August 1978

radio communication

journal of the Radio Society of Great Britain

RALLY DAYS ARE HERE AGAIN!

Inside the marquee at the Longleat Rally

The grounds of Longleat House made a perfect setting for the Bristol RSGB Group Rally

Photos: Gainsborough Studio

Members of the RAF ARS who met at the Drayton rally

Photos: G4AJD

The RSGB bookstall at the Drayton rally

ALL OUR PRICES INCLUDE VAT

AMATEUR RADIO BULK BUYING GROUP

ALL OUR PRICES INCLUDE VAT

G3TDZ FM TRANSCEIVER

(March 1978 Rad Com)
Most parts available as follows:

PCB's: Audio, **£1.99**; Rx, **£4.84**; Tx, **£2.53**; 9MHz Osc, **96p**.

Filter CFR455E/F, **£11.85**; Heat Clips, **30p**; 35pF Ceramic Trimmers, **40p**; 10pF Foil Trimmers, **19p**; 22pF Foil Trimmers, **19p**; 60pF Foil trimmers, **26p**; BA102 Diodes, **29p**; 2N918 Transistor, **40p**; 40673 FET, **67p**; 2N3866 Transistor, **86p**; BLY33/40290 Transistor, **£1.60**; BC303 Transistor, **30p**; TBA120/SN6660 IC, **85p**; DIL741 IC, **43p**; LM 3900, **87p**; FX 1115 Ferrite Beads, **3p**.

KITS available as follows:
Receiver (less 10·245 Xtal & 455kHz coil), **£38.00** or Mini Kit 1 (=pcb's & other components), **£23.99**; Mini Kit 2 (= Semiconductors), **£7.56**; Mini Kit 3 (R's & C's), **£6.55**; Transmitter, **£22.20**; or Mini Kit 1, **£10.42**; Mini Kit 2, **£8.20**; Mini Kit 3, **£3.90**.

G3TDZ ADD-ON POWER AMPLIFIER

(June 1978 Rad Com)
Complete kit including aluminium case. **£12.85.**

NEW LOW PRICE FOR 40 WATT P.A. KIT—NOW WITH FULL GUARANTEE ON TRANSISTOR

Our 40W PA kit for FM/CW now comes complete with an attractive metal case and at the reduced price of **£18.30 inc VAT, full guarantee on the transistor, EVEN IF IT HAS BEEN SOLDERED**, PA Transistors 2N6084 are available separately at the very competitive price of **£9.86+79p** VAT=**£10.65.** You are wasting money if you buy these elsewhere because:

- Our prices are lower
- Our Kit transistors are fully guaranteed
- We know our products because we build, test and use them.

IGNITION SUPPRESSORS

We have the widest range of suppressors available as follows: Screened plug connectors (essential for VHF), straight or angled—**£1.20.** Plug in Distributor Suppressor—**£1.10.** 1µF Capacitor, available with normal push fit lucar connector, larger lucar or fully insulated with wire connections, **49p.** 2µF, normal or large lucar connector, **52p.** 0·5µF Coax type, **£1.97.** 3µF Capacitor for Lucas ACR alternator, **£1.30.** 3A Chokes, **71p.** 7A Chokes, **£1.00.** Solid Copper stranded ignition cable, **10p per ft.** Connectors, **8p** each. Distributor screening can, **£1.71.**

E310 & E430 TRANSISTORS

E310 1½dB NF FET, **75p**; E430 1½dB NF Dual FET, **£1.50**; Circuits available on request.

CERAMIC & CRYSTAL FILTERS

We have the widest range of 455kHz and 9MHz filters available:

Model	Application	6dBBW	Stopband	Supplied	Price
KVG—9MHz					
XF-9A	SSB TX	2·5kHz	45dB	2×Xtals	£26.35
XF-9B	SSB RX/TX	2·4kHz	100dB	2×Xtals	£35.30
XF-9B01/02	SSB RX/TX	2·4kHz	100dB	1×Xtal	£73.90
XF-9E	FM	12kHz	90dB	None	£32.80
XF-9M	CW	500Hz	90dB	1×Xtal	£25.00
SEI—9MHz					
QC1246AX	SSB RX/TX	2·4kHz	100dB	2×Xtals	£31·50
YTK—9MHz					
YF-90E05	CW	500Hz	90dB	1×Xtal	£25·30
YF-90F2·4	SSB TX	2·4kHz	60dB	2×Xtal	£23.00
YF-90H12	FM	12kHz	90dB	None	£27.00
MURATA & TOKO—455kHz					
CFT455C	AM			None	55p
CFR455E	FM		55dB	None	£11.85
CFR455H	AM	6kHz	55dB	None	£10.30

SSB Filters are available less carrier crystals—**£4** less.

NEW 70cm 100 W Linear

from Microwave Modules

Just arrived, 12V operation, fully protected **£247.50.** Also converters and transverters:
Converters: 144/28, **£20.25**; 144/28LO, **£22.50**; 144/2, **£20.25**; 144/4, **£20.25**; 432/28S, **£29.90**; 432/144S, **£29.90**; 1296/28, **£31.50**; 1296/144, **£31.50.**
Preamp, 144MHz, **£14.63.**
Varactor: 1296MHz, **£33.75.**
SSB Transverters: 432/28-S, **£133.88**; 432/144, **£149.62**; 432/144-R, **£169.88**; 144/28, **£88.88.**

TTL AND CMOS I.Cs.

7400	19p	7420	19p	7475	56p	74145	£1.24	74193	£1.84
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7403	19p	7427	34p	7485	£1.33	74153	90p	74169	£1.62
7404	24p	7428	47p	7486	35p	74157	90p	74221	£1.55
7406	44p	7430	21p	7490	58p	74164	£1.38		
7408	26p	7432	38p	7492	60p	74165	£1.70	74H00	35p
7410	22p	7440	21p	7493	65p	74174	£1.19	74H04	44p
7411	22p	7442	84p	7496	97p	74175	£1.30	74H10	39p
7412	27p	7447	£1.00	74107	52p	74177	£1.40		
		7473	40p	74121	43p	74180	£1.30		
7414	82p	7474	36p	74123	£1.05	74192	£1.84		

Quantity discount on 7400 Series only: 25-99 less 10%; 100 less 20%.

4001	21p	4017	96p	4025	21p	4050	63p	4082	21p
4002	21p	4018	90p	4030	67p	4051	74p	4510	£1.03
4006	£1.80	4020	89p	4040	90p	4053	81p	4511	£1.70
4012	33p	4021	92p	4042	£1.03	4060	£1.10	4518	87p
4013	57p	4023	21p	4047	95p	4078	21p	4528	£1.12
4016	62p			4049	63p	4081	21p		

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Closing date for contributions unless otherwise notified: 1st of month preceding month of publication

AMATEUR ELECTRONICS UK

AEUK – Your number one

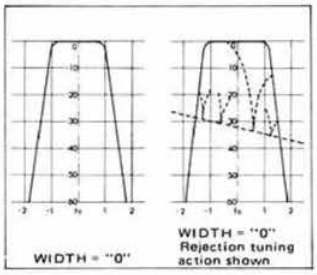
FT-901DM

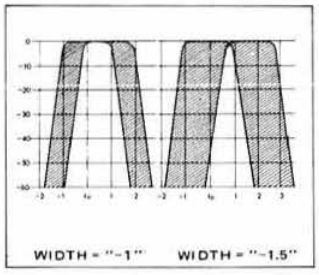
COMPETITION-GRADE HF TRANSCEIVER

HIGHLIGHTS

The ham's dream—to have the best—is now reality. Introducing the FT-901DM all-mode HF transceiver from YAESU. Designed to give you the competitive edge either at home or on a DX-pedition, the FT-901DM includes these advanced features:

Unique receiver filtering system including rejection tuning, variable IF bandwidth tuning, and audio peak frequency tuning for the ultimate in unwanted signal rejection.





Digital frequency display with memory circuitry for transmit and receive. Ideal for QSY during net operation, multiplier hunting during contests, or daily schedules. Modern PLL frequency derivation for accurate, stable operation.

Offset tuning for either transmit or receive frequency allows precise zeroing in on that rare DX.

Built-in Curtis electronic keyer. That's one less box to pack along while traveling, and the 8043 chip provides excellent immunity from RF interference.

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SOLE AGENT SWAN ELECTRONICS

AMATEUR ELECTRONICS UK

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Yes, technical excellence in it's *fullest* sense including a standard of mechanical engineering beyond compare to guarantee you, the discerning purchaser, years of trouble-free service. YAESU'S electronic engineering capabilities have never been bettered and when it comes to construction the standard of workmanship and quality of mechanical parts are truly superb.
Never mind the fancy specifications that appear from time to time—before you purchase examine the general construction and then ask to see the 'innards'—we think you'll then do what the majority does—settle for a no-compromise piece of *machinery* with the YAESU label on it.

THERE'S SOMETHING FOR EVERYONE FROM YAESU—TAKE THE FRG-7 FOR THE CRITICAL LISTENER TO THE TOP-NOTCH 2M FT-227R—THE FINEST IN MOBILES.

YAESU'S RANGE IS NOW SO GREAT THAT NO SINGLE ADVERTISEMENT CAN HOPE TO PORTRAY IT'S FULL EXTENT. ALL THE MORE REASON FOR GETTING YOUR OWN CATALOGUE COPY WITH OUR VALUABLE CREDIT VOUCHER AS OFFERED BELOW—

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► SPECIAL VOUCHER OFFER ◄

Here's a 10-1 winning offer if you'd like the latest Yaesu catalogue. Just send us 4 - 9p stamps (36p) and we'll send you Yaesu's latest fully illustrated brochure together with our Credit Voucher for £3.60 against your eventual purchase. A couple of stamps will bring you the latest Atlas or Swan leaflets or our current used equipment list.

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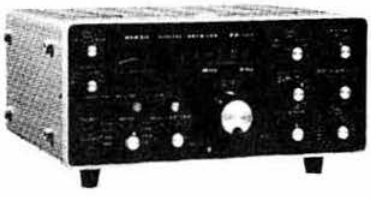
FR101S
Standard Rx 10–160m, SSB–CW etc
FR101D
De luxe Rx As "S" + BC,FM,VHF.

FL101 HF Tx 10-80m, SSB, CW, AM, FSK 180W P/P transceives FR or FT101



FR101SD Standard Digital receiver as "S"
FR101DD De luxe Digital receiver as "D"

FT101EE Transceiver 10–160m, 230 & 12V
FT101E As "EE" + RF processor

FT301S Transceiver 10–160m, 10W 12V
FT301 Transceiver 10–160m, 100W output

FT301SD Digital transceiver 10W output
FT301D Digital transceiver 100W output

FT901 TR/x 10-160m, SSB-AM-FSK-CW-FM-MEMORY-DIG-ANALOGUE
FT901DM All options—top of the line.
FT901D Less keyer-Memory and DC-DC
FT901DE Less FM-Memory and DC-DC

FT200B
Transceiver 10-80m, 180W pip. Mains (FP200) or DC (DC200) PSU's.

FT501
Transceiver 10-80m, 500W pip Digital readout 234 vac with FP501.

FP4
4 amp 12V PSU

FT202R
2m
Handheld

YO301
MultiuseMonitorscope

FV301
External VFO (301)

SP101B
External speaker 101

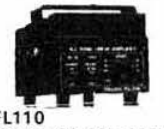
FL2100B
Linear Amp. 10-80m

QTR24
World time clock

FF50DX
Low pass filter

FP301D FP301 + Clock/Ident

FP301
20 Amp 12V PSU



FL110
Linear 160-10m 100W

FC301
Ant, Tuner Power meter

YAESU MUSEN

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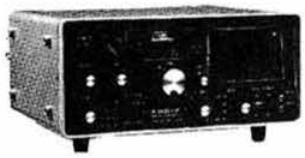
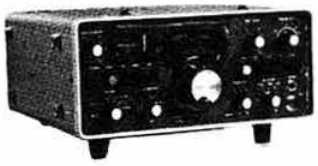
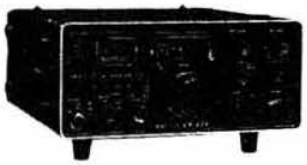


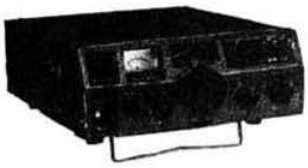
FRG7
Receiver 0-5-30MHz continuous Tuning
12V, Battery, + 234 VAC



FT620B
Transceiver 50-54MHz SSB/AM/CW
230V-12V ideal for transvertors etc.

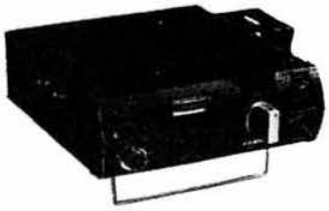


FT22IR
Transceiver Multi mode 144MHz
USB/LSB/AM/CW/FM 12 + 234V

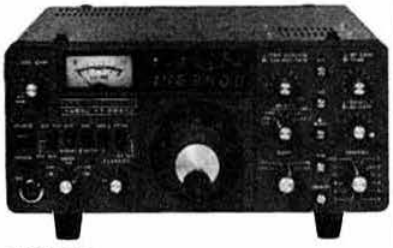


FT7
Transceiver 10-80m, SSB-CW, 10W 12V
DC. VFO.

FT227R
Transceiver FM 144MHz 10W Optically
coupled synthesiser 5KHz steps.



FT223
Transceiver FM 2m, 10W. 23 channels,
tone burst. On air-squelch LED's etc.

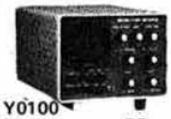


FT225RD
Transceiver multimode 144MHz Dig
and/or analogue, memory, 12 & 234V.

FRG7000
Receiver 0·25–30MHz continuous. Digital
readout and clock timer.

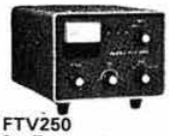
YC500 500MHz digital frequency counters
YC500J 10ppm time base accuracy
YC500S 1ppm time base accuracy
TC500E 0·02ppm time base accuracy

FV101B
External VFO (F×101)



Y0100
Monitorscope RF.
IF. AF.

FTV650B
6(4)m Transvertor



FTV250
2m Transvertor

YH55
Communications
Headphones

YD844
Desk
Mic.

YP150
Power meter to 150W

YC601
Digital readout F101

YC221
Digital readout FT221

YC355*
Digital counters.

YD84
Desk mic
600/50K

YD846
Fist mic

South Midlands

ESTABLISHED 1958—20 YEARS

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NEW DELUXE GENERAL COVERAGE RECEIVER

The FRG7000 is a digital readout, to 1kHz, general coverage receiver which inclusively covers 250kHz to 30MHz. The receiver is sensitive (0·7μV for 10dB s/N) and very stable. Selectivity is switchable; ±1·5kHz for CW/SSB and ±3kHz (@-6db) for AM. A digital clock is incorporated (settable to local and GMT times) with a relay timer circuit

FRG7. ANALOGUE OR SMC DIGITAL READOUT

The FRG7 is a general coverage solid-state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drift cancelling loop for continuous, spin-tuned coverage of 0·5 to 30MHz.
The receiver is sensitive (0·25μV for 10dB. S+N/N(SSB) and stable with AM, SSB and CW modes catered for. A three-position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted, It is mains powered, but should the supply fail or portable operation be required eight dry cells are automatically switched in.
The U.K. sales of many thousand FRG7's last year amply demonstrates the outstanding value and enormous versatility of the unit with applications in Amateur (First Rx or standby), SWL (Amateur and BCL) or for less demanding professional applications.

FRG7

The SMC, full specification, internally mounted counter (easily installed in existing receivers) provides: a 100Hz readout (100 fold improvement), flashing ± digit (to indicate VFO over-range) and adjustable gate time.

YAESU FT227R WITH SMC SCANNER

We are pleased to have made the 227 even better! In addition to full coverage of 2 metres in 5kHz steps our internally mounted scanner permits automatic tuning of 145–146MHz in 25kHz steps in four or 10 seconds (switchable). When it finds an occupied channel it stops, giving you seven seconds before it moves on. If you wish you may lock it onto that channel or if you do not want to listen to that frequency ('LO for instance') a momentary squeeze of the P.T.T. will make the scanner skip the channel the next time round.

MORSE KEYS HAND TYPE
(P&P 60p AND PLUS VAT 12½%)
HK707 150 × 76 × 50mm 0·5Kg **£8.50**
HK704 154 × 84 × 73mm 0·9Kg **£10.50**
HK710 167 × 100 × 100mm 1·3Kg **£18.15**
BK100 Mechanical Bug **£13.40**

HANSEN VHF WATTMETER
Flat 50–150MHz SWR ±3% (to 3:1) 20 & 200W FSD (±10%) 6¼" × 2¾" × (4¼").
FS302M (P&P 85p+8% VAT) **£22.50**

ULTRA BAL 2000
Ferrite-Balum 3–30MHz 50/75 ohms 9oz. Body 6¾" long × 1¼" dia. Rated to **2000W** PIP. SO239 socket UB1 1:1. **UB2000** (P&P 40p+12½% VAT) **£9.00**

DISCONE ANTENNA G-DX1
80–480MHz. Vertical polarised 3dB¼. Omni-directional Low VSWR
G-DX1 (P&P £1.05+12½% VAT) **£37.50**

G WHIPS (ills. left) (P&P 90p VAT 12½%)
Tribander 10–20m (+LF) **£17.50**
Multimobile (+MM) **£20.50**
Flexiwhip 10m (+FF) **£12.50**
Basemount ⅜" hole mount **£3.00**
LF40. 80. or 160 **£5.25**
MM40, 80 or 160 **£5.25**
FF15, 20, 40, 80 or 160 **£5.25**
Telescopic whip for coils **£2.00**

BOOM MICROPHONE HEADSET
600 ohm magnetic lightweight boom mic. Ideal for mobile or contests, etc.
Microphone only (P&P free+12½%) **£9.75**
Footswitch only (P&P free+12½%) **£5.95**
MD35 complete (P&P free+12½%) **£14.75**

FM BOOSTER T203
88–108MHz low noise pre amp. Fitted flying leads (car plugs) up to 20dB gain. 12 volts with LED indicator 1¼" × 3½" × 2¼".
T203 (P&P free+12½% VAT) **£7.75**

HANSEN DUMMY LOAD
30W peak, 15W cont. 50 ohms. PL259 VSWR 1·2:1 at 150MHz. **DL20** (P&P 25p+8% VAT) **£4.75**

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50–500MHz. Vert. or Horiz. mount. 3·3m Boom. VSWR <3:1
LT606 (P&P £1.50+12½% VAT) **£75.95**

BANTEX (ills. left) (P&P 95p VAT 12½%)

70¼	¼λ 70MHz	**£4.50**	**UCL** (¼+½)λ 432MHz	**£8.00**
B5	⅝λ 144MHz	**£7.75**	**UCC** (⅜+½)λ 432MHz	**£13.50**
BGA	½λ 144MHz	**£9.00**	**MB** Magnetic Base	**£9.10**
B5U	⅝λ 432MHz	**£5.00**	Unwanted Base Deduct	**£0.50**

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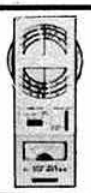
GI3WWY	**Tandragee**	**(0762) 840656**
GW3TMP	**Pontybodkin**	**(035287) 846 DAY**
GW3TMP	**Pontybodkin**	**(035287) 324 EVE**

Communications Ltd

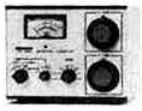
OF PROFESSIONAL EXPERIENCE

YAESU



TRANSISTOR DIP OSCILLATOR
LDM815 1·5–250MHz on fundamentals battery c/w earphone and 6 plug-in coils 2kHz modulation. 1–15MHz Crystal facility. (P&P free + VAT 8%) **£38.50**
LIM870 Antenna impedance meter 1·8–150MHz 0–1Kohm direct reading (P&P free + VAT 8%) **£38.50**

WATTMETER REMOTE RF HEAD
50–150MHz ideal for mobile use. Separate directional coupler 3" × 2¾" × 1¼" and illuminated indicator 5" × 2¾" × 1¼" c/w brackets, etc. Power 20 and 200W FSD (±10%), SWR to 3:1 (±3%)
FS711/V (P&P 85p + 8% VAT) **£23.50**



LEADER ANTENNA COUPLER
3·5–30MHz. 50/75 ohm Coax (VSWR <5:1) and Single Wire (10–250 ohms) transformed to 50 ohms. To 500W PIP SSB Wattmeter 20 + 250W FSD
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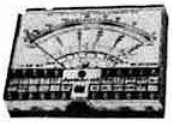
Up to: 1kW. 1·5GHz, 0·3dB less, 1·2:1 VSWR, 450dB isolation, 50 ohm "N" or "PL" fittings. Ex-stock, P&P 30p (VAT + 8%).
TWS120 1 in 2 out nickel SO239 **£4.50**
TWS150 1 in 5 out nickel SO239 **£9.95**
TWS220 2 in 4 out nickel SO239 **£10.40**



ICE MULTIMETERS (P&P 45p + VAT 8%)
20K/V. 1000X overload on Ω
80 Microtest 40 Ranges **£16.60**
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MFJ TUNERS (P&P free + VAT 12½%)
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901 900 + 4:1 balun etc. **£44.25**

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SML SWR25 SWR METER
Twin Meter SWR25. Up to 160MHz. Calibrated to 3:1 SWR. SO239s **SWR25** (P&P 50p + VAT 8%) **£10.00**

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ODR123C (P&P free + VAT 8%) **£13.42**

LEADER WATT METERS
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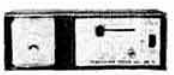
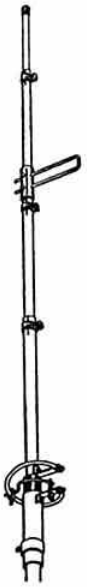


REACE UH74 VHF/UHF meter
10W FSD 50(70), 144, 432MHz. V.S.W.R. SO239 sockets. 5½" × 2" × 1½" + head.
UH74 (p&p 50p + VAT 8%) **£12.75**



CUSHCRAFT COLINEAR *(illustrated right)* **EX STOCK** RINGO RANGER:—6dB gain over ¼ ground plane. Uses 3 × ¼λ in phase and 1/8λ stub. Ultra low angle radiation, extremely low weight.
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Large range of models (small selection below)
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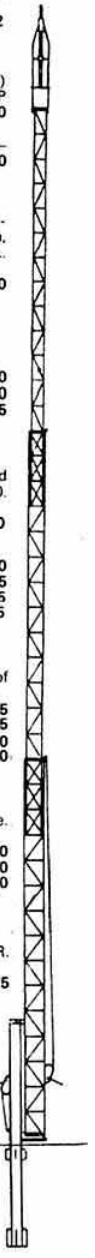

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BARCLAYCARD VISA

TS 820

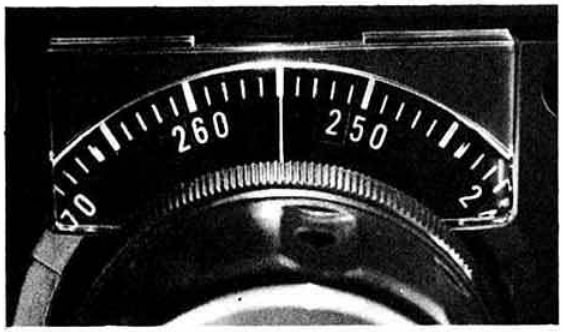
What makes the TS820 the finest HF transceiver available to the radio amateur? It's a unique combination of the unequalled design ability of Trio engineers together with their determination to make every function on the transceiver, both electrical and mechanical, perform at the highest level of perfection. That they have achieved their aim is amply demonstrated by the ever increasing demand for the TS820 all over the world.

The TS820 provides, in one package, a complete all band HF station with several design features which are exclusive to Trio and make this transceiver the leader in its field. Let's consider some of these more closely.

THE TUNING DIAL

Probably the most used control on any rig, but so often lacking in attention to detail. The common approach is to have two dials, one calibrated 0-100 KHz in 1KHz steps, the other 0-500 KHz in 100KHz steps. This means that the operator has to mentally add together two readings when trying to decide what frequency he is on.

Trio adopted a different system for the TS820 and the result is the twin disc monoscale dial.



This dial reads from 0-500 in 1KHz steps and as you can see from the photograph, is completely unambiguous—you know where you are all the time. This is Trio attention to detail.

PASSBAND TUNING SYSTEM

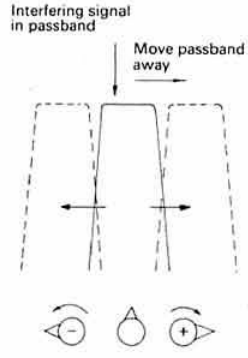
The insignificant little knob labelled "IF shift" on the front panel of the TS820, controls a system which is such a powerful operating aid in today's crowded bands that it has to be used to be appreciated.

In effect, the IF shift system gives the set operator the facility of moving the IF filter with its 8 pole selectivity, across the spectrum of signals appearing at the receiver mixer output, and it operates without changing the frequency to which the receiver is tuned. In practice, take the case of the VK3 who is S2 above the noise level and has just replied to your call. You have settled down to listen when I9XYZ comes up 2KHz away and splatters into your receiver passband—so just turn the IF shift knob to move the passband away from him, and there is your VK3 still readable whilst I9"!" vanishes.

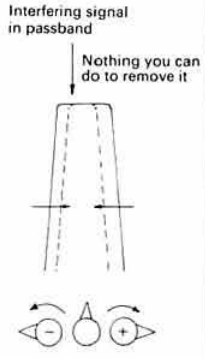
The facility also works with the CW filter fitted and it is then incredible, since you can tune the receiver to the middle of a bunch of stations and by turning the IF shift knob, pick them off one by one with no interference between stations.

This IF shift system is unique to Trio and must not be confused with "IF width" tuning using overlapping filters since this operates in a different fashion entirely. The "IF width" system gives the operator a basic filter bandwidth of, say, 2.5KHz for SSB and then allows him to mske this gradually narrower by double mixing an overlap filter in the IF. It has two snags, one in that you cannot move the IF passband away from an interfering signal and secondly, the overlap filter requires the use of two mixers in the IF chain which may degrade the IF performance—the TS820 of course is truly single conversion using only one fully balanced receive mixer.

Perhaps a couple of diagrams will help in understanding the two approaches.



I.F. SHIFT operates by retaining complete passband width but moving it so as to reject interfering signals



I.F. WIDTH operates by narrowing I.F. passband but remaining at same frequency. Little or no rejection of signals within passband.

DIGITAL READOUT SYSTEM

So often, the digital readout systems in transceivers do nothing more than count the VFO frequency and present this as the operating frequency—usually the counter reads 0-500 and the MHz digits are permanently wired to the bandswitch. It looks impressive but is usually inaccurate because it takes no account (a count?) oh never mind; of inaccuracies in heterodyne crystals or carrier oscillator frequencies. Let's face it, there's hardly any point in having readout to 100Hz if the only thing you have to set the readout against is the 100KHz calibrator in the receiver, but if you see a "CALIBRATE" knob associated with a digital readout unit, it's a sure sign of just such a system.

Trio, of course, did the job correctly, and in both the TS520S and TS820, the digital readout system measures all the oscillator frequencies used in the transceiver, does the calculations and presents you with your exact operating frequency regardless of band, mode, RIT shift or being on transmit or receive. It's again typical of the Trio attention to detail.

As a follow on to this point, consider what happens when you change modes in a transceiver. With the TS820, the carrier oscillator outputs are injected into the PLL system so that changing from USB to LSB does not change your operating frequency. In most other equipment, such a switch results in an operating frequency change of around 3KHz, and if in the same rig you have the simple so called digital readout system, that system will insist that you have remained on frequency when in fact you are yelling your head off 3KHz down the band.

From an ergonomic (lovely word that) standpoint, the TS820 panel layout further reflects the Trio care in design. You will notice that the controls are very sensibly arranged with AF and RF gain controls on concentric shafts as are the mic gain and carrier controls. Two more controls likely to be used together are the IF shift and RIT—so they're arranged to be together. It sounds simple in description but look at some rigs where the controls are arranged in seemingly haphazard fashion and you will see how difficult they could be to operate.

Whilst looking at the knobs, you might care to notice that Trio have provided, in addition to all band 160-10m coverage, an extra uncommitted band. This is to allow for the fact that at WARC, there may be additions or changes to the existing amateur bands. Looking ahead, the Trio design team made provision for this so there's no cause for concern if you own an 820 or 520S but it may be an idea to check on the bandswitch of the rig you just bought and figure out where that additional 18MHz band will go!!

Trio metering in the TS820 gives you a complete picture of station operation, including as it does, measurement of PA HT (how else can you calculate your power) and also compression level in dB so that you can set up the compression to suit your requirements, without relying on preset control settings and guesswork.

The fully variable, metered speech processor is a fast-acting low-distortion RF compressor as opposed to an IF clipping system which can introduce unacceptable loss of speech quality. Up to 40dB of compression is available without blowing the tops off the PA tubes.

As a further aid to setting up the rig, Trio include a monitor facility which samples the SSB signal from the transmit IF chain and demodulates it to allow you to check the quality of the transmitted signal.

When it comes to signal quality, Trio are the acknowledged leaders. The years of experience in the use of proper PA tubes (6146B in the 820) have given them this lead and the use of RF negative feedback around the PA and driver stages of the TS820 have made the already excellent intermodulation performance even better. If you want to check how a good signal should sound, just listen to a TS820, or a TS520 for that matter; don't simply take my word for it.

These notes give only a brief insight to the TS820 system. The entire transceiver is designed with extreme skill and only the TS820 can provide you with the best possible HF transceiver around today.

To complete the description of the TS820, we should also cover the ultra stable PLL system which gives single conversion on all bands, both in transmit or receive modes; the fully encapsulated VFO system; the automatic receiver audio bandwidth shaping to suit the mode in use; the true FSK system built into the rig with adjustable shift from 170-850Hz; the silent PA cooling fan; built in 25KHz calibrator; provision for extra bands and for fixed channel operation; the advanced noise blanker system; the switchable time constant AGC system; the "TUNE" facility that you can use all day without damage and no time limit; the front panel VOX controls; the digital hold facility; the provision of rear panel connectors for every possible use, including transverter, linear, phone patch etc etc.

Finally, the specification which anyone can check at any time—these figures are correct and typical of any TS820. Let's face it, most of the leading DX operators and discerning amateurs are now using the TS820. Why not join the club and find out about Trio quality and engineering?

SPECIFICATIONS

Frequency Range	160 meter band 1.8 to 2.0 MHz 80 meter band 3.5 to 4.0 MHz 40 meter band 7.0 to 7.5 MHz 20 meter band 14.0 to 14.5 MHz 15 meter band 21.0 to 21.5 MHz 10 meter band 28.0 to 28.5 MHz 28.5 to 29.0 MHz 29.0 to 29.5 MHz 29.5 to 30.0 MHz WWV 15.0 MHz (receive only) A U X band uncommitted
Mode	CW, USB, LSB, FSK
RF Input Power	SSB: 200 watts PEP CW: 160 watts DC FSK: 100 watts DC
Antenna Impedance	50 to 75 ohms, unbalanced
Carrier Suppression	better than 40 dB (Mod. freq. at 1.5 kHz)
Sideband Suppression	better than 50 dB (Mod. freq. at 1.5 kHz)
Receiving Sensitivity	0.2 μV for 10 dB S+N:N or better
Image Ratio	160 to 15 meter band: better than 60 dB 10 meter band: better than 50 dB
IF Rejection	better than 80 dB
Frequency Stability	Within ±1 kHz during one hour after one minute of warm-up, and within 100 Hz during 30 minute period thereafter
Receiving Selectivity	SSB: 2.4kHz (–6dB)/4.4 kHz (–60dB) CW: 0.5 kHz (–6 dB)/1.5kHz (–60 dB)* *) with optional CW filter
AF Output Power	More than 1.5 watts into 8 ohms
Audio Output Impedance	4 to 16 ohms (speaker or headphone)
Tube and Semiconductors	3 tubes, 5 ICs, 30 FETs, 74 transistors, 165 diodes
Power Requirements	120/220 VAC, 50/60 Hz or 12–13.8 VDC (with optional Power Converter DS-1)
Power Consumption	Transmit: 280 watts, Receive: 26 watts
Dimensions (W × H × D)	333 × 153 × 335 mm
Weight	16kg

TS-820 £693 inc VAT. DG-1 £136 inc VAT. TS-520S £525 inc VAT.

MICROWAVE MODULES

We have always held the opinion that Microwave Modules products represent the very best in VHF and UHF accessories for the radio amateur. It is with great confidence that we stock their complete range and are normally able to supply any item immediately.

You may not be aware that the MM range has been extended, not only with the 144/432 transverter incorporating 1·6MHz repeater shift but also the same animal with a 2MHz satellite shift. These shifts are also available on the 432/144 receiving converter.

Pride of the pack at the moment, however, is the new MML432/100 which, if you know the product title scheme, reveals itself as a solid-state 100W output linear for 70cm operators. Performance is terrific and although it's the most expensive device they have yet produced, it seems certain that serious 70cm operators, contest groups and DX chasers will all use this linear. In stock now.

If you require any advice on mating MM products with TRIO gear, please do not hesitate to call. Together, Trio and Microwave Modules make an unbeatable combination.

PRICE LIST		Price inc VAT
MMC70	4m converter	£20.25
MMC144/28LO	2m converter	£22.50
MMC432/28R or S	70cm converter	£29.90
MMC432/144R	70cm converter	£27.00
MMC1296/28	23cm converter	£31.50
MMC1296/144	23cm converter	£31.50
MMV1296	23cm tripler	£33.75
MMD050	50MHz counter	£66.96
MMD500P	500MHz prescaler	£27.00
MMD050/500	500MHz counter	£85.32
MMT432/28	70cm transverter	£133.88
MMT432/144R	70cm transverter	£169.88
MMT144/28	2m transverter	£88.87
MMA144	2m preamp	£14.63
MML432/100	100W 432MHz Linear	£247.50

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★ Non-volatile memory
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REMOTE "HEAD UP" DISPLAY £19.95 inc VAT

The Multi-800D is the latest 2m transceiver to leave the production line in Japan. It is a fully synthesised transceiver covering 144–148MHz with a full bodied 25 watts plus output to give you longer distance contacts. But its big attraction is the things it doesn't have. Ironical but true!

1) No restricted coverage—you can operate any channel you choose—no need to get the soldering iron out to change the diode matrix.
2) No power control on the rear panel; it's on the front—and the power is infinitely variable between 1 and 25 watts—ideal for transverting.
3) No tone-burst control on the rear panel—it's automatic but can be defeated by a front panel switch.
4) No confusing channel numbers or doubt whether you have selected the correct repeater shift—the bright LED read-out gives true frequency display on both TX and RX even when working normal or reverse 600kHz repeater shifts.
5) You won't have to retune the front-panel frequency selector for reverse repeater working or monitoring the input frequency—the flick of a front-panel control is all that is necessary.
6) The memory is not lost when you switch off the ignition or unplug the rig—it's there always and it can memorise two frequencies not just one!
7) It doesn't just have one repeater shift—you can programme any shift you wish in addition to the 600kHz—e.g. 1.6MHz for 70cms.
8) No wrist-aching tuning either—tuning is manual or electronic—you can take a leisurely stroll at 10kHz per second or race across the board at 500kHz per second.
9) And there are two safety features—every 100kHz of electronic tuning a bleep sounds—this means less looking at the dial and more eyes on the road—and there's also a remote "head-up" display available that enables you to place the frequency read-out in a position near the line of vision.

Having read about the things the 800D hasn't got, an SAE will bring you a four-page brochure about all the things it has got! But hurry—they are in great demand.

FDK 70cms MULTI-UII

★ Fitted 6 repeaters and 4 simplex
★ Automatic tone-burst
★ 12 watts output
★ Receiver RF pre-amp
★ Receiver IRT control
★ 4 channel autoscan

Fitted 6 repeaters + 4 simplex £259
Fitted choice of 2 channels £225

70cms is fast becoming a most exciting band for mobile operation with more and more repeaters coming on the air. Many enjoyable QSO's are being had on 70cms now; completely QRM free and S9 plus. And more and more people are finding that the U-11 with its 12 watts output (typical), receives pre-amps for the hottest front-end around and auto-scan is the ideal choice. Not surprising therefore that more and more people are saying "I'm using a U-11 here".

FDK 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 autoscan positions. Any one of the Autoscan 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 **£95** it is unbeatable! 10 channel marine version **£113** inc. VAT

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If ever you needed an excuse to purchase a 2-metre rig for the car here it is. We've managed to negotiate a special deal with our factory in Japan. The result? . . . **£149**'s worth of engineering that even amazes the most critical purchaser for its sheer value and performance. If you still need convincing then thumb through some of the past couple of years' advertising to see when a 2-metre FM rig could be bought for less than **£150**! The latest factory fresh shipment has just arrived so here's your chance to make the biggest saving of 1978! And here's a prediction too: many of you will look back at this advertisement in a few months' time and be glad you purchased your rig at such an incredibly low price—just a few will regret they hesitated and found the price had risen!

So what do you get for **£149·75**?—12 watts FM, 25 channel capability (S0, S20, R3, R4, R5, R6, R7 fitted) 2 priority channels, true S and R channel readout, channels fitted indicator light. Automatic protection circuit, microphone, quick release mobile mount, DC power lead, hardware etc., a 12 months' guarantee and free delivery. (Channels S21/22/23 available at **£7.50** extra inc. VAT)

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- ★ 40 watts drive for 1kW

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160–10W, 3kW
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- ★ 3kW continuous
- ★ 3 core balun
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- ★ Military construction

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	1V (p-p) 100kHz <
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L. A. WILES & SON, Aisthorpe, Scampton, Lincoln. Tel 0522 71 351

G. B. PACKER (COMMUNICATIONS), 28 Henniker Road, Debenham, Suffolk, IP14 6PY. Tel 072886 214

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432 100W Linear	£220	MMV 1296, 23cm varactor	£33	MMC144/LO 2m converter	£20		
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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.

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D. A. Evans, G3OUF

EDITOR
A. W. Hutchinson

ANNUAL SUBSCRIPTION RATES

UK corporate: £8, including VAT **Overseas: £8.**

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

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COMPOSITION OF RSGB ZONES

Zone A: Regions 1, 2 and 18
Zone B: Regions 3, 4 and 5
Zone C: Regions 7, 8, 16 and 19
Zone D: Regions 6, 9, 17 and 20
Zone E: Regions 10 and 11
Zone F: Region 15
Zone G: Regions 12, 13 and 14

COMPOSITION OF RSGB REGIONS

Region 1 Cheshire, Cumbria, Greater Manchester, Isle of Man, Lancashire, Merseyside.
Region 2 All that part of Humberside north of River Humber, North Yorkshire, South Yorkshire, West Yorkshire.
Region 3 Hereford and Worcester, Salop, Staffordshire, Warwickshire, West Midlands.
Region 4 Derbyshire, all that part of Humberside south of River Humber, Leicestershire, Lincolnshire, Nottinghamshire.
Region 5 Bedfordshire, Cambridgeshire, Northamptonshire.
Region 6 Berkshire, Buckinghamshire, Oxfordshire.
Region 7 Greater London south of River Thames, Surrey including that part of London north of the Thames administered by Surrey.
Region 8 Kent, East Sussex, West Sussex.
Region 9 Cornwall, Devon.
Region 10 Dyfed, Gwent, Mid Glamorgan, Powys, South Glamorgan, West Glamorgan.
Region 11 Clwyd, Gwynedd.
Region 12 Grampian, Highland, Island Authorities, Tayside.
Region 13 Borders, Fife, Lothian.
Region 14 Central, Dumfries and Galloway, Strathclyde.
Region 15 Northern Ireland.
Region 16 Essex, Norfolk, Suffolk.
Region 17 Isle of Wight, Channel Islands, Dorset, Hampshire, Wiltshire.
Region 18 Cleveland, Durham, Northumberland, Tyne & Wear.
Region 19 Greater London north of River Thames, Hertfordshire.
Region 20 Avon, Gloucester, Somerset.

QTC

amateur radio news

/A operation

The Home Office has asked the Society to draw Clause 9 of the Amateur Licence A, and particularly paragraph (4), to the attention of its members. It is necessary that the address of the temporary premises, and not just the general area, shall be given at the prescribed intervals. This requirement was inserted into the licence so that any interference to government or safety of life transmissions could be readily located.

The Society is well aware of the implications of giving an address over the air, and discussions are being held with a view to finding an alternative which would be acceptable to the Home Office.

432MHz interference

Operators using the 432MHz band on the south coast of England have been experiencing interference centred on 432·5MHz and extending ±3MHz. This is caused by a radio location system known as Syledis used by BP-Shell at several locations around the UK. The amateur service is the secondary user of this band, but the RSGB view is that it is not necessary for this transmission to be located in the narrow band communication segment of the amateur allocation. The manufacturer's specification provides for the carrier frequency to be located between 400 and 500MHz.

Raynet

The chairman of the Raynet Committee, G8CAC, regrets any misunderstanding that arose from the content of the *Radio Communication* May 1978 "Raynet" column. The controllers listed had failed to return to G3GJW a completed questionnaire urgently required for Raynet central records.

QSL Bureau, G4GAA-G4HZZ

Mr B. R. George, G3ZOH, draws attention to his new address, included in the QSL Bureau sub-managers list on page 685 of this issue. He also comments that cards continue to be sent to him for despatch, instead of to G3DRN, the QSL Bureau manager; and that he holds a large number of cards for stations who have not sent envelopes to him or who have failed to renew the supply on receipt of their last envelope.

GB (special event) callsigns

The QSL Bureau sub-manager for GB callsigns, Mr C. Turner, G8NL, requests organizers of special event stations not to ask for QSL cards to be sent to personal callsigns. Instead, they are asked to request "QSL via Bureau", otherwise he receives a large number of cards and no saes, and the operators wonder where all the QSLs are.

Any cards marked GB3 will be sent by G3DRN to G8NL and not to an individual call.

ELECTION OF RSGB REGIONAL REPRESENTATIVES

The results of the elections for those regions where ballots were held are as follows:

REGION 2	
R. C. Andreang, G4CMT	12 votes
D. Smith, G4DAX	50 votes
REGION 5	
F. C. Handscombe, G4BWP	4 votes
R. E. G. Kendall, G8BNE	6 votes
REGION 12	
F. Baxter, GM3VEY	19 votes
F. Hall, GM8BZX	29 votes
REGION 15	
H. J. Campbell, GI8FOK	4 votes
D. M. Jones, GI3KVD	3 votes
I. Kyle, GI8AYZ	12 votes
REGION 16	
M. S. Appleby, G3ZNU	58 votes
M. J. Coan, G4EOL	54 votes
K. F. Eastty, G3LVP	2 votes
K. R. Naylor, G8FUF	1 vote

The numbers above exclude nine votes which were rejected as invalid. In no case would these have altered the results.

December 1978 RAE

The RSGB will be running two centres at which the December RAE may be taken, in London and Derby. Requests for the application forms (stating the centre required) must reach the local examination secretary, RSGB, 35 Doughty Street, London WC1N 2AE, by first post on Friday 18 August 1978. Please note that once the lists are closed no late entries can be accepted.

The fee for the examination will be £10, to be forwarded with completed application form (cheques and postal orders payable to RSGB).

Can you help?

The Society requires the following bound volumes of *Wireless World* and *Experimental Wireless* for its library.

Wireless World

Volume 8, 3 April 1920–19 March 1921.
Volume 9, 2 April 1921–10 March 1922.
Volume 10, 1 April 1922–30 September 1922.
Volume 11, 7 October 1922–31 March 1923.
Volume 12, 7 April 1923–26 September 1923.
Volume 14, 2 April 1924–24 September 1924.
Volume 15, 1 October 1924–4 February 1925.

Experimental Wireless

Volume 2, October 1924–December 1925.

Any assistance in the provision of these volumes would be welcome.

BATC convention

The British Amateur Television Club will be holding a convention on Saturday 9 September 1978 at the Conway Hall, Red Lion Square, London. The convention starts at 11am; everyone is welcome, whether or not they are members of the BATC. It is hoped to have displays of both commercial and members' own equipment, and there will be lectures in the afternoon.

Parking is free in the afternoon, but it is rather difficult to find a space. It is recommended that visitors travel by rail; the nearest underground station is Holborn (Kingsway).

Sutton Coldfield RS comes of age

The Sutton Coldfield Radio Society is celebrating its 21st anniversary this year. Formed from a nucleus of some of the amateurs who ran the radio station at the 1957 World Scout Jamboree in Sutton Park (callsign GB3SP), the society still has several of the founder members; for example, Vernon Sutton, G3GLQ; Alan Dennis, G3CNV, and Tom Douglas, G3BA.

To celebrate this, the society is holding an exhibition in the Sutton Coldfield Library from 17 to 26 August. This will include a station using the callsign GB3SC and operating on all hf bands and 144MHz, and possibly 432MHz.

The RAC Amateur Radio Group Scheme

Membership of this scheme is open to all amateur radio enthusiasts and provides membership of the Royal Automobile Club at a discount of £1.50 below the normal RAC membership subscription rate. Since 1 June 1978 the annual subscription for members of the group scheme has been £9.50.

The group scheme's subscription renewal date is 17 May (World Telecommunication Day) each year, and all members renew on the same date. Anyone joining the scheme will pay at the pro-rata rate of 80p per month for the remainder of the year. In addition, the RAC once-only joining fee of £2.50 is also payable, regardless of the period remaining in the membership year. Radio amateurs who are already members of the RAC and wish to transfer to the group scheme will not pay the joining fee. A desirable option is the RAC Recovery Service, the annual subscription for which is £7 for the whole or part of the year.

The scheme is administered by the Royal Automobile Club's Scottish Western Counties Office, 242 West George Street, Glasgow G2 4QZ. The co-ordinator of the scheme is Mr A. W. Hutchinson, 88 Broomfield Road, Chelmsford, Essex CM1 1SS, who will be pleased to deal with any queries from potential members.

Special preparatory meeting for WARC 79

This meeting will be held at Geneva between 23 October and 17 November 1978. The administrative council of the ITU invited the CCIR to carry out the necessary studies to ensure timely provision of the technical information likely to be needed as the technical basis for the work of WARC 79. Subsequently it set the dates of the special preparatory meeting, which is a joint meeting of CCIR study groups.

Dr J. A. Saxton (a past-president of the RSGB) has been nominated as the principal co-ordinator for the preparatory work. Further definition of the tasks of the meeting will probably be provided by the 14th plenary assembly of the CCIR which ended on 23 June 1978 at Kyoto, Japan.

It is anticipated that national delegations will contain members who are radio amateurs. The IARU plans to hold a reception in Geneva, during the meeting, which will be a joint activity of IARU HQ and Region 1.

CCIR honours contributors

As part of its 50th anniversary celebrations, the International Radio Consultative Committee (CCIR) is honouring persons who have made notable contributions to its work over the past 50 years.

The scientists and engineers honoured have received a scroll citing the field in which their contribution was made. The presentations were made at a special ceremony held during the 14th plenary assembly of the CCIR held in Kyoto, Japan, from 7 to 23 June.

The following are Honour Award recipients from the UK: Mr G. H. M. Gleadle, Mr T. Kilvington, Mr G. Millington, Dr J. A. Saxton, Dr R. L. Smith-Rose, Captain C. F. Booth (posthumous) and Mr L. W. Hayes (posthumous).

FACSIMILE

by Dr A. C. GEE, G2UK

FACSIMILE (fax) is an electromechanical system for the transmission and reception of pictures and other graphic information from one place to another. It operates either over a landline, cable or radio system. The system has been in use professionally for 40 years or more, and in the last 10 years has developed very rapidly indeed, particularly in relation to specialized fields. Photographs for newspapers, weather maps, weather satellite pictures, documents, and fingerprint and "mug"-photo transmissions, to mention only a few.

Early activity

From the radio amateur's point of view, while there have been a few enthusiasts for the mode, little interest has been shown—if the lack of information about the mode is anything to go on. Some 10 years ago the author produced one or two articles, which were published in radio amateur magazines, endeavouring to stimulate some interest in fax. He enjoyed quite a lively correspondence after the appearance of these articles, but it soon became apparent that there was little point in pursuing the project very far at that time. There were numerous reasons for this; one of the most obvious being that suitable machines were not available at prices the radio amateur could afford. Another difficulty was that, as regards this country at any rate, special authorization had to be obtained from the licensing authority for permission to transmit fax, and, when granted, one's experiments had to be confined to the higher frequency amateur bands.

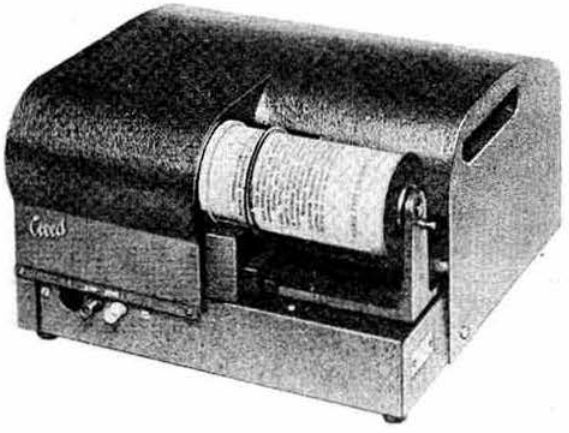
The reception of weather charts by facsimile, stimulated some interest in the mode among one or two enthusiasts. One was John Tuke, who actually built up the mechanical part of the system himself, and wrote a detailed description of it in one of the radio amateur magazines. This sparked off quite a lot of interest. Other descriptions of systems built up by enthusiasts using professional machines they had managed to acquire also appeared. About that time, there appeared on the surplus market some small compact machines called "Deskfax" machines. These were intended for use between offices, via the telephone system, for the transmission and reception of such graphic material as signatures, documents, drawings and so on.

Several of the companies associated with the manufacture of electromechanical equipment for the communications industry began to produce these machines. Creeds, Siemens and Western Electric were among those whose machines of this type were to be found. It seemed these would be just right for amateur radio use, and again there was a flurry of interest; descriptions appearing in the American amateur radio magazines on how to convert these for amateur radio transmission and reception and for the reception of weather charts. The recording material was called Teledeltos paper and was fairly readily obtainable. It was an electrothermally sensitive paper which changed colour when an electric impulse was applied to it, and it gave quite a presentable reproduction of the originals, which were scanned in a similar unit at the transmitting end by a spot of light. However, in this country the system did not catch on in amateur radio circles, no doubt due to transmitting licence difficulties, and the supply of machines dried up too; so again, little progress towards amateur radio fax was made.

At the beginning of 1977, new amateur radio transmitting licence regulations came into force, and fax was included in the modes which were authorized for use on most of the frequency bands allocated to radio amateurs, viz the 7, 14, 21, 28 and 144MHz bands. This concession immediately stimulated interest again in fax, and there is not doubt that, if suitable equipment can be found, this time we may see some activity in the field of facsimile appearing on these amateur bands.

The fax system

It might be as well at this point to outline briefly the system of facsimile transmission and reception for those who are not familiar with it. The picture to be transmitted is attached to a drum which can be rotated at a definite speed. A point of light is directed on to the rotating picture and is moved along to scan the picture at a predetermined rate. Light—which will vary with the characteristics of the picture—is reflected off it into a photosensitive device. The electrical output from this is conveyed, after suitable processing, either by wire or radio to a similar machine, where another drum rotating at the same speed, and of the same dimensions as that in the transmitting machine, carries paper upon which the



A typical "Deskfax" type of fax machine referred to in the text. These are fairly readily available from surplus sources - much more so than the "standard" fax machines, and can provide the basis for a limited "local" fax transmission and reception system to enable the enthusiast to gain experience

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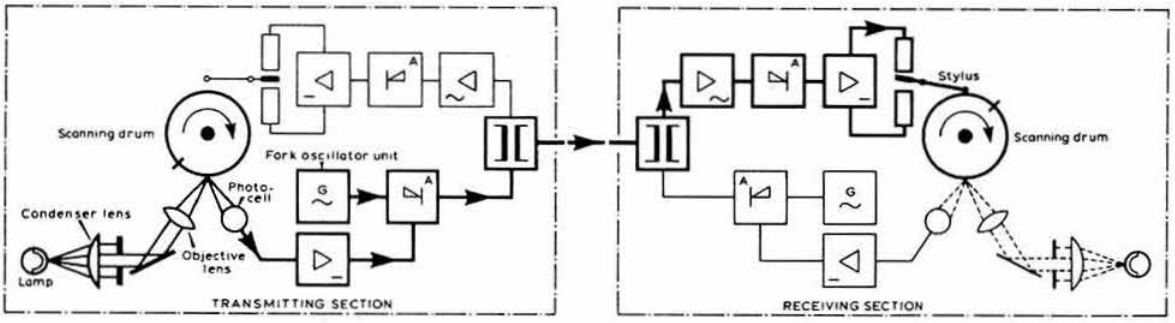

Fig 1. "Transceiver" arrangements for two fax units connected by landline so that pictures can be sent and received in either direction. Synchronization is provided by a tuning fork oscillator on one of the units. Transmission is by lamp/phototube arrangement; reception via the stylus

transmitted picture is reproduced. This paper may be photographic paper, in which case the receiving machine reproduces the transmitted signal as a varying light source, or it may be a special type of paper sensitive to electrothermal or electromechanical stimulation.

It will be apparent that if the above system is to work, a good deal of synchronization between similar parts of the transmitting and receiving machines is necessary. The drums need to rotate at the same speed, and the scanning of the picture in the transmitting unit must synchronize with that in the receiving unit. And the receiving unit must start up on an impulse from the transmitting unit or the two pictures will not correspond with each other. So it will be apparent that the system is a fairly complex one to get adjusted and to keep in adjustment if acceptable results are to be achieved.

Fig 1 illustrates a simple line-connected facsimile system in which, on the left, is the schematic for the transmitting unit. A tuning fork oscillator unit provides synchronizing frequency and power for driving the drum. The lamp system and phototube section are shown, and the resulting voltages are fed via a landline to the receiving unit. Here the synchronizing voltage from the fork unit in the transmitter is used to drive the receiving drum motor as well, and the voltages from the transmitter phototube are used to control the stylus carrying out the recording process.

Fig 2 outlines in schematic form the transmitting unit for a radio fax system. In this arrangement, the scanning drum is moved across in front of the lamp and photoelectric cell by the fact that it is mounted on a lead screw which, as the drum rotates, moves it along the screw. This is a method of scanning found in a number of fax machines and obviates the need for moving the lamp and photoelectric mechanism. Synchronization is provided by a tuning fork oscillator unit.

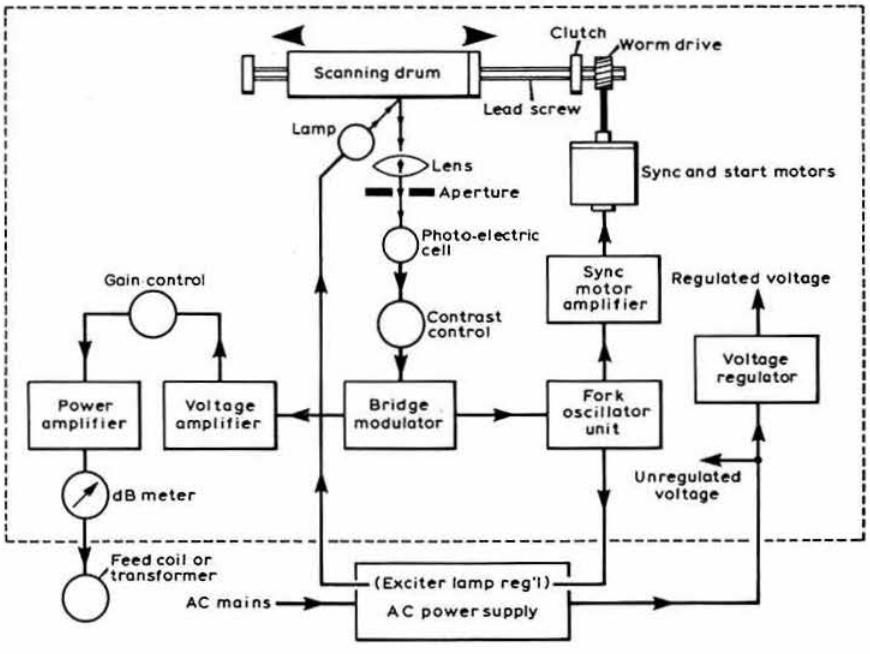

Fig 2. Transmitting block diagram

Fig 3 is the receiving unit schematic for a matching unit for the transmitter unit of Fig 2. Here the drum is scanned by a similar lead screw arrangement, and provision is made for synchronizing the start and stop of the drum. Recording is by means of a lamp system, and synchronization of the drum speed with that of the transmitting unit is assured by means of a tuning fork unit identical to that in the transmitter.

Fig 4 shows, in some detail, the arrangement of the lamp system in the transmitter unit, and how the drum moves along on the threaded lead screw, thus scanning the picture being transmitted.

Weather chart reception

Perhaps one should interject here a comment or two about the reception of weather charts by slow-scan, long-persistence cathode ray tube techniques. This is now the current method of recording the weather pictures of cloud cover, etc, transmitted by the various weather satellites. Photographs are taken of the images produced by this system and very good pictures are obtainable in this way. This is not true facsimile, however, and the system will not be dealt with further in this article. But it should be noted that the signals from these satellites can be recorded by an electromechanical machine of the type described above, and in fact they are often recorded in this manner as well as by crt systems.

Availability of equipment

The author was one of a small group of enthusiasts who were instrumental in introducing radio teleprinting (rtty) to the amateur radio scene in this country some years ago. This was only possible because at that time a number of suitable teleprinters came on to the surplus market at prices which the amateur could afford. Until a similar situation occurs in relation to facsimile equipment, it is unlikely that facsimile transmission and reception will become much in evidence on the amateur bands. However, one never knows. Once amateur rtty got going, it was quite surprising how quickly quite up-to-date machines began to appear on the surplus market, and much the same might well happen with regard to facsimile.

One of the difficulties which very soon raised its ugly head in regard to rtty, was that different machines worked at different speeds and had different code characteristics. Generally speaking there were two speeds in common use then, and much confusion, difficulty, annoyance and attempts at agreement were produced by these two standards. Most unfortunately, this situation is many, many, times worse with regard to facsimile! There are innumerable commercial standards in operation, and if these machines do come on to the surplus market there is likely to be much confusion!

Anticipating these problems, the Deutscher Amateur Radio Club EV produced a proposal at the International Amateur Radio Union, Region 1 Conference at Warsaw in 1975, for introducing "standards" for amateur radio fax. This was a very good move, and these proposals formed the basis for discussions which have since taken place, and which will be reported in a future issue of *Radio Communication*.

Apart from the obvious advantage of having a set of standards to which all participants should endeavour to work, there is one paramount consideration of a very practical nature—that is that the fax enthusiast should be very careful to ascertain the characteristics of any machine he might find on the surplus market and which he is contemplating purchasing. As we have indicated, there is such a variation in the parameters used in

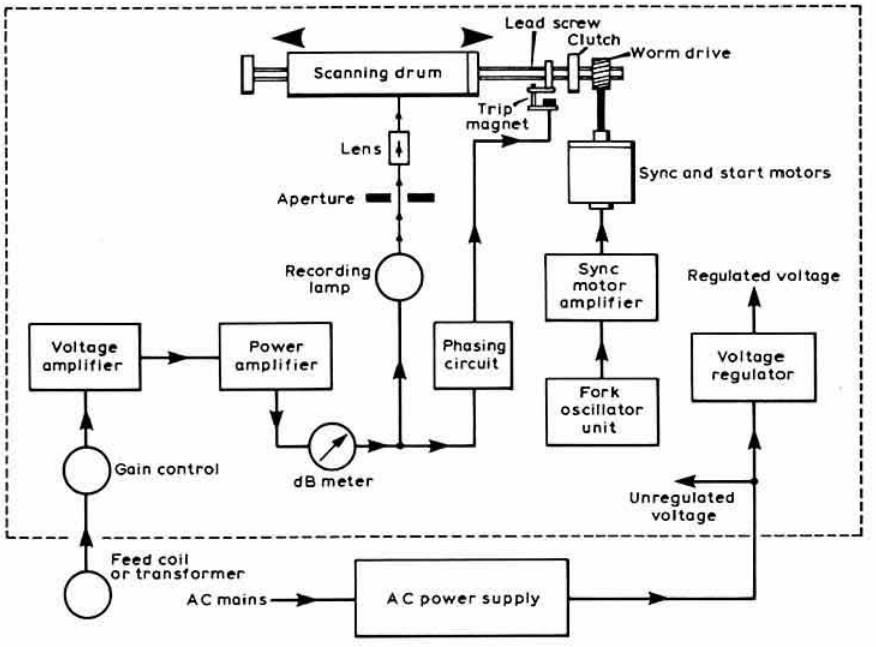

Fig 3. Receiving block diagram

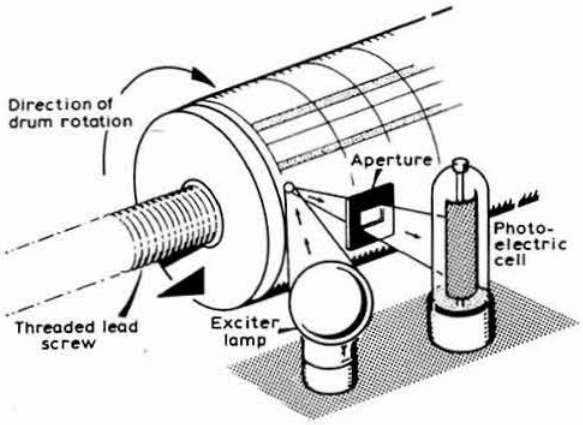

Fig 4. Arrangement of lamp system in typical fax transmitter

commercial practice, that it is even more important than it was in the case of rtty, to be sure to get a machine which is compatible with others in the service one wishes to participate in. The important parameters to consider are:

Drum speed. In commercial practice, speeds of 60, 90, 120 and 240rpm are found. However, 240rpm is considered to be rather too high for hf radio links; 180rpm is also in use, as is 100 and 150rpm in the specialized types of machine such as "Deskfax" machines.

The drum speed is of some importance in commercial practice, as the length of time required to send a picture—and consequently the cost—depends on the drum speed. A 22 by 18in weather chart takes 18min to send at 120rmp; 24min at 90rpm and 35min at 60rpm. The drum speed is not all that important to the radio amateur, except in so far that one must have the same speed available on one's fax machine as the other chap is using.

The index of co-operation. This is a figure given by multiplying the number of scan lines per inch, by the drum diameter in inches. Thus a machine with a drum diameter of 3·52in and a scan pitch of 100 scan lines to the inch, has an index of co-operation of 352. If there is a difference in the ioc between one machine and another, there will be a difference in the height: width ratio of the reproduced picture compared with the original. This may or may not be of importance. In the case of, say, mechanical or architectural drawings or navigation charts, it is obviously of great importance, but in the case of documents, some pictures, etc, the difference may not be so important. Weather chart facsimile is standardized at an ioc of 288 or 576. For radio amateur use, the ioc is possibly not quite such an important standard as it is in professional work. Though, maybe, when the yl operators take to fax they might well be a bit put out if their portraits came out short and fat, whereas in reality their figures are tall and slim!

Other factors. There are numerous other factors which have to be considered in getting the transmitting and the receiving units compatible, but there is not space here to consider them in detail. The direction of scanning is important, ie whether the picture is scanned from left to right and from top to bottom, or vice versa. If a picture is scanned in the wrong direction, the most awful *faux pas* may occur, such as a right-handed batsman appearing as a left-handed one, or a row of medals on the chest of a prominent personality appearing on the wrong side! And then there are such matters as phasing signals, starting signals and synchronization to consider.

Perhaps something more can be said about the latter. Earlier commercial practice was to use an electronically-driven tuning fork to provide a synchronizing source of power to drive the motors driving the drum on the transmitting and receiving units. These forks had to be tuned up to pretty tight tolerances. If a fork vibrating at a standard frequency of 1,020Hz was as much as 0.6Hz out of frequency, this was an "out of tolerance" degree sufficient to ruin the picture reception. Nowadays the synchronizing power is generated by a crystal oscillator system, and this is obviously the system which would be the most suitable for the radio amateur. Presumably, however, if two fax enthusiasts were located sufficiently close to each other on the same ac mains supply, and they wanted to try out experiments with fax between each other's QTHs, it would be satisfactory to use the mains as the drum drive power source, as synchronization in these circumstances would automatically be taken care of.

What then are the possibilities for amateur radio fax?

First of all, one could limit one's interest to the reception of fax broadcast signals. Much interest and a lot of valuable experience can be derived from setting up gear to record weather maps. It might not be too difficult to find suitable machines at prices one can afford. These machines usually have a recording system—electrothermal or electrochemical—which does not require darkroom facilities. So this is probably the best approach for the "beginner" fax enthusiast.

Alternatively one could go straight for a transmission/reception project, working with a fax enthusiast friend located not too far away. For this project one could use the "Deskfax" type of machine, of which there are a few around, which can be obtained at reasonable prices. Furthermore, there are several enthusiasts who have had experience with these machines and have got them working. Teledeltos paper for these machines is also available, as are manuals, though the latter do take some finding!

One must remember, however, that these machines have "standards" all of their own and they will not be compatible with the more normal fax machines, needed for weather chart reception, working with other fax stations overseas, reception of "broadcast pictures" etc. Furthermore, "standards" vary between different models of these "Deskfax" machines themselves. The Creed type TR100/1 has an index of co-operation of 200, while the TR102/1 has an ioc of 260. Both machines have a drum speed of 150rpm, not one of the now "universal internationally recommended" drum speeds which are all in multiples of 60rpm. However, these small machines do offer the opportunity of getting going on fax transmission and reception and, bearing in mind the limitations indicated, they do give the fax enthusiast something to experiment with.

Conclusion

The author hopes that this article will have given the reader some idea of the present state of the art fax-wise; indicated the broad principles of the system, and the difficulties which have to be overcome in setting up a fax amateur radio station. From the radio amateur point of view, the system offers plenty of challenges, and anyone looking for a hard nut to crack will find it in fax as so little in equipment or in information is readily available to the amateur. However, this is amateur radio at its best and, now that the licence regulations have been eased, without doubt the other difficulties which have to be surmounted in introducing fax to the amateur radio scene will in due course be overcome.

Acknowledgements

To Les Parnell, G8PP, for many years in charge of the picture room at Cable & Wireless, for much help and advice.

To Gerald Parnell, chief communications officer *Daily Mail*, London; also for much help and advice.

To too many correspondents to mention by name, for their helpful letters, etc.

To the British Amateur Television Club, for permission to use the diagrams appearing in this article, which illustrated various articles appearing in their journal *CQ-TV*.

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NEW PRODUCT

144MHz linear

The EDL144S from Polar Electronic Developments Ltd is the latest version of this linear amplifier. Modifications include a front panel switch to change the operating conditions of the pa stage to Class AB2 or Class C as required; a press button to activate the changeover relays when setting the standing current of the pa stage; a rear socket for ptt keying by auxiliary contacts in an exciter, and a voltage regulator to provide a stable 300V positive for the screen grid of the 5894 valve.

A power output of 100W on A3j for an input of a nominal 10W is claimed. The unit incorporates a low noise preamplifier, with gain adjustable by a front panel control. All transmit-receive switching is accomplished by an rf vox circuit. Anode current and rf output are metered with front panel selection.

The cost of the EDL144S is £128+VAT, and further information can be obtained from Polar Electronic Developments Ltd, Domville Road, Liverpool L13 4AT; tel 051-220 6666.

A digital oscillator stabilizer

by T. WINTER, G4AOK*

THE unit to be described is intended as an add-on unit to improve the stability of a vfo fitted in a transmitter or receiver. It will not make a bad oscillator into a good one; however, it will turn a good oscillator into an excellent one. The long-term stability of the variable oscillator will be the same as that of the crystal oscillator used as the reference, and the short-term stability is plus or minus a few hertz. This system is superior to a phase-locked oscillator as it avoids the fm noise which will be generated in the loop unless very great care is taken. Its main disadvantage is that it will not compensate for any mechanical instability, and the initial frequency can vary, causing a dial error (not a problem if a digital readout system is employed).

No originality is claimed for the concept, as the author first saw this described in a series of notes in "Technical Topics" in *Radio Communication* during 1973–4, and where it was designated as a "huff and puff" stabilizer. However, the method of implementing the system is original. All the original stabilizers used ttl logic; this has several disadvantages, namely power consumption is high and, the main one, that fairly high currents are being switched at very high speed (less than 1ns). If cmos logic is used, the power consumption is very low, and as the logic is voltage-operated with edges rising relatively slowly, the problem of harmonic radiation into other parts of the receiver is minimal.

Since developing this cmos-based unit, the author has learned that the originator of the system, Klaas Spaargaren, PA0KSB, has also changed to cmos logic (*Ham Radio* December 1977, noted in "Technical Topics" *Radio Communication*, April 1978). However, this unit, although basically similar, represents an alternative approach and will help readers gain further insight into a most effective technique. PA0KSB's unit will operate to 40MHz but this is achieved by the use of a low-power Schottky ttl device for IC1 rather than an all-cmos approach.

The basic element of the system is a frequency counter, with only the counter representing the least significant digit being used. If this first counter is of the four-bit binary type (divide by 16) it will have one output which represents a count of eight. From an examination of the truth table of the counter it can be seen that this output will be at a low level when the count is between zero and seven, and at a high level when the count is between eight and 15. If it could be arranged that when the count was below eight a correction was applied to the oscillator to cause an increase in frequency, and when the count was above eight the correction was reversed, it is clear that the system should stabilize at a point where the counter alternates between a count of seven and eight applying corrections as necessary to maintain this condition. The system employed is slightly more sophisticated in practice, as the size of the correction is greater the further the count is away from the stable point. It should be clear at this point that the oscillator is going to be stabilized in a series of steps, each one 16 counts of the divider away from the next. The word "counts" is used deliberately, as the value (in hertz) of each count varies in relation to the time that the gate of the frequency counter is open. The resolution of a counter, or the value of one count in the least significant digit, is equal to $1/T$, where T is the gate period in seconds. In this case $T = 0{\cdot}5$s, hence each count has a value of 2Hz. It can be seen from this that the oscillator will lock at 16×2Hz intervals, or every 32Hz. This has proved adequate for easy tuning of all modes of signals, including 170Hz shift rtty.

Circuit description

Integrated circuits 1b and 1c are used to form a 1MHz crystal oscillator, this being the reference oscillator of the counter section. ICs 2, 3 and 4 are decade dividers, dividing the 1MHz signal by 100, 100 and 10 respectively. Thus a square wave with a period of 0·1s is applied to the clock input to IC5. This is a decade counter of the Johnson type which gives a decoded output in decade form, ie 0 to 9. At pin 12 of this ic there is a carry output which is high for the first five counts and low for the higher five counts, this gives a square wave with half its period equal to 0·5s, the gate signal. Two other signals are required to operate the system, one to transfer the information from the input of the latch IC7 to its output, and one to reset the counter to zero prior to the start of the next counting period.

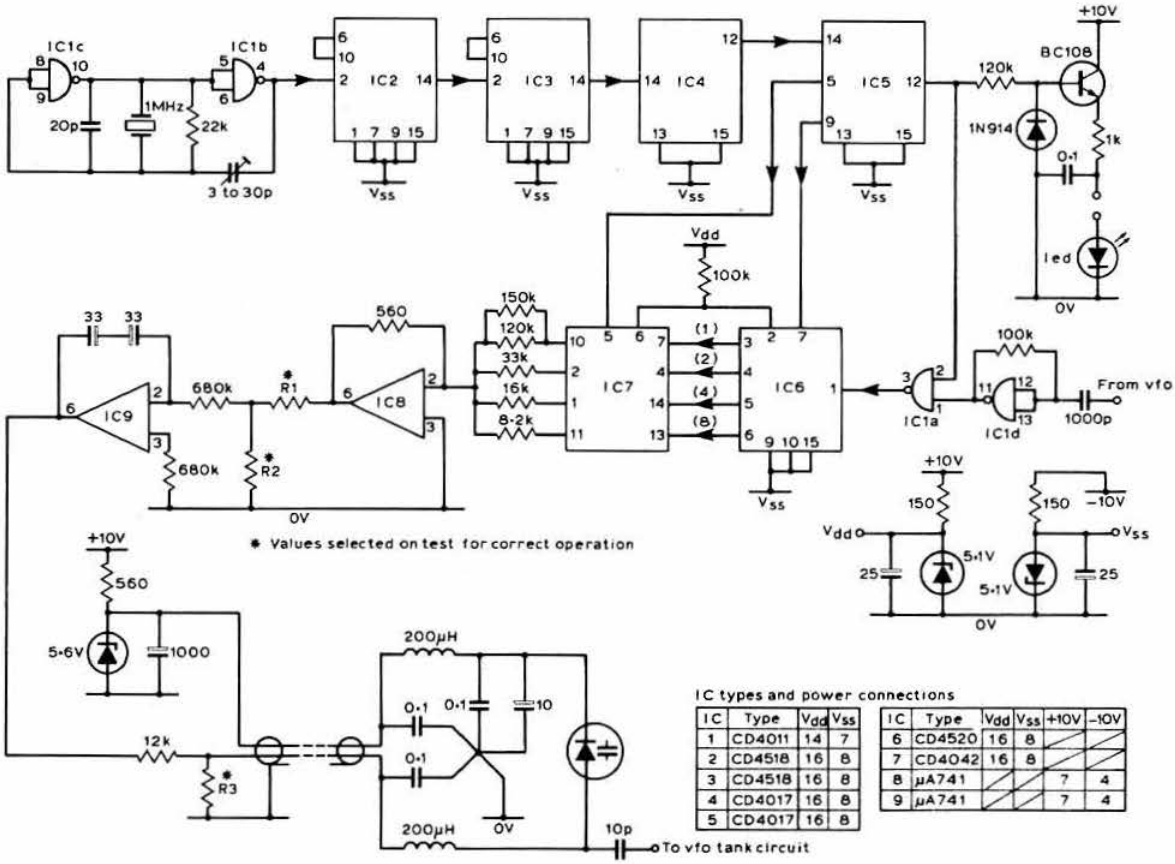
From the timing diagram (Fig 2) it can be seen that the outputs corresponding to counts of six and eight can be used to provide these functions. The transistor and led coupled to pin 12 of IC5 provide an indication of operation of the system. IC1d is used in the linear mode to act as an input amplifier for the sinusoidal vfo signal and to convert this signal into cmos logic levels. IC1a is the

Truth Table D to A

Count	Output of IC6 1	2	4	8	Output of IC8 —sum
0	−	−	−	−	+15
1	+	−	−	−	+13
2	−	+	−	−	+11
3	+	+	−	−	+ 9
4	−	−	+	−	+ 7
5	+	−	+	−	+ 5
6	−	+	+	−	+ 3
7	+	+	+	−	+ 1
8	−	−	−	+	− 1
9	+	−	−	+	− 3
10	−	+	−	+	− 5
11	+	+	−	+	− 7
12	−	−	+	+	− 9
13	+	−	+	+	−11
14	−	+	+	+	−13
15	+	+	+	+	−15

− equals a logic 0
+ equals a logic 1

*12 Lynn Avenue, Sale, Cheshire.



IC types and power connections

IC	Type	Vdd	Vss
1	CD4011	14	7
2	CD4518	16	8
3	CD4518	16	8
4	CD4017	16	8
5	CD4017	16	8

IC	Type	Vdd	Vss	+10V	-10V
6	CD4520	16	8		
7	CD4042	16	8		
8	µA741			7	4
9	µA741			7	4

Fig 1. Circuit diagram

gate which allows the oscillator signal to pass to the counter for a period of 0·5s. This signal is counted in IC6, a 4-bit binary counter, and the output count applied to the input of the latch IC7. The output of the latch remains constant while pin 5 is held at a low level; however, when pin 5 is raised to a high level the levels at the inputs are transferred to the output. By further reference to Fig 1 it can be seen that this transfer occurs after the counter has stopped counting, and hence the data is stable. After pin 5 has returned to a low level a reset pulse is applied to pin 7 of IC6, returning the counter to zero in readiness for the next count. From this it can be seen that the whole system cycles, and is updated, once every second.

It is now necessary to convert this digital signal into an analogue correction signal which can be applied to a variable capacitance diode to produce a frequency correction. This is accomplished using ICs 8 and 9 as a digital-to-analogue converter and an integrator respectively. An operational amplifier should have a very high input impedance, low output impedance and a very high gain. If these conditions are met, the gain of the amplifier can be set by applying feedback from the output to the inverting input. It can be shown that the gain is equal to minus R_f/R_{in} where R_f is the feedback resistor and R_{in} is the series input resistor. If the input impedance is very high, very little current will be flowing at the input pin, and it can be said that this point is virtually at earth. As a result, several inputs can be applied, and the gains of each input can be varied by changing the value of R_{in} appropriately. The output will be the sum of all the inputs multiplied by their appropriate gains, which are set by the R_{in} resistors.

The cmos logic of this system is run off power rails of plus and minus 5V; therefore a logic 0 is a level of minus 5V, and a logic 1 is a level of plus 5V. By examination of the truth table it can be seen that if the gain of IC8 is set at one for bit one, two for bit two, etc, then the output will be higher at both extremes of the count, ie 0 and 15, and lowest at the centre of the count, ie 7 and 8. Thus we have a level which is proportional to the error in frequency, and is negative for counts above 8 and positive for counts below 8 (remember the operational amplifier has a negative gain and so it inverts).

The second operational amplifier, IC9, is connected as an integrator. In this mode of operation, if a positive dc level is applied to the input resistor the output of the circuit will be a linear ramp which will continue to fall until the limit of the operational amplifier is reached. Likewise if a negative level is applied the output will ramp up until the upper limit of the amplifier is reached. In this

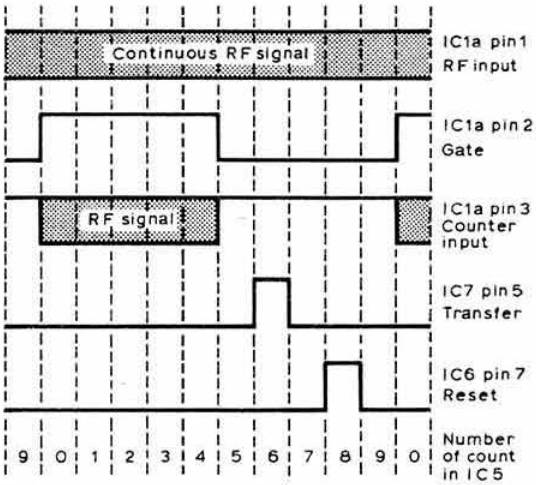


Fig 2. Timing diagram

system the input voltage is changing once every second as the latch is updated. this means that the output of the integrator will be continuously rising and falling about a mean level. However, if drift is present the time travelling in one direction will be longer than in the other; the mean dc level changing as a result. The rate of change of the ramp output depends upon the output of IC8, which is dependent on the value of the binary output of the latch. If this correction voltage is now applied to a variable capacitance diode connected across the oscillator tank circuit, the control loop is closed and the stabilizer should correct for any drift in the oscillator.

The resistors marked with an asterisk on the circuit diagram have to be selected for correct operation of the stabilizer. To find the value of R3 the drift of the oscillator when unstabilized must be measured, and the varicap diode must be able to move the frequency of the oscillator by at least this amount, preferably twice as far. So, if the number of kilohertz/volt is determined for the diode, and it is known that the maximum output swing of the integrator is approximately plus or minus 4V, a value for R3 may be calculated from the formula:

$$R3 = \frac{12{,}000}{(8 \times \text{drift} \div \text{diode constant}) - 1}$$

where the drift is in kilohertz and the diode constant in kilohertz/volt. The value of R1 and R2 is best determined by initially fitting a 10kΩ potentiometer and adjusting it for an oscillator frequency which does not jump too far either side of the mean, say no more than 5Hz, under normal conditions. The potentiometer can then be replaced by appropriate value of fixed resistor.

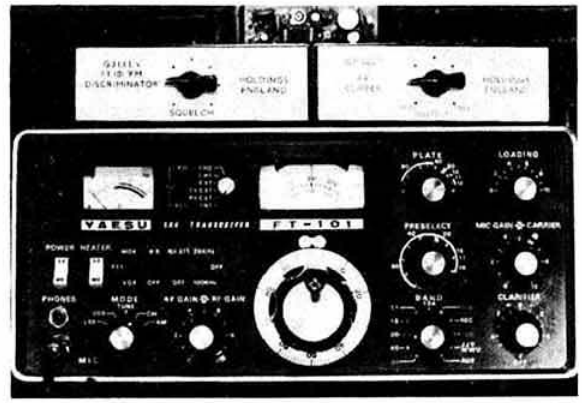
Conclusions

This system has been constructed and fitted to a Yaesu FRG7 receiver, with excellent results. The variation about a set frequency is approximately plus or minus 5Hz, depending on the part of the band being tuned. Long term stability was measured over a period of 10h, and the drift was found to be less than 5Hz (due to drift of the 1MHz reference oscillator). Spurious responses in the receiver are minimal and cannot be heard with band noise present. The upper limit of the oscillator is at present held to about 4MHz by the operating speed of the cmos logic used in the digital sections of the system. Considering the overall improvement in stability obtained, for a minimal cost, the addition of such a stabilizer must be considered to be a very worthwhile project. □

NEW PRODUCT

Holdings add-on unit for the FT101

The FT101 must surely be the subject of the largest number of modifications ever applied to a single piece of equipment, not because of its deficiencies but rather to increase its versatility and to use it as the heart of a hf and vhf station. The latest add-on units are produced by Holdings of Blackburn, and comprise an nbfm discriminator and an nbfm transmit unit. The former is a plug-in addition providing fm receive facilities. A switched bias arrangement selects a.m. or nbfm with the FT101 in a.m. mode; no internal connections are necessary.



The nbfm modulator is intended for use with a transverter to be driven by the FT101. The recommended transverter is the Europa C, which will be fitted with repeater shift facilities by SEM. This combination will then provide coverage of 1·8–28 and 144MHz with a.m., fm, cw and ssb modes, without any changing of the interconnecting leads. Output from the Europa driven by the FT101 will be either 15W or 30W fm and 100W p.e.p. ssb. Resetting of the external bias control is necessary to obtain the higher output on fm. Full installation details and circuitry are provided with the units.

Cost of the plug-in discriminator is £39 (inc VAT); the fm transmit board with switch and wiring costs £8 (inc VAT), and there is a special combined price for the two units of £45. For further details, and information concerning other mods to the FT101 series, contact Holdings, Mincing Lane, Darwen Street, Blackburn BB2 2AF; tel 59595. □

An ssb filter for the FRG7

by J. VERDUYN, G5BBL/PA0VDR*

Introduction

The selectivity of the 6kHz ceramic i.f. filter in the Yaesu FRG7 general coverage receiver is clearly tailored for a.m. reception; consequently, when receiving ssb, strong stations only a few kilohertz off-tune operate the agc, making a weaker on-tune signal less readable. With the availability of a reasonably priced 2kHz mechanical filter [1] in mind, it was investigated whether this filter could be fitted for ssb while retaining the ceramic filter for the a.m. mode. Thanks to Yaesu leaving two poles of the 6-pole mode switch unused, this proved possible and no drilling of the front panel was required.

The main specifications of the Toko MFL455 mechanical filter are: BW – 6dB, greater than 2kHz; BW at – 50dB, less than 5kHz. The centre frequency is 453·5kHz, which is 1·5kHz lower than the 455kHz of the ceramic filter, but on the air this is hardly noticeable due to the 6kHz bandwidth of the latter filter.

Apart from having to cut the copper track on the i.f./af printed circuit board twice, installing this filter should be quite easy for an experienced amateur. Good eyesight and a desoldering tool are essential. Nevertheless it must be realized that guarantee claims may not be honoured after carrying out this modification. If in doubt, do not do it. Check the advertisements of grey box suppliers, maybe one will offer to install the filter (at a price).

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Circuit description (Fig 1)

One of the unused poles of the mode switch selects the input of the appropriate filter, while the second pole grounds the input of the other filter. Diode switching is used to select the output of the filter in operation, while isolating the output of the other filter. The control wire of this switch is connected to the 9V supply line of the bfo. When the bfo is switched on in both ssb modes, D1 conducts while D2 is reversed-biased. In the a.m. positions, the voltage on the bfo supply line is virtually zero due to the low resistance between the drain and source of fet Q408. Now D2 conducts and D1 is reversed-biased.

The mechanical filter comes with a small printed circuit board (and the two matching transformers), but a larger pcb was designed in order to mount the components of the diode switch.

Installing the filter

Make up the board, Fig 2; remove the FRG7 from its case and put the receiver upside down. The printed circuit board is mounted on short pillars, with T1 nearest to the i.f./af print, alongside the box with the 1MHz harmonic generator. Remove the battery holder and drill two 3mm holes through the strip into which the battery box slides, making sure that this box will clear the heads of the 6BA screws afterwards. Use a hand-drill and remove all the drill-swarfs with adhesive tape to avoid a possible short-circuit later.

On the i.f./af print locate the pins of the ceramic filter and the position of R420 (1·5kΩ). With a desoldering tool, remove this resistor. Using a sharp knife, break the copper track between C417 (0·01μF) and the input pin of the ceramic filter by making two cuts 1mm apart and carefully scraping away the copper between these cuts.

The second break is between the output pin of the ceramic filter and the junction of C420 (1pF), R421 (220kΩ) and the base of transistor Q405. Solder R420 back between the input pin and the input ground pin of the ceramic filter.

Locate the two unused poles of the mode switch and wire these as shown in Fig 1, using miniature coaxial or

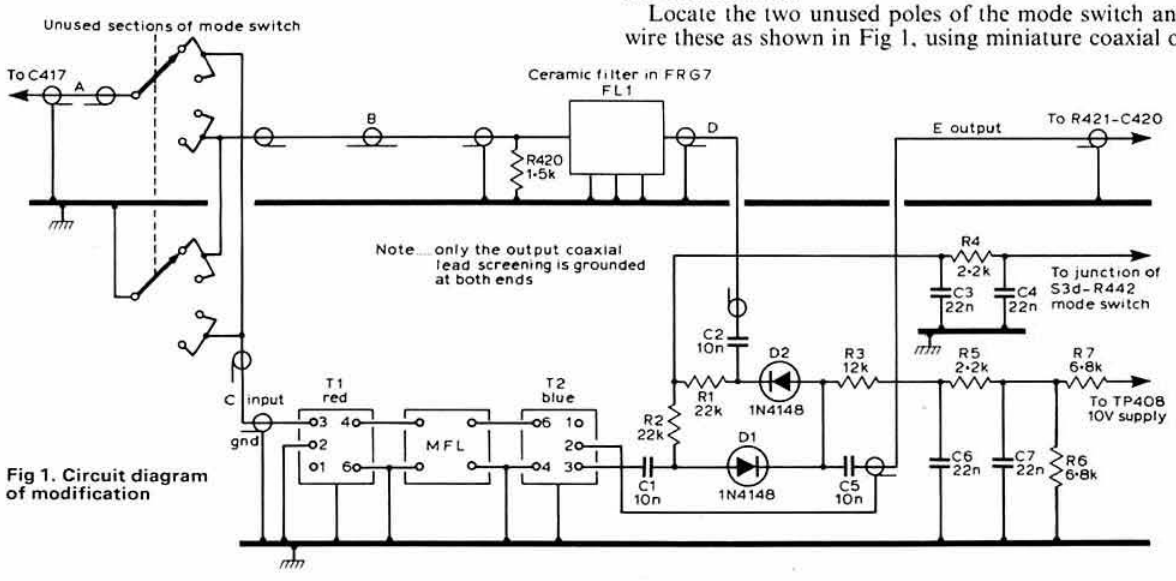


Fig 1. Circuit diagram of modification

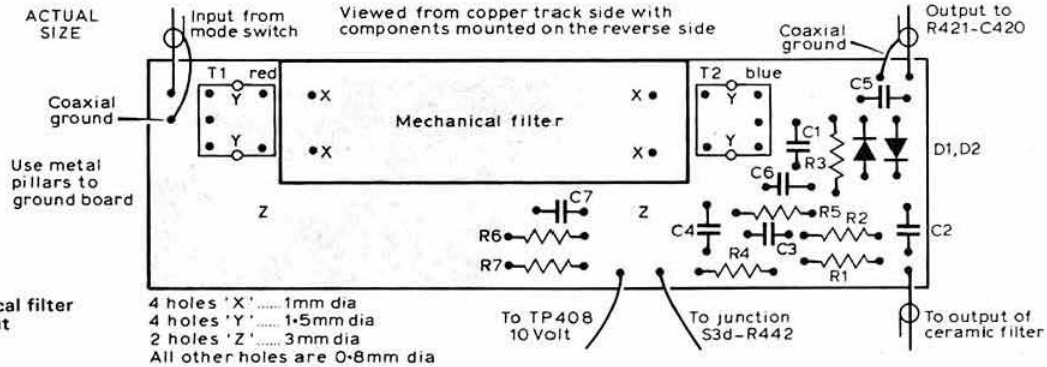


Fig 2. Mechanical filter pcb layout

screened cable. Note that four of the five cables are grounded at one end only; the screens of cables A and B are soldered to the input ground pin, while the outer-braids of cables D and E are connected to the output ground pin of the ceramic filter.

The three cables to the mechanical filter pcb are kept as short as possible, but well separated by taping them to the cable-harness. The length of the two wires from the diode switch is not critical; one is soldered to the 10V supply at the junction of C454 (100µF) and TP408, while the control wire is connected to the mode switch at the junction with the wire from R442 (100Ω). A short wire grounds the mode switch to the i.f./af board.

Alignment

After checking the wiring, the FRG7 can be switched on, and the performance on a.m. should be the same as before. Switch over to lsb and tune to the 1MHz signal from the harmonic generator. With a fitting alignment tool, slowly peak both T1 and T2 for maximum S-meter reading, which should now be the same as the reading in the a.m. mode.

Next find a suitable lsb station and adjust T406, the bfo oscillator coil, and the tuning knob on the front panel in turn until this station sounds right. Check the adjustment of T406 by tuning to some other stations, including very weak ones with the TONE switch in "Narrow" position.

There may be a slight difference in the setting of T406 in order to obtain maximum readability of all stations. With the mode switch on usb, repeat this on 14MHz, adjusting trimmer TC404 for the best clarity. The setting of T406 and TC404 is quite critical and may be adjusted to one's preference. Some amateurs prefer a slightly "toppy" signal, while others like a more natural-sounding signal.

Conclusion

With an ssb filter installed, the performance of the FRG7[2] is very good indeed and comparable with the Heathkit HW100 transceiver. Although cw reception is also greatly improved, it is hoped that a similarly-priced 600Hz mechanical filter will become available in the future.

Local amateurs, who have tested the modified FRG7 on the air, commented favourably on the audio quality in the ssb mode.

The author thanks G3ZUW for his valuable assistance with this project.

References

[1] See "New Products" *Radio Communication* August 1977, p607. Obtainable from Ambit International, 37 High Street, Brentwood, Essex CM14 4RH. Price £9·95 excl VAT and p&p.

[2] For a review of the FRG7 see *Radio Communication* March 1977, pp198–200.

[3] For a circuit diagram of the FRG7, see *Radio Communication* July 1976, pp478–9. □

BOOK REVIEW

Understanding Amateur Radio. By Jay Rusgrove, W1VD, Doug DeMaw, W1FB, and George Grammer, W1DF. 223 pages, 8¼ by 10¾in (softbound). Published by the ARRL. Obtainable from RSGB Publications (Sales), 35 Doughty Street, London WC1N 2AE. Price £3·65 including p&p.

The techniques of amateur radio have evolved and expanded with such complexity, and so quickly, that it is no longer only the beginner who needs some help in grasping what it is all about. Many more-experienced amateurs must feel the need for guidance in one or other of the branches of the subject, and sometimes even in the fundamentals.

The present book is a completely revised edition of George Grammer's first book of this name, brought up-to-date in terms of modern amateur practice, and produced in the larger *QST* format. There are 15 well-illustrated chapters and the style is clear and simple; the mathematics are minimized.

After dealing with electrical fundamentals and circuitry, there is a good and quickly-assimilated introduction to semiconductors and valve basics. Then come chapters on how cw and phone transmitters work, followed by a similar explanatory treatment of receivers, and a generous coverage of antennas and feeders. The workshop and test bench section, which includes some practical information on etched circuit boards, and some wise words on trouble-shooting, precedes a chapter on building receivers.

Accessories for the receiver, such as audio limiters or clippers, cw crud-o-ject, front-end overload protection, etc, are described.

Building transmitters and transmitting accessories are two important chapters, and one notices particularly a novice valve transmitter for 3·5 and 7MHz with a power of about 10W, a transistor transmitter for 7MHz with 350mW output, a transistor vfo with output on 3·5 and 7MHz, and a regulated power supply.

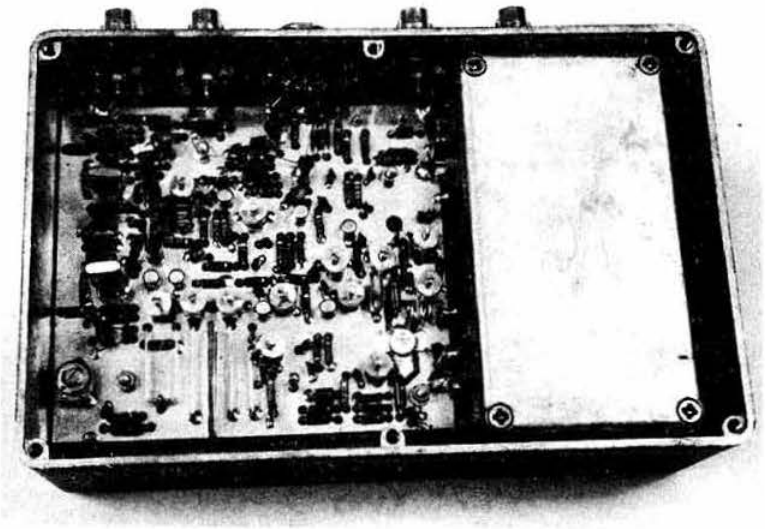
The transmitter accessories are numerous: transmatch, monimatch, rf wattmeter, rfi considerations, keyers, rf-sensed antenna changeover relay.

Power supplies, measurements, antennas and masts, some practical advice about setting up a station, and a good index, conclude a book which seems sure to have a wide appeal. *T.P.A.*

EQUIPMENT REVIEW

Microwave Modules MMT432/28S transverter

by J.P.MARTINEZ, G3PLX*, and R.F.STEVENS, G2BVN



Internal view of the MMT432/28S, showing the pcb layout and (on right) the power amplifier compartment

General description

This solid-state transverter is designed for use with a 28MHz transceiver in terrestrial or satellite communication. The "S" version now available offers a selectable 2MHz shift to permit use with Oscar 8, which is the first satellite to use the 435-438MHz segment for transponder operation. The unit comprises a low noise receive converter, a transmit converter, and linear power amplifier stages providing an output of at least 10W.

The housing is a black diecast case 7¼ by 4⅝ by 2⅛in and weighs under 1kg. This compact housing enables the unit to be suitably weatherproofed and mounted close to a 432MHz antenna when long feeder runs are involved, the losses at 28MHz being considerably less than those at 432MHz. The linear mode of operation enables the use of cw, ssb, fm or a.m.

Circuit description

Incoming 432MHz signals pass through a pin diode antenna changeover relay to the first rf amplifier using a BFR34A silicon transistor. The second rf amplifier uses a BFY90, and from this stage the signal is fed to a 3N204 mixer mosfet giving an output at 28MHz. A 28MHz signal at very low level from a transceiver is fed through an attenuator to a balanced dual-gate mosfet mixer using two 3N204s, and is then mixed with the 404MHz local oscillator output (derived from a 101MHz crystal) to produce the 432MHz output. After passing through high Q circuitry to remove any spurious, the low level signal is fed to an amplifier consisting of two BFY90 stages and a 2N6256 pre-driver stage. The output at this point is about 200mW of rf. The two stage linear amplifier uses a 2N5944 and a 2N5946 in the output.

Printed strip-line circuitry is used in all uhf tuned circuits, except those associated with the antenna changeover relay and transmit mixer filter. A zener diode regulated network provides all bias voltages. The pin diode switch is said to have a loss of less than 0·2dB. The 28MHz i.f. has a circuit sensing the presence of rf drive and automatically switches to transmit. This facility can be manually overridden if desired.

Performance

The test report (supplied with each equipment) provided the following figures:

432MHz saturated output power	11W
Max level of spurious outputs	—65dB relative to max output
Receive converter gain	38dB
Receive converter noise figure	3dB
Max frequency translation error	3kHz
Max current consumption	1·8A

Bench measurements gave the following results:

Receive converter gain	37dB (433MHz input to 29MHz output)
Bandwidth at 3dB points	430 to 434MHz
Image rejection	17dB
Noise figure	3·5dB (measured with 50Ω source)

Measurements on the transmitter section were carried out with the supply line set at 12V:

Output power with high level input drive (ie saturated)	11W
Gain, 28MHz in to 432MHz out, with internal gain preset at max and with input level well below saturation	19dB

Spurious outputs. The worst output spurious was the lo output at 404MHz, which was 75dB below 11W out.

Intermodulation distortion. Since the information provided with the unit only quoted the saturated power output, and no information was given as to what level to

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drive it to on ssb, two conditions were measured in the intermodulation test.

(i) With one input signal, its level was lowered from P_{sat} until the output power had dropped to 25 per cent of P_{sat}. A second signal was then added to this at the same level and the third order products measured. They were 17dB below the level of each output tone.

(ii) Two input signals were varied together in level until the output intermodulation products were 26dB below the output tones. This is a standard i/p level test on commercial equipment and the p.e.p. power in this condition was 4W.

Conclusion

The MMT432/28S transverter is a physically small unit which, in its latest version, is flexible in the band 432–436MHz, making it suitable for both terrestrial and satellite use. The power output of the unit is ideally suited for Oscar use, and if a higher level of power is required for terrestrial use, the 10W output level provides adequate drive for a linear amplifier. Such a linear amplifier producing 100W output will shortly be available from the manufacturer. Construction techniques are of a high standard, and the instruction book, and supplementary information, provides adequate guidance for the use of the equipment.

The MMT432/28S was provided for evaluation by the manufacturer, Microwave Modules Ltd, Brookfield Drive, Aintree, Liverpool L9 7AN, from whom it is available at a cost of £133.88, including VAT. □

RSGB QSL BUREAU SUB-MANAGERS

(At 1 July 1978)

G2:	J. W. Russell, G2ZR, 55 Holcombe Close, Bathampton, Bath BA2 6UP.
G3 and G4 two-letter calls, G5 calls:	Mrs C. Pope, G4CMM, 136 Ridgeway Drive, Bromley, Kent BR1 5DD.
G6 calls. G8 two-letter calls and	Mr and Mrs A. J. Mathews, G6QM, 62 Ashlands Road, Hesters Way, Cheltenham
G8AAA-OZZ:	GL51 0DE.
G8PAA-G8PZZ:	Mrs C. Pope, G4CMM, 136 Ridgeway Drive, Bromley, Kent BR1 5DD.
G3AAA-DZZ:	C. A. Bradbury, BRS1066, 13 Salisbury Avenue, Cheltenham GL51 5BT.
G3EAA-HZZ:	S. L. Newport, G4DEV, 101 Elibank Road, Eltham, London SE9 1QJ.
G3IAA-KZZ:	P. Lumb, G3IRM, 14 Linton Gardens, Bury St Edmunds, Suffolk IP33 2DZ.
G3LAA-NZZ:	P. Farquhar, G4FYA, 95 Agnew Road, Fleetwood, Lancs FY7 7BJ.
G3OAA-PZZ:	J. H. Brazzill, G3WP, 43 Forest Drive, Chelmsford, Essex CM1 2TT.
G3RAA-TZZ:	Mrs C. Pope, G4CMM, 136 Ridgeway Drive, Bromley, Kent BR1 5DD.
G3UAA-VZZ:	M. J. Newton, G3UKW, 53 Derwent Avenue, Garforth, Leeds LS25 1HN.
G3WAA-XZZ:	F. G. Rylands, G2VF, 39 Parkside Avenue, Millbrook, Southampton, Hants SO1 9AF.
G3YAA-ZZZ:	I. Batley, BRS39896, 3 Folldon Avenue, Fulwell, Sunderland, Tyne & Wear.
G4AAA-AZZ:	C. Johnson, BRS31379, 118 Harvest Road, Smethwick, Warley, West Midlands B67 6NG.
G4BAA-BZZ:	R. F. Rawlings, G3WBV, 74 The Lindens, Fieldway, New Addington, Surrey CR0 9EL.
G4CAA-CZZ:	P. Jobson, G3HLF, 41 The Avenue, Gravesend, Kent DA11 0NA.
G4DAA-DZZ:	D. Buckley, G3VLX, 16 Wood Ride, Petts Wood, Orpington, Kent BR5 1PX.
G4EAA-EZZ:	P. C. Barry, BRS22730, 32 Rutland Avenue, Sidcup, Kent DA15 9DZ.
G4FAA-FZZ:	Mrs A. R. Burchmore, G8LXK, 49 School Lane, Horton Kirby, Dartford, Kent DA4 9DQ.
G4GAA-HZZ:	B. R. George, G3ZOH, 2 Gleeson Drive, Orpington, Kent.
GB:	C. Turner, G8NL, 56 Sunny Bower, Tottington, Bury, Lancs BL8 3HL.
GD:	W. P. Waid, GD3GQX, 1 Mount William, Summer Hill, Douglas, Isle of Man.
GI:	R. P. Parsons, GI3HXV, 45 Erinvale Avenue, Belfast BT10 0FP.
GJ:	H. J. Chater, GJ2LU, 106 Rouge Baullion, St Helier, Jersey, CI.
GM:	D. R. Macadie, GM6MD, 11 Marchmont Road, Ayr KA7 2SB.
GU:	W. E. Butt, GU2FZC, "Meo Voto", Green Lanes, St Peter Port, Guernsey, CI.
GW:	J. L. Reid, GW3ANU, 28 Waterston Road, Gabalfa, Cardiff CF4 2SS.
BRS and A numbers:	D. Borne, G4CYW, "Roughways", Chub Tor, Yelverton, Devon PL20 6HY.

The Intruder Watch comes of age

by S. A. G. COOK, G5XB, RSGB Intruder Watch organizer, and C. J. THOMAS, G3PSM, IARU Monitoring System co-ordinator

THIS year marks the 21st anniversary of the RSGB Intruder Watch system. With a little over a year to go before the world administrations and telecommunication organizations find themselves plunging into the next World Administrative Radio Conference, it is perhaps appropriate to report in general on the International Amateur Radio Union Monitoring System and, in particular, the part played by the RSGB Intruder Watch.

Due chiefly to the energy and foresight of early pioneers, the foundations laid by the RSGB in 1957 have led to the establishment of a worldwide network of amateur band monitoring stations under the direction of the IARU, bringing together some 30 or more IARU member societies and forging links with nearly as many government regulatory administrations. For many years one member of the RSGB Council has held the secretaryship of IARU Region 1, while, since 1972, G3PSM, now also a Council member, has taken on the responsibility of co-ordinating the worldwide activity of the IARU Monitoring System. A measure of the work involved in this last operation can be judged by the monthly inflow of intruder reports which now average 2,500. These reports are cross-checked, integrated, summarized and published in the *Intruder Monthly Summary*, a document of some 20 pages, which is distributed to contributing monitoring stations and societies, and to official bodies (including the International Telecommunication Union in Geneva). The accompanying extract from a recent *Intruder Monthly Summary* gives an indication of the size of the task.

A modified report form on the lines of those now in use in Region 2 was introduced in 1976 and is depicted in Fig 1. Its introduction has resulted in a considerable saving in work and, due to the smaller size and weight, has partly compensated for the increased cost of postage. The forms are supplied as a three-leaf sandwich of ncr (no carbon required) paper, and entries are made with a ball-point pen or typewriter. The bottom copy is retained by the monitoring station for reference purposes, the top two are sent to the national co-ordinator for action, and the top copy is then detached and sent to IARUMS headquarters for inclusion in the *Intruder Monthly Summary*.

IARUMS/5

IARUMS INTRUDER WATCH REPORT FORM

Station subject to Harmful interference

Frequency in kiloHertz

Callsign of station causing harmful interference to the Amateur Service

IARUMS H.Q. COPY

Day	Month	Year	Time UT	Emm	Traffic and Comments

Fig 1. Report form (actual size 5¼ by 3⅔in)

In the UK, the RSGB Intruder Watch functions with a small but dedicated team of about 20 or so monitoring stations. More are needed for reasons which will be explained later. The monthly aggregate of RSGB Intruder Watch reports runs as high as 200 but averages around 150, and most result from normal amateur bands operation.

In any monitoring operation, accessibility of information and feedback of results is of prime importance. To this end, once monitoring stations are established they are supplied with a copy of the general procedures and instructions in order to regularize reports as regards classification of emissions, traffic description and other salient features of intruding signals. Feedback of information to monitoring stations is chiefly supplied by the *Intruder Monthly Summary*, but more detailed information, when available, is by letter from the UK co-ordinator to individual members.

Although the sheer size of the task of logging intrusions of broadcasting stations in the 7MHz and harmonically related segments is in itself a problem, an even greater one is posed by the proliferation of binary data and teleprinter communications throughout the high frequency spectrum. The 14 and 21MHz amateur bands are apparently well known as "happy hunting grounds" for diplomatic, military and commercial systems displaced by interference from their normal operating channels. As a result, QRM from these sources, being of a transitory nature but none-the-less troublesome, is difficult to identify and even more difficult to trace and make the subject of a meaningful official complaint.

Regular offenders have their identity concealed by their mode of transmission, and they present a slightly different problem. Here, the absence of sophisticated equipment in the monitoring station constitutes a limitation. A few members have simple teleprinter apparatus, but more assistance is needed from amateurs possessing, or having access to, printers capable of taking 50Bd 5-unit signals or demodulating individual channels of frequency-division and time-division multiplex circuits. Ideally one would like to provide watchers with equipment capable of handling any of the well-established systems, but it is only after looking at the price tag of a 2/4 channel time-division multiplex ARQ monitor, to quote just one of the many desirable and necessary devices, that the obstacles to amateur band monitoring stare one in the face.

However, in recent months, the RSGB Intruder Watch has achieved a measure of success in identifying some of the simpler systems by a kind of delayed action. Several watchers possessing cassette recording apparatus have co-operated in this venture by sending with their monthly logs a tape of the aggregate signals, ie the mark and space tones of intruders normally logged as "UiPr" (unidentified printer). These, when up-converted from audio

Extract from "Intruder Monthly Summary"

Freq	Emm	Dt	Times (UT)	Ident	Cl	Adm	Loc	Traffic and comments	SOI
7,038	A1	09	2320–XXXX	RGT77	FX	URS	URS	"396 DDDD (5BL)"	208
7,039	A3	17	2200–2300	—	BC	—	—	Far Eastern music	208
7,040	P9	10	2300–2400	—	—	URS	URS	10 pps	208
		11	0040–XXXX						
7,041·5	F4	09	1105–XXXX	—	—	—	—	5kHz spread	208
		25	1142–XXXX						207
7,042	F1	09	1240–XXXX	—	—	—	—	UiPr	207
		12	1230–XXXX						207
7,045	P9	03	0434–XXXX	—	—	URS	URS	±20kHz	208
		11	0238–XXXX					±10kHz	
		12	0015–XXXX						
7,050	A3	DY	0230–0600	Cairo	BC	EGY	EGY	—	999
			1800–0040						
7,050	A3	DY	1100–1730	Urumchi	BC	CHN	CHN	—	999
			2300–0230						118
7,050	P9	10	2335–2336	—	—	URS	URS	—	208
7,052	F1	07	1540–XXXX	—	—	—	—	UiPr 500Hz shift	128
		26	2021–2400						999
7,053·53	FI	07	1340–XXXX	—	—	—	—	UiPr 1kHz shift	206
7,055	A3	DY	1830–2230	Peking	BC	CHN	CHN	—	999

to radio frequency by the simple expedient of feeding the tone in question—or any others that happen to be in the recorded bandwidth—into a low level A3J exciter, are then tuned on a conventional narrow band communication receiver and offered to a time/frequency spectral display and, eventually, to a hard copy printer. Offenders, hitherto unidentified, who have responded to this treatment include examples of simple fsk (F1 U5) at 50 and 75Bd, four-frequency diplex (F6 U5 and U7) and individual components of independent sideband frequency-division complexes (A7b). Another piece of "skullduggery" successfully applied has been the separation of the two channels of a half-speed 5-unit aggregate (50Bd split into two at 25Bd with character interleaving) by the simple expedient of punching a tape of incoming or recorded signals and running the aggregate tape through a reader sandwiched together with another tape so punched to inhibit alternate characters.

Subterfuges such as these are necessarily time consuming, both for the recording monitoring station and the descrambling operator. Nevertheless the end is deemed to justify the means, and until more elaborate equipment becomes available these devices will be used to assist in unravelling the ever-increasing problems of intruder monitoring.

A further aid to the identification of intruders will be the provision of "noise-tapes" of 10 or more of the simpler forms of telegraph signals appearing in the exclusive amateur bands. These tapes will shortly be available to monitoring stations possessing a cassette recorder to enable the operators to be more precise in classifying and logging intruding transmissions.

Feedback information is also received from the Home Office monitoring station to which the UK co-ordinator refers any cases of persistent intrusions as they occur. For example, the wideband pulse signal which has plagued segments of the spectrum persistently since the summer of 1976 is being repeatedly reported to the authority, and information on the action taken has been published by the RSGB and the information media generally. This particular offender remains the subject of much investigation by many other services other than the amateur service. Recent successes made on both national and international levels include the suppression of an A9B spurious emission from ASB2 on 14,425kHz which was being copied on 14,346·1kHz, and a similar A9B linocomplex transmission from CVM5 in Uruguay which was causing some concern on 14,347kHz.

In general an intruder is not reported to the Home Office unless the incident is logged and confirmed on two occasions at the same time of day and in two different geographical locations. This is why the Intruder Watch needs more monitoring stations; more than double the present 20 is needed to produce the necessary evidence to initiate prompt action. With WARC 79 imminent, the assistance of enthusiasts with sophisticated equipment is needed to preserve our exclusive amateur allocations. □

oscar news

29MHz preamplifier

The circuit of a preamplifier recommended to increase the sensitivity of most communication receivers at the hf end of their coverage was given on page 799 of the October 1977 issue of *Radio Communication*. Many of these preamps have been built and have given good results, and AMSAT-UK is now making available a small pcb for this unit. This will be ready drilled and contain component identification. The cost is 60p each (incl p&p), and orders should be sent to the hon secretary of AMSAT-UK: R. Broadbent, G3AAJ, 94 Herongate Road, London E12.

The circuit and other satellite information appears in the 11-page leaflet *Guide to Oscar operating*, available from G3AAJ for 15p.

Satellite photographs

Full colour 8 by 10in photographic prints of WA6TUF's artist's impressions of Oscars 7 and 8 and Phase 3 are available for $3·25 each. Also available are custom painted 16 by 20in duplicates of each illustration. Write to M. Smith, AA6XI (ex WA6TUF), 25215 La Lome Drive, Los Altos Hills, CA 94022, USA. □

RADIO COMMUNICATIONS and the ITU

This is the second in the series of articles prepared by the International Telecommunication Union to mark the "Radiocommunication" theme of this year's World Telecommunication Day.

Radio makes its first steps

Early experiments

The first experimental radio transmission of a message, made in 1895 by Marconi, was the culmination of years of study and experimentation by many scientists (see "Pioneers of Radio" *Radio Communication* July 1978). But the development of radio, and its commercial application to the transmission of messages, was extremely rapid. Men were quick to realize the many potentials of the new invention, not the least of which was that it was now possible for the first time to communicate with ships at sea.

After conducting experiments with wireless telegraphy, the Russian physicist Alexander Stepanovich Popoff established a radio station at Kronstadt, near St Petersburg, in March 1897, and equipped the cruiser *Africa* with his apparatus. In 1899 wireless communication was established between the battleship *Admiral Aprasin* and the coast over a distance of 72km. On 23 January 1900, using Popoff's apparatus, a message was flashed from St Petersburg to the icebreaker *Yermak* in the Baltic Sea, instructing the crew to rescue a group of fishermen stranded on floating ice in the Gulf of Finland.

Commercial operation begins

Meanwhile, Guglielmo Marconi's Wireless Telegraph and Signal Company Limited was registered in London on 20 July 1897. The company had a share capital of £100,000 in 1898; by 1911 this had increased to £1 million, but no dividends were paid during that period. During those years the company established a commanding position in the wireless business, including a virtual monopoly in Britain and Canada.

But the field of wireless was an area of keen competition. So, for example, in Germany Adolph K. H. Slaby (1849-1913), who had himself made distinguished contributions by the invention of resonant coils to measure wavelength, joined with Count George von Arco and the AEG in the manufacture of wireless equipment. Their company and those of Braun, Siemens and Halske, were amalgamated in 1903 as Telefunken. To keep his lead, Marconi changed his business tactics. Instead of merely manufacturing equipment and selling it to anyone, he decided to organize a great wireless system of his own.

Marconi built his own transmitting stations on land, strategically located along the sea trade-routes, and placed his own operators on board ships fitted with his equipment. They were forbidden to communicate with any other wireless station on any other ship unless it also was a Marconi station. To carry out his plan, the Marconi International Marine Communication Company was created in 1900, and from May 1901 many Marconi stations were opened in Britain, Ireland, Italy, Canada, Belgium and Newfoundland. The first radio communication company in the USA was the Marconi Wireless and Telegraph Company of America; it was organized as a New Jersey corporation on 22 November 1899.

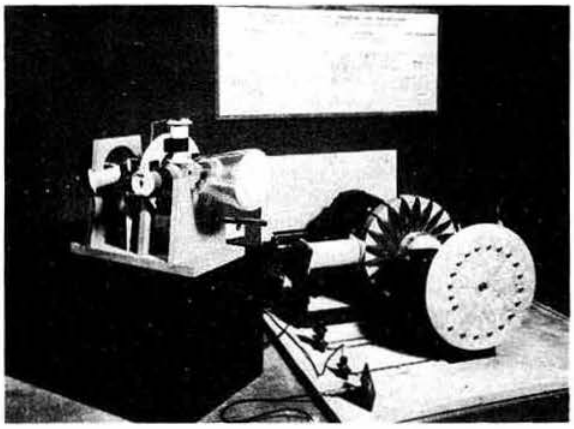
One of the scientific advisers to Marconi's British company, from 1899, was John Ambrose Fleming (1849–1945), the first professor of electrical engineering at University College, London. He certainly helped Marconi in the design of the transmitting station at Poldhu in Cornwall, which was used for the first transatlantic transmission.

The thermionic valve

However, Fleming was also adviser to the Edison Electric Light Company in London, and had made extensive studies of the "Edison Effect" in the late 'eighties.

When working with Marconi, Fleming soon became thoroughly acquainted with the coherer as a detector of wireless waves and, one day in 1904, he decided to try one of his lamps, in which a metal plate had been placed around the negative leg of the filament. When electromagnetic waves were transmitted to this lamp, and its metal plate connected to a galvanometer, a strong current was indicated. His great patent for the discovery of the thermionic valve was applied for on 16 November 1904. Two years later, in 1906, an Austrian engineer, Robert von Lieben took out a German patent covering all electronic amplifiers.

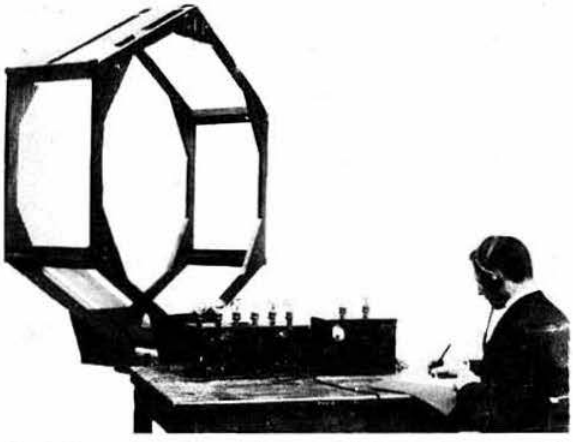
One of Fleming's early experimental diodes (Photo: *Marconi Company*)



A model of the first tv broadcast receiver made in Germany in 1906 using the cathode ray tube originally invented by Braun (Photo: *German Museum, Munich*)

One further step was needed to wean the newborn valve: Lee De Forest (1873–1961), an American radio engineer, took it quite independently of Fleming in 1906, by placing a grid between the filament, or cathode, and the metal plate of the anode. Thus the stream of electrons from the cathode to the anode, discovered by Sir Joseph John Thompson (1856–1940) in 1897, was modulated by the grid, and any weak signals passed to the grid were greatly amplified.

De Forest, with his "glass bottle full of nothing", probably contributed more to the rapid development of radio and the science of electronics than anyone else. By the middle of the 20th century more than 200 million radio valves were manufactured annually in the world. This valve, the triode or audion, was useful for the amplification of weak signals arriving at the receiver, particularly when more than one audion was used in cascade. Furthermore, when combined with an oscillator as was done by Alexander Meissner in 1913, it acted as a strong source of electromagnetic waves. By 1914 it had begun to replace the arc in radiotelephony as a producer of continuous radio waves.



A wireless telegraphy receiver used in France between 1925 and 1928 (Photo: *Thomson-CSF*)

Harmful interference

As more and more ships became equipped with wireless, so trouble began. Because the spark transmitters used a very wide bandwidth, two chatting operators would practically blanket any other vessel within 100km that might have wanted to use the air. The only way to choke them off, and it was frequently used by some who wanted to send a message, was to "drop a book on the key". This meant, literally, that a book, or any other heavy object, was put on the transmitting key, setting up such a continuous roar of interference that nobody could hear or send anything at all. Confusion was rendered worse confounded. These, and many other inevitable interferences, with everyone operating at will on the same wavelength, naturally led to wireless feuds and quarrels, filling the air with curses, aspersions, and choice obscenities. With such conditions prevailing, naturally the service was far below the efficiency it could have reached, even in those early days.

Clearly, with Marconi trying to establish a monopoly, and his operators only answering their colleagues of the same company, and with foul language being the order of the day, the need for international regulations arose much earlier in the the case of radio than for telegraphy. The first preliminary conference was called for 1903, only two years after the first transatlantic wireless signal had astonished the world.

International regulations

The physical existence of radio equipment aboard ships and in land stations was obviously not enough to ensure an efficient international service. Two radio stations must communicate on the same frequency, and if this frequency is also used by a third station then interference may occur. Throughout the history of radio it has always been the aim to choose and assign appropriate frequencies by international agreement, to lay down rules for the operation of radio stations, whether on ship, on an aircraft or on land, and to approve standards for apparatus and their operators. It was to this end that the preliminary international conference on radio took place in Berlin in 1903.

The first world war greatly stimulated the development of radio and then, in the early 'twenties, a new kind of radio service began —broadcasting. All this gave rise to a new problem—how to share out the radio frequencies over which transmissions travel so as to avoid the otherwise inevitable interference between stations. Since the use of radio constantly grows, it is a problem which has to go on being solved all the time. The international responsibility for radio frequencies is still one of the International Telecommunication Union's heaviest and most vital jobs. The first move was made at the Washington Radio Conference of 1927, which allocated bands of frequencies to all of the different radio services, including maritime and broadcasting. □

technical topics

Pat Hawker, G3VA

TO look through the display advertisements these days is to gain the impression that a high-performance hf receiver suitable for two-way dx and medium-distance working in crowded bands will inevitably cost an amateur several hundred pounds; that to put a complete station on the air could well involve an expenditure of over £1,000; and that by adding a few frills it would be easy to double that figure. Indeed it could be argued that by comparison with motor vehicles this would still be a modest price for a system that allows you to "travel" all over the world from the comfort of your own home.

There is, however, a very substantial reason why it is necessary to stress that, even if such sums may represent good value for money, a station can still be put together for a fraction of such costs, and yet give very satisfactory results. Recently in *World of Amateur Radio* I drew attention to comments from a member of the Papakura Radio Club in New Zealand who feels that the amateur fraternity has sold the hobby down the drain by allowing the trade to create a "status" for the increasingly high cost ssb transceivers that are beyond the financial resources of the school leaver and the family man. The New Zealand amateur believes this is resulting in few young amateurs being able to take an active part in the hobby. It is no good telling newcomers that they can put together a low-power cw transmitter and direct-conversion receiver for a very modest sum if the whole climate of the hobby seems intent on propagating the idea that anything other than A3j is out-moded!

Low-cost receivers

But, can an ssb/cw receiver, that can cope with modern band conditions and provide the necessary stability, still be put together on a kitchen table for say £25–£35? Clearly not, for instance, if one insists on having two 9MHz high-performance crystal filters, one for ssb and one for cw, separate crystals for the hf oscillator for each band segment, crystals for usb/lsb switching, semiconductor amplifiers and mixers of really wide dynamic range, digital readout, roofing filters, up-conversion to vhf, etc.

It is only by stripping a design down to the essentials that it is possible to achieve good performance and reasonable operating convenience *without* costly components. In essence there appear to be several approaches that can give adequate results at low cost:

(1) Direct-conversion, provided always that one takes care to avoid hum and microphony, breakthrough of strong broadcast a.m. stations, drift and oscillator pulling, and spurious responses on harmonic frequencies. A dc receiver can be simple and cheap, but in practice there are some pitfalls for the unwary.

(2) The single-band receiver (dc or superhet) which is then converted to other bands by means of a crystal-controlled converter. The 3·5 to 4·0MHz tuning range is usually the most suitable for the basic design.

(3) The *single*-crystal multi-band converter, as in the "hf gem" and "hf polished gem" described in the May *TT*, and further explored below.

The simple forms of direct-conversion result in double-sideband reception, although I have attempted elsewhere ("Radio receivers and associated systems", *IERE Conference Publication No 40*) to show that, provided a good af filter is used, this is less of a disadvantage than is often imagined, particularly for cw reception. Although this problem can be overcome by phasing-type ssb demodulators, this does make the dc receiver significantly more difficult to construct and adjust.

High performance cw receiver

Increasingly it is being recognized that there is a practical alternative—the single-band *valve* superhet receiver built along classic lines but with the added stability of a single-band vfo and possibly a crystal-controlled bfo. Recently, for example, Gerald Stancey, G3MCK, sent along an outline (Fig 1) of a *high-performance* cw valve superhet receiver covering 3·45MHz to 3·70MHz that (with careful shopping and a little luck) need cost only about £20 yet is "very nice to use and fun to make". In fact it was put together with only simple hand tools, a dc voltmeter, 500kHz and 3·5MHz crystal oscillators and some use of an HRO receiver for checking. Selectivity is provided by a Collins 500Hz bandwidth mechanical filter at 455kHz, and there would seem to be no reason why an ssb filter should not be used as an alternative.

The receiver has image rejection of about 55dB (adequate, but may be improved later by using an external

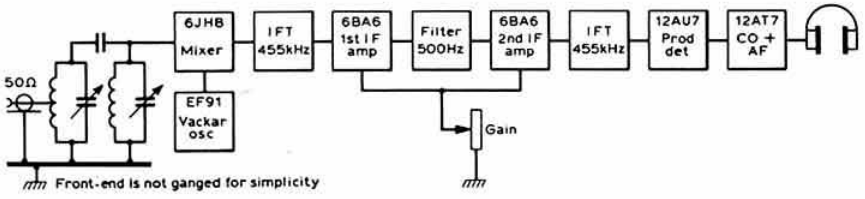


Fig 1. Outline of G3MCK's low-cost, high-performance, 3·5MHz cw receiver which, with "careful shopping and some luck", can be built for around £25. All stages are built using standard "handbook" designs. The 6JH8 is a beam deflection tube similar to (but usually cheaper than) the 7360 and is used in a semi-balanced mixer. The position of the 500kHz (mechanical) filter is discussed under the heading "Unwanted receiver and bfo hiss"

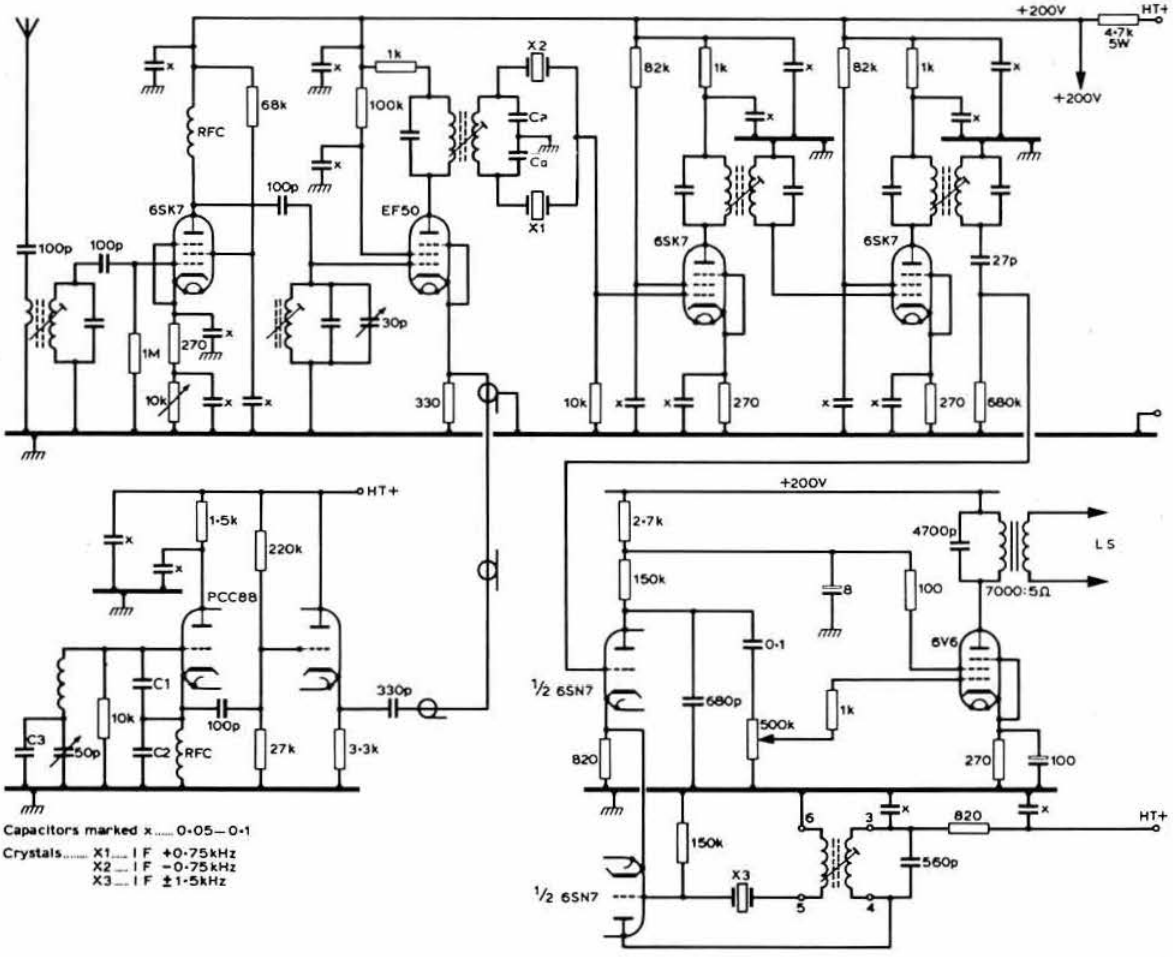


Fig 2. "Dumpmaterial" 3·5MHz receiver, described by PA0DKO in *Electron*, with two-crystal ssb filter and crystal-controlled bfo using surplus crystals based on vintage "octal" valves and EF50 pentode mixer

low-pass filter); i.f. breakthrough better than 80dB; and sensitivity about 1μV (considerably better than is needed on 3·5MHz). The HRO was used to set the oscillator range and acts as a signal generator during alignment. The absence of bandswitching and ganged tuning greatly simplifies construction. The 6JH8 semi-balanced beam deflection mixer eliminates the need for an rf stage and provides good signal handling capabilities. Although basically simple, this design is well capable of holding its own on 3·5MHz with receivers built along much more complex lines. And, if you feel the mechanical filter should be placed immediately after the mixer, I will be returning to this subject in a paragraph or two.

3·5MHz receiver with surplus material

In *Electron* (No 4, April 1978), D. Kooystra, PA0DKO goes back to the days of the 6SK7 and EF50 for his 3·5MHz receiver using "dumpmaterial". However, it is not just a question of nostalgia but of putting together a straightforward receiver which, although unlikely to be as "hot" as the G3MCK model, is still capable of good ssb performance, and can be used on other bands with a converter: Fig 2.

The single-crystal converter

In *TT* (May 1978, pp406–7) details were given of the New Zealand "hf polished gem" as a semiconductor version of the long-established "hf gem" converter for 7, 14 and 21MHz, using a single 3·5MHz crystal in fundamental and overtone modes. Since both these designs omitted the 28MHz band, I questioned whether the crystal could not be operated on its seventh overtone (24·5MHz) to provide the 28·0–28·5MHz segment of this band. This resulted in a most helpful note from Dick Rollema, PA0SE. He writes:

"In answer to your question, I can confirm that it is possible to operate a suitable 3·5MHz crystal on its seventh overtone. Since 1961 I have used a converter for the 28 to 1·8MHz bands with my tunable 3·5–4·5MHz

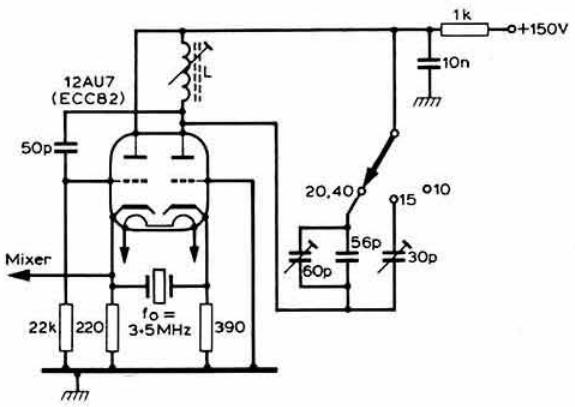


Fig 3. Overtone crystal oscillator used by PA0SE for an hf converter which, in conjunction with a 3·5MHz single-band receiver, provides coverage of all hf bands with a single crystal specified for overtone operation on 10·5, 17·5 and 24·5MHz. By using 10·5MHz injection for both 7 and 14MHz there is no problem of a strong birdie on 7MHz, as found in the "hf gem" approach, although at the cost of backward tuning on 7MHz

receiver, using a single crystal for the bands 28 to 7MHz.

"The circuit I use is the trusty Butler arrangement (shown in Fig 3). Originally the crystal was ordered specifying that it was required for overtone operation on 10·5, 17·5 and 24·5MHz and it readily oscillates as intended.

"In the 28MHz switch-position the slug in L is adjusted until the oscillator starts reliably on the seventh overtone, the coil resonating on 24·5MHz without any additional capacitance apart from the strays of wiring and valve. The 17·5 and 10·5MHz resonances are effected by adjusting the trimmers in the appropriate switch positions. I do not use the oscillator on the fundamental 3·5MHz frequency. For 7MHz the 10·5MHz injection frequency is used, as for 14MHz. This avoids any strong birdie on 7MHz, although it does have the disadvantage that the receiver tunes backwards on this band (ie tunes 3·5 to 3·4MHz to receive 7·0 to 7·1MHz). However, this was not considered a serious drawback as the dial is calibrated separately for each band. It should also be appreciated that a single calibration for 3·5 to 3·6MHz will not hold good for all bands since the overtone frequencies of a crystal are not exact multiples of the fundamental frequency; the difference can amount to several kilohertz on the higher overtones. This is due to the fact that the overtones are not electrical harmonics but overtones of a *mechanical* vibration. The same effect occurs with piano strings where the overtones are not pure octaves of the fundamental notes—one of the reasons, incidentally, why it is so difficult to make an electronic tuning device for a piano!"

Kits and components

Although I believe there are still some advantages in using valves (particularly if you have them already available) in low-cost receivers of good performance, I would not wish to give the impression that one cannot build a reasonably good receiver using modern semiconductor components and labour-saving integrated circuits far cheaper than one would have to pay for equivalent factory-built units (although these will probably include a number of facilities that add little to the basic performance as an *amateur-band* receiver).

One component distributor that seems to be doing something very practical to encourage a revival of innovative home construction is Ambit International of Brentwood (run by W. S. Poel). The company has, for instance, just published a catalogue that is a good deal more than just a catalogue, under the title "The World of Wireless—Tecknowledgey No 1" and packed with many useful application notes on receiver devices. The company even has a scheme whereby constructors with really novel ideas that could prove suitable for projects are provided with the necessary components to develop the equipment free of charge. However, W. S. Poel tells me rather sadly, "It is depressing how few serious enquiries we get under this scheme, which I feel could be indicative of a general collapse of enthusiasm".

One successful project, however, has been a single-band 3·5MHz ssb receiver/tunable i.f. system developed by D. Carey, G8HRM, and a kit of parts is being marketed at about £25. This unit is varactor tuned, uses two ics including audio output, two mosfets, two jfets and one bipolar device. Yet the company is resigned to the fact that most newcomers to amateur radio will prefer to save up for a black-box receiver or transceiver. In the USA there have been complaints that distributors and suppliers are discontinuing the handling of many of the slower moving components. It therefore seems only fair to comment that constructors in the UK are at an advantage in still being served by a number of enterprising firms.

Unwanted receiver and bfo hiss

Those readers who over the years have diligently followed the debates about gain-distribution in hf and vhf receivers may have been wondering why G3MCK puts his mechanical filter (Fig 1) a stage later in the receiver than is usually recommended these days. Most designers stress the improvement in dynamic range made possible by placing a selective filter as early as possible in a receiver, usually immediately following the mixer, or a near unity gain isolating/matching stage following the mixer.

The reason for G3MCK's departure from this practice is an interesting one that emphasizes once again that it is often only too easy in receiver design to cure one problem at the expense of another.

Originally G3MCK put his filter straight after the mixer, only to discover that the subsequent high-gain i.f. stages were themselves contributing excessive wide-band noise. This problem has been noted before (for example, *ART* 6, p113 or *ART* 5, p107) but tends to be forgotten. It is the reason why commercial designers have been forced to adopt the practice of putting a "roofing" filter early in a receiver while shaping the main selectivity by a further filter(s) later in the i.f. strip. This is effective but, of course, is an expensive technique for amateurs. So often, as G3MCK found out, it is more satisfactory, if only one filter is to be used, to put this far enough along the i.f. strip to eliminate the noise from the high-gain stages; otherwise one may finish up with a receiver of good dynamic range but which seems to lack sensitivity. Many of the

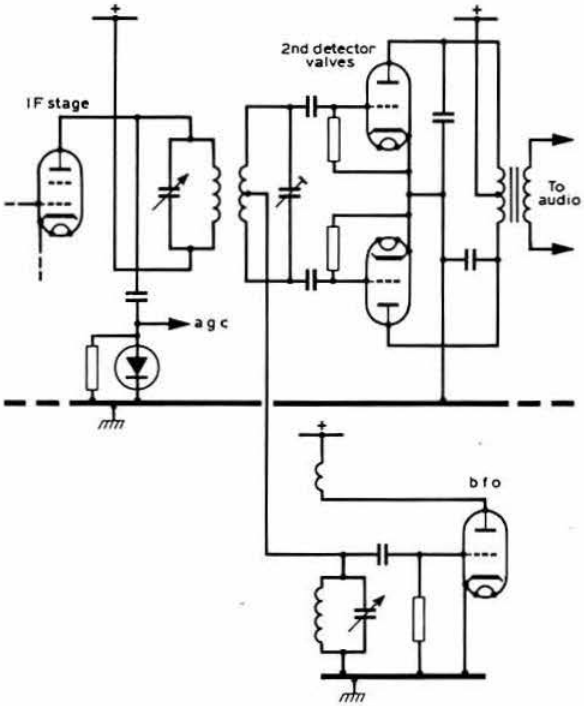


Fig 4. The circuit diagram of G6GR's "quiet bfo" described in December 1939 in an article which underlined the value of using a balanced detector to reject oscillator sideband noise appearing as "hiss" when a bfo is switched on

better receivers of the 'forties and 'fifties had their crystal filters well along the i.f. chain.

Another aspect of this same problem of introducing "hiss" into the later stages of a receiver is bfo/carrier re-insertion hiss. Many receivers have an audible rise in hiss level when the bfo is switched on, as a simple test will show. To understand more about how to overcome this problem it is worth referring back almost 40 years to a most perceptive article by E. L. Gardiner, G6GR, in *The T&R Bulletin* of December 1939, entitled "A quiet beat frequency oscillator".

What G6GR proposed so many years ago was a push-pull balanced detector (Fig 4) that, in effect, rejected the sideband noise of the bfo. Although, today, balanced product detectors are not uncommon in superhet receivers (and often recommended for direct conversion receivers), it is seldom pointed out that one of the major benefits these bestow is the rejection of bfo noise. It can also result in the agc/S-meter operating satisfactorily with the bfo switched on. The advantage is even more pronounced for the greater oscillator injection needed for good ssb reception, and G6GR emphasized that it was particularly useful when applied to wideband vhf receivers.

It is perhaps sad to reflect that although G6GR stressed the useful improvement that could be achieved with a balanced demodulator almost 40 years ago, and was puzzled that this should have "escaped the notice of the designers of communications receivers", it has by and large continued to do so, even, sometimes, when a balanced product detector has in fact been incorporated for other reasons.

With the vast majority of older receivers (and many modern ones) one still notices an appreciable rise in hiss when the bfo is on. Perhaps this is because we have all come to believe that the "noise" in a communications receiver is determined almost entirely in the front-end, overlooking that in practice a significant amount of unwanted and unnecessary noise and hum and microphony *can* come from oscillators, i.f. stages, af stages, poor smoothing, etc.

Amplitude-limited oscillators

In his notes on his Franklin fet oscillator (*TT* June 1978, p509), Harry Burton, ZL2APC, drew attention to an often-forgotten aspect of high-stability oscillators—the benefits bestowed by the incorporation of amplitude limiting. This concept was well explained by the late Geoffrey Gouriet in "High stability oscillator" (*Wireless Engineer* April 1950, pp102–115). It is worth stressing that these benefits apply not only to the Gouriet-Clapp arrangement but to *oscillators generally*, both crystal and *LC* controlled.

The history of the "Clapp" oscillator is itself a curious one. Details of this series-tuned Colpitts arrangement were first published in *Proc IRE* in 1949 by J. K. Clapp, but the basic technique had been used by the BBC in stable transmitter-drive units since about 1941, having been developed by Gouriet but, because of war-time conditions, never published. This of course was unknown to Clapp who developed the circuit quite independently in the USA some half-a-dozen years later.

In the 1950 paper, when he did finally publish his analysis of the circuit, Gouriet strongly emphasized the additional advantages to be obtained by providing an agc-type biasing system to limit the amplitude of oscillation, so making the oscillator less vulnerable to changes in ht and heater voltages applied to the valves. Gouriet underlined, by comparing an electronic oscillator with a mechanical pendulum, that to achieve maximum stability in *any* oscillator it should include some form of limiter to provide a condition of stable equilibrium when the actual amplitude of oscillation is sufficiently small to be confined to a substantially linear portion of the device characteristic. He indicated several ways this could be done, using a diode to rectify a small portion of the rf output and feeding the dc potential back as agc to the oscillator valve. Fig 5 shows the practical form of the original BBC oscillator. The tuned circuit and associated capacitors were contained in a temperature-controlled oven and considerable attention was paid to achieving good mechanical design and temperature stabilization. The measured performance of these units (working at about 1MHz) was extremely impressive by the standards of over 35 years ago (and by no means negligible even by current standards):

(1) HT/frequency coefficient ±2·5 parts per million for ±20 per cent ht voltage.
(2) LT/frequency coefficient ±2·5ppm for ±5 per cent lt voltage.
(3) Frequency stability:
  (a) Short term (about 1 hour) ±1ppm
  (b) Medium term (about 1 day) ± 10ppm

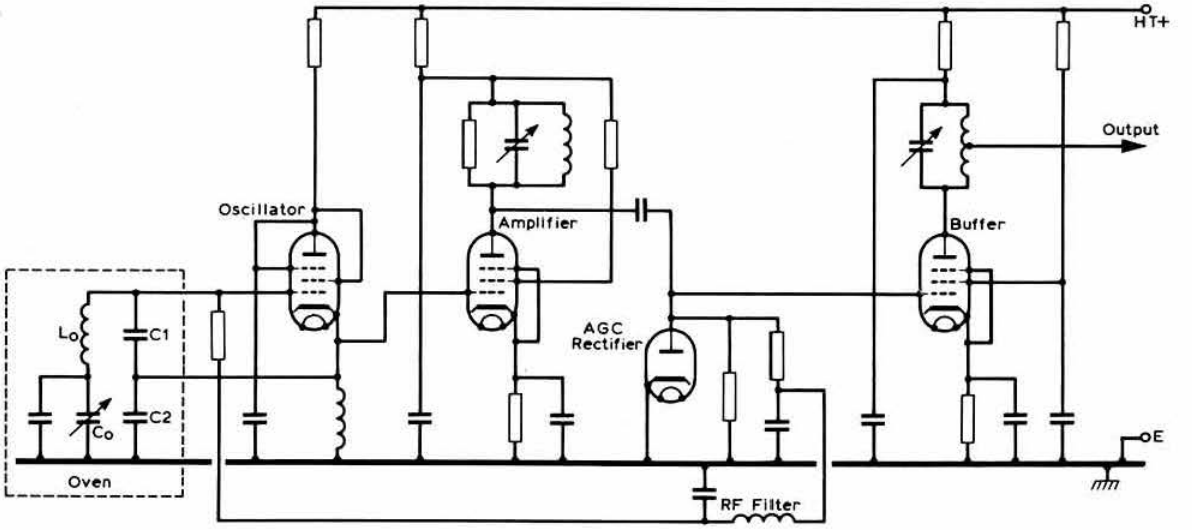


Fig 5. The practical form of the Gouriet-Clapp oscillator, as used by the BBC from about 1941, showing the incorporation of an agc system to provide amplitude limiting. Frequency stability is improved by ensuring that the oscillator device functions on a linear portion of its characteristic and also minimizes harmonic content

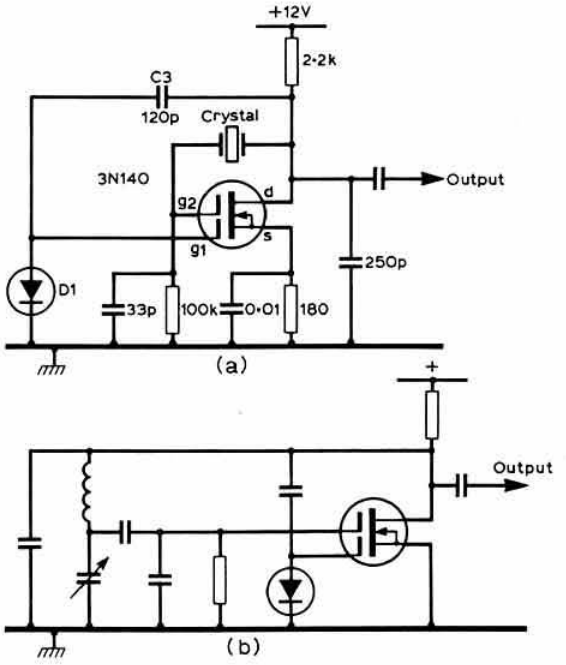


Fig 6. The 1969 Italian suggestions for the incorporation of an agc loop to provide a high-stability mosfet crystal oscillator or, alternatively, how the system might be applied to a Vackar oscillator. D1 is any good quality rf silicon diode. A discussion of this circuit appears in recent editions of *Amateur Radio Techniques*

(c) Long term (about 1 month) within re-setting accuracy of ± 30ppm.

It is also worth pointing out that the idea of limiting the amplitude of an oscillator to improve stability dates back to at least 1933 when the technique was advocated independently by L. B. Arguimbau and J. Groskowski; and several recent editions of *Amateur Radio Techniques* have included details of two dual-gate mosfet oscillators (crystal and Vackar) incorporating an agc system, as described by G. Tomasseti, I4BER and Colla in *Electronic Design* in 1969, Fig 6. This again stresses that "to obtain maximum stability from an oscillator, some form of agc loop is desirable". Admittedly this is a system that will not significantly improve a poor vfo, and is, indeed, more in the nature of gilding the lily.

Temperature controllers

In the April *TT*, details were given of a proportional control system for crystal oscillators as outlined by I6MCF, using transistors as heating elements and as temperature sensors. This has prompted Ian White, G3SEK, the Society's vhf manager, to point out that National Semiconductors has introduced an integrated-circuit temperature controller, with the type number LM3911, which combines temperature sensing and some control functions on a single chip. It is available in both TO18 and 8-pin dil packages; G3SEK has been using the cheaper dil version for about a year to provide a simple crystal thermostat. The thermostat was designed to slide over an HC6U crystal in an existing frequency counter: thus it needed to be both simple and very compact.

The circuit of Fig 7 is more or less self-explanatory. The voltage output of the sensor is proportional to temperature and is compared with a preset voltage by the on-chip op-amp. When the temperature is below the set-point (at

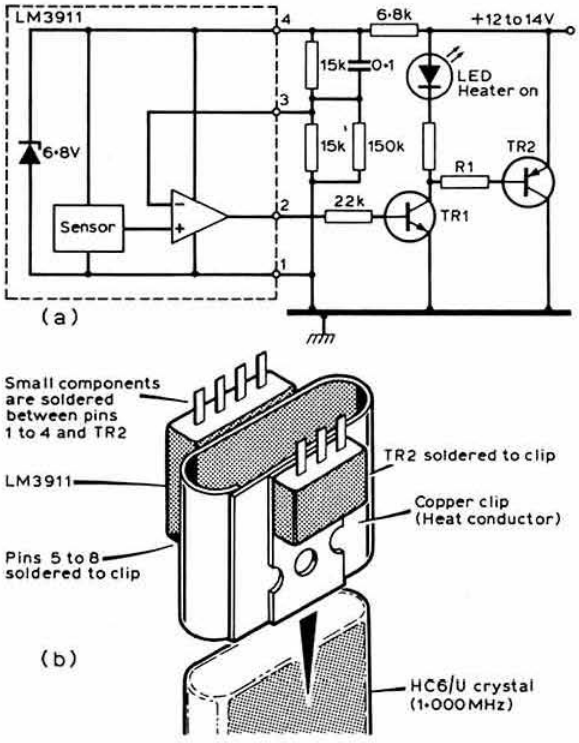


Fig 7. (a) Circuit diagram and mechanical details of the temperature control system used by G3SEK, based on the LM3911 ic. Collector of TR2 and pins 5, 6, 7, 8 of LM3911 device are soldered to the copper mounting clip. TR1 can be almost any npn silicon transistor; TR2 is a tab-mount pnp silicon power transistor

G3SEK this is about 50°C) the op-amp switches on a transistor used as a heater; on reaching the set-point the heater is turned off.

All the components are mounted on a copper clip which is shaped to slide snugly over the metal can of the crystal.

Although electrical design is straightforward (with the aid of a data sheet which is available with the device from suppliers such as Technomatic Ltd, 54 Sandhurst Road, London NW9, tel 01-204 4333), the thermal "design" requires a certain amount of trial and error. All the parts have to be in good thermal contact in order to minimize "slop" in the thermal feedback loop. R1 controls the base current of TR2 and, hence, the heater power; its value depends on the current gain of TR2, the supply voltage and the heater power required. Too much heater power leads to violent temperature overshoots and temperature cycling; too little results in a long warm-up time.

G3SEK found that with ¼in of plastic foam insulation a heater power of 2–3W gave an adequate compromise between temperature stability and warm-up time (15–20min). He also reports that the thermostat had given a good account of itself during portable operation in temperatures from below freezing to those of high summer.

Pip-tone generator

Graham Packer, G3UUS, has pointed out that now that "pip-tone" (aos) techniques have been authorized by the Home Office, readers may find useful the arrangement shown in Fig 8. Although basically designed for use with the Liner 2, it should prove suitable, with alterations to the timing capacitor if necessary, for many rigs. No internal connection to the transmitter is needed as the unit just goes into the microphone lead.

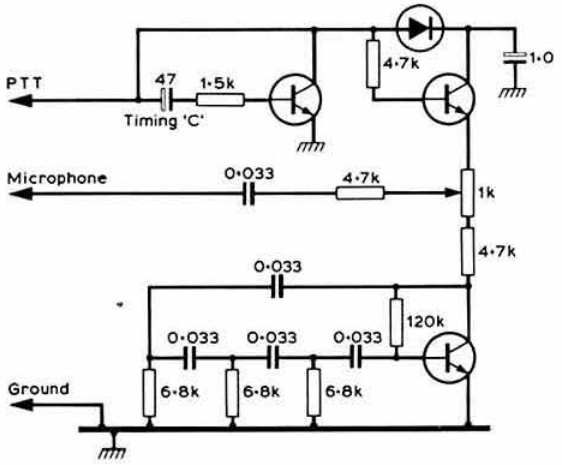


Fig 8. Details of the "pip-tone" generator used by G3UUS with the Liner 2 but which could be applied to most equipments by suitable adjustment of the timing capacitor

NE555 dc-dc inverter

David Long, G3PTU, noted the battery-charging arrangement for nicad batteries suggested by P. N. Butterfield, G4AAQ (*Radio Communication* May 1978, pp398–402). This incorporated an NE555 dc-dc inverter, and G3PTU has been surprised to find out just how much output can be obtained from the 555 when used in this way—up to about 200mA rated, possibly 500mA if pushed. This has encouraged him to adapt the system in

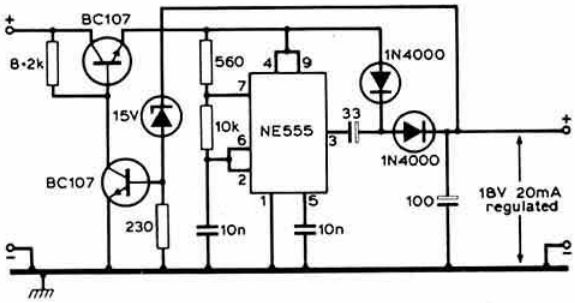


Fig 9. G3PTU's 555 dc-dc inverter used to provide sufficient voltage for operating a phase-locked-loop ic from 12V supplies

order to power an N561 phase-locked-loop ic (which requires a minimum of 18V) from a 12V source, with voltage stabilization: see Fig 9. It seems to be a useful way of obtaining a higher voltage line when using 12V power sources. □

microwaves

Charles Suckling, G3WDG *

Beacon news

Readers will be pleased to hear that both the GB3ALD (Alderney) and GB3IOW (Isle of Wight) 10GHz beacons are back on the air. The reason for the failure of GB3ALD has not been definitely ascertained; G3VPF and GW3PPF travelled to Alderney specially to find the cause of the trouble, but on reconnecting the power supply to the transmitter it functioned correctly. It is possible that low temperatures during the winter may have caused the Gunn oscillator to change mode. Shortly after switching on, GB3ALD was received at Hayling Island by G3JVL using his portable receiver.

Reception reports of GB3IOW indicate that its signal is somewhat weaker than before, due to a slightly lower gain antenna, but that it still has good coverage. On the same site, and using the same callsign, is the new 1·3GHz beacon, which has now been operational for some weeks. G3KSU, G3JVL or the writer would be most interested in reception reports of this beacon, so that information concerning its coverage area can be compiled.

From G3COJ comes the information that a new beacon is operating in Holland, using the callsign PA0QHV, on 1,296·915 and 2,304·92MHz. This beacon should be a most useful indicator of good propagation conditions, particularly on 2·3GHz where no such facility has existed before. The 1·3GHz transmission has been received at good strength by several stations in this country, and G4BYV has also copied the 2·3GHz beacon. Other reception reports would be most welcome and can be sent to A. Bol, Koninginneweg 23, Zandwoort, Holland.

Operating news

G4BYV reports that he now has several watts of ssb on 2·3GHz, from a 2C39A mixer (144 + 2,160MHz) and amplifier, using the cavities described by WA9HUV in *Ham Radio Magazine* (February 1975). He has sent full details of the system, which it is hoped to publish in the near future. With the new transmitter, G4BYV now has a regular two-way ssb path to G3LQR (Suffolk), and during a recent spell of good conditions he also worked PE0DOL and PA0DBQ, as well as a number of stations on 1·3GHz. Other stations reported active on 2·3GHz ssb are G4BEL and G3LTF.

News has just come in of some successful tests on 3·4GHz between G4BRS/P and G3FYX over a 10km path in the Bristol area. G3FYX operated from home with a 200mW transmitter feeding a scaled G3JVL loop-Yagi antenna, and a ring mixer converter. The equipment at G4BRS/P consisted of a 10mW transmitter and a 4ft dish.

In a recent letter G3NKL (Preston) mentions that there is now a considerable amount of 10GHz activity in his area, with himself, G3FNQ (Southport) and G4DBM (Preston) operational. G8JAG (Cumbria) is also reported to be active. G3NKL's equipment consists of a 15mW Gunn transmitter, balanced mixer and 17in and 29in dishes. A circulator is used to permit duplex operation with a single antenna. His best QSO so far is 146km.

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Data transmissions from GB3LBH

The photograph shows one of the nine pages of data currently being transmitted by the 10GHz beacon GB3LBH. This was actually taken off-screen after transmission over the 14km path from Romford on equipment operated at the recent Alexandra Palace Exhibition—and before it was badly damaged in an accident.

Additional pages give details of the other 10GHz beacons, with the final page being a GB3LBH caption which is displayed while the beacon continues its 10min speech/data/tone cw cycle.

One of the pages of data currently being transmitted by the 10GHz beacon GB3LBH

The equipment was designed and built by G8LLB, G8FJG and G4ALN, who were also responsible for the beacon. The modulation was supplied from a closed-loop audio cassette. The data is sent in standard Kansas City format with 1,200 and 2,400Hz tones at 300Bd. A feature of the microprocessor demodulator is that inter-page noise is rejected automatically. By using special control characters at the beginning and end of each data page, any noise present when data is not actually being transmitted is suppressed and is not displayed or printed.

10GHz net

G8ASP suggests that in view of the increasing number of stations becoming operational on 10GHz in the London area, it would be a good idea to institute a liaison net on 144·33MHz to arrange tests, meetings etc. He suggests that stations should call on this frequency at 2030 local time on Sunday evenings. G8ASP also mentions that both he and G8ADC will be operating for the remainder of the 10GHz Cumulative Contest periods from Dunstable Downs, and that they will also be taking out equipment for 3·4GHz.

(Continued on page 698)

Microwave band planning

R. L. DAIN EVANS, G3RPE, by
RSGB microwave manager

AS was noted in the report on the recent Region 1 Conference (*Radio Communication*, July 1978), the opportunity was taken during the first-ever microwave session to plan the microwave bands for the first time on a regional basis. The purpose of this article is to summarize the conclusions.

The reported microwave allocations in each country are shown in Fig 1. While many countries share the same allocations, there are obvious exceptions. For example, only five countries have an allocation at 3·4GHz. Several countries have smaller allocations, while some countries such as Norway, Poland and Italy have recently received allocations (albeit small in some cases) where previously they had none. Perhaps the most worrying is the case of France where their original "standard" allocations have been progressively and drastically reduced over the last few years.

In attempting to make a sensible band plan, several factors were borne in mind:

(a) It was necessary to plan on the basis of our existing allocations. Although there will inevitably be some changes as a result of WARC, these would not in any case take effect until 1981.

(b) It seemed sensible to plan in terms of the wider allocations but to bear in mind the reduced allocations in some countries.

(c) The optimum degree of band planning at a particular time is difficult to decide. With too little planning there is a danger that effort will tend to be dispersed frequency-wise, with the risk of producing incompatible equipment (as may now be the case on 10GHz). On the other hand, planning in too great detail is at best pointless or at worst destructive if too rigid or too restrictive in techniques to be employed.

(d) Within some allocations, pulse modulation is permitted. At the conference it was strongly recommended that we should attempt to keep these facilities and to retain allocations sufficiently wide to contain these modes and the guard bands necessary.

(e) The narrow-band segments to be $n \times 1{,}152 - n \times 1{,}152 + 2$MHz. The basic drive frequency of 1,152MHz also fits in with 1·3GHz practice (ie $1{,}152 + 144 = 1{,}296$MHz), and harmonics of 1,152MHz also extend into proposed bands above 40GHz.

(f) Beacons to be, at least initially, on harmonics of 1,152·00MHz. The main advantages of this were outlined in conference document M/T33 (also *Radio Communication* May 1977, pp370–1). These include the possibility of operating beacons at several frequencies derived from a single driver, which could simplify the construction of beacons and make them more valuable as propagation indicators.

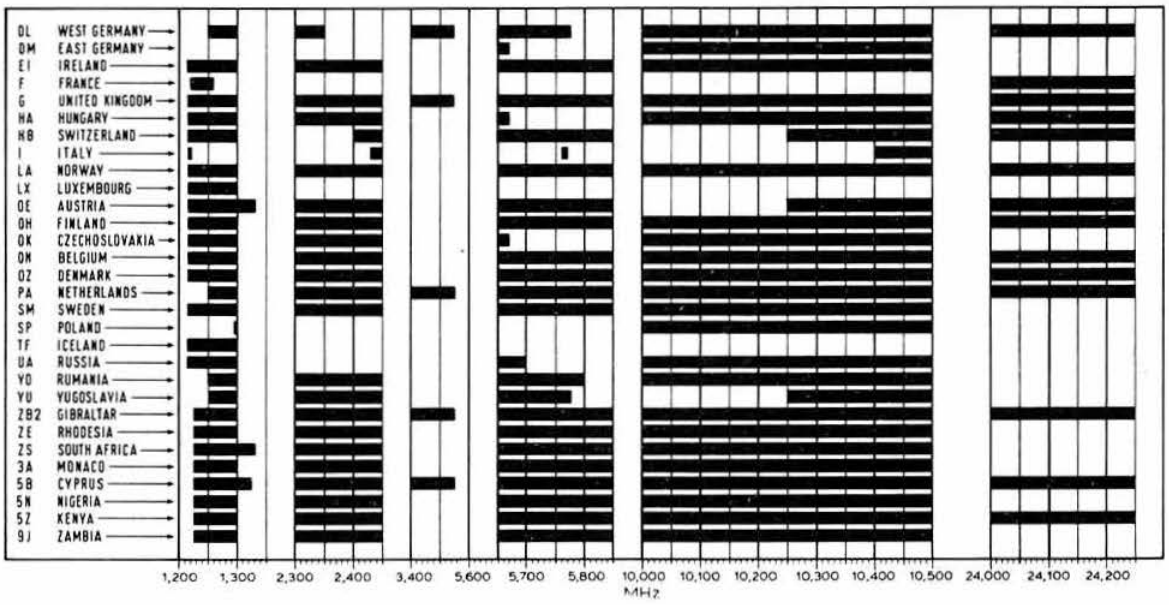


Fig 1. Region 1 microwave allocations. The following have no allocations above 1GHz: CN, EA, EL, LZ, OD5, OY, SV, 4X, 7X, 9G, 9H and 9Q

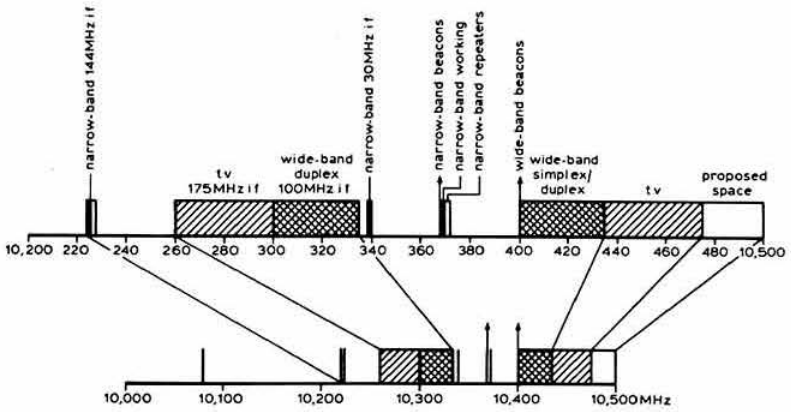


Fig 2. Provisional 10GHz band plan agreed at the Region 1 conference in Hungary, April 1978

Provisional microwave band plans

2·3GHz

MHz	
2,300	Band edge
2,300–2,310	Proposed space allocation
2,304–2,306	Narrow-band working frequencies
2,304·00	Narrow-band beacons
2,304·2	Narrow-band spot frequency
2,350–2,400	Pulse transmissions
2,390–2,400	Proposed space allocation
2,450	Band edge

Note: DL repeater on 2,303·925–2,348·925MHz

3·4GHz

MHz	
3,400	Band edge
3,400–3,410	Proposed space allocation
3,456–3,458	Narrow-band working frequencies
3,456·00	Narrow-band beacons
3,456·3	Narrow-band spot frequency
3,475	Band edge

5·7GHz

MHz	
5,650	Band edge
5,650–5,670	Proposed space allocation
5,700–5,800	Pulse transmissions
5,760–5,762	Narrow-band working frequencies
5,760·00	Narrow-band beacons
5,760·5	Narrow-band spot frequency
5,850	Band edge

10GHz

MHz	
10,000	Band edge
10,080–10,082	Second channel 10,368–10,370MHz, 144MHz i.f.
10,224–10,226	Narrow-band duplex 144MHz i.f.
10,226–10,228	Narrow-band repeater 144MHz i.f.
10,260–10,300	TV duplex 175MHz i.f.
10,300–10,335	Wide-band telephony 100MHz i.f.
10,338–10,340	Narrow-band duplex 30MHz i.f.
10,368–10,370	Narrow-band working frequencies
10,368·00	Narrow-band beacons
10,368·9	Narrow-band spot frequency
10,400	Wide-band beacons
10,400–10,435	Wide-band simplex and duplex 30MHz i.f.
10,435–10,475	TV duplex 175MHz i.f.
10,475–10,500	Proposed space allocation
10,500	Band edge

24GHz

MHz	
24,000	Band edge
24,000–24,050	Proposed space allocation
24,192–29,194	Narrow-band working frequencies
24,192·00	Narrow-band beacons
24,250	Band edge

(g) At the conference there was considerable demand for frequencies for working duplex, especially at 10GHz. The preferred spacings were:
30MHz for both wide- and narrow-band working;
100MHz for wide-band working only;
144MHz for narrow-band working only.
A spacing of 175MHz for tv on 10GHz was also suggested.

(h) Narrow-band spot working frequencies to be harmonics of 1,152·1MHz; later 1,152·05MHz, 1,152·15MHz as necessary.

(i) In planning the 10GHz allocation, the most important consideration seemed to be to minimize the risk of equipment being built which was incompatible with other equipment or which was difficult to improve. For this reason it was logical to concentrate both narrow- and wide-band operating at the higher frequency end of the band. This also fitted in with those countries with reduced allocations, especially Italy (10,400–10,500MHz). In practice, QRM is unlikely to be a problem, so that a less-than-rigid adherence to the rather detailed plan will cause few problems.

The tables summarise the general position on a band-by-band basis. The information for 10GHz is also given in Fig 2. □

MICROWAVES

(Continued from page 696)

Equipment for disposal

GM3DXJ has a quantity of waveguide components for disposal, including a large amount of "quasi-WG12", which is suitable for 3·4GHz, as well as some WG16, 18 and 20. Anyone interested in relieving him of this is asked to telephone him on 031-449 4533 to arrange collection.

Polarization

In response to several letters from stations new to the microwave bands, this opportunity is taken to restate that horizontal polarization is the standard. When waveguide is used, this polarization corresponds to the broad face of the waveguide being in the vertical plane. □

4-2-70

Graham Knight, GM8FFX*

Raynet frequencies

At a recent joint meeting of the VHF and Raynet committees the following frequencies were confirmed for Raynet use: 144·800, 144·825, 144·850 and 144·875MHz. Peter Balestrini, G3BPT, the RSGB emergency communications manager, stated that more than 50 per cent of the Raynet groups throughout the country were already operating on these frequencies in the all-mode section of the band. Some operation was still taking place on 145·200MHz, and on 145·800MHz on a shared basis. It was also noted that just as sstv enthusiasts tend to congregate around 144·230MHz on ssb, Raynet operators tended to be around 144·260MHz. On 432MHz, Raynet uses 433·200 and 434·800MHz; these frequencies have not been allocated to repeaters as they may eventually be used for Raynet talkthrough.

Since the above frequencies were read out on GB2RS many letters have been received about Raynet from both dx and fm operators. Most letters mention Raynet groups operating on popular fm frequencies, and a very considerable number of letters from the Midlands mention Raynet groups operating in the exclusive ssb section of the band—with some Raynet fm operators even on 144·300MHz. Many letters state that it is obviously pointless trying to carry out serious Raynet communications on frequencies already carrying a great deal of amateur QSOs. Let us hope that the use of the allocation in the all-mode section is welcomed and respected by all vhf amateur operators.

Shetlands expedition

Three operators from Holland, PA3AHD (formerly PE1AVU), PE1CAL and PA2DWH, went on a dx expedition to the Shetland Islands in June, operating on 144MHz from both the ZT and ZU QTH locator squares using the callsign GM5CJF/P. As a result of early publicity for the trip in *Radio Communication*, GB2RS and other European magazines, the group had many prearranged schedules which kept GM5CJF/P on the air 24 hours a day for two weeks. Breaks were only taken to refill the generators or repair gale damage to the tent.

The group did exceptionally well on meteor scatter, having completed QSOs with 50 stations all over Europe. The best ms contacts were with DM2BYE (HM53a), DM4PSN (GK07c), DL7QY (GM48b), F9FT (CJ51f), OE3UP (HI70j), SL2CU (LZ), SM2CKR (KX12b), SK6AB (FR30c), UC2ABT (NN18a), UR2RQT (MS80e) and YU3TCD (GF39d), plus many more G, DL and PA0 stations. Most of the meteor scatter contacts were completed well within their scheduled times, and it is a measure of the group's success that some very respected ms operators have still not had 50 completed contacts.

*PO Box 49, Aberdeen AB9 8JA

The cw keyer designed by PE1AVU and used by the expedition, incorporates two separate 1,024-bit memories and it is capable of sending at a maximum speed of 500 characters/min. A four-speed reel-to-reel tape recorder was connected to the audio output socket on the Icom IC211E transceiver to assist in the reception of the high-speed cw.

The ms schedules were abandoned for a short time on the afternoon of 4 June when a sporadic-E opening occurred. In the 30min following 1730gmt, GM5CJF/P worked cw with OK2LG (II24b), OK3TJK (II46g), OE3UP (HI70j), and ssb with OE3XUA (HH10b) and HG3VJ. It is interesting to note that these contacts were made from one of the most northerly points in Britain at exactly the same time as stations in Cornwall and Wales were working to CN8CC in Morocco, and ZB2VHF was being copied on 50MHz in America.

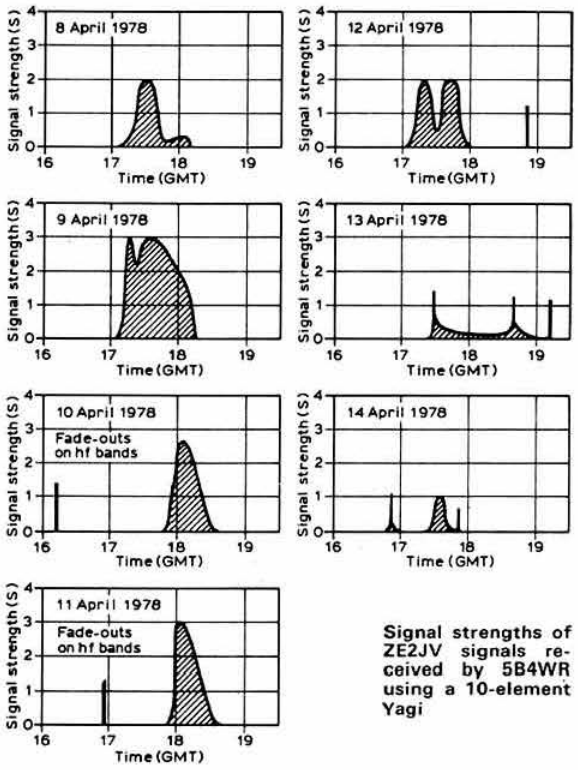
Later in the day the GM5CJF/P group again struck gold when an auroral opening started at 2220gmt and lasted until 0145gmt. The expedition stayed mainly on cw during the event and had QSOs with 68 stations, with the best dx being G3NSM, G4DEZ, G4DGU, G4FUF, G4FAB (YN37c), GI4GVS, GI5AJ (XO22j), SM3AKW (IW30e), SM5EKQ (HS47d), UR2DZ (MT54h), UR2NW (LT74d), and, best of all, OH2CX in QTH locator square MU65c.

A total of 19 hours per day was devoted to ms contacts, with the remaining five hours in the evening being used for normal tropo contacts with stations ranging from GD3UMW to OZ10F. The three operators worked 21 countries and proved it is possible to go to the far north of the UK and still work 144MHz dx every day if the expedition is well prepared and equipped for high-power operation. The problems in mounting an expedition of this type to the Shetlands from Holland are immense, and PE1CAL, PA2DWH and PA3AHD are to be congratulated on their achievements. The group is already planning another 24-hour-a-day expedition to a "far-away place" for next year—in fact they left the GM8FFX QTH saying they were thinking of an island a long way to the north-east of Shetland—we all have a year to brush up on our ms techniques and to ponder on this last tantalizing piece of information.

Transequatorial propagation

Signals from Ray Cracknell's ZE2JV beacon on 144·118MHz were first heard in Limassol, Cyprus, by Nic Kyriazis, 5B4AZ, at 1725gmt on 8 April 1978. He alerted Roland Whiting, 5B4WR, who checked the frequency and confirmed reception. From then on, 5B4AZ and 5B4WR, who had both been sceptical of the original 144MHz te reports, turned into true believers and have since monitored the frequencies with fervour. The graphs show the duration of the openings and the average signal strengths received in Cyprus from the ZE2JV beacon for the period 8 to 14 April. These openings coincided with an ionospheric storm which caused bad reception and fade outs on the hf bands on 9, 10 and 11 April. On 10 and 11 April, reception on frequencies below 21MHz was very badly affected.

Throughout this period the beacon signals received at Cyprus displayed the rapid and irregular flutter fading which is characteristic of the transequatorial circuit. Signals were also sometimes accompanied by echoes of a



Signal strengths of ZE2JV signals received by 5B4WR using a 10-element Yagi

fraction of a second duration, and were also characterized by an increase in bandwidth of up to 4kHz. The ZE2JV beacon transmission is on F1 with a small amount of shift. 5B4AZ and 5B4WR soon found that the use of narrow filters in the receiver to improve the signal-to-noise ratio did not help, but on wide-band reception they had to cope with local man-made interference—there is very little ignition suppression in Cyprus. Two-way contacts took place between ZE2JV and 5B4WR on 10 April at 1800gmt, and between ZE2JV and SV1AB on 12 April, also at 1800gmt. Ray Cracknell reports that these record-breaking contacts had severe flutter and frequency spread, making it very difficult to get a satisfactory beat note with the bfo.

Ray Cracknell has arranged for his beacon to transmit 50W to an 11-element horizontally-polarized Yagi antenna, leaving breaks in the transmission so that any operators hearing the transmission on 144·118MHz can break in. Ray then switches to his 200W rig and replies to any caller. Because of the flutter fading and, sometimes, echoes, ZE2JV and 5B4WR have devised a simple calling and reporting procedure for initial contact:

1—signal occasionally readable;
2—signal readable with difficulty;
3—signal readable without difficulty.

The transmitting station uses the above code, sending his own callsign only, eg 5B4WR 5B4WR 5B4WR 1 1 1 1 5B4WR.

The 144MHz te openings continued into May and June, starting with an F1/A1 QSO between ZE2JV and SV1DH on 8 May, with signals peaking S6 but again with flutter fading. Roland Whiting copied the ZE2JV beacon in Cyprus on 9, 13, 14, 15, 16, 17, 18 and 19 May usually around 1800gmt. Good signals were also copied on the 5B4WR–ZE2JV path of 5,970km at the late time of 1904gmt on 2 June.

Both ZE2JV and 5B4WR are having great difficulty in persuading other stations in Europe and Africa to join in, as Ray and Roland have certainly proved that very long distance te contacts are possible on a regular basis. 9H1CD in Malta heard the ZE2JV beacon on 14 May, and perhaps by the time this appears in print many more stations will have had 144MHz transequatorial contacts. A te net for Europe and Africa is held on 28·310MHz at 1500gmt, and the net controller ZE2JV invites vhf stations to break in with reports and comments.

Once again amateurs have demonstrated that they are in a unique position to record and utilize such rare propagation phenomena. But for 5B4AZ's careful and persistent monitoring of ZE2JV's beacon the 144MHz transequatorial path between Limassol and Salisbury would have passed unnoticed.

Many other interesting transequatorial contacts have been taking place in the last few months throughout the world. On 24 February at 1159gmt JH6TEW in Kikuchi City, Kumamoto, Japan, worked VK8GB in Darwin, Australia, on 144MHz te. The Japanese station is located 32°N of the equator and Darwin is 12°S, both stations lie on the 130°E longitude line, and this almost exact north–south path is a distance of 4,992km. It is also interesting to note that this QSO took place at 2000 local time—the same local time as the ZE to 5B4 contacts.

A glance at a recent Japanese *CQ Magazine* reveals that te on 50MHz is really alive in the Pacific area, with many low-power JA stations working dx thousands of miles away. Using rigs like barefoot Yaesu FT620s, they are contacting 3D2 (Fiji), FK8 (New Caledonia), KG6 (Guam Island) and YJ8 (New Hebrides), to say nothing of VKs and ZLs.

From Mexico XE1GE worked CE3OK and LU3EX on 50MHz te ssb on 24 February. Earlier, on 13 February, YV5ZZ heard LU3AAT on 432MHz transequatorial for a short burst of just 30s. YV5ZZ has had to curtail his te contacts to let him get on with making improvements to his moonbounce system.

Sporadic-E reports

As reported in last month's late news, an unsual Es opening took place on 4 June when G3XCS, G4GHI, GW4CQT and GW8FTA all contacted CN8CC in Morocco on 144MHz ssb. CN8CC's home callsign is F6CVE and he is located 20km north of Casablanca, and uses 10W to an 8-el antenna. At 1741gmt on 4 June LZ1AB (LC27d) worked two stations in Yeovil; G4GHI running 40W, and G8MZI running just 3W from an IC202. At 1105gmt on the same day another operator with an IC202, G8HWD in Norwich, worked I7KBI (IB75a), I7LQY (IB53a), and I7UCT in HB27c. At 1400gmt on 8 June Mike Lee, G3VYF, in Basildon, worked 9H1CD, IT9XIX (HX36), I2CVC/7, I7LVI and I7WAF in JA62e. Smaller Es openings continued in June: G3FPK at Purley working OK3CDR on cw at 1015gmt on 19 June, and a day later Ron Marriot, G3LTN, at Barkway, worked 9H1BT at 0948gmt.

Meteor scatter

There is always dx available to those with the patience and skill to operate using ms techniques. Clive Penna, G3POI, has been very active on ms with more than 20 completed contacts in the month of June, including QSOs with F1CQ (CD22g), F1EWG (ZD48j), OH1FA (LU42h), HG6KVB/P (KH01g), YU2RGO (IF01a) and, at long last, CT1WW in WS63b.

Alistair Simpson, GM8NCM, got up at 5am to try ssb ms, and was rewarded with a QSO with F6FHP in AE21g. The distance was 1,384km and the contact was completed in less than an hour via nine pings and seven bursts, including one of 55s.

Tropo conditions

There have been frequent tropo openings on both 144MHz and 432MHz during the mid-summer period. On 144MHz the G stations have been working many Scottish dx expeditions. GM3JIJ/P in Stornaway in the Outer Hebrides was very much in demand from operators seeking the QTH locator WS69c. The formerly rare square of ZR near Peterhead had quite a high level of activity, with expedition stations GM8LHT/P, GM4AWU/P and GM8MJV/P all operating at times of excellent tropo conditions. Paul Widger, GM8AGU/P, and Ian McHardy, GM3JFG/P, put the Island of Barra on the map in a big way, and GM8OVN came on from the extremely rare XS square. During these conditions GM8AZS/M, driving 30 miles north of Aberdeen, was able to work through the Kent repeater GB3KR with a barefoot FT221R.

The peak of these openings occurred on the nights of 17 and 18 June when OY5NS caused a sensation by putting a 5 and 9 signal as far south as Norfolk. OY5NS, who uses 80W output of ssb to a 10-el antenna, had stations piling up 10 deep to work him. On the same days the Lerwick beacon GB3LER was heard at S9 in London, Amsterdam and Hamburg. Many low-power stations in the southern half of the UK were able to work to Norway for the first time, with LA3EQ, LA5KQ, LA6HL and SM7GWU in QTH square CW66 being the stations in most demand.

What can only be described as pandemonium broke out during the openings on the repeater frequencies. DX stations were accessing British repeaters and Continental repeaters were appearing on frequencies normally occupied only by British repeaters. Several requests for QSL cards were heard on various repeaters, and prompted Jack Hum, G5UM, to write to *4 – 2 – 70* to remind operators that awards are only issued for direct contacts.

The same good conditions also existed on 432MHz, with G4DGK in London being a tremendous 5 and 9 plus signal at Aberdeen on the morning of 18 June. G8ARM, DB1BP, LA6HL, LA8UU and SM6HYG were also outstanding signals on ssb, with G8ACN at Saffron Walden being the strongest on fm. In many cases signals on 432MHz were stronger than on 144MHz, especially as most were running 10W direct from transverters.

Supreme Award for G3OSS

Supreme Award No 21 goes to Angus McKenzie, G3OSS, of North London. He already held Senior Awards for 144MHz and 432MHz, then a contact with G3LDR in Tyne and Wear gave Angus his 60th county on 70MHz and, in consequence, the Senior 70MHz Award No 38. This made up the trio of Seniors required to qualify for the Gold Leaf Supreme Award No 21, an outstanding effort when the low population of 70MHz is borne in mind. All the 70MHz enthusiasts realize the QSL problem and are very ready to oblige in order to help others to achieve what has become one of the most difficult of all the awards.

In fact, an increasing number of 70MHz operators are sending *pro formas* with all contact details already filled in; all the recipient has to do is verify the contact in the station log, sign it and return to the sender. An elegant example of the reply card type QSL is provided by Tony Oakley, G8IWA, of Beverly near Hull. Awards manager, Jack Hum, G5UM, came across it when checking Tony's claim for a 432MHz Standard Award (he earns No 133). G8IWA's card is self-addressed and carries the QSO details on one side, on the other is a politely worded message: "Dear . . ., with the ever increasing costs of printing and postage one cannot expect that every amateur will wish to produce QSL cards to confirm every QSO. Nevertheless it remains a fact that the QSL card is the one piece of evidence required by other amateurs interested in obtaining achievement certificates. While I would of course prefer your own personalized QSL card to confirm this QSO, should you not wish to send me one I would be obliged if you would sign on the reverse side of this card and return it to me. A stamped addressed envelope is enclosed for your further convenience". G5UM observes that it would be a very stony-hearted member who failed to respond positively to such an approach.

REAL DX 1978

70MHz aurora	G3SPJ-GI3RXV	570km
70MHz tropo	GM3WOJ-GU3HFN	590km
144MHz tropo	GM8MBP-DF5GX/P	1,300km
144MHz aurora	G4FUT-RR2TEJ	2,100km
144MHz ms	GM5CJF-YU3TCD	1,910km
144MHz Es	G3LTN-9HICD	2,200km
144MHz eme	GW4CQT-K3NSS	4,500km
432MHz tropo	VK6KZ-VK3ZBJ	2,460km
432MHz eme	G3LTF-JA6CZD	13,600km

The grapevine

Further auroras on 12, 26, 29 and 30 June . . . Was G4GPO the first UK station to work Belgium on 70MHz . . . Martlesham Contest Group members relieved to hear that recently-engaged G3XDY has not booked the wedding to coincide with the September 144MHz Contest . . . The French-made F9FT antennas are being imported into America in very large numbers since they won the West Coast Antenna Gain Measuring Contest. K2UYH is using eight of the F9FT 16-element Yagis for his eme dx expedition to W0 and W7 . . . Wrong for a former Council member to be operating on fm on 144·300MHz . . . ZB2VHF is on 50·004MHz. The ZB2 beacons are soon to move to a site at the top of the rock. Reports on any ZB2 beacon would be welcomed by ZB2BL at PO Box 292, Gibraltar . . . G4CMV heard a three-minute burst on SM3BIU during the June Perseids shower. □

the month on the air

John Allaway, G3FKM *

THE opening paragraph in September 1977 *MOTA* referred to the fact that an official letter from the Nigerian Ministry of Communications (Radio Services Branch) had stated that amateur licences were not being issued in Nigeria until the present state of emergency in that country comes to an end. The paragraph also pointed out that users of 5N2 callsigns other than 5N2NAS were probably not licensed, and that this was a very bad state of affairs as pirate activity could possibly affect the attitude of the Nigerian Government to amateur radio at WARC 1979. In other words support for properly licensed amateur radio was expressed and pirate activity condemned.

Sadly, this comment has produced a letter from WO II Oyekunle B. Ajayi, secretary of NARS, in which he accuses RSGB (in the form of the writer) of interfering in the affairs of a fellow IARU Region 1 member society, and also of not being aware that amateur radio is not a political or profitable hobby. Your scribe feels that perhaps there may have been some misunderstanding due to language difficulties, but does wish to emphasize that RSGB supports *officially approved* amateur radio activity in *all* countries.

(A further letter from Mr Ajayi, addressed to IARU Region Secretaries, makes it clear that the following stations are all officially recognized by NARS and the Nigerian Ministry of Communications: 5N2AAJ, 5N2AAE, 5N2AAK, 5N2AAV, 5N2NAS and 5N2ESH, plus any other amateurs operating from the club station 5N2NAS. Licensed amateurs who are expecting to visit Nigeria are invited to write to NARS, PO Box 2873, Lagos, Nigeria, for advice.)

VE3IXH (whose home callsign is G3ZLE) has written to say that he is receiving QSL cards for alleged contacts made with his UK callsign. He is at present living in Canada.

G4FQE, hon secretary of the Bury Radio Society, reports a case of interference with a contact between F6CYL and P29JS by a station using the callsign G3BRS. The society wishes it to be known that this unpleasant incident was not caused by their club station G3BRS or by any of their members.

News from overseas

John Sainsbury, ZL1WJ, (formerly G8HV, ZL2ASA, 9J2HE, VS9AHE, 5Z4HE, 5X5HE, 5H3HE, VQ1HE, VQ4HE, VQ3HE, VQ5HE and ZE6JS) was due to arrive at Tarawa Atoll in the Gilbert Is by the end of June. He was taking his FTDX560, FL2000 and a KW trap dipole—the latter to be stretched between two conveniently placed coconut palms. A beam is to be acquired

John Sainsbury, ZL1WJ etc, who is now in Tarawa, Gilbert Is

in the near future and John already has a rotator. He hopes to have the callsign VR1WJ and he should be in VR1 for two or three years. He expects to keep schedules with VK3PA and ZS4MG daily at 0500 on 14.138kHz and at 0515 on 21.200kHz until 0630. It is intended to operate on all bands except 1·8MHz using both cw and ssb, and calls should be made within 4kHz either side of his frequency. John says that QSLs for all his previous operations are still available (with the exception of ZE6JS) by direct application to him at the address in "QTH Corner". Adrian Sainsbury, John's son, was once VS9AAS, and still has QSL cards and his log—he may be reached (as may ex-VS9AMT) at the other addresses given in the same list.

Vin Callaghan, G3JMH, reports that the information given in May *MOTA* concerning WA2DWE's handling of QSL matters for ZD7SD and ZD7SS is no longer correct. Cards should now be sent direct to the address in "QTH Corner". Sybil and Bill would like to apologize for the delays in QSLing which have taken place since last December when the Union Castle liners discontinued their calls at the island and no mail arrived until 9 June. There is no landing strip on St Helena, and all mail and cargo is carried by sea.

Ian Wollen, G3UZI, who was in Sri Lanka for many years as 4S7IW (and then became MP4BGS, MP4MBK and MP4TCD), recently visited Tobago. He visited Sunny, 9Y4DL, who is surgeon in charge at the Tobago hospital, and who was previously in the UK for 16 years in Newcastle and Edinburgh. Sunny is the only active amateur in Tobago and has an SB104 with linear and tri-band beam. He enjoys contacts with Britain.

G4DBR reports that Basil Lepine-Williams, VR4LW, who is with the Church of Melanesia in the Solomon Is, is looking for UK contacts. Basil and some other stations in the same area meet most days at 0800 and 1730 on 14.315kHz. VR4LW is happy to arrange schedules—please write to him at the address in "QTH Corner".

5Z4QP (Mombasa, Kenya) will close down at the end of July and return to the UK. Tony says that his equipment consisted of a KW2000A with 14 and 7MHz

*10 Knightlow Road, Birmingham B17 8QB.

Adrian Sainsbury, VS9AAS, Khormaksar, Aden, 1964-1966. Equipment consisted of HT37 transmitter with SX111 receiver and quad at 90ft

dipoles. All QSLs will be despatched via the bureau, and G3TRR will be reactivated in the near future.

DX news

ZL4QL/A is now on the air from Campbell Is. ZL4LR/A keeps a schedule with N2OO on Fridays and Saturdays at 0430 on 14,305kHz, and also operates on cw before this time on 14,009 or 14,030kHz where he seems to listen for callers about 3kHz higher than his own frequency. There is a possibility that he may also be found on 3,509 and 7,009kHz, and he is also occasionally in the Pacific DX Net at 0600 on 14,265kHz. Those still needing a QSL for a contact with ZL3LN/C on Chatham Is between January and July 1976 are advised to contact ZL4DE who may be able to help.

VK9ZM has now commenced operation from Willis Is and keeps a regular schedule with his QSL manager, VK4ABW, on Wednesdays at 0630 on 7,110 or 14,110kHz, and on Saturdays at 2200 on 14,110kHz. He has a linear and a beam antenna and should be on the island for some time; he is equipped for all bands 1·8 to 28MHz.

CO2FT/ET2 has been heard at 2300 in the 14,125—14,035kHz area, but seems to prefer working stations in other socialist countries. WA3WAJ/TJ is being worked several days each week around 2100 on 14,205 and 14,300kHz. He will be there for three years and asks for QSLs via W4DTO. TJ2P is also on quite often at the same time around 14,210kHz.

WA6OXZ/VQ9 was due to leave Chagos during June. However, a new operator—WA4YVG/VQ9—has appeared on the bands and he should be on the islands for a year. WD9FCC/VQ9 is also still active.

ST0RK has a new tri-band beam and should be sought between 0600 and 0900, and between 1900 and 2100, around 14,320, 21,320, 28,500 or 28,550kHz.

Long Skip gives some interesting information concerning Sable Is. It seems that the Nova Scotia Board of Commissioners of Public Utilities was to consider an application from Nova Scotia's Gainsborough county for incorporation of the island, but that this was cancelled. Such a move would have removed the island's separate DXCC status. It seems that permission for landing or operation from Sable Is in the near future is rather unlikely.

VP8PL in South Georgia should be on the air by now and is likely to be found on 14,025, 21,025 or 28,067kHz. QSLs go to G3LIK.

4D80DU was a special station on the air from 10 June to 10 July and celebrated the 80th anniversary of Phillipine independence. The CH3 prefix was used by stations in Harriston, Ontario, to celebrate the town's centenary.

Although there seems to have been some doubt about the authenticity of OJ0BW it is believed that this is OH5NW and that he will be on Market Reef for three months, return home for two months, and then return to OJ0 for a further four-month stay. He has Drake equipment and a ground plane antenna.

SU1ER has written to G2BVN to tell him that he is now back on the air. His transmitter is crystal controlled on 14,125 and 14,230kHz and he is usually to be found between 2000 and 2200. His callsign was previously SU1ES.

Amateur radio, once again, will be featured at the Canadian National Exhibition—the world's largest annual exhibition, held in Toronto. This year the CNE will celebrate its centennial year and the special amateur station CX3CNE will operate from 16 August to 4 September. All contacts will be confirmed by special QSL card.

Welcome

The following overseas amateurs joined the Society during May and June: C5AAJ, C5AAR, CT1SE, CT1ZE, DC1DB, EA7LE, E10CW, EI1DH, F3GC, F6KFA, F8AQ, HB9IN, I1UW, K8MN, LA1G, N6HL, OD5ES, OE5REB, SM5EUU, VE3GQV, VE7CEX, VE7DYD, VK3NBJ, VR4LW, WA2HOY, W3OGY, W6AQ, WA6LTH, WB6BPA, WD8DEB, ZB2EB, ZE1DT, ZS5NY, 4Z4UX and 5B4EI.

Dxpeditions

According to *West Coast DX Bulletin* a letter from LA5DQ (who is believed to be taking part in the expedition to Bouvet Is) published in *Amateur Radio*—the journal of the Norwegian ARS—gives the information that a Norwegian Antartic expedition will start in December 1978 and spend three weeks on Bouvet Is followed by a visit to Queen Maud Land. A vessel will be standing by Bouvet Is with a helicopter for surveying and supplying the island, and a meteorological station is to be installed as part of a world-wide investigation into the upper atmosphere. Scientists who are also radio amateurs will participate and will try to establish stations in both areas. Arrival in 3Y0 should be just before Christmas.

ZL1s ADI, AJL, AMO and BKL, plus ZL4NF and WA6YQW, hope to be on the air from Chatham Is—possibly as ZL3CQ/C—from 27 October to 7 November. This will cover the period of the CQ WW DX Contest (phone section).

There are rumours of pending activity from Mt Athos by SV1AN and SV1GA. No dates have been given, but this may take place at any time.

Landing permission for the Mellish Reef expedition has now been granted, and the call VK9ZR issued. P29JS and WA8MOA will meet the rest of the crew on Lord Howe Is on 23 August and will then travel in the 38ft ketch *Banyandah*. After four days they should reach the reef and hope to stay up to 10 days.

Contests

The NRRL 50th Anniversary Contest

0000 to 2400 19 August (CW).
0000 to 2400 20 August (Phone).
Frequencies: 3,505—3,575, 3,600—3,650, 3,700—3,750, 7,005—7,040, 7,050—7,100, 14,010—14,075, 14,150—14,300, 21,010—21,125, 21,200—21,350, 28,010—28,125 and 28,400—28,700kHz. Stations outside Norway to contact LA/LB/JW/JX and 3Y. Each station may be worked once on each band and on both cw and phone. Entries may be (a) single-operator—less than 15W input, (b) ditto—more than 15W, (c) multi-operator and (d) listener. Exchanges consist of RS/T and serial QSO number (from 001). Norwegian stations will send a single letter to indicate their county. European stations score one point per contact, others three (double if on 3·5 or 7MHz). The multiplier is the total number of counties worked on each band added together. Listeners should log call of Norwegian station heard, the number sent and the callsign of the station being worked. Scores are as for the transmitting section. Winners in each class in each country will receive an award (reasonable score provided). Continental winners will be awarded a special plaque. Use separate logs for phone and cw, and show date, time, band, station worked, number sent, number received, points, if multiplier. Enclose summary sheet with final score, callsign, name and address, mode and operating class information, and include the usual signed declaration. Post before 10 October to: NRRL Contest Manager A. Almedal, LA5QK, N-4052 Roeyneberg, Norway. Note the contacts made during this contest may be used in applying for the WALA Award.

The Scandinavian Activity Contest

1500 16 September to 1800 17 September (CW).
1500 23 September to 1800 24 September (Phone).
3·5 to 28MHz, but only the following segments may be used: (CW) 3,505—3,575, 7,005—7,040, 14,010—14,075, 21,010—21,125 and 28,010—28,125kHz; (Phone) 3,600—3,650, 3,700—3,790, 7,050—7,100, 14,150—14,300, 21,200—21,350 and 28,400—28,700kHz. Non-Scandinavians work Scandinavians, and the latter include LA, JW, JX, OH, OH0, OJ0, OX, OY, OZ and SM for the purposes of the contest. Entries are multi-band single-operator, multi-operator, and multi-transmitter multi-operator. Exchanges consist of RS/T plus serial number (from 001). Europeans score one point per contact and the multiplier is the number of different call areas contacted, portable stations in LA and OZ count as LA0 and OZ0. Final score is total QSO points multiplied by the sum of multipliers from all bands. Use separate logs for each band and complete a summary sheet and declaration. Logs must be mailed before 15 October to EDR contest manager OZ1LO, Leif Ottosen, Bankevejen 12, Køng DK-4750 Lundby, Denmark.

QTH CORNER

EI2VMT	(see G5CCJ).
G5CCJ	B. G. Martin, Box 28 – RR2, Solsberry, Ind. 47459, USA.
GU4CHY	R. W. Allisette, PO Box 100, Guernsey.
JD1YAH, JD1YAK	K. Yamamoto, JR1JFO, 469 Hassei, Miura City, Kanagawa 238-03, Japan.
VK9ZR	H. Mead, VK2BJL, PO Box 85, Round Corner, 2158, NSW, Australia.
VP1DX, VP1MM, VP1EF, VP1RS	Tunnel Radio of America DX Club, Box 2900, N Dixie Highway, Ft Lauderdale, Fla, 33334, USA.
VP1RDT	PO Box 461, Belize City, Belize.
VP5AH	via WA4DRU, A. B. Harbach, 2318 S Country Club Rd, Melbourne, Fla, 32901, USA.
VR1AY	John Sainsbury, c/o Air Tungara Corp, PO Box 43, Bairiki, Tarawa, Gilbert Is.
VR3AK	via KH6AHZ, R. Donavan, 179 Aumoe Rd, Kailua, Hawaii, 96734.
VR4LN	B. H. Le Pine-Williams, PO Box 19, Honiara, Solomon Is.
ex-VS9AAS	A. Sainsbury, Broadcasting House, Private Bag, Wellington, New Zealand.
ex-VS9AMT	M. Townley, British Forces Broadcasting Service, Dean Stanley St, London.
ZD7SD, ZD7SS	PO Box 16, Jamestown, St Helena, S Atlantic.
3B7DA	P. Alex Mootoo, 39 Brown Sequard Av, Vacoas, Mauritius.
ex-4S7IW	I. D. Wollen, G3UZI, Lorien, Rusper Rd, Horsham, Sussex.
K5CO/5A	now via T. Meadows, 820 Intervale, Garland, Tex, 75053, USA.
5Z4QP	now G3TRR, A. M. Mills, 150 West Park Drive (West), Leeds, LS8 2DA.
9H3AL	via G4FSZ, R. Smith, 42 Woodchurch Close, Sidcup, Kent DA14 6QH.
9H3AM	via G3VLX, D. Buckley, 16 Wood Ride, Petts Wood, Orpington, Kent BR5 1PX.

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

4th SEANET Worldwide DX Contest

0001 19 August to 2359 20 August.
Telephony, all bands 1·8 to 28MHz. Single-operator, single- and multi-band, and multi-operator categories. Exchange RS and serial QSO number (from 001). Contacts with HS, YB, DU, 9V, 9M2, 9M6 and 9M8 count 20 points on 1·8MHz, 10 on 3·5 and 7MHz, and four on 14, 21 and 28MHz. Contacts with other countries "within the SEANET area" count half these points. These are A4, A5 A6, A7, A9, AC3, BV, CR9, EP, HL/HM, JA, JD, JY, KA, KC6, KG6, KX6, P29, S21, S79, VK, VQ9, VS5, VS6, VU, YJ8, ZL, 3B6, 3B8, 3D2, 4S7, 4W, 5Z4, 9K2 and 9N. Only one contact per band with each station. Please note that contest numbers should start with 001 on each band. Logs and summary sheets with signed declaration must reach SEANET contest organizer, Henry Woo, 9V1RD, PO Box 2728, Singapore, by 31 October. Certificates will be sent to all qualified entries.

Results of the **18th All Asian DX Contest** have been received. They show that there was no UK entry in the phone section. In the cw section G3PVA scored 4,440 points on 14MHz, and G6NK 256. In the multi-band category G3ESF scored 8,400 points, and G2AJB 900.

Band reports

Conditions on 14MHz have been good throughout the month, with openings into Australasia in the evenings, and 21MHz has been open into the west coast of the USA and the Pacific on a few mornings. The 28MHz band has been rather disappointing. A Soviet prediction suggests that the sunspot number may reach 100 this autumn and a peak of 150 in 1980.

Many thanks to the following for information used in this section: G2HKU, G6GH, G3CWI, G3KSH, GM3LYY, G3VLX, GD4BEG, G4EHQ, G4ETN, G4FMO, SP3AGE, BRS17567 and BRS33915.

Stations listed in italics were using cw, the rest ssb.

3·5MHz 0000 PYs, 9Q5BF. **2100** TR8MC (QSL via W2YY).

14MHz. 0500 FH8OM. **0600** TA1ZB, VK9ZM. **0700** FO0PJM (QSL via KH6JEB). **1200** FR7BE, P29s MF, NRA, NKV, UK0LAK. 3D2UP. **0800** KM6FC, KS6GV, VR8O, YI1BGD, ZK1DR, *ZL4LR/A*, 5W1BL. **0900** FO8s, P29BL, *VK9YS*. **1000** VKs. **1100** CE9AT. **1400** 9N1MM. **1500** 9M2CR. **1600** VK9YL, YI1BGD. **1900** AP2ASM, FO0PHM, YB0WQ. **2000** WA6OXZ/VQ9. **2100** KX6MS. **2200** LU4AA/Argentina 78.

21MHz. 0600 KL7RIT, VK7, VR3AK, W6. **0700** KM6BI. **0800** FO0PHM, HM2GS, KH6s, *KX6BU*, ZK2TT, 5W1BL. **0900** *KH6XX*. **1000** AA6V/KH2 (Guam), VR4CF, VR8O. **1100** 3D2WR, 5W1BN (QSL via KH6JEB). **1200** FR7BE, P29s MF, NRA, NKV, UK0LAK. **1300** TR8BR. **1400** P29NNL, VK9YL. **1500** JA. **1600** 5N2NAS. **1700** *D68AD*, HS1WR. **1800** KH6XX, *KJ6DO, 4A3JJ*, 5H3BP. **1900** SU1MI, VR8O, WB7DOS (Mont), *8J3ITU*. **2000** *CL2FRC, FM0COO*, S79MC (ex-MP4BCC), WD9FCC/VQ9. **2200** *VP8AI, ZL1AH*. **2300** CE, *HK0BYU*, VK7, VP1RDT, *ZD7WT* (QSL to ZD8TM), ZD8TM.

28MHz. 0000 W1–W4, W8, W9, VE2. **0800** *VK2AHM, VU2GO*, 5T5ZR. **1000** VK6VF. **1100** OE5SJL/YK, 4Z30TJ. **1800** XQ3TV (Chile). **1900** CE, KG4, TI. **2000** CE, CX, HC, LU, PY, TG, YS, 8P6. **2100** HK, KH6HSN, KZ5, LU, PJ2MI, W1–W5, ZP. **2200** HH2MC, YV, W1–W5, W8. **2300** W1–W5, W8, W9.

Thanks are expressed to the authors of the following from which information has been obtained: the *Ex-G Radio Club Magazine* **(W3HQO)**, *DX News Sheet* **(Geoff Watts)**, *Long Skip* **(VE1AL/3)**, the *West Coast DX Bulletin* **(WA6AUD)**, *DX'press* **(PA0TO)**, and *CQ Magazine* **(W1WY)**.

Please send all items **to reach G3FKM** no later than **11 August** for the **September** issue, and by **8 September** for the **October** issue.

HF propagation study

Predicted hpfs (MHz - 10) for August 1978

GMT -	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	201	187	208	279	309	304	310	301	309	309	266	224	201
Ascension	202	197	188	177	293	313	315	331	336	361	322	222	202
Bahrain	192	171	208	268	300	295	294	282	296	289	237	214	192
Bangkok	154	149	205	252	262	271	262	258	266	282	227	185	154
Barbados	216	187	174	169	195	256	274	266	267	265	286	276	216
Bermuda	205	177	154	139	159	229	255	253	255	255	263	252	205
Bogota	213	185	162	164	195	199	267	260	261	261	279	268	213
Buenos Aires	224	206	191	192	171	251	293	301	300	300	315	281	224
Cape Town	208	152	111	260	310	317	335	346	329	348	285	228	208
Colombo	186	163	209	267	294	290	282	275	291	272	232	206	186
Cyprus	181	163	185	242	275	274	274	262	272	268	246	200	181
Dakar	225	211	197	210	280	304	299	310	313	329	322	270	225
Denver	177	162	147	136	134	138	182	202	213	228	238	218	177
Fairbanks	153	162	169	195	201	200	185	192	192	188	185	185	153
Falklands	216	190	194	188	138	242	296	305	304	310	321	297	216
Gibraltar	136	120	121	143	180	190	191	186	186	187	197	153	136
Hong Kong	150	147	202	239	257	258	253	249	251	229	215	176	150
Honolulu	153	158	163	188	197	197	169	155	182	224	216	190	153
Iceland	124	115	106	133	157	168	169	171	174	177	169	145	124
Jamaica	206	180	158	147	178	192	265	256	256	255	267	258	206
Lagos	235	206	199	243	307	314	324	342	357	371	324	262	235
Las Palmas	197	180	171	187	246	267	266	267	265	270	276	238	197
Lima	219	194	177	174	210	159	279	280	275	272	293	280	219
Los Angeles	164	161	152	144	129	111	152	195	219	234	230	215	164
Malta	153	138	145	187	223	225	227	219	224	220	223	171	153
Mauritius	180	162	208	285	313	313	321	310	329	324	279	229	180
Mexico	188	169	148	128	180	159	211	242	244	248	251	228	188
Moscow	136	122	148	195	210	218	215	213	216	237	195	159	136
Nairobi	191	199	202	279	314	314	326	322	343	360	328	294	191
New Delhi	169	154	209	258	276	280	270	262	280	251	223	192	169
New York	192	171	152	131	143	200	228	241	243	247	252	232	192
Osaka	164	167	196	215	233	239	238	233	208	187	177	181	164
Perth	183	163	209	266	291	289	282	235	209	182	166	149	183
Rio de Janeiro	228	211	194	190	162	301	296	304	304	307	322	279	228
Salisbury	224	206	191	275	317	319	338	336	360	354	308	244	224
Seychelles	205	187	208	280	309	305	317	307	318	271	225	228	205
Singapore	169	154	209	258	276	280	270	262	280	289	229	192	169
Suva (s)	164	162	185	197	219	224	224	230	202	199	206	182	164
Suva (l)	247	219	196	241	229	195	180	164	157	135	303	267	247
Sydney (s)	150	147	202	239	257	258	230	218	192	167	158	176	150
Sydney (l)	219	196	183	178	215	177	147	140	131	125	209	280	219
Teheran	186	163	209	267	294	290	282	275	291	265	227	206	186
Vancouver	155	159	159	174	168	162	176	190	182	197	205	194	155
Wellington (s)	174	167	196	210	232	238	215	187	172	154	200	187	174
Wellington (l)	234	211	196	199	166	152	133	116	116	139	255	281	234

Bands recommended are those between 1pt and half hpf

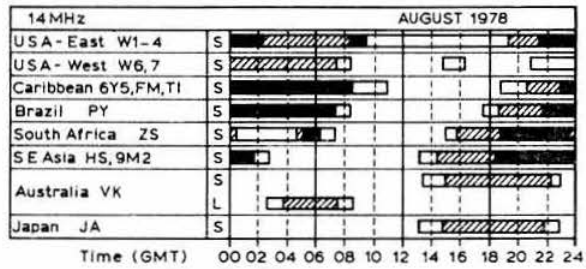
Propagation predictions

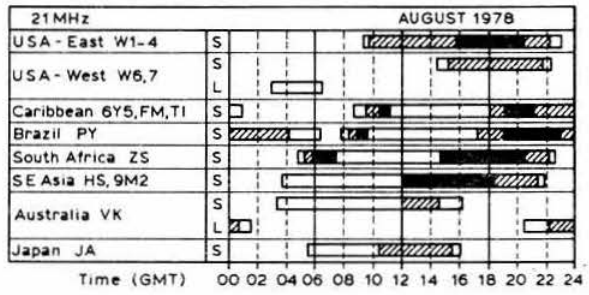
August is the last month of bad summer-time dx conditions, which are much worse than in winter on **28** and **21MHz**. From September onwards these usually improve on both bands to reach their maximum towards the end of October beginning November. As compensation for poor dx, sporadic short-skip conditions will continue on the hf bands throughout the month.

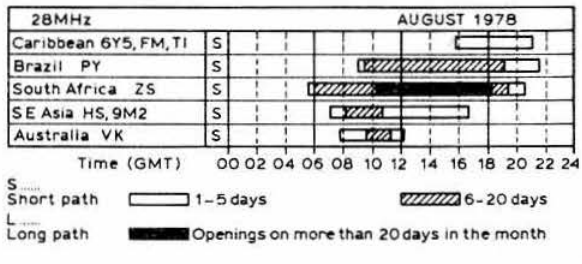
North America will only be heard under exceptional circumstances on **28MHz**, and South America will not be heard with certainty on all days. Traffic with Africa will be certain, and slightly better than during the previous month. Improved dx conditions can be expected with South-East Asia and Australia. On **21MHz**, traffic with North America during the early evening will be certain, and traffic with western North America will be better than in the previous month. As nights in the northern hemisphere lengthen, traffic along the line North and Central America—East Asia will cease earlier, and traffic with South Africa and Australia will cease later.

The nighttime dx band will continue to be **14MHz**. Traffic during the early hours with North America will not be quite as good as last month. During the late afternoon, traffic with South Africa, South-East Asia, Japan and Australia will be possible, although it will be affected by European QRM. During daytime, **14MHz** remains the ideal band for traffic with Europe, and distances covered will increase with the advancing autumn. This also goes for **7** and **3·5MHz**. The interruption of **3·5MHz** by the dead zone during the latter half of the night must be expected.

The provisional sunspot number for May 1978 from the Swiss Federal Observatory was 79·3, with high solar activity during the second half of the month. On 29, 30 and 31 May the daily numbers exceeded 100. The predicted smoothed sunspot numbers for September, October and November are 97, 102 and 107 respectively.







swl news

Bob Treacher, BRS32525 *

Pacific prefixes

The rumoured change mentioned in *MOTA* in May relating to American dependencies in the Pacific area seems to have become reality. Several correspondents mention hearing stations signing KH2 on Guam Island. The pile-ups for stations using these new prefixes are obviously going to be immense, and will certainly generate even more activity on the already-crowded 14MHz band.

Expedition news

Some really advance information concerns the intended expedition to Navassa Island in November. The ssb callsign will be N0TG/KP1, while on cw the callsign will be W0RJU/KP1. No QRGs or QSL information is known yet.

At the time of writing, the JD1YAK expedition to Ogasawara had just commenced, with the frequencies around 14,200kHz choked with strong European signals frantically calling to get another all-time new country. The Cocos-Keeling expedition by P29JS and F6CYL had also been monopolizing the bands. Both Jim, VK9YS, and Anne, VK9YL, were in constant demand, and they were both consistently good signals in G-land. Their QSL information is via K4UTE (VK9YS) and F6CYL (VK9YL). Do not forget ircs for a direct reply. There is still no definite news about the 8Z4 expedition, but rumours are growing about a proposed trip to 6O1.

DXCC status

It is interesting to note from the latest DXCC list received from G4FAM that Transkei (S8) and Bophuthatswana (H5) have not been given DXCC status. Anyone working or hearing these "countries" should not claim them for any award credit. Also, they should not be counted in the scores for the all-time or 1978 countries lists.

It is also worthwhile noting several other anomalies on the list with which readers may not be familiar. First, those working or hearing stations anywhere in Germany before 17 September 1973 can count them as in a separate country from the Federal Republic of Germany (DL) and German Democratic Republic (DM) which, for amateur radio purposes, became separate countries from that date. Similarly, those working or hearing the French Comoro Is (FH8) before 5 July 1975 can count that as a separate country from Comoros (D6) and Mayotte (FH), which came into existence for amateur radio purposes from that date. Likewise, Papua and New Guinea were both credited as DXCC countries until 16 September 1975, now Papua New Guinea (P29) counts as one country. Anyone who has been at this game long enough may now be five countries better off! This list is published by ARRL and can be obtained from them—enclosing several ircs—by writing to American Radio Relay League, Newington, Connecticut, USA 06111.

1978 HF Countries Table

Station	(MHz) 28	21	14	7	3·5	1·8	Total	Mode
BRS17567	166	182	210	41	80	5	684	ssb/cw
BRS25429	134	115	174	71	106	14	614	ssb/cw
BRS35943	127	128	165	74	111	4	609	ssb
BRS29641	127	138	171	74	72	4	586	ssb
A8841	85	118	197	56	81	0	537	ssb/cw
A9140	107	102	115	73	66	20	483	ssb/cw
BRS35454	106	109	147	46	66	6	481	ssb/cw
BRS32286	121	100	116	35	56	0	428	ssb
A9191	108	97	131	41	47	0	424	ssb
ARS39965	96	110	114	35	36	5	396	ssb/cw
BRS34740	73	85	99	50	50	7	364	ssb
ARS39018	38	82	111	28	44	3	303	ssb
BRS40154	46	87	144	14	11	1	303	ssb
BRS20185	63	49	77	21	42	2	254	ssb
BRS37782	49	56	91	19	32	4	251	ssb
A9107	37	50	83	20	44	5	239	ssb
BRS39162	50	63	66	14	25	7	225	ssb
BRS34658	10	42	81	32	55	4	224	ssb
ARS39720	35	58	80	17	20	0	210	ssb
BRS27421	0	0	126	45	39	0	210	ssb
ARS39965	47	54	58	9	18	4	190	ssb/cw
ARS37620	2	27	97	5	5	0	136	ssb
ARS38280	39	46	38	10	1	2	136	ssb
BRS18529	5	19	58	3	28	2	115	ssb

The mail

Continuing the dx flavour of this month's news, numerous reports this time of plentiful Pacific dx on 21MHz during morning hours; including VR8O, 3D2WR and ZK1DR, plus KH and KM6. The 21MHz band also seems to have provided the goods during June, with many Pacific loggings and innumerable openings to the west coast of the USA mentioned. Even 28MHz has produced signals from 5W1AU at—of all times—2100.

Neville Spry, BRS17567, reports a good month in relation to QSL returns, boasting VK2AGT/LH, ZK1DR, C21AA, YI1BGD, ZL4LR/A, ZL1AA/K, VK9NI and KM6FD. Currently he stands at 314 confirmed of 330 heard; his TH3Jnr, perched atop his Welsh hillside, has certainly made an impression.

Stephen Turner, ARS37620, would like some help from a fellow swl. He owns an ex-Army R208 10–60MHz rig, but it needs realigning. If anyone can help, and lives in Cheshire, Stephen would be pleased to hear from him; his address is 9 Wallingford Road, Handforth, Wilmslow SK9 3JT.

Robert Small, A8841, considers conditions have been poor recently, but then provides a list of exotic Pacific dx which tends to disprove that theory a little. However, several new ones have found their way into his log, and his best QSLs this time are from JT1KAA and HK0QA. Robert also points out that he now has 12 different cards from TU2.

Eric Hall, BRS27421, comments on the apparent upsurge of signals from VK of late. He has logged 104 in all call areas, but by comparison has heard very few signals from ZL. With his interest in VK, I suspect he may well be entering the swl section of the VK/ZL contests later in the year.

Finale

Letters are acknowledged this time round from BRSs 37782, 29641 and 20185, and A9191.

Copy for the **October** issue should reach your scribe no later than **26 August 1978.** □

*392 Rochester Way, Eltham, London SE9 6LH.

GEORGE JESSOP, G6JP, RETIRES

On 30 June, George Jessop retired from his position as consultant to the Society, which he held since January after having been general manager for three years. In some ways, this was a big step—in other ways just another phase in a life full of interest in radio which goes back over 55 years.

If anyone was born into radio, it was George. His father was chief engineer at the Osram Lamp Company in Hammersmith, and they even lived in a house adjoining the factory. Lamps changed to valves when, at the beginning of the first world war, Osram was persuaded by the government to divert some of its lamp-making skills into valve-making. After qualifying as an electrical engineer at the Regent Street Polytechnic (with evening classes on radio given by Post Office engineers), his first job was in the Osram factory. This was fine turning feather edges on metal cones for making glass-metal seals, a job at which he admits he was not very successful. He remained with the same firm for the whole of his career—although not just turning cones. As time passed, he became increasingly involved with the development and pre-production, and then the large-scale production of valves.

At the outbreak of the second world war he was sent as technical manager, with four others, to establish a new factory in Lancashire which, after training its 120 staff from scratch (they were mainly cotton workers) ended up by producing 50,000 receiving valves, 2,000 transmitting valves and 500 crts each week. Returning to the Hammersmith factory after five years, he was made responsible for receiver valve production until 1950, and then for transmitter valves until 1960. He then became technical advisor to the sales department until he retired—for the first time.

George's first radio was the inevitable crystal set. His second was (and this was 1923) a 12-valve superhet. And when one burns out 12 filaments in 12 valves in one go, as happened, it is at that time one sees the advantage of living next door to a valve factory. It is perhaps only to be expected that, being directly concerned with the development of valves to work at higher and higher frequencies, George was led to become directly involved with the famous 56MHz tests held in 1933, which pioneered the use of vhf (as opposed to 500kHz) for communicating with aircraft.

After his spell "up north" during the war, his amateur radio interests still reflected his strong technical learnings. He was a member of the RSGB Technical Committee (as it was then), and became involved with Society publications in the most direct way. His first book was one on circuits, his second on Service valve equivalents. Then followed the most successful *Radio Reference Data Book* and the *VHF/UHF Manual*, the latest editions of which are current best sellers.

In 1969 he became a member of Council, where his wide experience of committees and professional institutions was most valuable. In 1974 he became the 40th President of the Society.

Putting aside the normal office of Immediate Past-President, he then took over as general manager of the Society in January 1975, initially for three months only. Since that time, the administration of the Society has been greatly strengthened to cope with the vastly increased work-load. The current satisfactory state of the Society's finances is due in no small measure to decisions made during this time.

It is perhaps a bit of a misnomer to use the word "retire" with regard to George. All that will happen is that he will have more time to deal with his current projects: a technical history of amateur radio, reconstructing working models of "vintage" equipment, and updating current books. As with all his activities over the years, his efforts will be to the advantage of the Society and its members. *G3RPE*

RAE courses 1978–9

Acton. Acton Technical College, High Street, Acton, London W3 6RD. Wednesdays 6.30pm. Details of enrolment and commencement dates from the college.

Belfast. Belfast College of Technology, College Square East, Belfast BT1 6DJ. Tuesdays 5.30–8.30pm. Theory and practical, also morse instruction if required. Enrolment early September.

Birkenhead. North Wirral College of Technology, Borough Road, Birkenhead (formerly Birkenhead College of Technology). Thursdays 6.45–9.15pm, commencing September. Enrolment 4–11 September, or at class meetings. Further details from Department of Electrical Engineering.

Blackburn. Blackburn Technical College. Wednesday evenings, commencing end of September. Enrolment at College of Technology and Design, Feilden Street, Blackburn, on 6–8 September. Further details from G3LLL, tel Blackburn 40762 evenings, or Blackburn 59595/6 daytime.

Chingford. Friday Hill House, Simmons Lane, Chingford, London E4. Commencement and enrolment Thursday 21 September. Fee £9 (approximately). Enquiries to 01-500 6034.

Farnborough. North and West Farnborough Further Education Centre, Cove School, St John's Road, Farnborough. Commencing Thursday 21 September, 7.30pm. Morse proficiency course commencing Monday 18 September, 7.30pm. Further details from J. Brett, principal, at the school.

High Wycombe. Buckinghamshire College of Higher Education, Queen Alexandra Road, High Wycombe, Bucks HP11 2JZ. Enrolment 4 September, 9.30am to 8pm. Details from R. A. Stringer, School of Engineering, Buckinghamshire College of Higher Education.

Langley. Langley College of Further Education, Station Road, Langley, Slough SL3 8BY. Station operation (with college station G3XPL), Mondays 1730–1900; morse, Mondays 1900–2030; theory (with full laboratory facilities), Thursdays 1900–2100; students may choose a programme from these three modules. Enrolment 12 and 13 September, 12.30–8pm. Full details from E. C. Palmer (G3FVC), at the college.

Leamington Spa. Mid-Warwickshire College of Further Education, Warwick New Road, Leamington Spa CV32 5JE. Commencing September. Enrolment 7 and 8 September. The course will be one evening each week for approximately 30 weeks. Further details from the college, tel Leamington Spa 311711.

Manchester. North Trafford College of Further Education, Talbot Road, Stretford. Separate courses for RAE theory and morse code, plus an advanced course for amateurs who have already passed the RAE. Both courses will be on one evening each week, 6.30–9pm. Enrolment 11–13 September. Further details from R. J. Birkinshaw, at the college.

Northampton. Duston Adult Centre, Duston Upper School, Northampton. Commencing Tuesday 26 September, 1900. Enrolment week from 11 September, 1900. Fee, for 20 weeks, £12. For further details tel 0604 33834.

Walsall. Walsall College of Technology, St Paul's Street, Walsall. Commencing October. Enrolment 6–8 and 11 September. For further details tel Walsall 25124.

contest news

70MHz Fixed Contest rules

0900–1700gmt, 22 October 1978
All entries and checklogs to: VHF Contests Committee, c/o Mr R. Taylor, G4BEL, 12 The Rampart, Haddenham, Cambs CB6 3ST. The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1,2,3,4c,5a,6a,7a,8,9a,10a,11–12.

432MHz Cumulative Contest rules

2000–2230gmt, 13,21,29, October, 6,14,22,30 November 1978
All entries and checklogs to: VHF Contests Committee, c/o Mr C. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Berks OX12 7DQ. The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1,2,3,4b,5a,6a,7a,8,9a,10b,11–22.

432/1,296/2,304MHz Open Contest rules

1600–1600gmt. 7–8 October 1978
All entries and checklogs to: VHF Contests Committee, c/o Mr L. Hawkyard, G5HD, 100 Shirley High St, Southampton, Hants. The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1,2,3,4a,5a,6a,7b,8,9a,10a,11–22.

This contest is timed to coincide with an IARU Region 1 event. Contestants wishing to enter the IARU contest should complete a multiband summary sheet and the following multipliers should be used on that sheet only: 432MHz × 1, 1,296MHz × 5, 2,304MHz × 10.

Region Round-up Contest results

Quite a few entrants in last year's Silver Jubilee HF Contests suggested that it might be a good idea to continue to hold a similar event each year, and the HF Contest Committee accepted the suggestion. However, it was somewhat disappointing to find that there were so few logs submitted. In the cw section 21 valid transmitting and one listeners' logs were received, and in the phone section 26 transmitting and seven listeners' entries arrived. A scrutiny of logs seems to suggest that many stations gave contacts and points but did not send in any entry. Unfortunately, the cw contest clashed with the WAB Phone Contest and this undoubtedly had a bad effect on both.

Conditions on 3·5MHz during the cw section were very poor indeed, and most entrants had difficulties making good scores on that band. There was no station in Region 15 recorded in any log received for 3·5MHz although the other 19 regions were active, but on 7MHz all 20 regions were logged. During the phone section 3·5MHz was behaving normally again and all regions were worked on each band.

The winner of the cw event was Cris Henderson, G4FAM, of Beckenham, Kent, and the listener section was won by Ron Thomas, BRS15822, of Clapton, London. Winners of the phone section were Stuart Jesson, G4CNY, of Hereford, and David Hill, BRS34310, of Crawley.

As always, participants were invited to send in comments and suggestions with their logs. The committee is very happy to note that the most frequent comment related to the excellent spirit and good operating which seemed to mark the contests. The adoption of IARU recommendations concerning contest-free sections of the two bands used was also well received. Several comments were made concerning the timing of the contests—G4FAM and G4BWP would prefer 12 hours, G3SJJ six to eight hours, and G3NKS pointed out that 0600 to 1400 may be good, but that perhaps four hours would be even better as it would then be similar to AFS which has recently increased in popularity. It was also suggested that the finish should be earlier to avoid the beginning of Sunday evening television viewing. Few entrants commented on the choice of initial contact number, and most started from 001. There was a suggestion that counties should be used as multiplier instead of RSGB regions—but, although this would encourage portable entries, the intention is to draw members' attention to the fact that the Society does have regional organization and representation!

G3HJF remarked that cw contests are the only ones from which one emerges a better operator than when one starts, and G3HGJ wondered whether all GI stations run low power as he never heard one ... G4EMN suggests that February might be a better time for these contests as there are fewer counter attractions at that time of year. The most prophetic comment of all came from G3NKS (one of those operators who made only a few contacts but kindly submitted his log) who said "someone has to be bottom of the table"—and he was!

The standard of log keeping was very high and thanks are particularly due to those who went to the trouble of providing check lists of regions contacted. It was sad to note that several good logs were posted well after the closing date and therefore could only be treated as checklogs.

An analysis of the antennas used showed that dipoles of various kinds were the most popular, particularly the G5RV type. Inverted-Vs were also very popular, and a number of W3DZZs were in use. Rather surprisingly, verticals were hardly mentioned.

The HF Contests Committee would like to thank all those who took part—and particularly those who made kind comments about the committee's work!

CW TRANSMITTING SECTION

Posn	Callsign	QSOs/Regions per band 3·5MHz	7MHz	Points
1	G4FAM	75/16	100/20	18,900
2	G4BWP	76/18	90/19	18,426
3	G3SJJ	53/16	104/19	16,848
4	G3NOM	59/17	90/20	16,502
5	G4CNY	64/17	81/19	15,624
6	G3HVX	72/17	71/19	15,408
7	GW3HCL	45/17	80/20	13,875
8	G3NKS	50/15	92/18	13,860
9	GW3MPB	42/16	87/18	13,770
10	G3WRQ	55/17	64/18	12,285
11	G4BUO	35/15	83/19	12,036
12	G4FLM	34/15	86/18	11,880
13	G3GC	56/14	64/19	11,814
14	G3LIK	33/14	86/17	11,067
15	G3VDL	44/15	60/19	10,608
16	G4AEM	43/15	60/18	10,296
17	G4FUP	45/14	62/18	10,272
18	GM3OXC	20/11	83/20	9,269
19	GW3SB	33/14	57/17	8,277
20	G3ZDW	35/17	36/19	7,668
21	G3CVB	23/13	48/19	6,784
22	G4DMR	20/11	56/18	6,612
23	G4FNL	20/12	46/18	5,940
24	G3ILO	23/12	36/17	5,133
25	G3NEO	23/12	33/18	5,040
26	G4FAS	24/14	30/16	4,830
27	G4FKS	10/6	53/19	4,800
28	G3HJF	17/10	39/14	4,032
29	G3AWR	11/8	35/17	3,425
30	GW3CW	—	57/19	3,230
31	G3MCK	43/12	—	1,608

Checklogs were received from G4EBK and G5BBL. Logs were also received from G2HLU, G3HGJ, and G4ELZ but arrived late and, under general rule 6e have been used as checklogs.

CW RECEIVING SECTION

BRS13056 15,822 points

PHONE TRANSMITTING SECTION

Posn	Callsign	QSOs/Regions per band 3·5MHz	7MHz	Points
1	G4CNY	174/20	101/20	33,000
2	G4BWP	143/19	109/20	29,484
3	G4BLX	128/20	111/20	28,640
4	G4FAM	120/19	114/20	27,378
5	G4ADD	109/19	116/20	26,325
6	G4DSF	112/20	106/20	26,160
7	G3WHK	122/19	90/20	24,804
8	G4BHT	100/19	98/20	23,166
9	G4BYY	117/19	68/19	21,090
10	G3XMV	110/18	76/19	20,646
11	G2FNK	92/16	99/20	20,628
12	G3UAS	49/15	60/19	11,118
13	G2HLU	63/16	43/18	10,812
14	G4DMR	56/16	48/17	10,296
15	G3YSG	44/14	58/19	10,098
16	G3TKR	74/18	29/13	9,579
17	G3UFY	53/15	41/14	8,178
18	G4EMN	35/14	42/16	6,930
19	G4DXW	38/13	35/15	6,132
20	GU3YIZ	30/11	40/15	5,460
21	GM4DZX	23/13	43/14	5,319
22	G3ZJF	30/12	30/12	5,040
23	G3NEO	23/14	26/15	4,263
24	G4DMG	37/15	16/8	3,657
25	G3CVB	28/11	17/9	2,680
26	G3NKS	29/11	10/7	2,106

A log was also received from G2QT, but it arrived late and, under general rule 6e, was treated as a checklog.

PHONE RECEIVING SECTION

Station	Points	Station	Points
BRS34310	18,252	BRS38656	11,211
BRS33673	14,586	BRS38848	9,951
BRS38568	14,178	BRS38280	4,872
A9191	13,886		

7MHz Contest 1977 results

The slightly reduced QSO and points totals in both sections of the contest reflected the poorer conditions on 7MHz this year. Despite this, the HF Contests Committee was pleased to receive about the same overall number of entries as in previous years.

Beams and other large antenna systems were in evidence among the leading stations in both sections; as were, no doubt, adequate receiver facilities to deal with the heavy commercial and broadcast interference problems. It is hoped that the 1979 WARC will provide a positive solution to these difficulties.

Most contestants appeared to be satisfied with the present rules. Unfortunately, some ambiguity crept into the rule concerning bonus points, leaving UK entrants uncertain on the correct bonus claim for UK prefixes. The answer was that bonus points may not be claimed for inter-UK contacts, and scores were adjusted where necessary. The rules for the 1978 event, which appear in June 1978 *Radio Communication*, have been amended and it is hoped that this is now clear.

The ssb weekend clashed with two other contests. The calendar is very congested at this period and, short of moving the contests to a completely different part of the year, it is very difficult to avoid this situation. Although publicity of dates is reasonably good between European societies, there are many contests which receive little advance circulation of dates.

Our thanks to those who included suggestions and comments with their logs. Lastly, an apology for the late appearance of these results which was due to technical difficulties.

UK CW TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points
1	G3UJE	4,311	17	G3YMC	2,065
2	G3XWZ/A	4,221	18	G3MWP	1,695
3	G3VMW	4,071	19	G4FDC	1,565
4	GM3ZSP	3,807	20	G3VDL	1,320
5	G4FAM	3,590		G4CCQ	1,320
6	G2QT	3,225	22	G2AJB	1,220
7	G3PDL	3,045	23	GM4AWA/A	1,085
8	G4DSE	2,870	24	G4BUO	1,020
9	G3FZG	2,645	25	G4DDL	970
10	G3DYY	2,475	26	G3PHW	940
11	G4DUW	2,345	27	G3ZDW	820
12	G5PQ	2,305	28	G8DI	576
13	G3TBK	2,300	29	G3HJF	510
14	G3ESF	2,215	30	G3ILO	360
15	G3TXF	2,145	31	G3UMV	275
16	G3NKS	2,070			

UK SSB TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points
1	G3TZH	3,347	10	G4BYY	1,080
2	G4FAM	2,470	11	G4ACQ	845
3	G3XPO	1,986	12	G3UAS	800
4	G2QT	1,860	13	G3SWX	590
5	G4BXT	1,835	14	G3XFW	320
6	G3VLX	1,630	15	G3NKS	210
7	G4APL	1,510	16	G3UMV	158
8	G3TKR	1,430	17	G3ILO	30
9	G3WHK	1,205			

REST OF WORLD CW TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points
1	W1DA	920	10	UL7CT	365
2	EP2TW	755	11	UA9VK	355
3	EP2IA	750	12	UA9CAL	295
4	W3OG	740	13	UW9SG	290
5	WB4MIX	430	14	W2ND	250
6	UA9FCI	385	15	UL7CAD	180
	UL7AAB	385	16	UL7IBC	125
8	UM8MAO	375	17	UA9MY	35
9	UK9HAC	370			

EUROPE CW TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points
1	HA8UB	700	27	DJ1YH	435	52	DL1YA	355	78	SM6BXV	280	103	UB5EDJ	210
2	PA0LVB	640		HA0LM	435		UB5TAM	355		UB5CN	280		HB9DX	210
3	DJ8IZ	620	29	PA0CLC	425	54	UB5JFP	350		UA3QAH	280	105	UR2RER	205
4	IK2FGP	613		OZ2UA	425		OH2JQ	350		HA5BX	280		UP2BAO	205
5	OZ1W	580	31	UO5OBD	415	56	LZ2KBA	346		OH1FM	275		UA2FBD	205
6	DJ6FO	570	32	PA0PN	411		UA3AEZ	340	82	OH5PT	275	108	UF6FAL	200
7	UC2ABT	555		UP2BCT	410	57	OK3TAO	340		UT5HD	275	109	TF3CW	198
8	DF4QW	545	33	PA0VB	410		PA0DIN	340		UR2RHF	275	110	YO3CR	195
9	SM6EUZ	540		SP8GSC	410	60	LB1G	338	86	UA3LAR	273	111	UA2DC	185
10	SM0CCE	515	36	DF3QN	405	61	DJ6EN	335	87	UF6CX	271		PA3ABA	185
11	YU1AJF	513		SP2JKC	405		DJ2GP	335	88	OZ1BII	270	113	OK1AXB	180
12	SM6AYM	510	38	UB5ZAT	400	63	UO5ODB	330	89	DA2VH	265		SM0BDS	180
	DJ3IW	510	39	UK5EAG	395		UB5BAZ	330		LA5IH	265	115	UA2FCW	170
14	HA5CF/5	508		DK8KC	395	65	OH2BN	326	91	UA3LAC	255		UB5GBD	170
15	HA5LZ	505	41	SP9CAV	393	66	OF7NW	320		UY5TE	255	117	EA4BV	165
16	PA0LCE	495	42	OZ4HW	390		LA2EO	320	93	UP2BAT	250		OZ1LO	165
17	UA4HGG	490		YO2BTK	390	68	DK4HD	305		UF6FCR	250	119	UB5FCI	160
18	OK1AGA	485	44	F6API	388	69	SM3EWB	295	95	PA0TA	245	120	UB5QBG	143
	DJ4AN	485	45	OK1AFN	385	70	SM7AIL	291	96	SP6DB	235	121	PA0IA	135
20	PA3ABB/A	465		EA2OP	385	71	YO3KWF	290		UB5IEP	235		UC2WAZ	135
	UB5IF	465	47	UB5ZDF	380		HA7SU	290	98	SM0CGO	230	123	YU3NP	123
	DK3AX	465	48	UK4PCE	373		DJ1QQ	290	99	F3WW	228	124	OH9TD	120
23	UR2RCU	460	49	UP2PCW	370	74	UA3AGX	285	100	UP2OM	220	125	OK3KFO	100
24	UQ2PG	455	50	LZ1XX	365		UA4HDV	285		DL1PB	220	126	UP2BDX	30
25	DF1KT	445	51	UQ2PP	358		DJ5GW	285	102	DL0NZP	213	127	YU1SF	25
	ON4XG	445				77	DF6XB	283						

EUROPE SSB TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points
1	DL6AX	715	12	OZ8ZB	260	23	DK4IO	190	34	UV3DN	135	45	OK2BLG	100
2	ON6JG	565	13	LA5QK	255	24	F6DRP	185		YO3ABL	135		OK1KIR	95
3	DK2WH	560		F8WE	255		SM7AIO	180		UP2OU	125	46	UA4UAZ	95
4	DK8FS	470	15	OZ3KE	243	25	PA0BFO	180	36	UW3EQ	125		UC2WAS	95
5	DF1KT	435	16	UW1AE	240		SP3EQE	180		OZ2UA	125	49	DL1YA	90
6	DF6XB	425	17	OZ4HW	225	28	OF7NW	175	39	UA3XAN	115	50	OK1KZ	75
7	UP2ER	370	18	UK2WAF	210	29	YU3JU	160		DA1OI	110	51	OK2JK	65
	PA0XAW	370	19	F6API	208		SM6BXV	155	40	F8TM	110	52	UA3PBY	60
9	UR2QA	325	20	UA3AEZ	205	30	HB9DX	155		OH2SB	110	53	UP2BBF	50
10	DL7SU	318	21	UY5OQ	200		UP2BAW	155	43	OH2JQ	108			
11	ON4XG	270	22	OK1DKS	191	33	OF1HS	145	44	UC2BA	105			

REST OF WORLD SSB TRANSMITTING

Posn	Callsign	Points
1	UA9CBO	335

OVERSEAS CW LISTENERS

Posn	Station	Points
1	ONL383	410
	LZ2F166	410
3	UB5-071-346	275
4	YU1RS-461	225
5	OK2 18248	215
6	BERS195	200
7	UA3-12759	195
8	UP2-038-1582	150
9	OVL06	90

CW UK LISTENERS

Posn	Station	Points
1	BRS35608	2,285
2	BRS15822	2,035

UK SSB LISTENERS

Posn	Station	Points
1	BRS32525	2,535
2	BRS34032	1,800
3	BRS34740	1,650
4	BRS34310	1,645
5	BRS15822	1,225
6	BRS38827	815
7	BRS38709	755

OVERSEAS SSB LISTENERS

Posn	Station	Points
1	SM3 5384	565
2	ONL383	495
3	FE1778	465
4	DL-A36/158337	385
5	I0 59469	302
6	SP0021-GD	235
7	UP2-038806	220
8	UB5-0683	210
9	UA2-125334	195
10	UC2 00561	175
11	DL237-12237	125
12	UP2038-672	90
13	I054651	60

First 1·8MHz Contest 1978 results

Ken Riddoch, GM3ZSP, completed a fine double by winning this event after his success in the Second 1·8MHz Contest 1977. His Trio TS520, transverter and dipole at 60ft, have given him a total of 1,463 points for the two contests, and he retains the Maitland Trophy for the second year running. At the other end of the UK Al Slater, G3FXB, gained second place using a T4/R4 to a dipole, also at 60ft. In third place was another Sussex station, that of Kevin Smith, G4EHF, who used a KW2000A and dipole at 40ft.

The overseas section again received good support, and the welcome appearance of many LA stations, given a temporary "weekend" 1·8MHz licence, not only increased activity but also gave most UK entrants an unexpected bonus. The winner, Wolfgang Daub, DK3KD, made 105 QSOs. Runner-up was Günter Schwarzbeck, DL1BU, making 96 QSOs.

In the under-18 age group, the leader was David Lurcook, G4ERW, scoring 434 points to give him 25th place.

Logs were very neat and well presented, and only one required rescoring. Although most entrants have lost points, there were only three duplicates found in the 61 entries checked!

Very few comments were received with the logs, which seems to indicate general satisfaction with the rules, although the one apparent bugbear concerns the timing of the contest—some entrants feeling that it could have been brought forward an hour. Do others feel the same? "Silent" entrants may like to drop the adjudicator a postcard indicating their preferences.

Both the Somerset and Maitland Trophies will be awarded to GM3ZSP. Certificates of merit go to G3FXB, G4EHF, G4ERW, DK3KD, DL1BU, LA8UU and YU3TJA.

Finally, the HF Contests Committee gratefully acknowledges checklogs from G3KKQ, G3TAA, G3USE and G3ZRZ.

G4FAM

SECTION A—UK

Posn	Callsign	Points	Posn	Callsign	Points
1	GM3ZSP	736	23	G3GC	456
2	G3FXB	702	24	G2MJ	448
3	G4EHF	664	25	G3SYM	447
4	G3YMC/A	653	26	G4ERW	434
5	G4BPO (G3RPB)	652	27	GW3JI	432
6	G3SJJ/A	630	28	G3CXX (G3NKO)	418
7	G3IGW	620	29	GM3XOQ	403
8	G3XSC	599	30	G4DUS	401
9	GI3IVJ	584	31	G4EBK	393
10	G3OLB	581	32	G3HTI	373
11	G3XTT	579	33	G3KLX	351
12	G3TMA	572	34	G4CZB	334
	G3TQD/A (G4GAA)	572	35	G3ILO	327
14	G3WUX/A	567	36	G3IFF	310
15	G3ZSU	542	37	GM3OXC	307
16	G4EDG	537	38	G4ERT	295
17	G3SJE	521	39	G2BTO	294
18	G4CWH/A	514	40	G8RZ	277
19	G3YHV	508	41	G3VQO	264
20	G3WGV	488	42	G3FVW	235
	GU4EON	488	43	G3ULY	205
22	G3TLF	487	44	G4GCB	137

The entry from G3KMR was disallowed under general rule 3.

SECTION B—OVERSEAS

Posn	Callsign	Points	Posn	Callsign	Points
1	DK3KD	502	10	DJ6FO/P	238
2	DL1BU	490	11	DF4BO	211
3	LA8UU	436	12	LA4LN	186
4	DJ3XK	388	13	LA9YF	174
5	DJ9MH	383	14	LA8YB	136
6	LA5HE	375	15	OK1DCF	135
7	DK6AS	359		OK1DKW	135
8	DJ5BV	328	17	OK2PAW	95
9	YU3TJA	308	18	OL6AUE	65

DF Qualifying Event Burton-on-Trent results

Twenty-four teams assembled beside the River Trent on 21 May for the Burton-on-Trent DF Qualifying Event; they were also assembled beside four 132kV power lines and above a high pressure gas pipeline. At 1320 signals were heard by all competitors from station "A", G3NFC/P on 1,916kHz, and station "B", G4AXR/P on 1,985kHz. However, entrants found it difficult to obtain definite bearings on station "A", so, initially, everybody headed for station "B".

G4AXR/P was located on a thickly wooded hillside at Fauld, some five miles from the start. The antenna, which was about half a mile long, was fed near one end via a short section threaded through the undergrowth. After some experiment, the operator found that when he transmitted, competitors ran away from him. This did not prevent Peter Lisle from catching him unawares at 1435, closely followed by Messrs Gage, Mahoney and Hawkins, although some entrants spent over two hours on the site.

Only four teams managed to locate G3NFC/P before 1630, even though it was only two and a half miles S of the start near Drakelow Power Station. This may have been because the transmitter was coupled into a disused (and earthed) power line which passed over the start. The power had been adjusted so that, although adequate signals were achieved at the start and near the line, the station was inaudible at a distance. Additionally, bearing errors of up to 90° prevented rapid location of the station.

			Time of Arrival	
Posn	Name	Club	Stn "A"	Stn "B"
1	P. Lisle	Mid-Thames	1534	1435
2	J. R. Vickers	Slade	1615	1517
3	B. J. Mahoney	Rugby	1616	1437
4	T. C. Gage	Mid-Thames	1630	1436
5	M. P. Hawkins	Chelmsford		1440
6	T. R. Butson	Chelmsford		1459
7	C. M. Wells	Mid-Thames		1506
8	A. W. Butcher	Chelmsford		1507
9	D. Holland	South Manchester		1508
10	C. D. Merry	Dartford		1512
11	P. J. Yeates	Salisbury		1513
12	G. Whenham	Coventry		1514
13	B. R. Poole	Mid-Thames		1521
14	J. Cockett	Mid-Thames		1527
15	E. L. Mollart	Mid-Thames		1537
16	P. Tyler	Mid-Thames		1538
17	D. E. Newman	Slade		1604
18	P. Homer	Dartford		1610
19	C. Plummer	Coventry		1612
20	W. J. North	Mid-Thames		1613
21	P. Woollett	Dartford		1614
22	J. McBurney	South Manchester		1616

Two teams failed to find either transmitter.
J. R. Vickers and B. J. Mahoney qualify for the National Final.

Low Power Contest results

The low power 7 and 3·5MHz contest, held on 9 April, attracted a total of 37 entrants, 10 of these from outside the UK. The winner of the UK section was G4EDG, who will receive the 1930 Committee Cup. His score of 24,250 was made on both bands, using a maximum power of 1W, and this gave him a good lead over G4ELZ, who was second with 20,250 points. G4ELZ also used 1W and worked both bands. In third place was G4CWH with a score of 18,900 on 7MHz only, again with 1W maximum power.

The winner of the overseas section was PA3ABA with 7,175 points, with DJ6FO second, and DK6AJ third. In addition to the entries shown in the tabulation, several other overseas QRP stations took part in the contest but did not send in logs.

Conditions on 7MHz were generally good, although many entrants complained of QRM from QRO stations competing in the Swiss H22 Contest. There were also problems on 3·5MHz, where conditions were

poor, with almost every entrant complaining about the difficulties of making contacts on the band.

There were a number of adverse comments about the scoring system and, in particular, the bonus points for 7MHz. A few entrants suggested that the bonus would have been better applied to contacts made on 3·5MHz, while others felt that the 7MHz bonus had inhibited activity on 3·5MHz and that there should be an incentive to encourage stations to work both of the bands.

The times of the contest met with general approval, although a substantial number of entrants were unhappy about the break period being left to the individual choice of the operator. There appears to be a preference for a fixed time break of one hour, and 1230–1330 local seems to be a popular choice. The bonus and the fixed break proposals will be considered by the committee when it reviews the rules for the 1979 event.

Certificates have already been mailed to the leading three stations in each section.

The committee thanks all entrants for supporting the contest and G3CMH, G3USE, G4GVN and GW3CW for their checklogs.

G6LX

UK SECTION

Posn	Callsign	Pwr	Bands worked (7 and/or 3·5MHz)	Points
1	G4EDG	1W	both	24,250
2	G4ELZ	1W	both	20,250
3	G4CWH	1W	7 only	18,900
4	GM3OXX/A	1W	both	18,250
5	G3UFY	1W	both	18,100
6	G3AZ	1W	both	17,675
7	G3YMC	1W	both	17,125
8	G3NEO	1W	both	16,300
9	G4DDL	1, 2, 5W	both	15,050
10	G4CZB	1W	7 only	13,700
11	G3PCW	1W	7 only	12,900
12	G3DNF	2, 5W	both	12,025
13	G3AIO	2W	both	12,000
14	GM3USL	1W	7 only	11,975
15	G4DDX	5W	both	9,900
16	G3KKQ	5W	both	8,725
17	G8PG	1, 2W	both	7,625
18	G3AWR	5W	both	7,250
19	G4FPA	1, 5W	both	6,575
20	G3LHJ	2W	both	5,400
21	G4AEM	2W	7 only	5,250
22	G3YWU	1W	both	5,200
23	G3IFF	5W	both	5,125
24	G4DVK	5W	both	4,935
25	G4AYS	1, 3W	both	4,675
26	G3KSK	5W	7 only	3,750
27	G3JKY	2, 3W	3·5 only	625

OVERSEAS SECTION

Posn	Callsign	Pwr	Bands worked (7 and/or 3·5MHz)	Points
1	PA3ABA	1, 2W	both	7,175
2	DJ6FO	2W	7 only	5,350
3	DK6AJ	2W	7 only	3,100
4	DK9TZ	2W	7 only	2,850
5	OZ6SF	5W	7 only	2,050
6	OK3FF	2W	both	1,695
7	DJ6GE	2W	7 only	1,650
8	OK1DKW	5W	7 only	950
9	EA2OR	1W	7 only	800
10	DK5RY	3W	7 only	100

May 1978 144MHz Portable Contest results

Entries for this contest increase each year, demonstrating the continuing popularity of the event. Once again the ingredients for happy/P operation were present, with kind weather, high activity and good propagation playing their part.

For the second year running the Wulfrun CG mastered the event, and in the process they recorded the largest number of QSOs so far logged in any 144MHz event. Their 854 contacts included 359 over 500km and 10 over 1,000km. Addiscombe ARC was runner-up, and both groups will receive certificates.

G3VPK

Posn	Callsign	Points	Points/ QSO	QTH	Best dx	Km
1	GW8BHH	13,523	15·9	YM44	SK7CE	1,133
2	GW4ALE	12,104	15·2	YM04	DC1XC	915
3	G3PMH	12,028	14·6	AM51	SM6GFS	970
4	GW4GMO	11,542	15·1	YL05	SK7CE	1,195
5	G3ZIG	10,761	13·1	AM06	SM6GFS	865
6	G3PIA	9,695	13·2	ZL33	OZ7CR	975
7	G4DSP	9,309	14·9	AN61	SK7CE	875
8	G4CAR	8,019	13·0	ZM21	OZ9ZI	976
9	G8OHM	8,004	14·0	YM50	SK7CE	1,059
10	G6HH	7,726	11·4	AK03	OZ5QF	740
11	GW8EDH	7,725	14·1	YM12	DK2JXA	855
12	G3YCW	7,555	10·6	AL33	SK7CE	930
13	G4FDX	7,186	11·5	ZL17	SM7GUS	1,025
14	G8FIS	7,130	14·5	ZO55	DC8BB	707
15	G8GAJ	6,936	10·2	YN29	DC2XFA	780
16	G4CQR	6,769	10·5	AL66	GM8AZS/P	760
17	G4BRA	6,374	11·1	YL62	OZ7BRJ	1,041
18	G4BEM	6,360	10·2	ZN61	F4DK	1,061
19	G4DZO	6,325	10·2	AK11	GM8AZS/P	749
20	G3WKS	5,997	10·8	AL73	GM8AZS/P	712
21	G3SAD	5,641	10·0	ZL09	OZ1OF	796
22	G3WOR	5,582	8·9	ZK09	OZ1OF	874
23	G3WOI	5,541	11·1	ZL53	DK7LJ	910
24	G3AHD	5,303	11·8	ZO55	F9NT	676
25	G4DAR	5,113	11·5	YM40	DK5LA	997
26	GM3WOJ	4,938	10·6	XO26	G3YMD/P	560
27	G3XWZ	4,778	11·8	ZN62	DK3LL	848
28	G8MWA	4,543	9·2	AL43	OZ1OF	790
29	G3WUX	4,362	8·1	ZM80	F1AWL	940
30	G4ERP	4,294	8·0	ZL01	DC6EX/P	646
31	G3FJE	4,189	8·7	ZM79	OZ5IQ	833
32	G3VRE	4,168	8·7	ZL41	DB9YJ	750
33	GD3FLH	3,903	10·5	XO67	DF1JC	855
34	GW8CSA	3,791	9·6	YL15	DK3LL	970
35	GW6GW	3,751	9·3	YL25	DK4TX	695
36	G3EFX	3,652	7·4	ZL26	DK3LL	841
37	G3ZPU	3,559	9·4	ZN11	DC8AGA	640
38	G3XNO	3,417	9·8	ZN13	DC6EX/P	680
39	G4EUZ	3,135	10·0	ZO02	DC4QF	680
40	G8LVQ	3,132	9·0	ZN02	F1DGF	638
41	G3YMD	3,118	9·3	AL76	GM8FFX	700
42	G4CDU	3,096	10·5	XK27	GM4HAM/P	540
43	G8LED	3,009	7·7	ZM45	OZ4DK	705
44	G4FES	2,941	9·0	XK30	F1EUS	800
45	G3JEQ	2,916	7·6	ZL77	SM7DIZ	950
46	G4ERG	2,879	11·3	ZN07	DK2JXA	705
47	GM4HAM	2,779	9·9	YP44	G6HH/P	572
48	GM4EZJ	2,674	9·6	YP42	ON5UI	951
49	G2ASF	2,541	8·4	ZN52	DC8AGA	636
50	G3HQX	2,538	6·8	ZL74	DC5LQ	837
51	G8OPR	2,481	7·4	ZL53	OZ5QF	790
52	GM4GRC	1,996	9·5	YQ64	G6HH/P	628
53	GW8GRB	1,991	7·8	YN75	ON5RU	632
54	G4DLB	1,971	5·8	ZM73	GM4GRC/P	475
55	G8FKI	1,942	6·1	AL23	GM4EZJ/P	498
56	G8OIU	1,627	7·9	AL56	GM3WOJ/P	538
57	GM3ZQM	1,588	8·6	YP59	PE0GPL	560
58	GU8NIS	1,576	8·9	YJ48	G3AHD/P	525
59	GI4GTY	1,517	9·5	WO40	G6HH/P	587
60	G4CRC	1,474	9·8	XK64	G4EUZ/P	550
61	G8GXE	1,395	6·6	ZL26	GM4GRC/P	532
62	G8MZO	1,261	4·8	ZK19	DB1EA	360
63	G4FWC	1,228	7·0	ZM33	DL3GU	632
64	G4AAX	1,200	7·4	ZP62	G6HH/P	495
65	GM3WEE	986	7·2	YQ66	G3WKS/P	610
66	G8KRB	858	8·6	ZO46	PE1ARC	450
67	G8MFK	540	5·4	YL20	ON5UI	421
68	GM8OUR	502	6·4	XQ80	G6HH/P	620
69	G8LM	358	5·1	ZM37	GM3WOJ/P	317
70	G4CGS	328	5·7	ZN11	F1CPQ	486
71	G4EDV	299	7·3	YO54	G3WOR/P	430
72	G3IGV	251	8·1	XK47	F0DZP/P	375

Check logs are acknowledged from BRS33823, G3XFW, G8LVM, G8NBS, GI8OJG, G8OMI, PA0FKP, PA0XMA, PE1ARZ, F1DRR and F1KBF.

IARU Region 1 VHF/UHF Contest 1977 results

September 144MHz Fixed

16. G8KUC
21. GJ5CDQ
30. G8IQO
56. G8EYC
63. G4DEZ
70. G3GNR

September 144MHz Portable

11. G6HH
16. GW3OXD
19. GW8IZS
26. G4BPO
27. G3PMH
32. G4CVI

October 432MHz Fixed

8. G3NNG
28. G3VPK
42. G3FZL
50. G3JMA
60. G4CQR
72. G3OHM

October 432MHz Portable

5. G4BPO
10. GW3UBX
14. G4BRA
28. G4EEE
42. G3AKF
62. G4ALE

October 1,296MHz Fixed
4. G4BEL
5. G3VPK
11. G3JXN
17. G3SBV

October 1,296MHz Portable
3. G3XDY
4. G4BRK
6. G4ALE
7. G3ULT

October 2,304MHz Fixed
7. G4BEL

October 2,304MHz Portable
2. G4ALE
4. G3WOI
5. G3XDY

A booklet containing full results may be obtained by sending a large (6in by 9in) sae to R. Taylor, G4BEL, 12 The Rampart, Haddenham, Cambs.

Region 1 (RSGB) VHF Contest rules

0900–1700gmt 10 September 1978

Bands. Any three from 70MHz, 144MHz, 432MHz or 1·3GHz.
Section 1. Multi-operator, fixed or /P. Separate callsign on each band, simultaneous operation.
Section 2. Single operator, fixed or /P. One to three bands out of the above. /P ops may go up to 20 miles outside the region. **ALL** ops must say that they are in or from Region 1. On 1·3GHz the QTH location exchanged must be different from the one used on the other bands (as in NFD).
Section 3. Operators outside Region 1 are invited to enter logs. Score **ONLY** for Region 1 QSOs.
Rules. The following general rules published in the January 1978 issue of *Radio Communication* will apply: 2, 3, 5a, 6a, 9a, 10a, 11 to 16, 18, 19, 20b, 21.
Scoring. A For 70, 144 and 432MHz, as above rules 7a; for 1·3GHz, 3 points per km; followed by B, C and D in that order.
B Multiply 70MHz by 3 and 432MHz score by 4.
C According to antenna height asl. Multiply band totals as below:
0–200ft by 2, 200–400ft by 1·8, 400–600ft by 1·6, 600–800ft by 1·4, 800–1,000ft by 1·2, 1,000–1,200ft by 1·1, 1,200ft and over by 1.
D Add 10 points bonus for each contact with a Region 1 station.
Logs. Separate sheets for each band. One cover sheet to include ngr and antenna height asl.
Awards. 1, The G2CIP Shield; 2, The G3SMM Shield; both to be held for the year. Certificates of merit to band leaders in 1 and 2 and best log in 3.
Entries. Within 15 days to G2CUZ, 34 Sandbrook Road, Ainsdale, Southport PR8 3JE.

Looking ahead

17 September—IOW "get-together", Alverstone Manor. Details from G3KPO.
24 September—Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent. Details from GW3KYA.
2-4 November—ARRA Exhibition, Granby Halls, Leicester.

Contests calendar

5–6 August	Romanian DX (Rules in July issue)
6 August	DF Qualifying Event, South Manchester (Details in July issue)
11–12 August	European DX (WAE) (CW) (Rules in July issue)
12–13 August	70MHz Open and SWL (Rules in June issue)
19 August	NRRL 50th Anniversary (CW) (Rules in August issue)
19–20 August	4th SEANET Worldwide DX (Rules in August issue)
20 August	DF Qualifying Event, Slade (Details in July issue)
20 August	NRRL 50th Anniversary (Phone) (Rules in August issue)
26–27 August	All Asian DX (CW) (Rules in June issue)
2–3 September	SSB FD (Rules in June issue)
2–3 September	144MHz Open and SWL (Rules in July issue)
9–10 September	European DX (WAE) (Phone) (Rules in July issue)
10 September	RSGB Region 1 VHF (Rules in August issue)
16–17 September	Scandinavian Activity (CW) (Rules in August issue)
17 September	DF Final, Basingstoke
23–24 September	Scandinavian Activity (Phone) (Rules in August issue)
October–November	432MHz Cumulative (Rules in August issue)
7–8 October	432/1,296/2,304MHz (Rules in August issue)
7–8 October	VK/ZL Oceania (Phone and RTTY)
14–15 October	21/28MHz SSB (Rules in May issue)
14–15 October	VK/ZL Oceania (CW)
21–22 October	7MHz SSB (Rules in June issue)
22 October	70MHz Fixed (Rules in August issue)
28–29 October	CQ WW DX (Phone)
4–5 November	7MHz CW (Rules in June issue)
4–5 November	144MHz CW
10–11 November	European DX (WAE) (RTTY) (Rules in July issue)
11–12 November	2nd 1·8MHz
25–26 November	CQ WW DX (CW)
3 December	144MHz Fixed

Mobile rallies calendar

6 August—RSGB National Mobile Rally, Woburn Abbey.
13 August—Derby Mobile Radio Rally, Lower Bemrose School, Bedford Street, Derby. Gates open at 12 noon. Free admission and parking. Attractions include trade stands, junk sale, prize draw, flea market (tables £1 per hour, no traders) and refreshments. Ample accommodation if wet. Details from G3EYM.
20 August—Cardiff RSGBG Mobile Picnic, Porthkerry Park, Barry, South Glam.
20 August—Preston ARS Mobile Rally, Walton-le-Dale County High School, Bamber Bridge, Preston (one mile from M6, junction 29). Talk-in on S22. Usual attractions including bring and buy stand. Plenty of free parking. Doors open at 11am. Details from G8KTM, QTHR.
27 August—Torbay Mobile Rally, STC Social Centre, Brixham Road, Paignton, from 10.30am. Talk-in on G8NJA S22. Attractions include trade stands, radio and general draws, hot and cold buffet. Full details from G3UIQ, tel Newton Abbot 3025.
10 September—Stalybridge Festival Mobile Rally, Cheetham Park, Stalybridge, Cheshire. To be held in conjunction with the Stalybridge 1978 Festival. Details from G8KQP, QTHR.
10 September—Telford Mobile Rally, Town Centre Malls, Telford, Salop. (Approached via A5 exit off M6, A442 from N or S, or M54 from W.) Free convenient parking and admission. Opening 11am; talk-in on GB3TRG. Jointly organized by Salop and Telford radio societies, attractions include trade stands and exhibits, full catering, bring-and-buy stands (£1 per table per hour), free coach ride to Ironbridge Open Air Museum, horse and trap rides, police dog display, RSGB bookstall, club stand, etc. Further details from G8DIR, tel Shrewsbury 64273; G8FSV; or G3UKV; all QTHR.
17 September—Peterborough R&ES Mobile Rally, Walton School, Mountsteven Avenue, Peterborough. Details from G3EEL, QTHR, tel 65423/62881.
24 September—Harlow & DARS Mobile Rally, Netteswell Comprehensive School, Harlow. Details from G8FRG, 232 Pennymead, Harlow, tel 0279 32486.
1 October—Great Lumley Mobile Rally, Community Centre, Great Lumley, Tyne & Wear. Trade stands, etc. Details from G8JLQ, QTHR.

obituaries

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

Mr W. Ingle, G3OIZ
Bill Ingle, who died on 25 June aged 62, was active on most bands until quite recently. He had many contacts, both local and further afield, and he kept fairly regular skeds with his son, G3ZNE.

Mr C. T. Jay, GW3KSQ
Cyril Jay, who died on 24 June aged 68, was operational until his death. Licensed for many years, he was well known on all bands and gave many a first contact with GW to a wide range of stations. At the time of his death he was chairman of the Port Talbot (British Steel Corporation ARS) club, as well as being a member of the FOC and TOPS clubs.

Mr A. Kuhnel, BRS3572
Arthur Kuhnel died on 20 May. He had been a member of the RSGB for 39 years.

Mr R. H. Lawrence, G3UNL
Ralph Lawrence died in June at the age of 66. He was a well-known cw operator on the hf bands and a regular attender at meetings of the Southampton and Winchester clubs.

Mr A. D. Stenning, G4JA
Alan Stenning, who died on 5 June aged 65, was a lifelong radio enthusiast who began as a schoolboy, continued as a ship's radio officer, and whose final QSOs were made in May this year. From 1929–36 he was G2JA. He also inspired his son David, who is now the very active G4ENE (ex-9H3P). Recently, due to illness, Mr Stenning was "reduced" to using a microphone, although previously he had been a great exponent of the brass pounder, being a member of TOPS, the OT Club, A1 Op Club, the RCC and FOC.

We have also been advised of the deaths of:
Mr E. B. Hughes, G3WQR, on 12 May aged 63;
Mr B. L. Morrison, GM4EPE, in June;
Mr R. R. Stringer, G3DKF, on 14 May.

your opinion

SYNTHESIZED CONTROL

The Editor
Radio Communication

Sir – The latest sophisticated hf transceiver to hit dealers' adverts in a shower of superlatives boasts of fully synthesized control with digital read-out to 100Hz. What many buyers may not realize when they lay down their 1k in cash is that they are buying a built-in handicap of 100Hz tuning steps.

Slovenly "netting" on ssb has been a major cause of complaint within the fraternity for many a year, yet this new advance in design guarantees a new wave of "approximate coincidence". Defenders will rush in with a plea that their incremental receiver tuning will help out: it does not, of course – it merely compounds the confusion.

Most disillusioned are those who aspire to use the rig for rtty. With the universal use of 170Hz shift, a synthesizer step of 100Hz makes it wildly inappropriate. Precision netting is imperative on rtty, and especially during contests and periods of high activity. With a mere 10 to 20kHz allotted to rtty on the hf bands, these splendid new black boxes tuning in 100Hz "chunks" are a guaranteed hit *and* miss and will assuredly clobber our meagre "living space".

Colin Richards, 9M2CR
(SSB since 1953)

Special event stations

GB3ITZ, 19 August
RAF Sealand ARC will have a special station at the RAF Sealand Open Day, at Deeside, Clwyd, from 1000–1800. Operation will be on 3·5, 14, 21 and 28MHz, and talk-in on 144·22 ssb or via GB3MP on R6, later directed to S22 for local traffic. Visitors welcome; ample car parking space.

G3CMH/A, 19 August
Yeovil Amateur Radio Club will be operating a special event station from the Mid Somerset Show, Shepton Mallet, Somerset. Operation will be on all bands 3·5 to 28MHz A1, A3J; 144MHz A1, A3J, F3; with talk-in on S21 if required. Visitors will be most welcome, and special QSL cards will be issued through G3NOF, QTHR.

GB3MGH, 19 August
A special event station will be in operation at Marston Green Hospital, Marston Green, Birmingham B37, to help commemorate the 40 years' service by the hospital since 1938. Operation will be on vhf and hf bands, from 9am to 5pm. There will be a certificate of commemoration for those who require one, available on receipt of 50p incl p & p. All proceeds will go to Marston Green Hospital and the RAIBC Birmingham. All QSL cards and contributions for the certificate, and any enquiries, to M. O'Donnell, No 7 Conrad Close, Highgate, Birmingham B11, tel 021-773 6923.

GB3TCF, 26–28 August
A special event station at the Town and Country Festival, National Agricultural Centre, Nr Kenilworth, Warks, will operate from 0900 to 2100 on 26 and 27 August, and from 0900 to 1700 on 28 August. Operation will be on 1·8MHz and 144MHz all day. An operating rota will be used for 3·5 to 28MHz, and it is intended to operate from 0900 to 1100 (approximately) on 14 or 21MHz, from 1100 to 1500 on 3·5MHz and for the remainder of the day on 14 or 21 MHz. Contacts on sstv and rtty will be available at any time. QSL cards will be issued for all contacts made, and it is hoped to present a prize from a draw made from all British Isles contacts. In addition, there will be displays of home construction, amateur radio astronomy, Raynet and a film show. The National Agricultural Centre lies on the A444 and can be reached easily from the A45 or A46. A talk-in station will operate on 145·55MHz S22.

GB3LC, 16–17 September
A group of RSGB members is presenting an amateur radio event which will be open from 1000 to 1700 on both days. The event will be housed in a large marquee in the grounds of the Hornsea leisure park, situated on the outskirts of Lancaster, and it is being sponsored by Lancaster City Council and the Hornsea Pottery Co. The object of the exercise is to present the best of amateur radio to the public by means of displays, demonstrations and working stations. Two hf stations, together with talk-in on 3,670kHz and 144MHz S22, will be in operation, and of course any amateurs will be welcome, especially mobiles, for whom a section of the car park has been reserved. A special feature of the event will be a radio link-up with the Lancaster twin towns of Rendsburg in NW Germany, and Perpignan in S France, and also with other Lancasters in North America, of which there are several.

The following special callsigns will also be on the air during August and September:

1 August	**GB3SC**	Sutton Coldfield
3–15 August	**GB8CRU**	Tickenham, Norfolk
5 August	**GB3TRG**	Telford, Salop
5 August	**GB3PRU**	Prudential Assurance Co, London
5 August	**GB3WHF**	Wimborne
19 August	**GB2TS**	Tollerton, Yorks
20 August	**GB3PRS**	Bamber Range, Lancs
20 August	**GB3NRC**	Kingsthorpe, Northants
20–26 August	**GB3TH**	Dorchester, Dorset
21 August	**GB3RN**	*HMS Mercury*, Hants
23 August	**GB3SRC**	Chingford, London
28 August	**GB3VER**	St Albans, Herts
28 August	**GB3FHC**	Flaxwell Heath, Bucks
8 September	**GB3STD**	Ovingdean, Sussex
9 September	**GB8SFC**	Cheetham's Park, Stalybridge, Cheshire

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* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 75p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

The closing date for each issue is the 1st of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

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.

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS.

Do not post to RSGB HQ or Advertising Representative

FOR SALE

Creed 86R reperforator, unused, £10. Buyer collects. A. Cooper, 1 Cottage Crescent, Camelon, Falkirk, Stirlingshire. Tel 0324 23533.

Kokusai 455kHz ssb filter, with some G2DAF Mk1 components and xtals, £20. KVG XF9B filter, with DL6HA boards, £25. Very tatty HRO, no psu, £5. Buyers collect. *Wanted:* antenna noise bridge. Write. G3OXS, QTHR.

CMOS electronic keyer by G3KHZ, dot and dash memories, automatic 3:1 dot dash ratio, low battery consumption, self-contained, £15. G3BIA, QTHR. Tel 01-977 6705.

Heathkit SB101 tx/rx, SB600 spkr/psu, SB610 monitorscope, mint cond, £250. Hammarlund SP600 rx, 0·5–54MHz, £60. Dual trace 'scope, 5MHz, as new, £50. Single beam 'scope, 1MHz, £15. AM/F27 Highband, £10. VVM, £10. G3TEJ. Tel 0480 54560.

Eddystone 888A, unmarked, exc cond, manual, xtal calibrator, Tiltine blocks, orig box, buyer collects, £80. New audio notch filter, Cambridge kit, £4.50. Garex 2m converter, 28–30MHz i.f., has fault, £8.50. Avo Minor, exc, £6. G3FK, QTHR. Tel 07257 436.

Trio 3200, fitted 11chs, helical, nicads, all accessories, boxed, as new, £180 or offers. Would pay cash with Trio for FT101, etc. Lamb, 178 Alvechurch Road, West Heath B31 3PW. Tel 021-475 5313.

Cossor dual beam 'scope, heavy, £20. Ultra lowband packset, mic, manual, £15. G8AEV 2W 2m a.m. tx, £15. FM vfo, £5. Hudson lowband mobile, mic, manual, £20. Transformers 5V 3A (2) 275–0–275V, 110–0–110V, 4V 3A, 6·3V 3A, £8; 175–0–175V, 0–5–9–12V 5A, £5. G4AWF. Tel Blackpool 811108.

Versatower W40, good cond, comp telescopic and pivot down winches, first reasonable offer accepted. TS700, immac, unmodified cond, £275. Watts. Tel 01-485 2231, daytime.

Thorn 3000 19in colour tv, solid-state, exc cond, £100; or swop tape rec, 15in/s pref but not essential. Unwin, 91 High Street, Long Buckby, Northampton. Tel Northampton (0327) 842373.

Pye hf tx/rx, 4ch, xtal controlled within 3–15MHz, c/w mains and mobile psus, one rx ch u/s, £55. Geloso V80, all bands, less valves, £7.50. G4BFO, QTHR. Tel Ringwood (04254) 2273.

FL50B, 160–10m, ssb/cw 50W vox kit, mint, boxed, handbook, £65. Collins 32V-3, 80–10m, a.m./cw, 150W, wkg, with handbook, £25. Codar AT5 with ac psu circuit, £20. G3DQY, QTHR. Tel Polegate (03212) 5704.

WD22 tx/rx 6–9MHz, comp, £10. BC624 vhf rx, £5. 8BN8 valves, "Everlasting", latest USA, new, £5 ea. Drake 2B 6V metal valves (AR77E), 50p ea. New VCR97 crt, £5. All plus post. G3OSH, QTHR. Tel Ilminster 3349.

Heath HW101 tx/rx, cw filter, Heath psu HP23A, £175. Buyer to arrange carr. G4DEV, QTHR. Tel 01-850 3304.

BC221, £14. Xtal calibrator No 10, £2. ¼hp motor with gears, £3. Several HC18U xtals, 37–59MHz, also HC6U. *Wanted:* Pye Lynx camera, any cond, electric welding set or transformer. Tel Tony, 01-452 6724.

Pye U450 uhf base stn, tx and rx wkg on RB6, 5W o/p, £40. Pye F27FM base stn tx on 2m, 30W o/p, £30. G4CCC, QTHR. Tel Reading 471761 (home), Reading 864446 (work).

2513/CM2140 character gen rom, suitable G3PLX vdu, £4.50. Welmec 8ch paper tape punch, with manual and psu, £20. G8ISI, QTHR. Tel Liphook (0428) 723168.

SX117, HT44, PS150–120, SB610, SB620, HA10, HA1, SP60, TH3, Ham M with auto control, Osker pwr meter, all manuals, orig boxes, £100s spare valves, tubes, £500 lot. Buyer dismantles and collects wkg stn incl console. G3FPD. Tel 0403 722909.

Mullard L343/01 amp, 2–24MHz, three 4–400 valves in final, new, no psu, £120. G3LBG, QTHR. Tel 0702 521561.

FT101, 160m fan, £275; KW lpf, £20; MMC 144/28 lo 2m converter, £15; all ono. Keats. Tel 0305 4224 (Dorset), daytime only.

IC202 2m ssb portable tx/rx, 144·0–144·6 and 144·8–145 for beacons, ext pip tone and rf power control modules, £135. Also 2N6082 25W pa parts, £5, or free with above rig. G8LZP, QTHR. Tel 0242 53368, weekends only.

Yaesu FRG7, mint cond, still under guarantee, (SMC), £95. Tel Bedford 54003, evenings after 6pm.

VFO 30G, as new, surplus to requirements, £60 ono. G8NHN, QTHR. Tel 0253 722652.

FT75, 10–80m, ssb, 12V dc 230 ac psus, seven xtals FV50^{C} vfo, Tavasu mobile ant, four coils, two 12Y7As, manual, £200, offer. J. Tye, G4BYV, "Inter-nos", Swanton Morley, Dereham, Norfolk NR20 4NU.

KW109, mint, £70. Stolle 2010 rotator, unused, £30. McElroy bug key, £12.50. Trans, 16V 20A, £5. HRO spares, old handbooks, modern meters, much other gear, sae list/enquiries. G2CDB, QTHR (Birmingham). Tel 021-455 8931.

Drake TR4CW, four months old, as new, comp with psu, spkr, etc, first £475 plus carr Securicor. Tel Barry 741520.

KW2000A, ac psu, manual and circuit diagrams incl, £145. Also Eddystone 888A, vgc, £75. G4CRM, QTHR. Tel 070 14 52442.

Avo CZ457/5 resistor/capacitor/inductor evaluator, high specification, very wide range, better than 0·05% accuracy, £50, or offers (few only)? Philips ac valve, millivoltmeter, £30. Buyers collect or arrange carr. *Wanted:* 7BP7/5FP7 sstv tube. Robinson. Tel Stocksfield (Northumberland) 3449.

JVC 3606 combined tv radio cassette recorder and radio Mk2, almost new, worth approx £180, p/x. *Wanted:* Eddystone S777R rx, must be mint. L.D. Ireland, Carnhell Green, Camborne, Cornwall TR14 0WA. Tel Praze 236.

Polar Electronic Developments 2m transverter, few hours use, as new, with spare (new) pa driver, wired FT101, £100 ono. G3SCP, QTHR. Tel 0582 419178.

FL200B 80–10m ssb tx, 240W p.e.p., with mic, £100. XG14 group B tv antenna, high gain, as new, £12. Variac 3XW, oil filled with overvoltage, £5. G4DCE, QTHR. Tel Coalville 31413.

Homebrew linear, pair G-G 813, int 3kV psu, range 1·2–18MHz (ex-army), £65 ono. HRO mech filter, modern front end, many coils incl all bandspread except 15m, no psu, scruffy, hence £20. Stone, London. Tel 01-357 3232, office hours.

Heathkit HW32A, homebuilt psu, ptt mic, £60. Star SR550 ham band rx, £40. Codar AT5, 250S mains unit, £20. Osram DA30 valves, boxed, new, offers. G3AVL, QTHR. Tel 051-264 8001.

NCX3 tx/rx, three bands, vgc, £100 ono. "Leafield", Ashmore Green, Nr Newbury, Berks. Tel Thatcham 67010.

Standard C146A, two antennas, charger, ext mic, £90; telescopic tubular mast, pneumatic operation, 30ft, £65; AR20 rotator, £15; all vgc, going hf. G4GRK, G8FWR, QTHR.

KW Atlanta, psu/spkr, 80–10, 500W p.e.p., new RCA valves, pa unmarked, good order, £210. Collect. G2WK, QTHR. Tel 0203 73415.

Comp hf station: KW2000B, £200; KW1000 linear, £120; Comdel speech processor, £25; vswr meter, by KW, £5; low pass filter, antenna switch box, £1; ·hure desk mic, £7; rf ammeter, £2; TH3Jr with balun, heavy duty motor, £60. A.P. Haynes, 8 Watling Street, Radlett, Herts.

New BAY96 diodes, £2.50 ea; 100 up, £1.50 ea. Narda model 805 freq meter, as new, small lab inst, 500MHz to 1,500MHz, £20. Racal RA218 ssb adaptor, as new, with manual, £65 ono. G3RNV, QTHR.

FT201 80m–10m tx/rx, a.m., ssb and cw modes, filters, ac/dc int psu, SP101 spkr, £300. IC22A, 10ch, five simplex, five repeater, £115. Pye Cambridge, moded, £20. Solartron CD1012 'scope, offers. G3RUD. Tel Tamworth 69386.

IC240 2m fm tx/rx, good cond, £160. G3NCR, QTHR. Tel 01-789 6161.

Liner 2, fitted preamp, exc cond, comp with all maker's supplied accessories, in maker's box, £100 ono. G8FRA, QTHR. Tel Coventry 415815, after 6pm.

FDK Multi U11, six repeaters, four simplex, £180; FT221R, £300; Airmec 210A mod meter, a.m.-fm, 300MHz, £95; Marconi TF995A/5 sig gen, 1·5–220MHz, a.m.-fm, £175; 2m solid-state linear, 240W rms 28V, with commercial 28V 20A psu, £100; Creed 7ERP and 6S6, £45; Storno spares, for 600 series, poa; all equipment fb cond. G8KZH, QTHR. Tel 021-550 9324.

Antique brass morse key, £25. Hallicrafter Super Sky Rider model SX208, £25. Westinghouse type UN overcurrent relays, £5 ea, Grid dip oscillator and coils, £10. Panoramic adaptor type BC103B, £10. A.P. Haynes, 8 Watling Street, Radlett, Herts.

UHF fm Storno tx/rx, wkg 70cm, comp, xtals for RB14, SU8, fitted preamp, £60. AM10B, wkg 2m, c/box, cable, £25. UHF base rx, Pye valve, wkg, tunable, £10 ono. G8HWZ, QTHR. Tel Tamworth 892741, after 6pm.

FT2FB 2m mobile rig, 10W/1W, fitted 144·25, ·48, ·60, S0, S20, S21, S22, R5, R6, R7, with mobile mount, handbook, orig packing, vgc, £110 ovno. Trio 9R59DE comms rx, vgc, £40 ovno. Tel 022 779 3262 (Chestfield, Kent), after 6pm.

FR50B, 28–30MHz, fully cov, vgc, £70. G8IIL, QTHR. Tel 0733 60246.

Liner 2, fitted 3N200 preamp, exc cond, Belcom mains unit, mic, mobile mount, orig handbook and packing, £115 ono. G8FXG, QTHR. Tel 0235 813916 (Oxon), evenings.

Drake TR4-C, £380. AC-4, MS-4, FF-1, £95. Datong UC/1, psu, mint cond, little used, £75 or offers. Ferguson. 16 Erracht Road, Inverness.

KW202, vgc, £185 ono. *Wanted:* HF tx/rx. G8KMN, "Englefield", Hooton Road, S Wirral, Cheshire. Tel 051-327 4280/1885.

Collins rx 72S3, tx 35S1, psu 516F1, £600 for package or split for best offer cash/gear; KWM2A, hb psu, £525; all clean, no mods. G3MFE. Tel 0604 846203.

3CM front end, incl Gunn tx, varactor tuning, Schottky mixer, ferrite circulator, 17dB horn, £69. G8APX, QTHR.

Drake R4C, MS4, 250Hz cw filter, eight extra xtals, 160–10m, Drake update, £325. G3VBL, "Our Dick's", Oak Avenue, Penwortham, Preston, Lancs PR1 0XA. Tel 0772 45302.

Triton 2 solid-state 200W ssb/cw tx/rx, 10–80m, psu, good cond, £260. Akai VT100 portable video recorder, comp with camera monitor, uhf tv adaptor, mains charger, two video tapes, £340. Can deliver. G4BFS, 19 Manor Close, Aveley, S Ockendon, Essex.

KW202 rx, comp with handbook, separate vhf unit containing psu, 2m converter, fm unit, £185. Longhurst, 8 Bayston Road, King's Heath, Birmingham. Tel 021-444 1053, evenings.

HRO, with psu and spkr, spare valves, coils and other spares, £25. Teleprinter 7B, wkg, £10. G3OMF, QTHR. Tel 05643 2190.

Liner 2, psu, £115. Eddystone 898 dial, unmarked, £8. Mains transformer 2 × 28V at 2A, £3. Radiomobile model 1070 car radio, mw/lw, push-button, £15. 10W mobile public address amp and horn spkr, £10. G8BBN, QTHR. Tel 0202 37225.

Recording tape: 7in reels of ¼in wide super quality magnetic tape, £1.45 ea. 11in dia bulk reels ¼in tape, enough for four 7in reels, £3.35. 11in reels of ½in wide, suitable for video, £3.15. (All prices incl p & p). G3AZI, QTHR.

HW101, 80–10m, HP23 psu, good cond, £180. Buyer collects or pays carr. G3YSE, QTHR. Tel 061-798 9282.

Hy-Gain 203BA 14MHz single band 3-el Yagi, £70; Mosley 21MHz Power Master Yagi, £25; Early KW107 atu, works well, £35; Variac 5A mains, looks as new, £12; all surplus. G3REO, QTHR. Tel Coniston 329.

Heathkit SB500 2m transverter, wired for Trio TS510 use, comp with leads and manual, pro built, mint cond, £50. Also Trio VFO-5D remote vfo, with leads and manual, mint cond, £25. Clive Waldron, G3ZZU, QTHR. Tel Bristol 691582.

FRDX400, with 2m and 4m, with or without matching spkr, very little used, mint cond, offers. G8GEA, QTHR. Tel Orpington (Kent) 31156, after 8pm.

Sommerkamp twins FRDX500 FLDX500, exc cond, worked the world, orig cartons and manuals, £325. J. Sharratt, G3XKF, "Honeysuckle Lodge", Mentmore, Leighton Buzzard, Beds. Tel Cheddington 661390.

Trio TS500 hf tx/rx and psu, re-valved with recent pa 6146s by Lowe, good air reports, £165. G4EVW, QTHR. Tel Uttoxeter 2821.

FT200B and FP200, still under warranty, £280. G4BLI, Liverpool. Tel 051-722 9043.

572B, new, £20. Pair QY4-250, £15. 3-20A, £1. Pair new EL34, £4. DJ4BG 015 af/cw filter board, £3. DJ6PI 005 prescaler, £5.50. TDA1022 ic, £5. TBA120S, 40p. 7430, 10p ea. 7473, 15p ea. 7474, 15p ea. 7475, 20p ea. 74141, 30p ea. MC1035P, £1.50 ea. G3XFW, QTHR.

Western DX33 Tribander, can be used as dipole, 2-el or 3-el beam, never installed, bargain, £65. Buyer collects or carr extra. May consider exch 18AVT/WB if new, comp with radials, etc. Fay, 5 Harland Way, Glebe, Washington, Tyne & Wear.

Two 300pF 2kV wkg var cap, type JB5021/12, £3.75 ea. Two 500pF 1kV wkg var cap, type JB5021/1, £3 ea. Two 150pF 3·5kV wkg var cap, £2.50 ea. GM3POK, QTHR. Tel 050 682 3377.

Storno 600 (CQM612), 12ch; standard control box, full leads, etc; second control box, full autoscan; mics, xtal t/bursts, etc; exc cond, h/book, £155. Europa transverter, £44. PSU above, ex-KW2000, £30. 9in video monitor, s/state, £35. Collect. Tel 01-648 5895.

Cambridge (AM10D), 6ch, fm, 2m, boot mount incl, cables, mic, etc, fitted S0, R6, S16, t/burst works on R ch only, 10W, good cond, £35 ono. *Wanted:* low-cost ssb hf mobile rig, eg HW12A, why? G4DRS, QTHR. Tel 0525 60478, evenings.

Trio QR666 gen cov rx, £110 ono. 60ft sectional steel tower, free standing, climbing ladder attached, what offers? T.J. Court, G8OCX, "Swiss Cottage", Spring Hill, New Arley, Nr Coventry CV7 8FB. Tel 0676 41248.

Shack clearance: 50W a.m./cw tx, 160–10m, homebrew, built around Geloso N.4/104-S vfo, with Woden UM3 modulation transformer (though modulator not wired), offers around £35. Tel Cardiff 593077.

Camera, ex-BBC studio camera, EMI Vidicon. £45. Monitor, transistorized, £32.50. Hudson a.m. tx, rack, 6·40 pa, £14. Jeep £250. Colour monitor, £45. 6ft enclosed 19in rack, £14. Video amp, £4. Brian, G8CQS, QTHR. Tel 0724 3940.

Heath SB102, vgc cw filter, HW23A psu, SB600 spkr, manuals, spare valves, etc, £220. T/A speech compressor, used twice, £20. Mod tran UM1, unused, £3. Heath RA1 rx, calib, spkr, manual, offers. Prefer inspect, collect (Surrey). G2KI, QTHR. Tel Byfleet 46722.

Trio TS500 PS500 80m to 10m tx/rx, ssb, a.m., cw, £130 ono. Buyer collects. G3VNU, 117 Fortunes Way, Bedhampton, Havant. Tel Havant 471794.

MMT 28–432, plus 46-el Parabeam, £75 ono; or exch for HQ1 mini quad in first class cond. G4HBI, G8KNP QTHR. Tel 061-336 4702 (office).

Europa transverter 28/144, very good cond, int antenna changeover relay fitted, spare valves available, £60. *Wanted:* Microwave Modules transverter 28/144. G8GFR, QTHR. Tel York (0904) 27422.

Trio TR7010, good cond, £120. Nombrex sig gen, 150kHz–350MHz, £10. LM14 freq meter, charts, £15. Xtals: HC25U 51·8125, 76·575, 76·600, 76·625, HC6U 71·200MHz, £1 ea; 15·8275, 15·7775, 15·5775, 6·525MHz, 75p ea. G3LWT, QTHR. Tel Hungerford (Berks) (048 86) 3396.

2m mosfet converter, 28–30MHz output i.f. transformers, ITT xtal filter, 10·7MHz i.f. chip, 0–100μA edge meter, diecast box to suit, offers the lot. *Wanted:* Edison diecast S-meter case and movement. G3TOI, "Glenfield", Bury Road, Basingstoke. Tel 20432.

Xtals: HC6U 44MHz rx and 8MHz tx for R6, S21, S22, S23, never used, £4 per pair; 9MHz tx for 144·733, 144·800, 145·533, 145·333, 75p ea; 38·66MHz xtal, £1.75. Struthers, 20 Harrison Gardens, Edinburgh, EH11 1SQ. Tel 031-346 0905.

FR50B rx, 10–80m, fitted xtal calibrator, 2m converter with preamp and Burns fm discriminator, exc cond, handbook, orig packing, £85. Tel Thanet 42930.

Liner 2, with preamp, mobile mount, mic, handbook, exc wkg cond, £95. G4DFI, QTHR. Tel 01-303 6470.

Complete homebrew 20m ssb stn, 400W static/60W mobile; comprises 12V dc mobile tx/rx based on G3ZVC board with two 6146 o/p, mains psu, 400W linear, mic; can demonstrate wkg; £100. G3VPX. Tel Sheffield 874324.

Variac 2 KVA 0–270V, £18; D8/2m, £12; D5/2m, £10; PBM14/2m, £20; all new. Frequency meters: 20–250MHz, looks like BC221, £15; TS127/U 375–725MHz, £10. Six large 2V storage batteries, chloride YC9BF, £50. Tel Godalming (Surrey) 29757, after 7pm.

25W for 200mW drive class C amp, 144–6MHz, 70 by 20 by 10mm, new and tested, £25. Callbuoy 14A radio-telephone, 2,182kHz portable distress tx/rx with two-tone alarm, £70 ono. GW8JOJ, 12 Black Barn Lane, Usk, Gwent.

Woden de luxe transformer, 500–0–500, 150mA, 6V + 5V, £3. Matching choke 20H, £1.50. Carr extra. Micamold paper capacitors, 8μF 1,000V dc, wkg, £1 ea; 2μF ditto, 50p. *Wanted:* Yaesu FV50B, in good order. G3CPM, QTHR. Tel Broadway (Worcs) 2753, evenings.

Murphy B40C rx, 0·64–30·5MHz, S-meter, comprehensive handbook, £25. Pair of KEF kit 3 loudspeakers, in white cabinets, 16·5in by 34·5in by 14in, on black plinth, £110. *Wanted:* for Torbay Raynet Group: Pye, Storno etc, radiotelephones, mobile or base stn, high band preferred. G8HHQ, QTHR.

Yaesu FT224, 2m, mobile, 24ch, output 10/1W, toneburst, xtals R3, R4, R6, S0, S20, S21, S22, S23, S24, £150 ono. G3PLL. Tel Oakham 812134.

SB220 2kW linear, professionally built, rated 2kW p.e.p. and 1kW dc input continuously for 15min, 1kW of anode dissipation, 150W drive needed (separates the men from the boys!), cost new £736. Also KW107 Supermatch atu, cost new £121.50. *Wanted:* HRO–500 loudspeaker and vlf preselector. Sensible offers please via G3ZXN, QTHR.

QTH G5RM available shortly. Detached Victorian town villa, freehold, three reception rooms, five bedrooms, two top rooms, kitchen, scullery, etc, usual offices. Main rooms decorated ceilings, large garage, garden, summer house etc, £37,500. Some furniture may be available. Write G5RM, QTHR.

Fluke 8600A dig-multimeter, £150 ono. FT200, FP200, immac cond, £260. TA33Jr, £40. (Exch both for FT101(E)). Standard C146A 2m walkie, 0, 13, 20, 22, 7, all extras, £100. Two steel scaff poles, 15ft, £3 ea. AR88, h/book, £3. Expectant father. G4GLB, (Greenhithe). Tel 0322 844726, or Erith 31115.

25W 2m Pye fm Europa, £65. 70cm Pye Motorfone, RB14, SU8, SU8 xtals, £75. Solid-state hf tx/rx, Ten-Tec Argonaut, ssb/cw, 5W p.e.p., 80m–10m, £150. Advance Alfa 2 dvm, £35. 13 Plessey SL600 ics for multimode, Plessey handbook, £20. G8DER. Tel 021-745 4068.

Yaesu FT221, little used, manual, £248. Pye FM10D, 8ch, fitted R3, R5, R6, S20, S21, S22, S23, S24, plus toneburst, exc orig fm set, £89. Advance 63A a.m./fm sig gen, 7·5 to 250MHz continuous coverage, £39. Three stabilized psus, used but tidy, 12/14V 5A, £19.50 ea. Two UEL Lion hb/fm mobiles, 12·5kHz, exc cond, £70 ea. Qty Plessey SL402 and SL403 (with circuit) ics, 2 and 3W audio output, 12/14V dc, (8Ω load). Three new, boxed, Mullard QY4/250s, £12 ea. G3CON, QTHR. Tel Cheltenham 28959.

Exch: new Fluke 8000A-01 digital multimeter, case, instruction books, (costs £270+), for a pair of 2W+-channelled walkie-talkie of good quality, for Australian use, cash tied or swop for IC202, IC215, Ken-KP202, FT227R, IC240, similar. P. Turner. Tel 0842 2484 ext 40, 9–5, or 0842 61648, after 6pm.

MM 2m converter, 4–6MHz i.f., £10. Eddystone 358X rx, good cond, £10. Homebrew comms rx, needs attention, £5. Nombrex 4Z rf sig gen, 150kHz–300MHz, £5. G4DBW. Tel Swanley 64356.

Trio TR7500, hardly used, still under warranty, offers, or would consider exch for FT7 tx/rx or similar, with cash adjustment either way. *Wanted:* would like to borrow for copying FTDX401 circuit diagrams, all expenses paid. G4FEQ. Tel Castleford (0977) 552862.

FR400SDX, all options, exc cond, orig carton, £180. KW E-Zee match, unused, £38. Delivered reasonable distance. Redman, G4HBP, "Ploughman's Piece", Thornham, Norfolk. Tel Thornham 322.

3-el beam antenna, TA33Jr, £50. Will deliver 50 miles. 32ft wooden pole, £10. Buyer collects. G3TCJ, QTHR.

Yaesu FT2F, fitted 12 IARU channels and narrow filter for 25kHz channel spacing, vgc, £90 ono. Groves, 62 The Crescent, Abbots Langley, Watford, Herts. Tel King's Langley 62201.

RTTY equipment: ST5 tu, £20; Creed 7E teleprinter, £20; both fb, can be seen wkg. Valve rx tu, £5. Pye Bantam, fm, 3ch, £35. G4ADE, 53 Denbrook Avenue, Tong, Bradford, Yorks. Tel 0274 682363.

2m Storno Viscount, with good preamp, toneburst, xtalled R6, R7, £35. G3MEO. Tel Steeple Morden 852465.

Professional appearance hf linear amp, three PL509s, £100. Jaybeam MBM48/70, £8. Homebuilt 4-el 2m quad, £8. Ring for details. Blake, G3MWV, QTHR. Tel Croker 2872, evenings.

Liner 2 ssb tx/rx, comp with mic, mobile mount, handbook, good cond, £100. G4DHY, QTHR. Tel 03446 5793.

IC215, 12ch, R0–9, S20, S22, £100. G8FWF, QTHR. Tel Ryde 64085.

Spectrum analyser, 2,900MHz 3,100MHz, with calibration chart, 500Hz power requirement, £20. T99 rack tuner, 0·5MHz 30MHz, £15. Hunts r/c bridge, £10. RF line amps, mains power, £5 ea. Buyers collect on all items. G8NAV. Tel Canterbury 264722, after 6.30pm any day.

KW107 Supermatch, dummy load, pwr/swr meter, antenna switch, vgc, manual, £85. Sinclair DMZ digital multimeter, as new, carrying case, leads, manual, £50. *Wireless World* stereo dolby noise reduction processor, built from Integrex kit, fully aligned, connection details, £45. G4EBI, QTHR. Tel 01-231 0879.

FT75, dc psu, G-whip with coils for 40m and 80m (no base mount), £160. G4DXE, QTHR. Tel 0905 53017.

Telford TC10 tx, all modes 144/146MHz, no mods, xtal call channel 144·300, handbook. Heathkit SW bridge, 1·8–30MHz, £5. Write K.North, 36 Pocklington Place, Hole Lane, Birmingham B31 2AH.

Canadian 52 set carrier, busbar, atu, many rx and tx spares, sae for list. *Wanted:* 52 set connectors, 12V psu and remote rx psu. Also 12 set for spares. Taylor, G3UCT, 27 Glen Road, Fleet, Hants. Tel Fleet (02514) 6998.

Magazines: *SWM,* '52–'67; *PW,* '52–'62; *PTV,* '52–'62; *Radio Constructor,* '60–'67; offers. G3INZ, QTHR.

Star SR200 a.m./ssb/cw rx, amateur bands only, 1·6MHz xtal filter, mixed valve and transistor, £30. G3UFP. Tel Harpenden 4148.

Late model TS700, beautiful cond, professionally maintained, built-in sidetone (Lowe mod), xtals for S20, S21, S22, S0, R7, impeccable audio, exc sensitivity, winner of fixed station 2m contest September '76, £310 ovno. G4FRX, QTHR. Tel 01-602 5855.

Creed 75RP, auto tx, in very clean wkg order, £45. G-whip, 10–15–20–80m, comp, £15. High band AM25B, £12. *Wanted:* Punch and reader attachments for Creed 444, also new answerback drum. G3TGF, QTHR. Tel Orpington 26802.

RTTY equipment, DM170 and TD224, cost £395 as new, £230. *Wanted:* 3kHz mechanical filter for Collins 51J4; also test gear. McAllister, 218 Eckington Road, Coal Aston, Derbys. Tel Dronfield 413413.

ARAC102 2/10m rx, £65. P.H. Lovelock. Tel Tysoe 543.

IC22A, as new, orig packing, bracket, toneburst, xtals S0, S20–24, R3–7, R7 rev, £115. Feakes. Tel East Stoke (063 685) 230.

IC22A, 11ch plus one rx, fitted commercial int preamp, £125 Robinson, G2KF, QTHR. Tel 072 681 2337.

IC202, year old, mint, £140. MEL 25W linear for same, with SD306 preamp, £32. Datong rf clipper, as new, £35. Jaybeam 5-el Yagi 2m, new, £5. G3SPJ, QTHR, Tel 01-311 8405.

Telomast, 50ft fully extended, five 10ft galvanized steel sections, most of rigging should be suitable for re-use, £40 ono. G4EJJ, QTHR (Sheffield area). Tel Dronfield 412775.

FDK Multi 2000, 2m multimode tx/rx, plus 10-el xy, £235. HW32A, HP13A, £65. Hallicrafter S20R gen cov rx, £10. TDA1022 bucket brigade delay, £4.50. *Wanted:* FT101, FT200, Atlas 180, or similar, HQ1. S. Macfarlane, 6 Tinto Road, Bearsden, Glasgow. Tel 041-942 8263.

Heathkit HW12A, mains psu, communications spkr, mic, leads, manual, professionally built, mint, £85 ono. Buyer collects. G4EHU, QTHR. Tel Bridgwater 55923, any evening after 1830, except Wednesday.

2m 6-el quad, unused, £15.50. G4GRU. Tel 061-439 5050 ext 573, daytime.

FT200 with FP200 psu, 80 thru all 10m, with manual and orig boxes, inspect by appointment, or carr extra, £245. G4DCQ, QTHR (Norfolk).

FRG7 rx, mint cond, £135 ono. Creed 7B printer with solid-state tu, £55 ono. Can deliver Scotland, N England. GM4BDJ, QTHR. Tel 0875 53025.

KW2000E, with ac psu, £275. TR2200GX, fitted 11ch, helical, nicads, £125. Noise bridge, £6. G4GZM. Tel Dudley (0384) 232348.

TX ST18, pair 4 × 150, four valves, xtal control, basis of *Rad Com* linear Sept '74; 2 types, one without blower motor; price C £22, F £18. G3IUL, QTHR. Tel 01-890 7091.

Uniden digital 80/10m tx/rx, cw filter, new 614Bs, immac, £395. 15m 4-el Yagi, £40. YP150 Yaesu pwr meter, 1·8–200MHz, £30. Yaesu FL2100B linear, £200. GM3XNE, QTHR. Tel 0294 67326.

FT200, FP200, mint cond, £250 ono. Storno Southern base stn, 7ch fm rig, £30. Wharfedale 100·1 tuner/amp, 35W rms, £70 ono. Apply Martyn, G4GMH. Tel 01-226 1262 ext 247 office hours, or Basildon 413041, evenings/weekends.

Receive 2m on mw car radio, Sentinel mf converter, £11.50. *Wanted:* Valve or fet voltmeter, Heath or similar, with rf probe. Portable ssb/cw tx/rx or tx, covering 80/40m at least. G4DYC, QTHR.

FT221, immac, in orig packing, little used, genuine reason for sale, £295 ono. G8CFT, 8 Airedale Close, Broughton Brigg, S Humberside. Tel Brigg 55633, after 6pm.

Beam, 10 and 15, 3-el Asahi, brand-new, orig packing, £40. Carr extra. G3UEN, QTHR. Tel 0262 850258.

Digitex D110 visual display system (see *Rad Com* December '77, p980), Baudot or ASCII, five speeds, ttl or loop input, uhf or video output, 13 lines, 80 characters/line, as brand-new, £300. Delivery by arrangement. G3RDG, QTHR. Tel 01-455 8831.

Drake C-Line, latest serial numbers, absolutely mint, with orig cartons, R4C, T4XC, AC4, MS4, extra filters and many additional band segment xtals, £780, with free Securicor delivery and insurance. GI3KDR, QTHR. Tel 0247 55162, evenings.

Yaesu FT2FB, 144MHz fm tx/rx, fitted 11 xtal channels, six simplex, four repeater, one reverse repeater, £110. G8NWE, 209 King's Acre Road, Hereford. Tel Hereford 66920, evenings.

2m linear amp, single 4CX250B, self-contained psu, relay switching and input attenuator, 10–15W input, £75. Homebrew 2m fm tx/rx, 6ch, 3W rf o/p, hand held, commercial pcbs, similar to 2200, £65. Sherratt, 32 Springfield Way, Cranfield, Beds MK43 0JN.

IC202, 14 months old, 144·0–144·4, plus 144·8–145·0, nine nicads and charger, leather case, handbook, and orig packing, £150 ono; or exch for FR400DX, JR599, why? G3YTQ. Tel Fareham (Hants) (0329) 23413.

Pye Cambridge AM10D, fully modified, fitted S0, S20, R6, R7, R3, R4, xtal toneburst, incl 5/8λ antenna, £45 ono. Thorn 8500 colour panels, i.f. and chroma, also timebase, offers. G4BPU, QTHR. Tel Basildon 414044.

AR88D, good cond. Hallicrafter SX16 collector's set, good cond, bargain at £68. Bovingdon, BRS30362, No 6 Roberts Lane, Horn Hill, Chalfont St Peter, Bucks.
Icom IC202, transistor, linear, 20W 12V, rf vox, fm unit (gives 15W with linear), xtals, 70cm tx/rx, G3TDZ 2m rx, wkg, pcb, G3HBW 2m conv, 4–6MHz i.f., two fm demod boards 450–470kHz, offers. G8BAA, QTHR. Tel 0782 622201.
Yaesu FRG7, as new, under guarantee, £140 ono. Baker, 2 Clare Garden Cottage, Cheltenham. Tel Cheltenham 27352.

WANTED

Circuit diagram or other information on Schneider Electronique Digitest 501 digital multimeter, made in France by Schneider for Honeywell. G3LDU, QTHR.
Spare parts for AR22 or TR44 cdr rotators. Ham band xtals for Pye Cambridge. 6MJ6 or equivalent valves. Xtals for FT221R. LCR bridge. Also ideas from owners of Trio JR60 rxs. SSM 2055. G3IDW, QTHR.
Handbook for Avo valve tester No 3; manual for Advance sig gen type D1; also manual for Hartley 13A 'scope; buy or copy. G8HCF, QTHR.
Two Bantams, must be a.m., 2m or hb; have got two fm/hb, exc cond, for exch. GU3HKV, QTHR. Tel 0481 47278, 6–7pm.
Multimode 2m tx/rx, 221R or similar. 2200GX, good cond. Turner, 132 Marine Parade, Brighton, Sussex. Tel Brighton 607737, evenings.
Most types of morse keys for collection, and for overseas collectors. Details to G3IRM, QTHR. Tel 0284 4318.
Heathkit SB10 sideband adaptor, with handbook. G3LQO, 10 Girdle Road, Hitchin, Herts SG4 0AN.
Joystick vfa. Details to Dimery, BRS40397, 81 Sandbeck House, Grove Place, Doncaster, S. Yorks DN1 3AT. Tel 68339.
2m equipment incl beam rotator, mobile tx/rx, a.m., fm or ssb, for 12V operation. Buyer will collect. All letters answered. G3HDT, "Gatherick", Duddo, Berwick-on-Tweed. Tel 0289 88260.
Kahn Research Labs sideband rx adaptor. CV–157/URR sideband adaptor. Nuvistors, types 7587, 8056, 7586, 7895. Xtal 96·9825kHz. R–220/URR manual. 3kHz, 500kHz i.f. mechanical filter. 500MHz prescaler. Nems-Clarke Panadaptor type 350/7. R389/URR rx. Fletcher, 62 Moorbridge Lane, Stapleford, Nottingham. Tel 0602 397446.
"Practical Electronics", April '77, urgent, beg, buy or borrow. Information on sources of Geiger-Muller tubes. GJ3GPL, QTHR.
Pair of 4CX250Bs, bases, chimneys, Datong rf speech clipper board. G8LGL, QTHR. Tel Nailsea (02755) 2478.
Electroniques i.f. strip, xtal filter model, 455kHz or 1·6MHz, Mk2 or 3. G3KRH, QTHR. Tel 01-455 5039.
Kokusai MF455 15k or 10k filter. G3IJB, QTHR.
Eddystone 770R rx manual, loan for copying or purchase. All replies answered. G4BSH, QTHR.
KW2000 or FTDX500 or similar tx/rx, fair price paid for set in first class cond. Can collect if necessary. Tel 0632 810400.
Circuits and bits for linear: valves, transformers, blower, junk, etc, anything. HF beam or quad. Scrap Mosley Commando tx. GM4ENF, QTHR. Tel Cupar 4842.
Lattice tower 10ft section. AR88/D/F/LF, not wkg, any cond considered, must be in London area. Manual for AR88 D, good condition. Information on RAF rx type R4187, manual, circuit diagram, etc. Details and price to Colin Shirley. Tel 01-202 7823.
HF band beam, 2-el or 3-el, for local group. G3ZSQ. Tel 0274 57218. Or G3PLI. Tel 0274 41405.
Manual Racal counter type 815R. Manual Advance counter type TMC1. Scope tube GEC LD 924E. Manual Venner type TSA3336/1. *For sale:* VCR 97, with shield, £3. Tel 01-883 3474.
FTDX150, Swan 350, KW2000A/B, or good hf bands rig; bases for 4CX250B chimneys; blower; 9R59DS, JR310 or good hf band rx; HW32A dc psu. *For sale:* IC22A, toneburst, 13ch, mobile mount, £125. Tel Bolton 592929, after 6pm.
Cornishman ssb h/b tx, comp or nearly comp. CCT diagram and info for Emsac 2m nuvistor converter, 28–30MHz i.f. G3UZB, QTHR.
Ex-army No 12 (or 12HP) sender, in wkg order or incomp set for spares. Require Canadian 52 set connectors, 12V psu, remote rx psu and atu No 2A. Taylor, G3UCT, 27 Glen Road, Fleet, Hants GU13 9QS. Tel Fleet (02514) 6998.
Codar T28, good cond, and diagram, urgent. G3RIS, QTHR. Tel 0263 2122.
Eddystone 730/4 gen purpose rx and manual, good cond. J. Bain, 5 St Andrews Road, Marton, Middlesbrough. Tel Middlesbrough 318449.
Heathkit RA1, Trio JR310, wkg or not. Atkinson, 17 York Crescent, Alnwick, Northumberland.
Collins 32S3 tx; please state price, cond and year. Also Collins a.m. filter, F4557 series. Williams, GW4FOK, QTHR. Tel 0639 4643.
KW 50Ω dummy load. *For sale:* G2DAF ssb rx and tx, slight repairs required, £60 the two, would split. GW3KYT. Tel Llanddulas 737.
Liner 2, preamp, psu, mobile mount, first class wkg cond, possible mic. Also Hilo pump-up mast. *For sale:* Europa B transverter, 28/144MHz, exc cond, £45. G8MPN, QTHR (Wolverhampton). Tel Codsall 3509.
Manuals, to buy or borrow, for Pye AM10 and STC SF1 Starphone. Write Bob Dunbar, 31 Castle View, Sandal, Wakefield, Yorks. Or tel Wakefield (0924) 255587, after 6pm.
Trio TS520, Yaesu FT101E, Heathkit HW101 or similar hf bands tx/rx, must be in really nice cond. Please contact G3WY, QTHR. Tel Evesham 45497.
CV1596 (09D) cathode ray tube. Replacement for Hartley 'scope 13A. G8ODQ, 84 Victoria Avenue, Bloxwich, Walsall, West Midlands. Tel 0922 77189.
HQ1 Minibeam and suitable rotator, will collect or pay delivery. Revill, G4GKZ, 74 Selworthy Drive, Stafford ST17 0PP. Tel 63387.
A first class unmodified KW204 (or similar) tx, with handbook; or why? Required mainly for cw wkg, therefore a T9 note essential. Could collect up to around 50 miles. 10 Avenue Road, Frome, Somerset BA11 1RP.
P40/60 tiltover telescopic Versatower, or similar. Trio AT200 antenna tuner. G3AOS, QTHR. Tel 061-980 2415.
Kokusai MF455 10k filter, without xtals. G5BQR, QTHR. Tel Ken, Welwyn 6367 (office hours).
FT200/FP200, in good cond, around £200. *For Sale:* Olympic T100 a.m./cw tx, wkg, £20 plus carr or collect. Armistead, GM8JMN, QTHR. Tel 031-445 1343.
Urgent. Would like to share accommodation, house etc, with radio amateur, 25–30 miles of London, preferably south, main interest ZL land; I am local government officer, would like to share expenses. *For sale:* Racal universal counter timer CT488; Racal universal counter timer CT487; Avo transistor test set CT537; USA army valve testing set; HRO plus coils (7) BS (4), ps; xtal cal GEC BW270; coil comparator LC100-C No 5662; BPL; no reasonable offer refused. G4FYW, 13 Elmstead Road, Erith, Kent. Tel 01-874 6464 ext 6265, office.
HQ1, MBM88/70. Will collect reasonable distance, G3NAQ, "Bagatelle", Southend, Brightwalton, Newbury, Berks RG16 0BE. Tel Chaddleworth 446.
Borrow or hire 2m tx/rx with frequency coverage up to 148MHz (eg FT227R), to use on a tour of USA during September. Person can borrow my TR2200G or Liner 2 in exchange. G8LQM, QTHR. Tel Worcester (0905) 620909.
Homebrew linear amp, for hf bands, similar to design in *Rad Com* August '75, using PL509 valves, or why? G4ANW, 16 Chestnut Drive, Broadstairs, Kent CT10 2LN.
Rotary transformer (ex-Canadian 52 set dc psu), manufacturer Robbins & Myers Company, input 11V/25A, output 1,300V/0·12A 156W. Also 19 set Mk3, psu, etc, comp, wkg, unmodified and undamaged. G3UCT, 27 Glen Road, Fleet, Hants. Tel Fleet (02514) 6998.
FT200, FP200, or similar rig. G3ANG, 6 Meadowcroft, Euxton, Lancs PR7 6BU.

DIODES/ZENERS

1N914	100v	10mA	.05
1N4005	600v	1A	.08
1N4007	1000v	1A	.15
1N4148	75v	10mA	.05
1N4733	5.1v	1 W Zener	.25
1N753A	6.2v	500 mW Zener	.25
1N758A	10v	"	.25
1N759A	12v	"	.25
1N5243	13v	"	.25
1N5244B	14v	"	.25
1N5245B	15v	"	.25

SOCKETS/BRIDGES

8-pin	pcb	.20	ww	.35
14-pin	pcb	.20	ww	.40
16-pin	pcb	.20	ww	.40
18-pin	pcb	.25	ww	.75
22-pin	pcb	.35	ww	.95
24-pin	pcb	.35	ww	.95
28-pin	pcb	.45	ww	1.25
40-pin	pcb	.50	ww	1.25
Molex pins .01		To-3 Sockets		.25
2 Amp Bridge		100-prv		.95
25 Amp Bridge		200-prv		1.95

TRANSISTORS, LEDS, etc.

2N2222	NPN (2N2222 Plastic ,10)	.15
2N2907	PNP	.15
2N3906	PNP (Plastic - Unmarked)	.10
2N3904	NPN (Plastic - Unmarked)	.10
2N3054	NPN	.35
2N3055	NPN 15A 60v	.50
T1P125	PNP Darlington	.35
LED Green, Red, Clear, Yellow		.15
D.L.747	7 seg 5/8" High com-anode	1.95
MAN72	7 seg com-anode (Red)	1.25
MAN3610	7 seg com-anode (Orange)	1.25
MAN82A	7 seg com-anode (Yellow)	1.25
MAN74A	7 seg com-cathode (Red)	1.50
FND359	7 seg com-cathode (Red)	1.25

C MOS

4000	.15
4001	.15
4002	.20
4004	3.95
4006	.95
4007	.20
4008	.75
4009	.35
4010	.35
4011	.20
4012	.20
4013	.40
4014	.75
4015	.75
4016	.35
4017	.75
4018	.75
4019	.35
4020	.85
4021	.75
4022	.75
4023	.20
4024	.75
4025	.20
4026	1.95
4027	.35
4028	.75
4030	.35
4033	1.50
4034	2.45
4035	.75
4040	.75
4041	.69
4042	.65
4043	.50
4044	.65
4046	1.25
4049	.45
4050	.45
4066	.55
4069/74C04	.25
4071	.25
4081	.30
4082	.30
MC 14409	14.50
MC 14419	4.85
4511	.95
74C151	1.90

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7400	.10	7473	.25	74176	.85	74H72	.35
7401	.15	7474	.30	74180	.55	74H101	.75
7402	.15	7475	.35	74181	2.25	74H103	.55
7403	.15	7476	.40	74182	.75	74H106	.95
7404	.10	7480	.55	74190	1.25		
7405	.25	7481	.75	74191	.95	74L00	.25
7406	.25	7483	.75	74192	.75	74L02	.20
7407	.55	7485	.55	74193	.85	74L03	.25
7408	.15	7486	.25	74194	.95	74L04	.30
7409	.15	7489	1.05	74195	.95	74L10	.20
7410	.15	7490	.45	74196	.95	74L20	.35
7411	.25	7491	.70	74197	.95	74L30	.45
7412	.25	7492	.45	74198	1.45	74L47	1.95
7413	.25	7493	.35	74221	1.00	74L51	.45
7414	.75	7494	.75	74367	.75	74L55	.65
7416	.25	7495	.60			74L72	.45
7417	.40	7496	.80	75108A	.35	74L73	.40
7420	.15	74100	1.15	75491	.50	74L74	.45
7426	.25	74107	.25	75492	.50	74L75	.55
7427	.25	74121	.35			74L93	.55
7430	.15	74122	.55			74L123	.85
7432	.20	74123	.35	74H00	.15		
7437	.20	74125	.45	74H01	.20	74S00	.35
7438	.20	74126	.35	74H04	.20	74S02	.35
7440	.20	74132	.75	74H05	.20	74S03	.25
7441	1.15	74141	.90	74H08	.35	74S04	.25
7442	.45	74150	.85	74H10	.35	74S05	.35
7443	.45	74151	.65	74H11	.25	74S08	.35
7444	.45	74153	.75	74H15	.45	74S10	.35
7445	.65	74154	.95	74H20	.25	74S11	.35
7446	.70	74156	.70	74H21	.25	74S20	.25
7447	.70	74157	.65	74H22	.40	74S40	.20
7448	.50	74161	.55	74H30	.20	74S50	.20
7450	.25	74163	.85	74H40	.25	74S51	.25
7451	.25	74164	.60	74H50	.25	74S64	.15
7453	.20	74165	1.10	74H51	.25	74S74	.35
7454	.25	74166	1.25	74H52	.15	74S112	.60
7460	.40	74175	.80	74H53J	.25	74S114	.65
7470	.45			74H55	.20		
7472	.40						

74S133	.40
74S140	.55
74S151	.30
74S153	.35
74S157	.75
74S158	.30
74S194	1.05
74S257 (8123)	1.05
74LS00	.20
74LS01	.20
74LS02	.20
74LS04	.20
74LS05	.25
74LS08	.25
74LS09	.25
74LS10	.25
74LS11	.25
74LS20	.20
74LS21	.25
74LS22	.25
74LS32	.25
74LS37	.25
74LS38	.35
74LS40	.30
74LS42	.65
74LS51	.35
74LS74	.35
74LS86	.35
74LS90	.55
74LS93	.55
74LS107	.40
74LS123	1.00
74LS151	.75
74LS153	.75
74LS157	.75
74LS164	1.00
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9301	.85	95H03	1.10
9309	.35	9601	.20
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LM309K (340K-5)	.85	LM340T12	.95	78M05	.75	LM1458	.65
LM310	.85	LM340T15	.95	LM373	2.95	LM3900	.50
LM311D (Mini)	.75	LM340T18	.95	LM380 (8-14 PIN)	.95	LM75451	.65
LM318 (Mini)	1.75	LM340T24	.95	LM709 (8, 14 PIN)	.25	NE555	.35
LM320K5(7905)	1.65	LM340K12	1.25	LM711	.45	NE556	.85
LM320K12	1.65					NE565	.95
						NE566	1.25
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2102L-1	1.75	8T13	1.50
2114	9.50	8T23	1.50
TR1602B	3.95	8T24	2.00
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		2107B-4	4.95
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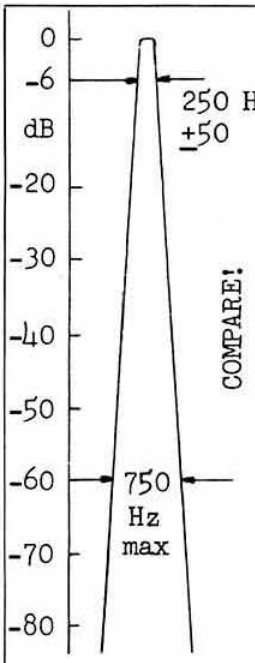

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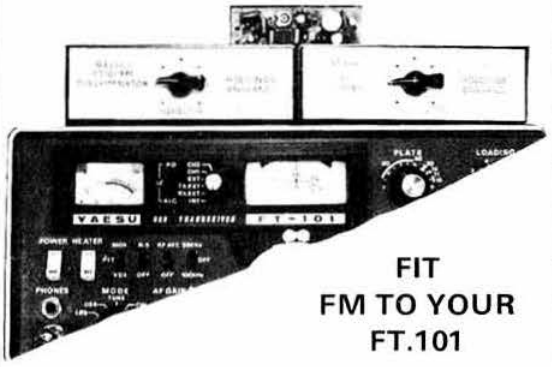

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