (N/C)
Extra xtals	£2.45 (N/C)

FDK (New PII price!)

Multi 3000 2m All mode	£495.00 (N/C)
Multi 800D 2m 25 watts	£289.00 (N/C)
Multi 700E 2m 25 watts	£229.00 (N/C)
Multi Palm II 2m hand-held special package	£99.95 (N/C)
M-11/Q16 xtals E5.00 Palm II xtals £3.00	
Multi-Palmsizer 2m synthesised 40 channel hand-held	£149.00 (N/C)
Palm IV 70cms	£159.00 (N/C)

DENTRON

MLA 2500 160-10m 2Kw linear	£699.00 (N/C)
MT3000A 3Kw 160-10m tuner	£280.00 (N/C)
MT2000A 3Kw 160-10m tuner	£180.00 (N/C)
160-10AT Supertuner 1Kw	£99.95 (N/C)
JR Monitor 160-10m tuner 300w	£59.95 (N/C)
V-2 160-10m PEP/SWR meter	£59.95 (N/C)
MT 200A Transceiver	£399.00 (N/C)
1Kw 80-10m linear 240v	
GLA 1000	£295.00 (N/C)

AR

AR240 Synthesised hand-portable	£168.00 (N/C)
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MIZUHO (NEW LOW PRICE!)

2m SSB 1 watt portable	£135.00 (N/C)
Extra xtals	£3.00

NAIGAI (NEW LOW PRICE!)

2200 2m 500w PIP linear	£429.00 (N/C)
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ADONIS MICROPHONES

AM802G Compressor - 3 outputs	£59.95 (N/C)
AM502G Compressor - 1 output	£39.95 (N/C)

ASP MOBILE ANTENNAS

201 - 2m 1/4 wave	£3.50 (1.00)
2009 - 2m 5/8th wave	£9.25 (1.00)
677 - 2m 5/8th wave deluxe	£14.95 (1.00)
462-70cms colinear	£8.25 (1.00)
667 - 70cms colinear deluxe	£17.95 (1.00)
Magnetic base and cable	£8.50 (1.00)
"No-hole" boot mounts	£3.75 (0.50)

HF ANTENNAS

HQ-1 20-15-10m mini-quad	£96.50 (2.50)
C4 20-15-10m vertical	£48.50 (2.00)
Mosley 20-15-10m mini-beam 600w	£99.00 (2.00)
Mosley 2Kw version	£129.00 (2.00)
TA32 600 watts 20-15-10m	£81.00 (2.00)
TA33 600 watts 20-15-10m	£120.75 (2.50)

All prices include VAT at 15%
Coming soon! 16 and 20 amp power supplier
£69 and £95. Phone for details

Mustang 2Kw 20-15-10m	£149.50 (2.50)
Hy-gain 12 AVQ 20-15-10m	£43.00 (2.00)
Hy-gain 14 AVQ 40-10m	£60.00 (2.00)
Hy-gain 18 AVT/WB 80-10m	£87.00 (2.25)
Mosley TD3JR 20-15-10m dipole	£31.00 (1.00)
Mosley RD5 SWL ham dipole	£36.30 (1.00)
EL-40X 80-40 Mini dipole	£39.50 (1.00)
HF5 5 band vertical	£41.50 (1.00)

VHF ANTENNAS (JAYBEAM)

4Y/4M 4el yagi	£17.20 (2.00)
C5/2M 5db colinear	£40.00 (2.00)
5Y/2M 5el yagi	£10.25 (1.50)
8Y/2M 8el yagi	£13.25 (1.50)
10Y/2M 10el yagi	£28.40 (2.00)
PBM10/2M 10el parabeam	£33.60 (2.00)
PBM14/2M 14el parabeam	£40.80 (2.50)
5XY/2M X'd 5 element	£20.70 (1.50)
8XY/2M X'd 8 element	£25.80 (2.00)
10XY/2M X'd 10 element	£34.30 (2.00)
Q4/2M 4el quad	£21.50 (1.50)
Q6/2M 6el quad	£28.50 (2.00)
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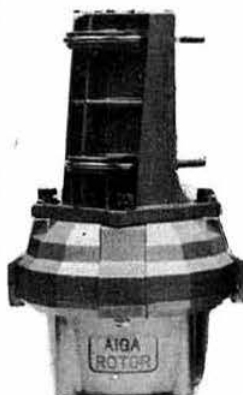


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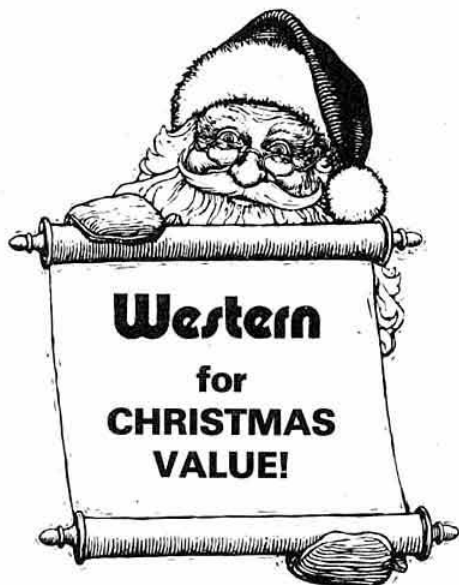
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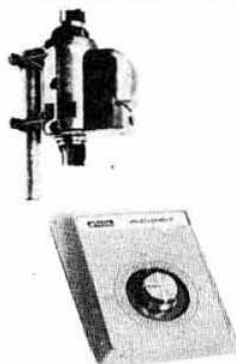
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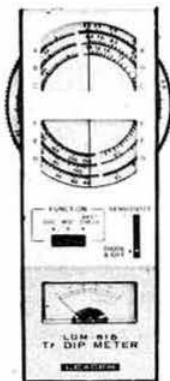
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	VHF MOBILE (Carriage £0.95) + VAT 15%
340 1/2	Standard Base £2.10
310 1/2	Swivel Base £3.50
344 1/2	Sprung Base £5.55
440 1/2 2m	Standard Base £3.50
330 1/2 2m	Swivel Base £4.45
341 1/2 2m	Sprung Base £6.65
350 1/2 2m	Fine Tune Base £7.15
351 1/2 2m	Sprung 350 Base £8.25
057	127cm Tapered Whip £1.95
056	63cm Parallel Whip £0.95

BANTEX VHF MOBILE ANTENNAS

	(Carriage £0.90) + VAT 15%
42SS 1/2 4m	Stainless whip £1.75
40GF 1/2 4m	Glass whip £3.55
20SS 1/2 2m	Stainless whip £1.50
18GF 1/2 2m	Glass whip £2.80
B5 1/2 2m	Glass whip £7.75
BGASS 1/2 2m	Stainless whip £8.60
BGAGF 1/2 2m	Glass whip £9.10

CUSHCRAFT VHF OMNI ANTENNAS

	(Carriage £1.00) + VAT 15%
ARX2	Ringo Ranger 2m £20.00
AR2	Ringo 3dB 1/2 2m £12.00
AR25	ORO AR2 £14.00

H-SMC

	(Carriage £1.60) + VAT 15%
GDX1	Discone 80-480MHz £37.50
GDX2	Discone 50-480MHz £39.50
LT606	LogP 50-500MHz £75.95

YBAYBEAM VHF FIXED ANTS

	(Carriage about £1.00) + VAT 15%
4Y/4M	4 element yagi £14.95
PMH2/4M	2 way harness £10.80
D15/23	15 over 15 slot £26.90
UGP/2M	Ground Plane £8.15
C5/2M	Vert Colinear £34.80
5Y/2M	5 element yagi £9.90
8Y/2M	8 element yagi £11.60
10Y/2M	10 ele long yagi £24.70
14Y/2M	14 ele long yagi £31.50
PBM10/2M	10 ele Parabeam £29.20
PBM14/2M	14 ele Parabeam £36.50
Q4/2M	4 element quad £18.70
Q6/2M	6 element quad £24.80
D5/2M	5 over 5, slot fed £15.90
D8/2M	8 over 8, slot fed £21.60

G-WHIP VHF MOBILE ANTENNAS

	(Carriage £0.95) + VAT 15%
TRIBANDER	10-20M Slide £20.00
LFCOIL	40/60/160M each £5.70
LPWHIP	Telescopic £2.60
MULTIMOBILE	10-20M Auto £23.00
MMCOIL	40/60/160M each £5.70
MMWHIP	Telescopic £2.60

GEM QUAD FIBREGLASS 10-20M

	(Carriage £2.09) + VAT 15%
GQ2E	2 Element quad £124.00
GQ3E	3 Element quad £187.00

MOSLEY TRI-BAND BEAMS

	(Carriage £3.50) + VAT 15%
TA32 2 ele. 200W RMS	£70.00
TA33 3 ele. 200W RMS	£106.00

SMC TRAPPED DIPOLES 10-80M

	(Post £0.75) + VAT 15%
S500	Standard - 14 SWG £26.50
HPIK	High Power - 14 SWG £29.00

WIRE & BRAIDS

	(Post and Packing extra) + VAT 15%
7/029H	Cu Hard Drawn yd £0.15
7/036H	Cu Hard Drawn yd £0.18
7/044H	Cu Hard Drawn yd £0.24

AERIAL INSULATORS

	(Post Extra) + VAT 15%
SMCP1	3" Polyprop. ribbed £0.37
SMCP2	8 1/2" polyprop. ribbed £1.85

WIGHTHAPS AERIAL TRAPS

	(Post £0.40) + VAT 15%
WTS	Standard - White £5.85
WTHP	High Power - Blue £8.25

BALUNS 3-30MHz

	(Post £0.50) + VAT 15%
BN85	1:1, "U" bolt mount £13.50
HIQ	1:1, "Hang up" Type £8.70

LIGHTNING ARRESTORS

	COAXIAL (Post £0.30) + VAT 15%
SM566	Spark, SO239/PL259 £2.65
SM567	Spark, SO239/SO239 £2.65

CABLES RF FEEDERS

	(Carriage extra) + VAT 15%
RG58U	50Ω 0-2" Stranded yd £0.18
UR43	50Ω 0-2" Solid yd £0.17
UR76	50Ω 0-2" Stranded yd £0.17
UR67	50Ω 0-405" Heavy yd £0.42
RG213	50Ω 0-405" Heavy yd £0.42
306	300Ω Ribbon yd £0.12

COAX PLUGS UHF

	(Post and Packing £0.20) + VAT 15%
PL259	Standard UHF plug £0.48
UG175/U	Reducer UR43 £0.12
UG176/U	Reducer UR70 £0.12
PL259R	"Reduced" plug £0.58
PL259SL	"Solderless" UR67 £0.55
PL259SS	"Solderless" UR43 £0.55
PL259P	Push-on plug £0.69
PL259E	Elbow plug UR43 £0.83
SO239F	4 hole socket £0.42
SO239T	2 hole socket £0.42
SO239NI	Socket "nut" inside £0.51
SO239NO	Socket "nut" out £0.51

COAX PLUGS BNC

	(Post £0.20) + VAT 15%
UG88	Plug, Std UR43 £0.54
UG959	Plug, Large UR67 £2.65
UG291	Socket, 4 hole std. £0.56
UG1094	Socket, Nut fixing £0.56
UG89	Socket, Free, UR43 £0.72
UG914	Double female £0.93

MASTING

	(Carriage extra) + VAT 15% (N.B. Max 20", Max BRS 13")
1 1/2" od	Aluminium 16g ft £0.42
1 1/4" od	Aluminium 16g ft £0.46

MAST BANDS & PLATES

	(Carriage £0.40) + VAT 15%
SMP3	3 hole guy plate 2" £0.85
SMP4	4 hole guy plate 2" £1.55

ROPES - WIRES

	(Post and Packing extra) + VAT 15%
3mm	HT steel, 0-63T. yd £0.18
4mm	HT steel, 1-5T. yd £0.24

ROPES - TERYLENE

	(Post and Packing extra) + VAT 15%
1 1/2"	BS150 lbs (circ.) yd £0.07
1 1/4"	BS650 lbs (circ.) yd £0.10

CABLE GRIPS

	(Post and Packing £0.30) + VAT 15%
1 1/2"	Bulldog, galv. £0.19
1 1/4"	Bulldog, galv. £0.16

SHACKLES

	(Post and packing £0.30) + VAT 15% N.B. Pin sizes given.
1 1/2"	D galvanised £0.24
1 1/4"	D galvanised £0.28

THIMBLES

	(Post and packing £0.20) + VAT 15%
F1235	1 1/2" Nylon, for terylene £0.14
F985	1 1/2" Nylon, for terylene £0.16

RIGGING SCREWS TURNBUCKLES

	(P&P £0.30) + VAT 15%
4" x 1/2"	pressed £0.75
4 1/2" x 1/2"	pressed £1.65

GUY STAKES

	(Carriage £1.00) + VAT 15%
GS18	18" Angle galv. £2.55
GS27	27" "T" galvanised £3.75

STAND OFF BRACKETS

	(P&P £1.75, Sec. £2.80) + VAT 15%
W12	12" bracket pair £6.50
W18	18" bracket pair £8.75
W18HD	18" Heavy Duty pair £11.75

RAWLBOLTS

	(Post and Packing £0.40) + VAT 15%
D2	1 1/2" rawlbolt £0.24
	1 1/4" rawlbolt £0.29

MAST TO BOOM CLAMPS

	(Post and Packing £0.70) + VAT 15%
SMC53	1-2" mast, 1" boom £1.10
SMC63	1-2" mast, 1-1/2" boom £1.25

MISCELLANEOUS HARDWARE

	(P&P extra) + VAT 15%
SMC59/15	2" mast sleeve 15" long £4.20
SH2	Snap hook 2" £0.68
MC1	Mast cap cast alloy 2" £1.85

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OSBORNE ROAD, TOTTON
SOUTHAMPTON, SO4 4DN
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9-5.30 Monday-Friday
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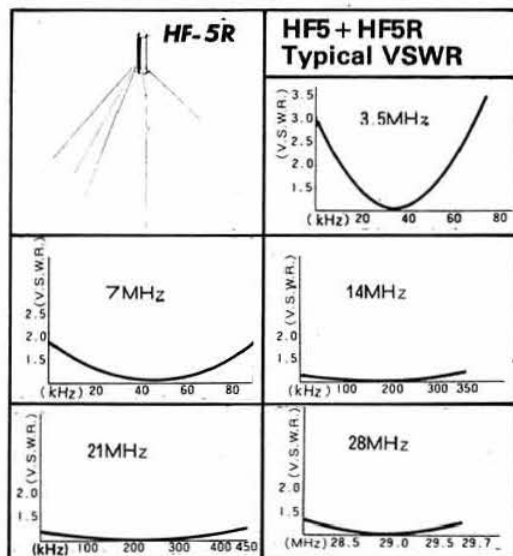


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Communications Ltd

A VERY HAPPY CHRISTMAS



NEW 5-BAND VERTICAL SMCHF5

Part illustrated
to the right

£35 + VAT

80, 40, 20, 15, 10 metre coverage from this remarkable new antenna. Only 4.8m (15½ft) high and 4.2cm in diameter, it nevertheless is capable of handling 500W PEP on 10, 15 and 20m (200W PEP 40 and 80) within its 1.5:1 VSWR bandwidth. 50 ohm coaxial feed is to an in-built SO239 socket. Suitable for mounting at ground level on an earth post (with or without radials) or in an elevated position (only 2.9kg) with wire radials or better still with the HF5R.

The HF5R (max power 150W PEP) has five solid radials of very similar length (2.05 to 2.2m) sloping at 45° to the antenna (1.8kg).

SMC HF5 £35.00 + 15% VAT £40.25 + (p&p*)

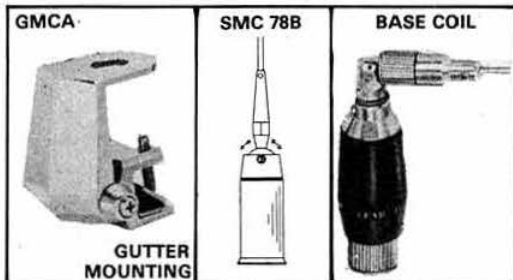
SMC HF5R £23.35 + 15% VAT £26.85 + (p&p*)

*CARRIAGE: on either or both together £1.50

SMC MOBILE ANTENNAS

SMC mobile antennas, tabulated below, feature an inbuilt PL259 connector which mates with the SO239M of the cable assembly which in turn fits a ½in hole or the cast chromed gutter mount. This is ideal for easy removal (element change, car wash and anti-vandal), tests and portable operation. All models have a locking fold-over joint, except the SMC78B which has an inbuilt ball (in case the cable assembly is fitted askew).

If two or more antennas are mounted on the car, in most cases, equal lengths may be chosen. The range encompasses base loaded 10 and 15 metre elements, 2m $\frac{1}{4}\lambda$ and $\frac{1}{2}\lambda$, the latter being particularly recommended as the actual system gain, if the antenna is poorly sited, is usually very substantial.



	SMC15SE	SMC10E	SMC10SE	SMC2NE	SMC78F	SMC78B	SMC258
BAND	21MHz	28MHz	28MHz	144MHz	144MHz	144MHz	432MHz
TYPE	($\frac{1}{4}\lambda$)	($\frac{1}{4}\lambda$)	($\frac{1}{4}\lambda$)	$\frac{1}{2}\lambda$	$\frac{1}{4}\lambda$	$\frac{1}{4}\lambda$	$\frac{1}{2}\lambda + \frac{1}{4}\lambda$
GAIN				3dB	4.5dB	4.5dB	5.5dB
POWER	130W PEP	100W PEP	200W PEP	100W PEP	100W PEP	150W PEP	100W PEP
LENGTH	1.72m	1.27m	1.72m	1.30m	1.75m	1.72m	0.94m
WEIGHT	430gm	360gm	430gm	220gm	400gm	440gm	190gm
PRICE	£11.00	T.B.A.	£11.00	T.B.A.	£10.00	£11.00	£10.00



C/w 4m RG58, PL259 plug
RG4 £3.00 + VAT, £3.45
(p&p 30p*)

P&P on one or more elements £1.00 (+ 15%)*; accessories 30p or free with element



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DEPEND UPON



ASCOT ANTENNAS

This is a complete range of mobile antennae and accessories developed and manufactured in the United Kingdom.

All antennae are rugged and designed to withstand extremes of weather by using: fine stainless steel whips, A100 nylon bases, chrome-plated brass ferrules, heat-treated silver-plated beryllium copper contacts and polished stainless steel shock springs.

NB: Complete aerial consists of base plus whip plus mount.

PICK THE TYPE ($\frac{1}{4}\lambda$ 0dB, $\frac{5}{8}\lambda$ 3dB, 1λ 3dB)

$\frac{1}{4}\lambda$ (4/2/70)	340	STANDARD BASE :	60-550MHz	£2.10
	310	SWIVEL BASE :	58-500MHz	£3.50
	344	SPRUNG BASE :	50-120MHz	£5.55
$\frac{5}{8}\lambda$ (2m)	440	STANDARD BASE :	140-200MHz	£3.50
	330	SWIVEL BASE :	137-200MHz	£4.45
	341	SPRUNG BASE :	132-200MHz	£6.65
1λ (2m)		STANDARD BASE :	135-175MHz	£4.80
	350	FINE TUNE BASE :	130-175MHz	£7.15
	351	SPRUNG 350 BASE :	125-175MHz	£8.25

SELECT THE WHIP (Stainless steel)

057	127cm TAPERED: $\frac{1}{4}$, $\frac{5}{8}$, & 1λ	70MHz	£1.95
056	63.5cm PARALLEL: $\frac{1}{4}$ & 1λ	144-432MHz	£0.95

CHOOSE THE MOUNT

(Magnetic Mount & Assemblies c/w 4.5m Coax)

$\frac{1}{4}$ OR $\frac{5}{8}$	085	STANDARD CABLE ASSEMBLY MOUNT	£2.80
	095	FIBREGLASS MOUNT TO S0239	£2.10
	092	MAGNETIC MOUNT	£8.95
1λ ONLY	084	STANDARD CABLE ASSEMBLY MOUNT	£4.15
	088	COWL MOUNT TO S0239	£4.95
	091	MAGNETIC MOUNT	£9.80

ADD AN ACCESSORY (if required)

(Mounts fit both the standard cable assemblies)

088	GUTTER CLIP ADAPTOR	£4.75
093	BOOT LIP ADAPTOR	£2.90
031	BLANK OFF COVER $\frac{1}{4}\lambda$ and $\frac{5}{8}\lambda$	£0.80
044	BLANK OFF COVER $\frac{1}{4}\lambda$ only	£0.45

LIKE THE PRICES? THEN:

ADD VAT 15% and p&tp. (Antennas £1.00, accessories only £0.50).

Ascot antennas are available; mail order from SMC HQ in Totton, personal callers to any branch (Leeds, Chesterfield, Woodhall Spa), SMC agent or reputable amateur radio dealers throughout Britain.

SOUTH MIDLANDS COMMUNICATIONS LTD

OSBORNE ROAD, TOTTON
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THE ORIGINAL

VERSATOWERS TELESCOPIC & TILTOVER STRONGER

WINDSPEEDS UP TO 117mph

Twelve years of continuous development has produced a range of over 50 models, all of which conform to the current B.S.S., requiring minimum designed wind speeds of 85mph and up to 117mph.

Available between heights of 25-120ft post, base plate, wall, fixed base or mobile on high-speed trailers.

Before purchasing a Tower, we strongly recommend consulting one of our engineers for advice regarding the most suitable combination for an installation. It would be incorrect to nominate a specific headload as this is dependent upon load distribution, geographical location and siting.

P40ft £276.75 +VAT 15%

P60ft £335.90 +VAT 15%

STANDARD SERIES POST MOUNTING

P40HD £416.20 +VAT 15%

P60HD £472.50 +VAT 15%

HEAVY DUTY SERIES POST MOUNTING

NEW '30ft': 10ft SECTIONS



P30 £249
BP30 £269

+VAT 15%
+Carriage

Capable of supporting a HF beam or several VHF Ants. The headunit accepts 2" tube and provides for a rotator. Operation is easy with single winch system.

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KYOKUTO

KYOKUTO DENSHI COMPANY LIMITED



FM2016E 2m FM DIGITAL SYNTHESIZED TRANSCEIVER



The KDK FM-2016E is a 12V DC two metre FM transceiver for mobile and base station use. It has been compactly designed with emphasis on maintenance and ease of use by using the latest CMOS IC digital PLL circuitry.

Rx 144.000-148.995MHz and Tx 144.000- 145.995MHz. Direct readout of operating frequencies by large size LEDs.

The most commonly used, 100kHz and 10kHz, switches are mounted coaxially. These will not go below the 0 or above 9 position facilitating frequency changing by feel only, for "eyes-on-the-road" motoring and use by those with impaired sight.

An electronic memory using CMOS RAMs (Random access memory ICs drawing only 25nA!) allows any four out of the 1,000 channels to be written-in (stored) at a flick of a switch. An auto-charging back up NiCad battery maintains the RAMs contents after disconnection from the power.

The plus 600kHz and minus 600kHz positions of the mode switch provide for normal repeater operation. In position 1T-2R the set Tx's on the frequency in memory channel 1 and Rx's on memory channel 2 (likewise the 3T-4R position). This provides for non-standard shifts, and is also convenient for use in conjunction with up-converters.

The memory may be scanned in the "closed" mode, (the scanner will stop at the first channel in use) or in the 'open' mode, (stopping at the first empty channel). Scan-hold allows transmission immediately the scanner stops.

Dual-gate MOS-FETs are used for the RF and mixer to provide superior inter-modulation characteristics with high sensitivity. Performance is held constant across the wide frequency range covered, by automatic electronic tuning.

A monolithic crystal in the first IF and a commercial quality 15-pole ceramic filter in the 2nd IF provides extremely sharp selectivity. The 2nd IF is built with discrete components to keep stray coupling to a minimum and a ceramic discriminator has been adopted for excellent temperature stability and long-term alignment.

The RIT (Receiver incremental tuning) and centre zero meter are useful for contacts with off-frequency or drifting stations.

The single conversion transmitter uses a balanced mixer, five stages of electronic tuning, and a four-stage low pass filter for a clean, spurious-free signal.

The ultra-modern silicon transistor in the final will survive even an infinite VSWR.

Power: HIGH (15 Watts) and LOW (1 Watt), is selectable by a front panel switch (useful with a linear).

Direct FM of the VCO results in superb audio.

A two mode (burst or continuous) tone generator is adjustable from 1,750 to sub-audible frequencies.

A 5-pin "DIN" connector is provided on the rear panel for a KDK SC-12A SELCALL (tone encoder-decoder) unit, headset-microphone combinations or similar.

£240 inc. VAT at 15%
(£208.70 + VAT)

SEE ONE TODAY



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FT107M

NEW SOLID STATE HF TRANSCEIVER

FULL EQUIPMENT MODEL
WITH MEMORY FEATURE*

If you have been searching for an all solid state HF transceiver with a "broad band" output that will deliver 75 per cent of maximum power into a 3:1 load, then look no further than this top of the line Yaesu. The FT107M covers 160-10M (plus) and is fully equipped with: variable IF bandwidth, audio peak/notch filter, RF speech processor, variable threshold noise blanker, full metering—including SWR, and boasts a schottky diode ring mixer for excellent receiver dynamic range. The all new memory system provides 12 stored channels (with fine tuning), scanning from the optional microphone and the exclusive DMS—digital memory shift. This system using a photo interruptor (with fine tuning) to control the 100Hz synthesizer thus providing any offset up to 500kHz—from the memory channel.

A full list of accessories is available to complement the FT107M. The illustration below shows (reading from left to right): the SP10107P speaker/phone patch (normal speaker SP107 available); the FTV107R two band transverter (two from 432, 145 or 50MHz); the FT107, itself, the FV107 remote VFO (with 5 crystal channels); the FC107 antenna coupler with twin VSWR/power meters, and the FP107E AC psu with speaker.

For further details of this exciting new system, please contact any authorised sales outlets for a free colour brochure. Or better still, see it for yourself, try one out today!!!

- ★ 160-10 meters plus WWV plus 2 auxilliary bands
- ★ USB-LSB-CWW-CWN-FSK-AM operation
- ★ All solid state, including final amplifier
- ★ Full broad band "no tune" power amplifier
- ★ 240W PIP. 75 per cent power output at 3:1 VSWR
- ★ 12 memory channels with clarifier on memory*
- ★ Digital Memory Shift gives offset from memory*
- ★ Up/down scanning control from microphone*
- ★ Variable IF bandwidth—16 crystal poles
- ★ Bandwidths: 6kHz*, 2-4kHz-300Hz, 600Hz-300Hz*
- ★ Selectable CW "fixed" widths CW-W and CW-N
- ★ Tunable Audio Peak (AFP) and Notch filter
- ★ Diode ring mixer for high Rx dynamic range
- ★ Noise blanker—front panel adjustable threshold
- ★ AGC; slow-fast-off switchable from the front panel
- ★ Attenuator 0-20dB, plus RF gain on front panel
- ★ RF speech processor fitted—front panel adjustable
- ★ Semi-break in with side tone for excellent CW
- ★ Vox built in and adjustable from the front panel
- ★ Digital (100Hz) plus analogue frequency displays
- ★ Meter Reads; Vcc, Ic, ALC, Compression and SWR
- ★ Clarifier (RIT) switchable on Tx, Rx, or on both
- ★ Choice of built-in or separate power supply
- ★ Plug in circuit boards and mother board

*Optional



WORKING FOR OUR COMMON INTERESTS—at Yaesu Musen Amateur Radio equipment is not a sideline but the only business. Over 130 licensed amateurs proudly produce the most diverse product line available, SSB, CW, AM or FM for mobile, portable or base use.

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RADIO SOCIETY OF GREAT BRITAIN

35 Doughty Street, London WC1N 2AE

Telephone 01-837 8688

Founded 1913
Incorporated 1926

Member society, International
Amateur Radio Union

PATRON: HRH The Prince Philip, Duke of Edinburgh, KG

The national society representing all UK radio amateurs

Membership is open to all those with an active interest in radio experimentation and communication as a hobby. Applications for membership should be made to the general manager, from whom full details of Society services may also be obtained.

GENERAL MANAGER AND SECRETARY

D. A. Evans, G3OUF

EDITOR

A. W. Hutchinson

ANNUAL SUBSCRIPTION RATES

UK corporate: £10, including VAT

Overseas: £10

Associates under 18: £4.

Students aged 18 to 21: £6

(Student applications should give the member's age at last renewal date and include evidence of student status)

Affiliated societies: £10 (including *Radio Communication*);
£6 (excluding *Radio Communication*).

RSGB NEWS BULLETIN SCHEDULE

INTENDED RECEPTION AREA	NORMAL READER	RESERVE READER	LOCAL START TIME
Frequency: 3,840kHz. Mode: SSB			
NE Scotland	GM3HGA	GM3VEY	1130
Frequency: 3,650kHz. Mode: SSB			
SE England	G2MI	G4ARZ	0900
Midlands	G2CVV	G8QZ	0930
SW England/Wales	G8ML	G3JFH	1000
N Ireland	G13GAL	G13SXG	1030
NE England	G5VO	G3MCF	1100
E Scotland	GM4CUZ	GM4FLP	1430
Frequency: 3,660kHz. Mode: SSB			
Central Scotland	GM3TCW	(Vacancy)	1130
Frequency: 7,047.5kHz. Mode: AM			
UK	G3LEQ	G2CVV	1100
Frequency: 144.250MHz. Mode: SSB. Horizontal polarization			
SW from Midlands	G3BA	G3KQF	0930
NE from S Devon	G3CHN	(Vacancy)	1000
NW from Manchester	G3SMT	G4IAL	1000
NNW from Cleveland	G8LIC	G8FTZ	1000
W from Carlisle	G8DVO	G3VIJ	1030
SE from Lincoln	G8OFQ	(Vacancy)	1030
SW from London	G3FZL	G3IIR/G3VAG	1030
S from Aberdeen	GM8GHV	GM3ZBE	1030
W from Bristol	G4CJZ	G3ZVY	1100
W from Bangor, Co Down	G13TLT	G13SXG	1130
Frequency: 145.525MHz (S21 FM). Vertical polarization			
Jersey	GJ8KNV	GJ4ICD	0930
Cornwall	G2ABC	G3NPB	0930
Hampshire, north	G8CKN	G3PZN	0930
Suffolk	G3ZNU	G4FSG	0930
Leeds	G3SPX	G3PSM	0930
Co Down	G13WEM	(Vacancy)	0930
Edinburgh	GM4EHO	GM8PKQ	0930
E Cornwall/S Devon	G3ZYV	(Vacancy)	1000
Londonderry	G12DHB	(Vacancy)	1000
London	G3FZL	G3IIR/G3VAG	1000
Birmingham	G3PVJ	G3BA	1000
Lincolnshire	G8OFQ	(Vacancy)	1000
Tyneside	G4FUT	(Vacancy)	1000
Glasgow	GM8PSM	GM3UCI	1000
Elgin	GM8LHE	(Vacancy)	1000
Southampton	G8LVC	G8ADM	1030
E Sussex coast	G8SC	G3ZFE	1030
Bristol	G4CJZ	G3ZVY	1030
Manchester	G3LEQ	G3JWK	1030

A
seasonal
message
from
the
President



As 1979 and my year of office draw to a close, I welcome this opportunity to thank all members of our staff at headquarters and Chelmsford, together with the numerous volunteers, who have contributed to the Society during the past 12 months.

This year our membership has seen the largest annual growth for several decades, and the solid foundation of the Society means it is well able to meet the challenge of the 'eighties and provide a more efficient and flexible service to its members.

This month, regrettably, two Council members will be retiring after many years of service to the Society. I refer of course to Roy Stevens and Cyril Parsons, and I cannot let this opportunity pass without expressing my own thanks to them for their untiring devotion and advice over the years.

I wish you all, whatever your interests in amateur radio, a very happy Christmas and a prosperous new year.

John Bazley, G3HCT

WARC REPORT

Geneva

27 October 1979

This report summarizes the activity of WARC, as it affects the amateur, up to 27 October.

It is strongly emphasized that these are first decisions only, and they could be modified by subsequent meetings of main committees or at a plenary meeting.

THE opening plenary session of the World Administrative Radio Conference took place on 27 September, and on the following day the first meeting of Committee 5—Table of Allocations took place. Committee 5 has five working groups, each responsible for a segment of the frequency spectrum, as follows:

WG5BA	0-4MHz	WG5D	960MHz-40GHz
WG5BB	4-27.5MHz	WG5E	40GHz and above
WG5C	27.5-960MHz		

During the second week Article N30/41 was considered. This was a matter of great concern, and the result of the debate could have had far reaching effects on amateur radio. However, after considerable discussion it was agreed that the frequency above which morse qualification would not be necessary be amended to 30MHz. This decision effectively defeated the USA proposal that the morse requirement should be optional throughout the spectrum. Other small amendments were made but these have no major effect on the present position. During this meeting the IARU was asked by the chairman for comments and information.

WG5BA

The position of 1.8MHz is still under discussion, but in IARU Region 1 the probable outcome is an exclusive segment from 1.810 to 1.850kHz, plus the existing Footnote 194.

WG5BB

Concerning 7MHz, the position is confused, to say the least. Both broadcasting and maritime mobile are looking for additional frequencies. The probable result is that there will be no change in the existing allocations.

WG5C

On 3 October China proposed the introduction of land mobile and maritime mobile into the 28-29.7MHz band, but withdrew the proposal after discussion and negotiation.

This group considered 47-68MHz, and on 17 October, after a long discussion, it was decided to refer the question of a footnote, or resolution, to a later meeting.

France and the USSR strongly opposed an amateur allocation between 50 and 54MHz in IARU Region 1, and efforts to obtain reference to Region 1 failed by 53 votes to 47. The presentation of the proposal in committee was unsatisfactory, and delegates were given only three or four minutes to read the paper. Further lobbying took place prior to the next meeting of Committee 5 at which it was proposed to return to this band.

There was no change to 144-146MHz in all regions, but at least two countries insist on a footnote so that they can add the fixed and mobile services in their countries.

WG5D

This group considered the position at 1,215-1,300MHz and allocated 1,215-1,240MHz to radiolocation and radio navigation satellites. The segment 1,240-1,300MHz was allocated to radiolocation (primary) and the amateur service secondary, with a satellite uplink at 1,260-1,270MHz.

The group confirmed the existing amateur allocation at 2,300-2,450MHz, and authorized a new segment for the amateur satellite service at 2,400-2,450MHz without any restriction.

No change was made to the existing position of 3.3-3.5GHz, but there was support for an amateur satellite allocation at 3,400-3,410MHz—this will be the subject of further discussion.

The 10-10.5GHz section remains unchanged, except for an amateur satellite segment at 10.45-10.5GHz.

The 24GHz amateur allocation remains unchanged.

WG5E

This group has presented the following amateur allocations for committee approval: 47-47.2GHz, 75.5-76GHz, 142-144GHz and 248-250GHz—all exclusive amateur/amateur satellite. The bands 76-81GHz, 144-149GHz and 241-248GHz are available on a shared basis. □

Christmas holidays

RSGB headquarters and the Chelmsford editorial office will be closed from 24 December 1979 to 1 January 1980, both dates inclusive.

Radio Communication publication date

Commencing with the next issue, the official publication date of *Radio Communication* will be changed to the first Friday in each month.

However, it is intended to publish the March, June, July, August, September, November and December 1980 issues a week earlier than the official date.

QSL Bureau

G2 series. After many years service as a QSL Bureau sub-manager, Mr J. W. Russell, G2ZR, has been forced to resign on health grounds.

The new sub-manager for the G2 series is Mr C. H. Adams, RS10906, 4 Park Gate Gardens, East Sheen, London SW14 8BQ.

G4JAA-JZZ. Mr K. Baker, G3WTV, 16 Woodfield Road, Radlett, Herts WD7 8JD, has been appointed sub-manager for this series.

G4KAA-KZZ. Mr K. Draycott, G3UQT, 175 Oliver Road, Kirk Hallam, Ilkeston, Derbyshire DE7 4JW, has been appointed sub-manager for this series.

G8UAA-VZZ. Mr C. Lennox, G8NVP, 65 Westover Road, Branley, Leeds 13, W Yorkshire, has been appointed sub-manager for this series.

EI/GI Convention report

This year's convention, held in Dundalk, Eire, over the weekend 13-14 October, was again a most successful event. The first day was devoted to social activities, culminating in the dinner in the evening. This main event of the day was so popular that the 100 seats available were quickly sold out.

Mr Sean Nolan, EI7CD, immediate past-president of the Irish Radio Transmitters Society, presided at the dinner. The toast to the RSGB was proposed by Mr Jim Upton, EI8Z, president of the IRTS, and Dr Dain Evans, G3RPE, deputizing for the RSGB President, responded on behalf of the Society. The guests were regaled by many samples of Irish humour throughout the evening.

On the following day there was a small trade show, and a lecture programme which featured talks on antennas and the recording of dx observations.

The organizing committee was led by Mr Barney Patterson, G13KYP, and the RSGB was represented by: Dr Dain Evans, G3RPE; Dr John Allaway, G3FKM; Mr Bill McGonigle, G13GXP; Mr Norman Miller, G3MVF; and Mr David Evans, G3OUF.

1980 Presidential Installation

The installation of Mr P. Balestrini, TEng(CIE), MITE, G3BPT, as the 46th President of the Radio Society of Great Britain will take place on

Saturday 12 January 1980

7 for 7.30pm

on board

mv Mayflower Garden

sailing from

Westminster Pier promptly at 7.30pm for a short cruise on the floodlight River Thames

Admission will be by ticket only. Tickets will be limited to two per member, and the total number available will also be limited.

Price per person.....£2

Applications for tickets should be addressed to: Mrs H. Allin, RSGB HQ, 35 Doughty Street, London WC1 2AE

RAE courses

The Kingston & D ARC is anxious to start an RAE class in its area, and is seeking a lecturer. Anyone who can assist is asked to contact G3HFO, QTHR.

The Castlereagh College of Further Education will run an RAE course from January to December 1980. The course instructor will be G13TZB. Further details from the college.

Raynet—a tie for Christmas

An ideal Christmas present—a tie with the Raynet motif on a navy blue background—may be obtained at a cost of £2.75, incl p&p, from Jane Balestrini, QTHR G3BPT.

Doram Electronics

This company, formed in 1974 to distribute RS Components products by mail order to the amateur market, has been acquired by the Dutch De Boer Group. Further information can be obtained from: Doram, Fitzroy House, Market Place, Swaffham, Norfolk PE37 7QH.

WANTED**VHF WRITERS**

The Society is in need of competent amateurs experienced in the vhf field who are able and willing to write on vhf subjects for the Society's publications. Payment is made for all published work.

Anyone willing to offer his services is invited to write to: The Editor, Radio Society of Great Britain, 88 Broomfield Road, Chelmsford, Essex CM1 1SS.

Printed circuit techniques for the amateur

by CLIFF SHARPE, G2HIF*

THE printed circuit has become a familiar and essential feature of all modern electronic equipment. Within the last decade it has become so widespread in its applications that almost every technique used in the construction and manufacture of electronic circuits embraces some aspect of the technology. As a printed wire board, which basically comprises a pre-wired assembly of discrete components mounted on a synthetic-resin-bonded laminate of glass fibre, the printed circuit is to be found in practically all commercial electronic equipment. In the design laboratory too, where the ease with which a circuit can be modified is more important than the ability to reproduce it, development engineers often prefer to work with individually printed circuit boards because the prototype unit is made more representative of the ultimate production.

The printed circuit is no less important to the radio amateur, for without the facilities to produce his own printed wire boards he must find the scope of his experimental and constructional activities seriously curtailed. Indeed, it is a sign of the times that fewer and fewer enthusiasts even contemplate building anything unless a pcb can be purchased ready made. The reasons for this trend in amateur radio may be argued indefinitely, but this paradoxical resistance to "homebrew", in what is fundamentally a diy hobby, is indisputable.

The design and manufacture of a pcb to the highest professional standards embrace many technologies which are alien to the radio amateur not employed in the electronics industry. These range through the use of simple draughting aids and photographic processes to expensive, specialist computers which reduce every stage of pcb manufacture to digitally-controlled operations. Moreover, in industry the circuit designer seldom sees his function as extending into the domain of the pcb engineer, hence it is hardly surprising that something of this inhibiting attitude should be reflected by the amateur who, as an experimenter, is more inclined to align his thinking with that of the designer.

There can be no doubt that many of the specialist resources in common use by the professional engineer are not readily available to the amateur, for, if he is to make his own pcbs in the shack, he must rely solely upon simple diy techniques. Unfortunately the belief that the processes used in pcb manufacture cannot be simulated by diy methods is so widespread that many amateurs hesitate to attempt them. Many are convinced before they start that the finished board will not only be much inferior to the commercial article, but that, even if it turns out to be better than expected, it will prove to be far too expensive for experimental work.

How true this belief is depends upon what degree of sophistication the amateur constructor considers to be necessary in a home-produced board. Multi-layer pcbs with plated-through holes, for example, demand technologies which

are not available universally throughout industry, much less to the diy amateur. He must ask himself, therefore, if he really has a genuine need of such advanced technologies. Fortunately the answer is seldom in the affirmative, and, provided he is prepared to limit his requirements to basic essentials, there is no reason why diy methods should not be made to yield standards that compare favourably with those of industry.

The following review of some of the processes used in pcb manufacture looks at the methods and materials available to the amateur. Various techniques are discussed in detail and, while there is no suggestion that they are the only diy methods which are possible in the shack, it is considered unlikely that any can be simplified further without reducing the quality of the final product. The materials and equipment recommended have been chosen as being suitable for amateur use. They are not necessarily the best, nor the only, products available, but nearly all are reasonably priced and can be obtained in small quantities from agents or retailers. Clubs intending to set up their own facilities for pcb manufacture are advised to "shop around", as some of the photographic materials etc are likely to be cheaper when purchased in larger quantities.

The basic methods

The various methods of producing a pcb using only diy techniques can be classified into three categories. The first, cheapest and simplest, is by the direct application of a non-photo-sensitive resist to the copper face of the laminate. This is essentially a "one-off" operation suitable only for experimental boards on which the component density is low. The second and third categories are similar in that they involve the use of a photo-sensitive resist which permits many boards to be made from a single artwork master. Categories two and three differ only in the type of resist used and in the number of photographic operations required to produce the finished board. Both these methods are capable of producing a pcb to professional standards, and may be regarded as being simplifications of the well-established industrial processes.

In each of these basic methods a certain minimum of artwork is necessary. This may be applied directly to the copper face as in the first, or, more generally, to tracing paper or to a cellulose acetate transparency. While skills in the use of draughting techniques are an advantage, they are by no means essential, since the electrical functions of a pcb are affected less by the neatness of draughting than by the accuracy of the circuit layout. It is strongly recommended, therefore, that before any attempt is made to produce any artwork, or to apply a non-photo-sensitive resist to a copper surface, a few rough sketches of possible wiring layouts are investigated in order to get a clearer idea of how the finished pcb will look. These sketches need not be drawn precisely to scale, but they should include details of fixing holes, cable terminations and positions of any screening partitions.

*20 Harcourt Road, Wantage, Oxon OX12 7DQ.

When a satisfactory layout has been selected from the preliminary sketches, draughting can begin on the artwork master. The exact positions of the tracks and components on the pcb may have to be changed slightly as the artwork is built up stage by stage, but if care has been taken in making the sketches it should be possible to accommodate any modifications without recourse to the original drawings. Once the artwork has been completed, check very carefully for errors before proceeding to the next operation.

This will depend upon which of the three processes is being followed. In category one, where the resist is being applied directly to the copper surface of the laminate, it remains only to etch away the unprotected copper in a bath of ferric chloride solution to leave the remainder as the required printed circuit. Simple washing, drilling and burnishing operations complete the pcb.

In the second category the artwork, which will be a positive representation of the required wiring layout on a clear transparency, must be photo-copied to the copper face of the laminate. This operation requires the whole of the copper surface to be photo-sensitized with a positive resist in order that a contact print can be made by exposure to ultra-violet light. With the positive resist the exposed areas are removed by developing to leave the unexposed resist pattern as a faithful print of the artwork master. The normal etching and finishing processes complete the pcb as before.

The third method makes use of techniques similar to those used in category two, but since the copper face is coated with a photo-sensitive negative resist, it is necessary to make a photographic negative of the artwork first. This negative can be made on film by taking a simple contact print as before. After developing, the unwanted areas will be opaque black, and the wanted circuit tracks clear transparencies. This film negative becomes the new photographic master through which the circuit layout is transferred to the copper face by making a second contact print. Again the usual etching and finishing processes complete the board.

Although there is little to choose between the quality of the final product as produced by the positive and negative photo-resist processes, most amateur constructors will find the positive resist process simpler and easier to follow. It tends, however, to be the more expensive of the two methods because the additional cost of most positive resists more than offsets the cost of the film. The negative resist process is widely used in industry because of the greater flexibility it offers in reproducing the photographic artwork.

The artwork masters

Artwork masters are necessary only for processes which use photo-sensitive resists, and while it may be argued that their preparation is one more operation to increase the expense of making a pcb, the advantages obtained are significant. Their use permits easy duplication of a circuit board, modifications can be introduced with the minimum of difficulty, and, because the artwork is prepared on a non-metal surface, a much higher standard of draughting is possible.

Masters made for use with a photo-positive resist must be prepared on a clear transparency—plasticized cellulose acetate is ideal—to avoid the possibility of paper fibres masking the ultra-violet light during exposure of the resist. This problem does not arise with a photo-negative resist, hence the artwork for this process can be prepared on cheaper and more-readily-available tracing paper. Unfortunately it was not possible to



Fig 1. Example of pcb produced from pen and ink drawings. The master is normally drawn two or three times full scale and then reduced by photographic processes. Printed circuits drawn directly on to the copper laminate with an etch-resist ink pen are usually in this style

investigate more thoroughly the precise photographic behaviour of a wide range of alternative artwork materials prior to this review, as it was more important to establish working methods within a reasonable time. Since factors such as paper grade and thickness, transparency to ultra-violet light, and grain size of the film can all influence the quality of the finished product, it was deemed sufficient to recommend a particular product if it gave good results in practice. The use of other materials with similar specifications are not precluded however, and amateur constructors who believe that a particular grade of paper or film would be equally satisfactory are encouraged to experiment for themselves.

In the photographic processes, the two most important properties of the materials used for the artwork are their opacity to light and ultra-violet light and the thickness of the tracing paper and cellulose acetate—the optimum thickness of both is about 0.003in. Thinner paper and acetate tends to stretch and not lie flat, while thicker materials defuse the light and reduce the definition of the contact print.

The use of draughting aids can make the preparation of artwork on almost any surface a relatively simple operation. These aids are marketed by several firms specializing in this field, and while they are not always as cheap as might be expected, they so simplify the task that anyone with the ability to position a dot or line on a grid can produce quite professional-looking artwork.

The complete range of aids is too numerous to list here, and any amateur who is interested is advised to write for brochures to any of the firms listed in the appendix. Fortunately, first-class artwork can be produced with a comparatively small range of aids if the tracks are limited to a choice of two widths—0.04 and 0.1in—and the terminal pads to about four sizes of circle. Radiused corners, T-joints, ellipses, pear-drops, and special groupings for ics are all readily available but are by no means essential for most diy circuit boards.

Two main types of draughting aid are in common use: the dry-transfer type as marketed by Alfaco, Letraset and RS Components, and the waterproof self-adhesive tapes and pads by

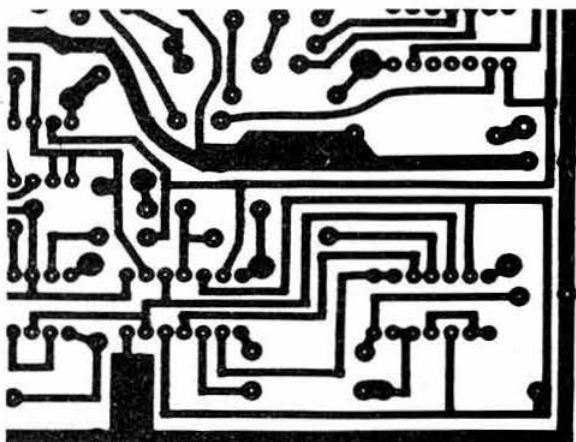


Fig 2. Example of a positive pcb master produced with draughting tapes and pads on an acetate sheet. This type of master may be used directly to mask a board coated with positive resist

Chartpak, Circuitape and Brady. The dry transfers cost less than the self-adhesive aids but they can be used only once. The self-adhesive aids, on the other hand, can be peeled off and moved several times, allowing modifications to the artwork if circuit changes have to be accommodated at a later date. Both types of aid are primarily intended for use on tracing paper or similar materials but, if applied to a thoroughly degreased surface, they will adhere sufficiently well to suffice as the non-photo-sensitive resist. This particular use of the aids, however, is not highly recommended, as it is difficult to prevent the etching solution from being drawn into the joints between tapes and pads by surface tension.

If the primary objective is to make a pcb as cheaply as possible, and artwork masters are considered to be unnecessary, a non-photo-sensitive resist pen is sold by Dalo and RS Components for draughting directly upon the copper surface. The method is quick, cheap and relatively simple; it is ideally suited to the manufacture of "one-off" experimental boards, but the final artwork can be no better than the amateur's ability to draw neatly on the copper. Alternatively, if some form of artwork is necessary because duplicate boards are required, or if it is desired to copy a pcb layout from the printed page, quite passable artwork masters can be draughted on tracing paper using opaque indian ink and a No 3 Uno stencil pen.

Styles of wiring layout in pcbs

A pcb can be laid out in any one of three distinct styles. The first, and most commonly used for all applications, prints the circuit as a number of irregularly-shaped islands of copper each carrying one or more component terminations. These interconnect with curved tracks of varying width according to the dictates of adjacent tracks and islands. This style has the merit of requiring less draughting precision during the preparation of the artwork; it is, therefore, generally favoured by freehand draughtsmen working with pen and ink. The artwork is usually drawn as a scaled-up positive and photographed to provide a negative master for use with negative resist. Electrically it has few special advantages, even when careful thought has been given to the circuit functions of each track, and, at the worst, it can lead to a pcb having excessively-large stray capacitances at

critical points and to common impedances being formed between otherwise independent stages.

Draughting aids of the types recommended do not lend themselves to the making of large irregularly-shaped areas. They are most frequently used, therefore, in a second style of pcb in which standard-sized component terminating pads are positioned at the intersections of grid lines. The interconnecting tracks between the pads are run in a rectilinear pattern with short lengths of tape or transfer strip. This style has a certain aesthetic merit but sometimes necessitates longer tracks between terminating pads, merely to preserve the rectangular pattern. It can, however, be made fully compatible with the special requirements of rf circuits; it also allows a high density of components without the need to depart from an orderly arrangement. Tracks laid to a strict geometrical pattern are ideally suited to complex logic circuits which often require few additional components. The geometrical layout is often adopted by pcb manufacturers making use of computer-aided design services.

In a third style of pcb, tracks are eliminated almost entirely and only the minimum of copper is removed during etching. The artwork is built up by placing strips of tape or transfer to represent the insulating boundaries between the terminating pads, which are enlarged to rectilinear areas forming common connections. It is usual to print the pcb directly from a positive master using a photo-negative resist. This style of pcb is not suited to high-density layouts which incorporate multi-pin ics. It can, however, be used to advantage in high-current solid-state transmitters where it is more important to minimize the lead impedance than it is to reduce the stray capacitances to earth.

Although these styles of pcb are quite distinct and possess their own special advantages, there is no necessity to adhere strictly to any one for any particular circuit. Professional pcb designers tend to work in the style which finds common usage at their firm or in that which is specified by the circuit designer. The amateur constructor, on the other hand, is bound neither by convention nor by the dictates of a circuit designer. He is, therefore, free to adopt those features of each style which best suit his specific requirements. One such hybrid style favoured by all pcb designers, because it allows a geometrical arrangement of components without the constraints imposed by a rectilinear track layout, is that of snaking the interconnections through the layout in as direct a path as possible. This style is not recommended with dry transfer draughting aids because of the difficulty of putting down the curved tracks, but it is ideally suited to narrow self-adhesive tapes.

Whichever style and manufacturing process is adopted, the pcb designer will benefit by familiarizing himself with the dimensions of all the components he intends to use. These can be standardized to the nearest 0.1in; for example, 1W resistors require 0.4in spacing between fixing pads, a typical 0.1μF tubular capacitor 0.7in, and a T05-size transistor three pads at the corners of a triangle of base 0.2in and height 0.1in, etc. If many components are to be stacked side by side, it will also be helpful to memorize the lateral spacing required by each to the nearest 0.1in.

On a properly-assembled pcb all the components should be mounted on the face, or earth plane, side of the board. They should be held in place by soldering the leads to correctly positioned pads on the underside. If necessary the leads should be bent not closer than 0.05in from the body of the component to pass through the board at right angles. The only exception to this rule is when the electrical requirements demand that a

decoupling capacitor or an emitter lead, etc must be taken directly to an earth plane in order to minimize the lead impedance at uhf/shf.

In laying out the circuit, the designer should endeavour to position the components to lie parallel to the axes of the board. Component assemblies which require resistors and capacitors to be mounted normal to the plane of the pcb, or in a random arrangement, present an untidy appearance besides being less satisfactory electrically. All signal leads should be kept as short as possible, and every care must be taken to avoid the input and output of any stages operating in the same frequency range being in close proximity.

An earth plane is essential for all rf circuits, and strongly advised for high-gain lf applications. If the component density is such that tracks are required on both sides of the pcb, avoid breaking up the earth plane into islands which are interconnected only by narrow isthmuses of copper track. Similarly do not run long earth return leads which present a common impedance to several stages, as these practices are a common cause of unwanted feedback and general instability.

The amateur constructor seldom has access to photographic enlargers etc. He must, therefore, work to a unity scale when laying out the artwork. In practice this is not the severe handicap it might first appear to be, because the designer is kept constantly aware of the true size of the components with which he is working. Scaled-up artwork demands less draughting precision, but tends often to give the inexperienced draughtsman a false impression of the dimensional tolerances allowed on the finished pcb. The simple processes of this diy technology do impose limitations on the degree of miniaturization which can be recommended, but it is the author's firm belief that by working to a 1:1 scale many of the hazards are automatically avoided.

Preparing the artwork

Once the pencil sketch of the proposed layout has been made, work can begin on making the artwork master. If this is intended for use with a photo-positive resist, the master must be prepared on transparent cellulose acetate; if the resist is photo-negative and the artwork is to be copied on to film, however, it is usually quite satisfactory to work on good-quality tracing paper—provided the subsequent photographic processes are strictly controlled. In each case the basic procedure is the same. When completed, the master will be used to make a contact print of the circuit either on the copper surface or on the film. It is most important, therefore, to prepare the master so that it is orientated to produce the correct shadow image.

In the positive resist process the printed wiring will be a 1:1 replica of the artwork, which must be draughted as viewed directly from the underside of the pcb. The negative resist requires an intermediate contact print to be made on film and, if adequate definition is to be maintained through both printing processes, the film must always be used with the emulsion in contact with the artwork or the resist-coated surface. This can only be done by preparing the artwork master as if it were the printed wiring viewed through the pcb from the component face. Again the scale must be 1:1 but the draughted artwork is a mirror image of the printed copper.

To ensure a neat, regular arrangement of the components on the finished board, it is recommended that a 0.1in grid is secured under the master before draughting begins. As a further guide to positioning the components during the preparation of the artwork, the outline of the board should be clearly

marked on the grid, as should the positions of all fixing holes, cut-outs, terminations and forbidden areas.

With the grid in position and clearly visible through the tracing paper or acetate, mark in the four corners of the board and the fixing holes with draughting aids or a Uno stencil pen. The centres of small circles can be used to indicate the drilling points, and crossed lines to indicate the corners.

Dry transfer draughting aids are applied by positioning the symbol on the grid and rubbing lightly with the rounded point of a soft pencil; the dry tip of a used nylon-pointed pen is ideal. The symbol will then adhere to the artwork when the transfer is peeled away. Self-adhesive draughting tapes and pads can be placed in position with a special draughting scalpel. Alternatively the corner of a single-edged safety razor blade is equally satisfactory, as the cutting edge may also be used to trim the length of tape as it is applied. If wrongly positioned on the grid, this type of aid can be lifted several times without difficulty and, as an economy measure may even be re-used from old masters.

When the corners and fixing holes have been indicated, the circular symbols which form the terminating pads for the component leads may be positioned similarly by making frequent reference to the original pencil layout sketch. Work through the circuit stage by stage, joining up the pads with draughting tape or equivalent dry transfer strip to represent the wired tracks. Adhere strictly to the grid using 0.1in diameter pads wherever possible. Do not use tracks which are thinner than 0.04in, and be especially careful to leave at least 0.04in clearance between adjacent tracks and circles throughout. Use 0.075in diameter pads only when space does not permit a larger size; eg dual-in-line ics etc.

Without the help of specially-made jigs, it is not possible with the simple diy methods described here to align the positions of printed tracks and pads on opposite sides of a pcb. Tracks which are required to cross, and which cannot be taken through component gaps, must include short jumper wires. If insulated with a short length of sleeving, these can be mounted on the face side of the board and soldered into position in the same way as any small component. In rf circuits particularly, this form of jumper is preferred to that of the commercial practice of printing tracks within the earth plane because it preserves the plane intact. All jumper wires should be made as short as possible—usually 0.4in to match a typical small component spacing—and should be confined to leads not carrying signal currents.

Contact printing

The exact procedure by which the circuit is printed on the copper laminate will depend upon which of the three basic methods is being followed. If the circuit has been drawn directly on the copper surface, the special ink serves as a positive resist and no further steps are necessary prior to etching. The following paragraphs which relate to contact printing are applicable, therefore, only to those methods in which the circuit on the artwork is transferred as a pattern of resist to the copper surface by photographic processes.

The number of steps in this operation depends upon the type of resist which is being used. When this is photo-positive, the contact print can be taken directly from the artwork master, but when the resist is photo-negative it is necessary first to make a photographic negative of the positive artwork. The negative is then used as the new master from which the contact

print is taken on the photo-sensitized copper. In both processes the circuit of the original artwork is ultimately reproduced as an identical pattern of resist on the copper laminate.

The method by which the photographic negative is itself printed is similar to that used in printing the pattern of resist on the copper. It differs only in the materials used and in the timing and nature of the exposure. Provided the photographic plate is large enough to accommodate the full-size pcb, there is no fundamental reason why the negative master cannot be made on almost any readily-available film. In practice, however, fast film requires a very short and accurately-timed exposure, which is not possible without some photographic equipment. A slow, high-contrast film is therefore to be preferred because it is less demanding of those who are not experienced in photographic arts. One such film is the Ilford N7E50, which is marketed in a wide range of plate sizes and can be obtained from most photographic supply agents. The film, which is blue sensitive, may be handled safely in a darkroom illuminated by indirect light of a 5W red bulb. This level of illumination will provide just sufficient light in which to work once the eyes have had a few minutes to adjust. Faster films, of course, must be handled in complete darkness.

The contact print is taken from the artwork master very simply. No camera, lens or other photographic apparatus is required, except for a small light source and a piece of plate glass large enough to cover the pcb. However, in order to facilitate positioning the artwork and film correctly under difficult lighting conditions, a simple exposing frame is recommended. This may be fabricated from wood and metal by fastening three strips of aluminium angle to a flat, rigid base. A 14in length of 12in-wide chipboard shelving would be ideal for 10 by 8in film plates. The aluminium angle should be fixed in the centre of the wooden base to form a shallow, rectangular well with the same dimensions as the film plate. The frame should be completed by painting it matt black to minimize unwanted reflections and by the glass plate cut to fit within the well. Ordinary 32oz/ft² window glass makes an excellent plate and can be obtained cut to size from any glazier or diy merchant for about 50p.

The exposing frame is used with a light source which should be suspended 75cm above the well to provide an even illumination over its whole area. The light source should not be too intense, and may be provided by an ordinary 12V 2W pea lamp in a non-reflecting holder. The light may be operated manually with a conventional on/off toggle switch.

Before the film is removed from its light-tight wrapping, trim the artwork master to the same size as the photographic plate and make sure all materials and equipment are to hand. Check the darkroom blackout is intact (black polythene sheet is excellent cheap blackout material) and switch off all lights except the red safelight. Allow a few minutes for the eyes to adjust, and remove one film plate from the pack. Place this in the well of the exposing frame with the light yellow emulsion side uppermost. N7E50 film is supplied backed with a red filter on the reverse side; in poor lighting the emulsion side can be identified, therefore, as being the paler colour.

Next place the artwork master in the frame above the film so that the flat side of the tracing paper or acetate is in contact with the film emulsion; ie the draughting aids are uppermost. Cover with the glass plate and press down flat to ensure the whole area of the master is in good contact with the film. Expose the film to the small light by switching it on for 8s; switch off and remove the exposed film from the frame.

Develop the film by immersing it in Ilford Phenisol, which should be diluted one part of developer to four parts of water before use. Half-a-litre of the mixed solution is quite sufficient to develop at least six or eight small films. Agitate the solution continuously while developing for 4min; remove the film with a pair of rubber-tipped tongs to avoid damaging the wet emulsion, and rinse thoroughly in water before transferring it to the fixing solution. Ilford Hypam, with or without a hardener, is recommended. After about 3min full lighting can be restored and the film negative removed for further rinsing in running water. Shake off the surplus water and hang up the film to dry.

When the film has dried completely, the emulsion will have hardened sufficiently to withstand normal handling. The film is now a negative of the original artwork, with the circuit appearing as transparent tracks against a jet-black back-

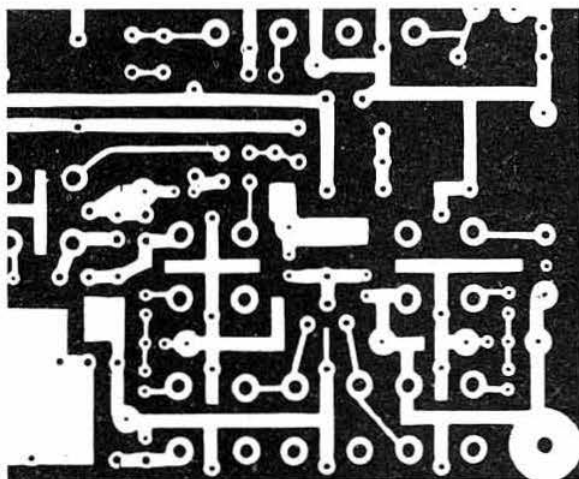


Fig 3. Example of a negative pcb master which has been contact printed on photographic film from a positive master. A negative master must be used with a negative resist

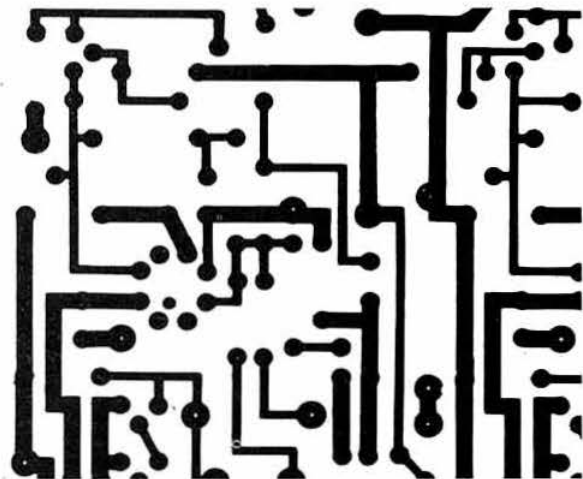


Fig 4. Example of a positive mask produced from a negative master by contact printing. Note that the sharp definition of the original taped master is retained through two contact printings

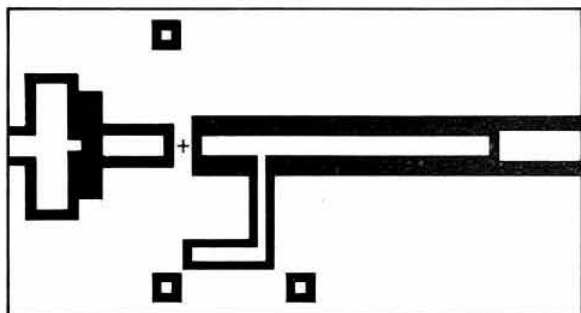


Fig 5. Example of a pcb for uhf applications. The draughting tapes are used only to outline the areas of copper to be retained (shown white). The master for this type of printing must be used with negative resist

ground. Check that these are clear of any fogging and that the exposed areas are opaque. Examine the thinner tracks carefully, and if the edges are not sharply defined, or if the width does not appear to be uniform over its whole length as in the original master, it is possible that either the artwork has not been pressed flat and in contact with the film emulsion over the whole surface area, or that the tracing paper of the master has diffused the image. A fault arising from the artwork not being in good contact with the film usually occurs over a small area of the master only, whereas the effects of diffusion are more uniform. Faults due to this latter cause occur through variations in the transparency of the original artwork or through the paper being too thick. Diffusion faults are less likely to occur when the artwork has been draughted on clear acetate but, if present to a minor degree, may be corrected by reducing the duration of the exposure or by moving the light source farther from the film.

Also examine the negative for any signs of under-exposure. Film which is under-exposed will not be opaque and will show differences in the blackness of those areas masked by tracing paper and those not so covered. Black printing on white paper should not be visible through the opaque areas when held up to daylight. Should it be necessary to increase the exposure, lengthen the duration of the exposure rather than decrease the distance between the light source and the film.

Any small flaws in the black areas may be touched up on the emulsion side of the film with an artist's brush and indian ink.

Severe fogging can be cleared by carefully scraping away the emulsion with a razor blade.

Photo-sensitizing and printing on the copper laminate

The procedures for sensitizing the copper laminate with either the positive or negative resist are very similar. First cut a piece of single- or double-sided copper-clad board slightly larger than the required size; smooth off any rough edges with a fine file, and thoroughly clean and degrease the copper surfaces. Detergents, alcohols and trichlorethylene are very effective, but if not readily available a hunt round the domestic cleaning cupboard is likely to reveal something equally suitable. Vim or Ajax cleaning powders applied with a damp cloth not only do a thorough job of the degreasing but they will also remove any oxide and leave the copper surface with a slightly matt finish to which the resist can adhere easily.

Rinse away every trace of scouring powder and other cleaning agent under running water, and dry off the surplus moisture on a clean paper tissue, taking care not to touch the copper surface with the fingers. Place the board, copper side uppermost, on another clean tissue and leave to dry thoroughly, preferably in a warm, dust-free atmosphere.

Although it is not essential, a small, light-tight drying oven will be found particularly useful in speeding up this and the subsequent drying processes which are necessary in making the pcb. A small drawer, cupboard or even a strong cardboard carton is easily converted into a simple drying oven by fitting several 100W electric light bulbs as heating elements. If one lamp is provided for every 2ft³ of drying space, and the walls of the oven are only moderately well insulated, the equilibrium temperature should reach about 70° to 75°C, which is quite adequate for most pcb purposes. Each lamp must be fitted into a large cocoa tin which has been painted matt black inside and outside to enable it to behave as an efficient radiator and to prevent any stray light from ruining the dried photo-resist by accidental exposure. The surface temperature of the tin will become too hot to touch after quite short periods of operation, so care must be taken to ensure that the lamp fittings and wire insulation will not deteriorate in the elevated temperature.

When the board has dried and cooled to room temperature it is ready to be covered on the printed circuit side with a thin coating of resist. The manufacturers recommend either dipping, spraying or spinning, and make their materials with a wide range of viscosities appropriate to the processes. With the

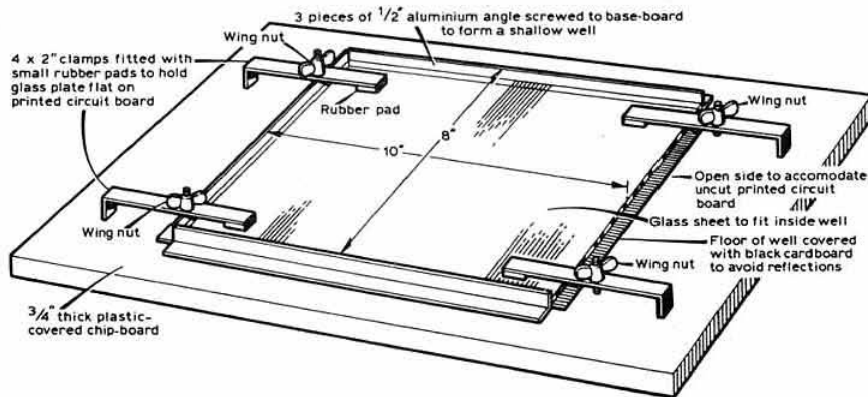


Fig 6. An exposing frame for diy pcbs

exception of the aerosol spray, none of these methods is particularly well suited to diy processes, if only because they tend to be wasteful in the amount of resist required to cover a single board.

The essential properties of sensitized board are that it should be evenly coated to about 0.0005in thickness and be as free as possible from specks of dust etc. The definition required in printing a pcb to the foregoing standards is not exceptionally high, hence it is more important to ensure a uniform coating of resist than it is to define the exact thickness. It is quite possible, therefore, as an alternative to the aerosol spray, to apply the resist with a soft brush or small roller coater.

Place the board on a flat surface and cover with the resist according to the instructions on the aerosol, or by painting with long, light strokes across the board. The covering made by both methods will appear blotchy or streaky at first, but if the board is allowed to stand for a few minutes on a perfectly horizontal surface, the resist will flow to provide an even covering over the whole area. The resist is not light sensitive until it has dried, so that the operation can be carried out in subdued daylight. Sunlight and ultra-violet light must be avoided.

As soon as the board has become evenly covered, transfer it to the drying oven, or to the darkroom, where it should be allowed to finish drying on a level surface in complete darkness. If the surface is inclined, the resist will continue to flow while it remains wet and will form a thick ridge along the lowest edge of the board which will not expose properly. It is often advisable, therefore, to avoid the problem by making the board slightly oversize and by trimming it after the printing has been completed.

The drying will take several hours at room temperature and, if preferred, the board may be left overnight until the resist is quite hard. Alternatively the drying can be completed in the oven by baking at approximately 70°C for 1h. When dry, the resist becomes fully light sensitive and may be used to make a contact print immediately. It is inadvisable, however, to place the sensitized surface in contact with the artwork master while it is still warm. Sensitized boards may be stored for long periods without deteriorating if kept in a cool place and in light-tight wrappings. Several firms, including Circutape Ltd and RS Components Ltd, market boards precoated with positive resist which may be exposed using the artwork masters described in the foregoing paragraphs.

The contact print is made on the sensitized copper surface by exposing it to ultra-violet light in a manner similar to that used in printing the photographic negative from the original artwork. Place the board in the exposing frame with the coating of photo-resist uppermost. Lay the master on top with either the plain side of the cellulose acetate positive master, or the emulsion side of the negative master, next to the resist. Cover with the ultra-violet transparent glass plate; press flat to ensure the master is in good contact with the sensitized surface over the whole area of the board and place beneath a source of ultra-violet light ready for exposing.

Most photo-sensitive resists are slower than photographic film and require a longer exposure time. They are usually blue and ultra-violet sensitive, and may be handled in relative safety under a red safelight for a period long enough to set up the sensitized board and master within the frame.

Any light source used to expose the sensitized board must be rich in the longer ultra-violet wavelengths. Almost any mercury vapour discharge lamp will suffice, provided the duration of the exposure is adjusted to accommodate the different intensities, but many lamps of this type are either expensive or

difficult to obtain. Various alternative ultra-violet sources have been tried in an attempt to find one which is well suited to amateur requirements and ultimately a compromise had to be made between the intensity of the ultra-violet radiation, cost and availability.

The source eventually chosen, and to which all the exposure times quoted below are related, is an 8W 12in fluorescent black-light ultra-violet tube manufactured for special lighting effects. This is available from the Service Trading Co for under £2. A ballast choke for use with this lamp is available at moderate cost from the same firm. RS Components Ltd also market an ultra-violet exposure unit which is designed especially for use with their pre-sensitized boards. This unit accepts pcbs up to 250 by 150mm, and contains two ultra-violet sources similar to the one recommended.

The ultra-violet lamp should be mounted about 30cm above the plane of the pcb so that the area to be exposed is evenly illuminated. If a small cupboard has been converted for use as a drying oven, it will be found convenient to mount the lamp on the underside of a shelf or on the roof of the cupboard itself. No reflector is necessary, but it is advisable to provide some protection for the eyes if they are likely to be exposed to the ultra-violet radiation for long periods.

The minimum duration of the exposure necessary to make a good contact print will depend upon the thickness of the photo-resist coating, the intensity of the ultra-violet source and upon the amount of ultra-violet absorbed by the glass plate used to hold the master in position.

Window glass of the thickness recommended absorbs only a small amount of the useful ultra-violet radiation, but as types of glass vary considerably in their properties, it is advisable to

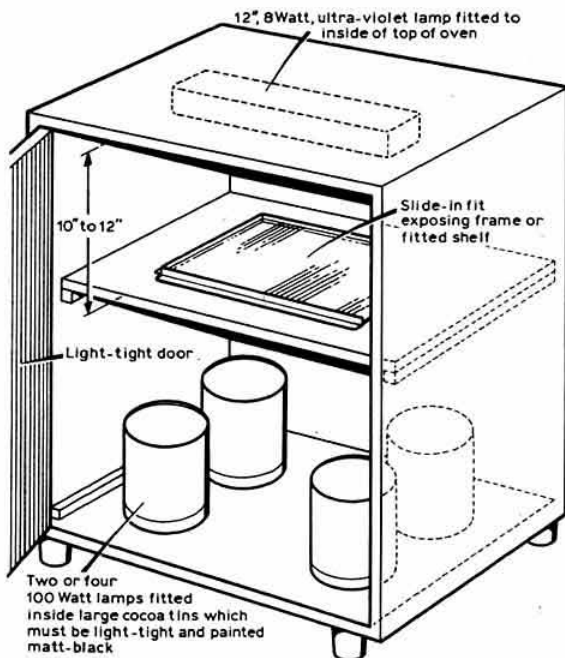


Fig 7. A diy pcb oven

check an unknown sample before use. This may be done by observing the shadow cast on a white handkerchief which has been laundered with a detergent washing powder. The test should be carried out a few feet away from the ultra-violet source and with the darkroom not illuminated by any other light. The shadow cast by ultra-violet transparent glass should be only just discernable.

Fortunately it is important only to obtain the maximum contrast between the exposed and unexposed regions, and since a positive resist preserves the circuit tracks which are masked by the opaque draughting aids, the exposure tolerances are quite wide. The positive resists recommended become fully exposed under the 8W ultra-violet lamp after about 20min, but longer periods of up to 50min do not appear to produce any appreciable loss of definition in the final print.

The exposure time for negative photo-resists, however, is more critical, since the black areas of the film negative cannot be regarded as being completely opaque to ultra-violet. Over-exposure, therefore, is more likely, and the margin between over- and under-exposure is consequently much less. With the equipment described above, the negative resists require about 15min exposure for the best results if the thickness of the resist coating is not greater than 0.0003in. Thicker coatings may benefit from longer exposure times, but it must be remembered that it is the exposed areas that are retained, not the unexposed regions as with a positive resist.

Under poor lighting conditions it is not possible to tell if either type of resist has been exposed correctly until the board has been developed. After exposing for the prescribed period, the ultra-violet lamp should be switched off and the pcb removed from the frame under a red safelight. The board should be then placed in a developing dish, resist side uppermost, and covered with developing solution.

The developing processes for both positive and negative photo resists are similar to those used in ordinary photographic work except that no fixing is necessary. Developing solutions vary according to the type of resist and the manufacturer. Some are used directly, while others must be diluted with water.

It is not possible, therefore, to generalize except by recommending that the instructions of the resist manufacturer are followed carefully. The developers for the positive resists listed in the appendix are alkali, and a dilute solution of sodium hydroxide is quite satisfactory. Seven grams of sodium hydroxide pellets dissolved in one litre of distilled water will make sufficient solution to develop one or two average-size boards. Alkali developers must not be used in aluminium developing dishes, as the solution will react with the metal. Negative resist developers are generally organic solvents and should not be used in the common photographic developing dishes which are made from white perspex or similar material. Hard polythene or glass dishes are to be preferred for both types of developing solution.

When the exposed pcb is immersed in the developer, the solution should be agitated by rocking the dish gently to wash away the unwanted resist. Particular care should be taken when using negative resists which have been applied with an aerosol, as the developer tends to soften the exposed surfaces. If the agitation is too violent, thin tracks may lift from the board and become displaced. Normally the developing process should be completed within a few minutes of the board being placed in the developer but, if necessary, the agitation should continue until the areas of copper to be etched away are washed clear of all traces of resist.

At this stage the pcb should be taken from the developer and examined under normal lighting. Traces of resist and dye colouring may be found to be remaining on the unwanted copper surfaces. These must be removed prior to etching, and usually yield to re-immersing in clean, fresh developing solution for a few minutes.

The fully-developed board should now be removed from the solution and the excess developer carefully drained off. It is possible to rinse off any surplus alkali developer under running water, but this should not be attempted when organic developers may have softened the resist. Both types of resist should be allowed to dry before further handling, and will benefit by a short period of baking in the oven. Twenty minutes at 75°C will be quite sufficient, after which the resist will be hard enough to withstand normal handling. Hardened resist scratches easily, however, and contact with any abrasive materials should be avoided.

Etching the board

Whatever method is being used to make the pcb, the wired circuit is "printed" on the copper surface by etching away those areas of the laminate not protected by a resist. It follows, therefore, that if the second copper face of a double-sided board is to be used as an earth plane, it too must be adequately covered by some form of resist before it can be immersed in the etchant.

It is possible to use another coating of photo-resist for this purpose, but it is simpler and cheaper to cover the copper with a printed circuit lacquer or a clear vinyl aerosol spray. Take care not to contaminate the printed wire side of the board, and allow about 30min at 65/75°C for drying. Alternatively self-adhesive, waterproof fabrics such as Fablon or Contact may be used if more convenient. After serving its purpose the protective fabric can be peeled off, or the vinyl lacquer covering removed by acetone or other suitable organic solvent.

At this stage it is advisable to examine carefully the pattern of resist on the wiring side of the board. The uniform surface of the resist may have been scratched accidentally, or places may be evident where the coating appears to be too thin. Repairs may not always be necessary, but the policy should be to administer first-aid whenever there is any doubt. Surface tension will pull the etchant into every minute flaw in the surface of the resist, and this often results in an otherwise perfect track being open circuit.

If any flaws or thin patches of resist are found they can be repaired by covering with a spot of positive resist, cellulose paint or a piece of waterproof draughting aid tape. Do not use ordinary pvc tape or Sellotape, as these are not sufficiently waterproof to stand being immersed in the etchant for more than a few minutes.

The etching process itself is best carried out in a deep narrow plastic tank large enough to contain enough ferric chloride solution to cover the board while it is suspended vertically by a nylon thread. PVC tanks of this shape are available from suppliers of photographic materials, but most amateurs will find any cheap, shallow tray or box perfectly adequate if it is made from rigid polythene or pvc. The shallow container need only be large enough to take the board laid horizontally with the surface to be etched uppermost. It should be deep enough to contain sufficient etchant to cover the board to a depth of 1 or 2cm and still allow a margin to permit agitation by gentle rocking. Metal trays must not be used unless vitreous enamelled.

The etching solution itself can be made up from various chemicals; ferric chloride or ammonium persulphate being the most common. The industrial grade of anhydrous ferric chloride is quite adequate for etching pcbs, and it may be obtained in small quantities from any firm advertising pcb hardware for about 50p/500g.

About 500g of anhydrous ferric chloride dissolved in one litre of water will make enough solution to etch between 5 and 10 boards depending upon size. Care should be exercised in dissolving the ferric chloride, as the reaction is exothermic and apt to fume. Also, the solution should never be left in an open tray after use as the vapour from normal evaporation will promote rusting on any unprotected steel surface. Unused etchant should always be stored in glass or polythene containers which can be sealed with a plastic lid.

The time required to etch a pcb will depend upon the strength and temperature of the ferric chloride solution. Fifteen to twenty minutes is generally long enough, although it is not unusual to find small areas of copper that are more resistant to the etch than others. Additional time in the etching solution will not harm the pcb if the coating of resist was evenly applied and baked after being developed. Continual agitation of the solution either mechanically or by bubbling air speeds the operation considerably, as does the addition of a small quantity of hydrochloric acid; 50ml to one litre of etchant is quite sufficient. Etching solution which has been used too often takes on a distinct greenish colour, and unless filtered regularly it will also form a thick sludge at the bottom of the tray. It is recommended, therefore, that any container used for etching is kept solely for this purpose.

When the etching process has been completed, the pcb should be removed from the ferric chloride, rinsed thoroughly under running water for at least 10min and then dried off.

Finishing treatment

Before the components can be mounted on the pcb it must be cut to size and drilled. These operations are best carried out in a workshop equipped with a guillotine and a small bench-mounted power drill, but the amateur constructor who is not so well endowed can manage with a few simple hand tools. Copper-clad, glass-fibre laminate may be cut cleanly along a straight edge with a fine tooth hack-saw provided the blade is kept at a very small angle to the plane of the board. A jig to guide the saw blade will ensure an accurately positioned cut and will save a great deal of time and effort with a file later.

The holes for the component leads should be drilled 0.8 or 1mm diameter through each pad according to the gauge of the wire. Glass-fibre laminate is hard on small twist drills and, if they are used in a normal hand brace, allow at least one drill for each hundred holes. Work from the printed wire side of the board, using the pad holes as the drilling centres.

If the board has an earth plane, the copper must be cut away from around each hole carrying a component lead to prevent a short circuit. On a densely-packed board, a large diameter trepanning tool will cut away more of the earth plane than is necessary, so care must be taken to ensure that no islands of copper are left isolated. Component leads which are bent correctly to pass through the earth plane at right angles require not more than 0.3mm clearance, thus it will be found possible to trepan away just the right amount of copper with a few turns of a 2mm twist drill held in a simple hand brace. Holes which are to be used to pin a pad through to the earth plane must not be trepanned, as this will make soldering difficult. Small

copper rivets make excellent earthing pins, and electrical contact can be assured by soldering on both sides.

When the pcb has been drilled, trepanned and all the earthing connections made, the board should be rubbed down with a fine grade of steel wool to obtain a bright finish, which can be preserved from oxidation by covering with a thin coating of printed circuit lacquer.

Appendix

The following list of materials, manufacturers and suppliers of pcb hardware does not pretend to be comprehensive in any way. Amateurs professionally engaged in the design and manufacture of pcbs will undoubtedly be able to extend it considerably. An article of this kind, however, would not be complete without the names and addresses of those firms from whose products much of the experimental facts detailed above were obtained.

Intending purchasers of pcb hardware are strongly advised to specify their requirements from firms' catalogues and to obtain current price lists before ordering. Several of the manufacturers listed below prefer not to supply directly to the customer unless the order exceeds a minimum value.

Photo-sensitive resists

Positive resist type OFPR.

Negative resist type TPR 201.

Developers.

Thinners.

Manufactured by Tokyo Ohka Kogyo Co Ltd, Japan.

UK agents: Semitek Agents (Birmingham) Ltd, 270 High Street, Harborne, Birmingham B17.

Positive resist type AZ1350 etc.

Developers.

Thinners.

Manufactured by Shipley Chemicals Ltd, Humber Avenue, Coventry CV3 1JL.

Fotolac positive resist lacquer aerosol.

Developer.

Available retail from G. F. Milward Electronic Components Ltd, 369 Alum Rock Road, Birmingham B8 3DR.

Negative resist aerosol.

Developer.

Available retail from agents for Tandy Corporation.

Photographic materials

Ilford film type N7E50.

Developers, Phenisol.

Fixers, Hypam.

Available retail from most photographic supply agents and Radiographic Supplies Ltd, Longmoor Lane, Breaston, Derby DE7 3BQ.

Positive resist coated copper-clad laminate

Available from RS Components Ltd, PO Box 427, 13-17 Epworth St, London EC2P 2HA.

Circuitape Ltd, New Street, Aylesbury, Bucks HP20 2NL.

Instagraphics Products Ltd, Chapel Works, Batchelor Lane, Horsforth, Leeds.

Draughting aids

Self-adhesive tapes and pads.

W. H. Brady Co Ltd, Daventry Road Industrial Estate, Banbury, Oxon OX16 7JU.

Circuitape Ltd, New Street, Aylesbury, Bucks HP20 2NL.

Chartpak Ltd, Station Road, Didcot, Oxon OX11 7NB.

Dry transfers.

RS Components Ltd.

Alfac.

Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 8LR.

Ultra-violet lamps, ballast choke etc.

Available retail from Service Trading Co, 57 Bridgman Road, Chiswick, London W4 5BB.

A limited range of pcb materials including those marketed by RS Components, Alfac, Tandy etc are available retail through Witney Audio, 29 Corn St, Witney, Oxon. □

Automatic cr/lf for vdus used with rtty

by I. CLINE, G3EMU*

THE author, having been reprimanded for forgetting carriage return and line feed on several occasions, felt that he should do something constructive about it. The cause of the trouble is the fact that, not being a typist, he looks at the keys most of the time, and does not realize that he has sent his allotted 68 characters. The result at the receiving end, if using the normal printer, can be annoying, even messy.

He devised two solutions. The first gives a red warning light after pressing 64 keys, approximately five before the end of the line. The warning light will only be extinguished by pressing the line feed key. The second method is more elaborate and fully automatic. Again a total of 64 keys can be pressed, and this time cr/lf will be sent automatically. A spare key can be used to send them both manually, or the normal keys can be used. Both systems are for use with a diode matrix, as used on the G3PLX type of vdu, which seems to be in use at a number of stations.

First method

The first method (Fig 1) employs cmos logic plus two small transistors.

A CD4040 12-bit counter is used to count the 64 keys being pressed. The clock input to this device is the same strobe pulse that goes to the uart in the vdu. On reaching the 64 count its output goes "high" and is applied to the "set" input of a CD4013 flip-flop. The Q output goes "high" and turns on a BC184 that has a red led in its collector circuit. This is the warning light, which the author has mounted in a prominent place on the keyboard.

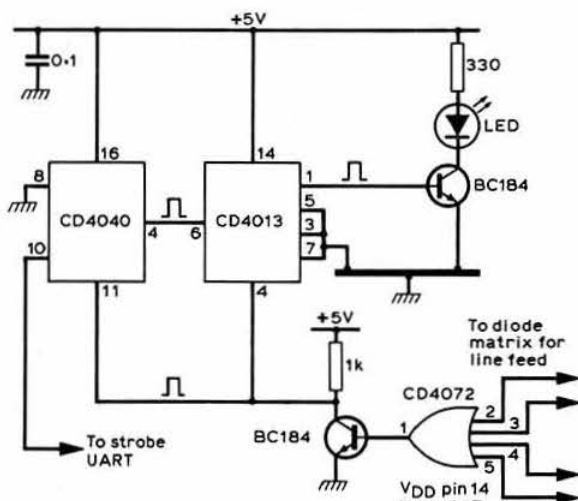


Fig 1. Circuit used to give warning that cr/lf required

The other IC is a CD4072, a four-input OR gate. The four inputs go to the lines on the Murray-coded diode matrix corresponding to the line feed code. These will normally be sitting "high" and the output from the OR will also be "high". This point is connected to the base of a BC184, turning it on and pulling the collector "low". The only case when this state will change, is when the line feed code is sent. Then the OR output goes "low" and the BC184 collector goes "high".

This point, being connected to "reset" on the flip-flop, makes Q "low", extinguishing the led. The same line is connected to "reset" on the counter, resetting for a fresh count. That completes the cycle of operations.

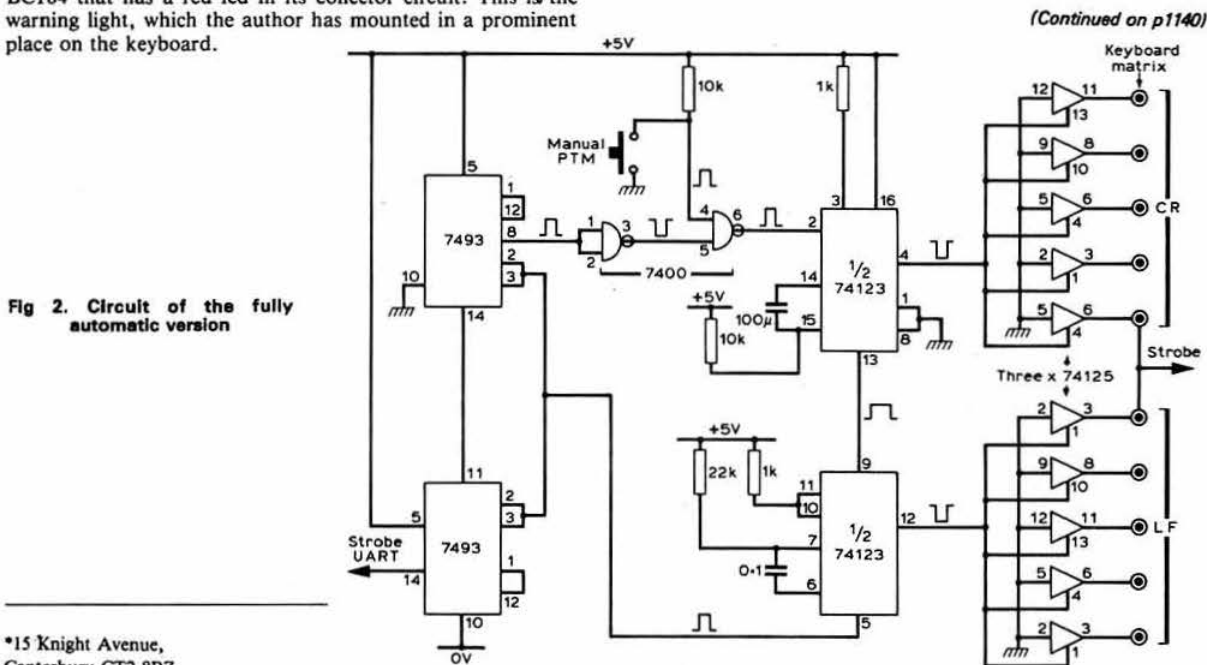


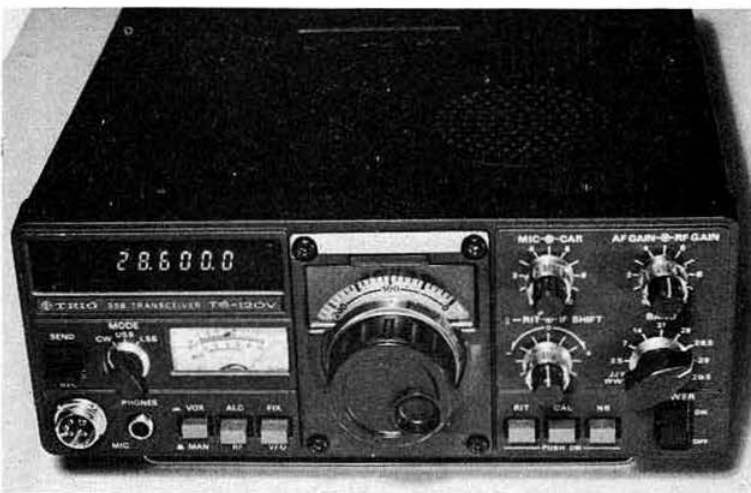
Fig 2. Circuit of the fully automatic version

*15 Knight Avenue,
Canterbury CT2 8PZ.

EQUIPMENT REVIEW

Trio TS120V hf transceiver

P. J. HART, BSc, G3SJX*



Introduction

Anyone who has attempted to install an FT101, or any other of the popular hf transceivers, into the average modern saloon car will appreciate the advantages of a compact lightweight rig for mobile operation. The Yaesu FT7 (reviewed *Radio Communication* June 1979) and Trio TS120 are two such compact transceivers.

The TS120V is a 10W transceiver for 12V battery operation, covering all bands 3.5 to 28MHz. Complete coverage of the band 28 to 30MHz is included as standard, making the transceiver ideal for driving vhf transverters. A range of matching accessories is available, including mains psu, external speaker, external vfo and atu. Since the review was completed, a higher power version, the TS120S giving 100W p.e.p. output, has become available. A cw filter is available as an optional extra.

Description

The transceiver circuitry is constructed on five main printed boards mounted on both sides of a sturdy central framework. The pa compartment and heatsink are mounted at the rear, and board interconnections are made using miniature multiway plugs and sockets. A compact, rugged and easily accessible layout has been achieved, and the whole transceiver weighs a remarkably light 4.9kg.

Both analogue and digital readout are provided as standard, with frequency readout to within 100Hz. Standard built-in features include noise blanker, vox, cw break-in, 25kHz calibrator, rit and i.f. shift. The vox controls and internal speaker are mounted on the top plate. The front panel controls are well laid out and easy to use. The key jack is located on the rear plate together with the usual power and accessory connectors. No provision for external receiver input is provided independent of the antenna relay. This may make the transceiver more complicated to use with some vhf transverters. Trio do not provide a microphone with the TS120, presumably to keep down costs. Microphones with impedances in the range 500Ω to 50kΩ are suitable, and there appears to be plenty of audio gain available.

The TS120 is a single-conversion transceiver with an i.f. of 8,830kHz. This gives rise to a clean design with few spurious signals. The tuning range on each band is 500kHz, 28–30MHz being covered in four bands. A form of frequency synthesis (pll unit in the TS120 manual) is used for the conversion oscillator, eliminating the need for the usual bank of crystals. A separate vco is used for each band with the main vfo tuning 5.5–6.0MHz. Reference frequencies from the counter board as well as inputs from the 8.83MHz carrier oscillator and vfo are used in the pll unit. An interesting feature of this transceiver is the provision of i.f. shift or passband tuning. This proves very useful for copying weak cw in the presence of adjacent channel interference. The frequency of the 8.83MHz carrier oscillator is shifted with respect to the filter passband. This has the effect of shifting the audio passband up or down, and allows low-pitched or high-pitched interfering signals to be placed down the skirts of the filter. If the frequency of the 8.83MHz oscillator alone were shifted, a change in audio beat note would be obtained as with a conventional bfo. To eliminate this problem, the frequency of the synthesizer is shifted by an equal amount.

Wideband circuitry with switched filters is used in both the transmitter pa and receiver front-end. This eliminates the need for the customary preselector and pa tuning controls, and makes for rapid band changing and ease of operation. Dual-gate fets are used for all receiver rf and i.f. amplification stages, and fet balanced mixers are used in both the receiver and transmitter. ALC and output vswr protection are incorporated in the transmitter. Full output power will only be achieved with an output vswr of less than 1.5 to 1. It is recommended that an atu is used on antenna systems where the vswr exceeds this figure.

Measurements

Unless stated otherwise, all measurements were made using a 13.8V supply. The current consumption on receive was measured as 0.7A, and on ssb transmit as 3.5A at full power, or 1.3A with no input.

Receiver sensitivity

Receiver sensitivity measurements were made by connecting a

*42 Gravel Hill, Addington, Croydon, Surrey.

Table 1. Technical details

Frequency range	3.5 to 30MHz with WWV (15MHz) receive only
Mode	USB, lsb or cw
Supply voltage	12~16V dc (standard: 13.8V) negative earth
DC current (at dc 13.8V)	Transmit 4A (vswr 1:1.5 or less) Receive 0.7A
RF output power	10W
Audio input impedance	500Ω ~ 50kΩ
Audio output	More than 1.5W (with less than 10% distortion) into an 8Ω load
RF output impedance	50Ω
Frequency stability	Within 100Hz during any 30min period after warm-up Within ±1kHz during the first hour after 1min of warm-up
Audio frequency response	400 to 2,600Hz, within -6dB
Carrier suppression	Carrier better than 40dB down from the output signal
Sideband suppression	Unwanted sideband is better than 50dB down from the output signal
Spurious radiation	Better than 40dB down from output signal
Image ratio	Image frequency better than 50dB down
I.F. rejection	I.F. frequency is 70dB or more down
Receiver sensitivity	0.25μV s+n:n 10dB or more
Receiver selectivity	SSB, cw 2.4kHz bandwidth (-6dB down) 4.2kHz bandwidth (-60dB down)
Semiconductors	ICs, 26; fets, 15; transistors, 82; diodes, 135
Dimensions	241 (241)W by 94 (108) H by 235 (281)D mm. Figures in (): projections included
Weight	Approx 4.9kg

Hewlett Packard 8640B signal generator to the antenna input and measuring the af output across the speaker socket using a wideband voltmeter. The input level was adjusted to give a 10dB signal-plus-noise-to-noise ratio in the centre of each respective band. The receiver is extremely sensitive as the following results show:

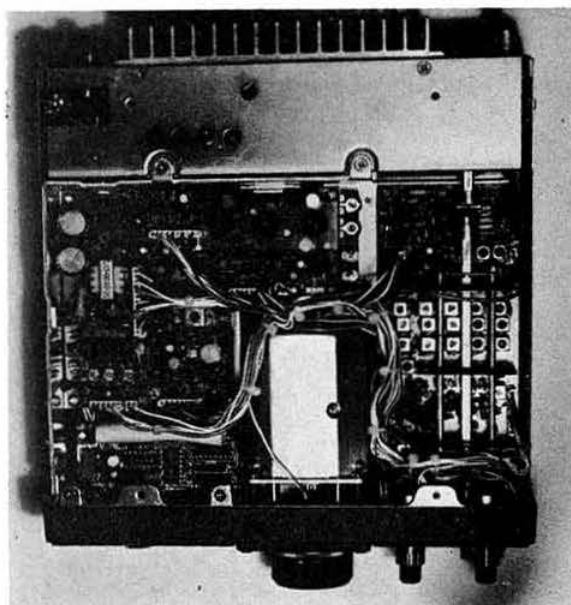
Band	Input for 10dB s+n:n	Input for S9
3.5MHz	0.09μV	29μV
7MHz	0.11μV	35μV
14MHz	0.13μV	43μV
21MHz	0.15μV	55μV
28MHz	0.16μV	53μV

I.F. rejection and image response

I.F. rejection was measured as better than 88dB, and image rejection as 56dB on 28MHz, improving at lower frequencies to 82dB on 3.5MHz. These results are well within the manufacturers' specification.

Intermodulation and blocking

Strong signal handling was measured using two Hewlett Packard signal generators type 8640B coupled together with a hybrid coupler and connected to the antenna input socket. The frequencies were set at 10kHz and 20kHz away from the frequency to which the receiver was tuned, and the levels increased equally to give an intermodulation product in the receiver passband with a s+n:n ratio of 10dB. This occurred when the generator levels were 65dB above the level needed to produce an on-tune signal of 10dB s+n:n ratio. This is a fairly typical figure for a modern hf transceiver. A similar test conducted on a Yaesu FT7 gave an impressive figure of 71dB. The blocking performance was evaluated by setting one generator to give a 20dB s+n:n ratio and introducing an interfering signal from the other generator until this ratio was degraded by 6dB. The



Top view of TS120V with cover removed

ratio of unwanted to wanted signal levels is the blocking performance, and the results were as follows:

Kilohertz from wanted signal	Blocking response
40kHz	89dB
20kHz	80dB
12kHz	74dB

Strong signal performance was evaluated at 28MHz and at 7MHz with identical results.

Frequency stability

This was well within the manufacturer's specification.

Transmitter power output

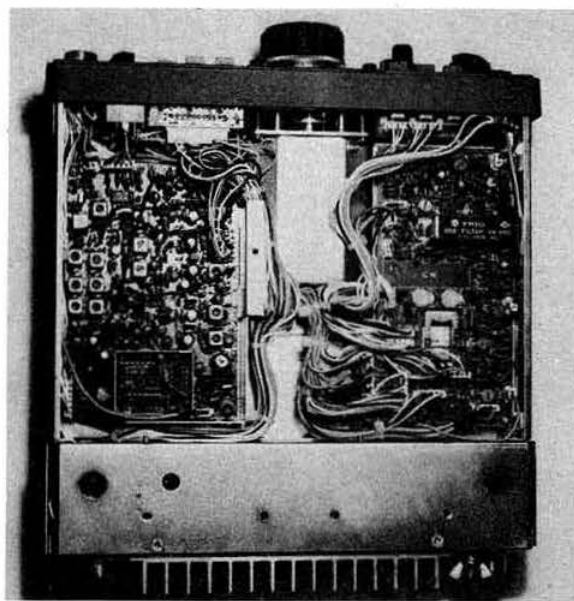
The transmitter power output is automatically limited by the alc circuitry, and for the transceiver under review a maximum power output of 12W was obtained into a 50Ω load. Driving the transmitter from a two-tone audio oscillator to give 10W p.e.p. output on each band, intermodulation distortion was measured as better than -28dB with respect to either tone of the two-tone signal. This is a satisfactory figure.

Transmitter spurious output

The levels of spuri measured at 10W output into a 50Ω load were very low and may be summarized as follows; the approximate frequency is given, together with the level relative to the output power.

Band	Principal spuri
3.5MHz	Harmonics and spuri less than -55dB
7MHz	Harmonics less than -60dB; spuri at 5.2MHz and 8.8MHz -55dB
14MHz	3rd harmonic -55dB; spuri at 5.2MHz -58dB
21MHz	3rd harmonic -55dB; spuri at 12.2MHz -50dB
28MHz	3rd harmonic -50dB; spuri at 19.2MHz -46dB

Carrier suppression was measured as -60dB on usb and -50dB on lsb. Sideband suppression was measured as -70dB on usb and -60dB on lsb.



Bottom view of TS120V with cover removed

Transmitter audio response

The overall transmitter audio response is shown in Fig 1. With the microphone gain control set at maximum, 10W rf output on 28MHz was obtained for 0.6mV af input at 1kHz. Ample gain is available to allow the least sensitive of microphones to be used.

Supply voltage variation

The supply voltage range is quoted in the manual as 12 to 16V. A check was also made using 11V, as this is about the level down to which the equipment would be used under portable conditions before changing batteries. Satisfactory operation was obtained over the whole range on both transmit and receive. Eight watts p.e.p. at low distortion could be obtained at 11V on ssb, although 11W could still be obtained on cw.

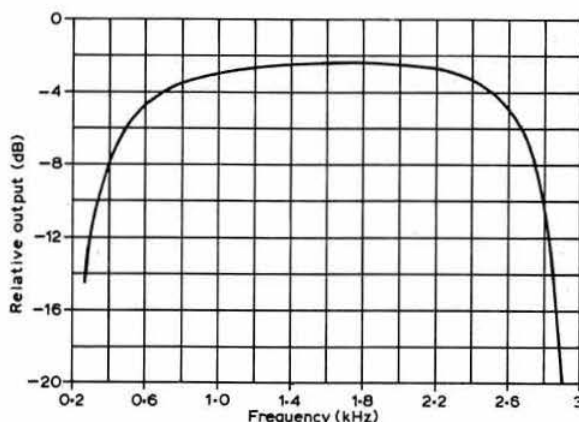


Fig 1. Overall transmitter audio response

Conclusion

Air testing the TS120 confirmed the excellent results obtained from bench measurements. Good quality reports were obtained from stations contacted using the transceiver both on its own and driving vhf transverters. Under mobile operation the noise blanker seemed effective, but more audio power would have been an advantage for motorway driving. Just-noticeable strong-signal problems were experienced in the evenings on 7MHz using a well-sited G5RV antenna. These could be eliminated by putting a 6dB attenuator in the antenna input. An FT7 operated under similar circumstances was clear of such problems.

The TS120 comes complete with essential connectors and a manual. The 24-page manual is adequate only as an operating manual. Circuit diagrams are included, but no alignment procedures, fault-finding or servicing instructions are given. In common with many hf transceivers, the circuit diagrams are not that easy to follow.

The TS120V represents excellent value at the current price of £408 including VAT. The higher-power version, the TS120S, is available for £495 inclusive of VAT. In conclusion, the author would like to thank A. R. Bellfield, G4GLN, for the loan of the TS120, and T. G. Giles, G4CDY, for producing the photographs. □

Automatic cr/lf for vdu used with rty

(Continued from p1137)

Second method

The second, fully automatic system (Fig 2) is similar in some respects. This time the author used ttl, mainly because the ics were to hand.

The counter uses two 7493s, the "B" output of the second one going "high" on the count of 64. This goes first to a two-input NAND gate as an inverter, then on to one input of another NAND. The other input is connected to a "push to make" switch which is a manual over-ride. The output from this gate triggers one half of a 74123, a double monostable. Here the output goes "low" enabling the tri-state buffers so that they connect the appropriate pins of the diode matrix of the Murray code to ground. One also goes to the strobe pin on the matrix.

The time constant on the 74123 is enough to allow the carriage return on a printer to take place. The negative edge of the pulse from pin 13 triggers the other monostable, repeating the process on the line feed matrix code. The output from pin 5 will reset the counters and restart the count. The clock for these counters is taken from the strobe pulse that goes to the uart.

In practice it will not completely fill a line on the paper due to the number of figure and letter shifts which may have been used. These will also be counted, but one will be on the safe side and not annoy the operator at the other end by over-running the line.

Either of these circuits should prove a boon to an inexperienced typist. □

An ssb filter for the FRG7

by J. VERDUYN, G5BBL/PA0VDR*

FOLLOWING the publication of the first article under this title (*Radio Communication* August 1978), which was really intended for the more experienced amateurs, correspondence received indicated that a number of FRG7 owners required additional guidance. In many cases they could not obtain assistance to carry out the modification, and as a result decided to do it themselves.

Printed circuit board

Quite a number of FRG7 owners do not have facilities to produce printed circuit boards, and it was felt that such a board should be made available. Fortunately Messrs Wood & Douglas, 9 Hillcrest, Tadley, Basingstoke, offered to include this printed circuit board (Fig 2 in the original article) in their interesting range of boards and kits; the price, including VAT and postage, is £1. Veroboard is not recommended, and those who used this type of board should check that all the unused copper strips are grounded, in order to avoid leakage around the filter and instability.

Wiring

Locating the unused sections of the mode switch is best carried out with an ohmmeter, as future models of the FRG7 may use a different type of switch. However, all receivers supplied until recently should be wired as shown in Fig 1. A detail of the i.f./af print is shown in Fig 2, indicating where the two cuts in the copper track should be made. Resistor R420 is removed from the component side and soldered directly to the pins of the ceramic filter at the other side of this print.

When soldering, keep a clean house, remove any splashed solder immediately before proceeding, especially near the mode switch. Take care not to push the pins of the two matching transformers T1 and T2 into their plastic formers as the windings may become damaged.

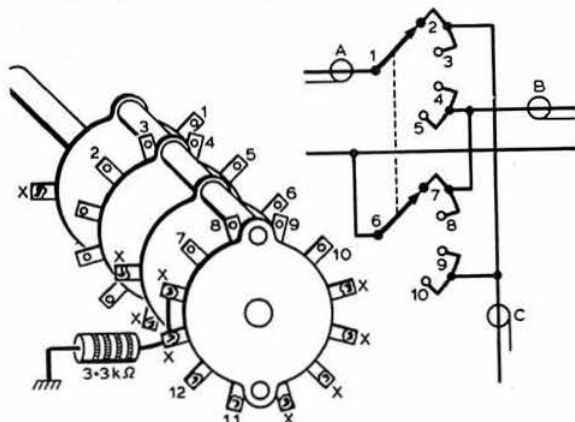


Fig 1. Mode switch wiring. Connect: coaxial cable A to 1; coaxial cable B to 4, 5, 7 and 8; coaxial cable C to 2, 3, 9 and 10; 6 to ground on i.f./af print; 11-12 to R4-C4 on filter print. Contacts marked X are wired as in original

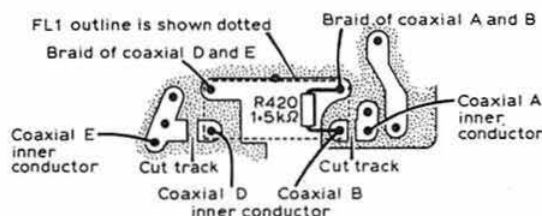


Fig 2. Detail of i.f./af print showing wiring and location of cuts in printed circuit track.

BFO stability

With the narrow ssb filter fitted, the bfo stability becomes more important than is the case with the original filter. Unfortunately the bfo in the FRG7 is quite temperature sensitive but, when used in a normal domestic environment with a fairly constant temperature, this does not pose any problems. However, the bfo could need realignment when taking the receiver out on a cold or extremely warm day, as ssb may become nearly unintelligible.

Tests showed a 400Hz drift over a 30min period during which the temperature was lowered 15°. The bfo coil is solely responsible for this drift. The small physical size of this coil requires a ferrite core with a high permeability, which also has a large negative temperature coefficient, α . This decreases the inductance when the temperature is increased. The coil is situated close to the af-amplifier ic, which warms up slightly during operation, and alignment of the bfo should be carried out after a 15min warm-up period.

As an experiment a Toko coil (Type RW06A6408, 360 μ H) with the lowest available α (150ppm) was obtained from Ambit International and substituted for the original bfo coil. In line with the manufacturer's recommendation to use as little as possible of the core in critical applications, extra capacitance was added to the existing tuning capacitors. Each one of the two 620pF mica capacitors was shunted with a 220pF polystyrene capacitor. This reduced the drift to about 200Hz. If the room temperature remains fairly constant, drift is not noticeable at all (less than 100Hz) but, as was pointed out, stability is already quite sufficient with the original coil.

RF gain control

As most communication receivers feature an rf gain control, it has been suggested that the attenuator (LOCAL-NORMAL-DX switch) be replaced with a potentiometer to control the a.c. voltage. However, in a receiver like the FRG7 with many stages in front of the i.f. filters, intermodulation products and overloading in general are likely to increase, considering that the bias points are shifted towards the cut-off region of the active devices. It can be demonstrated, for example, that on 7MHz in the evening weaker stations become perfectly readable after switching in the antenna attenuator. An attenuation of 6dB gives, in theory, 18dB reduction of intermodulation products, and in practice this shows up as a considerable reduction in background noise. Therefore, the existing attenuator should not be discarded too easily.

The availability of a printed circuit board should enable more owners to carry out the modification described. Also it should be easier to get in touch with an experienced hand willing to do the job. If the FRG7 is mainly used for ssb or cw, the author considers the addition of a proper ssb filter more useful than the widely available digital frequency read-out. □

* 14 Ragleth Grove, Trowbridge, Wilts BA14 7LE.

Mains psu for 144MHz transceivers

by F. G. RAYER, TEng (CEI), G3OGR*

THIS ac-operated psu has been in use for some time with an IC240, and has proved reliable and convenient. The IC240 is listed as requiring 2.5A maximum, or about 0.4A to 0.7A receiving, and no doubt the psu would be suitable for other transceivers of similar output power (10W). Recommended voltage is 13.8V, plus or minus 15 per cent, but a note states that the voltage should not exceed 15V. Regulation in the circuit used here results in no apparent change in voltage between no-load and full-load conditions.

Circuit points

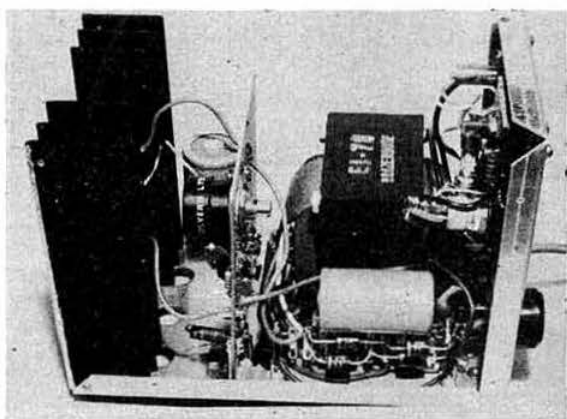
In Fig 1, the 20V secondary of T1 provides approximately 29V across C1, C2, C3 with no load, dropping to about 23V at 2A load. It is important that this voltage is maintained on load. Fuse F1 is to protect T1 from rectifier or capacitor failure.

IC1 provides regulation and voltage control, with voltage adjustment by RV1. Before connecting the transceiver, RV1 is set for the wanted voltage, as shown by an accurate meter, with R5 not yet connected.

R1 controls the shut-down current, which is about 3A, with 10Ω. This protects the psu against short-circuits in its dc output connections. If necessary, R1 may be modified in value, and increasing the resistance here reduces the maximum current available. With R1 at 15Ω, shut-down is at about 2A.

Note that output voltage falls as RV1 slider is moved towards R2, as this may be the reverse of what is anticipated.

It will be apparent that excess voltage must always be present at the reservoir capacitors C2, C3. A break in wiring to RV1, or collector-emitter short in TR1, could place this on the transceiver. To avoid this, probably unlikely in any case, ZD1 triggers SCR1, to blow fuse F2, should the output exceed 14V.



The psu with cover removed

To adjust this protection circuit, temporarily remove F2 and clip a 12V 24W or similar lamp in its place. Set RV2 slider near R6, and connect R5. Check that output is 13.8V. Reset RV1 for 14V, and slowly rotate RV2 wiper towards R5 until SCR1 triggers and the lamp lights. Switch off, return RV1 to 13.8V, and check that SCR1 is not triggered. Fuse F2 can then be replaced.

If a large zener diode which conducts at about 14V to 14.5V is available, this could be used instead, directly across the dc output points. The adjustable circuit was adopted because, of several diodes tried, some triggered at too low a voltage and some required too high a voltage.

C1 and C7 are fitted to keep spikes out of the dc circuit.

For ease of transfer from car to home, matching non-reversible two-way power sockets are used. The IC240 and many other transceivers have reverse polarity protection. If this is not present, fit a power diode across the dc input points at the transceiver, and an appropriate in-line fuseholder with fuse in one power supply lead. (An in-line series diode for protection is probably going to drop over 0.5V.)

Case

That illustrated is economically made from flanged "universal chassis" members—7 by 4in for bottom, 5 by 4in for front, with perforated metal 14 by 7in bent into an open box 7 by 5 by 4in and later secured with self-tapping screws. The bottom has a few 1/8in ventilation holes, and is raised with four rubber feet. If the cover is sheet metal, punch a few 1/8in holes in it on each side near the top.

*Reddings, Longdon Heath, Upton-on-Severn, Worcs WR8 0RJ

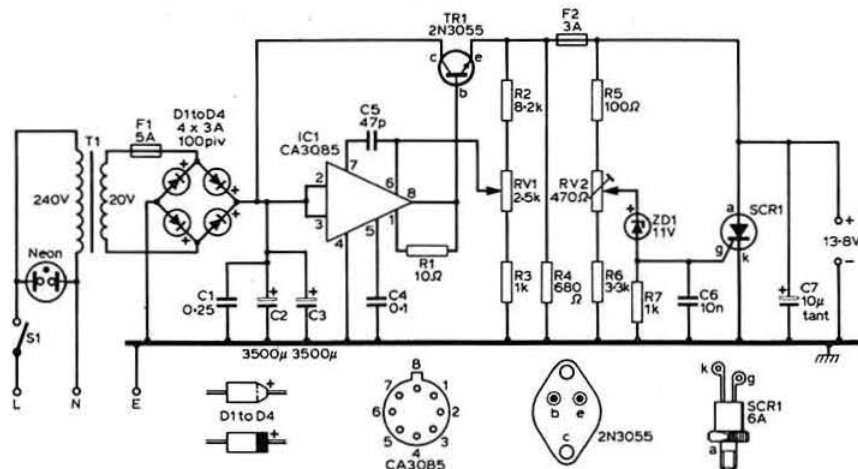


Fig 1. The stabilized supply circuit. F2 and the ZD1-controlled scr protect equipment against TR1 failure or excess voltage

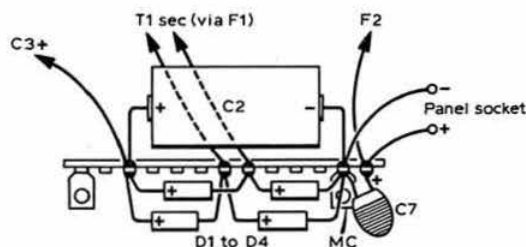


Fig 2. Rectifiers, C2 and C7

Heatsink

TR1 dissipates $(V_c - V_e) \times I =$, say, about 18W when supplying 2A. As a 5 by 4in finned heatsink was to hand, this was bolted vertically to form the case back, and runs only slightly warm. The cover is also screwed to it near the top.

TR1 must be isolated with an insulation set. Smear meeting surfaces with "Thermaflow" or similar compound. Base and emitter pins project inwards through clearance holes, and a tag on one fixing bolt provides for the collector (case) connection.

Rectifiers, C2 and C7

These mount on a tagstrip, Fig 2, bolted to the case bottom near the side of the transformer. F1 holder is bolted to the bottom near T1.

For mains input use a three-core cord with 2A or 3A fuse in the plug. The cord runs through a panel grommet and is anchored at a three-way tagstrip. Here, yellow-green connects to the case, blue to T1 primary, and brown to S1.

Main circuit board

This is about 90 by 90mm, 0.15in, with foils vertical, as in Fig 3. Cut foil breaks on the other side of the board under R2, and to separate 1 and 5, and 6 and 8 of IC1. The mounting and

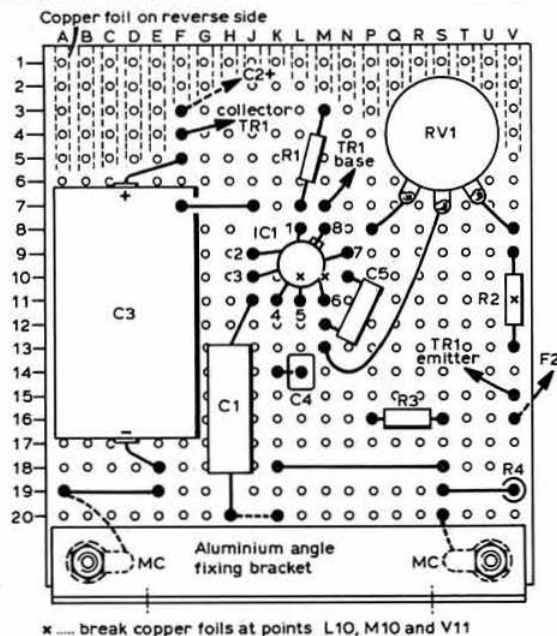


Fig 3. Component side of main circuit board

Components list

R1	10Ω	C1	0.25μF 150V
R2	8.2kΩ	C2, 3	3,500μF 30V
R3, 7	1kΩ	C4	0.1μF 150V
R4	680Ω	C5	47pF
R5	100Ω	C6	10nF 25V disc ceramic
R6	3.3kΩ	C7	10μF tantalum

All resistors 1/4W 5%

RV1 2.5kΩ (2kΩ or 2.2kΩ suitable) linear pot

RV2 470Ω (500Ω suitable) miniature pre-set pot

D1-D4 3A 100piv silicon diodes

ZD1 11V 400mW zener diode

SCR1 5A or 6A silicon controlled rectifier

IC1 CA3085

TR1 2N3055, insulation set and heatsink

S1 Mains toggle

T1 240V/20V 3A secondary

Mains voltage neon indicator, tagstrips, boards, "universal chassis" sides (Home Radio), fuse-holders, 5A and 3A fuses, non-reversible outlet, metal for cover, cord and mains plug, feet, etc.

earthing bracket must be bolted to the plain side of the board, as in Fig 3, and provides the ground return for C1, C3, C4, pin 4 of IC1, R3 and R4.

The completed board mounts near the heatsink, components towards the back. Leads C, B and E can then be soldered to TR1. Also connect C2 positive to C3.

Power may be drawn directly from TR1 emitter and the negative line, as in many regulated psus, and it can be said that in five or six such units employed over a number of years no collector-emitter short or excess voltage output ever arose. RV1 allows adjustment of the potential by a few volts on each side of the wanted supply output, and is set with a reliable meter in advance. Check that the voltage is the same on and off load.

Excess voltage protection board

The protection circuit is assembled on a small plain perforated board, Fig 4. This mounts behind the panel.

Adjust RV2 while observing a meter connected to the psu output, with a lamp replacing F2, as mentioned. A diode conducting at 11V was most suitable, but other zener voltages are possible, R5 or R6 being modified if required so that SCR1 is triggered by its gate when the supply rises over 14V or so. When the RV2 setting has been found, return RV1 to obtain 13.8V, and replace F2.

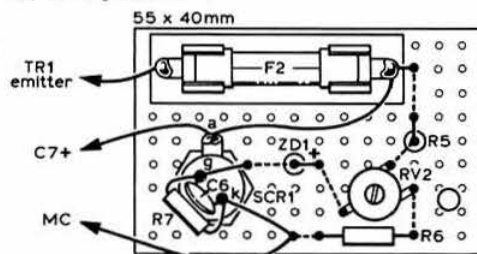


Fig 4. The scr excess-voltage protection board

General note

The psu is an immediate plug-in substitute for an accumulator. Layout changes to suit an existing box or cabinet should introduce no difficulties.

One such psu was found satisfactory when fitted with a transformer with 18-0-18V 4A (eg 36VA) secondary, using two diodes with secondary centre-tap grounded in the usual way. A 20-0-20V winding would, of course, be satisfactory. □

technical topics

Pat Hawker, G3VA

ALTHOUGH these notes are being written during "British Summer Time" it is once again the occasion to send all readers, old and new, Christmas and New Year greetings; to thank so many of you for your help and assistance in compiling this column; to apologize to those whose letters or ideas may appear to have been overlooked (the growing membership of the Society and increasing circulation of its journal poses particular problems for those of us who have only our precious spare hours to devote to all aspects of amateur radio!); and to look forward not just to a new year but a new decade.

What will the 'eighties bring? During the past 10 years there have been many significant changes in equipment and technology, though usually in the form of steady evolution, rather than sudden revolution: all-solid-state rather than hybrid transceivers; nbfm and ssb emerging as dominant modes on vhf; repeaters and their associated mobile and hand-held equipment; digital frequency synthesizers and displays; the steady growth of amateur satellites, rtty, sstv and the world above 10GHz... etc. But also, equally important, has been the better understanding of radio propagation and antennas, with at least some of the old myths dented if not destroyed.

As a hobby grows old, along with at least some of its adherents, there is a natural tendency to enthuse about things past, to resent things present and to fear things future. Though no great believer in the fabulous microchip and microprocessor revolution, I feel that it is still possible to believe that, by and large, amateur radio is getting progressively better and even more interesting; that innovation is still to be welcomed; that, as always, there is still room for different points of view, even if newcomers insist on making, all over again, the same mistakes that we did. We are fortunate in that the science of amateur radio communication is made up of a mixture of fundamentals which do not change and hardware that can be expected to have a reasonable span of life before it becomes obsolete. Knowledge does not become redundant. Good luck for the 'eighties!

Simple rf sniffer

In the old days the low-consumption torch bulb and a loop of wire, plus a neon bulb and absorption wavemeter were the standard aids for setting up almost any transmitter and most antennas. But today something a little more sophisticated is usually needed to cope with semiconductors, shielded coils and toroids and the like. But it does not need to be too sophisticated. In QST October 1979, pp15-7, Bob Shriner, WA0UZO, and Doug DeMaw, W1FB, show that even a very simple rf sniffer can be a useful aid: Fig 1. Such an rf detector, when used with a simple whip or inductive probe, can be useful as a rough-and-ready field-strength meter, rf line-up indicator, tester for the "goodness" (ie integrity) of transmitter shielding, and for rf signal tracing and the like. The voltage-doubler rectifier can be formed from any pair of rf diodes, germanium or

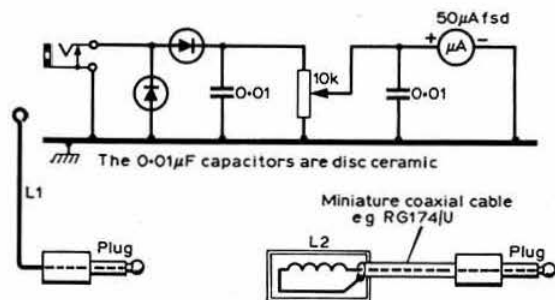


Fig 1. Simple rf sniffer plus probes has a multiplicity of uses. L1 is 10-15in length of $\frac{1}{8}$ in dia brass welding rod. L2 is 20t with o/d $\frac{1}{8}$ in plastic cap using epoxy cement

silicon, although it should be recognized that germanium types will prove more sensitive since they begin to conduct at 0.3-0.4V compared with the 0.6-0.7V of silicon types.

144MHz colinear vertical array

The attractions of a vertical, omni-directional colinear array for vhf or uhf operation become steadily more apparent as the use of vertically-polarized signals increases. But the colinear has to be approached with some caution; it is not a system that lends itself readily to fancy variations. One recalls, for example, the ingenious cross-over technique using lengths of coaxial cable to avoid the use of external phasing stubs; this looked better on paper than it ever seems to have worked out in practice (although one still sees glowing references to it occasionally in print, which leave one very puzzled). Just recently there has been quite a rash of new designs that claim to achieve colinear gain, but which seem to have overlooked the dangers and problems involved in bending elements so that they are quite close together and then expecting them to behave in true colinear fashion. There seems to be a whole set of new colinear myths in the making.

Nevertheless the traditional colinear design is still a very practical and useful arrangement. In *Amateur Radio* June 1979, VK2AXZ recalls the 144MHz array fashioned from stiff aluminium wire that used to appear in several editions of the ARRL handbook. Fig 2 shows his version, although I note that the original design had the phasing loops spaced 1in and that each comprised a 40in "hairpin" loop with 19in centre sections. The array can be made out of two 96-97in lengths of stiff

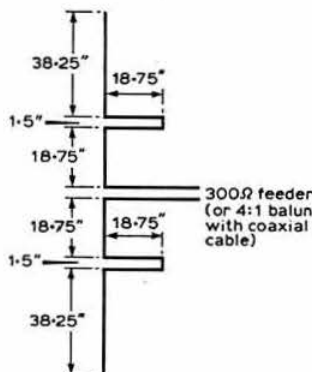


Fig 2. 144MHz colinear vertically-polarized array as used by VK2AXZ based on a classic ARRL handbook design. It can be used horizontally to provide a bi-directional broadside array

in aluminium wire (ARRL used to suggest "aluminium clothesline wire") and is fed with 300Ω balanced feeder or from either 52 or 75Ω coaxial cable through a 4:1 coaxial balun.

The elements are mounted on small ceramic pillars on a wooden pole (using small clamps of sheet aluminium wrapped around the wire and screwed to the stand-offs). The array concentrates radiation in the horizontal plane to provide omnidirectional gain—very useful for working to mobiles etc.

Switched-mode power supplies

During the recent discussion of heavy-current power supplies there have been several references to the size and weight of the "door-stop" mains transformers. To some this seems out-of-place with this era of solid-state transportability. There is an alternative approach that is finding ever-increasing applications in professional equipment: the use of switching-mode supplies in which the size and weight of transformer cores can be dramatically reduced by using inverter-type switching transistors to raise the supply frequency from 50–60Hz to as high as about 20kHz; this also allows much smaller-value capacitors to be used in the ripple filter.

A recent nine-page survey of American switcher power supplies (*Electronic Design*, 16, 2 August, 1979) indicates that these compact units are available in three main ranges: (1) from a few watts up to about 25W; (2) from 25 to 300W; and (3) beyond 300W up to 1kW or so. Overall efficiency is usually of the order of 80 per cent, and supplies include those providing highly-stabilized outputs at 5V, 12V, 15V etc. For example, one 750W range includes outputs of 2 to 28V and currents up to 200A in a standard 5 by 8 by 11in package. Professional units of this type tend to be in a price range well above that for amateur applications, but not a lot of practical designs for home construction have appeared.

It should be recognized that a problem with switch-mode power supplies that is not normally present with traditional power units is the generation of radio frequency interference (rfi) similar to that radiated by the many colour television receivers that tend to rely on this approach; to reduce rfi to a reasonable level requires careful attention to filtering and shielding.

To chop dc at kilohertz rates, the switchers tend to use three different circuit configurations, depending on whether the psu is high power, low power or high voltage. The article in *Electronic Design* outlines the basic switching techniques (Fig 3): push-pull; forward converter; and the flyback arrangement. Their operation is described as follows:

"The push-pull configuration is typically found in high-power supplies and gives the lowest output ripple of the three designs. It requires two switching transistors which produce alternating square waves. The supply output is regulated through a feedback loop containing a pulse-width modulator, which controls the length of time that each transistor conducts. If the dc output increases, the modulator reduces transistor on-time, causing a proportional decrease in the dc output voltage. Similarly, the modulator increases transistor on-time to increase voltage output.

"In some supplies, generally lower-power switchers, the forward converter arrangement is used. This requires only a single switching transistor. To prevent saturation of the transformer core, the forward converter contains a flyback diode connected to a third, bifilar-wound transformer winding. When the switching transistor is off, the diode returns excess magnetizing current to the supply's input filter.

"For higher-voltage applications, the flyback configuration performs better than the other two approaches. Like push-pull, this requires two transistors, but they switch alternately, rather than simultaneously. The configuration owes its name to the flyback transfer of stored energy between the transformer primary and secondary. Energy is stored in the transformer primary while the transistors are on. Once they turn off, the stored energy is coupled to the power-transformer secondary. Diodes from the transistors' emitters shunt the harmful kick from the transformer primary around each transistor."

In some units a second switching supply is used to keep control circuits alive and independent of the main output voltage to enhance self-protection and self-restarting. The switching-mode approach is clearly very attractive for those concerned with size and weight, although for normal domestic operation of amateur equipment one feels there is still a lot to be said for the 50Hz approach, even though it means finding those large door-stops.

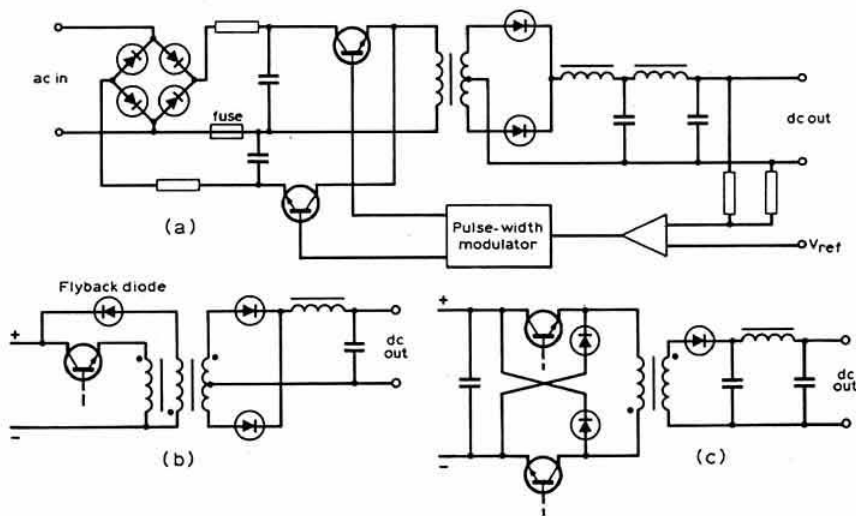


Fig 3. The three basic switching configurations used in switching-mode power supply units to provide ac at up to 20kHz to reduce the size of transformers, ripple filters etc. (a) Push-pull; (b) forward converter; and (c) flyback. Good filtering and shielding are needed with switching-mode systems to minimize rfi

Power round-up

Several other items seem relevant to recent *TT* discussion on switch-on surge reduction (October), earth leakage mains protection (October) and power supplies generally.

George Budden, G8JH, noting the technique used by G2BY to reduce switch-on surge, reports that for several years he has used a basically similar simple system but with the resistance provided by two 150W electric lamp bulbs in series, each short-circuited in turn by a switch: Fig 4(a). He reports: "It works like a charm and no smell of frying bacon—and you are unlikely to forget to switch the lamps off as they glow. I use the same system for my slide projector lamp." Of course, lamp resistance when "cold" is very much less than at operating temperature; nevertheless the two bulbs should offer more than sufficient resistance to eliminate really hefty switch-on surges.

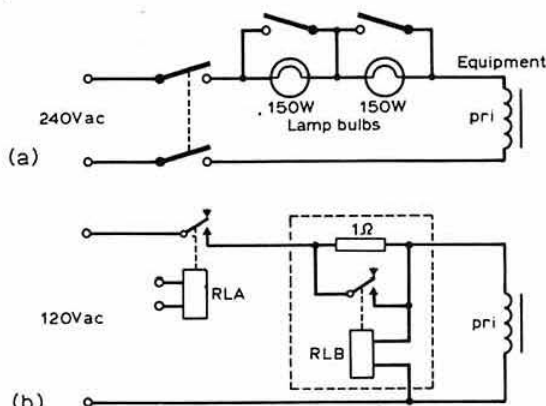


Fig 4. (a) Simple surge-reduction system using 150W lamp bulbs. (b) Simplified automatic surge-reduction system using mains-voltage relay (RLB) as described for 110-120V supplies

Similarly, Robert Klabis points out in *Electronic Design* 18, 1 September 1979, that the alternative automatic system (Fig 11, p940, October *TT*) can be simplified while remaining capable of limiting in-rush current. His revised circuit (Fig 4(b)) uses several fewer components than the earlier arrangement.

Relay RLB is now an ac relay at the rated supply voltage. When the main switch (RLA) is energized, the 1Ω limits in-rush current to about 80A, simultaneously reducing the voltage

across the primary of the equipment transformer to less than the pull-in voltage of RLB. As the in-rush current decays, the voltage across RLB increases until it pulls in, resulting in a second surge of current in the equipment transformer, but with neither surge approaching the magnitude of the heavy in-rush to an unprotected equipment.

T. E. Hall, G8HFW, commenting on earth leakage protection, points out that the power industry recognizes two types of elcb: (a) the current-operated type, as described in October, normally intended for protection of apparatus and buildings against electrical fire; and (b) voltage-operated elcbs which trip the mains supply if the potential difference between the earthed parts of the protected apparatus and the main earth terminal exceeds 40V, normally intended for protection against electric shock as well as fire.

A precise and repeatable over-voltage trip-point for a crowbar psu protection circuit, relatively unaffected by time or temperature changes, is claimed for the arrangement in Fig 5. This was described by W. Scott Roleson in *Electronic Design* 11, 24 May 1979, and is based on a cmos Schmitt trigger which is arranged to act upon a 2N6398 scr to blow the 4A fuse if the output potential rises above an adjustable trip-point. Normally the trip-point adjustment, RV1, is set so that IC2a is just below its threshold.

Microprocessors in vehicles

In the November *TT*, G3TUX expressed concern at the prospect of cei (car electronics interference) when operating high-power mobile in a vehicle fitted with semiconductor devices; or conceivably causing interference to the devices in passing vehicles.

The same topic is raised by W6OXX in *QST* (October 1979) who notes trade predictions that up to 30 per cent of new 1980 American vehicles may have microprocessor-controlled fuel metering, sampling such parameters as throttle position, speed, torque, air-temperature, exhaust temperature, exhaust-gas oxygen, spark timing and idle speed; all this of course in an effort to provide more miles per gallon. W6OXX feels confident that car makers will ensure that the electronic devices so fitted will be capable of tolerating any problems of vehicle environment but fears "what 100-plus watts of rf from a mobile rig will do". He has coined the term mpi (microprocessor interference).

The same issue of *QST* also has a reference to fitting capacitors to cure rfi to programmable electronic chimes. Altogether we seem to be entering an electronic world in which electromagnetic compatibility has been given a low priority.

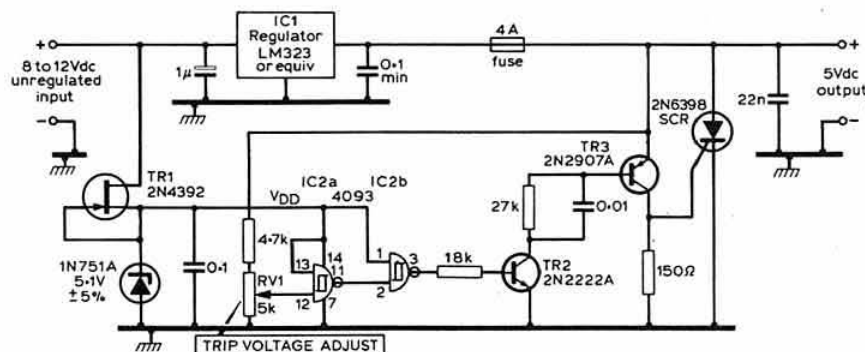
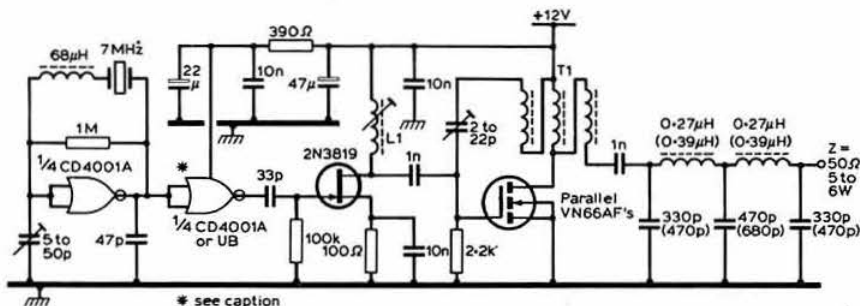


Fig 5. Precision over-voltage crowbar circuit using cmos Schmitt trigger to provide a trip-point relatively unaffected by time or temperature changes and using half of a 4093B quad two-input NAND device. Turning on the scr blows the 4A fuse

Fig 6. 14/21MHz cw transmitter providing 5-6W output from parallel VN66AF vmos devices. Keying is accomplished by taking one input of the CD4001A buffer high through a 100k Ω resistor and grounding with key. L1 is 0.7-2.1 μ H variable inductor (tuned to 21 or 14MHz as required). Output network values are for 21MHz, with 14MHz values in brackets. T1 is 2t 0.4mm enam on FX2634 core trifilar wound

**VMOS on 14/21MHz**

The notes on using relatively low-cost vmos fet devices for a 1.8MHz a.m./cw transmitter (September 77) has encouraged Dave Gordon-Smith, G3UUR, to send along details of his 14/21MHz cw transmitter which, with a dc input of 9.9-5W, provides an output of 4.8W at 14MHz, and 4.3W at 21MHz from parallel VN66AF devices he obtained from Ambit. In conjunction with a 7MHz vxco, which (with some crystals) will give a shift of 6-7kHz, this represents a useful QRP rig for these bands: Fig 6. He has tested this form of vmos pa on all bands from 1.8 to 28MHz, and has measured efficiencies at 1.8/3.5MHz of 60 per cent (10W in/6W out), dropping to just over 50 per cent at 14MHz, 48 per cent at 21MHz and a still useful 47 per cent at 28MHz (7W in/3.3W out).

G3UUR also uses a single VN10KM in a miniature a.m./cw(break-in) transmitter for 1.8 and 7MHz. This has an output of about 0.5W on a.m., and more than 1W on cw. Size is 1 by 2.5 by about 0.25in including the 1.8MHz crystal (vxo arrangements have not been found practical with 1.8 or 3.5MHz crystals): Fig 7. Despite the low power the a.m. is well received ("good and strong audio") locally around Bath, and has given contacts as far away as Cambridge.

These are only two of a number of ingenious "novelty" circuits developed by G3UUR in recent years, and others may be outlined later.

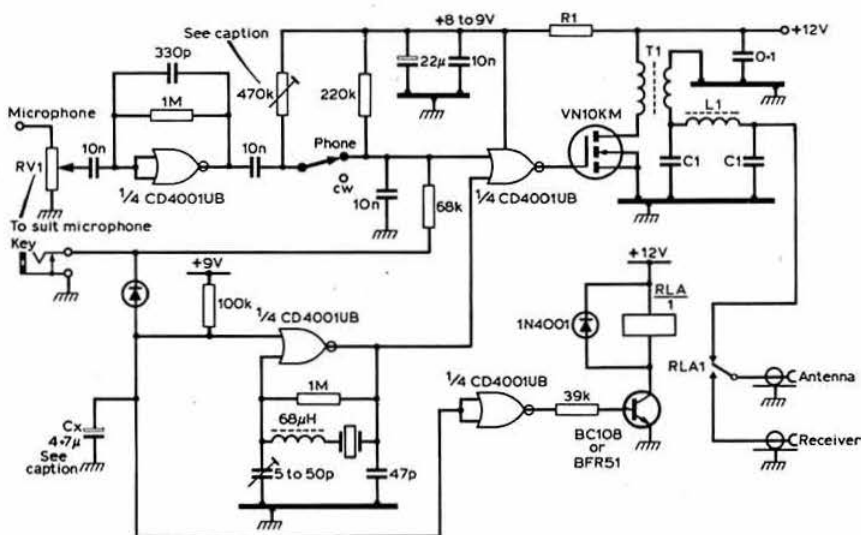
If one is not worried about cost, Siliconix have recently introduced a series of vmos devices intended for 28V operation at vhf and providing 10dB gain at 175MHz. These are the DV1006 (device dissipation 40W), DV1007 (80W) and DV1008 (160W) in stripline packages: USA prices in small quantities are \$25.50, \$45.90 and \$91.80.

3LO Melbourne calling

The September 17 quotation from Dr R. V. Jones' *The Secret War*, about the 'twenties joys of building radio receivers and receiving a postcard acknowledgement from Melbourne carrying the signatures of the 1928-9 English Test Team, stirred memories for Eddie Wood, G4JN. He writes: "I too was a teenage swl at that time, and my biggest thrill was similarly to pick up '3LO Melbourne calling' on 32m with an 0-v-1 homebuilt receiver . . . the acknowledgement was actually in the form of two cards; one showing the 3LO transmitter and its two studios; the other the signatures of the English cricketers headed by the formidable Jack Hobbs".

To prove his point G4JN sent along photocopies of the cards which he still has. Whilst the technical montage has a nostalgic appeal, my goodness what a team we had then: not only Jack Hobbs but Wally Hammond, Herbert Sutcliffe, Leslie Ames, Harold Larwood etc. As a Westcountryman I find schoolboy memories evoked by seeing that the vice-captain was J. C. White who was Somerset county captain for many years!

Fig 7. G3UUR's a.m. plus break-in cw transmitter for 1.8 and 7MHz. Cx determines hang-time of oscillator and antenna relay and can be altered to suit user (sets at about 0.5s with 4.7µF). L1 is 1µH for 7MHz, 3.3µH for 1.8MHz. C1 is 820pF on 7MHz, 2.7nF on 1.8MHz. The 68µH inductor and variable 5-50pF trimmer can be omitted and replaced by 50-100pF fixed i.f.; vxco facility is not required or, if operation is solely on 1.8MHz, where frequency shift is negligible. Alternatively if different size crystals are used on the two bands, the 68µH inductor can be wired to the miniature circuit so that it is not in circuit on 1.8MHz. The 470kΩ preset resistor should be set to give half maximum output volts on crt to provide acceptable a.m. (a.m. output power about 400-500mW, cw about 1.5-2W). G3UUR uses a T018 heat sink on the VN10KM, which is a difficult fit but worthwhile; for a.m. the ptt can short-circuit the key contacts to give change-over.



Testing crystals for ladder filters

Following his excellent design article on ladder crystal filters in the February 1979 *Radio Communication*, pp116-20, Jack Hardcastle, G3JIR, has put together some further notes on the initial testing of crystals for use in these filters. He writes:

"The tests were made as previously described using the two-crystal test circuit and, as shown in Fig 8, the measured bandwidth was plotted against capacitance on log-log graph paper. In the February article it was stated that bandwidth is inversely proportional to the square root of the coupling capacitance. This law has been plotted on the graph and it can be seen that for the 8,454kHz crystals it is a very good approximation. However, gifts of crystals from JA1JIX and G3YKB have enabled many more crystals to be tested, and although the original approximation is still useful, these further results show that it is better to plot a similar graph while the measurements are being made. This enables the potential of unknown crystals to be assessed very rapidly. In Fig 8 the number alongside each test point is the circuit impedance in ohms. Tests were discontinued at the minimum bandwidth, when the impedance became too low, and at the maximum bandwidth, when it became obvious that the fundamental properties of the crystal were preventing any further increase.

"It also occurs to me that it is worth explaining, for the benefit of non-mathematicians (which includes most of us) that it is the *slope* of the line $BW \propto 1/\sqrt{C}$ which is significant and not its absolute position on the paper. This means that the crystals which produce a similar slope curve most closely obey this law, and not (as may be thought) the crystals which are

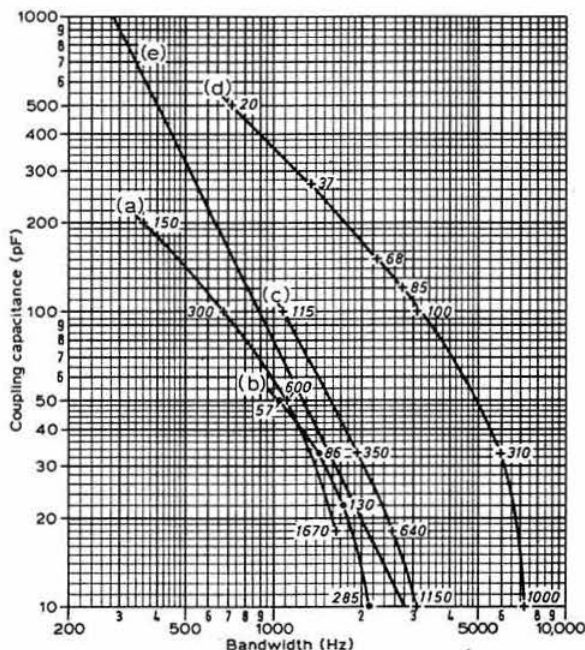


Fig 8. G3JIR's graph of filter bandwidth versus coupling capacitance for a variety of crystal types and frequencies. The number attached to each measurement is the circuit impedance in ohms. (a) 3.249MHz HC6U; (b) 34.16MHz miniature type (JA1-JIX); (c) 8.454MHz miniature type; (d) 9.511MHz HC6U (G3YKB); (e) plot of bandwidth inversely proportional to the square root of coupling capacitance

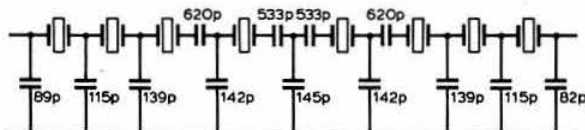


Fig 9. Circuit of eight-pole filter using crystals supplied by G3YKB. Nominal frequency, 9.511kHz. Input and output impedance 240Ω

closest to the line. In other words the line could have been drawn anywhere on the paper, so long as its slope remained the same.

"An eight-pole filter was constructed using G3YKB's crystals and the circuit is given in Fig 9. The -6dB bandwidth was 2,470Hz, and at -60dB it was 4,440Hz.

"Finally," continues G3JIR, "I allowed an error in Fig 7(c) of the February issue to escape my checking. Both the source and load coefficients should be the same, namely 3.035, and for practical purposes may be rounded to 3. It is doubtful whether, in fact, this could have misled anyone because it is given correctly in Fig 2 (February) but it is ironic that this diagram was included only to give extra clarification to the design process."

G3JIR is amazed at the way, each time he feels that he has done all he can on crystal ladder filters, somebody manages to suggest a new avenue that needs exploring.

Shielding with gaskets

Many amateurs are aware of the difficulty of providing a really well-screened enclosure from which little rf can escape or enter except along the ordered paths. One occasionally notes instances of amateurs using double-shielding by placing transceivers or transmitters within an additional "cage" or enclosure. In the reverse direction there can be problems when using cmos accessories, such as electronic keyers, in the presence of only moderate rf fields.

For professional applications, increasing reliance for improving the effectiveness of shielded enclosures is now being placed on the use of "rf gaskets", a technique more commonly associated with mechanical engineering. Gaskets made of knitted wire mesh, strips of expanded metal or metal particles in an elastomer are fitted between any openings in the enclosure and used with a variety of flanges, through-bolts and the like.

The RCA TK76 "electronic news gathering" (eng) portable tv camera, for example, uses an rf gasket to prevent rfi from the two-way communications links often used for eng, or from any local source of electro-magnetic interference (emi).

A seven-page article "An emi shield is only as effective as its weakest link—the gasket" by Bert Rashkow (*Electronic Design*, 9, 26 April, 1979, pp88-94) shows that there are many different types of rf gaskets being marketed in the USA, by firms such as Metex Corporation, intended for sealing openings in electronic enclosures (they also seal the equipment against environmental conditions such as salt spray, fungus etc). Although it seems unlikely that rf gaskets will be widely adopted for amateur equipment, they come as a useful reminder that an ill-fitting or inadequately secured transmitter top can often form virtually a "slot antenna". Poorly-fitting doors (or doors that become loose after a lot of use) have been among the problems that have plagued the makers of microwave ovens, although they claim these have now been overcome.

Constant-output audio elixir

The use of anti-parallel (back-to-back) diodes to provide audio clipping, for limiting its the output from a receiver, or for af speech-processing, is a very well-known technique. However, such clipping at af can result in heavy distortion due to the creation of in-band harmonics. Rather more sophisticated forms of output compression and regulation are required where the original waveform needs to be preserved. In 73 *Magazine* September 1979, pp116-7, C. W. Andreasen, N6WA, provides a circuit arrangement (Fig 10) for a limiting amplifier which he terms the "amazing audio elixir". Whether in fact it is a remedy to cure all ills is not for me to decide, but the arrangement appears to offer useful features: it will accept an audio input of between 100mV-10V and yet provide a reasonably constant af output which can be set at up to about 8V peak-to-peak. The circuit uses a bifet op-amp type TL081 and a fet attenuator (type MPF111 or almost any equivalent small-signal fet) together with a voltage-doubler type diode af rectifier.

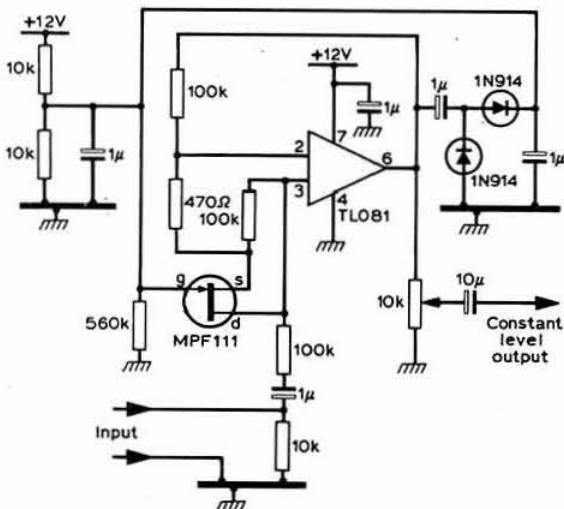


Fig 10. N6WA's audio elixir providing constant level output for inputs from 100mV to about 10V

Current saving with prom

In recent years many amateurs have adopted cmos logic, rather than ttl, because of the very substantial saving of battery power during the periods when the logic is not operating at high speed. LA8AK points out that many amateurs would like to use prom (programmable read-only memory) devices to replace the less convenient diode matrixes, but find that the heavy current consumption (60-150mA) may rule out their use in battery-operated equipment. One result is that the diode matrix is still often adopted for new equipment.

He draws attention to a technique originally described in *Electronics* where it was noted that the prom can be switched on only at the moment when it is needed. For many applications, the clock frequency for the prom is very low compared with the setting time of the device, and there is no need for the prom to be switched on continuously while it is being used for purposes such as translation or decoding. For example, in a callsign generator for beacon transmitters a "dit" length

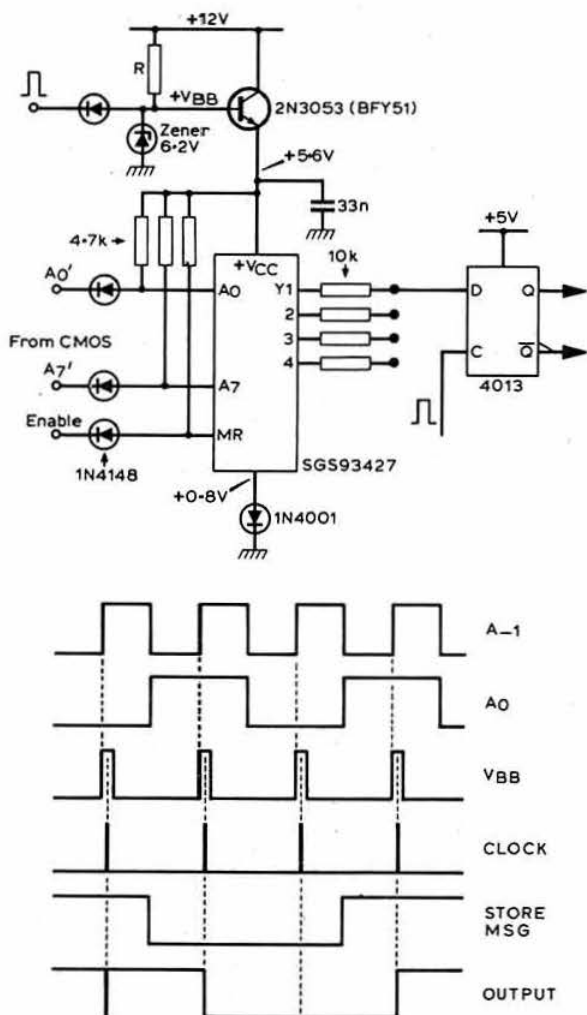


Fig 11. How the heavy current consumption of a prom can be greatly reduced, making such devices much more attractive for callsign generators etc in battery-operated equipment

(which will also be the bit length) may be 50ms, but it is quite practicable to have the prom turned on for only 1ms, making it possible to reduce the current drain to only two per cent of the original consumption. LA8AK suggests that, in order not to short-circuit the driving logic, AND gates with one input to V_{BB} can be used; alternatively the supply voltage rail for the prom can be raised by 0.6V and diode input gating used. D-type FF devices will store the output during the periods when the prom is switched off, while a dual monostable arrangement can provide the V_{BB} and clock drive.

In the example shown (Fig 11) a 4×256-bit prom is shown (DM8573N, SN74S387, SGS93427, IM5623 etc), and LA8AK has used these devices for the callsign generators of several of the Norwegian beacons. Address input bits 0 to 127 are used for the callsign, and 128 to 255 for the QTH locator; he has found the easiest way to shift from callsign to QTH is to shift address input A7 from 0 to 1.

microwaves

Charles Suckling, G3WDG *

Microwave distance awards

Jack Hum, G5UM, the RSGB vhf awards manager, has compiled a current list of microwave distance award holders. These are as follows:

- 1-3GHz: for a station's first contact beyond 600km
1, G4BYV; 2, GM8BJF; 3, G3DAH; 4, GD2HDZ; 5, G3KMS; 6, G3ZEZ;
7, G3LRP; 8, G3PQY/P.
1 (Receiving), BRS34348.
- 2-3GHz: for a station's first contact beyond 500km
1, G3LQR; 2, G4BYV.
- 3-4GHz: for a station's first contact beyond 400km
No claims.
- 5-6GHz: for a station's first contact beyond 300km
No claims.
- 10GHz: for a station's first contact beyond 150km
1, GW3RPE/P; 2, G3ZGO/P; 3, G8APP/P; 4, G3ZKR/P; 5, G3WDG/P;
6, G3BNL/P; 7, GW3EEZ/P; 8, G8CVS/P; 9, G8AZU/P; 10,
GW8CKT/P; 11, G3KSU/P; 12, G3WJG/P; 13, GM3DXJ/P; 14, G3OX-
X/P; 15, GM8BE/P; 16, GW4BRS/P; 17, G3VPF/P; 18, GM8HEY/P;
19, GW4ALN/P; 20, G3JHM/P; 21, GW8FJG/P; 22, G8BDJ/P; 23,
FOAKD/P; 24, G2RY/P; 25, G4DDK/P; 26, G8ANZ/P; 27, GW8DUP/P;
28, GW8EHK/P; 29, G8AXE/P; 30, G8ARO/P; 31, G8BCO/P; 32,
G3FYX/P; 33, G8GKV/P; 34, G3NKL/P; 35, GM3OUR/P; 36,
G8PMT/P; 37, G4HUP/P; 38, G3UKV/P; 39, G3ZME/P; 40, G4DBM/P;
41, GW3YGF/P (first troposcatter award, first two-way ssb
award—with G3JVL); 42, G3JVL (first fixed station award); 43,
BRS40670 (first receiving award).
- 24GHz: for a station's first contact beyond 150km
1, G3BNL/P; 2, GW3EEZ/P.

NEC microwave transistors

Amateurs wishing to obtain NEC microwave transistors, such as the popular low-noise devices NE578 and NE645, can now obtain them from Chris Bartram, G4DGU, 10 Duke of York Ave, Milton Heights, Abingdon, Oxon.

10GHz activity from EI

Many stations will be pleased to hear that EI is now active on 10GHz, in the form of EI7DG. He has wideband equipment and is looking for contacts, especially with stations in GW. His activity should give rise to a number of 10GHz firsts.

More 3-4GHz activity

Welcome news has just come in of a successful one-way test on the 3-4GHz band between G3VPF/P and GW3PPF/P. GW3PPF/P operated from Mynydd Eglwysilan (355m asl) 3km east of Pontypridd, and used a step-recovery diode multiplier driven at 432MHz, producing about 30mW output at 3,456MHz to a 4ft dish. G3VPF/P, at Batcombe Down (265m asl), 14km south of Sherbourne, Dorset, used an 18in dish with dipole feed, and an interdigital converter using an HP5082-2817 Schottky mixer diode, with a 144MHz i.f. This design is by DC0DA, and was published in *VHF Communications* 3/78 p154.

Signals over the 102km path were about 15dB above noise. The two stations are naturally keen to make a two-way contact in the near future, and would be pleased to hear from other stations willing to carry out tests.

Beacon news

A new 10GHz beacon has recently come on the air. This is GB3LEX, which is located 770ft asl at ZM24J, very close to junction 22 (A50) of the M1, north-west of Leicester. Its frequency is 10,400MHz, and the system consists of a Gunn oscillator feeding an omni-directional antenna. The radiation pattern is roughly cardioid, however, due to unavoidable obstructions close to the antenna. The main lobe beams slightly east of south. The project was undertaken by the GB3CF repeater group (secretary G8JFD).

The beacon can readily be identified by its 1s tone pips, with its call sign being given every minute and its call sign plus QTH locator every 4min. G8ANZ reports good reception of GB3LEX at Cleeve Hill; further reception reports will be welcomed by G8CAC, QTHR.

Stations operating on 1-3GHz will no doubt be pleased to hear that the GB3IOW 1-3GHz beacon is now running again. The writer can testify to this personally, having heard it at 15dB above noise at Brighton beach, using a 3dB nf briefcase-portable receiver with a dipole antenna. Reception reports should be sent to G3KSU.

As mentioned briefly last month, GB3SWH and GB3LDN recently became active on 10GHz and 2-3GHz respectively. The groups responsible for these beacons have supplied more information about them.

G3YXZ reports that GB3SWH was constructed by members of the South-West Herts UHF Group, and consists of a 145mW output Gunn oscillator and a 10dB gain slotted-waveguide antenna. At a later date it is hoped to phase-lock the oscillator to a crystal-controlled source. The GB3SWH beacon-keeper is G8EIM, and he would be pleased to hear from anyone who has heard the beacon.

GB3LDN was originally planned as a 1-3GHz beacon, but the greater need for a beacon for 2-3GHz to cover the London area led G8AYN and colleagues to build for 2-3GHz instead. It is of course the first 2-3GHz beacon to become operational in the UK. The all-solid-state transmitter generates 5W, and was built by G8AYN and G8IWX. G8CIU built the keyer; G8CTT and G8GGP were also involved in the project. The group would like to thank G3BPT for his invaluable help in obtaining the use of the site at Shooters Hill, Microwave Modules for donating one of the varactor multipliers, and QSL Crystals for donating the crystal. The antenna was built and donated by Antec, and is an omni-directional unit with 6dB gain. Reception reports can be sent to the beacon-keeper, G8AYN.

Recent round table meetings

The first-ever round table meeting at Martlesham Heath was held on 30 September, being organized by the Martlesham Heath RS. The morning session consisted of a general discussion and measuring equipment on the very comprehensive test equipment which had been provided. After lunch G4FSG introduced the first speaker, Dave Turner of the PORC Microwave Aerials Group. He described a new form of dish feed which could form an interesting alternative to the G4ALN design for rear-feeding dishes. It consists of a mushroom shaped piece of dielectric material, with a metal backing plate, tapered into circular waveguide.

The second lecture was by Tim Hewitt of the PORC Radio Propagation Group, who described the experiments being carried out at Martlesham to investigate enhanced propagation over a number of paths at 11 and 17GHz. He discussed the mechanisms involved in ducting, and the times at which best

*31 Oakwood Road, Chandler's Ford, Hants SO5 1LW.

conditions seem to occur; super-refraction tends to be best in the late afternoon/early evening, while overland enhancements are most likely early in the morning.

G3YGF, G4CNV and G4DGU then discussed recent developments in eme, and described the construction and performance of the stations active on eme in the south Oxfordshire area. G3YGF and G4CNV then demonstrated 10GHz troposcatter propagation by receiving signals from G3JVL over a near-200km path. They also demonstrated 10GHz ssb equipment.

The latest Winchester meeting was held on 21 October. Very welcome were six visitors from France who had travelled especially for the meeting: F1DPC, F1CVU, F3LP, F8WN, F6DPH and F6DLA. In the morning discussion session G3WDG announced the results of the 1979 10GHz Cumulative Contest. The question of talk-back was raised—144.33MHz ssb is now almost universal. Stations reported that there had been a lot of QRM problems, and it was agreed that 144.33MHz should only be used as a calling channel, and that stations should QSY once contact is established. G3RZD and G8GKV then made a plea for more microwave activity during the winter months, and it was agreed that Sunday mornings would be a good time; a net would be run on Saturday evenings on 144.33MHz at 2000gmt to set up skeds for the following morning. Other nets would be held on Sundays and Wednesdays to exchange news.

During the afternoon, G3KSU, G3VFP and G4BGP talked about various aspects of beacon construction, G3WDG discussed the construction of equipment for 24GHz, and G3YGF described how to construct and align the G3JVL 10GHz narrow-band mixer.

Microwave swl reports

G. P. Grzebeniak, RS41733, reports that he is now receiving on 1.3GHz, using a single G3JVL loop-Yagi antenna fed with UR67 cable, and a Microwave Modules converter. The first station to be heard was G3TDG over a 25-mile path across London. He would be pleased to listen for other ssb stations in the London area, and would also like to correspond with any other swls interested in microwaves. His address is 166 Chiswick High Road, London W4.

Another swl active on microwaves is D. B. Hall, BRS40670, who has been largely responsible for the design and construction of the 10GHz equipment owned and operated by members of the Telford & D ARS. This group recently achieved a 154km QSO with G3NKL/P over the path from Parlick Fell, 8km north of Longridge, to Brown Clee Hill. G8ARS has pointed out that there appears to be no provision for swls to claim microwave distance awards. The Microwave Committee unanimously agrees that swls can claim all microwave awards, and anyone wishing to do so should send their claims to G5UM. As BRS40670 heard G3NKL/P with his own equipment, he can rightly claim the first swl microwave distance award!

10GHz from the Outer Hebrides

GM8SAU reports that he is operational from Benbecula in the Outer Hebrides on 10GHz, where he is running 2W output on ssb to a 10ft dish! He is very interested in schedules with stations in Scotland, and in the Isle of Man, to which he is line-of-sight. He can be contacted by writing to Barry Titmarsh, Sergeants' Mess, Benbecula, Outer Hebrides, Scotland, or tel 0870 2384 ext 460.

A directional coupler for 24GHz

The availability of the Plessey GDO33 Gunn oscillator assembly has now made activity on the 24GHz band possible at modest cost without the need for access to machine tools. The oscillator is of course no use on its own, and additional waveguide components are necessary before a complete system can be put together. The most important of these is a directional coupler, since this forms the basis of an optimum receiver, and will also provide a means of power monitoring on transmit, and as a useful piece of test equipment.

The round-hole type of coupler is an attractive proposition, but at the power level of the GDO33 (10-30mW) insufficient coupling can be obtained to give an adequate level of local oscillator injection. Thus it is necessary to use the Moreno cross-coupler to obtain sufficient coupling, and a design for such a coupler which was built by the writer, using only hand tools, is shown in Fig 1.

Take two pieces of WG20 and file away the broad faces of both to leave 0.5in-long gaps. The two pieces should then fit snugly together—if this is not the case further filing will be necessary. The most difficult part of the coupler to make is the septum plate, but if the following procedure is used a minimum of trouble should be encountered.

First mark out the outside edges of the septum plate on a larger piece of brass, but do not cut out at this stage. Next,

(Continued on p1153)

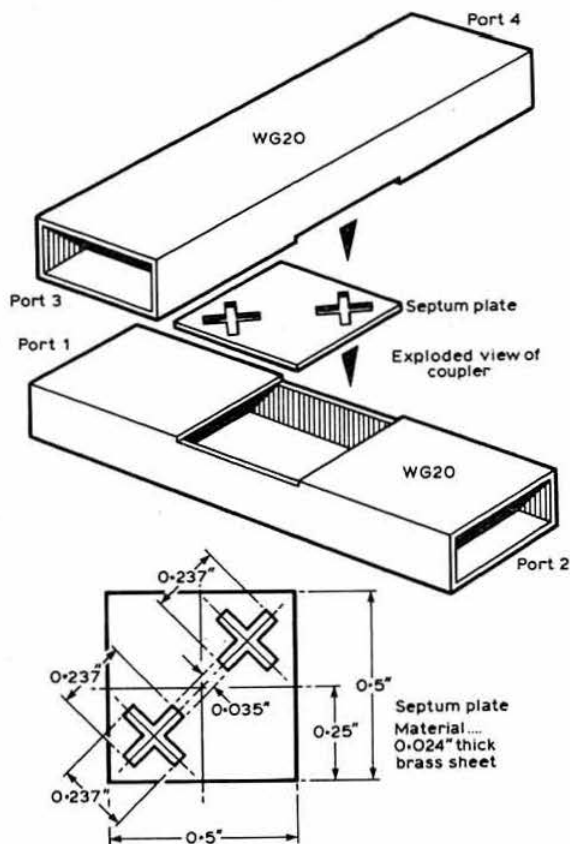


Fig 1. A directional coupler for 24GHz

Bob Treacher, BRS32525 *

SUDDENLY, the festive season is upon us once again and, with the long holiday period, many should find ample time to tune the bands. While on this festive note, let me thank everyone for their very useful and informative contributions over the past year.

28MHz ssb slp

Dave Whitaker was pleased to receive 10 logs for this slp, a slight increase over previous tests. Reports varied—some reporting heavy QRM, others a quiet band; obviously much depends on the receiver in use. A total of 45 countries was heard—18 in Europe, 10 in Africa, 8 in South America (32 different stations were logged from PY), 6 in Asia, 2 in North America, and VP8SB in Antarctica.

Rare QSL returns

Bernard Hughes, BRS25901, sent photostat copies of some of his best QSLs. Several very rare ones were included, eg XZ2TZ from the 1965 expedition sponsored by the World Radio Propagation Study Association; AC6H from Bhutan (again 1965, by Gus Browning, W4BPD); W9IGW/CE0, this was the IN-DXA expedition to San Felix Is in 1972; ZM7AG, Tokelaus Is; and ZM1AAT/K from the Kermadec Group. Certainly a good collection of rare dx, but the latest of these confirmations is 1972, which shows what choice dx was around in the "old" days.

To bring things right up to date, QSLs received and reported this time include VE1AH/1, JF1IST/7J1 (Okino Torishima), VK0PK and KP4AM/D.

144MHz dx

It was pleasant to receive a letter from GU3YIZ, who asked the question "When is an swl report called for?" He provided the answer too. He had a successful ms ssb QSO with DM2BYE in QTH locator HM53a in 1977. In October this year he received an swl report from a Russian swl in QTH locator QO53g. A look at the locator map will show this to be well over twice the distance of the DM's QTH. As he said "A little late, but it was very much appreciated".

28MHz

At the time of writing, the 28MHz band was producing excellent signals from all parts of the globe. Conditions during the RSGB 28/21MHz SSB Contest produced a great deal of dx from 0700 until 1900. The band remained open much later, with ZL and VK signals being copied around 2200. The west coast of the USA also figured extensively in reports, as did several stations in KH6 and KL7. HSIABD was a very good signal during the contest, so too was CSAAP. JA signals were also superb around 0800. KX6PP, P29RP and a YJ8 were reported at about the same time. The Equatorial Guinea trip, 3C1AA, was also audible. During the evenings, stations in the

1979 hf countries table

Station	28	21	14	7	3-5	1-8	Total	Mode
BRS25429	190	218	251	111	98	23	891	ssb
BRS25901	176	210	246	98	86	17	833	ssb
BRS35943/GM	162	198	233	110	106	10	819	ssb
ARS8841	152	172	241	81	85	8	739	ssb/cw
ARS41426	129	146	137	79	96	28	615	ssb/cw
A9191	69	103	155	64	49	9	449	ssb
BRS40293	90	75	136	51	42	7	401	ssb
ARS41386/GJ	76	127	120	48	20	2	393	ssb
BRS34740	86	94	81	33	38	7	322	ssb
BRS20185	85	75	114	24	23	1	322	ssb
BRS41333	77	106	56	19	44	2	304	ssb
BRS39161	59	78	126	18	19	2	302	ssb
BRS40814	60	68	98	39	18	0	283	ssb
BRS41136	74	75	79	27	17	0	272	ssb
ARS39784	77	57	83	26	23	2	268	ssb
BRS35121	23	47	113	24	34	7	252	ssb
ARS41554/GM	40	73	67	31	34	4	252	ssb
BRS18529	32	52	111	4	33	16	248	ssb
BRS40705	74	64	58	26	15	1	238	ssb
ARS40634	18	36	89	8	5	0	216	ssb
ARS40745/GM	26	40	94	19	22	0	201	ssb/cw
A9107	65	42	72	5	15	2	201	ssb
BRS40292/GU	42	42	58	19	30	2	193	ssb
RS27421	0	41	102	24	21	1	189	ssb
ARS40133	28	31	34	7	14	0	114	ssb

All-time countries table (starting score 500)

Station	28	21	14	7	3-5	1-8	Total	Mode
BRS17567	265	304	349	163	224	33	1,338	ssb/cw
BRS25429	243	281	319	212	216	36	1,308	ssb
BRS32525	231	281	303	197	233	26	1,271	ssb
BRS25901	220	280	312	182	189	22	1,205	ssb
BRS35943	203	264	294	188	212	22	1,183	ssb
ARS8841	189	222	294	111	134	5	996	ssb/cw
BRS34740	139	192	219	126	151	33	860	ssb
BRS32286	96	195	225	75	172	4	767	ssb
A9191	144	187	232	72	95	11	731	ssb
BRS20185	135	136	192	35	44	6	549	ssb

Caribbean—C6, 8P6, ZF1, HH2—were excellent copy, with W6/7 reported as late as 2000. Dave Whitaker, BRS25429, reports 190 countries logged on 28MHz this calendar year. It will be interesting to see whether the magic 200 can be reached. With conditions so good, the CQWW contests cannot have failed to produce a tremendous amount of activity and, I would guess, a large number of new countries for many.

Newcomers

Alan Glashan, ARS40745, reports from Dundee. He runs a National HRO into 110ft of wire, and passed the RAE in May. Cliff Jeffery, BRS42857, tuning 3.5MHz with his Trio 9R59DS, had been listening for only two months, and his log included a number of USA callsigns. With the dx season on 3.5MHz about to start, your scribe is sure that a number of stations with rarer prefixes will appear in Cliff's log, as well as in a number of other avid 3.5MHz dx listeners' logs. Reports on the 3.5MHz dx season will be appreciated, and a full report will appear in the new year. Last year, readers may recall, a challenge was set in these pages to see whether 100 countries could be logged in January. Unfortunately conditions and activity were disappointing and it was the first time for about five years that three figures had not been reached in a single month. The same challenge is issued again, and we wait with interest to see how close anyone gets. We welcome Tony Capner, BRS42819, who, with some help from G3TKF, purchased an Eddystone 888A. Tony is interested in the tables, but it seems a little late to submit an entry for this year! Watch this space for details of next year's table.

We welcome Brian Russell, BRS33915. He has been an amateur bands swl "for years" and has 305 countries confirmed and, like a few others of our regulars, only needs the

*79 Granby Road, Eltham, London SE9 1EH.

rarer expedition type operations now. Brian, as well as others, commented on the W7PHO story in the September issue—everyone seems to bear out Neville Spry's comments. Brian adds that he had the same problem with a card for JT1AN, 'PHO simply returned his envelope—minus 10cs—with a comment on the reverse "we don't QSL swls". As this was a new one, Brian sent a card direct to Arsen in Ulan Bator, who provided the desired card plus a letter and he sent Brian's 10cs back. If this rare station was happy to QSL an swl card perhaps he ought to advise his manager to do the same. After all, managers are meant to provide a service to the whole amateur fraternity—not just part of it. On a lighter note Brian explains how he received his confirmation from WD8QGG/KH8 at the second attempt. His QSL report listed six SM stations worked by the KH8. Two weeks later Brian received six QSL cards from KH8—none for him but one each for the six SMs mentioned in Brian's report! A second letter brought the desired card plus a letter explaining that it was the KH8's first swl report and he did not know what to do to confirm the report!

Other news

Rod Hunt, BRS41333, had been kept from the rig because of a hospitalized xyl, leaving him to cope with two junior ops. He had been hoping to sit the RAE in December but this had to be postponed. However, Rod's cw was improving to 15wpm thanks to the slow morse service run by the Society, and mainly from G4RS transmissions. Dave Stewart, BRS40293, queries the fact that your scribe "altered" one of the call signs reported by him in the October issue. The offending call sign was "YB0ADW". Dave reported a station as "YV0ADW on Aves Is". As the only station to have activated Aves Is this year had the call sign YV0AA, your scribe changed the offending letter and therefore it became feasible, as YB0ADW had been very active indeed. Your scribe would put this mis-logging down to "tired ears", but if the QSL should arrive he will be the first to eat his words!

Nice to hear again from Harold Moss, BRS18529, who reports an interesting QSL from OA8CL whose QTH was quoted in latitude and longitude. It seems his QTH is five days by boat from the nearest PO box at Iquitos! Certainly "rare" in another sense of the word.

Peter Cain, BRS36554, reported that he would be very active during October and November—a broken leg restricting his movements! He also remarked that the plaster was handy for jotting down call signs. The first part of his enforced period at the rig produced C6ANU, HZ1AB, YB0ADW (that call sign again!), 3C1AA, 5L7I and 9M2PV as acceptable additions to the plaster cast—I mean logbook!

Dave Whitaker reports FK8 and FO8 on 7MHz ssb, while the 3C1 expedition was easily logged on 14–28MHz, but no luck on the lower frequency bands. Dave has been altering his 1ft antenna farm and now has a 70ft wire and 180ft inverted-V. The longer one produced JA6, VS6 and HS1ABD in one session, and he was hoping it would produce over 20 countries on 1.8MHz during CQWW.

Robert Small reports 14MHz crammed with interesting dx—VP8VN, C21AM, HK0EFU, 3B8CJ and T4YL, while 21MHz produced KS6DV/KH1 and T3PA. These two call signs belong to the same person—KH1 is the USA sector of the Phoenix Is, while T3 represents the independent half, Kiribati.

Phil Waltho, BRS41136, reports increased activity, but with a change of work and QTH imminent his dxing will be curtailed in the near future. Andrew Oakley, RS39673, passed the

May RAE but is studying morse before taking out a call sign. He went to EA on holiday and took the shack with him, resulting in many EAs plus other more exotic dx.

CVRS SWL Contest

First reports from G4DFI suggests that this event was quite popular. A dozen logs had been received at the time of writing, with the best score over 200,000. Keith Kerr reports 102 multipliers on 14MHz, and Dave Whitaker 75 multipliers on 28MHz. Further reports and the results in due course.

Finale

Seasons greetings to all, and keep the news flowing. Please try to update table scores so that a realistic final table appears for this year. Copy date for the February 1980 issue is 31 December. □

Microwaves

(Continued from p1151)

mark out the centre lines of the crosses, and drill holes approximately 0.030in in diameter adjacent to each other along these lines so that their edges are just touching. Take a small pointed rectangular-section needle file and reduce its thickness with a grinding wheel to about 0.030in over the last 0.25in of its length. The thin edge of the file is then used to remove the metal between the holes, and the larger edge to file the edges of the slots to the correct size. The dimensions of the slots should be monitored using vernier calipers. Once the slots are correct, the septum plate can be sawn out from the sheet, filed to size and deburred.

The septum plate is then placed in the cut-out of one of the pieces of waveguide, and the other piece placed over it so that the pieces are jugged together. The waveguides should then be firmly clamped together, heated with a small gas flame, and soldered along all the joining edges. After cooling, the coupler should be inspected for signs of solder in the coupling slots or inside the waveguides. If this has happened the soldering will have to be done again.

In the receive mode the Gunn oscillator is connected to port 1, a matched load to port 2, the mixer (plus wavemeter) to port 3 and the antenna to port 4. With the GDO33 oscillator, the coupler provides about 1mA of mixer current. Should a much lower figure be obtained (eg less than 200µA), check that the components have been connected to the correct ports of the coupler. If correct, a poor mixer diode may be the problem and should be replaced by a known good diode. If insufficient coupling is still obtained, the coupler should be dismantled and the crosses increased slightly in size. However, this should not be necessary if the septum plate has been built carefully.

In the transmit mode the connections to ports 1 and 3 are reversed, when the mixer can be used as a power monitor and to indicate resonance of the wavemeter.

A further use of the coupler is to monitor the swr of an antenna, with the Gunn oscillator connected to port 1, a load to port 2, the mixer to port 4, and the antenna to port 3. Diode current is then an indication of reflected power, so that adjustments can be made to the antenna to minimize the swr. □

4-2-70

Graham Knight, GM8FFX *

432MHz moonbounce newsletter

One of the main reasons for the large growth in 432MHz moonbounce activity over the last few years has been the appearance of the monthly *432MHz eme newsletter* which has been edited and distributed by Al Katz, K2UYH. One of the special features of the newsletter is a list of forthcoming schedules—these are very useful to moonbounce operators and the many eme listeners, as they provide a focus for activity. Due to current mail problems, the K2UYH newsletter does not generally arrive until after the activity weekend! To combat this delay in distribution, Julian Gannaway, G3YGF, and Charles Suckling, G3WDG, are organizing a special scheme to circulate early copies of the schedule listings which are being received early by the Oxford group. Anyone interested in receiving copies should send stamped addressed envelopes to Julian Gannaway, G3YGF, at the Department of Science, Oxford University, Parks Road, Oxford, together with £1 to cover the photo-copying costs. This is being done on a non-profit-making basis to assist moonbounce operators, and G3YGF will let subscribers know when the money has been used up.

The *432MHz eme newsletter* has undoubtedly helped and encouraged a great many moonbounce operators, but due to the increasing popularity of the mode K2UYH's service is being overloaded. To assist in keeping eme operators in touch via this special newsletter, G3YGF and G3WDG will also provide copies of the previous *432MHz eme newsletter* with the current schedule listing. The newsletter itself contains reports of the previous month's activity, as well as station news and technical items, and will be of great interest to 432MHz operators and listeners. G3WDG and G3YGF will also add any extra items of news of specific interest to UK operators.

Parchment corner

Two reminders to claimants for RSGB vhf certificates are, first, always enclose an address label from a recent copy of *Radio Communication* as proof of RSGB membership, and second, if claiming one of the new QTH Squares Awards, make sure every card submitted bears the appropriate QTH locator square information. Claims for all vhf awards should be sent to Jack Hum, G5UM, 27 Ingarsby Lane, Houghton-on-the-Hill, Leicester.

The latest FMD certificates have been awarded to G3XBF/P and GW4EAI who have now received 144MHz Standard Certificates Nos 536 and 537. On the 432MHz front a Senior Award has been achieved by Geoff Spencer, GW4DRR, who earns certificate No 53. One of the outstanding operators in the Midlands area, Ian Gordon, G8IFT of Birmingham, has been awarded 144MHz Senior Award No 139.

The effort behind a Supreme Award

To Ray Elliot, G4ERX, of Brentwood in Essex, goes the distinction of not only achieving Supreme Award No 28 but

also of being the most recently-licensed person to attain a Supreme. G4ERX won his award by gaining a 70MHz Senior (No 44) to add to the 144MHz and 432MHz Seniors which he had already attained. Ray Elliot appreciates the corporate spirit which exists among the 70MHz fraternity, and is very thankful to the many operators who assisted him in working the counties required for the award. G4ERX reports, "G8IL specially put up his 70MHz antenna to give me a contact with Wiltshire; G4EQP came on specially to allow me to work Avon, and G3ZOD went out portable into Cheshire and Lancashire to give me those two counties to bring the total up to the requisite 60. Some of the 70MHz operators were tremendously helpful."

Although G4ERX won his Supreme Award on the basis of achieving three Senior Awards, it is worth remembering that a claim may be submitted on the basis of two Senior Awards (say, 144 and 432MHz) plus one 1,296MHz Standard. This means that the Supreme Award is available to Class B operators, but to date none has achieved it. With the growing availability of commercial ssb transmitters and linear amplifiers for the 1,296MHz band, it is doubtless only a matter of time before a G8 station attains a Senior Award.

Updating the "firsts and farthest"

Recent requests for updated "firsts and farthest" information on the vhf/uhf bands has brought a considerable mail to G5UM, who co-ordinates the claims and sees that SM5AGM also receives them for the official IARU Region 1 record.

From Jack Readings, GU3KFT, comes a list of believed firsts which he established during his expedition to Corsica in June under the callsign FOH1/FC operating from EB69B square. First FC-GJ occurred when he worked GJ4ICD at 1458gmt on 28 June, quickly followed by FC-G (G8HVV) and FC-GW (GW4HDF), all 144MHz A3J. Only two minutes after the DW4HDF contact he worked GW4CQT in the same YL25d square.

Jim Martin, GU3YIZ, comes up with a comprehensive (and probably definitive) list of "firsts" made from the Bailiwick of Guernsey, reminding readers that the bailiwick includes a number of islands which, in order of size, are Guernsey, Alderney, Sark, Herm and Jethou, all of which use the GU prefix. His list is:

GU-DL GC3EBK-DL3VJ/P 22 March 1953, tropo.
GU-DM GC2FZC-DM2BUL 9 July 1974, tropo A1.
GU-EA GC2FZC-EA1AB 23 September 1965, tropo A1.
GU-EI GC2FZC-EI2W 14 October 1956, tropo A3.
GU-F GC2FZC-F9JY 16 June 1954, tropo A1.
GU-G GC3EBK-G8MW 1 March 1953, tropo.
GU(Alderney)-GD GC3WMS/P-GD3NUE/P 3 September 1967, tropo.
GU-GI GC3EBK-GI3GXP 13 September 1956, tropo.
GU-GJ GC2FZC-GC2CNC 13 May 1954, tropo A3.
GU(Alderney)-GM GC2GC-GM3RUF/P 29 August 1965, tropo.
GU-GW GC2FZC-GW8SU 16 June 1954, tropo A1.
GU-HB GC3YIZ-HB9LN 26 October 1970, tropo A3.
GU-I GU3YIZ-I4MZY 12 December 1977, ms A3J.
GU-IT GC2FZC-IT9PLT 29 June 1976, Es A3J.
GU-LX GC2FZC-LX1S1 11 October 1963, tropo A3.
GU-LZ GU8FBO-LZ1AB 10 July 1978, Es A3J.
GU-OE GC8FBO-OE5FPL 26 October 1975, tropo A3J.
GU-OK GC2FZC-OK2AEI 27 June 1965, tropo A1.
GU-ON GC3EBK-ON4BZ 4 March 1953, tropo.
GU-OZ GC3EBK-OZ2FR 2 March 1953, tropo.
GU-PA GC3EBK-PA0HA 16 July 1955, tropo.
GU(Alderney)-SM GC3SIT/P-SM6PU 4 September 1966, tropo.
GU-SP GC3YIZ-SP5JC 7 June 1976, ms A3J.
GU-YU GU3KFT-YU2CTG 29 May 1979, Es A3J.

In his letter to G5UM, Jim Martin also attempted to update some of the Jersey "firsts" as follows, all on 144MHz:

*PO Box 49, Aberdeeh*AB9*BJA

Spain to Jersey	EA1AB-GC2TR	11 June 1964.
Eire to Jersey	EI2W-GC2CNC	8 October 1951.
France to Jersey	F9OK-GC2CNC	17 November 1953.
England to Jersey	G8IL-GC2CNC	24 May 1951.
Jersey to Guernsey	GC2CNC-GC2FZC	13 May 1954.

To supplement the above, Geoff Brown, GJ4ICD, offers the following; all 144MHz:

Yugoslavia to Jersey	YU2CKL-GJ8ORH	4 June 1978, Es.
Poland to Jersey	SP5JC-GJ8KNV	13 December 1978, ms.
Denmark to Jersey	OZ6OL-GC8EZA	26 October 1975, tropo.
Bulgaria to Jersey	LZ1AB-GJ8ORH	10 July 1978, Es.
Portugal to Jersey	CT1WW-GJ4ICD	7 June 1979, ms.
Czechoslovakia to Jersey	OK1OA-GJ8ORH	3 January 1979, ms.
Estonia to Jersey	UR2RQT-GJ8ORH	12 December 1978, ms.
Byelo-Russia to Jersey	UC2AAB-GJ8EZA	8 July 1977, Es.

Of especial interest are some 432MHz believed-firsts which GJ4ICD has offered. They are:

Spain to Jersey	EA1CR-GJ8ORH	11 March 1978, tropo.
Luxembourg to Jersey	LX1FX-GJ8KNV	24 September 1978, tropo.
Switzerland to Jersey	HB9ARI-GJ8EZA	11 September 1977, tropo.
Belgium to Jersey	ON5NK/A-GC8EZA	4 July 1976, tropo.
Holland to Jersey	PA0VV/P-GC8EZA	3 July 1976, tropo.

As if to demonstrate how quickly one claimed "first" may be outdated by another, G5UM reports that the above Corsica firsts had hardly been removed from the typewriter when a letter arrived from G3WZT in Sussex, to remind him of the contact made as far back as 8 June 1975, on 144MHz cw, when a meteor scatter QSO was established between 1230 and 1400gmt by FC6ABP and G3WZT at Horsham. This clearly pre-dates the contact reported above between FC0HI/FC and G8HVV.

Moonbounce from Wales

GW3XYW in Pontardulais, near Swansea, has joined the growing ranks of operators now making world-wide contacts on the 432MHz band via eme propagation. GW3XYW is full of praise for the efforts of the RSGB, and in particular G2BVN, G3BA and G3SEK, in assisting him to experiment with moonbounce propagation. On 8 September he had a successful contact via the moon with Chris Bartram, G4DGU—this QSO was completed between 0100 and 0130gmt on cw on 432.030MHz. It is thought that this is the first 432MHz eme QSO between G and GW. Subsequent contacts via eme by GW3XYW may also constitute records: 15MSH was worked on 26 September, and DL9KR was contacted on the following day. W1JR was worked on 4 October, and SM6CKU was contacted on 5 October. GW3XYW has already received the QSL card for the DL9KR contact and it records that the German station is running a very efficient moonbounce system with a home-built transverter feeding a YL1055 valve in a cavity design at 1kW. DL9KR's antenna uses 16 10-el Yagis built to his own design and fed with an open-wire phasing harness. His receive system uses a Drake R4A, converter, and a preamplifier mounted at the antenna feedpoint—it uses the NEC24483/NEC64535 design.

Ray Lucas, GW8GKF, at Caerphilly in Mid Glamorgan, has been using his extensive array of Toina 432MHz antennas to eavesdrop on some of the recent eme activity, and he reports hearing good signals from the W stations on the activity weekends. Another moonbounce listener is Doug Mallett, G3HUL, of New Costessley near Norwich, who has now erected an array of eight 13-el Yagis—each of which has an 8ft boom. With a great deal of help from Pat Gowen, G3IOR, G3HUL has been successful in adjusting the system and the BFR91 preamplifier to a point where he can now copy signals off the moon. During the recent activity weekend on 432MHz G3HUL copied eme signals on cw from 15MSH, SM6CKU,

SM2GFF, YU2RGU, DL9KR, K2UYH and K5JL. It is a measure of how well his moonbounce system was working that he could also copy ssb signals from LX1DB.

It is known that there are a fairly large number of licensed amateurs who can copy eme signals, but are there any non-licensed listeners on eme? If so, 4-2-70 would be very pleased to publish their reports. SWL reports on moonbounce are probably the most valuable of all.

Radio teletype on 144MHz

Concern has been expressed in several letters from 4-2-70 readers who are rtty enthusiasts who feel that their allocation around 144.600MHz is sometimes chosen by operators QSY-ing into the all-mode section of the band. At the IARU Region 1 Conference last year it was agreed to give publicity to Recommendation E of the minutes of the final plenary session which records that "Frequencies around 144.600MHz are kept clear of non-rtty contacts".

Problems of interference seem to arise from operators equipped with synthesized rigs who merely QSY by turning the frequency controls until they land on a frequency where no-one complains. Anyone moving frequency into the all-mode section should take care to avoid the rtty calling and working area, the fax and atv frequencies and, of course, the allocations where priority is given to Raynet.

Operators who are unsure of the various beacon and specialist allocations within the all-mode section, and who are unclear as to the normal precautions to be taken when QSYing to ensure a clear frequency, should study the new RSGB *Amateur Radio Operating Manual*. This book contains all the information required for successful operation on the vhf bands, and will ensure that new operators make the most of their new-found frequency allocations.

Transequatorial report

Roland Whiting, 5B4WR, the vhf manager of the Cyprus ARS, has kindly sent 4-2-70 the latest transequatorial propagation report. 5B4AZ and 5B4WR have continued to monitor the beacon signals transmitted from the ZE2JV site in Rhodesia on 144.160MHz. During August 1978 the te signals were only heard on two days, whereas this year they were heard on seven of the first 18 days in August. Because of the international scientific interest in these te experiments, these dates and reports are given in full. All the times quoted are gmt and the signal strengths are the average for the opening and are based on the te reporting code — the letter T indicates flutter fading; 1—signal present, occasionally readable; 2—signal present, readable with some difficulty; 3—signal present and readability 5.

9 August 1979, 1805-1838gmt, T1.
11 August 1979, 1758-1820gmt, T1/2.
12 August 1979, 1824-1840gmt, T1/2.
13 August 1979, 1740-1845gmt, T3—a very good opening.
14 August 1979, 1820gmt, spot check T1.
16 August 1979, 1816-1826gmt, T2 (this opening probably started earlier but the beacon was not fully operational until 1816gmt).
18 August 1979, 1720-1824, T2 with deep slow fades.

There is also the possibility that there could have been openings on 10, 15 and 17 August, as neither 5B4AZ nor 5B4WR were able to monitor on those days. The increase in the number of transequatorial openings this year has given the Cyprus operators hopes of perhaps a 432MHz QSO in late 1979. The special transequatorial net which exchanges the latest reports and information now meets on 28.988MHz.

Oxford University expedition

Over the last few years the team from the Oxford University RS has built a solid reputation for its well-planned expeditions, and this year's trip to Scotland was an outstanding success. The chosen site in the south-west of Scotland was in QTH locator square XO19a, just 10km east of Wigtown, 800ft asl with a clear take off over the sea. Two 16-el Tonna antennas were used on 144MHz, along with a 2dB noise figure preamplifier and a 400W ssb linear amplifier. The expedition found it possible to have regular contacts with stations on the south coast of the UK, and worked a total of 41 QTH squares on 144MHz. The best tropospheric dx worked included DB5PU (DK22c), F1FMZ/P (BF29c), F6DKW (BI12f), PA0XMA (DM44h), and OS7EH in CK03f.

During the expedition the group was able to observe a visual aurora, and despite a 350ft hill to the north-east they were still able to work 22 stations during two separate auroral phases. Visual observations were made during both radio auroras, and contacts were completed with stations in eight countries. The best of the 144MHz auroral contacts were with G8MFJ (ZL41c), GW8JLY (YL15g), DF4KI (DL62c), ON5FF (BL71e), EI9Q (WM65d), GU4EON (YJ48h) and F6CRP in ZG65g.

On 432MHz the group put up two 27-el G3JVL-designed loop Yagis stacked vertically, and the receiver again had a special preamplifier, this one with a 0.8dB noise figure. The linear had off days, and sometimes the output on ssb was considerably below the usual 400W level. Conditions on 432MHz were not as good as on 144MHz, but nevertheless good contacts were made with stations on the south coast of the UK, and their best tropospheric dx QSO was completed with GU8FBO in Guernsey. The RSGB beacons GB3EM on 432.910MHz and GB3WHA on 432.810MHz were consistently audible at about 16dB above noise. On one evening the French beacon FX4UHF was copied for a short time but no French stations were worked on the higher band.

During the second week of the expedition the group put up four of the 27-el loop Yagis to try moonbounce experiments. The antennas were spaced 7.5ft apart in a box formation, and the system measured 12dB of sun noise and approximately 1.5dB of ground noise. Encouraged by these excellent results under portable conditions, the group progressed to echo-testing off the moon, and then full eme contacts were attempted.

Schedules were arranged and moonbounce contacts were completed with I5MSH and LX1DB with "M" reports being exchanged. A contact also took place via the moon with no pre-arrangement—SM6CKU replied to a CQ call. The moonbounce tests coincided with very wet weather at the site, and this may have impaired the system gain on the horizontally-polarized antennas. Faraday rotation also affected the results, and it is interesting to note that Charles Suckling, G3WDG, who was listening on the Oxford dish at the same time, logged that signals were mainly vertically polarized. Despite these problems the group did hear K5JL, W1JR, DL9KR and ZE5JJ, all of whom would have been delighted to work GM on eme. Undoubtedly the three moonbounce contacts completed with I5MSH, LX1DB and SM6CKU constitute new records for eme from Scotland.

Another group of members of the Oxford University RS, consisting of G3CWI, G4EZN, G4FIL and G8OCJ, were listening to the moonbounce tests in Oxford. They had just finished assembling a 30ft diameter chicken-wire dish antenna, had measured 12dB of sun noise, and heard GM3YGF/P via

the moon. They also heard I5MSH and LX1DB, and now join the growing ranks of licensed eme listeners. A K2RIW type linear amplifier is under construction, and it is hoped to test the system at G3WDG's QTH.

Now that the days of the portable expedition with moonbounce capability is here, we shall doubtless soon have groups activating rare locations for the benefit of vhf and uhf operators world-wide. The group who went to Scotland, G3YGF, G8LYB, G8RHI, G8KRD and G8RPV, are certainly to be congratulated on yet another successful Oxford expedition which managed to encompass tropospheric, auroral and moonbounce operation under weather conditions which were less than ideal. Plans are already being formulated for the 1980 expedition.

Harmonics in the 50MHz band

Trevor Brook, G3WBQ, in Shamley Green, Surrey, has been paying special attention to signals heard on the 50MHz band. He has been studying the band since 1969, when he heard strong signals from ZE1AZC. He uses a Microwave Modules converter and a 3-el wide-spaced Yagi antenna from a site which has a clear take off to the south. ZB2VHF has been a consistent signal during the autumn months, and G3WBQ has also logged several other transmissions in the 50MHz band during these openings.

Careful research has revealed that a signal on 50.723MHz is in fact from a broadcast station in Nauakchott, Mauritania, a distance of over 4,000km. This signal has been logged on a great many occasions, sometimes at S9, and is the seventh harmonic of the 41m broadcast station. The fundamental is on 7.246MHz, 1kHz higher than its designated frequency, a fourth harmonic is also audible as an intruder in the 28MHz amateur band. The programmes are in Arabic or French, with an English pop music show being presented daily between 1900 and 1930gmt. The modulation on the higher frequencies is almost entirely narrow band phase modulation with a rather T8 carrier and almost no amplitude modulation. Although an intruder from 43MHz lower, this harmonic is a very reliable guide to conditions on the 50MHz band.

Another propagation indicator is a signal on 49.735MHz; this is a seventh harmonic from Radio Nacional España on 7.105MHz. Originally G3WBQ thought the signal on 49.735MHz came from Spain by Es, but from the times logged and the lack of correlation with ZB2VHF, G3WBQ wonders whether the signal comes from one of Radio Nacional España's transmitters on the Canary Islands. Perhaps one of our readers could assist in identifying the source of this useful harmonic.

G3WBQ and other stations on the south coast of the UK mention a useful signal on 50.4MHz which can be used to check converters and antennas. The transmission has a sound indicating it is a mix of vision and sound signals which measures 50dB down on the signal from the vision carrier on 52.4MHz from Caen. The spurious signal varies in strength from S4 to S9 depending on tropospheric conditions.

It is not often that intruders in amateur bands perform any useful function, but the transmissions detailed above would certainly be missed by many operators studying 50MHz conditions. The station on 7.246MHz does appear to need some attention, as on one day recently G3WBQ logged the fourth harmonic on 28.984MHz at S4, the sixth on 43.476MHz at S9, the seventh harmonic on 50.723MHz at S9, and even the eighth harmonic on 57.968MHz at S3. For the sake of the 50MHz

enthusiasts, we hope the station engineers do not read this in 4-2-70 and remove these useful yet spurious signals.

Amateur television

From time to time enquiries are received for the address of the British Amateur Television Club—one correspondent asked if it was still going! BATC is thriving, and membership details can be obtained from Brian Summers, G8CQS, 13 Church Street, Gainsborough, Lincolnshire. The club publishes an excellent journal under the title *CQ-TV*, and it always contains a mass of information for fast- and slow-scan enthusiasts. The latest issue carries two separate pleas for a talk-back frequency to be established on 145-250MHz. Well-known television operators G3PTU and G8CJS both mention the difficulties being encountered on 144-750MHz—even including slow morse transmissions. Both G3PTU and G8CQS would see many advantages in using 145-250MHz, as signals on this frequency could be fed to a tripler and vision modulation applied, resulting in a vision carrier on 435.750MHz. To avoid interference from beacons and repeaters it is necessary to have the vision carrier frequency above 435.5MHz to leave room for a monochrome fast-scan television transmission.

The latest issue of *CQ-TV* also carries an unusual circuit for narrow bandwidth television which would occupy about 10kHz in each sideband. The accompanying thought-provoking article suggests a possible circuit for digitally experimenting with narrow-band television. Two identical ram chips are used to store separate frames of information in such a way that while one ram is being loaded with one frame of information the other ram is releasing the previous frame twice. The result, theoretically, is an illusion of twice the frame speed and, with over 2,000 points per frame and eight different brightness levels, a reasonable picture should be possible.

Newcomers to amateur television can obtain a guide to amateur television from BATC Publications, 64 Showell Lane, Penn, Wolverhampton, Staffordshire. The guide costs £2 to non-members and covers all the aspects of atv, including reception, transmission, cameras, monitors, and fast- and slow-scan systems. This guide is highly recommended and has been written in a very practical way by members of the BATC.

EI2W works VE on 50MHz

Harry Wilson, EI2W, the only station in northern Europe to still have a special licence for transmission on the 50MHz band, has succeeded in working VE1AVX on two-way ssb. The contact took place on 20 October 1979, almost 21 years after EI2W's last historic QSOs on the 50MHz band. G3BA, G3COJ, G4BPY, G3USF, G3LDO, G3JHM and G5KW all had several crossband contacts from 28MHz, with the European operators staying mainly around 28-885MHz and listening above 50-010MHz for replies. Don Hayter, G3JHM, near Alton in Hampshire, reports very strong signals from VE1AFJ, VE1AVX, W1RJA, K1TOL, W2IDZ and N3AHI. Al Slater, G3FXB, in Horsham, worked 25 VE and W stations crossband in just two days of operation. Other outstanding signals on 50MHz were VE1ASJ, W1UQC, K1ICN, K1IKN, K1WHS, W1EJ, W1IAZJ, WB2CUS, W2IDZ, WB2FZK and W3JO. Although predicted in the RSGB news bulletins, the 50MHz openings started seven days earlier than the 1958 openings.

Several correspondents have written to ask whether EI2W is

actually still licensed for the 50MHz band, and your scribe is happy to report that the authorities in Eire renewed EI2W's special permit this year. They are of course fully aware of the tremendous amount of research EI2W did on 50MHz propagation during the 1958 solar peak, and they have kindly ensured that this work can be carried further during this peak in the solar cycle. Following publicity about EI2W's unique permit in 4-2-70 some months ago, South Midlands Communications have lent EI2W a Yaesu 50MHz transceiver which runs 10W output, and Harry is feeding this to a wide-spaced 3-el beam at his site near Dublin.

Operators who are interested in joining in on these crossband contacts should listen and transmit around 28-885MHz, and have another receiver running which can tune above 50MHz. It is essential and mandatory that operators listen on their 28MHz frequency at the same time as listening on 50MHz. The latest details about the solar flux and maximum usable frequencies are always given in the Society's GB2RS news bulletins.

American repeaters part 2

Last month's 4-2-70 gave details of the various American repeaters which had been demonstrated to G3HZI and GM8-JIP during their American holidays. Their reports have generated considerable interest, especially in the crossband units which link 144MHz with lower frequency bands. Tom Waller, GM4HIG, has been taking advantage of the excellent hf conditions to use the Metroplex Association's fm repeater on 29-640MHz—many of the stations he has worked through this repeater have, in fact, been cross-linked from 144MHz. Operators in New Jersey with hand-held 144MHz rigs are therefore working world-wide dx via the cross-linked 29MHz repeater. One of the members of the Metroplex Amateur Communications Association of New Jersey, WB2MGB, has sent full details of the association's network of repeaters, and the details make fascinating reading to European operators who are accustomed to using repeaters to improve mobile coverage over restricted areas.

The Metroplex Association has 10 repeaters: two on 440MHz fm, two on 220MHz fm, one on 145MHz fm, one on 52MHz fm, one on 28MHz fm, one on 430MHz fast-scan television, one on 144MHz rtty, and one on 29MHz ssb. One of the aims of the association is to stimulate activity on non-vhf bands, and they achieve this by cross-linking vhf and hf repeaters but reserve this facility for members of the association only. All the repeaters represent the latest in state-of-the-art equipment and technology—the 144MHz repeater has a four-bay, 6-2dB gain, omni-directional, vertically-polarized antenna, 560ft asl, with an erp of 260W. The 440MHz repeater runs 600W erp utilizing a 10dB-gain antenna, and is fed by nitrogen-pressurized heliax transmission line. All 10 Metroplex repeaters are on 24h per day every day, and a full emergency power back-up is fitted to each repeater.

Ian Abel, G3HZI, described Californian "autopatching" in November's 4-2-70, but the Metroplex repeaters use a different system. Telephone calls are made via the repeater by an operator using a touch-tone pad on his transceiver, and this dials that information into a Metroplex computer. The computer then verifies the operator's account number, selects the least expensive circuit for the call, re-dials the information into the outgoing circuit, which is part of a very-long-distance network containing local calls, foreign exchange lines, and

microwave communications channels. The computer provides the call facilities at the lowest rate and best quality regardless of the destination of the autopatch call. It also keeps records, and each member receives a monthly print-out of the calls he has made via the autopatch. Personal "speed numbers" are supplied to each member, as well as the special "speed numbers" assigned to the police and other emergency services. All emergency calls are paid for by the club and there is no limit to either the length or distance of normal autopatch telephone calls. The trustee of the repeaters (his callsign is sent during identification periods), is responsible for the content of all transmissions conducted via the repeaters. It is interesting to note that the association has had to request members to conduct their QSOs in English, as the control stations (who bear the FCC responsibility) may not understand what is being said in a foreign language!

To take advantage of the world-wide users of the Metroplex 28MHz and 50MHz repeaters, Metroplex International has been formed, and an information package about the association is available from PO Box 237, Lenia, New Jersey, 07605. Membership of this state-of-the-art organization is seven dollars annually.

Late news—50MHz wide open

The 50MHz band has been wide open since mid-October, and many amateurs in Europe have been working crossband from 28MHz. EI2W, who is of course licensed to actually operate on 50MHz, has now worked more than 50 dx stations. G8NWF reports on the tremendous signal being received on 50MHz from VE1AVX (ex WB2RLK/VE1) with just a dipole and a simple converter with no preamplifier. Gordon Pheasant, G4BPY, worked a whole pageful of W stations, including W1, 2, 3, 4 and 8, plus W5VY, WD5BDI, W9NFE, and W6XJ in California. G4BYP also worked AD6C, WB6NMT, KP4EOR in Puerto Rico, and K3SXA/MM. On 27 October at 0900gmt G4BPY copied VK6RTV, the Australian beacon on 52.300MHz, but no Australian QSOs took place despite VK6HK being able to hear British Ch2 tv till 1100gmt. GM3WOJ has been very busy on 50MHz, and has also worked American and Canadian stations. He reports G3COJ, G3FXB and GM3MHW as all being very active around 28.885MHz, and he has high hopes of a crossband contact between 50MHz and 70MHz; to this end he has been beaming west with his large 9-el 70MHz beam. GM3WOJ's best 28/50MHz dx so far has been a contact with HC1JX. □

Sporadic-E observations in 1979

by R. A. HAM, BRS15744*

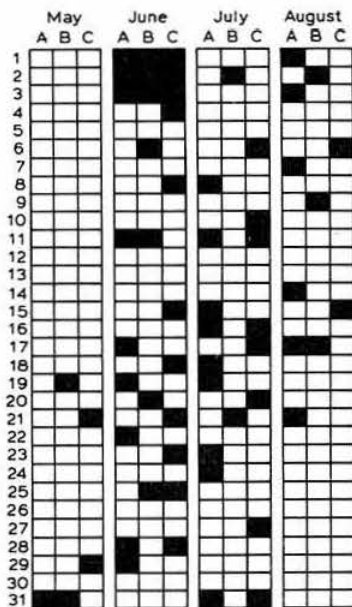
ALTHOUGH there were a few minor indications of sporadic-E in early May, mainly around 50MHz, the 1979 sporadic-E season got off to a late start at midday on 19 May and ended 95 days later on 22 August. This is approximately 23 days less than the 1978 season, and about the same as the 1977 season.

As in previous years the author has used an R216 vhf communications receiver, mainly to monitor the television synchronizing pulses transmitted on Ch R1, 49.75MHz, for advanced warning of sporadic-E and, when this occurred, to tune between 40 and 80MHz for mostly broadcast dx. Regular observations have shown that the 50MHz band is the most vulnerable to sporadic-E activity, and that the pulses on Ch R1 are among the first signals to be heard and the last to fade away in the UK, when sporadic-E is present. For the second year the author has used a JVC3060 625-line television receiver fed, like the R216, with a dipole antenna and tunable from 48 to 68MHz covering European channels E2, 3 and 4, Italian A and B and Russian R1 and 2, and once again the results were amazing.

During the 1979 season sporadic-E reflections influenced the normal paths of radio signals between 40 and 80MHz on 48 days, compared with 69 days in 1978 and 37 days in 1977. The author made daily observations at approximately 0800, 1230 and 1800gmt, and the sporadic-E events recorded at those times are indicated by the solid squares in Fig 1 under times A, B and C respectively.

*Faraday, Greyfriars, Storrington, Sussex.

Fig 1. Monthly distribution of sporadic-E



Continental broadcasting stations

Nearly every day, indicated in Fig 1, the sporadic-E disturbance extended to 73MHz, with strong signals from many eastern European broadcasting stations being received in the UK. Fig 2(a) shows the radio frequency distribution and the number of times that the signals were heard by sporadic-E. As in previous years the majority of the Continental signals were subject to deep and sharp fading at the beginning and shortly before the end of each event.

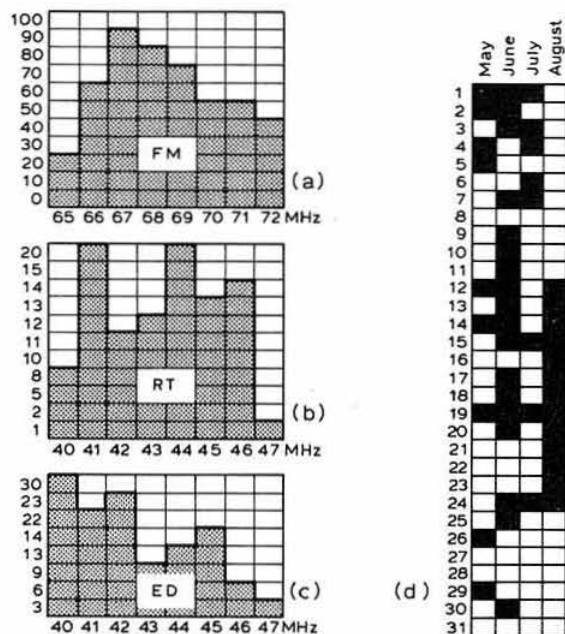


Fig 2. (a) East European fm stations heard in the UK during periods of sporadic-E. (b) European radiotelephone signals heard between May and August 1979. (c) Electronic devices heard during sporadic-E events. (d) Monthly distribution of solar radio noise recorded by the author on 146MHz

Dx tv

It was fascinating to watch the pictures from different national networks fighting for predominance on the same channel as the sporadic-E disturbance ebbed and flowed (Fig 3). Between 19 May and 22 August the author had positively identified television pictures from 17 countries (Fig 4) and among the interesting items seen from Continental tv stations were the visit of Pope John Paul II to Poland, the England-Denmark football match being played in England, and the UK programme "The Onedin Line" with English titles and the sound dubbed in a foreign language.

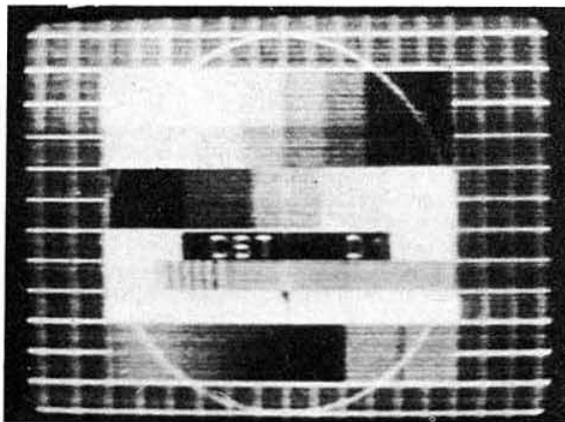


Fig 3. TV picture from Czechoslovakia received by the author on Ch R1 during the 1979 sporadic-E season

Television station	May	June	July	August
Austria	19 21 29 31	1 2 6 11 18 19 20 22 25 27 28 29	2 6 8 10 11 18 20 23 24 31	2 3 7 14 17
Bulgaria				
Czechoslovakia				
Denmark				
East Germany				
Finland				
Hungary				
Italy				
Iceland				
Norway				
Poland				
Portugal				
Russia				
Spain				
Sweden				
Switzerland				
Yugoslavia				

Fig 4. Distribution of tv pictures received in Band 1, identified by their test cards, during the 1979 sporadic-E season

European radiotelephone stations

Whatever the language, two-way radiotelephone signals are usually obvious. Fig 2(b) shows the distribution of these signals heard by the author during the period. The total number of radiotelephone signals received was 99, compared with 229 in 1978 and 141 in 1977. This year the main activity was around 41 and 44MHz.

Electronic devices

The words "electronic devices" are used to describe the host of teleprinters, tones and various beacons which are often heard between 40 and 50MHz when the E region of the ionosphere is disturbed. Fig 2(c) illustrates the radio frequency distribution of these signals heard during the 1979 season and showing that the main activity, as in 1978, was around 40MHz.

Major events

Although most of the 1979 sporadic-E events seemed less intense than those in 1978, there were two events which qualify for special mention. First, the longest event: most of the daylight hours of 1, 2 and 3 June were affected by sporadic-E, and periodic checks revealed about 30 strong signals from east European fm broadcast stations between 65 and 73MHz as well as the dx tv, reported by several people, mentioned earlier. Second, one of the most interesting events occurred during the early evening of 28 June, when, at about 1700gmt, UK amateurs were working into Italy and Yugoslavia with comparative ease on 144MHz. The tv pictures which were received from Italy, Poland and Spain were mixing together in Band 1, and the author counted 42 Continental fm stations between 65 and 73MHz.

28MHz band

Signals from the International Beacon Project station, DL01GI, 28.205MHz, were heard by the author on three days in May, 20 days in June, seven days in July and 15 days in August. These signals were usually very strong when sporadic-E was present.

Solar activity

The sun was slightly more "active" during the 1979 sporadic-E season than it was in 1978, Fig 2(d), with 48 days activity recorded by the author at 146MHz, compared with 44 days in 1978 and 21 days in 1977. As stated in previous years, the author cannot find any direct connection between solar activity and sporadic-E disturbances.

the month on the air

John Allaway, G3FKM*

ALL the rumours concerning decisions being taken in Geneva may have been confirmed (or otherwise) by the time this reaches readers, and the decisions which will set the pattern of our hf band activities for up to 20 years will be common knowledge. Whatever the outcome of the negotiations, your scribe can confirm, from personal observation, the respect with which our representatives were received. This was not an on-the-spot happening but the result of many hard years of preparation by IARU and national societies since the last WARC. A very large vote of thanks is due to those who did so much on our behalf—and RSGB members have particular reason to be pleased by the work done by Roy Stevens, G2BVN (Region 1 secretary) and Eric Godsmark, G3IWL, as well as having the honour of having the president of the IARU, Noel Eaton, G3SDA (usually known as VE3CJ) as a fellow member.

G3FG reports that his callsign is being used illegally on 3.5MHz, particularly in the evenings. John says that he is never on the air after 1600.

DX news

DX'press reports that OZ8AE/MM is aboard the polar vessel *Nella Dan* which is on its way from Melbourne to visit Macquarie Is and Antarctica during the Antarctic summer. He will use the callsign VK0JC from Macquarie—mostly during November—and then from Antarctica for several months. Frequencies to watch are 14,035 and 21,035kHz. QSLs should be sent to his home address. It seems that "VK0XU" was a pirate.

Now that the Canal Zone has become part of Panama, former KZ5 callsign holders are being issued with new calls in the HP1X/HP2X series.

TN0HL is an East German teacher who will be in the Congo until July 1980. He is very often to be found on or near 21,330kHz except at weekends.

The latest position on activity from Chagos is as follows: VQ9DS operates regularly from 1800 to 2100 and favours 21MHz ssb above 21,275kHz; WB6CBJ/VQ9 uses 14,240kHz from 0200; VQ9MR prefers cw and his operating times are around 1330 and 1900—frequencies quoted are 7,008kHz and 25kHz above the low end of the 14, 21 and 28MHz bands; VQ9JJ uses ssb at weekends after 1400 near 14,275, 21,310 and 28,540kHz; VQ9KK gets on the lower frequency bands, and useful times for Europe seem to be 2300 on 3,517kHz and 2330 on 7,007kHz, and on Saturdays he is on 3.5MHz from 1300 to 0100.

G4FKH will be in Mauritius in mid-December and should be on the island for seven weeks. His operating times will coincide with those listed in this month's propagation predictions for 3B8. Equipment will consist of a 3W home-built transceiver for 14MHz which will operate mostly on the QRP frequency of

14,060kHz, and the antenna will be a dipole orientated towards the UK. The callsign will be G4FKH/3B8.

Robin Francis, G3RWH, who was previously D68AD, expects to be in Raratonga, Cook Is, late this month. He hopes to be on the air with a ZK1 call sometime in February or March, and will be on the islands for about two years.

Gavin Hunt, GW4BFU, is a marine radio officer working aboard vessels engaged in world-wide trading, mainly under the Liberian flag. He has now been granted the /MM licence EL0AH and will be on the air from this month for about six months. UK contacts will be welcomed and special QSL cards are being printed.

G8RVV is currently in Oyem, Gabon, and has the callsign TR8DCD. He runs low power from a TS120V into a dipole antenna and expects to be in TR8 for six months. QSLs go to his home call. Other active Gabon stations include TR8GM, who is often on 14,275kHz at 0600, and TR8RB who prefers the 28,500 to 28,550kHz area from 2000.

ZD7HH will be found on the lower frequency bands during the winter and should be looked for on 3.5MHz ssb at 0600 and on 7MHz ssb at 0400 on Sundays. ZL2OM hopes to be on 3,505kHz at 0500 daily throughout the winter months.

It is believed that no DXCC changes will follow the recent changes in Kiribati callsigns. VR1BD is now T3KC, and KS6DV/KH1 is using T3PA as his alternative call. VR1AF became T3KA but left the islands on 10 October.

W6RO is the callsign of the Long Beach ARC and the station is located aboard the *RMS Queen Mary*. The club is active on all bands 3.5 to 28MHz daily on cw and ssb from 1700 to 0100. Contacts are confirmed with a special QSL card.

The prefix EJ was used by stations in Eire during the visit of Pope John Paul II.

VP8SU will be on S Georgia for the next 18 months and should have received an FT101 by now. This should increase his activity and he may now be found on all bands and modes instead of only on 7MHz cw and 14MHz ssb as previously.

Expeditions

VK2BJL has mentioned to G3GIQ the possibility that he may visit the Tokelau Is (ZM7) next year.

Mention of an expedition to various African countries by 12FGP in the near future, made in last month's *MOTA*, appears to have been based on incorrect information.

The expedition to Palmyra Is and Kingman Reef is expected to start on 4 January 1980, with five days of operating from each location simultaneously. WA2FIJ, W2TDQ, WA6YQW, K6LPL and K2HFX are already listed as operators, but more names will be added. The chartered boat will cost \$500 per day and the flight \$4,500, and it is expected that the whole expedition will cost in the region of \$20,000. Support from manufacturers seems to have been minimal and the expeditioners are taking their own equipment. Donations are urgently solicited and should be sent to the Kingman Reef-Palmyra expedition, c/o Jan Gould, WA6YQW, 1542 Beacon Av, Anaheim, Cal, 92802, USA.

G6RC reports (via W6KNH) that QSL cards were made out for every one of the 25,000-plus contacts made by the recent KP4AM/D expedition. Over 5,000 of these remain unclaimed, and anyone who made contact is invited to send an addressed envelope and ircs so that W6KNH can forward the appropriate QSLs.

G3GIQ says that PY1MAG will be going to Trindad Is early in the New Year for two months and will be active as PY0MAG mostly on cw.

*10 Knightlow Road, Birmingham B17 8QB.

QSL cards from GT4CDA are now to hand and are being despatched through the bureaux. Cards for GT4EJA/MM—featuring a colour picture of the *Manx Viking*—will not be available until early in 1980. Direct QSL requests can still be sent to PO Box 59, Isle of Man, or to QSL manager G4EJA.

Chris Eley, G4FTF, together with G4BIA and his wife, were in Andorra from 16 to 23 September. Roger was C31HA/P and Chris C31GY/P, and they used an FT310S plus FL110 linear into an HF5 trap vertical antenna (with 36 radials). Power was derived from batteries and the operation took place from a tent sited 2,100m asl. Over 600 contacts were made, including a very enjoyable one with ZL3LM and other ZLs. Unpleasant features included interference from UK stations ragchewing in the dx segment of 3-5MHz and frozen water carriers in the mornings! QSL to the address in "QTH Corner".

Visit to USSR

G3MHF is planning a week's visit (in March) to Moscow and Leningrad for radio amateurs and their xyls. The estimated cost is £225 per person in a twin room, and £260 per person for a single room. The package will include the return flight, first-class full-board accommodation, general sightseeing programme (with guide), and special visits to radio clubs, meetings with Russian amateurs etc, and to actually go inside Box 88. Places are limited and numbers need to be finalized well in advance. Please contact Mike Ockenden as soon as possible for further details and application form. His address is: 39 Rattle Road, Pevensey, E Sussex BN24 5DG. Tel 0323 762252.

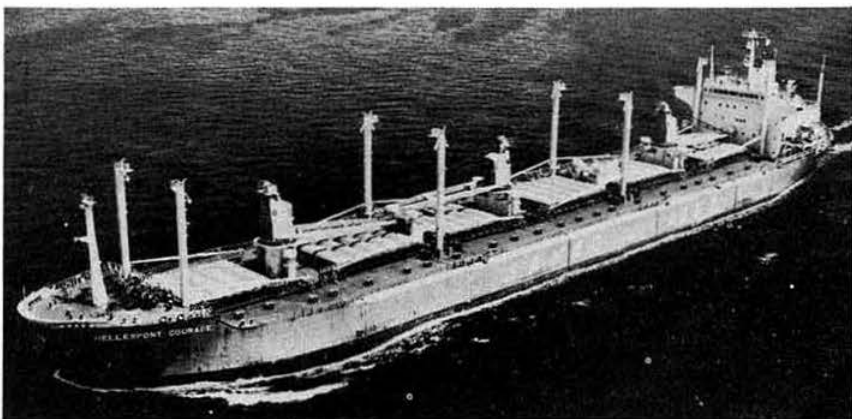
DX News Sheet

Readers looking for a source of information on unusual stations, dxpeditions, contests, QTHs, and many other matters of interest to hf band users, might consider a subscription to *DX News Sheet*—edited by Geoff Watts and distributed by the RSGB. It is a weekly sheet, and one year's subscription costs £10. Requests should be sent to RSGB HQ.

Another Geoff Watts production is the *Amateur Prefix-Country-Zone List*. This contains up-to-date information on DXCC status, normal and special prefixes, ITU callsign allocation, continent, CQ zone and ITU zone of every country. It has 15 pages, is regularly up-dated, and costs only 40p, or overseas (airmail) \$1 or five ircs from Geoff Watts, 62 Belmore Rd, Norwich NR7 0FU.



Gavin Hunt, GW4BFU (above), who is now EL0AH on board the *Hellespont Courage* (right)



Top band

In spite of the position of the sunspot cycle much interesting dx is being worked on 1-8MHz, and the number of the countries now allowing its use is increasing. However, your scribe would welcome more news of dx contacts made by the "regulars" this winter please. G5MP has kindly supplied a brief summary of October, which he found rather poor, with the usual W/VEs rarely audible and with no sunrise peak. He noted some 40 prefixes on during the CQ WW DX Phone Contest, and heard VP2KC (who used a 140ft vertical antenna) giving many East Europeans their first Caribbean QSO.

French language booklet

A special French language booklet has been produced by G4E-Q1 for use by those who wish to conduct simple contacts in that language. The 19-page production costs £1.50 (overseas £1.75) from Mary Craven, Grass Moor, Radford Rd, Alvechurch, Birmingham B48 7DT.

QRP

The G-QRP-Club has organized a Winter Sports 1979 Programme which is similar to that held in 1978. It will take place daily from 26 to 31 December (inclusive) and will be split up as follows: 1000-1100 on 21,060kHz (for UK/Scandinavian QSOs), 1100-1200 on 14,060kHz, 1130-1230 on 7,030kHz, 1200-1500 on 21,060 and 28,060kHz for Europe/USA contacts, and 1330-1530 on 3,560kHz. Further information may be obtained from C. Page, G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, W Sussex BN4 3JW.

Welcome

The following became members of the Society during October: DK1WL, DK9KD, DK9KX, EA3NE, EA5SW/6, EA6GG, EI2ABB, I2HGY, KA9FNR, OZ6IV, PA0ADC, SP9BQ1, VE2AGF, VK2BFJ, VK3BOB, WA2SKP, W2VDE, W7CKE, ZE1FX, ZL2BHK, 5N2ERL and 7P8BJ. A. Montes Fernandez (EA) and O. Shaik (ZS) became listener members.

Contests

ARRL 10m Contest

0000 8 December to 2359 9 December

Same station may be worked both on cw and phone but no cross-mode contacts allowed. A maximum of 36h operation is allowed. Exchanges consist of RS/T plus QSO serial number

(from 001). USA and Canadian stations will send their state/province. Stations not land-based will send RS/T and ITU zone. Each QSO is worth two points, four if with a novice or technician. The multiplier is the total of USA states, Canadian call areas, DXCC countries, and ITU regions (as sent by non-landbased stations). USA and Canada do not count as countries. Oscar contacts may be made. Logs must be posted before 5 January to ARRL Communications Dept, 10m Contest, 225 Main St, Newington, Conn, 06111, USA.

According to the *DX Bulletin* all contest logs for CQ contests should now be sent to the new CQ magazine address: 76 North Broadway, Hicksville, NY, 11801, USA.

Awards

The Worked All Gozo Award

Open to radio amateurs and listeners with no mode or band limitations. Only contacts/reports on or after 1 August 1972 are valid. Europeans must work and confirm eight different Gozo Is (9H4) stations, others five. Applications, with certified list (signed by two licensed amateurs) and 12 ircs (or US\$3) should be sent to Mr Joe Cauchi, 9H4L, 20 P.P.Hili St, Victoria, Gozo, Malta. The award is issued free to blind and handicapped operators. Note that the right is reserved to ask for any QSL to be submitted for inspection.

The Oman Award

Oman awards are being offered to radio amateurs world-wide subject to the following conditions: ssb contacts with eight or more A4X stations and/or cw contacts with five or more A4X stations. A contact will be accepted as having been made when signal reports, operators' names and QTHs have been exchanged. There is no date limitation. Send QSO details to: ROARS, PO Box 981, Muscat, Sultanate of Oman.

The Endeavour Award

Applicants must establish contact with RNARS members residing in Australia on or after 1 January 1979. One point is scored for each station worked/heard, regardless of mode. QSOs with VK2BNR count two points. Applicants in Australia need 15 points, in Oceania 10 points, and elsewhere five points.

Contacts with VK members on 3.5MHz count two points. Endorsements for cw, ssb, all novice, 3.5MHz, 28MHz, vhf and "five by five" (five points on each of the five hf bands) may be requested. Send log details, RNARS number of station worked/heard, date, time, frequency and mode, plus seven ircs to: R. Baty, HMAS Australia Rd, Henley Beach South, SA, 5022, Australia.

The Nine Dragon Award

This is being issued to celebrate the 50th anniversary of the formation of the Hong Kong ARTS. It is available to licensed amateurs and listeners, and contacts on or after 1 January 1979 are valid. Requirements are as follows: one QSO with nine different countries located in CQ zones 18, 19, 24, 25, 26, 27, 28, 29 or 30. One contact must be with VS6. CW, phone and mixed endorsements are available. Send a list of log data, certified by the awards manager of an IARU society. This should give callsign, date, time, band, mode and signal reports in and out, and should be accompanied by US\$3 or equivalent in ircs, and go to: Awards Manager, HKARTS, PO Box 541, GPO, Hong Kong.

CQ Awards

All CQ awards have increased costs, and the fee for WAZ, WPX and the CQ DX Award is now US\$5 or equivalent in ircs. The fee for WPX and CQ DX Award stickers is now US\$1. Award custodians are now: WAZ—Leo Haijsman, W4KA, 1044 Southwest 43rd St, Cape Coral, Fla, 33904, USA;

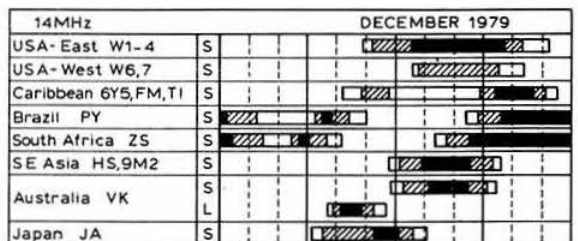
Propagation predictions

Conditions usually worsen in December compared with the previous months. This is caused by two factors: first, this month sees the maximum winter conditions, and operating times on the hf bands will be much shorter; second, the f2 mufs will be much lower than last month in the northern hemisphere. This will be in some way compensated for by much higher solar activity, so conditions on 28MHz will only be slightly worse than in the previous months.

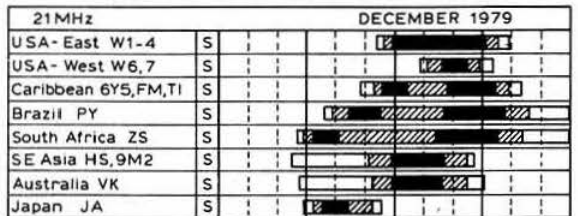
Traffic with all continents will be possible on 21MHz. Mid-winter conditions will allow extra traffic via the indirect (longest) path, which will be possible at dawn and at dusk. Specially mentioned is traffic with South America and East Asia.

During the long winter nights, and because of low f2 mufs, 14MHz will not be the night-time dx band as it was last summer. Night-time conditions on this band will only improve again towards the end February/beginning of March. As on 21MHz, several dx regions will be heard on 14MHz via the indirect path.

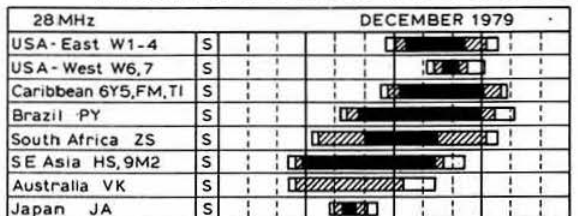
Because of frequent fading of 14MHz as a night-time dx band during the latter half of the night, 7MHz will become more important than before. Dx conditions always exist on this band when the longer part of the path lies in darkness. Traffic with Europe will be good on this band, and this and local traffic will not be interrupted by the dead zone. The seasonal condition of low static favours dx traffic on both 7 and 3.5MHz; the latter band will at times be interrupted by the dead zone just before dawn.



Time (GMT) 00 02 04 06 08 10 12 14 16 18 20 22 24



Time (GMT) 00 02 04 06 08 10 12 14 16 18 20 22 24



Time (GMT) 00 02 04 06 08 10 12 14 16 18 20 22 24

Short path 1-5 days
Long path 6-20 days
Openings on more than 20 days in the month

WPX/VPX/WPNX—Robert Huntington, K6XP, 5014 Min-dora Drive, Torrance, Cal, 90505, USA; CQ DX Award—Billy F. Williams, N4UF, 911 R 10 St Johns Drive, Jacksonville, Fla, 32211, USA.

Band reports

The G8KG report for October reads as follows: "The month of October gave us a first sight of near-peak conditions on the higher hf bands, and very good they were for the most part. The seasonal improvement which is normal at this time of the year coincided with the continuation of the steep rise in solar activity which began in August, and by the middle of the month the 28MHz band was providing excellent openings to most parts of the world. The WWV indices for 19 October (solar flux 242, A-index 2, Boulder K-index 0) signalled near-ideal high band conditions, and during the last 10 days of the month F-layer muf's above 50MHz were observed on a number of UK-ended paths and on many others elsewhere. The provisional Zurich sunspot number for September turned out to be 188.7, which is the highest value since August 1959. Preliminary data suggest that the value for October will be very similar. This means that the three-month mean value centred on August for plotting on Fig 1 on p834 of the September issue

QTH CORNER

J3ABV
JA7JT/JD1
K6C5X
via JH7BRG.
JA1NRH, I. Tomita, 1-2-9 Zaimokuza, Kamakura, Kanagawa, Japan.
K1CO/PJ7
W. P. Jacobs, 208 Sleepy Hollow Rd, Pittsburgh, Pa, 15216, USA.
PY2GWF/O
PY2XB/O
S2BTF
TN0HL
PO Box 13873, 01000 Sao Paulo, SP, Brazil.
T4YL
PO Box 108, Dacca, Bangladesh.
VK2ATZ/LH
DM2XLO, W. Lichtardt, Logauweg 6, D-117 Berlin, German Dem Rep.
VK9NW
via K9KXA, Mas Seo, 6430 N Lakewood Av, Chicago, Ill, 60626, USA.
VP2E
via VK3OT, S. R. Gregory, Box 622, Hamilton, 3300 Vic, Australia.
ZF2BN
Box 214, Norfolk Is, 2899, Australia.
ZF2CD
Via WA4MAV, R. J. Bishop, 3352 Brandywine Dr, Chesapeake, Va, 23321, USA.
3C1AA
via W4HET, P. Schmid, 8703 Westwood Dr, Vienna, Va, 22180, USA.
3C0AB
via W3ODJ, R. F. Thompson, RFD-7 Box 31, Waldorf, Md, 20601, USA.
via EA4MY, A. Bordallo, Cda Los Angeles, B1 400-A, Esc 1, Madrid21, Spain.
via EA8CR, Fernando Fernandez, La Rosa 33, Santa Cruz de Tenerife, Canary Is.

RSGB QSL Bureau, G3DRN, 30 Bodnant Gardens, London SW20 0UD.

of Radio Communication was 164, while the provisional value for September is about 173.

"As in January/February, the mean 2,800MHz solar flux continued to rise after the levelling-off of the mean sunspot count. The average for the 27 days up to 21 October was 221—which is the highest so far recorded in Cycle 21. The monthly average of about 218 for October was the highest since 1959. Another useful index—the seven day average—passed the 200 mark in mid-September and remained there up to the beginning of November, peaking at 237 for the week ending 20 October.

"It is too soon to be able to say whether the October conditions represented the peak of the cycle, but the writer tends to favour the view that this will not be reached until early in 1980, and that it will be significantly above the October level."

Many crossband 28/50MHz contacts have been made with the USA during the past month, and no doubt fuller details will appear at a later date.

Congratulations and thanks to the following contributors who managed to thwart the postal system and reach your scribe with information before the deadline date: G2s AMV and HKU, G5s HJ, JL and MP, G8KG, G3s AAE, DME, GVV, IMW and KSH, GM3s ITN and LYY, GM4CHX, G4s EHQ, ETN and GXL, and BR5s 17567, 25429, 31301 and 38934.

Stations listed in italics were using cw.

1-8MHz 0000 VP2KC, 0500 KP4ES, VE1DXA, VP2KC, 2200 UW9AF, 4U1ITU.

3-5MHz 0000 UF6VAG, 4U1ITU, 0500 PY2XB/O, 0600 D4C8C, HP3FL, J3ABV, K1CO/PJ7, VP2s E, KAC, W0MJ, ZL1HY, 0700 C6ACY, HH2T, N2KK/6, 2000 JA6LCJ, UK9AAN, 2200 HS1ABD, UOY, VS6DO, W1LC.

7MHz 0000 HH2T, 0500 KL7PJ, PY2XB/O, XE, 0600 FCOFHK, (QSL to DL1RK), F08FO, F8BAA (QSL to K2RW), T15AU, W6-W7, 1600 UOY, 2000 IT9SKO/IG9.

14MHz 0000 HH2PW, JT1AN, VP2s KC, VFK, 4S7ER, 9Q5VH, 0100 LU3ZY, 0500 FK8DD, 0600 FK8DG, VP1WS, 0700 FK8s CL, OZ T3KA, VK9RH, VKQJC, VP2s EY, KSU, ZLs, 0800 BV2B, F00HR, VK9NI, YJ8PD, ZK1CL, ZK2VE, 3D2WR, 5W1BZ, 0900 KC4USX, KC6SX, KL7EO, 1000 FP8HL, T3KC, VP5BD, YB0ACB, 1400 VS6GY, 1600 UK1PAL, 1700 UK1PAB, UOY, ZS2MI, 1800 ST2SA, VS6DF, 1900 KX6PP, ZD8RH (QSL to G4DBW), 2000 4U1UN, 2100 HMs, P29EJ, VQ9TR, 4K1A, 2200 KC6SX, ZL5AA, 3C1AA, 2300 KL7, VK6, 3C0AB, 21MHz, 0000 C5ABK, VP8QP, 3C0AB, 0800 JA, VK, 8J1ITU.

0900 HM5QQ, KL7EO, M1W, 5B4ES, 1000 JA, KL7, ZL, 1100 P29JS, VK9NW, W7, ZL, 5L7I, 1200 H3ILR, 1300 HS1ABD, UOY, 1400 3C1AA.

HF propagation study

	Predicted hpf + luf in megahertz for December 1979											
	00	02	04	06	08	10	12	14	16	18	20	22
Suva (s)	1600	1700	1700	1600	1600	3000	3000	3000	2400	1600	1500	1400
Wellington (s)	1500	1400	1500	1400	2800	3100	3300	3100	2400	1500	1200	1400
Osaka	1409	1410	1410	1511	3011	2810	2008	1808	1408	1508	1208	1209
Hongkong	1208	1009	1211	2114	4214	4012	3109	2505	1803	1604	1205	1006
Sydney (s)	1212	1014	1216	2117	3516	3212	3106	3203	2802	1604	1207	1010
Moscow	1003	0902	1002	1203	3204	4305	4305	3904	3102	1802	1203	1103
Bangkok	1307	1309	1312	2614	4715	5014	5110	4406	3203	1904	1405	1306
Singapore	1407	1409	1312	2815	4616	4614	4511	4306	3302	2002	1404	1406
New Delhi	1403	1405	1307	2810	4612	4411	4309	3305	2702	1902	1403	1403
Perth	1511	1513	1415	3018	3720	3618	3413	3207	3003	2303	1605	1508
Teheran	1503	1603	1403	3006	4709	5009	4908	4405	3302	2302	1603	1503
Colombo	1504	1607	1410	3013	4715	4815	4913	4508	3504	2403	1704	1504
Bahrain	1603	1703	1404	2907	4610	4511	4410	4306	3302	2702	1803	1703
Cyprus	1503	1602	1402	2205	4208	4909	4508	4405	3502	2602	1703	1604
Aden	1804	1705	1506	2909	4613	4514	4513	4307	3502	2903	2004	2005
Seychelles	1800	1800	1500	2800	4300	4600	4500	4500	3700	3000	2100	2100
Mauritius	1900	1800	1500	2800	4100	4200	4200	4000	3700	3100	2300	2100
Nairobi	2003	1803	1605	2609	4412	4613	4512	4408	3904	3103	2503	2203
Malta	1303	1302	1202	1303	3405	4106	3807	3706	3204	2404	1603	1403
Salisbury	2203	1903	1605	2409	4013	4314	4414	4411	3908	3205	2703	2303
Cape Town	2300	2100	1700	2700	3700	4000	4100	4100	3900	3300	2800	2500
Lagos	2304	2103	1803	1805	4409	4712	4513	4412	4110	3506	2904	2503
Suva (i)	2300	2200	1900	1900	3000	3000	3000	2400	2900	3000	2600	2600
Gibraltar	1202	1102	1002	0902	2303	3303	3304	3204	2903	2202	1602	1402
Ascension	2304	2203	1903	1706	3910	4614	4515	4214	3609	3004	2604	2604
Wellington (i)	2300	2100	2000	1600	2600	2500	2100	2000	2100	2400	2600	2500
Dakar	2300	1400	1900	1700	3900	4700	4500	4400	4200	3600	3000	2600
Las Palmas	1903	1703	1602	1400	2902	4505	4308	4208	4006	3405	2503	2103
Falklands	2306	2105	2005	1607	3012	3517	3521	3722	4020	3817	3013	2509
Rio de Janeiro	2305	2104	2004	1606	2809	4113	4317	4418	4417	3814	3110	2607
Buenos Aires	2205	2104	2004	1604	2607	3712	3818	4219	4418	4015	3112	2608
Sydney (i)	2115	1914	1912	1509	2108	2712	2518	2222	1923	2222	2519	2517
Lima	2100	1900	1800	1500	1900	2800	4800	4700	4600	4300	3100	2500
Barbados	2003	1902	1702	1500	1702	2807	4812	4514	4214	4011	3008	2405
Bogota	2000	1700	1600	1400	1600	2300	4800	4900	4300	4000	3000	2400
Jamaica	1800	1600	1500	1400	1600	1900	4300	4800	4400	4300	2800	2100
Bermuda	1800	1600	1400	1400	1600	2100	4600	4900	4800	4400	2800	2100
New York	1606	1406	1306	1405	1605	1807	3309	4811	4712	4210	2308	1907
Mexico	1600	1500	1200	1400	1500	1600	2000	4600	4800	4100	2200	1900
Montreal	1508	1408	1508	1408	1608	1809	3211	4712	4713	4011	2109	1809
Denver	1400	1400	1400	1500	1500	1700	3000	4700	3900	3000	2000	1700
Los Angeles	1300	1500	1500	1500	1400	1500	1500	2000	4300	3100	1900	1600
Vancouver	1200	1600	1600	1600	1600	1600	1600	1700	2500	2500	1700	1500
Iceland	0808	0808	0808	1007	1107	2207	3507	3607	3008	2008	1208	0908
Honolulu	1300	1600	1600	1600	1600	1500	1300	1200	1300	2100	1700	1400
Fairbanks	1400	1600	1700	1700	1600	1700	1600	1600	1900	1800	1700	1400

First two digits are hpf, last two luf. LUF 00 indicates data not available.

1500 EP2GY, S2BTf, 3C0AB. 1600 HS1WR. 1700 KH6CG. 1800 KH6BB, KL7D, K1CO/PJ7, S79MC, VPs 2KL, 2ML, 8SB, 3B6CD. 1900 J3ABV, ZS2MI, 9Q5WH. 2000 HC8GI, KH6XX, KL7, TD4NX, TN0HL, VQ9CI. 2200 OK3TAB/D2A, P21BT, T4YL, W6-W7-W0. 2300 HS5AID, TR8DCD.

28MHz. 0600 HM1EJ, JA. 0700 F08CK, JA, RJ8JBQ, ZL. 0800 JA, KL7D, KX6PP, VK, YJ8NGR, ZL, 3C1AA, VE1AMA/4U (QSL to DA1UO). 0900 AL70, FK8CR, JA, KL7, U0Y, VK, VS6FX, ZL, 3C1AA. 1000 C5AAP, H44HY, HS1ABD, KL7, WD6CDW/KH2, W1-W5, ZL. 1100 H44s PT, WH, KL7, P29s, VK. 1200 C6ACY, HC5EA, 4S7OW. 1300 TF0DF, VK9XW, VP2ML (QSL to K1RH), W7, 3C0AB. 1400 J3ARV, VP8SB, VU2DK, ZD7BW (W6-W7 and until 2200). 1500 EP2TY, KP2A, VE6. 1600 A22SM, CE2AA, CP6EL, FP8AA, VE5-VE7, ZS2MI, 1700 D4CBC, FP8AA, J7DMY, KH6BB, OA1CAU, VU2OF. 1800 KH6, VE5-VE7, YN1H, ZL2RF. 1900 HS1ABD, KH6, KL7FI, JA1PIG/PZ, UA0KAU (Zone 19), VP2s, VY1BU, ZL. 2000 KA6CNS/HC1, H2MC, KH6BOC, VK, ZL1PD, K9EF/8R1. 2100 K1CO/PJ7, ZL.

Acknowledgements are made to the authors of the following for items extracted: *DX News Sheet* (Geoff Watts), *Long Skip* (VE3FRA), *DXpress* (PA0TO), *CQ Magazine* (WIWY), the *Ex-G Radio Club Magazine* (W3HQO), *DX Bulletin* (KITN), and the *Long Island DX Bulletin* (W4UL/W2IYX).

Very best wishes for Christmas and the New Year to all readers—and please do not forget to send contributions for February issue to reach G3FKM not later than 4 January. □

Telecom 79

The following report was received after the November issue went to press:

While primarily catering for professional and commercial organizations, amateur radio was well represented at Telecom 79, the space for the stand being provided by the ITU, while cost of materials etc was borne by the IARU.

Many months of preparation and hard work by the Cern Amateur Radio Club, under the leadership of Jaap den Herder, PA0YJ, went into the stand, and the result was an exhibit of an extremely high standard. A number of working and static displays were included to illustrate many features of amateur radio. The working demonstration included an rtty repeater and a 1.3GHz/432MHz narrow-band tv repeater contributed by DARC, a colour tv link from 4U1ITU, and a microwave demonstration from the RSGB and Italian



Jaap den Herder, PA0YJ, welcoming M. Mili (centre) and M. W. Ritschard, Swiss Federal Councillor for Transport & Communication, to the amateur service stand

amateurs. The educational programme being undertaken by many societies today was represented by a static display of some beginners' construction projects and their associated literature, as well as some of the methods used to teach morse code. A videotape/slide film show was run continuously to introduce amateur radio to the WARC delegates. Sets of headphones linked to cassette recorders provided an opportunity for many to hear what signals received by moonbounce, aurora, te and meteor scatter sound like, and a demonstration of the new narrow-band voice modulation system was also featured. Experts on all these topics manned the stand continuously to provide further information.

The amateur satellite service was represented by a model of Oscar 7 and some of its spare flight hardware, and an example of a simple ground station for use with this satellite. The UK amateur satellite project UOSAT was described in one of the many photographic exhibits on the stand.

The major RSGB contribution to the stand was the microwave exhibit, and G3OUF, G3RPE and G3WDG travelled to Geneva some days before the exhibition to set it up. Two two-way links were established on 10GHz, one using standard wideband fm equipment as an example of the potential simplicity of 10GHz, and the other on ssb (provided by the Oxford University Microwave Group) to recognize the current state of the art. The latter equipment attracted much interest from delegates—one was overheard to ask at an adjacent professional stand displaying vhf ssb equipment, what was special with their equipment now that amateurs were using ssb at 10GHz!

In addition to the stand an amateur radio symposium held in one of the main conference lecture theatres also served to show amateur radio at its best. This was opened by Monsieur M. Mili, the secretary-general of the ITU, who commented upon the importance of the amateur service. Mr Noel Eaton, VE3CJ, president of IARU, then introduced the first speaker, Dr Dain Evans, G3RPE, who surveyed past, present and likely future amateur achievements on the 10GHz band, concentrating mainly on how amateurs can build their own equipment, and on what interesting propagation modes can be used to achieve dx with this type of equipment. The second speaker was Mr T. Lott, VE2AGF, who outlined the new narrow-band voice modulation system being developed in the USA. The third speaker, Dr K. Meinzer presented a most interesting talk on the AMSAT Phase 3 satellite programme.

Following the lectures, DARC gave a reception for amateurs who had contributed to Telecom 79, at which presidents from nine national amateur radio societies, including Mr J. Bazley, G3HCT, the 1979 RSGB President, were present. In addition, a number of important delegates to WARC were invited, which provided a most useful opportunity for last-minute discussions.

G3WDG, G3OUF

Mobile rallies calendar

1980

20 April—Southend & District Mobile Rally, De Havilland Suite, Southend Airport Museum, Aviation Way, Southend-on-Sea, Essex. Details from F. Thorogood, G8ORV, 30 Grange Gardens, Southend-on-Sea, Essex. More details later.

1 June—Hull & D ARS Mobile Rally, Hull University. Would traders please contact G8EAH, QTHR, for details of discounts for advanced booking. Further details nearer the date.

13 July—Upton Mobile Rally, Upton-on-Severn, Worcs.

raynet

T. I. Lundegard, G3GJW*

Members of the national Raynet Committee know that not everyone is familiar with the duties certain committee members have in connection with the organization and running of Raynet on a national scale. It is therefore intended that the holders of special appointments within the committee will explain what they do and the way in which they work, and this month it is the turn of the group information officer—Ingemar Lundegard, G3GJW. He joined Raynet in 1954, has served on the committee for upwards of 10 years, represents Raynet as a corresponding member of the VHF Committee, and is the county controller for Kent with six groups under his direction.

It became clear about five years ago that Raynet had need of more detailed records concerning groups, controllers and frequencies than were available at that time. (Throughout this text the word "controllers" will represent all types and grades of Raynet leaders including organizers.) G3GJW collected such information as was available from the committee records, *RSGB Bulletin* and *Radio Communication*. The original frequency list ran to just over half a page. Even this meagre source was of practical value, and G3GJW was allowed to circularize all known controllers at his own expense, which he continued to do until a couple of years ago. The advent of RSGB mailing resources on behalf of Raynet, coupled with the use of the Society's data processor in due course, resulted in the survey forms having been sent out by the Society for the past two years.

An index card system was used at first, but it had a limitation in that it was time-consuming to prepare lists from it. Current records are kept in two ways. (1) A file is kept of all returned annual Raynet survey questionnaire forms, which can be photocopied when necessary. Because use is always made of the original forms, rather than transferring all the information they contain elsewhere, it is important that they are completely legible. (2) A strip index contains basic details in the shape of group names or titles plus their controllers and their addresses (116 at present). The absence of group or controller information from both sources means that the Raynet Committee does not know of the existence of that particular group or its controller.

The 1980 Raynet survey questionnaire form was posted to all known controllers by first-class post during November. Any controller not receiving such a form is requested to contact G3GJW in writing not later than mid-December, preferably using recorded delivery. A survey form will be posted to the controller concerned by return.

Forms are sent to all controllers irrespective of rank or importance. As to whether they are returned individually or collectively via a senior controller, such as a county controller, is unimportant. The essential point to be made is that without a form covering each controller, the committee will not have the basic information enabling them to confirm his/her appointment for the coming year. This is done at the first committee meeting in each calendar year, usually during January.

What information is required? The name of the group; the geographical area it covers (it is helpful if this can be done in local government districts if possible); the membership number to which Raynet identity cards have been issued; the user services served; complete details concerning the controller and possibly one or two of his assistants; frequencies used, plus details as to how they are used and the numbers of stations on each frequency as base stations, mobiles or hand portables.

What problems arise? Forms go astray or are not returned quickly enough. Some are unreadable. Some exclude essential details or are obviously based on guesswork to the extent that one wonders whether the group concerned really exists. Frequency usage information is often ill-considered; some compilers ticking literally every single square or leaving them all blank—both equally useless. Instead of spot frequencies, bands of frequencies are frequently cited. Certain groups issue and use titles for officials within their groups which can in fact only be issued by the Raynet Committee. All these things make for a lot of unnecessary correspondence.

Summarizing: If a controller did not receive a 1980 survey form before the end of November, he is requested to ask G3GJW for another copy in writing without further delay. The controller should make sure that it is completed fully and legibly, returning it before the middle of January. As it will be used to update the RSGB data processor for posting information in the shape of newsletters etc to controllers, it is

only by making quite sure that the information is correct in every detail that the data processor can be correctly programmed. It has been found during this past year that there has been a tendency for RSGB and Raynet controller address details to differ.

G3GJW thanks all controllers who help in providing this annual information. As he pays for his own stationery and postage, saes would be appreciated when necessary. The information provided by each year's survey enables the Raynet Committee to confirm controllers' appointments, as well as putting together what is an essential fund of information without which it would be impossible to administer Raynet affairs.

obituaries

The Society records with regret the deaths of the following radio amateurs:

Mr R. Cathles, G3NDF

Ralph Cathles died on 4 October, aged 69. He was well known for his assistance to aspiring amateurs and during the past few years developed a network of cassettes, reading articles of interest from *Radio Communication* and other magazines, for blind amateurs.

Mr J. H. Chapman, GW8IQY

Mr Chapman, who died on 28 August, and whose many friends and associates included the "physiotherapy group", made his first transmission on the air in July 1974. He was active on the 144MHz wave band a.m./fm.

Mr A. W. Gover, G4AU

Alan Gover, who died on 11 September, became an amateur before the second world war, and helped keep watch on the air for enemy transmissions during the war. He continued his amateur activities, and became well known for his balloon-supported 1-8MHz antenna for contests. He remained active on all bands, especially 144MHz which he continued to work even as an invalid.

Mr J. Harrison, G3XSX

Mr Harrison, who died on 1 September, was a white stick operator and social campaigner for the blind. He was first licensed in September 1968 and was active on all bands, preferring 144MHz.

Mr J. F. McMahon, G13ZIA/E16CD

Sean McMahon, died on 1 October, aged 45. He was well known on the vhf and hf bands, both static and mobile, and he took local classes for the RAE. An early interest in his father's "Cat's Whisker" was to influence the rest of his life, as he became a radio and television dealer, and he delved into almost every aspect of his hobby helping many towards amateur radio.

Mr B. McMahon, G18SJT/E12AAB

Brian McMahon died with his father, Sean, on 1 October, aged 16. He was active on 144 and 432MHz, fm and fstv, and was studying for his Morse test.

Mr A. E. Scudamore, G3YEV

Alan Scudamore died on 21 July. He was active on 144MHz fm, and had also built his own hf rig.

Mr F. E. Tribe, MBE, GW4EEX

Fred Tribe, who died on 11 October, was chairman of the Hoover ARS, when he worked at the company's Merthyr site. On his retirement he moved to Reading where he became a popular member of Reading ARC. Although suffering from ill health, he remained active and was well known and respected among amateurs.

Mr D. Turner, G8KTH

David Turner died on 28 September, aged 19. He was an active member of the North Staffordshire ARS and of the North Staffordshire Raynet Group, and was awaiting receipt of his G4 callsign at the time of his death.

Mr C. D. Whaley, G6WA

Cyril Whaley, who died on 10 October aged 64, had been a member of the RSGB for many years. He was licensed in 1934, and was active on the hf bands until shortly before his death.

We have also been advised of the deaths of:

Mr R. A. Harris, G3EGT, on 9 August;

Mr J. M. Heath, G8AKS, on 16 June;

Mr J. H. M. Kirk, G3NYN, on 6 September.

*Saxby, Botsom Lane, West Kingsdown, Sevenoaks, Kent TN15 6BL.

contest news

RSGB HF Contests Championship 1978-9 results

Posn	Callsign	1	2	3	4	5	6	7	8	9	10	Total
1	G4BWP	15	0	60	0	15	30	60	50	10		240
2	G3MXJ	80	60				90					230
3	G3FXB	70			40		100					210
4	G4CNY	30				0	80		30	60		200
5	G4BUO		25		15	30			50			120
6	G2QT		20	30			50					100
7	G4FAM		50		0			40				90
8	G4APL	0		70								70
9	G3SYM/A				35					30		65
10	G3DYY	0				60						60
11	G3Y-											
	MC/A				30	20						50
	G3NOM		0	0	0	0	10		35			45
12	G3SJJ/A		40			5						45
	G4DUW	0	10	15			20					45
15	G4DBW	0		40								40
16	G3NKS			0				20		10		30
	G3IVJ	5			25							30
	G3IGW		15		5							20
18	G3YMC	0	0					20		0		20
	G3MBS				20		0					20
	G3YIZ	0							20			20
22	G4HSD					0			0	15	0	15
	GM3OXC	0		0	0	0		15		0		15
24	G3GC				0	0	0	10				10
	G3SJJ						0			5		5
25	G4DDL	0								5		5

Contests

1. 21/28MHz Telephony
2. 7MHz CW
3. 7MHz Telephony
4. 2nd 1-8MHz
5. 1st 1-8MHz

Awards

The G2QT trophy to F. C. Handscombe, G4BWP. Runner-up certificate to D. J. Andrews, G3MXJ.

6. Commonwealth Contest
7. Low Power Contest
8. Region Round-up CW
9. Region Round-up Phone
10. Summer 1-8MHz

144MHz September Contest results

The rules for this contest were published in the June issue of *Radio Communication*. After adjudication by the contest committee and publication of the results, the logs are forwarded to the European vhf manager responsible for the current international contests. We did not make this crystal clear, with the result that many logs were "radial ring" scored. The results tables are in "radial rings", and, to make this possible, correctly scored logs were additionally re-scored by the adjudicator.



The operating position of the Moonraker's Contest Group (Royal Holloway College) in the September 144MHz Open Contest. Located in the back of a Land-Rover, the station is being manned on right by G8PHG (just visible in background), operating, and G8SXB (Helen), logging, in foreground. Looker-on is G8SXA, left

The committee decided early this year, to adopt the recently agreed IARU single-multi-operator format. Comment was largely favourable; however, with experience, a number of stations have found and exploited the loopholes. Cover sheets "427", which form the major feedback circuit for the committee, have recently included a significant amount of unfavourable comment.

Congratulations to GJ4ICD for an outstanding single-operator score. Certificates go to GJ4ICD, G4FDX, GW8BHH/P and G4BWG/P. Thanks to G8JGK and G4HZA for check logs.

G5HD

MULTI-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	GW8BHH/P	8,995	730	YM44	DK00X	920
2	G4BWG/P	7,902	677	AL45	OK1KIR/P	852
3	G4BPO/P	7,636	742	AM67	F1EQU/P	741
4	G3PMH/P	7,493	669	AN61	F1EQU/P	760+
5	G6HH/P	6,689	626	AK03	OZ4VV	858
6	G3ZIG/P	6,534	572	AM06	SM7FJE	823
7	G3WKS/P	5,992	568	AL73	OZ1VV	858
8	G4IJE	5,643	603	AL12	—	—
9	GW3OXD/P	5,574	551	YM54	DK9TF/P	710
10	GW4ERP/P	5,319	590	YN75	DF2BW/P	698
11	G3FXB/P	5,055	540	ZK10	E1ACR/P	965
12	GM3OUR/P	4,621	317	XP76	F1CVE/P	752
13	GW8CSA/P	4,379	461	YL15	F6CJG/P	932
14	G8KUC	4,226	421	AL56	OZ1VV	806
15	G4CCC/P	4,211	532	ZL54	F1EQU/P	698
16	G4APA/P	4,163	516	ZL15	F1EQU/P	768
17	G3YMD/P	4,148	434	AL76	G4FUM/P	595
18	G8GBY/P	4,126	480	ZO77	F1FHI	765
19	G3PIA	4,084	486	ZL34	DL00S/P	644
20	G4DZO/P	3,975	433	AK11	E1ACR/P	968
21	G4HGT/P	3,950	507	ZN61	F6CRP/P	750
22	G2XV/P	3,509	397	AM72	G1BHY	563
23	G8RZO/P	3,317	467	ZL26	F1EQU/P	467
24	GW4GWU/P	3,240	351	YM04	F1ECM/P	702
25	G4HRC/P	3,022	346	AL23	F6CJG/P	804
26	G4DHF/P	2,894	361	ZN12	F9FT/P	710
27	GW4GMO/P	2,535	318	YL05	F1EPS	725
28	G4DSP/A	2,485	267	AN51	OZ1OZ	653
29	G3WRS/P	2,456	259	ZO46	F3TV/P	672
30	G8JVM	2,360	342	ZL42	—	—
31	G8KGI/P	2,282	286	ZK15	F6CZQ	750
32	GW8PMW/P	2,246	316	YN65	F6E2V	535
33	G3VER/P	2,198	318	ZN80	DK00X	701
34	G8OHM/P	2,142	355	YM50	DC6SN	590
35	G4HMX/P	2,129	347	ZN24	F1FHI	590
36	G8PHG/P	2,038	296	ZL52	DK6EI/P	621
37	G3ZBI/P	1,995	278	ZN71	F3R	693
38	G8GQP	1,963	280	YM50	DL0AN/P	490
39	G4CYA	1,923	249	ZN43	DK0MR/P	681
40	G8ODR/P	1,760	339	ZL29	F1ECM/P	527
41	G8MVA/P	1,747	263	AL43	GM3OUR/P	540
42	G8NWM	1,670	222	ZN19	F9FT/P	558
43	G8MLO/P	1,433	256	AL51	GM3OUR/P	531
44	G3UES/P	1,259	236	ZL66	DL0AN/P	519
45	GM8DVO/P	1,121	99	YP66	F1ANH/P	690
46	G4FUM/P	1,092	105	XO32	F5MY	770
47	G4AYM/P	985	185	YL29	—	—
48	G4HIR	981	187	ZL47	ON1RN	411
49	G8LVQ/P	925	160	ZN13	ON5CG/P	497

SINGLE-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	GJ4ICD	5,951	467	YJ70	OZ1OZ	1,082
2	G4FDX	5,039	557	ZL17	DJ3JT	709
3	G8NEY/P	4,006	429	YL62	DC2EC	722
4	G8SF/P	2,617	298	ZO55	F1FHI	772
5	G8AZI	1,476	130	ZO69	F9FT/P	688
6	G8GXE	814	106	ZL48	F1ECM/P	508
7	G3XKZ/P	674	130	ZM63	DL0AN/P	567
8	G4FZL	661	89	ZM25	DL0AN/P	560
9	G8MHV	628	89	ZM39	DL0AN/P	503
10	G4AGQ	574	102	ZL66	F1ECM/P	487
11	G8IFF	424	58	AM37	DC4ICD	445
12	G4HFO	412	50	YK03	GM3OUR/P	—
13	G8LXY	295	70	ZL09	PA0LGS	357
14	G8CDW	110	39	ZL30	ON4FF	272

LISTENERS

Posn	Station	Points	QSOs	QRA	Best dx	Km
1	RS32525	1,498	271	AL41	GM3OUR/P	516
2	RS34310	1,332	210	ZL80	GM3OUR/P	539
3	RS15822	786	144	ZL40	DL0AN/P	457
4	RS41733	715	119	ZL38	—	—
5	RS40920	455	83	—	GM3OUR/P	525

10GHz Cumulative Contest 1979 results

Once again this contest proved to be a very popular event, with 56 different stations appearing in the logs. No doubt better weather than last year helped, but many new stations contributed to the higher activity. The interest in this event in France was very welcome; next year it is hoped to receive entries from other countries as well.

Two main points arise from entrants' comments—talk-back and the QTH exchange. 144MHz ssb (horizontally polarized) is now universally used for talk-back, which has led to a QRM problem. It is strongly suggested that stations QSY to another frequency once contact is established—144.33MHz should only be used as a calling channel. The rules this year required the exchange of QTH and QTH locator only, but many stations exchanged ngrs which, while useful for distance and beam-heading estimation, do not form part of the contest exchange. In view of the obvious confusion on this point, no points were deducted from stations unable to supply QTH locators. Also, some comments were received on the duration of the activity periods, but as the leading stations reported a lack of time, no changes are envisaged.

Congratulations to the winners G3W/P, the Vectis Wireless Society (operated by G3KSU and G3WXC), and G3YGF/P (operated by G3YGF and G8RHI), for a very closely-fought contest. Certificates of merit also go to F6DLA/P, as the leading overseas entry, and to G3ZME/P (Telford & DARS, operated by G3UKV) as the highest placed station which had not won a certificate before in this event.

A special mention should also be made of the achievement of G8DPB/P. Not only was this his first event, but he is also a white-stick operator. Congratulations indeed.

G3W/DG

Posn	Call sign	Points	QSOs	Points from best period	Km of best dx	QTH
1	G3W/P	2,517	33	1,117	146	ZK
2	G3YGF/P	2,517	28	1,036	185	ZL, YL
3	G3ZME/P	2,173	24	816	160	YM
4	G3NKL/P	2,154	20	1,034	179	YN
5	G3JHM/P	1,835	24	820	164	YK, ZK, ZJ
6	F6DLA/P	1,665	15	931	155	AJ
7	G4HUP/P	1,587	20	672	233	YM, YN
8	G8AXE/P	1,571	18	703	125	YN
9	G8ANZ/P	1,378	23	499	91	YL
10	G3RZD/P	1,150	21	503	155	ZK
11	G8GKV/P	1,086	20	503	155	ZK
12	G8DPB/P	1,081	18	401	102	AK
13	F3LP/P	984	12	728	155	AJ
14	G3YJH/P	808	14	324	103	YM
15	G4CNV/P	742	7	411	121	YK
16	G6XM/P	736	11	313	119	ZL, ZM
17	G2DSP/P	653	15	240	103	ZK
18	G4ETU/P	635	17	240	71	ZK
19	G3WDG/P	355	5	355	85	ZL
20	G8ADC/P	18	1	18	18	ZL
21	F6BFE/P	11	1	11	11	AJ
	F6AJJ/P	11	1	11	11	AJ

Check logs from G3LQC/P (11 QSOs, best dx 119km), and GW3PPF/P (21 QSOs, best dx 142km) are gratefully acknowledged.

RSGB DF Contests National Final results

The 1979 National Final, held on 16 September, was organized by D. E. Newman on behalf of the Rugby Amateur Transmitting Society (RATS). The start was a car park in Salcey Forest, where the 17 qualifying teams assembled.

Station "A", ably operated by Graham Taylor, was hidden in Salcey Forest about half a mile from the start, with the antenna passing less than 100yd from the start. By using the driver stage only, a very weak signal was heard by the competitors. Station "B" was about five miles south of the start, manned and operated by Barry Palmer and Bill Mays, with the transmitter hidden in a blackberry bush in some old sandpit workings. The Great Ouse river and a system of lakes made approach to and location of the transmitter even more difficult. Station "C" was about 13 miles west of the start, with George Whenham and Phil Arnold hidden deep in a thicket in Knightley Wood, well over half a mile from the road—however, one team managed to drive in.

Competitors were kept busy most of the afternoon, and the winner, Eric Mollart, arrived at his third transmitter, after swimming a lake, with only 20min to spare.

An excellent tea was served at the Church Hall, Yardley Gobion, by Mrs Sue Lineham and her band of helpers, and the trophy and prizes were presented.

Thanks are due to the many helpers, and to the Forestry Commission (Salcey Forest), Mr Adams (Knightley Wood) and the foreman of Linford Works Sandpits for permission to use the sites.

Posn	Name	Club	Time of arrival		
			TX "A"	TX "B"	TX "C"
1	E. Mollart	Mid-Thames	1541	1609	1439
2	M. Hawkins	Chelmsford	1534	1431	1619
3	R. Vickers	Slade	1531	1447	1619
4	W. North	Mid-Thames	1535	1452	1623
5	P. Lisle	Mid-Thames	1625	1559	1438
6	R. Parsons	Burton	1529	1452	1629
7	A. Butcher	Chelmsford	1535	1452	—
8	C. Plummer	Mid-Thames	1535	1511	—
9	B. Bristow	Mid-Thames	1537	1454	—
10	P. Tyler	Mid-Thames	1540	1455	—
11	M. Easterbrook	Dartford Heath	—	1547	1455
12	A. Simmons	Mid-Thames	—	1615	1451
13	I. Butson	Chelmsford	—	1624	1457
14	C. Wells	Mid-Thames	—	1455	1624
15	P. Woollett	Dartford Heath	—	1627	1440
16	T. Gage	Mid-Thames	—	1455	—
17	C. Merry	Dartford Heath	—	1512	—

70MHz CW Contest rules

1000-1500gmt 20 January 1980

The following general rules, published in the January 1979 issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6b, 7a, 8, 9a, 10a, 11-22.

All entries and check logs to: VHF Contests Committee, c/o Mr J. Quarby, G3XDY, 16 Peacraft Road, Ipswich, Suffolk IP1 6PJ.

Affiliated Societies Team Contest 1980 rules

The only change to the rules for this event affects rule 5(c).

1. The general rules for RSGB hf contests, published in the January 1979 issue of *Radio Communication*, will apply.

2. When. 1300 to 1700gmt, Sunday 13 January 1980.

3. The Affiliated Societies Team Contest is a competition between teams of stations, each team or teams representing an RSGB affiliated society. Each such society is encouraged to enter as many stations and teams as it can.

4. (a) A society entering one team will have its placing determined by the aggregate scores of the five highest scoring stations in its team.

(b) A society may enter more than one team. The aggregate scores of the five highest scoring stations will be placed in team "A", the next five highest scoring stations placed in team "B", etc.

5. (a) Eligible entrants. Each operator must be a member of the society he represents, but need not be a member of the RSGB.

(b) Each station may be single- or multi-operator, but no operator may use more than one call sign during the contest period.

(c) All stations representing a society must be operated within 50 miles of the normal society meeting place.

(d) No station may represent more than one society.

(e) In the case of a society with national coverage, eg RNARS, each team may define a different society meeting place, but this should be a place of recognizable significance, eg a naval base. For all purposes, other than the indication of affiliation, each such team entry will be considered to be entirely separate.

6. Contacts. CW (A1), only in the band 3,510 to 3,590kHz.

7. Exchanges. RST, serial number commencing with 001, and "AFS". Stations active during the contest, but not submitting an entry, are requested not to send "AFS".

8. Scoring. Five points for each contact; plus five points for each "AFS" received, subject to confirmation by corresponding log entry.

9. Logs. Column 5 to be headed "AFS received".

10. Entries

(a) Each individual entry shall conform to the general rules. All such entries from one society are to be sent in one package to RSGB HF Contests Committee, c/o R. S. Unsworth, 105 Clarendon Road, Hazel Grove, Stockport, Cheshire SK7 4NS. Packages underpaid and bearing postage-due stamps will be returned to the sender.

(b) Each package must include a declaration signed by an officer of the society that each entrant is a member of that society.

(c) There should also be included a note stating the number of teams representing the society. If the package does not contain this information it will be presumed that the society wishes to enter only one team.

(d) Packages must be postmarked not later than 28 January 1980.

11. (a) An individual entry will be invalid if more than 20 per cent of the points claimed are for contacts with members of the entrant's own team.

(b) If it is clear that an entrant has deliberately failed to send "AFS" to certain stations, then the entry will be disqualified and the points claimed by his team for contacts with that entrant will be disallowed.

12. Awards

- The Edgware Trophy will be awarded to the leading affiliated society.
- A certificate of merit will be awarded to the station having the highest individual score.

The Commonwealth Contest 1980 rules

TRANSMITTING SECTION

- The general rules for RSGB hf contests, to be published in the January 1980 issue of *Radio Communication*, will apply.
 - When.** From 1200gmt on Saturday 8 March 1980 to 1200gmt on Sunday 9 March 1980.
 - Eligible entrants.** Members of the RSGB resident in the UK and radio amateurs licensed to operate within the British Commonwealth or British Mandated Territories.
 - Contacts.** CW (A1) only, in the 3.5, 7, 14, 21 and 28MHz bands. Contacts may be made with any station using a British Commonwealth callsign, except those within the entrant's own call area. UK stations may not work each other for points. In accordance with IARU recommendations contestants are requested to confine their operations to within the lower 30kHz of each band.
 - Scoring.** Each completed contact will score five points. In addition, a bonus of 20 points may be claimed for the first, second and third contacts with each Commonwealth call area (as listed in the accompanying table) on each band. All British Isles stations (G, GB, GD, GI, GJ, GM, GU and GW) count as one call area.
 - Logs.** Separate logs are required for each band. Each band log should be separately totalled and should include, at the end, a check list of call areas worked on the band. Logs must include gmt, callsign of station worked, RST/serial number sent, RST/serial number received and points claimed. Separate band totals should be added together and the total claimed score entered on the cover sheet.
 - Entries.** Entries may be single- or multi-band. Single-band entries should show contacts on one band only; details of contacts made on other bands should be enclosed separately for checking purposes. Multi-band entries will not be eligible for single-band awards.
- Each entry will consist of the separate band logs together with a signed declaration that the rules and spirit of the contest were observed.
- Entries should be addressed to D. J. Andrews, G3MXJ, 18 Downsview Crescent, Uckfield, East Sussex TN22 1UB, England. Adjudication of this contest will commence on Monday 12 May 1980. Any entry received after this date may be excluded from the contest. Overseas stations are therefore advised to forward their logs by airmail.
- Awards.** To the winner, the BERU Senior Rose Bowl; to the runner-up, the BERU Junior Rose Bowl; and to the leading UK station, the Col Thomas Rose Bowl. Certificates of merit will be awarded to: (a) first, second and third placings in home and overseas multi-band sections; (b) the leading home and overseas single-band entries on each band; and (c) the leading station in each overseas call area.

RECEIVING SECTION

- When.** Times and dates as for the transmitting section.
- Eligible entrants.** Members of the RSGB resident in the UK, and all swls resident in the British Commonwealth or British Mandated Territories. Only the entrant may operate his receiving station for the duration of the contest. Holders of transmitting licences are not eligible to take part.
- Scoring.** To count for points a station outside the entrant's own call area must be heard in a contest contact. CQ or test calls will not count for points. A station may be logged only once on each band for the purpose of scoring. Where both stations in a contact are heard they should be logged separately, and points may be claimed for both entries, provided that the stations are outside the entrant's own call area.
- Each complete log entry will score five points. In addition, a bonus of 20 points may be claimed for the first, second and third stations heard in each Commonwealth call area on each band. All British Isles prefixes count as one call area.**
- Logs.** A separate log is required for each band. Logs should show the date/time gmt, callsign of station heard, RST/serial number sent by station heard, callsign of station being worked and points claimed. A check list showing the call areas claimed on each band must be included.
- Entries.** Each entry will consist of the log sheets, check list and a signed declaration that the receiving station was operated in accordance with the rules and spirit of the contest and that the entrant does not hold an amateur transmitting licence. Entries should be addressed and sent as in rule 7 of the transmitting section.
- Awards.** The BERU Receiving Rose Bowl to the winner. Certificates of merit to the leading entrant in each continent.

COMMONWEALTH CALL AREAS

The following call areas are recognized for the purpose of scoring in the 1980 Commonwealth Contest:

A2	Botswana	VR6	
A3	Tonga Is	V55	
A5	Bhutan	V56	
C2	Nauru	VX9	Sable Is
C5	Gambia	VY1	Yukon
C6	Bahamas	VY0	St Paul Is
G/GB/GD/GI/GJ/GM/GU/GW		VU	India
H4	Solomon Is	VU	Laccadive Is
J3	Grenada	VU	Andaman & Nicobar Is
J6	St Lucia	YJ	
J7	Dominica	ZB2	
P2	Papua New Guinea	ZC4/584	
S2	Bangladesh	ZD7	
S7	Seychelles	ZD8	
T2	Tuvalu	ZD9	
T3	Kiribati	ZE	
VE1		ZF	
VE2		ZK1	Cook Is
VE3		ZK1	Manihiki
VE4		ZK2	Nuie
VE5		ZL1	
VE6		ZL2	
VE7		ZL3	
VE8		ZL4	
VK1		ZL	Auckland & Campbell Is
VK2		ZL	Kermadec Is
VK2	Lord Howe Is	ZL	
VK3		ZM7	
VK4		3B6/3B7	Agalega & St Brandon
VK4	Willis Is	3B8	Mauritius
VK5		3B9	Rodriguez Is
VK6		3D2	Fiji
VK7		3D6	Swaziland
VK8		4S7	
VK9	Christmas Is	5H3	
VK9	Cocos Is	5N2	
VK9	Norfolk Is	5V	Samoa
VK0	Heard Is	5X5	
VK0	Macquarie Is	5Z4	
VK0/VP8*	Antarctic	6Y5	
VO		7P8	
VP1		7Q7	
VP2A	Antigua, Barbuda	8P	
VP2E	Anguilla	8R	
VP2K	St Kitts, Nevis	9G1	
VP2M	Montserrat	9H	Maltese Is
VP2S	St Vincent	9J2	
VP2V	British Virgin Is	9L1	
VP5	Turks & Caicos	9M2	W Malaysia
VP8	Falkland Is	9M6/9M8	E Malaysia
VP8	S Georgia	9V1	
VP8	S Orkney Is	9Y4	
VP8	S Sandwich Is		
VP8	S Shetland Is		
VP9			
VO9	Chagos		
VR1	British Phoenix Is		

* All calls operated from Commonwealth controlled areas of the Antarctic (VK0, VP8, ZL5 etc) count as one call area.

RSGB Cumulative Activity Periods 1980 rules

The HF Contests Committee has been aware for some years of the difficulty that clubs have in mustering sufficient operators for events such as NFD and AFS. In an attempt to resolve this problem a series of "training sessions" has been organized on an experimental basis. It should be noted that these periods are intended to provide an opportunity to practice cw contest exchange techniques and should not be considered as a contest in the full sense of the word. Accordingly there will be no awards or certificates and the logs will only be subjected to a cursory examination. The committee is particularly anxious that comments and suggestions be included with logs, and these will be taken into consideration when deciding whether or not to hold future events of this kind.

Rules

- Aim.** To provide training and practice for potential contest operators.
- Eligible entrants.** Members of the RSGB or members of any RSGB affiliated society.
- Periods.**
 - 1.8MHz 2000-2200gmt Monday 7, Tuesday 15, Wednesday 23, and Thursday 31 January 1980.
 - 3.5MHz 1000-1200gmt Sunday 6, Saturday 12, Sunday 20, and Saturday 26 January 1980.
- Sections.** CW (A1), single-operator only.
 - 1.8MHz.
 - 3.5MHz.
- Frequencies.** 1.8MHz: 1,810-1,860kHz. 3.5MHz: 3,540-3,590kHz.

6. **Contest call and exchange.** CQ TEST. Exchange RST and serial number, starting at 001 for each period.
 7. **Scoring.** One point per contact.
 8. **Special conditions.** Entrants may operate in as many of the above periods as desired, and a station may be worked once in each period. The scores from any two periods on an individual band are added to give a band score. An entry may be made for each band. Individual scores will be tabulated by band. In addition there will be an overall club tabulation, and logs to be included in a club score should clearly indicate the name of the club on the cover sheet. Logs should include all contacts made during the activity periods, even if they are not included in the overall score. A log may contain all periods operated on a particular band but there should be separate logs for each band. Entries must be sent, postmarked not later than Monday 19 February 1980, to: R. L. Glaisher, G6LX, 279 Addiscombe Road, Croydon, Surrey.

BARTG Spring RTTY Contest rules 1980

When. 0200gmt Saturday 22 March until 0200gmt Monday 24 March 1980. The total contest period is 48 hours, but not more than 30 hours of operation is permitted. Time spent listening counts as operating time. The 18-hour non-operating period can be taken at any time during the contest, but off periods may not be less than three hours at a time. Times on the air must be summarized on the summary sheet.

Who. There will be separate categories for single-operators, multi-operator stations and short wave listeners.

Bands. 3-5, 7, 14, 21 and 28MHz amateur bands.

Stations. Stations may not be contacted more than once on any one band, but additional contacts may be made with the same station if a different band is used. Countries. The ARRL Countries List will be used and, in addition, each W/K, VE/VO and VK call area will be counted as a separate country. (Note: W/K, VE/VO and VK count once only for QCA purposes.)

Messages. Messages exchanged will consist of:

- Time gmt. This must consist of a full four figure group, and the use of the expressions "same" or "same as yours" will not be acceptable.
- RST and message number. The message number must consist of a three-figure group, starting with 001 for the first contact made.

Points. Points can be claimed as follows:

- All two-way rty contacts with stations within one's own country will earn two points.
- All two-way rty contacts with stations outside one's own country will earn 10 points.
- All stations will receive a bonus of 200 points for each country worked, including their own. (Note: Any one country may be counted again if worked on a different band, but continents are counted once only.)

Note: Proof of contact will be required in cases where the station worked does not appear in any other contest log received, or if the station worked does not submit a check log.

Scoring. (a) Two-way contact points, times total of countries worked.

(b) Total country points, times 200, times number of continents worked.

(c) Add (a) and (b) together to obtain the final score.

Sample score.

Exchange points (302) x countries (10) = 3,020
 Country points (10) x 200 x continents (3) = 6,000
 (a) and (b) added together to give a score of 9,020 points

Logs and score sheets. Use a separate sheet for each band and indicate all times on the air. Logs to contain: date; time gmt; call sign of station worked; RST and message number sent; time, RST and number received; and points claimed.

Note: Logs from short wave listeners must contain both the full report sent and received by the station logged. Incomplete loggings are not eligible for scoring. The summary sheet should show the full scoring, the times on the air and, in the case of multi-operator stations, the names and call signs of all operators involved with the operation of the station.

Log and summary sheets are available from the contest manager as follows: in the United Kingdom, on receipt of a large stamped addressed envelope; all other countries require two ircs to cover the cost of postage.

All logs must be received by 31 May 1980 in order to qualify. Send contest or check logs to: Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex, England EN1 4DX.

The judge's decision will be final, and no correspondence can be entered into in respect of incorrect or late entries. All logs will remain the property of the British Amateur Radio Teleprinter Group.

Certificates will be awarded to the leading stations in each of the three classes, and the top station in each continent and each W/K, VE/VO and VK call area.

Additional notes. If a contestant manages to contact 25 or more different countries on two-way rty during the contest, a claim may be made for the Quarter Century Award (QCA) issued by BARTG, and for which a charge of US\$3 or 15 ircs is made. Make your claim at the same time as you send in your log. Holders of existing QCA awards will automatically have any new countries added to their records. However, in view of the high volume of work which the contest manager will have to deal with, it will not be possible to prepare and send out new awards, or up-date existing awards, until the final results of the contest have been evaluated and despatched.

Similarly, if any contestant manages to contact stations on two-way rty within each of the six continents, and the BARTG contest manager has received a contest or check log from each of the six operators concerned, a claim may be made for the WAC Award issued by the RTTY Journal. The necessary information will be sent on to the journal which will issue the WAC Award free of charge.

Contests calendar

October 1979– January 1980	432MHz Cumulative (Rules in September issue)
November 1979– January 1980	1,296MHz Cumulative (Rules in September issue)
1–2 December	TOPS CW Club (Rules in November issue)
2 December	144MHz Fixed (Rules in November issue)
8 December	Verulam ARC Transmitting and Receiving 1-8MHz (Rules in November issue)
8–9 December	ARRL 10m (Rules in December issue)
1980	
6, 12, 20, 26 January	3-5MHz Cumulative (Rules in December 1979 issue)
7, 15, 23, 31 January	1-8MHz Cumulative (Rules in December 1979 issue)
13 January	AFS (Rules in December 1979 issue)
20 January	70MHz CW (Rules in December 1979 issue)
2–3 February	7MHz Phone (Rules in June and July 1979 issues)
3 February	432MHz Fixed
9–10 February	First 1-8MHz
10–16 February	BATC Activity Week and Television (Rules in December 1979 issue)
23–24 February	7MHz CW (Rules in June and July 1979 issues)
1–2 March	144/432MHz and SWL
8–9 March	Commonwealth (Rules in December 1979 issue)
22–24 March	BARTG Spring RTTY (Rules in December 1979 issue)
12 April	1,296MHz Trophy
13 April	Low Power
13 April	432MHz Trophy and SWL
3–4 May	144/432/1,296MHz and SWL
4 May	Regional Round-up CW
18 May	Regional Round-up Phone
1 June	70MHz and SWL
7–8 June	NFD
28–29 June	Summer 1-8MHz
5–6 July	VHF NFD
20 July	3-5MHz Field Day
3 August	144MHz QRP and SWL
11–12 August	Meteor Scatter
17 August	70MHz Trophy and SWL
6–7 September	SSB Field Day
6–7 September	144MHz Trophy and SWL
4–5 October	432/1,296/2,304MHz and SWL
12 October	21/28MHz
19 October	21MHz CW
19 October	70MHz Fixed
November– December	432/1,296MHz Cumulative
2 November	144MHz CW
8–9 November	Second 1-8MHz
7 December	144MHz Fixed

BATC Activity Week and Television Contest 1980 rules

2000–2230gmt daily 10–16 February 1980

Scoring. 2 points per kilometre on 432MHz

8 points per kilometre on 1-3GHz

16 points per kilometre on 10GHz

(One way contacts count for half the above points.)

Exchanges

1. A code group of four non-consecutive numbers chosen by each entrant. The code group must be different on each day and must be exchanged on video only.

2. Call sign, QTH locator, report (as BATC chart), and serial number (starting at 001 for each day), to be exchanged in video or sound if necessary.

Eligible stations. Single- or multi-operator, fixed, /A or /P. Note: the same location must be used for the whole contest.

Logs. To include all information exchanged, plus own QRA, station details, points claimed, full address of entrant.

Awards. A certificate will be awarded to the station with the highest score, and a special prize will be given to the most northerly entrant.

Contacts. Contacts may be made with the same station on the same band only once per session. The best four sessions will be counted for points but, if you are active for more, please enclose all logs for checking purposes.

Entries. To be sent to: G. P. Shirville, G3VZV, 18 Church End, Milton Bryan, Milton Keynes, Bucks; postmarked not later than 3 March 1980.

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of the RSGB. They must be submitted on the Members' Ads order form printed in alternate issues of *Radio Communication*, or on a postcard similarly laid out. Each must be accompanied by a recent *Radio Communication* mailing label addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 75p (stamps not accepted) for every 40 words or part thereof. They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

NOTE. Next closing date is 20 December, not 27 December as previously advertised.

Closing dates in 1980: 25 January, 29 February, 28 March, 25 April, 23 May, 20 June, 18 July, 29 August, 26 September, 24 October, 21 November, 19 December.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale. Advertisements may be edited or abbreviated as necessary.

Advertisements for 27MHz equipment will not be accepted.

Post to: **MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS.**

Do not post to RSGB HQ or Advertising Representative

FOR SALE

Icom 245E, mobile, 2m, multimode, £325. MMT 432/144R, £155. FT620B, plus MMT 144/50, £255. G8AFJ, QTHR. Tel Heysham 51734, home; or 65201 ext 4478, work.

FDK Multi 2700 Mk2, all modes, plus Oscar, mint cond, accessories, incl Lunar preamp, Stolle antenna rotator, 10-el XY Jaybeam with phase loop, all in good cond, £500 ono. WHY? G4CZC, QTHR. Tel Midway 401825, after 6.30pm.

2m fm rx, SR9, fitted S20, S22, R3-6, vfo, used little, £50. 2m a.m./ssb xtal controlled rx, 62H, £7.50. Various surplus items: valve testers; rack; AW43-89 crt, new; 8-level punch; uhf rx; etc. Tel Abingdon 20005.

Heathkit HW100 ssb cw tx/rx, good cond, hb psu, £125. Pair new 6146Bs, £10. *Wanted:* Yaesu FT7. Atkinson, 17 York Crescent, Alnwick, Northumberland.

Liner 2, preamp, £99. FT202R, carrying case, nicads, remote spkr/mic, channels S20-22, R0, R4, R7, £99. G3AWK, QTHR. Tel 0522 53136. **QTH:** detached house, exc location (one of the best in Middx), green belt, 500ft asl, antenna, planning permission, gas central heating, double garage, etc, £60,500. G2HCV, QTHR. Tel 01-954 2960.

Philips ship's comm rx, 8RO 501, 225kHz-31.2MHz, six bands, motorized and manual tuning, xtal filter, etc, t/r switch, S-meter, £85. BC1147A comm rx, 1.5-30MHz, £50. Buyer collects. S-meters, ex-equipment, forward reading, built-in light, £4 ea. Barnes. Tel Ulverston 54466.

Trio TS820, digital, cw filter, dc power pack, remote vfo, all vgc, £800. Advance sig gen, type D1, 9-320MHz, £35. G4FQI, QTHR. Tel Melbourne (Derbys) 3275.

FRDX400, FLDX400, totally unused, 1kW atu, Osker SWR200, Atlas 210X, Atlas antenna transformer, Carr extra or can deliver reasonable distance. G3NZT, QTHR (Cumbria). Tel 044 83 550.

IC21A, 10W variable, fm tx/rx, 12/240V, S0, S14, S20-22, R3, R7, toneburst, rit, centre zero, S/r/swr meter, orig manual, packing, as new, £145. G8MSK, QTHR. Tel Norwich (0603) 409730.

FT101E, as new, £500 ono. CR100, recent maint, £20 ono. AR88 wavechange switch; Cossor 349 'scope, new spare double-beam tube; offers? Property late Sqn Ldr J. Davies, Taunton ARC. G3XZW, QTHR. Tel 0884 40283.

Icom IC215, portable, immac, comp C-size nicads (nine), manual, fitted S0, R1-9, S20-24, S32, £145 ono. Spare nicads, £15. (All nicads few cycles only.) G8JFZ, QTHR. Tel 03552 30860, after 7pm.

FRG7 all-purpose comm rx, as new, manual, orig packing, £145. G4DF, QTHR. Tel Kenilworth (0926) 52546, evenings or weekends please.

FTDX401B, all band, 560W p.e.p., mint cond, £360. FRG7070, new, boxed, two Microwave Modules, £295. *Wanted:* FT101ZD, FT101E, FT7, Heath linear, hf beam, tower. G4IQT, Thanecourt, Barton, Bedford. Tel Luton 881323.

KW2000E, psu, serviced by Decca October, new 6146Bs, etc, boxed, handbook, £285. G3CDC, QTHR. Tel Woodborough (Notts) 3361, after 6pm.

FDK Multi U11 70cm fm tx/rx, 9ch fitted, auto toneburst, mint cond, £210 ono. Mr Le Masurier, G8NRZ. Tel Walton-on-Thames 44356/7/8, 9am-5pm only.

Eddystone EC10 Mk1, 500kHz, 30MHz, mint cond, orig carton, £70. Hodgson, 7 Wykewane, Malvern, Worcs. Tel 64520.

Atlas 210X, mint cond, little used, price incl mobile mount, mic, delivery, £400 ono. G3SVH, QTHR. Tel 0922 414524.

HRO-MX, manual, spare valves, 11 coil packs, 50kHz-30MHz, Bs 10M, £40 ono; Decca 19in video monitor, looped video audio possible, circuit supplied, £15 ono; both in good wkg cond. Buyer collects. G8PFL, QTHR. Tel Stourbridge 3640.

Hewlett Packard 608F laboratory standard a.m. sig gen, 10-455MHz, re-calibrated, service manual, perf wkg order, exc cond, a precision instrument, bargain, for quick sale, £375. G3RDC, QTHR. Tel Rugby (0788) 823250.

Trio 7010, 2m, ssb, h/b psu, 5/8 mag mount whip, £125. G4BWU, QTHR. Tel Stevenage 54261.

Multi U11, unused, full guarantee, £240. KP202, 1-45, S20-24, R7, spare battery tray, toneburst, £85. G-whips: 80, 160, £10; multi-mobile 20-15-10, with base, £21; extender, £9. Tel 0254 75037.

IC215, switched toneburst, S0, S20, S22, S32, R3-7, rev R6 rx, helical, mobile mount, orig packing, £140 ono. PFI tx and rx, SUB, nicads, leather cases, orig service manual, rx car adapter with spkr, £35. G8FRL, NOT QTHR. Tel Cambridge (0223) 64565.

Burndep BE201, mint cond, ext psu, ok 2m, £25 ono. USAF hf data rx, tunes 2-32MHz, needs modifying, £20 ono. Pye Vanguard AM25BV, ok spares, £5 ono. Canham, 82 Rugby Road, Binley Woods, Nr Coventry. Tel Dave, Wolston 543409, after 6pm weekdays.

Plemi 91-el wideband tv antenna (channels 21-68), approx 19.5dB gain, used for one week only, now boxed, cost £42 new, bargain, £30. Tel Longworth (Oxford area) 820166.

QM70 Scorpion transverter, manual, £60. Trio 9R59DS all bands rx, manual, £50. 2m converter, int psu, 28/144, £20. Avo electronic test meter Mk4, manual, £30. Avo electronic multimeter, 95 range, A bridge, manual, £50. All ono. G8LGR, QTHR. Tel Swindon 826364.

FPM 300 Hallicrafter tx/rx, ac/dc, solid-state front-end, ssb, cw, 10, 80m, mic, swr meter, manual, spare pa, driver, £350. R Scarlett, G4HZF. Tel Grimsby 54325, office hours.

Lafayette HA-600A rx, 0.15-30MHz, gen cov, ham bands, bandspread, 110/220V ac, 12V dc, £55. Sheppard, Little-Heath, Shepherds Way, Fairlight. Tel Pett 2526.

Icom IC280E, mint cond, orig packing, manual, mobile mount, etc, £245. ASP 5/8 144MHz whip, £10; magnetic mount, cable, £8; both mint cond. GW3YTL, QTHR. Tel Knighton (Powys) 528030, 6-8pm.

FDK Multi 11, as new, orig box, simplex channels S16-23, repeaters R3-7, plus S0, autoscanner, toneburst, £160. Buyer collects. Howells, G8OBJ, 16 Rayleigh Road, Stanford-le-Hope, Essex. Tel Stanford-le-Hope 70231.

Trio 220GX, 8ch fitted, rubber helical, nicads, mobile mounting bracket, incl usual accessories, all in good cond, £128 ono. Storno Viscount, single channel, control box, comp with details, £12 ono. Excl carr. G8BLTN. Tel 035 52 21071 (E Kilbride).

TR2200G, VB2200 power amp, R5-7, S0, S20, S22, fitted, auto toneburst, nicads, charger, £125 ono. Pye U10B uhf Cambridge, will tune 70cm, £40 ono. G8BDM, QTHR. Tel Bath 834127.

Cheltenham Puku two-berth caravan, 1975 model, as new, never been used, heater, fridge, flushing toilet, shower space, £1,600 ono; worth double this price. J. Densum, Cotswold, Startley, Chippenham, Wilts. Tel Seagry 720456.

HW112A, HP23, Heathkit, 80m, ssb, tx/rx, matching mic, spkr, recently fitted new pa valves, £90 ono. G3RSD, QTHR (Cleethorpes). Tel 0472 814662.

12/24V dc inverter, type L473, outputs pos, 600, 250, 195 (stab), 170, 90 (stab), bias 30, 90, neg stab, case, h/b only, c/w controls, cables, spkr, suitable KW2000 etc, presently powers SR150 Hallicrafter, prefer demonstrate, well-made job, £25. G2BPC, QTHR.

FT101B, exc cond, low noise transistor front-end, spare pa valves, ac/dc leads, handbook, buyer collects. G2FSA, QTHR. Tel Ashted 74733.

KW204 tx, KW202 rx, joined together by cable behind units, making comp tx/rx, incl int psu, almost as new, tuning dials 1-500, Shure 444 mic, £450. Buyer please collect. G3PPH, QTHR. Tel 051-525 2162.

HRO handbook, covers M-MX-5T, £5. Home bandspread HRO coils for 80/20/15/10m, £5 ea. G3JFC, QTHR. Tel Crayford 522489.

Solartron CD711S dual-beam measuring 'scope, xtal cal, timebase, 7MHz Y amp bandwidth, poor triggering, £25. G3TCU, QTHR. Tel Guildford (0483) 65607.

Eddystone 770R, 19-165MHz, £95. EC10 Mk1, 0-55-30MHz, mint, mains supply, £65. *Wanted*: 19in rx cabinet, particularly blue cabinet from Bamber. G3VXZ, QTHR. Tel Maidenhead 27350.

QM70 2m power amplifier, 40W, fm or ssb, preamp, instruction sheet, circuit, £15. G4BRF, QTHR.

Electrolytics TCC/Plessey, of recent manufacture, 400uF 325V wkg; pack of 10 to make 3,000V supply, use two rows for best regulation on ssb, £3.50. G3FJN, QTHR.

Yaesu FT2FB mobile tx/rx, 12ch, nice cond, handbook, boxed, £90. G3WEX, QTHR. Tel 021-354 4265.

40ft sectional lattice mast, top mounting for rotator/bearing, light enough to be carried on roof rack, strong enough for hf beam, £50. G3WUW, 9 Boldrewood, Burghfield Common, Reading. Tel 073529 3694.

Stereo CQF13C 10W 2m valve tx/rx, xtalld R6, S20, S22-23, R6 receive, Superbleep toneburst, manual, good wkg order, £40, no offers. Buyer collects. G4GHU, QTHR. Tel Harlow (0279) 415454.

IC202S, mint, only five months old, £170. Modular Electronics 25W linear, £30. G8MGA, Tel Weston-super-Mare 512698.

FR50B rx, FL50B tx, 10m xtal; both in good cond, no mods, the pair, £150; or will split. Tel Weybridge 47112.

HRO rx, not wkg but fb for spares, £13-50 ono. Mains transformer windings, 250-0-250V at 100mA, 6-3 at 4A, 5V, 6-3 at 3A, £5. Telephone, good wkg order, £2. *Wanted*: Handbook for R107, valves for spares for this rx and RA1; HRO60 rx, coils and psu not required, ARS40935. Tel Woburn 545.

Atlas 215X, c/w mobile mount, mic, professional a.m. mod, exc cond, cost £585 new, accept £400. Weston G3RGJ, 2 Charmouth Grove, Parkstone, Dorset BH14 0LP. Tel 0202 740147.

Drake R4C rx, 160m xtal, 1.5MHz bandwidth xtal, matching spkr, MN4C, atu, incl 250W rf power meter, swr meter, mint cond, £575 ono. M. T. Lewis, 73 Lomond Road, Spring Bank, West Hull, North Humber-side.

FR101, digital, deluxe, all modes, incl bc, 2 and 4m converters, matching spkr, £400. Tel 01-669 1992.

FT101E, good cond, comp with mic, power leads, etc, SP101 spkr, £450. FT220 2m tx/rx, realigned, preamp, leads, etc, £250. 12AVQ trap valve, £30. Will haggle over prices. G4DPZ (Danbury, Essex). Tel Dave, 0245 41 3508, evenings only.

Trio 9R59DS rx, spare valves, mods, nice cond, £50. Joystick system A antenna, comp with all accessories, never erected, £40. D. Fielden, G8TLS, 14 Pandle Fields, Fence, Burnley BB12 9HN. Tel 061-228 6282, work.

Multi 11 2m tx/rx, 10W auto, mint, six simplex, five rep, R3R, mounting kit, boxed, £140. G3MBW, QTHR. Tel Leeds 74794, evenings.

Trio 7010 ssb/cw rig, exc cond, orig packing, comp, £135 ono. G8ORS, QTHR. Tel Blackpool 592211.

Unused Sender 12 mains transformer (ZA3157), £15. Buyer collects. Various panel ammeters and voltmeters: M1, 50p ea; MC, £1 ea; desk type, £2 ea; portable type, £5 ea; see list. G2CWY, QTHR. Tel 01-445 2508.

Will exch: hardly used FR50B hf rx, spare valves; for any 2m or 70cm rx in mint cond, autoscans preferred. D. Austin, 13 Ridgehill Grove, Hollinsend, Sheffield S12 2GJ.

Europa B 28MHz/144MHz transverter, two sets valves, new cond, £75 ono; or swop, cash adjustment. *Wanted*: MM 432MHz transverter; EDL 144MHz linear; Yaesu YO100 monitorscope, Liner 2, G4DYY, QTHR. Tel 021-588 2043.

Racal RA17, good cond, £270. Sorno CQF13C-3B/14, S20, R4, 145-165, £20. Deliver 50 miles. *Wanted*: 80m loading coil for 14AVQ; Yaesu FP200; dc psu for FT200. Tel Farnborough (0252) 48836, evenings and weekends.

FDK Multi Palm 4, 70cm, hand-held, two months old, fitted 6ch, comp with all access, as new, nicads, charger, £140, post paid. G8LGE, QTHR. Tel 0924 825025.

HW32A 20m tx/rx, hb psu, £65. Buyer collects. G3LWL, QTHR. Tel Wincanton 33204.

Dentron GLA1000 linear amp, 1,200W i/p, mint cond, £200. Daiwa CL65 antenna tuner, £35. Tel Hereford (0432) 65092, evenings.

RF clipper FT101 Holdings kit, comp, as received from Holdings, £25. Tonkyn, G3EKM, QTHR. Tel Dobwalls 20224.

FL2100B, four hours use only, due tvi, absolutely as new, sacrifice, £275 ono. *Wanted*: R300; SRX30; gen cov rx. G4FKZ, QTHR. Tel 061-624 2808.

Mizuho SB2M, 2m, ssb, hand portable, £115. Ken KP202, 2m, fm, hand-held, 6ch, S0, S20, S22, R3, R5, 145-8, leather case, helical whip, £95. G8KNC, QTHR. Tel Lewes (07916) 77194, evenings.

2200GX, exc cond, the last 2200GX sold by Lowe Electronics, comp with orig accessories, plus three extra channels, helical, auto toneburst, led channel illumination, magnetic mic clip, £145 ono. GW8PLK, 1 Long Lane, Garston, Liverpool L19.

FT277E (FT101E), £440. SP101, £15. SSM Z match, £27. G4GMS, QTHR. Tel Edenbridge 862014.

FT101E, immac, £470 ono; FT221, as new, £325; both used only one year. Morse tutor, £36. Datong Technical Associates rx band pass filter, £20. Electronic key, EK150, £50; or exch for linear or atu. G4IJS, QTHR. Tel 05257 4343; or 0582 21212 ext 2134, office.

DX100U, £40. Heathkit ceramic mic, £5. G3RB, QTHR. Tel Whitley Bay 535054.

Swan 350, 240V psu, few spares and bits free; KW1000 linear; manuals, the two, £400 ono. Plus carr. Avo 7, needs attn, £10. Step down transformer, £5. Eddystone bug, £3. G3WNN, QTHR. Tel 01-959 4781.

Rotator AR10, £15. FT2F xtals, R5, R7, S20, £2 pr. 10-700MHz HC25U xtals, suitable marker osc, £1.50. SSM 2m tx, homebrew modulator, meter damaged, mic, xtals, £10. PF1 nicads, £5 pr. G3HSC morse records, advanced course, test record, £5. G4CQS, QTHR. Tel Broms-grove (0527) 33111.

Liner 2 2m ssb tx/rx, preamp, £90. G8FCH, QTHR. Tel Evesham 830525.

FT101E/FP101, exc cond, £425. Converter, MMC 144/28LO, £10. GDO Tech 15, £10. G3ZIF, QTHR. Tel 0484 863936.

Shure 201 mic, £11. KW balun, £2. Pair 4X150As, £10. Pair 6146s, £8. Parts for linears and HV psus; various meters. Parker, 133 Station Road, Cropston, Leicester LE7 7HH.

Comp hf strn, incl FT101B, FV101, Datong clipper, 444 mic, pwr/swr meter, KW dummy load, frequency counter, hf rotator (new), valve voltmeter, rf sig gen, small 'scope, vertical hf antenna, ham clock, digital clock, cables, connectors, etc, £800 ono. Buyer inspects and collects. G4GYC, NOT QTHR. Tel Andover (0264) 65011.

High level modulation amplifier (ex-RAF T1131), comp with psu, control units, 6ft 19in rack, incl circuit diagrams, gen, to clear shack, gift at £10. Buyer collects. G5CS, QTHR (Essex). Tel 01-398 1582.

FL200B tx, cw/ssb, 230W p.e.p., vgc, £90. Trio 9R59DS rx, professional mods, mechanical filter (Kokusai 10CK), side-band xtals to give switchable bandwidth, muting relay added, panel resprayed to match tx, £50. G3XRM, QTHR. Tel 0724 845436.

Heathkit IP18, 1-15V dc 500mA regulated psu, £18. TTC C3022 transistor checker, £14. Hangeat xtal calibrator, 1MHz, 100kHz, 10kHz, £14. QRP rf o/p power meter, 0-10W, £7. Doram keyer, £6. G4CQK, QTHR. Tel Walton-on-Thames 27199.

Eddystone EC10 Mk1 rx, batt and mains packs, £70. Trio 9R59 rx, £40. Buyer collects. Hussey, 18 Bredon Grove, Poolbrook, Malvern, Worcs. Tel Malvern 4968.

Pye base strn tx, fully modified for 2m fm, 30W out, £50. Pye Cambridge tx/rx, fully modified for 2m fm, 10W out, S-meter, mic, £60. Collis, 196 Belper Lane, Belper, Derby. Tel 3262.

R1155 rx, wkg order, d/f system removed, needs conventional power pack and possibly new valves, £9.50. Buyer collects or carr extra. G3EJD, QTHR. Tel 0783 367217, evenings please.

Solartron double-beam oscilloscope, CD7115-2, £50; Trio amateur bands rx, ssb, a.m., cw, JR50S, £40; Heath gen cov rx, GR64, £20; all items in good cond, manuals. G4ITS, NOT QTHR. Tel Gloucester 67725, evenings.

HW32A, HP23A, l/s, mic, mobile mount, handbooks, £70. HP13 dc psu, £30. Ex-MOD rf QRO amplifier, pair QY3-125s, 1.5-24MHz, fully metered, no psu, bargain, £30. G3MBN, QTHR. Tel Bath (0225) 810621.

18ATV vertical antenna, 80 through 10m, £50. G3ZDR, QTHR. Tel Gravesend 63284, evenings or weekends.

AR88D rx, £35. TXs for repair/spares: Hallicrafter HT32, £25; Sphinx 160/80/20, £10. *Radio Designer's Handbook*, 1953, £3. Philatelic UVL/SVY lights, £15; or exch 160 atu or Shure 444 mic. Buyer collects or pays carr. G3JWY, QTHR. Tel 0422 73804.

Europa B 2m transverter, CPS10 psu, as new, £95. Uniden 2020 hf tx/rx, exc cond, £450. Trio MC50 mic, £10. Tonna 16-el antenna, new, £25. Tel 0480 53775.

GEC BRT400 rx, long wave to 10m, £60. Yaesu frequency counter, 250MHz, £60. CQS 70cm/28MHz, transverter, £50. Shure 144 desk mic, £15. Vibratrol 2m 12V 80W amplifier, £45. G4CXL, QTHR. Tel Weybridge 43267.

Heathkit RA1 amateur bands rx, Q-multiplier, xtal calibrator, spkr, handbook, £40 ono; CR100 gen cov rx, handbook, £30 ono; both good cond. Call or phone. 6 Wedmore Road, Clevedon, Avon. Tel Bristol 562043.

Drake TR4C, AC4 psu, spare unused set of pa valves, £375. Drake MN7 atu, as new, £95. Leak Delta 30 stereo amplifier, £30. G3XXM, NOT QTHR. Tel Biggleswade 315440, after 6pm.

High power at 15 rf amps meter, good cond, £50; Nikon F2, 1.4/50 lens, exc cond (photometric head), £350 ono; Hammarlund HK-1B keyer; offers? Bekman Berkeley WVVV rx, ex-USAF, needs slight attn, £15. Jackman, 33 Shrubbery Avenue, Worcester. Tel 0905 20040.

Trio 2200GX, fitted S20-21, R7, orig packing, manual, nicads, charger, etc, mobile mount, little used, £125 ono. Marconi HR22 ssb, rx, manual, £20. G4AUL, 10 Wealden Close, Hildenborough, Tonbridge, Kent. Tel Hildenborough (0732) 832681.

TR2200GX, 12ch, nicads, charger, mobile mount, VB2200GX 10W matching amplifier, £150; TV502 2m transverter for TS520, TS520S and TS820, £100; both vgc. G4ICC, G80XB QTHR. Tel 0604 52601.

Trio 7200G, R5-7, S0, S20-24, orig packing, £130. Prefer buyer collects or plus carr. G3XII, QTHR. Tel Leyland 22121.

Webster Bandspanner variable inductor mobile whip antenna, tunes 10 through 80m, c/w chainlink bumper spring mount, 4m UR67 coaxial, £25. Prefer demonstrate. See other advertisement in this issue for companion dc/dc inverter to suit KW2000 etc series. G2BPC, QTHR.

2-el 10m centre loaded Yagi, commercial, cable, £15; Class D Mk2 6V wavemeter, £4; buyers collect. Modular Electronics 70cm converter, i.f. 28/30MHz, £13; QVO640, £3.50; QVO320, £3; QVO26, £2.50; plus postage. Property of late G2DGW, G3FD, QTHR. Tel Southend 554764.

Sommerkamp TS280 fm 75W synthesized 80ch 2m rig, £190. STC 10.7MHz 25kHz 445LQU901B filters, £7. Ultra Valiant; Murphy MR960; £10 ea. Wanted: Pye Cambridge; Motafone; Westminster; Bantam; F30 AM; controller Murphy MR1005. Kates. Tel Caterham 47892.

Jaybeam 8-over-8/70cm, collect, £10. Advance Electronics TCD500 1-500MHz 1/10/100 prescaler, 50mV at 500MHz sens, exc wkg cond, really useful prof unit, £75 ono. SSB gen module, incl XF9 type filter, 9MHz, £10. G8BJFZ, QTHR. Tel East Kilbride (03552) 30680, evenings. QRT: TS120S, never used, 200W p.e.p., £425 ono; TR7400A, 2m, fm, mobile, 144-148, 30W, synthesized, cost £328, £220; Datong morse tutor, £30; Pye 70cm tripler, £5; SEM 432-144 converter, £10; 10m ASP mobile whip, new, £10. Tel West Kingsdown (047485) 2733.

'Scope, large screen, £10. 2m fm rx. Navy key, £2. Handbooks: 38 tx/rx; HRO rx; Hudson 4m tx/rx. Hodges, 26 Weston Avenue, Adlestone, Surrey KT15 1UW. Tel Graham, Weybridge 51918.

HW209, six xtals suitable north of England, 145-0, 144-48, 145-6, 145-5, 145-03, 145-80 (replacements for here (S Wales) cost me £15), offers. GW2FBG, QTHR (Swansea area).

KW2000E, ac psu/lis, mic, h/book, £250. KW1000 linear amp, h/book, £150. Katsumi EK108A electronic keyer, ac, mains, £25. Heathkit Q-mult, £10. Jap bug key, £7.50. Codar PR30 preselector, tatty case, £5. Prefer buyer collect. G4EVG, QTHR (Reading). Tel Kidmore End 3562.

C146A, 2m, fm, hand-held, in orig packing, six months old, S20-23, R7, leather case, nicads, charger, h/book, mint, £115. Wanted: FV101, SP101, FTV250, MMT144/28. G4FYY, NOT QTHR. Tel Crawley 514788.

ETI 2m pa, case, oversized heatsink, SO239s, ammeter, nice one, £20. Four brand-new MOV TT21s, heaters never on, £10. Telequipment/Tektronix S54A single-beam professional solid-state oscilloscope, 10MHz bw, beautiful cond, £100. Buyer collects. G8BJFZ, QTHR. Tel East Kilbride (03552) 30680, evenings.

FT243 xtals, 5.675kHz, 25kHz spacing to 8.650kHz, 120 frequencies, 50p ea. HC6U xtals, 44-8666 (145-3) rx, 8.062-5, R5, 8.065-27, R7, 10.705, 10.660, 10.675, 10.685, 10.695, 10.725, 10.740, 10.790, 45-900, £1 ea. Plus postage. G3LHA, QTHR. Tel Coventry 414333.

FT101, immac cond, fan, 160-10m, a.m. filter, new pas and driver, Yaesu mic, MC1496 first rx mixer, MD108 second rx mixer, 31M b/cast band, manuals, leads, £320 ono. S. Fox, 11A Briary Wood Lane, Welwyn, Herts.

Trio 9R59DS comm rx, hardly used, mint cond, handbook, £55. Buyer collects. J. M. Watson, 3 Sherwood Avenue, Ferndown, Dorset. Tel Ferndown 877099.

IC202, 144-144-6, 145-8-146, nicads, handbook, £130. Modular Electronics 25W linear for IC202, preamp, single unit, professional construction, £30. Philips 12V/5A stab psu for all above; £15. Avo 7, good cond, £18. G4FYY, NOT QTHR. Tel Crawley 514788.

Parts for 2m linear: pair brand-new Eimac 4CX250Bs, vhf bases, chimneys; beautiful Collins 2Kv eht trans, very small; eht rect assay; capacitors; bleeder res; inhoff chassis, part machined; meters incl; £100. Collect. G8BJFZ, QTHR. Tel East Kilbride (03552) 30680, evenings.

Icom IC201 ssb/cw/fm tx/rx, £290. Datong up-converter, UC1, £85. Creed 7B 24V dc teleprinter, £6. Creed 7D 240V ac teleprinter, with cover, £15. TTU, type CV89, plus sc/dc converter, £20. PSU, type SUR19, £5. G8BRG, QTHR. Tel Newark (0636) 892531.

Model control units made by Palitoy, fully insulated, contain Parvalux transformer, full wave rectifier, forward/reverse switch, two fuses, 5ft mains lead, brand-new, boxed, output 6-8V at 1.5A, £3, incl carr. GW8EQJ, QTHR.

TS520S, spkr, £470 ono; DG5 display, £75; VFO520S, £70; cw filter, £20; all new, boxed, never used on air. IC240, xtal toneburst, timer, 5/8 mobile antenna, £150. Ringo Ranger, £10. ASP magnetic mount 5/8 whip, £10. FT101 dc kit, unused, £5. 140c/s fork, Creed 75, £4. All collect or postage extra. G3OPF, Tel Milton Keynes 562379.

2102 random access memory ics, 1k x 1 bit: 500ns low-power, 60p; 650ns, 50p. G8ISI, QTHR. Tel Liphook (0428) 723168.

Trio 2200GX, 8ch, helical, etc, used very little, £120. QM70 Buccaneer 2m transverter, vgc, £45. Pocketphones, SU8, £30. Lincor 2, clean, sensitive, £110. Wanted: Belcom LA106 linear; R300 rx; MMT 432/144. G8NQP, 27 Bulbridge Road, Wilton, Salisbury, Wilts SP2 0LQ.

KW Viceroy Mk3A ssb tx, 180W p.e.p., 80-10, new pa tubes, £80. Codar AT5, £20. Wanted: cheap 2m fm rig, w.h.y.? G4FMO, QTHR. Tel Ashby (05304) 3973.

FT277RA 2m fully synthesized tx/rx, fully modified by dealer, up/down scanner, mic, four memories, rev repeater, 25kHz board, auto toneburst, scans in 25 or 5kHz steps, scan pause and restart on occupied frequency, nicad retains memories, seven months old, still under maker's guarantee, in orig packing, only used on the air for one month, gone sideband, £250 ono. Tel 01-366 5638 (N London).

Liner 2, preamplifier, mic, manual, £90. Crofton video camera, tin Vidicon lens, £110. Pye Vanguard FM25B, S20-21, control box, mic, £35. Advance E series sig gen, up to 100MHz, £30. GD4GNH, QTHR. Tel 0624 82 3415, after 6.30pm.

Communication rx, Heathkit RG1, 0.6-32MHz, vgc, full manual, diagrams, £50. G4GQN, QTHR. Tel 09284 441.

Datong UC1 up-converter, perfect cond, £95. GM8HSY, QTHR. Tel Falkirk 23860.

Trio TR7010 2m ssb mobile tx/rx, £130. G3ZJF, QTHR. Tel Windsor 68364.

Trio JR599 custom special, exc cond, unused extras, £175. IC202S, 144-144-4, 145-8-146, 1-2Ah nicads, homebrew charger, exc cond, £170. 150MHz frequency counter, 5-digit, £40. 40W 2m linear, £20. GM4DOZ, Tel Prestwick 76642.

Liner 2 Mk2 144MHz ssb tx/rx, 10W clean output, one mod 144-10-144-57MHz cover, full details, comp, mic, mobile mount, manual, good cond, works well, ideal starter/mobile rig, £110; 6-el Jaybeam quad, one year old, £10; both £115. G8GZZ, Tel Woking 23506.

FDK Multi 700, 10W/1W, 2m, fm, 9ch fitted, £120 ono. FT227R, £195. Lincor 2, £90. Datong speech processor, £30. Andre Jamet trailer tent, £500. G8GMU, QTHR. Tel 0203 611101, after 6pm.

IC215E, R3-9, S0, S20-22, S24, nicads, charger, helical antenna, case, £135 ono. Buyer collects or plus carr. C. Baker, G8JGK, QTHR. Tel Chelmsford 69034, evenings; or Chelmsford 353221 ext 105, office.

Honda petrol generator, E800E, 220V ac, 12V dc, little used, vgc, £250 ono. G6GL, NOT QTHR. Tel Oxford 776779.

EK108A electronic keyer, 240V, 5V, boxed, instructions, £20 ono. Low pass filter for hf bands, £12 ono. Wanted: Versatower, around 35ft; IC240, or other 2m fm; converter, 9-11MHz out, 2m in. G4ENC, QTHR. Tel Wickersley (0709 84) 3632.

Icom IC245E, RM3 remote control; Seiwa MR2 pocket rx, comp; Lowe FS10 pocket scanning rx, comp; all bf cond, boxed. Phone and haggle. G8MXE, Tel Holworthy (0409) 253550.

FTDX560, mint cond, hardly used, £275 ono. Wanted: Marine vhf comm set. G3PVS, Tel Dummer (0256 75) 357.

TR2200GX, R0, R3-8, S20-22, nicads, charger, etc, orig packing, £120. ME15-2, PA3, boxed, switching for 2200GX, £25. Honda E300E, exc cond, workshop manual, £120. Heathkit RG1 gen cov rx, revaled recently, £25. MMC 432-28 converter, £15. 2m Europa B, mint, £60. TA31Jr trap dipole, £20. DL6HA 2m converter, 28MHz i.f., no xtal, £5. ASP-201, 2m, 1/4, new, £2. 70cm Starphone, hand-held, RB6, spare battery, manual, £30. Prefer buyers collect. G8APH, 17 St Peters Hill, Caversham, Reading. Tel 0734 472551, after 7pm.

FRG7 digital display, Lee Electronics readout, c/w installation instructions, £30, post paid. Michaelson, G3RDG, QTHR. Tel 01-455 8831.

Drake SSR1 rx, £100. QC1246AX filter, usb xtal, £20. Sota EDL432 linear, £30. Parts for 500V dc psu for above linear, £5. 65ft UR67 cable, PL259s, £5. Magnetic Devices 951 antenna relay, £5. G8KAX, QTHR. Tel Chelmsford 67131 ext 226, work.

Collector's item, set of four Igranic concert coils, c1925, in orig cartons, offers. *RSGB Bulletin*, *Radio Communication*, August 1963 to present date, less six lost copies, £21. G8PF, QTHR. Tel 0425 617576. **German** second world war rotary psus, a quantity available that is surplus to museum requirements, airborne and Army types available. Enquiries. Tel Abson 2843, evenings please.

14-el Parabeam, vgc, little used, garden too small, £20. Buyer collects. Bob Treacher, QTH as per *Radio Communication*. Tel 01-319 0426, after 7pm.

KW Viceroy Mk4, KW500 linear, KW 2m transverter, KW 160m transverter, all in 4ft rack, £100. Two vhf sig gens, LG50 Marconi vvm TF428A/1. Write. G6AB, QTHR.

IC245E, the multimode 144-148MHz mobile/base stn, synthesized, dual vfos, digital display, remotely programmable, exc performance and cond, six months old, £360 ono. Going hf. G4FMD, QTHR. Tel Malcolm, Great Dunmow (0371) 3119.

Final offer: Eimac, new, boxed, 4CX250Bs, £20 ea; or two for £32; limit of two per buyer. GM4AGS, QTHR. Tel Dundee 543113.

QR666, 170kHz-30MHz, fm unit, handbook, £100. Liner 2, preamp, handbook, mic, £100. Callers only. 30 Duchess Drive, Bridgnorth, Salop.

2m BCC mobile tx/rx, vfo receive to cover band, a.m., will receive fm, transmit xtals 144-88, 145, 145.5, 12V transistor p/p, xtal mic, handbook, £25. Pair field telephones, battery/magneto operated, cable, 1957, £20. G3MBL, QTHR. Tel 01-445 4321.

TS520, handbook, leads, fb cond, used only for rx, dc psu, £410 ovno. G8SDN, NOT QTHR (Beds). Tel 05257 4128.

Radio amateur/yachtsman's QTH, freehold s/d house, 30ft Ham-tower, TA33 plus 2m rotator, two miles from proposed marina, existing launching site, safe beaches, large lounge/diner, kitchen, hall, downstairs toilet, bathroom with toilet, three bedrooms, double garage with service pit, plenty hard standing for boats, caravan, etc, night store heating, roof and cavity insulation, fitted carpets, curtains, double glazing, cosy shack in nice garden, with sunlounge and earthmat, £35,000. Tel Weymouth 76640, evenings.

Jaybeam antennas: DB/70cm, £15; 5Y/2m, £5; both hardly used, buyer collects. Reay, 129 Brook Hill Road, Ward End, Birmingham B8 3NY. Tel 021-327 3624, evenings or weekends.

TR2200GX, R0-7, S20-23, auto toneburst, helical, nicads, charger, £130. Kenwood 10W pa, £30. ITT Starphone, RB2, 4, 6, 8, 14, toneburst, needs tweaking, £70. All test and collect. G4HMF. Tel Ipswich (0473) 51319.

Low SRX30, six months old, as new, boxed, offers. G3WDN, QTHR. TS12 tx, rx, control unit, ac psu, orig handbook, £25. Buyer collects. G3YTO, QTHR. Tel Fareham 0329 234143.

KW2000, ac and dc psus, new Shure 201 mic, Medco lp filter, spare valves incl three 6146Bs, overhauled by KW 1977, £130. Pye PF1 Pocket-phones, on RB4, £25. G3XQZ, QTHR. Tel Bedford (0234) 781149.

FT227R, scanner, mint, orig packing, 25kHz, 5kHz steps, £218. Uniden 2030, five R, six S fitted, HBW mains psu, 5/8 whip, base, £128. 8-el Jaybeam, £6. 5/8 mobile whip, base, £5. Wanted: Icom IC245E, unmodified, GW4AEC. Tel Llanelli (05542) 53186.

Futaba M series radio control tx/rx, six sets xtals, four waterproof servos, nicads, charger, used once, £120; two model boats; Fairey Swordsman, fitted Merco 29 w/c engine, £35; Graupner Elke, fittings, £25; or the lot, £160. G3GOT, QTHR. Tel Tealing 229.

Labgear LG300, spare 813, £17. Heathkit V7A vtm, £5. Minimitter lpf, £3. B2 tx, four coils, £12. HRO coils, 0-9-2-05MHz and 1-7-4-0MHz, £3 pr. Transformer, 370-0-370, 200mA, £4. G3VW, QTHR. Tel 01-205 1443.

Yaesu FT101E, 350Hz, cw filter, exc cond, SMC service June '79, £425. FV101 vfo, £60. Drake RA4, exc cond, Lowe service October '79, £180. Tel 01-357 3232, office; or Basildon 412435, home.

D43 db scope, c/w h/b, £75. Levell rc osc, £15. Levell ac V/meter, £15. H/B 2 match/swr bridge/lpf/80Ω dummy load, £40. WW 2m fm synthesizer pcbs, part c/t, £12. RTTY ST5 tu pcbs, part c/t, £10. Plywood 27ft telescopic mast, c/w 12ft ally pole extension, £25. Avo 8 Mk3, £40. G3LCS. Tel 0908 313379.

FT225RD, two months old, unwanted gift, £540. HQ180, revalued, professionally aligned, £160; HX50, mint, transformer, £80; or the pair, £220. Test and collect. Europa, B spec, £60. G4HMF. Tel Ipswich (0473) 51319.

Liner 2, matching psu, £100. Trio JR310 rx, calibrator, ssb filter, 28-30MHz cov, £75. G4HZV. Tel Camberley (0276) 63728.

Sorno Viscount, S20-23, preamp, self-contained unit, with low band unit for spares, £35. G4CMU. Tel Burgh Heath 54497.

KW E-Zee match, £25. KW103 power meter, £15. G4BXR. Tel 0908 566266.

TR2200GX, mint, orig packing, 12ch, nicads, charger, case, manual, mains p/p, £135. Toneburst CD40001, unused, £3. Xtals, HC6U: 44-95833, 44-94167, 4,043-750, 4,042-236, 8,055-556, 8,083-333, 8,086-11MHz, 10,000-0kHz, 2,182-0, 2,185-0, 2,527-0, 2,586-0, 2,104-0. Donohue, Tel Trevor, Runcorn 77021.

Collins S-line 32S3 tx, 516F2 psu, £450; 75S3C rx, £375; 312B-4 stn control, £110; manuals, cables, spare valves. KWM2 tx/rx, 512F2 psu, £650. G3YHX, QTHR. Tel Walsall 27719.

IC240, 22ch, orig packing, handbook, £150. Trio TR7010, 2m, ssb, mobile, handbook, £140. Multi Palm 2, S20-22, R3-5 fitted, case, nicads, charger, £110. G8MDP, QTHR. Tel 04447 2884, evenings/weekends.

Eddystone 940 gen cov rx, £110. Used Jaybeams: 70cm 18-el Parabeam, £12; 144MHz 14-el 75Ω Parabeam, £14. All wkg cond. Prefer buyer inspects and collects. Wanted: Bird 43 wattmeter, plug-in frequency elements. G8HHI, QTHR. Tel Yateley (0252) 871555.

Icom 22A, 17ch, xtal toneburst, SD306 preamp, mobile mount, etc, £125. Creed 7E printer; BARTG type terminal unit; the pair, £40. G3YIO, QTHR. Tel Burntwood 6019.

FT101E, cw filter, immac, as new, used only 10h on transmit, comp with leads, £460 ovno. FT7B, six months old, fitted all 10m xtals, used only 10h, as new, £360 ovno. Buyer collects. G3LPA. Tel Kettering 760336, after 6pm or weekends.

IC202, 144-0-144-8, new nicads and charger, £150. FDK Palm 2, 6ch, all extras, £120. Joystick and LOZ-500 atu, £35. Wanted: 144-28 transverter; 18AVT-WB vertical. G8NPM, QTHR. Tel Wickford (Essex) 4317, evenings.

DX100U, vgc, offers please, but buyer must collect. G3YVK (Essex). Tel Upminster 24265.

Mosley 4-band trapped vertical, boxed, prefer buyer collect, £20. G3VSD, QTHR. Tel Rossendale 25007.

Microcomputer, Nascom 1, using Z80 processor, addition to drive 50bad teleprinter, add-on modification to convert vdu display from 48 to 64 characters/line (switchable), as new, wkg cond, £220 ono. G3TYP, QTHR. Tel 0788 73954.

KW VFO4B, matching external vfo for KW2000B, work the dx split frequency, as new, circuit, £38. Trio 9R59DS rx, manual, £45. Wanted: FRDX400 rx with 2 and 4m converters. James Dingwall, G4ILW. Tel Newcastle Upon Tyne (0632) 872661.

Cambridge, fm, dash mount, fitted S20-23, R6-7, toneburst, £65; Liner 2, preamp, handbook, Shure mic, £90; both nice clean cond. Harris, G3TXC. Tel Great Dunmow 4168.

Yaesu FL50B, FR50B, cond as new, orig packing, £150 pair. Plus carr. G8OUV, QTHR. Tel 0425 52081.

Liner 2, preamp, £95. G3RSJ, QTHR. Tel High Wycombe (0494) 446228.

TH3Jr Hy-Gain hf beam, 20, 15, 10m, 600W p.e.p., vgc, prefer buyer inspects and collects, £80; if sent direct, incl delivery costs, £85. Henderson, GM4HKW, 53 Dumyat Drive, Falkirk FK1 5PA. Tel 0324 25559.

FT221R 2m multimode tx/rx, as new, orig packing, manual, house purchase forces sale, £320. Buyer collects. G8PXT, QTHR. Tel 0376 515632.

IC211E, mint cond, used little, £500. Microwave Modules M500P, £20. MMC 1,296/144, £25. MMC 144/LO, £15. Filters X59E, and Anzac, MD108, XF9B, and xtals in i.f. strip, offers. R. Hirst, 12 Gowan Lea, Woodford Road, London E18. Tel Roger, 01-989 1278; or 01-211 0306, work.

WANTED

KW2000B, psu, good cond, pref with Q-mult, will pay carr, student budget, so around £170 please. G4GCV, QTHR.

HP349A noise source, 28V uhf leads (eg Silvers Lab), ¼in foam heliax, SK620s, Datong FL1 circuit. G3ZYW, NOT QTHR. Tel 0703 737521, evenings.

KW107 atu, F460T rx section. G8HLJ, QTHR. Tel 051-653 0767.

VFO for Multi U11. G8SZD. Tel 0632 678828.

Valves: 50A1; 6BW6; QQV03-10; QQV03-12; 6-pin 180Ω relays, suitable Redifon 286. Write/phone. Dorsett, 15 Chalcrafts, Alton, Hants. Tel Alton 88715.

Cowl Gill motor, new or in vgc, reasonable price paid for right article. G8BNP, QTHR. Tel 0222 68768.

KW204 tx, mint. G3YJU, QTHR. Tel Aylesbury 87983, evenings.

Marconi TF888/3M /P sig gen or similar. Datong ASP processor. Shure 444. Gen cov rx, must be hot on 10m. For sale: Wilson 3-el 10m beam, new, in box, incl carr, £60. Jenkins, 76 Hillfield Avenue, Hornsey, London N8.

Pair vhf hand portables, eg GEC Couriers or similar. G8RHU, QTHR. Tel Seaford 892358.

VFO5S, for Trio TS515. Matching spkr for Yaesu FRDX400. Stobbs, 78 Hershall Drive, Middlesbrough, Cleveland. Tel 0642 211685, evenings; or 0642 246689, day time.

Harrogate sea cadets are desperate for equipment to set up a comms class, operating freqs 6-7 and 6-9MHz. Test gear and parts also welcome. Cash very short. C. Kirby, 17 Orchard Close, Sharow, Ripon, N Yorks. Tel Ripon 4235.

Sorno XS19-2a 8ch xtal shift unit. Handbook for Sorno Viscount CQM19. G3RSV, QTHR. Tel Leigh Sinton (0886) 32940.

YC601. YO100. Would part exch Europa B. G4LJO. Tel 0609 2068, office hours.

Pye Westminster, type W15 fm high band, dash mounted, single- or multi-channel suitable for modification for 2m, up to £80 for reasonable unit. GW3YSP, QTHR. Tel 0656 741583, after 5pm.

KW110 Q-multiplier, 455kHz, good cond. GJ2FMV, QTHR. Tel 0534 62210.

2m linear amp, 100W min, must have psu. Tait, 45 Fogralea, Lerwick, Shetland ZE1 0SE.

RADIO COMMUNICATION December 1979

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NO EMPTY BOXES THIS CHRISTMAS

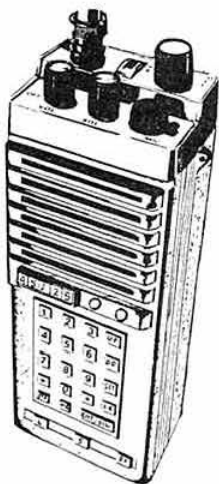
Now it can be told . . . Three years ago, when we opened, we had on display the finest array of empty radio boxes in England. Today our shelves groan under the weight of the widest range of amateur radio equipment—new and secondhand—under one roof anywhere in the country. But, as well as supplying the goods, we also try to provide the service, both technical and after-sales, and in terms of a fair and helpful attitude on part-exchanges. This is why our customers have become our friends, and THEIR friends have become our customers . . . and Brenda's coffee might just have something to do with it too!

**MERRY CHRISTMAS AND A HAPPY NEW YEAR
FROM BRENDA AND BERNIE**

★ ★ ★ ★ ★

And now for what's new in the shop. Pride of place, firstly because the drawing looks better at the top of the page and secondly because so much interest has already been shown in it, Yaesu's superb new hand-held, the microprocessor-controlled, synthesised FT-207R. In stock at last, come and try it, and see for yourself how good it is.

Next, two sophisticated new mobiles from Standard, the C7800 and the C8800. The C7800 is the first sensibly priced



FT-207R

70cm FM mobile to give full 10MHz coverage in 25kc steps with MHz step-button to cut tuning time. Among other features are tuning from mic or front panel—Su 20 available on push-button—two repeater offsets at 1.6MHz and 4.6MHz—digital readout—five memories—two-speed scan. The C8800 is the matching unit with the same features covering the 2m band in 5kc or 25kc steps.

These apart, we do of course carry our normal full ranges of new equipment by **YAESU, ICOM, TRIO, STANDARD, SWAN, MICROWAVE MODULES, DATONG FDK, KW, JAYBEAM G-WHIP** ETC, plus about the widest selection of secondhand gear you'll find anywhere, from, say, a KW2000 transceiver at £120 up to a complete Drake line-up at £800.



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IC-240 THE FAMOUS ONE

So well known that it is hardly necessary to say much about it! We told you a lot about it in September's issue so just as a reminder here are the main points:

- ★ Easy to use on the move without looking.
- ★ 22 Programmable channels—15 popular ones already done and seven for you to program to your own choice.
- ★ Full reverse repeat at the flick of a switch.
- ★ Dial calibrated in channel numbers for factory programmed channels.
- ★ Automatic tone burst which operates on 'Repeat' mode.
- ★ Superb quality and performance—as thousands of owners will confirm.
- ★ Excellent value for money. **£193 inc. VAT**

IC-280E THE REMOTEABLE ONE

Again we have often talked about this model before and there are now many in use. The scanning version is particularly popular and many find the 280 ideal for mounting in 'awkward' cars because of the remote facility. Main points are:

- ★ 80 channels in 25kHz steps.
- ★ LED frequency readout.
- ★ 3 programmable memories.
- ★ Complete front panel can be mounted remotely from the rest of the set by using the CK28 extension kit.
- ★ Scanner available for only £10 extra—this then also provides auto tone burst and instant facility for listening on the repeater input.

£250 inc. VAT

£260 with scanner



IC-255E THE NEW ONE

We will have a demo model on show at Leicester and hopefully a few to sell. Features are:

- ★ 25 watt output (1 watt low power).
- ★ 5 Memories.
- ★ 2 VFOs.
- ★ Built in scanner (with optional mic for scan control from the mic). Can scan the whole band, a selected portion, or just the memories.
- ★ Normal and reverse repeat—600kHz shift built in plus another user programmable shift, from the front panel (for 70cm transverting?).
- ★ Size 64 x 185 x 223mm.

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- MMT144/28:** 10m up to 2m
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CONVERTERS

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- MMC70/28:** 4m in, 10m out
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- MMC70/28LO:** 4m in, 10m out, with local oscillator output
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- MMC432/28-S:** 70cm in, 10m out
£29.90 inc. VAT
- MMC432/144-S:** 70cm in, 2m out
£29.90 inc. VAT
- MMC1296/28:** 23cm in, 10m out
£32.20 inc. VAT
- MMC1296/144:** 23cm in, 2m out
£32.20 inc. VAT

VARIOUS

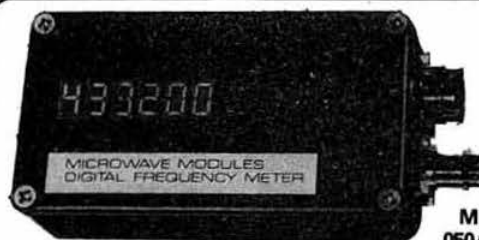
- MMD050/500:** 500MHz DFM
£69 inc. VAT
- MMD600P:** 600MHz + 10 Prescaler
£23 inc. VAT
- MMV1296:** 23cm Varactor tripler, 70cm in, 23cm out
£34.50 inc. VAT
- MMA28:** 10m preamplifier
£14.95 inc. VAT
- MMA144:** 2m preamplifier
£14.95 inc. VAT

Any further information on the above products may be obtained by contacting our sales department, who will be only too pleased to help.

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Slow Scan does not require any external hardware, just uses cassette port.

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PET—TRS80—Sorcerer: Marcotronics Software/Interface packages with documentation. Available for Pet 8, 16, 32K, TRS80 Level II 16K RAM, Sorcerer 16K RAM. Buy an Apple II from us and we give you the Slow Scan TV and Communications programs free.

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2N6080	4W 12dB	12V 175MHz	£4.00
SD1143	10W 10dB	12V 220MHz	£5.70
2N6081	15W 6-3dB	12V 175MHz	£5.60
2N6082	15W 6-2dB	12V 175MHz	£7.50
2N6083	30W 5-7dB	12V 175MHz	£8.40
2N6084	40W 4-5dB	12V 175MHz	£11.10
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VHF Scanning Receiver 10 Channels. Complete with nicads, charger and mounting bracket.
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Build, understand, and program your own computer for only a small outlay.

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R0	4-0277	8-0555	12-0833	14-9888	18-1250	44-9666
R1	4-0284	8-0569	12-0854	14-9916	18-1281	44-9750
R2	4-0291	8-0583	12-0875	14-9944	18-1312	44-9833
R3	4-0298	8-0597	12-0895	14-9972	18-1343	44-9916
R4	4-0305	8-0611	12-0916	15-0000	18-1375	45-0000
R5	4-0312	8-0625	12-0937	15-0027	18-1406	45-0083
R6	4-0319	8-0638	12-0958	15-0055	18-1437	45-0166
R7	4-0326	8-0652	12-0979	15-0083	18-1468	45-0250
S10	—	—	12-1041	14-9500	18-1562	44-8500*
S15	—	—	12-1145	14-9638	18-1718	44-8916*
S16	—	—	12-1167	14-9667	18-1750	44-9000*
S17	—	—	12-1187	14-9694	18-1781	44-9083*
S18	—	—	12-1208	14-9722	18-1812	44-9166*
S19	—	—	12-1229	14-9750	18-1843	44-9250*
S20	4-0416	8-0833	12-1250	14-9777	18-1875	44-9333
S21	4-0423	8-0847	12-1270	14-9805	18-1906	44-9416
S22	4-0430	8-0861	12-1291	14-9833	18-1937	44-9500
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SR = Series Resonance

*HC25 only

Also in stock R0 to R7 for FT221 R0 to R7 and S10, S15 to S23 for following: Belcom FS1007, FDK TM56, Multi 11 Quartz 16 and Multi 7, Icom IC2F, 21, 22A and 215, Trio Kenwood 2200, 7200, Uniden 2030 and Yaesu FT2FB, FT2 Auto, FT224, FT223 and FT202.

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455kHz		7-000MHz
1000kHz		10-700MHz
5-000MHz		48-000MHz
10-000MHz		100-000MHz

PRICES ARE EX VAT

PLEASE ADD 15%

MADE TO ORDER CRYSTALS SINGLE UNIT PRICING

	Price Group	Adjustment Tolerance ppm	Frequency Ranges	Price and Delivery A	Price and Delivery B
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	2	200 (total)	20 to 29,999 kHz	—	£16.50
	3	200 (total)	30 to 99,999 kHz	—	£10.50
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	5	50	1.00 to 1,499 MHz	£9.00	£6.00
	6	10	1.50 to 1,999 MHz	£4.75	£4.20
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5th ovt	12	10	60.00 to 99,999 MHz	£5.00	£4.00
	13	10	100.00 to 124,999 MHz	£6.15	£5.20
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We regret that it has been necessary for us to increase the prices of our made to order crystals, because of increasing costs of supplies and overheads. NOTE the cost of crystals on our B delivery have only slightly increased so should you be able to accept the longer delivery it will be possible to make considerable savings. Unless otherwise requested fundamentals will be supplied with 30pF load capacity and overtones for series resonance operation.

HOLDERS—Please specify when ordering—10 to 200kHz HC13/U, 170kHz to 170MHz HC6 or HC33/U, 4 to 225MHz, HC18 and HC25.

DELIVERY

Column A 3 to 4 weeks (This service is subject to availability)
Column B 6 to 8 weeks

Please note that it is not always possible to provide the A delivery service but a telephone call will confirm its availability.

Any orders received for A delivery when it is not available will automatically be placed on B delivery and a credit note issued for the difference in price.

DISCOUNTS 5% mixed frequency discount for 5 or more crystals at B delivery. Price on application for 10 or more crystals to same frequency and specification. Special rates for bulk purchase schemes including FREE supply of crystals used in UK repeaters.

EMERGENCY SERVICE SURCHARGES (to be added to A delivery prices). 4 working days £8, 6 working days £6, 8 working days £4, 13 working days £3 (maximum of 5 crystals on 4 day delivery).

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TERMS. Cash with order, cheques and postal orders payable to QSL Ltd. All prices include postage to UK and Irish addresses.

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Portugal—Sorubal SARL, Rua General Pimenta de Castro, 15-81, Lisboa 5.

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AMPLIFIER MODULE new fully assembled 6W IC unit 12V dc low impd. (4-8Ω) input and output for extn speaker amplification. With cct. £2.75.

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Resistor Kits. E12 series, 22Ω to 1M, 57 values, 5% carbon film, 1W or 1/2W (please state). Replenishments available. Ratings at 70°C.

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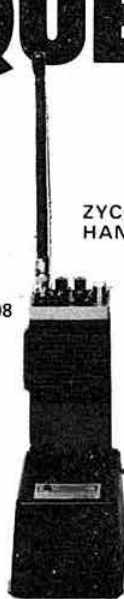
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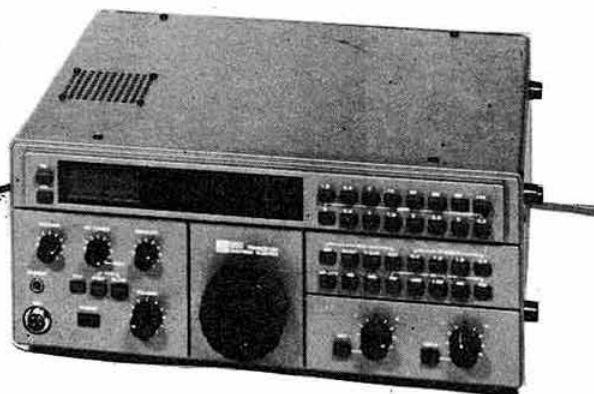
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VOX and speech processor as standard.

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Kit RX £31.00 Assembled RX £39.00
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70PA1. Receive pre-amp giving 12dB gain suitable for many 70cms systems. Size 1.0" x 2.0".
Kit £4.70 Assembled £5.60

PT1. Pi-tone generator for ssb rigs. Requires no batteries as powered from PTT line. Size 2.0" x 0.9".
Kit £2.40 Assembled £5.50

144FM2TR. Our answer to buying a Black Box. A single channel 1.5 watt transceiver having 0.4uV sensitivity. Crystal filter, noise squelch etc as per the 70 cms system and using TR2200 crystals. Size 6" x 1.25" each.
Kit RX £37.70 Assembled RX £51.10
TX £21.15 TX £29.45

144SY25. Synthesizer for our 144FM2TR system. Gives full 144-146MHz coverage in 25kHz steps with all repeater shifts. Outputs at 24MHz and 45MHz which are suitable for many commercial equipment. Size (4" x 2") (4" x 3").
Kit £42.00 Assembled £63.95

TB1. Toneburst generator using CD4001 to give 1750Hz for 500mS for repeater access. Size 1.5" x 1.5".
Kit £2.95 Assembled £5.35

MD05T. Drive source for microwave work. Uses a 96MHz crystal to generate 400mW at 384MHz. This can then be tripled to 1152MHz for mixing and further multiplication to microwave frequencies. A modulator is included on the board with facilities for PM/CW/FSK. Size 1.75" x 4.25".
Kit £19.25 Assembled £28.35

MD10PA. Power booster for the MD05T to give 10 watts output. Size 2.75" x 1.0".
Kit £20.90 Assembled £28.35

All the above kits are normally available ex-stock subject to parts availability. Kits generally consist of a full set of parts for the p.c.b. We do not generally supply boxes, switches and other hardware so you can build the modules into the cabinet of your choice. Any product correctly assembled will be gladly serviced and aligned. Give us a ring for assistance or further details on TADLEY (07356) 5324 evenings and weekends, or send a large SAE for full technical details. All prices include VAT at the current rate, please add 50p p&p on total order.

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Data sheets on all three R.F. clippers, including the new **MODEL D75**, are available on request. Price: **Model D.75** £49.00 plus VAT (£56.35 total). **Model A.S.P.** £69.00 plus VAT (£79.35 total).



Model A.S.P.



Model D75

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AS REVIEWED
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IT PAYS TO READ THE SMALL PRINT

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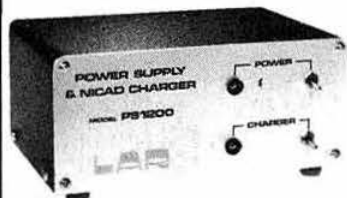
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CPS 10

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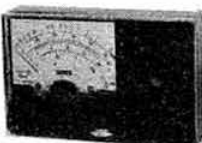


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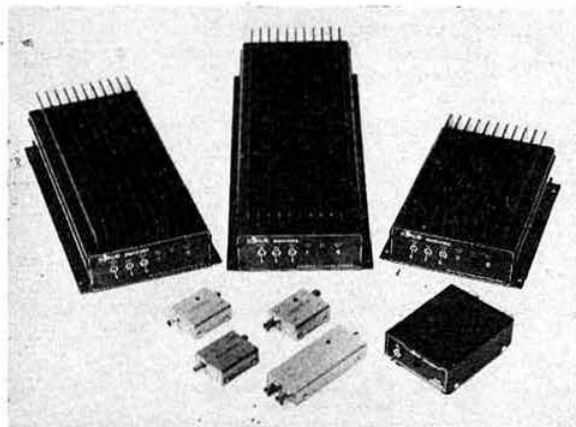
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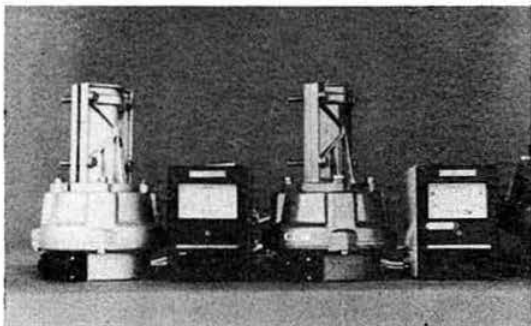
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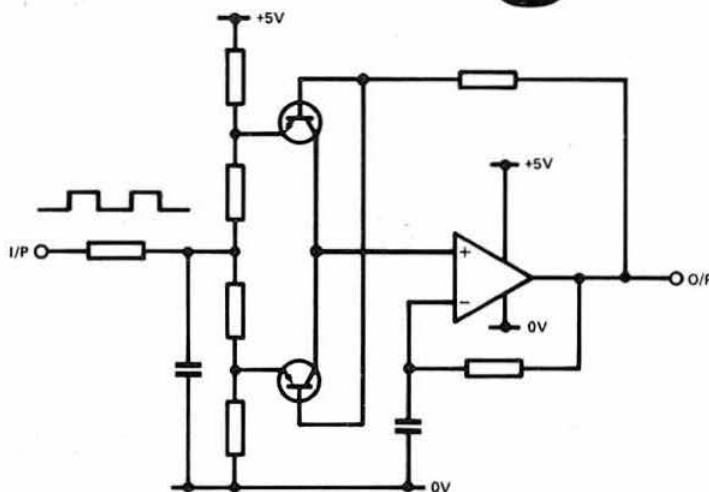
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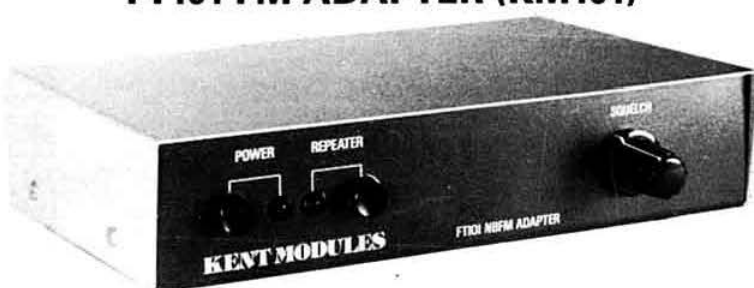
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