FOR THE RADIO ENTHUSIAST...

Practical Wireless

MAY 1983

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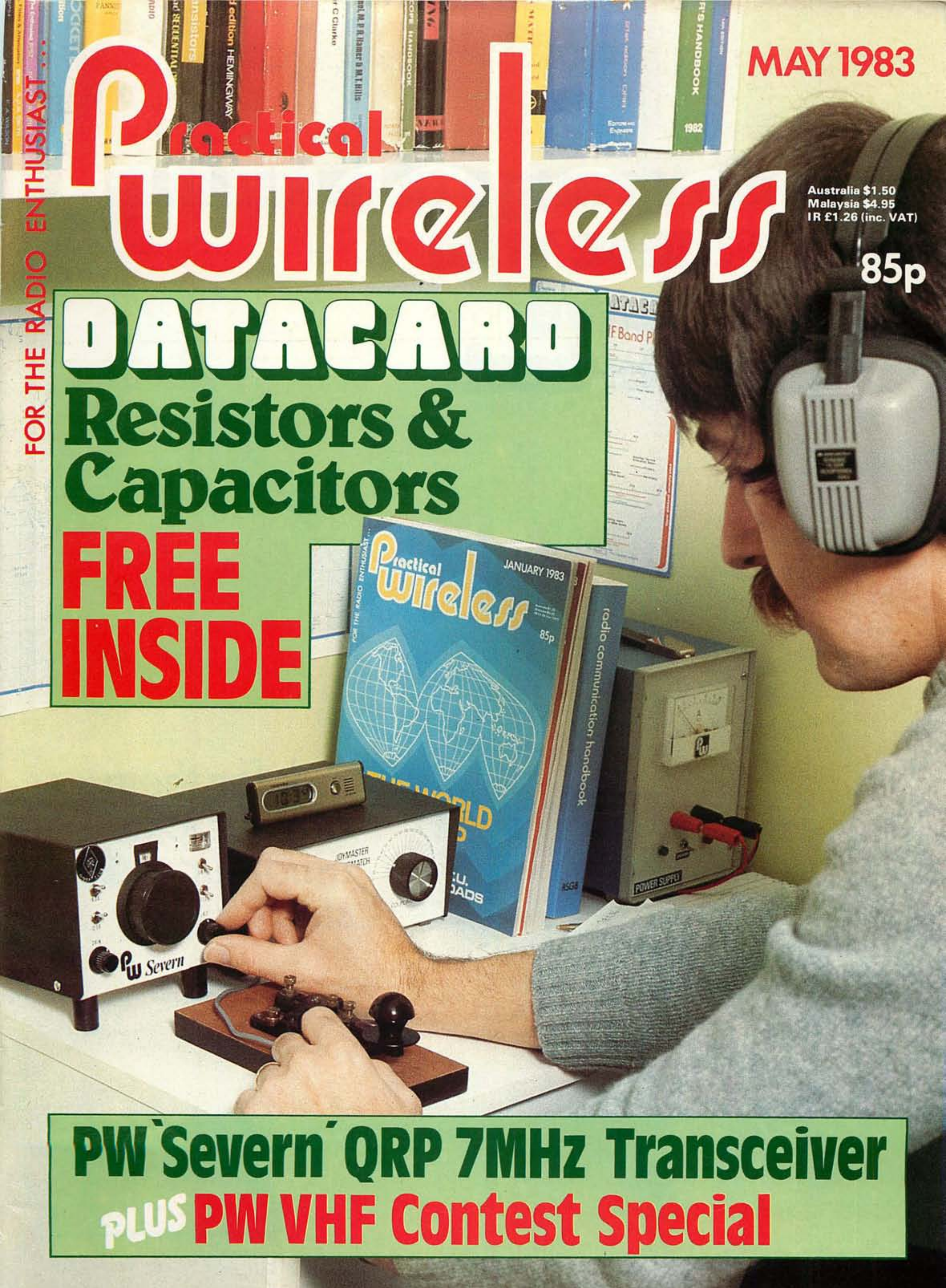

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MAY 1983 VOL. 59 NO. 5 ISSUE 914

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four models from Trio

for the HF man, the **TS 430S**

£736.00 inc vat carriage £5.00

A new HF transceiver, taking into account the outstanding performance of the previous Trio rigs you could be forgiven for thinking that it would be impossible for them to improve on existing models and specifications. Alternatively of course, you might be of the opinion that engineers with the talents as displayed by the designers of such rigs as the TS830S, TS130V and TR2500 etc. would have no trouble in pushing forward the frontiers of transceiver technology s we know it today.
The new HF transceiver from Trio is the TS430S. Those who have seen it and the fortunate ones who have used it on the air are all agreed that here we have a major advance for the enthusiastic operator on todays busy bands. Not only does the transceiver have full amateur band coverage from 160 to 10 metres (including the three new bands) but it also incorporates a general coverage receiver (150 kHz to 30 MHz). The new transceivers features are many; USB, LSB, CW, and AM with FM available (optional FM430 board), compact size 270mm wide/96mm high/275mm deep, continuous tuning over the entire frequency range, two separate VFO's and an up/down scan mode using the optional MC42S microphone. Eight memories, each of which can be used as a separate VFO are provided and frequency scan is programable between the two frequencies held in memory channels six and seven. Not only does the memory remember frequency but also the mode of operation, thus short wave DX and Broadcast stations can be stored alongside a SSB net channel and complete sense made as the frequencies are scanned. The by now normal Trio features are all included, IF shift, notch filter, speech processor and narrow/wide filter selection on CW, SSB and AM modes.
The TS430S, Trio's rig for todays operator.

for the SWL who deserves the best, the **R 2000**

£398.82 inc vat carriage £5.00

Now from Trio, the R2000 general coverage receiver. By taking all the superb features of the R1000 and combining them with the latest in microprocessor control Trio have, in one step, completely revised the standard by which short wave receivers are judged. Among the many features provided for the discerning listener are programmable scan, memory scan, memory retention of the mode set for a particular frequency and last, but not least, Trio have included an FM mode – why FM after all this time and our repeated comment that for a shortwave broadcast receiver FM is not really necessary. Take a look at the rear panel of the R2000: a socket marked VHF converter. Wouldn't it be superb if Trio produced a VHF converter covering from 118 to 174 MHz – then you would require FM, you would also require AM. Study the features and I am sure you will agree the Trio R2000 is the receiver for you.

Continuous Coverage from 150 KHz to 30 MHz
Use of an innovative up conversion digitally controlled PLL circuit provides maximum ease of operation and superb receiver performance. Front panel up/down band switches allow easy selection within the full coverage of the receiver. The VFO is continually tunable throughout the full 150 KHz-30 MHz range.

Ten Memories Store Frequency, Band and Mode Data
Each of the ten memories can be tuned by the VFO, thus operating as ten built in digital VFO's. The original memory frequency can be recalled by simply pressing the appropriate memory channel key. All information on frequency, band, and mode is stored in the selected memory. The "auto M" switch allows two types of memory storage: when the "auto M" switch is off, data is memorized by pressing the "M in" switch; when the "auto M" switch is on the frequency being used at that time is automatically memorized.

Memory Scan
Scans all memory channels or may be user programmed to scan specific channels. Frequency, band and mode are automatically selected in accordance with the memory channel being scanned.

Programmable Band Scan
Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish the scan limit frequencies. The hold switch interrupts the scanning process. However, the frequency may be adjusted using the tuning knob whilst in the scan hold position.

Three Built In Filters with Narrow/Wide Selector
In the AM mode 6 KHz wide or 2.7 KHz narrow may be selected. In the SSB mode 2.7 KHz is automatically selected. In the CW mode 2.7 KHz is again chosen and if the optional YG455C filter is installed then 500 Hz in the narrow position. In the FM mode 15 KHz bandwidth is automatically selected.
Other important features are: squelch on all modes, noise blanker, a large 4 inch front mounted speaker, tone control, RF attenuator, AGC switch, high and low impedance antenna terminals, optional 13.8V DC operation, record jack and, of course, provision for a VHF converter.
All in all, a truly remarkable receiver.

and later in the year for the **R 2000** a 118 to 174 MHz internal vhf converter.

LOWE IN LONDON, Open monday to saturday, six days a week
lower sales floor, Hepworths, Pentonville Rd, London. telephone 01.837.6702
LOWE IN GLASGOW, Open tuesday to saturday
4,5 Queen Margarets Rd, Glasgow. telephone 041.945.2626

for the VHF operator, the **TR7930** mobile transceiver

£305.21 inc vat carriage £5.00

Any amateur who has used or owns a Trio TR7800 has had the finest piece of 2 metre mobile technology at his fingertips. The TR7800 had simply everything that the keen mobile operator could ever want. Of course, there were a few points which customers said could be improved on and, I must admit, we, in the majority of cases, agreed. Trio, with the introduction of the new TR7930, have taken note of this feedback of information and the result, I am sure you will agree, is as close to perfection as you will find in a rig.

The improvements are, a green floodlit LCD readout which does not disappear in strong sunlight, additional memory channels, both timed and carrier scan hold on occupied channels, selectable memory channel for the priority frequency and automatically corrected mode selection (simplex or repeater) without having to instruct the rig. The most significant change is the liquid crystal frequency readout on a green illuminated background, but closely following this must be the ability to omit specific memory channels when scanning, and the programmable scan between user designated frequencies. This gives the rig the ability to scan simplex channels only, without holding on repeaters.

The Trio TR7930. The mobile 2 metre FM rig designed with ease of operation coupled to outstanding performance.

for the serious UHF and VHF operator, a DXing transceiver, the **TS780**.

With the arrival of the TS780, the dual bander rig has come of age, giving the two band multimode facilities of the original concept, plus a wealth of additional operating facilities. Taking a trip across the front panel of the rig we have the repeater facilities, a non-locking tone switch, ideal now that most repeaters are tone accessed and carrier maintained. The tone, of course, only works whilst the rig is in the FM mode. Below the tone switch is the TX offset switch giving plus or minus 600 KHz or 1.6 MHz, depending on whether 2 metres or 70 cm is selected and last, but certainly not least, reverse repeater – to my way of thinking proof that the TS780 was designed for amateurs by amateurs.

The meter functions on receive as S. meter, ALC meter or as a centre meter, the functions being controlled from a panel switch. On transmit the meter reads relative RF output. Immediately above the digital frequency and memory/VFO indicator are indicating leds: "a busy" led indicating in FM mode whether the squelch is open thereby, assuming the squelch level is correctly set, that the other station is transmitting. A "frequency lock" led tells that the F lock switch is pressed and the VFO knob inoperative. The "on air" led indicates the rig is transmitting and the "offset" led reminds you that the TX offset switch is set to repeater.

The memory operation has been updated: instead of having to progressively move through the memory content in sequence, by means of a rotary switch any of the ten memories (two more than the TS770's) can be selected at will. Entering frequencies into the memory is easier, as anyone who has a TS770 series will explain. Two priority frequencies are included: 9 and 10. Push buttons to the left of the VFO knob allow either of the two programmed frequencies to be quickly selected, immediately cancelling the previous instructions given to the rig. Just the thing for local net frequencies. SSB mic gain needs no explanation, as does the AF/RF gain control.

On the same control knob as the squelch level is a switch enabling the frequency width of scan to be determined. Briefly, when the rig is set to scan either in FM, FM step or SSB mode you can determine the amount of band to be covered.

The ranges are 0.5, 1, 3, 5 and 10 MHz, thus you can limit the rig to scan just the section of the band used by the mode you have selected.

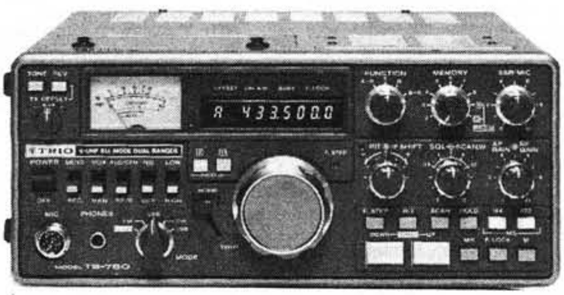
Example: scan width 0.5 MHz, VFO set at 144,000, coverage – 144.000 to 144.5 mode side band – result: free scanning of the SSB portion of the band. On FM the scan locks if a signal is present. On SSB the scan does not stop but you are made aware that there is activity on the band.

Another new control on the TS780 is the IF shift. Available for some time on HF equipment to cope with crowded band conditions, obviously the Trio design engineers have recognised that the 2 metre SSB end of the band can become crowded during contests or when there is "a bit of a lift on". At these times a rig that has the "IF shift" facility will certainly "score points".

The send/receive Vox/Man, meter function, NB, low/high power switches are all well known and have been found on previous generations of Trio base station equipment and again require no explanation. I could say the same thing about the mode switch but here you will notice alongside the standard FM position another marked FM CH. Put the mode switch in this position and instead of a free-running VFO you have a mechanical "click" step feel, the frequency now moving in either 12.5 KHz or 5 KHz steps. Of course the rig will also scan in these steps, controlled either by the scan switch or the up/down shift microphone. Again the Trio amateurs who design the equipment have here a major triumph.

By now you may be seeing why I am so enthusiastic about the TS780 but there is still more to come. How about a memory scan system that will scan either the 2 metre frequencies stored in the memory or the 70 cm ones or, if you wish, both. Well that's another feature of the TS780. Add to this list variable VFO steps of either 20 Hz or 200 Hz, a selectable braked feel to the VFO knob, rapid up and down MHz switching and you have the most comprehensive rig ever seen.

Too complicated some may say. Rubbish say I. Trio thrive on rigs designed to be simple to operate. Do you remember what John wrote in Radcom about the TR7500 and its competitors? And, finally, how about a rig that without resorting to a MHz switch will, by use of the VFO knob, tune from 144 to 146 MHz and from 430 to 440 MHz – only one rig –



£843.87 inc vat carriage £5.00

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THANET'S GUIDE

Just a few stars to choose from the fabulous galaxy of Amateur Radio Equipment available at Thanet Electronics.

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Send/battery indicator – Lights during transmit but when battery power falls below 6v it does not light, indicating the need for a recharge.

Frequency selection – by thumbwheel switches, indicating the frequency. 5KHz switch – adds 5KHz to indicated frequency.

Duplex simplex switch – gives simplex or plus 600KHz or minus 600KHz transmit (1.6MHz and listen input on 4E).

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TO THE GALAXY

Can YOU read the many RTTY and CW stations to be heard on the air?

Short wave listeners and amateurs are able to take more interest in other modes of transmission than speech with the new ranges of decoders and senders available. As well as amateur transmissions there is loads of interesting news and other broadcasts which can be read using these space-age devices. As UK importers of the world renowned TONO and TASCO products we can offer you a wide range of devices from a simple morse and RTTY reader which can be plugged into your TV to complete send and receive systems with memories and built-in displays or outputs for a high definition VDU. MR-250 £325, 9000E £699, CWR-670 £289, CWR-685E £789 and CWR-610 £189. Please call us for further details or visit us or your dealer for a demonstration.

ICOM produce a perfect trio in the UHF base station range, ranging from 6 Meters through 2 Meters to 70 cms. Unfortunately you are not able to benefit from the 6m product in this country, but you CAN own the IC-251E 2 Meter station and the 451E for 70 cms.

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Agents (phone first – all evenings and weekends only, except Scotland). **Scotland** – Jack GM8 GEC (031 665 2420) **Midlands** - Tony G8AVH (021 329-2305) **North West** – Gordon G3LEQ Knutsford (0565) 4040 Ansafone available

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FT-980 ALL MODE HF CAT *

∗ Computer-Aided Transceiver

This incredible new transceiver incorporates the highest level of microprocessor control ever offered in an HF all solid-state radio. Including a general coverage (0.15-30MHz) receiver with its own, separate front end, this amateur transceiver offers a new dimension in frequency control; whereby frequencies can be entered by either front panel keypad or tuning dial, and then scanned in selectable steps either freely or between any two programmable limits. Twelve memories include four with special protection, and two large digital displays allow full flexibility and control for split frequency operation while two meters allow full transmitter information.

Additional controls include IF Width and Shift on concentric controls, AMGC (Automatic Mic Gain Control) to set microphone input threshold, RF Speech Processor, ALC Meter Hold function, IF Notch and Audio Peak filters, Transmit Monitor, Noise Blanker and CW Full Break-in. Controls are also provided for FM Squelch and CW Keyer Speed when the optional FM and Keyer Units are installed.

The most important feature of the FT-980 is that practically all of the above features can be controlled by the user's separate personal computer, when connected through an optional Interface, also available from Yaesu. Where up to now the few amateur transceivers that offered any kind of computer interfacing at all permitted only frequency control, the FT-980 permits almost total control of all functions from a separate microcomputer, including Mode; IF Width and Shift; Scanner Step, Speed and Limits; and switching of most other functions. (Microcomputers are not available from Yaesu.)

FT-77 THRIFTY HF TRANSCEIVER

UTILIZING THE NEW CAD/CAM∗ MANUFACTURING TECHNIQUES, YAESU PRESENTS THE FT-77 AS A NEW MILESTONE IN RELIABILITY, SIMPLICITY AND ECONOMY IN HF COMMUNICATIONS.

Thrifty

Featuring efficient, all solid-state, no-tune circuitry, the FT-77 offers a nominal 100 watts of RF output on all amateur bands between 3.5 and 30 MHz, including the WARC bands. New CAD/CAM techniques plus the simple design of the FT-77 add up to one of the smallest, lightest HF transceivers ever; both in your hands, and on your wallet.

Simple

The front panel control layout and operation are actually simpler than some VHF FM transceivers, with only essential operating controls; while the simple circuit design leaves fewer parts that could cause problems. Nevertheless, all of the essential modern operating features for HF SSB and CW are included, along with extras such as dual selectable noise blanker pulse widths (designed to blank woodpecker or common impulse noise), full SWR metering, and capabilities for an optional internal fixed-frequency channel crystal, narrow CW filter and FM Unit.

Reliable

Computer-aided design of the circuit boards in the FT-77 ensures the most efficient component layout possible in the smallest space, while automatic parts insertion and soldering greatly diminish the chance for human error. Reliability and quality control are thus improved and simplified beyond the degree previously attainable in amateur equipment. This means longer equipment life with less chance of breakdown.

Expandable

The extremely compact size and simple control layout make the FT-77 ideal for mobile operation, or as the heart of a complete base station with the optional FP-700 AC Power Supply, FV-700DM Digital Scanning VFO and Memory System, FTV-700 V/UHF Transverter and the FC-700 Antenna Tuner. The competitive price of the FT-77, coupled with the expansion capabilities presented by these accessories, make this transceiver the perfect choice for those new to amateur HF communication, or as a practical second rig for old-timers.

∗Computer Aided Design/Computer Aided Manufacture

FT-726R VHF/UHF Multi-bander

YAESU

Combining all of the best features from Yaesu HF and V/UHF transceivers, the FT-726R opens a new world of operating ease and flexibility for FM, SSB and CW on the 50∗, 144 and 430/440 MHz amateur bands. The design of the FT-726R integrates the individual operating requirements of each of the three operating modes into one unit, and the user can then select which of the optional plug-in band modules he desires.

The VFO-A/B scheme has ten programmable memories, and can be tuned in 20Hz steps for CW and SSB operation, or in selectable steps for FM. FM tuning is accomplished by an indented tuning knob. IF Width and Shift controls are provided for CW and SSB operation, while both preset standard and user programmable repeater offsets can be selected for all modes. An optional Satellite Unit makes the FT-726R into a full duplex cross-band satellite transceiver.

∗144 MHz Unit installed, other Units available as options according to local regulations.

AGENTS

North West – Thanet Electronics Ltd. Gordon, G3LEQ, Knutsford (0565) 4040
Wales & West – Ross Clare, GW3NWS, Gwent (0633) 880 146
East Anglia – Amateur Electronics UK, East Anglia, Dr. T. Thirst (TIM) G4CTT Norwich 0603 667189
North East – North East Amateur Radio, Darlington 0325 55969
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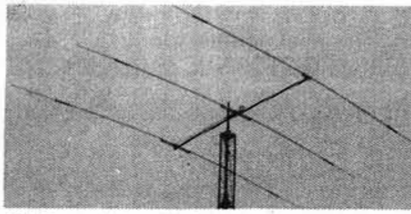
TET ANTENNA SYSTEMS



AX210N	10 ele. yagi for 2m crossed	74.95	(n/c)
HB10F2T	2 ele. 10m mono band beam	51.50	(n/c)
HB10F3T	3 ele. 10m mono band beam	74.95	(n/c)
HB15F2T	2 ele. 15m mono band beam	60.66	(n/c)
HB15F3T	3 ele. 15m mono band beam	93.46	(n/c)
HB15M25P	VP mini size 15m 2 ele.	69.50	(n/c)
HB15M35P	VP mini size 15m 3 ele.	102.30	(n/c)
HB34D	4 ele. tri band beam 10/15/20m	222.90	(n/c)
HB33SP	3 ele. tri band beam 10/15/20m	192.50	(n/c)
HB35C	Tri band array 10/15/20m	283.95	(n/c)
HB35T	5 ele. 10/15/20m	278.50	(n/c)
MV3BH	Vertical for 10/15/20m	37.99	(n/c)
MV4BH	Vertical for 10/15/20/40m	48.90	(n/c)
MV5BH	Vertical for 10/15/20/40/80m	63.95	(n/c)
MLA4	Loop antenna 10/15/40/80	105.60	(n/c)
SQ22	Phased 2 ele. swiss quad 2m	58.95	(n/c)
SQY06	6 ele. quagi 2m	45.75	(n/c)
SQY08	8 ele. quagi 2m	52.75	(n/c)
HB210S	10 ele. dual driven yagi 2m	47.99	(n/c)
TE214	14 ele. long yagi 2m	74.40	(n/c)
SSL720	9 x 2 ele. (18) slot fed 70cm	77.20	(n/c)
HB23SP	2 ele. tri band beam 10/15/20m	135.60	(n/c)
SSL218	9 x 2 ele. (18) slot fed 2m	144.79	(n/c)
TPH2	Phasing harness 2m	17.25	(n/c)
QYU10	10 ele. quagi 70cm	67.90	(n/c)
SQ007	70cm 2 ele. phased swiss quad	66.99	(n/c)
SQ10	Swiss quad 10m	97.50	(n/c)
SQ15	Swiss quad 15m	106.90	(n/c)
YAESU ANTENNAS			
Base			
RSL145GP	$\frac{5}{8}$ wave base ant. 2m	21.20	(1.50)
RSL435GP	$\frac{5}{8}$ wave co-linear 70cm	31.60	(1.50)
HF Mobile.			
RSL3.5	3.5MHz resonator & whip	12.21	(0.50)
RSL7.0	7.0MHz resonator & whip	11.80	(0.50)
RSL14.0	14.0MHz resonator & whip	11.45	(0.50)
RSL21.0	21.0MHz resonator & whip	11.20	(0.50)
RSL28.0	28.0MHz resonator & whip	11.00	(0.50)
RSL2A	Mast to suit above	5.00	(0.50)
RSM2	Gutter mount/Feeder/PL259 suit above	10.94	(0.75)
VHF Mobile			
RSL145	2m $\frac{5}{8}$ wave fibreglass whip	12.10	(0.50)
RSL145S	2m $\frac{5}{8}$ wave steel whip foldover	9.25	(0.50)
RSL150SS	2m $\frac{1}{4}$ wave PL259 shock spring	3.90	(0.50)
RSM2	Gutter mount/Feeder/PL259 (RSL145)	10.94	(0.75)
RSM4M	Heavy duty mag/Feeder/PL259	13.25	(1.00)
UHF Mobile			
RSL453S	$\frac{5}{8}$ wave antenna	15.50	(0.50)
ANTIFERENCE ANTENNAS			
VHF Mobile			
TAP3009	$\frac{5}{8}$ wave 3db snap-in hinged whip	11.42	(3.00)
TAP3677	$\frac{5}{8}$ wave 3db snap-in shock coil	15.64	(3.00)
TAP3002	$\frac{1}{4}$ wave unity gain snap-in hinged whip	8.81	(3.00)
UHF Mobile			
TAP3462	$\frac{5}{8}$ over $\frac{1}{2}$ wave 3db	9.89	(3.00)
TAP3697	$\frac{5}{8}$ over $\frac{1}{2}$ wave 5db	18.40	(3.00)
K220	Mag mount/Feeder to suit above	10.73	(2.00)

Simply phone or write and leave the rest to us

Antennas Various/Accessories			
HQ1	Mini beam 10/15/20m 2 ele. 1kW	TBA	(4.00)
C4	Vertical 10/15/20m	48.50	(3.00)
G4MH	Mini beam 10/15/20	85.00	(4.00)
KTLM-4	Gutter mount/Cable assy. SO239	6.90	(0.50)
DATONG PRODUCTS			
PC1	50KHz to 30MHz receive converter	137.42	(0.50)
VLF	Very low freq. converter	29.90	(0.50)
FL1	Frequency agile audio filter	79.35	(0.50)
FL2	Multimode audio filter	89.70	(0.50)
ASP/A	Auto RF speech clipper (YAESU)	82.80	(0.50)
ASP/B	Auto RF speech clipper (TRIO)	89.70	(0.50)
D75	Manual RF speech clipper	56.35	(0.50)
RFC/M	RF speech clipper module	29.90	(0.50)
D70	Morse tutor	56.35	(0.50)
AD270	Active dipole RX ant. (indoor)	47.15	(0.50)
AD370	Active dipole RX ant. (outdoor)	64.40	(0.50)
MK	Morse keyboard	137.42	(0.50)
DC144/28	2m converter	39.67	(0.50)
RFA	Broadband preamplifier	33.92	(0.50)
MPU	Mains power unit	6.90	(0.50)
MICROWAVE MODULES			
Transverters			
MMT28/144	10m transverter	109.95	(2.50)
MMT70/144	4m transverter	119.95	(2.50)
MMT432/144R	70cm transverter	184.00	(2.50)
MMT1296/144	23cm transverter	184.00	(3.00)
MMT70/28	4m transverter	119.95	(2.50)
MMT144/28	2m transverter	109.95	(2.50)
MMT432/28S	70cm transverter	159.95	(2.50)
Linear Amplifiers			
MML28/100S	10m 100W linear amp.	129.95	(3.00)
MML70/50S	4m 50W linear amp.	85.00	(2.50)
MML70/100S	4m 100W linear amp.	139.95	(3.00)
MML144/30LS	2m 30W linear amp. 1-3W in	69.95	(2.50)
MML144/50S	2m 50W linear amp.	85.00	(2.50)
MML144/100LS	2m 100W linear 1-3W in	159.95	(3.00)
MML144/100S	2m 100W linear 10W in	139.95	(3.00)
MML432/50	70cm 50W linear amp.	109.95	(3.00)
MML432/100	70cm 100W linear amp.	228.65	(4.00)
MML1296/10	23cm 10W linear amp.	199.00	(2.50)
MML432/30	70cm 30W linear amp. 1-3W in	99.00	(3.00)
Converters			
MM1000KB	ASC11 morse converter with keyboard	99.95	(3.00)
MM4001	RTTY to TV converter	189.00	(2.50)
MM4001KB	RTTY transceiver	269.00	(2.50)
MM4000KB	RTTY transceiver with keyboard	299.00	(4.00)
MMC28/144	10m to 2m converter	29.90	(1.00)
MMC50/28	6m to 10m converter	29.90	(1.00)
MMC70/28	4m to 10m converter	29.90	(1.00)
MMC70/28LO	4m to 10m with LO	32.90	(1.00)
MMC432/28S	70cm to 10m converter	37.90	(1.00)
MMC432/144S	70cm to 2m converter	37.90	(1.00)
MMC435/600	UHF ATV converter	27.90	(1.00)
MMC1296/28	23cm to 10m converter	34.90	(1.00)
MMC1296/144	1296MHz low noise converter	69.95	(1.00)
MMK1691/137.5	1691MHz meteosat converter	129.95	(2.50)
Morse Talkers			
MMS1	Morse tutor 2-20WPM Side tone	115.00	(2.50)
MMS2	Morse tutor (advanced) 6-32WPM + speak back	169.00	(2.50)
Amateur TV			
MTV435	70cm 20W (PSP) transmitter	149.00	(2.50)
MMC435/600	Converter ATV UHF output	27.90	(1.00)
Preamplifiers			
MMA144V	2m preamp RF switched	34.90	(1.00)
MMA28	10m preamp	16.95	(1.00)
MMA1296	23cm preamp	34.90	(1.00)
Frequency Counters			
MMD650/500	500MHz digital meter	75.00	(1.00)
MMD600P	600MHz pre scaler	29.90	(1.00)
MMDP-1	Probe	14.90	(0.50)
Filters			
MMF144	2m band pass 40W max.	11.90	(1.00)
MMF452	70cm band pass 40W max.	11.90	(1.00)
Various			
MMS384	384MHz signal source	29.90	(1.00)
MMR15/10	15db 10W attenuator	11.90	(1.00)
HI-MOUND MORSE KEYS			
HK702	Up down keyer marble base	24.50	(0.50)
HK704	Up down keyer	16.68	(0.50)
HK705	Up down keyer	12.50	(0.50)
HK706	Up down keyer	13.75	(0.50)
HK708	Up down keyer	11.96	(0.50)
HK808	Up down keyer marble base	39.57	(0.50)
MK704	Twin paddle keyer	10.95	(0.50)
MK705	Twin paddle keyer marble base	22.00	(0.50)
MOULDINGS			
IK	Iambic keyer	19.95	(0.50)

TOKYO HY POWER			
HC150	HF ATU SWR/Power meter 200W PEP	62.50	(n/c)
HC2000	HF 2kW ATU SWR/Power meter 6 POS ant. switch. 6 to 1 vernier high Q coils 2kW peak 1kW continuous	276.55	(n/c)
Antenna Rotators & Accessories			
9502	Channel master med duty up to 8 ele.	57.00	(3.50)
9523	Alignment bearing for 9502	15.81	(1.25)
KR400	Med/Heavy duty 180° meter (inc. lower casting)	90.85	(3.50)
KR400RC	Med/Heavy duty 360° meter Load 200Kg 1½"-2" masts	114.94	(3.50)
CASTING	Lower casting set (400RC)	15.00	(1.25)
KR600RC	Heavy duty 360° meter Load 200Kg Rot600Kg/cm Brake 4000Kg/cm 1½"-2" masts	163.30	(3.50)
Antenna Switches			
SA450	SO239 connectors 1 in 2 out	9.75	(0.50)
SA450N	"N" type connectors 1 in 2 out	12.75	(0.50)
Baluns			
BL50A	RAK 50 ohm ferrite BALUN 1:1 1.8-38MHz 1kW	12.88	(1.50)
BL-40X	Balun 2K PEP 1.1	11.52	(1.50)
Dummy Loads			
T30	30W DC 500MHz PL259	6.61	(0.50)
T100	100W DC 500MHz SO239	20.12	(1.00)
T200	200W DC 500MHz SO239	31.36	(1.50)
T210	Wide band 10W 1.2G-2.4G	24.50	(0.75)
AW05	Pocket RF wattmeter 5W up to 500MHz BNC	19.75	(1.00)
Filters			
AKD	Hi-pass blocks 0-200MHz RF interference to UHF above 400MHz	5.50	(0.50)
Linear Amplifiers			
YAESU			
FL110	HF 160/80/40/20/15/10m 100W (10W drive)	155.25	(n/c)
FL2100Z	HF warc 1200w PEP, SSB 1kW CW, 400W AM/FM/FSK	449.00	(n/c)
FL2010	2m VHF 10W linear	54.00	(n/c)
FL2050	2m VHF 50W linear 10W drive	115.00	(n/c)
FL7010	70cm UHF 10W linear	91.00	(n/c)
TOKYO HY POWER			
HL32V	VHF 30W linear 1-5W drive HI-LOW output	53.50	(n/c)
HL82V	VHF linear preamp output meter 2-12W in 35-85+ out	144.50	(n/c)
HL160V	VHF linear preamp output meter 1-10W in 160W+ out	242.40	(n/c)
HL45U	UHF linear preamp 2-15W in 10-45W out	119.75	(n/c)
ADONIS MICROPHONES Mobile/Base			
MM202S	Mobile safety mic. (non scanning)	23.00	(1.00)
MM202HD	Mobile safety mic. (scanning)	30.00	(1.00)
AM502	Desk mic. (compressor selectable)	45.94	(1.00)
Miscellaneous			
Mutec			
SNL144S	2m preamp RF switched	33.90	(1.00)
RPCB	144UB FT221/225 front end board	64.50	(1.25)
Ni-cads			
AA	AA size Ni-cad	1.00	(0.20)
C	C size Ni-cad	2.40	(0.30)
NC1850	Ni-cad charger (4 x C or 4 x AA)	9.50	(1.00)
DRAE PRODUCTS			
DRAE4	4 amp PSU	30.75	(2.00)
DRAE6	6 amp PSU	48.00	(2.50)
DRAE12	12 amp PSU	74.00	(3.00)
DRAE24	24 amp PSU	105.00	(4.00)
DRAE WM	135-450MHz wavemeter	27.50	(1.00)
"N" Connectors (Silver Plated)			
N58	"N" Male connector RG58	2.25	(0.25)
N8	"N" Male connector RG8	2.40	(0.25)
N308	"N" T adaptor (three female)	2.40	(0.25)
N307	"N" L adaptor (1 male 1 female)	2.40	(0.25)
N306	"N" Double female adaptor	1.90	(0.25)
N310	"N" Double male adaptor	2.50	(0.25)
NB304	"N" Female to BNC male adaptor	2.10	(0.25)
N402	"N" Plug to SO239	2.05	(0.25)
N403	"N" Socket to PL259	2.00	(0.25)
N404	"N" Socket to SO239	1.80	(0.25)
Speakers/Headphones			
Various			
RT650	4 ohm, 8 ohm 3W nom 6W max	6.50	(0.50)
MS60	3W nom 5W max	7.50	(0.50)
S2	Headphones (cobalt magnets)	5.75	(0.50)
YAESU			
YH55	Headphones Low Z	10.00	(0.50)
YH77	Lightweight headphones Low Z	10.00	(0.50)
SWR/Power Meters			
YAESU			
YS200		52.90	(n/c)
YS2000		69.79	(n/c)
Other Makes			
RF2000	Twin meter 3.5-150MHz F/Scale 200/2000W	18.25	(1.00)
YM1X	Twin meter 3.5-150MHz F/Scale 12 or 120W	14.99	(1.00)
Sensor 500	1.8-160MHz 5/50/500W	37.08	(1.00)
T430	Twin meter 144-430MHz	34.85	(1.00)
T435	Twin meter 144-435MHz	39.10	(1.00)

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Comment

IT MAY SEEM STRANGE to bring in changes in a magazine dated May, but this happens to be the first issue published in our new financial year. We've been looking very carefully at what we offer our readers, and have decided to continue our recent trend, away from "plastics gimmicks" towards the printed word. We know our Datacards, like "Resistor/Capacitor Colour Codes" this month, are very popular with many of you, as are some of the charts we've done, but there aren't all that many topics warranting that sort of treatment, and we thought we could spend the money better some other way.

With the growing interest in specialist modes like RTTY, TV both fast- and slow-scan, microwaves and satellites, we decided the best thing to do was to add more editorial pages to the magazine. This will let us give more regular coverage to these subjects, plus computing-in-radio, features for beginners, etc.

This month you're getting a bonus, a Datacard **and** extra editorial features! In future issues, we'll be fitting in extra pages wherever we can, but your ideas for any really useful Datacards or charts are always welcome.

Operation under the 50MHz limited licences scheme is now in full swing in the UK (see our *On the Air* feature in this issue). The geographical distribution of the licensees struck me as a little strange, and it would be interesting to know the guidelines used in selection. The comment in the GB2RS news of February 6 about crossband working to 50MHz stations being limited to holders of Amateur Licence A was intriguing in its wording—"those with Class B licences may not (work crossband) since 50MHz is not open to them."

I have never been able to understand what it is in the UK Amateur Licence B which prevents its holders from working crossband to an h.f. station. The licence does say that "The Station shall be used only with emissions . . . and within the frequency bands specified in the Schedule . . .", but it seems reasonable to assume that this limitation applies only to transmission. After all, the Wireless Telegraphy Acts authorise any UK citizen to listen to "licensed amateur stations" without limitation as to frequency. Or do you forfeit some of your rights as a citizen by taking out an Amateur Licence?

The UK Radio Amateur is faced with the task of trying to comply with rules and conditions laid down in his Licence, in the Telecommunications Convention and the Radio Regulations, and with interpretations which have been issued from time to time via the RSGB. Some of these rules seem to conflict, some seem not to make a great deal of sense when considered logically, and nowhere are they gathered together in one place for the benefit of licensees in general and newcomers to the hobby in particular. The need for a total revision of the Amateur Licence becomes more urgent every day—I hope that it will be completed soon.

Geoff Arnold

Services

QUERIES
While we will always try to assist readers in difficulties with a *Practical Wireless* project, we cannot offer advice on modifications to our designs, nor on commercial radio, TV or electronic equipment. Please address your letters to the **Editor, "Practical Wireless", Westover House, West Quay Road, Poole, Dorset BH15 1JG,** giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the "Buying Guide" box included in each constructional article.

PROJECT COST
The approximate cost quoted in each constructional article includes the box or case used for the prototype. For some projects the type of case may be critical; if so this will be mentioned in the Buying Guide.

INSURANCE
Turn to the following page for details of the PW Radio Users Insurance Scheme, exclusive to our readers.

CONSTRUCTION RATING
Each constructional project will in future be given a rating, to guide readers as to its complexity:

Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently. Generally this category will be used for simple projects, but sometimes for more complicated ones of wide appeal. In this case, construction and wiring will be dealt with in some detail.

Intermediate
A project likely to appeal to a wide range of constructors, and requiring only basic test equipment to complete any tests and adjustments. A fair degree of experience in building electronic or radio projects is assumed.

Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Constructional information will generally be limited to the more critical aspects of the project. Definitely not recommended for a beginner to tackle on his own.

SUBSCRIPTIONS
Subscriptions are available to both home and overseas addresses at £13 per annum, from **"Practical Wireless" Subscription Department, Room 2816, King's Reach Tower, Stamford Street, London SE1 9LS.** Airmail rates for overseas subscriptions can be quoted on request.

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Binders are available (Price £5.00 to UK addresses, £5.25 overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

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Please make cheques, postal orders, etc., payable to IPC Magazines Limited.

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SPECIAL FEATURES

● All Risks Cover ● "New Lamps for Old" Cover (as defined in policy) ● Index Linked Cover to combat inflation ● Includes Personal Liability cover against damages payments of up to £500 000 to members of the public ● Licence protection—covers legal costs arising from any breach of your licence conditions ● Equipment covered anywhere in the UK, Channel Islands and Isle of Man, but not Northern Ireland and Eire ● Fixed Antennas (Aerials) covered ● Frequency, Power and SWR Meters and similar radio-related test equipment covered ● 30 days cover on Western Europe included Free of Charge ● Absolute Security as this scheme is underwritten by a leading member of the British Insurance Association on the London Insurance Market ● Practical Wireless radio receiver and transmitter projects covered (when stated in feature) ● Available to Clubs and Organisations† ● Available to Companies†

†Write directly to B. A. LAYMOND & PARTNERS LTD, for a special application form and full details enclosing the coupon below.

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MOBILE/PORTABLE EQUIPMENT

Cover for property contained in vehicles is subject to a Limit of Liability of £250, increased to £750 where the vehicle is protected by a reputable audible alarm, correctly set and operational.

When the vehicle is unattended, mobile equipment secured so that tools or a key are required to remove it must be disguised or concealed from view. Portable and mobile equipment not so secured must be placed in a locked boot or otherwise concealed from view, or removed from the vehicle entirely. Equipment not in a secure building or vehicle must not be left unattended.

How Much Will It Cost?

Sum to Insure	£1000	£3000	£5000
Annual Premium	£20	£35	£45

The premium is charged on sums insured in pre-selected bands. Thus equipment totalling £3750 would be in the band up to £5000, and the premium would be £45. Quotations for larger sums available on application.

Claims will be settled after deduction of an excess in the following manner:

Type of Loss		Excess
From saloon cars and hatchbacks with fully concealed luggage compartments		15% of claim (minimum £25)
From estate cars, vans and hatchbacks without concealed luggage compartments		25% of claim (minimum £25)
All others:	Sums insured up to £3000	£25
	Sums insured up to £5000	£50

How To Insure

Complete the application form below to obtain immediate insurance cover. Photocopies will not be accepted

APPLICATION FOR PRACTICAL WIRELESS RADIO USERS INSURANCE SCHEME PW5/83

Name in full (State Mr, Mrs, Miss or Title)

Address

Post Code

Occupation Age Phone No. (Home) (Work)

I/We hereby apply to insure the equipment detailed below

BLOCK LETTERS

	Manufacturer's Name	Model	Serial No.	Description of equipment to be insured e.g. Base station; Mobile; CB; etc.	VALUE £
1					
2					
3	Antennas (Aerials), s.w.r. meters, etc.				

Please continue list of equipment on a separate sheet if necessary **TOTAL SUM TO INSURE £**

DECLARATION: I/We hereby declare that: 1. The sums insured represent the full replacement value of the equipment. 2. I/We have not* had insurance cancelled, declined, restricted, or other terms imposed in any way other than the normal Policy terms. 3. This proposal shall be the basis of the contract and that the contract will be on the Underwriters normal terms and conditions for All Risks and Legal Costs/Expenses cover unless otherwise agreed. 4. I/We have not* sustained any loss or damage to any radio communications equipment or been involved in litigation relating to use of radio equipment during the past three years, whether insured or not. 5. All the above statements made in connection with this proposal are true and no material information has been withheld. 6. I/We understand no liability shall attach until this proposal shall have been accepted by Laymond's and the premium paid in full and a Certificate issued.

* If you have, please give details on a separate sheet.

Date Signed

Rush us details of PW Club Insurance ☐
PW Company Insurance ☐

DELAY IN ARRANGING COVER COULD COST YOU A GREAT DEAL OF MONEY. COMPLETE THIS APPLICATION AND POST WITH YOUR PREMIUM MADE PAYABLE TO "LAYMOND'S" NOW. ADDRESS TO: PRACTICAL WIRELESS (INSURANCE), B. A. LAYMOND & PARTNERS LTD., 562 NORTH CIRCULAR ROAD, LONDON NW2 7QZ. TELEPHONE: 01-452 6611.

PW RUIS... SOME CHANGES

From our experience of the first year of operation of the PW Radio Users Insurance Scheme, several changes in the conditions of the Policy are being made, with effect from 1 May 1983.

These changes mostly affect the use of radio equipment either portable or mobile, when the risk of theft is particularly high. Details are given on the opposite page, which also shows the revised bands for Sum Insured and Premiums.

We are sorry if the new conditions make PW RUIS seem less attractive. They have proved necessary for two main reasons.

1. Our premiums were originally calculated on the assumption that radio enthusiasts would want to insure **all** their equipment, whether it was used at home, out portable, or in the car. In fact, they've mostly preferred to cover only their mobile and portable gear, where the risk is highest, and maybe understandably so, though PW RUIS does give "new lamps for old" cover, which most household contents policies do not. Unfortunately, it's a fact of life that insurance of high risks demands higher premiums.

We did look at the idea of having two separate policies, one for equipment used only at home and another giving mobile/portable cover, but it began to get rather too complicated.

2. Quite a few policy-holders seem to have taken the attitude that once they've insured their radio equipment, they no longer need to look after it themselves.

We've had people leaving a hand-held transceiver in the middle of a public park when they ran for shelter during a picnic, then finding it missing when the rain stopped. We've had people leaving a window open so that the dog left sitting in the car could breathe on a hot sunny day. When they got back, the dog was alright but the rig that had been on the seat next to him had vanished.

Remember that an insurance policy is a contract between the policy-holder, who promises to comply with the policy terms and conditions and to take reasonable care of the insured property, and the Underwriters, who promise to compensate him if the property is damaged or stolen, provided that the policy terms and conditions have been complied with.

But enough of the bad news—now for some good. New policies, or existing ones being renewed, will now automatically include cover against any legal liability arising from the ownership of radio equipment, masts and antennas, up to a limit of £500 000.

We're sure that PW RUIS still represents good value for money. We hope you'll think so, too.

Letters

RSGB Correspondence

Sir: It is not surprising that Mr Copley-May got no response on reciprocal licensing if he rang the bell at **28** Doughty Street!

More seriously, is it not time that, instead of fostering internecine squabbles in public the like of Mr Harada, Mr Copley-May and Mr Dilley—if they feel they represent "grass roots" feelings, got off their high horses (or should it be asses?) and did something constructive for the Society **and** amateur radio rather than simply uttering public condemnations? . .

True the Society has its warts and blemishes; physical and staffing constraints at Doughty Street have precluded excellence. The News service effectiveness is curtailed by both the HO "vetting" procedure and the antics of amateurs themselves (by jamming frequencies in use).

Amateur radio is inexorably tied-up with politics at National and International level by its very nature and if the authorities (HO and military) choose not to communicate with an **amateur** society (or even with each other) it is hardly the Society's prerogative to demand attention. **Of course, strong views have been expressed** on such matters as frequency allocations, use of slow c.w., cable TV, interference and planning permission, but it is not right to blame the Society if authority chooses to ignore such views, especially when authority is under duress from vested, commercial interests. Illegal operation and delays in licence issue are matters for authority to settle—we can only point out shortcomings and **request** action.

If individuals are incensed by such things then I would suggest they personally contact their MPs—this is how the CB lobby succeeded! (Pester might be a better word.)

It is strange how enthusiasm evaporates when the "grass-roots" member is asked to make a commitment of time (and often money) to the cause of amateur radio by actually **doing** something for the Society. When did you, the reader, last attend an area, regional or annual general meeting or partake actively in Society affairs other than rallies? How about RAYNET, Repeater Groups, offering lectures to affiliated societies, running an RAE or Morse class? One could go on endlessly.

What is manifest to me (as an active member of the Society) is that Saint Apathy rules supreme and fosters destructive mal-content at grass roots.

To quote Winston Churchill. "We must all pull together." What hurts about the present attitudes and viewpoints is that a few do the pulling and many just pull to pieces. The critics of the Society are hereby challenged to change their Society by doing, not saying: you elect the officers!

M. W. Dixon G3PFR
Secretary RSGB Microwave Committee
Chairman UKFM Group (Western)
Ordinary amateur!

Spares

Sir: Is it possible either your magazine or your readers could let me know where I can obtain dial lamp bulbs for an ex-US forces BC-348 receiver. The bulbs (2) are LM-27.

I am also having great difficulty finding a calibrated dial for my ex-RAF R1155 RX (L or N model).

C. M. Duncan, Roadside Cottage,
Hoswick, Sandwick, Shetland

News

Radio Netherlands

Starting at 0600UTC, 30 April 1983, Radio Netherlands is planning to operate a special amateur radio station for 24 hours from its studio centre in Hilversum, Holland. This year marks 55 years since regular broadcasts began from the Netherlands to what is now Indonesia. Since amateurs have been involved in the pioneer work of both domestic and international broadcasting, the station feels it rather appropriate to involve them in a project tied in with World Communication Year 1983.

A special callsign has been applied for and full details will be given in the Tuesday communications magazine for s.w.l.s, *Media Network*. Times of transmission are listed in the table, or for details you can write to: *English Section Radio Netherlands, PO Box 222, 1200 JG Hilversum, The Netherlands.* A special QSL card will be issued for listeners managing to hear the special station.

Time (UTC)	Target Area	Frequencies (kHz)
0748	New Zealand & Australasia	9770, 9715
0848	New Zealand & Australasia	9715
0948	Europe	15560, 11930, 9895, 6045, 5955
1348	Europe	17605, 11930, 9895, 6020, 5955
1448	South East Asia	11740, 17605, 21480
1848	East & Central Africa	6020, 11740
2048	West & Central Africa (also audible in Europe)	21685, 17695, 15220, 11930, 9715
0248*	Eastern United States & Canada	9590, 6165
0548	Western United States & Canada	9715, 6165

*Friday UTC but Thursday in target

Rallies and Events

Maidstone Amateur Radio Society have organised their 1983 Mobile Rally for Sunday 1 May, starting at 1100hrs, at the YMCA Sports Centre, Melrose Close, off Cripple Street, Maidstone, Kent.

Their last rally attracted over 1 000 people and this year the demand for space from the trade has been so good that they are increasing the show area. All the usual features will be there, including talk-in on S22 by GB2YSC, bring-and-buy stands and bookstall etc., plus special items to interest the whole family.

The admission fee is only 50p and car parking is free. Further information from: *G4FOE, QTHR.*

The Swindon Radio and Electronics Rally, organised by the Swindon and District Amateur Radio Club, will be held on Sunday 15 May, starting at 1000hrs, at Park School, Marlowe Avenue, Swindon.

Talk-in will be available on S22 and SU8/GB3TD and there will also be demonstrations, hobbies and handicrafts, bring-and-buy stall, trade stands and refreshments. Also included are stands of general interest for the whole family, and once again there will be a film show and other attractions specifically for the children.

Car parking is free and admission will be only 50p. Further details from: *Rally Organiser, K. A. Saunders G8SFM, Tamarisk, Tetbury Lane, Leighterton, Gloucesterhire GL8 8UP. Tel: (066 689) 307.*

Microwave Round Table

If you are at all interested in any aspect of the r.f. spectrum above 1GHz the next in the popular series of microwave round tables to be held on Sunday 17 April at the IBA Engineering HQ at Crawley Court near Winchester should not be missed.

Meetings take the form of an informal gathering of people interested in operation on the amateur bands above 1GHz—**all** are welcome. The venue will provide an ideal opportunity to examine equipment that has been built for microwave operation, evaluate your own equipment on an extensive range of test equipment and generally swap ideas.

Radio Luxembourg—50 years old

Radio Luxembourg (English Language Service) is into its 50th year, but due to the particular nature of the programming, which has been sponsored over the 50 years, the majority of archive material such as recordings have disappeared into the hands of private collectors or old advertisers. Radio Luxembourg would be particularly interested in obtaining any such recordings relating to the 30's, 40's and 50's. They would also like to locate any other memorabilia such as old QSL cards, photographs, programme schedules and especially diary information related to their initial broadcasts in 1933. Any information should be sent to, *Tony Fox, Radio Luxembourg, 38 Hertford Street, London W1.*

2-metre f.m. Contest

The Stevenage and District Amateur Radio Society will be running a 2-metre f.m. contest on Sunday 10 April, 1983 between 1300 and 1700GMT in the 144·500 to 144·845MHz and 145·200 to 145·575MHz sections of the band.

The contest is open to members and non-members of the society and there will be three classes of entry: 1. Stations running up to 25 watts output; 2. Stations running more than 25 watts output; 3. Short Wave Listeners.

Further information is available, in return for an s.a.e., from: *The Contest Secretary, Bernard Dean G6NZC, 82 Lingfield Road, Stevenage, Herts SG1 5SN.*

1983 EDXC Conference

The 1983 European DX Council Conference, the annual meeting point for international broadcasters, technical staff and DXers, is to be sponsored by Marconi Communication Systems Ltd. based in Chelmsford, Essex.

The Conference, which will be organised by a British shortwave listeners' club, the DX Association of Great Britain, and hosted by the BBC's External Services, will take place on 20 to 23 May 1983 at the London Penta Hotel in Cromwell Road, Kensington, West London.

Many prominent international broadcasters will attend this annual Conference, and further information is obtainable from: *European DX Council, PO Box 4, St Ives, Huntingdon, Cambs. PE17 4FE.*

Introduction to Amateur Radio & SW Listening

Over the last three years an introductory short course to amateur radio has proved so successful that the organisers are running it again at two centres in Nottingham.

The syllabus includes an outline of the RAE, some basic theory, receiver operation on the amateur and broadcast bands, plus practical points concerning construction techniques and antennas. In short, a useful preliminary for the aspiring RAE candidate.

At Hucknall College of Further Education, a six-week course commences on Monday 16 May 1983 and at Arnold and Carlton CFE a five-week course commences on Wednesday 25 May 1983. At both colleges the course starts at 1900hrs, each session running for two hours under the direction of the course tutor, Alan Lake G4DVW.

For enrolment and further details, apply direct to the colleges: *Hucknall CFE, Portland Road, Hucknall, tel: Nottingham (0602) 637316, and Arnold and Carlton CFE, Digby Avenue, Mapperley, tel: Nottingham (0602) 876503.*

UK VHF/UHF Beacons

We have recently received from John Wilson G3UUT, the v.h.f. and u.h.f. beacon co-ordinator of the RSGB v.h.f. committee, details of operational UK beacons.

Reports on reception of these beacons can be sent to G3UUT at: *RSGB, Alma House, Cranborne Road, Potters Bar, Herts. EN6 3JW.*

Repeater News

1·3GHz: The first batch of proposals for 1·3GHz ATV repeaters have now been lodged with the Home Office for their consideration. This follows agreement of the technical specifications by the RSGB VHF and Microwave Committees.

GB3WX, the UK's first 1·3GHz voice repeater, on channel RM9 and located at Race Hill, Brighton, Sussex is once again operational.

The RSGB–RWG have stated that no further 1·3GHz microwave ATV repeaters will be licensed until the preliminary results of the initial licensed units have been assessed. A paper covering the UK bandplanning of these devices will be given to the 1984 IARU conference. Proposals for further ATV repeaters already lodged with the RWG include Manchester, Derby, Blackpool, Ipswich and Bournemouth.

144MHz: The Home Office has now approved applications for v.h.f. repeaters within Phase 5 proposals (submitted to the HO on 24 April, 1982).

The RWG have received a letter of intent from a group of amateurs on the Channel Island of Jersey, requesting consideration for a v.h.f. repeater installation. The callsign GB3GJ has been suggested and if this proposal clears the planning stage, it will be offered to the HO under v.h.f. Phase 7.

The group responsible for the East London 144MHz repeater GB3EL, which has been QRT for over 12 months, have had their licence withdrawn by the RSGB for repeatedly failing to respond to requests from HQ to re-establish the device. Other ways of using the HO licence are being considered by the RSGB, and may not include the establishment of a new East London device.

432MHz: The HO has finally approved all applications for u.h.f. repeaters within Phase 6 (submitted to the HO on 26 November, 1981).

GB3TD, the Swindon, Wiltshire-based u.h.f. repeater, will become operational later this year. Similarly, GB3NT, the re-sited Newcastle unit, is expected on air as soon as approval is obtained.

Repeaters and Beacons—new licence: A new form of licence is being prepared by the HO to cover all new and existing repeater and beacon installations. One specific departure from the current licence requirements is the removal of non-licensed close-down personnel from the stand-by listing currently required by the HO. Some 43 people across 35 repeaters will be affected by this change.

Repeater Working Group: Following recent elections, the 1982 committee of the RWG were re-elected. Malcolm Appleby G3ZNU has been appointed Chairman of the RSGB VHF Committee. Chris Morcom G3VEH has decided to step down after chairing this committee through an eventful four years. *PW* would like to join with probably all UK amateurs in thanking Chris for his tireless efforts.

Callsign	Frequency (MHz)	QTH	ERP (Watts)	Antenna system	Beam direction	Antenna height a.o.d. (metres)
GB3SX	28.215	AL71d	10	Dipole	0°, 180°	167
GB3SIX	50.020	XN49f	100	Yagi 3 ele.	270°	58
GB3CTC	70.030	XK46d	40	Yagi 2 ele.	45°	320
GB3WHA	70.040	AL71d	16	Yagi 2 ele.	315°	168
GB3BUX	70.050	ZN61a	20	Turnstile × 2	Omni.	460
GB3ANG	70.060	YQ35c	100	Yagi 3 ele.	160°	370
GB3CTC	144.915	XK46d	40	Yagi 3 ele.	45°	320
GB3VHF	144.925	AL52j	50	Yagi 3 ele. × 2	288°, 348°	275
GB3LER	144.965	ZU65f	50	Yagi 4 ele.	22°	107
GB3ANG	144.975	YQ35c	20	Yagi 4 ele.	160°	370
GB3WHA	432.810	AL71d	25	Yagi 8 over 8 ele. × 2	90°, 330°	165
GB3SUT	432.890	ZM31b	60	Yagi 8 over 8 ele. × 2	0°, 135°	270
GB3EM	432.910	ZN32b	50	Yagi 8 over 8 ele.	150°	600
GB3CTC	432.970	XK46d	5	Yagi 4 ele.	45°	320
GB3ANG	432.990	YQ35c	100	Yagi 9 ele.	170°	370

VHF Contest Special

VHF Contest Operating-Getting Started

Ian White G3SEK

Contests are the ultimate challenge in operating skill. If you are a newcomer to the amateur bands, v.h.f./u.h.f. contests are also the best way to learn the art of good operating. But there is nothing more discouraging than trying to operate in a contest without any idea of what you are doing: this article will tell you what to do, and more important, **why.** It will show you how to take part in a contest, even if only to "give a few points away", and how to use contests to develop your own operating skill.

Good operating can actually be summed up in three simple rules:

(i) Put yourself in the place of the person you're trying to work.
(ii) Get things right, first time.
(iii) Think about what you're doing, and learn from your experience.

These rules are easy enough to state, but putting them into practice can be a lifetime job! This article will start you off in the right direction, and after that it's up to you. Although much of the article is about developing good operating techniques through taking part in contests, the same techniques are of value in many other aspects of amateur radio. DX chasing is the most obvious example, and G4EJA's article in the October 1982 issue of *PW* is well worth another read.

Before the Contest

Whether your objective is to win the contest outright or merely to survive your first contest QSO without freezing in a panic, you will need to prepare. First of all, **read the rules**—even if you think you know what they will say! The rules for the *PW* 144MHz QRP contest are in this issue, on page 28. Most of the other UK v.h.f. contests are organised by the RSGB, and their rules are published in *RadCom.* The rules for any particular contest are rather cryptic, and are intended to be read in conjunction with the General Rules published in the pull-out supplement to the January issue.

Even if you are only "giving a few points away" and do not intend to enter a contest, try to follow the rules anyway to avoid confusing other people.

If you have not already done so, work out your QTH locator[1]. In some RSGB contests you must also give your "location", i.e. your bearing and distance from some clearly identifiable place. Having decided on the location information you are going to send in every QSO, write it on a crib-card and put the card where you can see it easily. Then if your brain congeals in mid-QSO you can just read parrot-fashion from the card while collecting your wits!

Another essential operating aid is a check-sheet (or check-log) to tell you **quickly** if you have worked a station before. Your ordinary log is no good for this, and you **can't** do it in your head. Take a large sheet of paper (A3 or bigger depending on your ambition and eyesight), pin it to a board and divide it into 9 × 3 vertical columns, one for each letter of the alphabet plus one for overflows. Then index stations alphabetically by suffix (e.g. G3**S**EK under "S") as you work them. Alternatively you can index stations by the last letter of the callsign e.g. G3SE**K** under "K". One thing to remember—make sure **everyone** knows which method you intend to use!

Indexing divides the look-up time by 26, and unlike book, card or even computer indexes you need no hands to consult a single big check-sheet.

Answering a CQ

The easiest way to start to learn contest operating is to answer CQ calls from other stations. If you are starting contests absolutely from scratch, listen to a few QSOs first to see how it goes and find a station whose operator seems to know what he (or she) is doing. The station who calls CQ ought to take all the initiatives and direct the course of the QSO, and as a beginner you can simply follow his lead.

What if someone else is calling too? The key to getting your callsign recognised in a "pile-up" is to put yourself in the place of the other operator. He is probably trying to hold the microphone, write in the log **and** snatch a gulp of coffee, so call him exactly on the frequency he is already tuned to. He knows his own callsign and will assume that anyone on the frequency is calling him, so the instant he goes over to receive (many stations use a pip-tone) call him by **spelling** your own callsign **once.** Use standard phonetics (Alpha Bravo Charlie etc.) because those are what he is expecting to hear. If there is no reply to your first quick call, or you can hear other longer-

PRACTICAL WIRELESS 144MHz QRP CONTEST

Date	Callsign	QTH locator	Sheet N° of

Time GMT	Callsign	Report & Serial N°		QTH locator	Points
		Sent	Received		

WRM776

Fig. 1: Sample of the *PW* QRP contest log sheet

winded stations still calling, you have time to reassess the situation and maybe call again.

As I said earlier, a good operator will get your callsign right the first time. However, not even the best operator can manage to do that every time, and some people seem always to need several repetitions before anything sinks in! In any case the other operator may not be hearing you as clearly as you can hear him. He may be running higher power, or he may have a lot more QRM at his end. Possibly also he has a pile-up of stations of roughly equal strength, all calling at once. Therefore he may have to call "QRZ?" or just "Again?", both of which mean "I know somebody's calling, please call again". So do that, the same as before. If an operator can get **something** out of the pile-up, even a single letter, he can then use it as a "hook" to pull out the station he wants. For example he may say, "QRZ the station with kilo in the call?" or just "QRZ the kilo station?". If that could have been you, call again. If not, **keep quiet!**

Success in pile-ups is not easy, and there are no guaranteed solutions. If you aren't doing too well, the most important thing is to try and understand why not, and then keep practising.

Exchanging the Information

Assuming you have successfully called the station you wanted, you can start to exchange the contest information. The station who called CQ will send his first, and your objective is to get that information down in your log. Getting it **right** is more important than doing it quickly. The operators who make large numbers of contacts are the ones who rarely ever have to ask for repeats or make corrections, so you should concentrate first on accuracy, and speed will come automatically.

The information to be exchanged is governed by the rules of the particular contest. A sample logsheet for the *PW* contest is shown in Fig. 1: check it against the rules on page 28. You will usually be writing in your own station logbook, which hopefully has a similar format. At some stage log the time of the contact to the nearest minute or so, but skip that for now because you're too busy listening to the other station. Write down his callsign, which you already know, but be sure you write it down correctly. It is remarkably easy to write down G8SEK or G6SEK when you meant G**3**SEK, and this incorrectly logged exchange of callsigns would invalidate the whole QSO!

The next item is the incoming signal report and serial number, in the right-hand of the two columns headed "Report and Serial Number". A correctly-copied exchange of signal reports is essential for a valid QSO. If signal reports are reasonably accurate, they can form a good guide to how quickly and how often you will need to send your own information when the time comes. An incoming report of "59" suggests that you only send your own information once. A report of "31" means that you should e-nunc-i-ate extra cle-ar-ly, and should probably repeat everything at least once more. The serial number of the contact begins at 001 and advances by one for each contact. It should be sent together with the signal report in a single five-figure group, e.g. 59001.

The QTH locator should be spelt out, as in Zulu Lima One Five Hotel. Do not give numbers in a way that could be misheard, e.g. fifteen and fifty are easily confused. The figure 0 should be pronounced as "zero". In RSGB contests the location should only be sent if the rules require it: even then it is never sent to Continental stations, who rightly regard it as yet another British eccentricity! If you have to repeat any information, do so item by item, e.g.

"59034 . . . 59034 . . . ZL15h . . . ZL15h . . ."

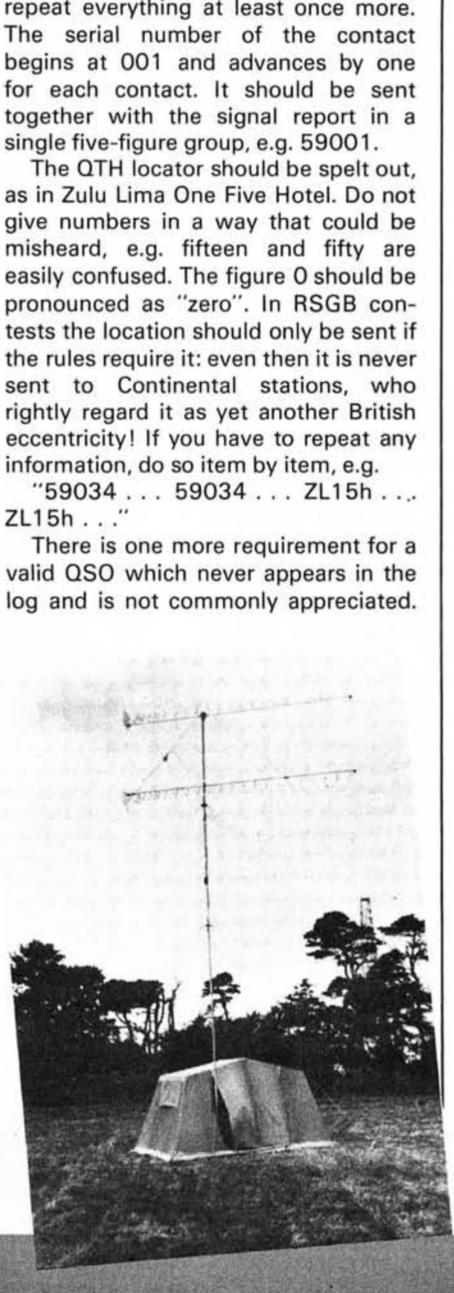
There is one more requirement for a valid QSO which never appears in the log and is not commonly appreciated. Each station ought to acknowledge that the information from the other has been received correctly, as far as he can tell. This can usually be assumed if nothing is queried, but all that is needed to make certain is the word "Roger", which means "Yes, I have **everything** OK". Some people say QSL, but that can be confusing; in this context it does not mean that the station wants to exchange confirmation (QSL) cards with you. No such confusion can arise if you say "Roger", which is clearer, simpler and equally correct.

It is a waste of time to read other people's information back to them as a way of confirming it, but if in doubt never hesitate to ask for a repeat of the dubious parts. Finally, when you are sure in your own mind that **everything** is correct—and not until then—seal it by saying "Roger".

Exchanging contest information means passing the transmission back and forth several times. Your licence does not require you to give any callsigns during such rapid-fire exchanges; at most you only begin and end your transmissions with "From G6ZZZ", and then sign appropriately at the end of the contact.

Is this Frequency Clear, Please?

When the contact is over, the frequency "belongs" to the operator who called CQ in the first place. In practice the sequence of the contact gives him the last word, and after signing with you he will often call CQ again without pausing. You then need to move frequency, either to find someone else to call, or to call CQ yourself. In the latter case you will have to find a clear frequency. During a busy contest there is generally no such thing as a completely clear frequency, but you may be able to find one that seems to be acceptably clear. After having listened on it for several seconds, make sure by **asking** "Is the frequency clear?"—even into apparently thin air. The answer may well be a deafening **"NO!"** from a local in QSO with a weak station you cannot even detect, but there will be no hard feelings so long as you ask before launching into your CQ call.



A hand through the tent flap gives fast beam rotation

VHF Contest Special

Calling CQ

Calling CQ in a contest implies that you are willing and able to sort out any resulting pile-up and generally take charge of the situation. In other words, you have a lot more to do than if you simply answer other people's calls. When you do call CQ, make it clear what you are doing, and also spell your callsign frequently. A reasonable pattern for a CQ call would be:

"CQ contest, CQ contest from Golf six Zulu Zulu Zulu, Golf six Zulu Zulu Zulu". It may be useful to add your QTH square, e.g. "calling from Zulu Lima square". Then repeat the whole call, though not more than about three times before listening for a reply. Do not use the "peacetime" UK calling frequency of 144·300MHz (s.s.b.) or the f.m. calling channel S20 (145·500MHz) for contest calls, and avoid any other special channels or frequencies listed in the relevant bandplans. On Sunday mornings stay clear of 144·250MHz and S21 (145·525MHz) while the GB2RS news service is on.

Sorting out a pile-up is far harder than being in one. You must not only identify the callsign of the station you want to work, and then take charge of the progress of the contact, but also try to convince the unsuccessful callers that it is worth their while to wait and call again. If you can identify some feature of a second callsign and ask that person to stand-by, he will almost always wait. The key to managing a pile-up is (guess what?) to put yourself in the place of your callers; and the only way to do that is to have had plenty of practice as a caller yourself.

Be Friendly

Contests **are** competitive, but they should also be fun, and a little courtesy and good humour go a long way to reduce the potential friction. Normally a good operator can well afford the time to greet callers and thank them for the contact, and you can always **sound** interested and pleased to work someone without actually expressing the fact in words. Even when the going gets really rough and there is no substitute for total efficiency, there is no need to be brusque. On the other hand it is equally impolite to force a busy contest operator into a long and chatty QSO: save that for after the contest. Outright rudeness is fortunately rare during v.h.f. contests, and usually means that a normally polite person is getting rattled because too many things are happening at once!

After the Contest

If you are entering the contest you will need to write out the logsheets, work out your scores and fill in the forms. At this stage you will appreciate the benefits of keeping a neat and legible log! Presumably you can read your own writing, but if you are going to be responsible for translating the writing of several operators it is worth checking during the contest to make sure you can read theirs too. Take care in transcribing the original logs onto the logsheets: one well-known station lost lots of points before someone dropped him the hint that perhaps his office typist wasn't the best person to decipher his logs! The important thing is that your entry will be judged on the basis of the logs you send in, not the QSOs you actually made: it's up to you to see that the two things are one and the same.

As well as putting yourself in other people's place during the contest, try putting yourself in the place of the adjudicator after the event. He will not expect 100 per cent accuracy, but when the information is checked letter by letter, number by number, most people do in fact achieve well over 99 per cent. Having all the logs at his disposal for cross-checking, the adjudicator can easily form an opinion on your general standard of accuracy: from experience I can tell you that a dud log stands out a mile and attracts very close and suspicious scrutiny! The adjudicator is also more likely to give the benefit of any doubts to an entry which is otherwise accurate, neat and easy to check.

Many hands make light work!

Scoring the contacts is simple in the case of the *PW* contest, and the rules on page 28 are self-explanatory. Most other European v.h.f./u.h.f. contests are scored on a points-for-distance basis, either straight points per kilometre or the simplified RSGB radial ring system. Increasingly these days people use computers to work out the distance and points; otherwise you have to use the special QTH map (often called a QRA map) which is available from the RSGB or *PW* advertisers. When scoring with the QTH map you need to use either a ruler or, for the radial ring system, a set of concentric 50km circles drawn on a transparent overlay centred on your own QTH.

Your final task is to fill in the declaration that you have abided by the rules and spirit of the contest, together with the other information requested. At this stage, **read the rules again** to make quite sure your entry is completely in order and that you are sending it to the right address. It makes no sense to waste hours of operating effort by missing out some vital detail when sending in the contest entry.

Final

Reading a magazine article on "contest operating" is no substitute for firing up the rig and **doing** it. So even if you have never tried a contest before, make a resolution now to have a go at the *PW* 144MHz QRP contest in June.

As I said at the outset, contest operating is a challenge, so don't expect to find it too easy at first, and don't be discouraged. There are very few natural-born good operators: the rest of us (myself included) have to **learn** the skill, and still occasionally make a mess of things! The important thing is to keep on practising and learning.

Good luck in the contest!

(1) M. W. Dixon G3PFR, *Where are you? Where am I? PW* Jan 1982. ●

VHF Contest Special

The VHF Contest Station

N.P. Taylor G4HLX

Radio amateurs must be second only to anglers in their desire to impress each other with their achievements. After a good v.h.f. opening, for example, the bands are full of locals exchanging boasts about distances worked, signal reports exchanged and so on. Few amateurs can have failed to sense this competitive spirit at one time or another, and for many it is the heart of their enjoyment of the hobby. There is no doubt that it is the will to beat others in some way that has spurred on many of the technical advances in radio.

All this rivalry comes together in a more organised fashion in a contest. Operating under a simple set of rules, participants can pit their station against others. They know that their position in the results table will be determined by the efficiency of their transmitting and receiving equipment, that of their antennna, the characteristics of the site from which they transmit, their operating skill, plus, it must be said, a little bit of luck.

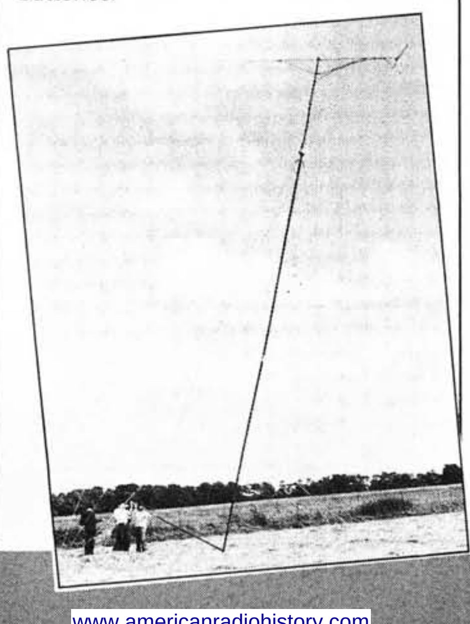
Entering a contest is a useful opportunity to check how well one's equipment performs; its shortcomings will very quickly become evident under the stringent conditions which usually prevail. Furthermore, the high level of activity provides a good chance to work unusually long distances or into rare locations, particularly because stations in these locations will often be operating from good, portable sites, improving signal strength in both directions. Setting up and operating a station from a portable location adds a new dimension to the hobby and can produce surprisingly long distance contacts on v.h.f. and u.h.f.

The requirements for success in a contest can be divided into two parts: the station itself and the operator. There is a certain degree of overlap, as the operator's ears and the grey matter in-between undoubtedly comprise the most important items of equipment in the station! The filtering, noise blanking and signal processing performed here can make a mediocre station good and a good station excellent. Real operating skill, including the important ability to listen effectively, can only be gained by experience, and a guide to getting started is included elsewhere in this issue.

A 24-hour contest really does mean burning the midnight oil

The Station

So we turn our attention to the requirements of the station itself in a contest, in particular on the v.h.f. and u.h.f. bands. As already hinted, these requirements are generally more exacting than in normal circumstances. For example, all the equipment will be expected to work continuously for an eight or twenty-four hour period, probably with a higher transmit/receive-time ratio than usual. If being used portable, operating in a climate often somewhat cooler and damper than the average shack! It will be expected to run at peak efficiency on a power supply very different to its usual domestic mains, with much poorer regulation if a generator is being used, or probably lower voltage if on batteries.



A large antenna has definite advantages but can require special techniques for erection

There are some specific areas of equipment performance of importance for v.h.f./u.h.f. contest use, so here we examine in turn the receiver, the transmitter and the antenna. The fact that a transceiver is more probably in use does not alter this logical breakdown into its receiving and transmitting functions.

For telephony contacts, single sideband (s.s.b.) is almost universally used. Whatever other pros and cons there may be, f.m. is unsuitable simply because of the bandwidth it occupies.

The Receiver

The receiver is probably the item of equipment which will show most signs of stress during a contest. At other times it is normally employed to listen to a sparsely populated band with few really strong signals. Under these conditions it may be able to pull in very weak signals. But contrast this with a typical situation in a contest: two local stations, each strength S9 + 40 on your receiver are operating 10kHz apart, and you are trying to hear a weak S3 signal (i.e. 76dB weaker, or 40 000 000 times lower in power, than the locals) who is sitting on a frequency between the two strong ones. In a quiet band there would be no problem at all in hearing the strength S3 signal, but now sensitivity is one of the least important aspects of the receiver performance, and far more relevant is its ability to cope with a crowded band full of very strong signals, while still being able to pull in the weaker ones.

Poor strong-signal handling, through cross- or inter-modulation or blocking, can be the result of deficiencies at a number of points in the receiver design. At v.h.f. the problem is usually associated with the front-end and first mixer, or impurity of local oscillator output (a problem more prevalent amongst receivers with digital synthesis oscillators). A Schottky-diode ring mixer, if properly designed, will generally out-perform a MOSFET or bipolar mixer in this respect.

Perhaps the easiest and most common way of seriously degrading a receiver's strong-signal performance is to fit a high gain pre-amp. There is little point in using such a device with most modern v.h.f. receivers, except perhaps at the mast-head to overcome feeder losses, if significant, but even then the gain should be limited to the minimum necessary to compensate for these losses. Excessive gain is bound to decrease the dynamic range of the system, by requiring a less strong signal to overload the mixer or subsequent stages. Remember that the signal-to-noise is not necessarily improved by a pre-amp just because it makes the "S"-meter move further. If a pre-amp really is regarded as essential, then in a contest it is equally essential that it can be quickly switched out of circuit when it gives problems.

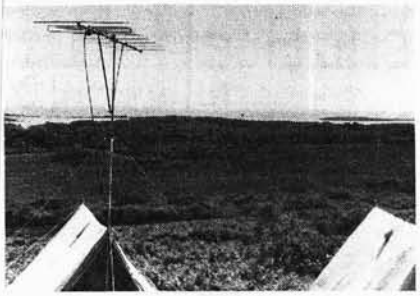
These receiver problems often manifest themselves by making signals sound excessively broad or distorted, which has sadly given rise to some bad feelings from time to time when unjustified complaints have been made to stations apparently radiating poor quality signals. Before making such a complaint it is essential to eliminate one's own receiver as a possible source of the problem. This is best done by heavily attenuating all signals (not just the offending one) entering the rig, and checking if the problem prevails. If not, or if it is reduced, the fault lies in the receiver.

The Transmitter

Whereas receiver problems in a contest are generally those of design, s.s.b. transmitter problems tend to be of adjustment. It is all too easy in the excitement of it all to turn everything up just a little too far. Even a properly adjusted transmitter, set up for normal speech levels at the start of the event, can misbehave when an enthusiastic operator starts shouting into the microphone (presumably to be better heard by the DX!).

The most frequent problem is overdriving of a stage of linear amplification, usually the output stage, with very non-linear results, leading to gross distortion, splattering and an excessively broad signal. Apart from the problems this causes stations trying to use adjacent frequencies, it represents a waste of output power and generally renders the signal less readable.

This splattering through over-driving comes about through two common mistakes. The first is using a linear amplifier separate from the main transceiver and driving it with too much power output from the transceiver. This is a particular risk



Even a simple station can do well from a good site, which doesn't have to be very high — the antenna just needs a clear take-off. Here this is achieved at only 45m a.s.l.

when several different people's equipment have been brought together to establish the contest station. In such cases it is essential to try out all the equipment together beforehand, as saying "your TX will probably give enough output to drive my linear" is not sufficient: it may also give too much. Reduce the output power of the driver until full output from the linear is only just achieved on the highest peaks.

The other common cause of splattering comes about through a mis-guided attempt to increase the mean output level. The mean level of a speech waveform is very much lower than the peak, so that most r.f. power output meters will register only about a quarter to half of the true p.e.p. output for an un-compressed s.s.b. signal. This leads some operators to turn up the microphone gain or drive controls, relying on the a.l.c. system (if there is one), or just simple overloading of the output stage, to provide some crude compression of the speech.

A far better approach is to keep the drive levels at all stages well below limiting, and use a separate speech processor, of the audio compression, or preferably, r.f. clipping type, to increase the mean output power for the same p.e.p. Even this can cause problems though: the increased mean output power is accompanied by increased power dissipated in the output stage which may be significantly greater than its design value. If cooling is insufficient there will be overheating, leading to the risk of damage and of non-linear behaviour, which takes us back to square one.

There is little doubt that it is high power transmitting stations which more frequently radiate poor quality, broad signals. In a low power station, the absence of any external linear amplifier is one less trouble spot, but nevertheless care must be taken to avoid excessive settings of mic. gain and drive controls. The advantages of some form of speech compression are particularly useful to the QRP station, provided that it is not excessive. In particular, audio distortion that results in high-frequency audio components reaching the modulator must be avoided.

In low power contests, such as the *Practical Wireless* 144MHz QRP Contest, there is a power output limit, requiring the control and measurement of output power of the transmitter. This is covered in the article *Power Measurement for QRP*.

The Antenna

The gain afforded by directional antennas is, of course, of great benefit to both the transmitting and receiving performance of the station. Apart from increasing signal strengths, the directivity is useful in attenuating unwanted strong signals off the sides of the beam. Most Yagi type beams have a number of lobes and nulls, and if one strong local signal is causing particular problems to the receiver it may be possible to effect a cure by carefully adjusting the rotator to place a strong null in the appropriate direction.

For a low-power station the gain of the antenna is particularly important, in order to obtain a high effective radiated power (e.r.p.). When operating within a

A caravan provides comfort for portable operation

power limit, 3 watts in the case of the *PW* contest, the variations between different stations' effective powers will be entirely due to gains and losses in the antenna and feeder system. For example, almost 50W e.r.p. can be achieved by 3W to an antenna system with 12dBd gain (including cable losses). Another station with identical equipment and antenna, but with a run of poor quality coaxial cable giving 3dB more loss, would only obtain 25W e.r.p.

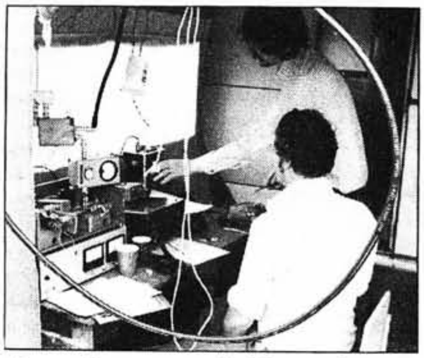
It is very easy to dismiss small losses here and there in the system as unimportant. But short-cuts like cheaper plugs and sockets, coaxial relays, feeder etc., can easily accumulate a significant loss, bearing in mind that every 3dB lost represents half of the e.r.p. and could make the difference between being heard by a DX station and not.

The penalty paid for the benefits of a high-gain antenna is that a very narrow beam width prevents one from hearing other signals active on or near the frequency in use, but from other directions. It is not unusual to call CQ for some time, before moving the beam a bit to discover that the lack of calls had been due to unwittingly sharing the frequency with another station. A further consequence is the possibility of missing a short-lived lift in conditions in another direction, which might have brought some contacts over great distances.

The ideal solution is to have a separate monitoring station just keeping an ear on the band in all directions. A more practical option which may be worth considering is to obtain the required gain by stacking several antennas, which reduces the beam width in the vertical plane, but not in the horizontal plane, thus maintaining a fairly broad main lobe.

The Site

For fixed home-based stations, the choice of site is unlikely to be something that can be easily varied, depending on one's priorities when house-hunting. Many of us find that



Even the most reliable equipment often seems to misbehave in a portable contest

our home location is somewhat less than ideal, and the sensible alternative is to take to the hills and "go portable". There is no doubt that the benefits of setting up the station on a good hill-top are considerable, and a band which sounds dead at home can be suddenly alive with DX activity from a good open site.

Portable operation can be a very rewarding activity, and can be very simply effected. Whereas high-power transmitters will require a source of power such as a generator, a low-power station, which can provide remarkable results from a good location, can be powered by several sets of re-chargeable cells or a 12V car battery.

In choosing a site for v.h.f./u.h.f. operation, height is the first thing that normally springs to mind. However it is probably more important that the "take-off" is clear in all important directions, i.e. that the ground falls away in the directions in which it is anticipated that most stations will be worked. These directions should be clear of obstructions, by way of other hills, buildings, or even trees, if these are higher than the antenna. By and large a spot with a "good view" is also a good v.h.f. site (although there are exceptions) and a map which shows these spots as tourist attractions, such as the more recent Ordnance Survey maps, can be a good starting point.

Having found a likely looking spot on the map, it is worth going to "try it out" before the contest, assuming that there is public access. A hand-held receiver capable of monitoring the strength of beacons and repeaters is a straightforward way of comparing several alternatives, provided the tests are all conducted under similar (preferably "flat") propagation conditions.

There are two more essential steps to using the site. The first is to obtain permission from the landowner to use the site, and to have access to and from it by any private roads or paths that may be involved. This is usually easy enough if you explain exactly what you are doing, and that you will leave the site clean and litter-free.

The final preparation is to check that no other amateurs are also planning to use the site or an adjacent one. Even a good receiver will not cope with another station a few hundred yards away further along the ridge or hill you have chosen! This means telling local amateurs what you plan to do and asking them if they are participating, and from where. A local club may be a good place to seek this information.

In Conclusion

Just some of the aspects which affect the likely performance of a station in a v.h.f. or u.h.f. contest have been covered here. There are many others. Those which are important in a particular case can only be found by trial. It must be emphasised that while room for improvement will be found in any station, even the simplest station can give good performance if well operated. Some contests have separate sections with restrictions on output power, number and height of antennas, etc., giving the simpler station a better chance, by competing against other stations of similar standard. Others, such as the *Practical Wireless* 144MHz QRP Contest, set a power output restriction for all contestants, giving everyone a chance to compete effectively without high power linear amplifiers and their attendant problems. ●

Power Measurement For QRP

C. L. Desborough G3NNG

The vast majority of v.h.f. operators do not have a method of r.f. power measurement at 144MHz (2m) and indeed, very seldom need to know their exact power output. Any power details required are taken from the "black box" specification.

Some amateurs possess a simple universal power/s.w.r. meter which, although excellent for s.w.r. checks at 144MHz, must be calibrated against known powers at that frequency before

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a scale may be established.

This short article describes an inexpensive method of setting and measuring a power level of 3 watts to conform with the *PW* QRP contest rules. If you already possess a precision "through line" power meter for 144MHz then all you need to do is correctly set your transceiver for 3 watts output.

A popular misconception by many amateurs attempting to reduce their output power, whether for QRP operating or driving the big linear, is that reducing the microphone gain reduces the p.e.p. output. This, unfortunately, does not follow.

Turning the "mic gain" down reduces the **mean** output power, but an oscilloscope will quickly verify that the **peaks** of power or p.e.p. remain the same. Thus, add a speech compressor, and the increased **mean** power takes you back to square 1, or shout a little more and your p.e.p. could be even higher!

However, all is not lost. Most, if not all, of the popular "black boxes" have a facility for an external a.l.c. voltage input. This a.l.c. voltage reduces the r.f. gain of the TX portion of the transceiver at a low level stage and is the only convenient method of controlling the p.e.p. output. Typical voltages for the a.l.c. are normally between −1·5V and −4·5V and may be supplied from either a dry battery or a separate low voltage power supply. Further details are given later.

Method of Measurement

The circuit shown in Fig. 1 is used as a peak reading voltmeter across a suitable 50Ω resistive load. Provided the voltmeter has a resistance of 10kΩ/V or more, then the ceramic

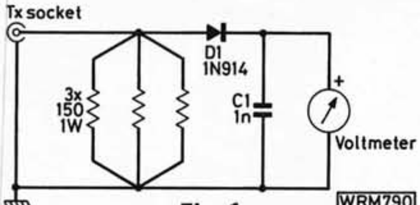


Fig. 1

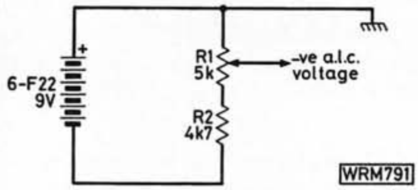


Fig. 2

reservoir capacitor C1 will remain charged to the peak rectified voltage across the load.

The load consists of three 1 watt resistors (not wirewound) in parallel, with a minimum of lead length (10mm or less) per resistor. These may be suitably mounted on a coaxial socket and connected by a length of coaxial cable to the transceiver, or directly into the antenna socket.

The diode D1 and the capacitor C1 should also have a minimum lead length. The leads to the voltmeter may be any convenient length as only d.c. is carried.

To calculate the voltmeter reading for 3W output:

Power (P) $= \frac{V^2}{R}$ where V is the r.m.s. value of voltage across the load of R ohms.

The peak voltage $(V_p) = V\sqrt{2}$

Hence,

$$P = \frac{V_p^2}{2R} \text{ or } V_p = \sqrt{2PR}$$

For P = 3 watts and R = 50Ω

$V_p = 17{\cdot}3V$

Approximately 0·6V will be dropped across the diode and hence the meter should read 16·7V at the 3 watt output level.

Setting the 3W Power Level

First check that the equipment you have has the a.l.c. facility and that a negative voltage is required.

The circuit shown in Fig. 2 should be constructed using any 9V battery such as 6-F22 (PP3), 6-F50-2 (PP6) etc. If a fixed voltage power unit is used—check that the output terminals are floating and either terminal may be grounded, it is not easy to develop 9V across a dead short!

Connect the +ve terminal to the transceiver chassis and the slider of the variable resistance to the a.l.c. input. Add the circuit of Fig. 1 to the antenna socket and a voltmeter on the 25V range across C1. Note: an adequate voltmeter having 20V full scale deflection may be made using a 100μA meter with two series 100kΩ resistors.

Select "transmit" in the s.s.b. mode and whistle into the microphone. Note: check the note of your whistle is between 500Hz and 2kHz to keep within the filter passband! Increase the microphone gain (if this control is available on the front panel) until any further increase does not increase the output voltage on the meter. This prevents limiting.

Adjust the a.l.c. voltage to give a meter reading of not greater than 16·7V and you are ready to go for the QRP contest.

A typical value of a.l.c. is −2·9V for 3 watts output from the FT-221R. ●

PW 144MHz QRP Contest - RULES

19 June 1983
0800 — 1600 GMT
Please note the revised times

This event has been introduced to provide a v.h.f. contest with the challenge of genuine QRP operation. The 3 watts p.e.p. output limit has been chosen to simplify operation by users of low-power transceivers, such as the FT-290R, C58, IC202 etc. The scoring system is particularly simple, as is the contest exchange, and we hope the contest will appeal to newcomers and experienced alike.

A trophy will be presented to the overall winner, with certificates going to the runner-up and to leading stations in a number of other categories (e.g. leading single-operator station) at the discretion of the adjudicators.

Full results will be published in a future issue of *Practical Wireless*, together with details of the leading stations, including some photographs.

Rules

(1) General: The contest is open to all licensed UK radio amateurs, fixed stations or portable, using s.s.b., c.w. or f.m. in the 144MHz (2m) band. Entries may be from individuals or from

VHF Contest Special

groups, clubs, etc. The duration will be from 0800 to 1600GMT on 19 June 1983.

(2) Contacts: Contacts will consist of the exchange of the following minimum information:

(i) callsigns of both stations
(ii) signal report, standard RS(T) system
(iii) serial number: a 3-digit number incremented by one for each contact, starting at 001 for the first
(iv) QTH locator

Information must be sent to, and received from, each station individually, and contact may not be established with more than one station at a time.

If a non-competing station is worked and is unable to send his QTH locator, his location may be logged instead. However, for a QTH square to count as a multiplier (see rule 4), the full 5-figure locator must have been received in at least one contact with a station in the square.

Contacts via repeaters or satellites are not permitted.

(3) Power: The output power of the transmitter final stage shall not exceed 3 watts p.e.p. If the equipment in use is usually capable of higher power, the power shall be reduced and measured by satisfactory methods (see page 27 for some recommendations).

(4) Scoring: Each contact will score one point. The total number of points gained in the eight-hour period will then be multiplied by the number of different QTH squares in which contacts were made (a "square" here is the area defined by the first two letters of a QTH locator).

Example: 52 stations worked in AK, ZK, ZL, ZM and YL squares; final score = 5 × 52 = 260.

Only one contact with a given station will count as a scoring contact, even if it has changed its location, e.g. gone /M or /P. If a duplicate contact is inadvertently made, it must be clearly marked as such in the log.

(5) Logs: The log submitted as an entry must be clearly written on **one side only** of A4 sized paper ruled into columns showing:

(i) time GMT
(ii) callsign of station worked
(iii) report and serial number sent
(iv) report and serial number received
(v) QTH locator received (or location)

Underline or highlight the first (or any **one**) contact in each of the QTH squares worked.

At the top of each sheet, write:

(a) date
(b) callsign
(c) your QTH locator as sent
(d) sheet number and total number of sheets (e.g. sheet No. 3 of 5)

At the foot of each sheet write the number of scoring contacts on that sheet.

(6) Entries: Accompanying each entry must be a separate sheet of A4 sized paper bearing the following information.

(a) name of entrant (or of club etc. in a group entry)
(b) callsign used during contest (including any suffix)
(c) name and address for correspondence
(d) location of station during contest
(e) QTH locator **as sent**
(f) whether single- or multi-operator (where a single-operator is an individual who received no assistance from any person in operating the station, which is either his permanent home station or a portable station established solely by him/her); if multi-operator, include a list of operators' names and callsigns
(g) total number of contacts and QTH squares worked
(h) list of the QTH squares worked
(i) a full description of the equipment used including TX p.e.p. output power
(j) if the transmitter is capable of more than 3W p.e.p. output, a description of the methods used (i) to reduce and (ii) to measure the output power
(k) antenna used and approximate station height a.s.l.

Failure to supply the previous information may lead to disqualification. Any other general comments about the station, the contest and conditions during it are welcome, as are photographs of the station (but please note that these cannot be returned).

The following declaration must then be written and **signed by the entrant** (by one responsible person in the case of a group entry): "I confirm that the station was operated within the rules and spirit of the event, and that the above information is correct".

This declaration concludes the entry, which should be sent, with the log sheets, to: Practical Wireless Contest, c/o Dr. N. P. Taylor G4HLX, 87 Hunters Field, Stanford in the Vale, Faringdon, Oxon SN7 8ND.

Entries must be postmarked no later than 27 June 1983.

(7) Adjudication: Points will be deducted for errors in information sent or received as shown by the logs. Unmarked duplicate contacts will carry a heavy points penalty. A breach of these rules may lead to disqualification. In the case of any dispute, the decision of the adjudicators will be final.

Practical Wireless

144MHz QRP Contest

This is to certify that

....

was placed......in the results of the above contest

EDITOR, Practical Wireless

Uncle Ed

FREQUENCY MEASUREMENT—1

Almost every new radio receiver or transceiver nowadays has digital readout of frequency, rather than just the traditional analogue dial with scale and pointer. Some of these readouts are driven from the frequency setting mechanism—often a synthesiser—so that they indicate the frequency called up by the operator, rather than the frequency that the set is actually operating on. If the set is working properly, these will be the same of course, but if something goes wrong, it may not be transmitting or receiving on the frequency it says it is!

Sets that indicate what frequency they are actually operating on all incorporate some sort of digital frequency meter. You can add one of these to any superhet or direct conversion receiver, in other words one which uses an oscillator in its conversion process, but not to a "straight" t.r.f. receiver with diode envelope detection of a.m. signals. Be warned though, it's not very straightforward on some multiple-conversion receivers with variable i.f.s. For example those based on the Wadley Loop principle (Lowe SRX30, Yaesu FRG-7, etc) where, as the receiver tunes from, say, 28 to 29MHz, the v.f.o. goes from 3·455 to 2·455MHz. Rather more crafty circuitry is required here for a digital readout.

Before looking at the problems of digital frequency readout from a superhet receiver, I think it will help if I explain something of the way in which digital frequency meters (d.f.m.s) in general work.

Measurement of anything involves comparing the item to be measured with a known standard. You could find out how wide this column of print is by laying a ruler across it with the zero mark at one edge, then reading off what mark on the ruler scale lies over (or nearest to) the other edge. You could measure frequency by comparing the unknown with a signal from a variable frequency oscillator (v.f.o.), adjusting the v.f.o. until their frequencies are the same and then reading off the dial of the v.f.o. That's not very helpful if we want digital readout though.

Digital instruments basically count events, and this should give us a clue as to how we can go about measuring frequency. Imagine you're on a long boring train journey and decide to pass the time counting the ¼-mile posts along the side of the track; how many you pass in, say, five minutes timed against the stopwatch function on that nice new watch you got for Christmas. To keep the figures simple, let's say you count 20 posts. That means 4 posts per minute, which is 1 mile per minute and therefore 60 m.p.h. To arrive at an indication of speed, we actually measured frequency — so many events per unit of time — and the two essentials were a way of counting the events (your eyes and brain) and a way of setting the reference time period (the stopwatch).

Digital frequency meters work in just that way. The signal whose frequency we want to measure passes through a switch (called a **gate**) to a counter. The gate is controlled from an accurate time reference (usually based on a quartz crystal oscillator) so that it allows the signal to pass for perhaps 1 second (see Fig. 1). When the second is up, the number registered by the counter is displayed on the digital readout. The counter is registering cycles per second, which is the same as frequency in hertz (Hz). And *that's all there is to it!*

Well, almost. Like most things, there are a few extras or variations. Unless you want the digital readout to be a blur of changing figures during each counting period, you need to find some way of holding the previous count. This is done by putting a latch between the counter and the readout. The number held in the latch is updated at the end of each count.

A 1 second gate time gives 1Hz **resolution** (that just means that the display changes in 1Hz steps), so that the right-hand digit indicates "hertz", the next one to its left "tens of hertz", and so on. That right-hand digit is called the **least significant digit** (l.s.d. for short) because it's the smallest step, and a change there has least significance. The furthest left-hand digit of the display is the **most significant digit** (m.s.d.) because a change there has the most significance.

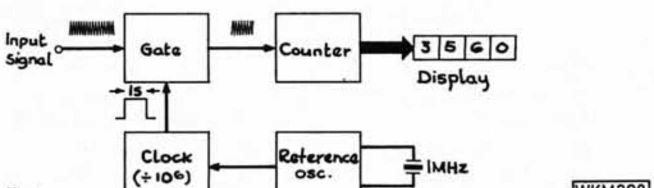


Fig1.

WKM208

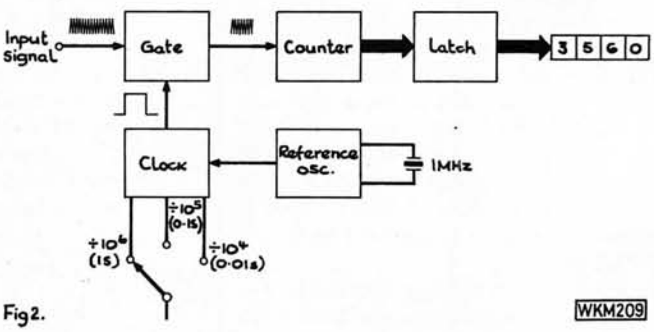


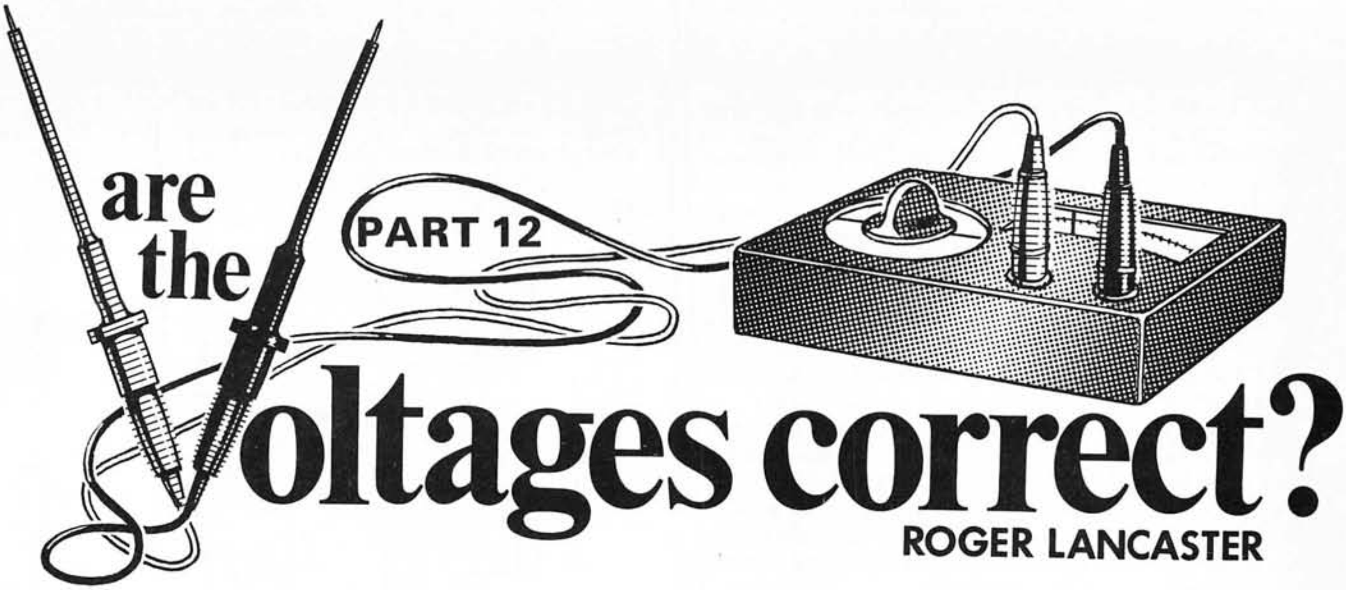
Fig2.

WKM209

If you are using the frequency meter to adjust a v.f.o. or tune a receiver onto a given frequency, then a 1 second gate time is generally too long. You have to adjust the tuning, wait for the next complete 1 second counting cycle to be completed to see how near you've got, adjust the tuning again and so on. A pretty tedious process when you may not need that 1Hz resolution anyway. In receivers, 100Hz resolution is commonly used, which requires a gate time of one hundredth of a second, so that the digital readout follows changes of tuning instantly for all practical purposes.

In general-purpose frequency meters, it's useful to have the choice of fast reading or high resolution, and several gate times are often provided. A more versatile frequency meter, incorporating a display latch and a choice of gate times, is shown in block diagram form in Fig. 2.

I shall be coming back to the question of resolution, and of accuracy (not the same thing) later on, but next month I'll look at receiver readouts.



are the Voltages correct?

PART 12

ROGER LANCASTER

Solutions to last month's problems: The circuits are reproduced here in Figs. 12.1, 12.2 and 12.3.

No. 1: You were asked to calculate the d.c. potentials at the "+" and "−" inputs and the value of V_O if the following d.c. inputs were applied to the circuits of (a) Fig. 12.1 and (b) Fig. 12.2:

(i) +100mV
(ii) −500mV
(iii) −2V

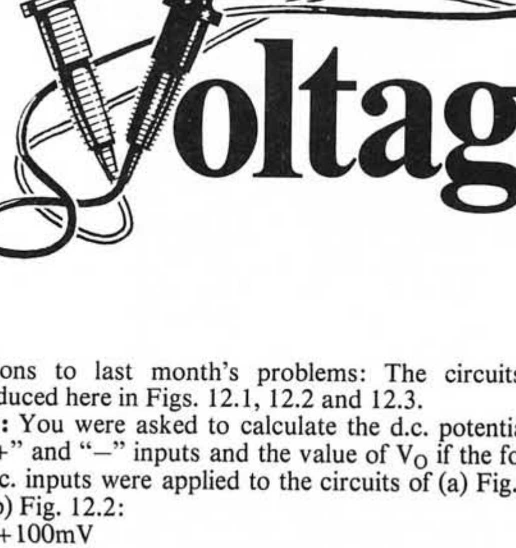


Fig. 12.1

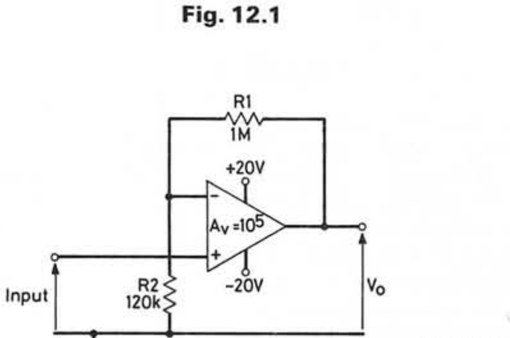


Fig. 12.2

(a) "+" and "−" inputs will both be **0V** for all values of input, since "+" is earthed and there is virtually no measurable difference between the two inputs. Gain is given by

$$\frac{-R1}{R2} = \frac{-1000k\Omega}{50k\Omega} = -20 \text{ so:}$$

(i) $V_O = (-20) \times 100 = -2000\text{mV} = \mathbf{-2V}$
(ii) $V_O = (-20) \times (-500) = +10\,000\text{mV} = \mathbf{+10V}$
(iii) $V_O = (-20) \times (-2) = +40\text{V}$, but this would be above the upper limit, so V_O will be limited to about **+11V**.

(b) "+" and "−" inputs will both be equal to the input voltage since this is applied direct to "+".

$$\text{Gain} = 1 + \frac{1000k\Omega}{120k\Omega} = 1 + 8{\cdot}3 = 9{\cdot}3$$

(i) $V_O = 9{\cdot}3 \times 100 = 930\text{mV} = \mathbf{0{\cdot}93V}$
(ii) $V_O = 9{\cdot}3 \times (-500) = -4650\text{mV} = \mathbf{-4{\cdot}65V}$
(iii) $V_O = 9{\cdot}3 \times (-2) = \mathbf{-18{\cdot}6V}$. (This should be just within the limit of the −20V supply.)

No. 2: You were asked to determine the d.c. potentials on the following pins of the i.c. holder if the i.c. was removed from the circuit of Fig. 12.3:

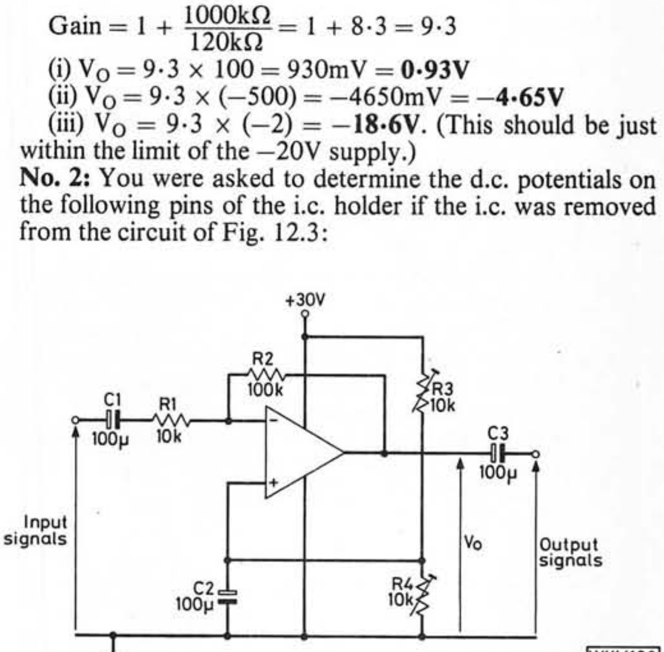


Fig. 12.3

"+" input, "−" input, V+, V−, V_O.

The "+" is at the junction of equal resistors R3 and R4 across +30V, so this potential will be **+15V.**

Having no resistive connection with any d.c. supply "−" will measure **0V** ("floating"). This is like connecting only one of the meter leads to the circuit.

V+ = **+30V** (direct connection).
V− = **0V** (earthed).
V_O = **0V** (no resistive connection to any d.c. supply).

The op. amp. voltages described in Part 11 refer to the "normal" bipolar transistor based i.c.s; c.m.o.s. op. amps. (based on f.e.t.s) differ in the range of supply and output voltages possible, also the input biasing arrangements for these are much less critical.

Digital ICs

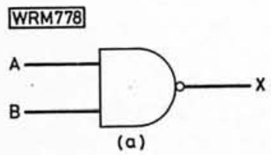
While digital (or logic) circuits have more applications in computers and allied equipment, they do also have a place in radio. Basic logic gates are used in control (switching) circuits and flip-flops are used in the counting circuits of frequency displays.

Over the years, the circuit symbols for logic devices have changed almost as frequently as the products of the Paris fashion houses, so don't be surprised if you find symbols different to those in this article. The symbols used will depend upon the age and source of the circuit.

Two logic voltage levels are used. These are logic *0*, usually 0V, and logic *1*, usually 5V. Inputs and outputs of digital i.c.s are therefore either at logic *0* or logic *1*, usually abbreviated to simply *0* or *1*. The notation is used in "truth tables", a very concise and convenient way of describing the complete operation of a logic device.

Basic Gates

Fig. 12.4(a) shows the simplest form of the most common of the basic gates, the NAND gate, and Fig. 12.4(b) is its truth table. The two inputs are A and B and the output X.



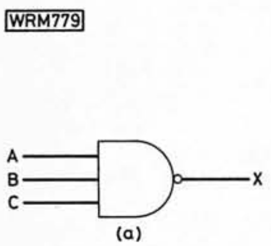
A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

(b)

Fig. 12.4

The operation of the NAND gate could be described in words as follows: output X is at logic *0* (0V) only when inputs A and B are **both** at logic *1* (+5V). The truth table tells us the same thing in a different form: the rows of the truth table make up a "full perm" of all the possible combinations of inputs together with the resulting output.

A NAND gate can have any number of inputs but only one output. A three-input NAND gate is shown in Fig. 12.5(a) and its truth table in Fig. 12.5(b).



A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

(b)

Fig. 12.5

The word description of the NAND gate is probably simpler than the truth table, but in more complex devices and combinations of devices wordy descriptions can be very cumbersome and difficult to understand, then the truth table really comes into its own.

Several gates can be contained in a simple 14-pin i.c. package, as shown in Fig. 12.6. Here, four 2-input NAND gates, using three pins each, utilise 12 of the pins—there must always be two pins reserved for the combined power supply (one at +5V, the other earthed at 0V). The same kind of package could hold three 3-input gates (four pins each), or two 4-input or 5-input gates or one gate with up to 11 inputs.

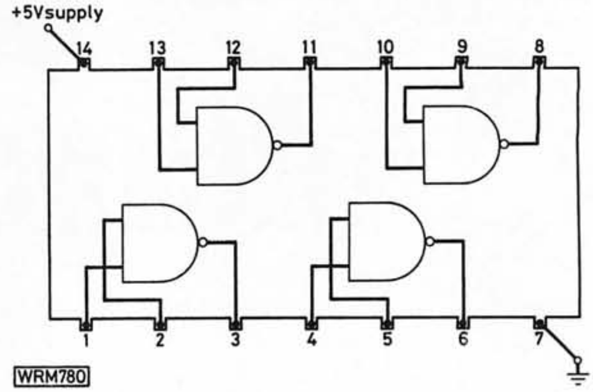
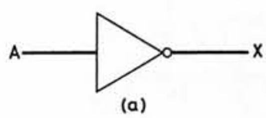


Fig. 12.6

When checking the voltages, don't forget the power supply (+5V) first. Input and output pins should show either *0* or *1* (nominally 0V or +5V) **if conditions are static,** but these are unlikely to measure exactly. Logic *1* can be any voltage between +2V and +5V and the device will still work, logic *0* can be anything between 0V and +0·8V. Typical readings are **+3·2V** for logic *1* and **+0·05V** for logic *0*.



A	X
1	0
0	1

(b)

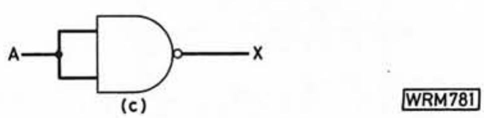
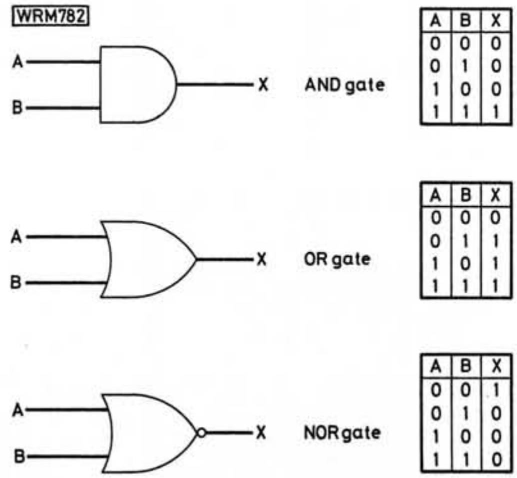


Fig. 12.7

One possibly surprising fact is that whenever an input is "floating"—not connected to anything—it usually assumes a logic *1* condition (due to the internal circuit of the gate) and the gate behaves accordingly. If you try to measure the voltage on such a pin, of course, it will no longer be floating (due to the meter resistance) and the meter will probably indicate a voltage in the "grey area" between the logic states—typically **+1·6V**, even when an electronic voltmeter is used—but the gate will usually still function as if there were a logic *1* on the pin. Gates should never be used in a circuit with floating inputs, however, because it is so easy for stray voltages to be induced onto the input and for this to upset the circuit action. To ensure logic *0* on an input, that input should be **earthed** and to ensure logic *1* it should be **returned to +5V.**

Another common gate is the NOT gate, or inverter, shown in Fig. 12.7(a) together with its truth table in Fig. 12.7(b). A NAND gate can be connected so as to behave like a NOT gate and this is shown in Fig. 12.7(c). The output is simply the logic opposite of the input.

Inputs and outputs of gates in circuits under running conditions are sometimes rectangular **waveforms** which alternate between *0* and *1*, in which case a meter would read the average voltage over a period of time. A method of calculating this was described in Part 7, but this is unlikely to be of any help in determining whether a gate is faulty or not. You would need a double-beam oscilloscope to verify that the gate was obeying its truth table **at every instant** under such operating conditions. If this is not available, you might be able to stop the circuit action and **impose** the various logic states and measure the resulting outputs to verify that the gate is obeying its truth table. If this is not possible, the i.c. will have to be removed and tested by applying power supply and input levels and checking the outputs which result. A 4·5V battery is sufficient for power supply and logic 1 inputs for testing purposes.



A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

A	B	X
0	0	0
0	1	1
1	0	1
1	1	1

A	B	X
0	0	1
0	1	0
1	0	0
1	1	0

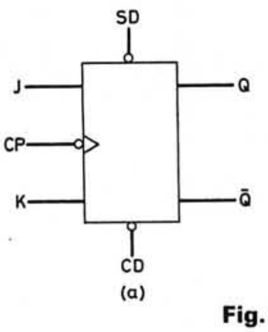
Fig. 12.8

Gates can be faulty in different ways. The only criterion is: if it obeys its truth table it is OK, if not it is faulty.

Some other gates with their truth tables are shown in Fig. 12.8.

The J-K Master-Slave Flip-Flop

The symbol for this common counting circuit element is shown in Fig. 12.9(a) and its truth table in Fig. 12.9(b). Q and $\overline{Q}$ are the two outputs, $\overline{Q}$ being read as "NOT Q" and **$\overline{Q}$ is the logic opposite of Q at all times.** J, K and CP are the essential inputs, SD and CD being "optional extra" inputs.



J	K	Q after CP
0	0	no change
0	1	0
1	0	1
1	1	change

(b)

Fig. 12.9

The J-K is a clocked device. Nothing changes at Q or $\overline{Q}$ until a clock pulse has been effective at the CP input. In this "normal" type of J-K, this constitutes the CP input changing from *1* to *0*. See Fig. 12.10: the Q outputs can only change at times indicated by X. Just how Q will change at times X depends upon the prevailing states of J and K immediately **prior** to time X, and this is what the truth table shows:

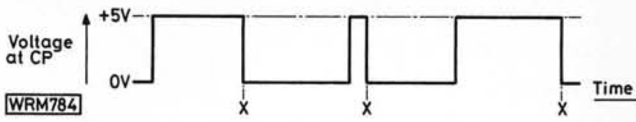


Fig. 12.10

Row 1: When J = K = 0, Q does not change, even after a clock pulse, e.g. if Q was *1* before time X it will remain *1* after time X.

Row 2: When J = 0 and K = 1, Q will become *0* after a clock pulse, whatever it was before the clock pulse.

Row 3: When J = 1 and K = 0, Q will become *1* after a clock pulse, whatever it was before the clock pulse.

Row 4: When J = K = 1, Q will change state after a clock pulse, i.e. if Q was *1* before time X it will become *0* after time X and if it was *0* before time X it will become *1* after time X.

Often, J and K are held at permanent logic *1*, in which case a series of clock pulses produces a waveform at Q as shown in Fig. 12.11, i.e. at **half** the frequency of the clock pulses. In other words, one cycle of Q output indicates that two cycles of CP have been "counted".

If the Q output is connected to the CP of a second J-K, one cycle of Q output from the second J-K will indicate a "count" of **four** original CP input cycles. The Q output of a third such J-K would "count" eight original clock pulses and a fourth J-K would "count" sixteen. Such an arrangement of four J-Ks can be modified to "count" **ten** original clock pulses and this circuit then becomes a **decade counter.** A decade counter is often built on a single chip.

A string of decade counters connected in series is therefore useful in frequency displays, a squared version of the frequency to be indicated forming the original clock pulses. The output from the first decade counter will pulse tens of hertz, the output from the second decade counter hundreds of hertz, and so on.

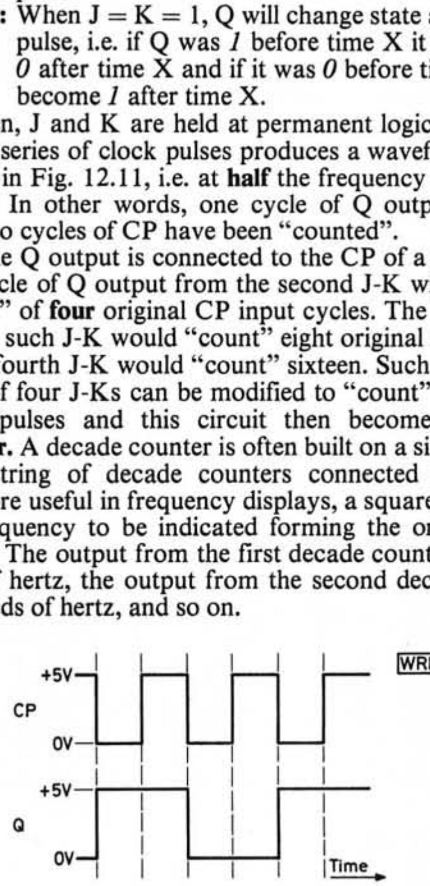


Fig. 12.11

If available, SD and CD are held at logic *1* for normal operation, being earthed (logic *0*) only when it is desired to override the J, K and CP inputs. If SD becomes *0*, Q becomes *1* **immediately** (without waiting for a clock pulse) and if CD becomes *0*, Q becomes *0* **immediately**. SD stands for "set direct" and CD for "clear direct". If both SD and CD are made *0* simultaneously, the Q output is indeterminate (could be *0* or *1*) and the circuit design should make this combination of inputs impossible to occur. It is common practice for all CDs in a counter to be momentarily earthed at the start of every counting sequence to ensure that the counter always starts from an overall count of zero.

continued on page 65▶▶▶

Versatile HF Bands Antenna

Most qualified radio amateurs and experienced s.w.l.s will endorse the opinion that the antenna is the most important component in a successful radio station, the operator can spend hundreds of pounds on a receiver or transmitter, but without an efficient antenna its performance is going to be grossly impaired.

G2DYM Aerials, the antenna specialists, based in Tiverton in Devon, have for many years advocated the use of symmetrical dipoles fed by 75 ohm twin feeder, to effectively remove the effects of direct radiation (reduced energy transference) and reverse TVI, usually incurred by using unbalanced coaxially-fed systems.

For the discerning amateur or s.w.l., G2DYM's "Ultimate" Anti-TVI Trap Dipole utilises eight traps in pairs, resonant at 28, 21, 14 and 7MHz (10, 15, 20 and 40m) respectively, and by the addition of outer tails for 3·5MHz (80m) "perfect dipole" operation is achieved on each band, together with an option of using the array in a Marconi "T" configuration for top band.

Using a suitable a.t.u. (G2DYM recommends, and can supply, the S.E.M. Z-match a.t.u.) the antenna will also tune-up on the three new WARC bands 10, 18 and 24MHz (30, 17 and 12m).

Several installation configurations are suitable for the antenna, which include: straight line, which takes up 30·5m of horizontal space; inverted "V" taking up between 22·5 and 27·5m across the base and in an equally-folded configuration for installing in the loft or attic.

With a 1kW rating, the "Ultimate" antenna will easily cope with the permitted UK r.f. power level, costs £105 (which includes carriage) and is supplied complete with insulators and 22·5m of 75 ohm balanced twin feeder.

For further details, contact: *G2DYM Aerials, Uplowman, Tiverton, Devon. Tel: 03986-215.*

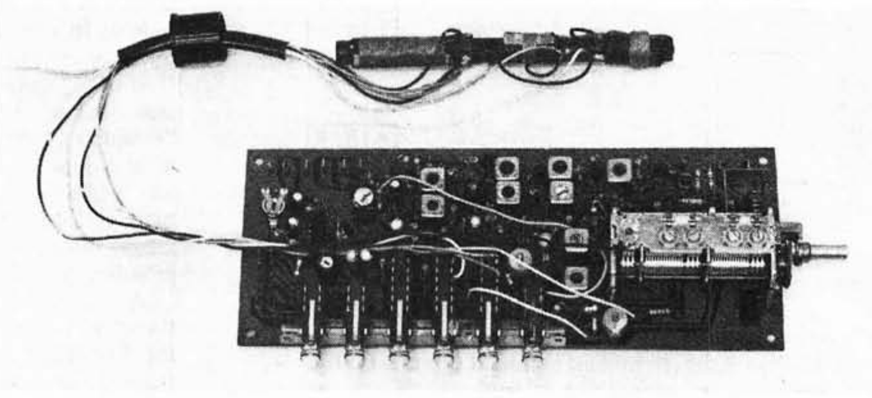
FM4 Tuner

As the starting point to constructing a budget price audio system, readers may like to consider a low-cost a.m./f.m. stereo tuner board from Isherwood Electronics.

Called the FM4 tuner, the unit features interlocked pushbutton switches, mounted on the p.c.b., to select gram. and tape inputs in addition to l.w./m.w./v.h.f. and v.h.f.—a.f.c.

Audio output is in stereo and the tuning is by conventional rotary multi-gang capacitor. Terminals are provided for all off-board connections, including an optional stereo beacon l.e.d., f.m. antenna and 12V d.c. supply. Also supplied is a ready connected ferrite rod antenna for l.w./m.w.

Priced at only £9.95 (includes VAT and p&p), the FM4 provides the tuning, central switching and pre-amplifier for a budget price audio system, and is available, brand new and boxed, from: *Isherwood Electronics, Hozier Street, Blackburn, Lancs. Tel: (0254) 57616.*



VHF/UHF/SHF Low-loss Feeder

I have recently received information on the availability of a low-cost 50Ω low-loss coaxial cable.

Called H100, it is manufactured by Popes in Holland, a member of the Philips group, possibly with the 934MHz CB service in mind, but as the specification sheet says, "Due to its very low attenuation, H100 offers possibilities not only for CB but also for amateurs using the higher frequencies up to 1296MHz."

The cable is similar to UR67 in size, but with about half the inherent loss figure. It is also suitable for termination using standard u.h.f. or N-type connectors.

Priced at only 80p per metre (VAT included) and carriage 5p per metre, with a 20 per cent discount for lengths over 100m, the cable, or further information, is available from: *W. H. Westlake G8MWW, West Park, Clawton, Holsworthy, North Devon, EX22 6QN. Tel: (0409) 253758.*

Soldering Kit

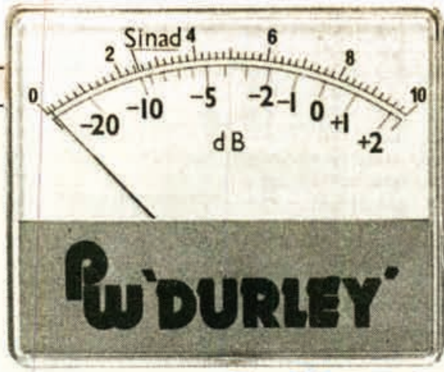
If you are setting-up a workshop or thinking of replacing that "workhorse" of the electronic constructor's bench—the soldering iron—you will probably be interested in a soldering kit, recently introduced by Litesold.

Called the SK18 kit, it is a complete soldering/desoldering kit that is centred around a high efficiency 18 watt mains iron, constructed to the latest electrical standards, and fitted with a 3·2mm copper bit. There are also two alternative bits included, of 1·6 and 2·4mm.

The kit also includes a reel of 3m long 18 s.w.g. flux-cored solder, stainless steel tweezers, three double-ended soldering aids and a reel of desoldering braid.

Supplied in a clear pvc wallet, the SK18 kit is available direct from Litesold at a special mail order price of £14.55, which includes p&p and VAT.

Light Soldering Developments Ltd., 97/99 Gloucester Road, Croydon, Surrey CR0 2DN. Tel: 01-689 0574.



by E.A.RULE

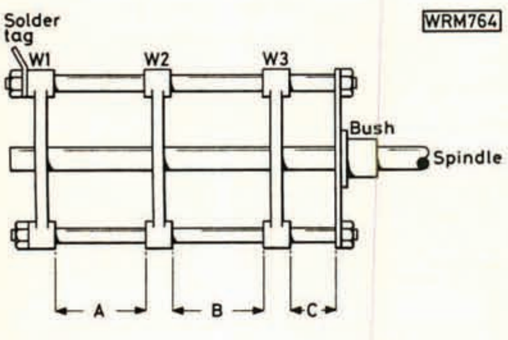
Part 3

Distortion and SINAD Meter

Constructional details having formed Part 2 of this article, Part 3 concludes the construction of the instrument and provides full setting-up instructions, together with some general uses

Set the SINAD/IHFM meter controls as follows: LOAD to EXT, VOLTS range switch S5 to 100. Selector switch S2 to VOLTS; FREQUENCY range switch S3 to 500–2000Hz, "%" distortion level switch to 100. SET level control fully anticlockwise. FREQUENCY and PHASE controls, C, F and VF to centre position (12 o'clock) and FILTER to OUT.

Switch on the instrument and check that voltages around the circuit are correct. The mains ON, VOLTS and FILTER OUT l.e.d.s should be illuminated at this stage. The meter may flick over its scale when switching on but should now be reading less than 5 per cent of full scale. Connect the signal generator to the input socket and feed in a calibrated 10V signal **at 1kHz.** Switch the meter to its 10V range and adjust R52 for full-scale deflection, i.e. 10 or 100 per cent on meter scale. (Note if 10V is not available from your generator a signal level of 1V may be used with the meter also set to its 1V range.) Switch the meter to its 100V range (or 10V): it should fall to 10 per cent of full scale, i.e. be reading the same voltage on the higher range. Reduce the input voltage level to 100μV and switch the meter to its 0·1mV range. Adjust R59 for full-scale deflection.



SWITCH	SPACING mm			WAFER TYPE		
	A	B	C	W1	W2	W3
S3	16	16	8	2P6W	Dummy	2P6W
S2	4	4	8	4P3W	Screen	4P3W
S5	4	4	8	1P12W	Screen	1P12W

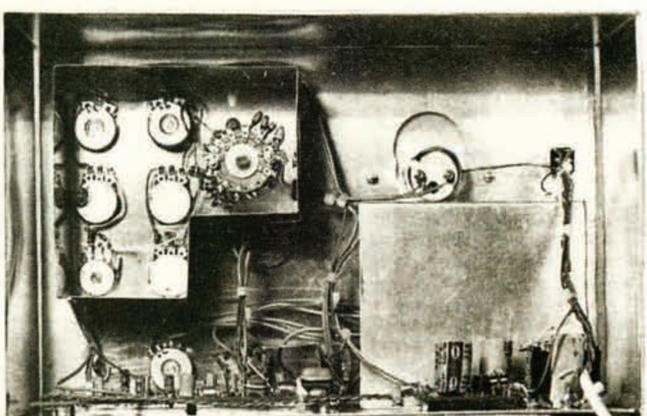
Fig. 3.1: Assembly spacing details of the multi-pole wafer switches

Next, switch the meter range back to its 10V position (or 1V) and reset the input signal to the same level. The meter should be reading full-scale deflection again. Switch the FILTER to IN (the l.e.d. indicator should also change over), adjust R55 for full-scale deflection. Switching the FILTER to IN or OUT should now leave the meter reading the same in both positions. Switch the FILTER to OUT.

Now set the voltage range switch to its 1mV range and adjust the generator output level to give a convenient reading on the meter. Swing the signal generator over the frequency range 15Hz to 100kHz while maintaining a constant signal level. The meter should also show a level response over this range of frequencies. It may show variations and these could be due either to variations in the actual input signal or to the meter itself. Unless you are certain of your signal generator regarding its accuracy or output **do not perform the following adjustments.**

Assuming your generator is above suspicion, any variation in the high-frequency response of the *PW* Durley can be corrected by adjusting the values of C35 and/or C26. Unless you are sure of your generator, simply note the actual variations that are taking place. For example, if the response is 2dB down at 100kHz this should be noted and used as your reference output from the generator during the next part of the setting-up procedure. In other words, when setting-up the meter for a "flat" frequency response you must remember that your signal generator is 2dB down (in our example) and allow for this.

Switch the *PW* Durley to its 10mV range and inject a signal at 1kHz to give a suitable reference reading on the meter scale (say 0dB); any reading can be used providing it is used for all the following setting-up operations as your 0dB reference point. Switch the generator to 100kHz and adjust the value of C23 (which consists of two insulated



An internal view of the author's prototype with internal screens in position

wires approximately 35mm long twisted together) until the meter indicates your 0dB reference point. Note: hand capacitance effects will be noticed while adjusting this. Re-check at 1kHz. Switch the *PW* Durley to its 100mV range and re-adjust the generator output at 1kHz until your 0dB reference point is indicated. Switch the generator to 100kHz and adjust C24 until the meter indicates your 0dB point. It may in some cases be necessary to change the value of C25 to bring the trimmer capacitor into its range. Re-check at 1kHz. Switch to the 1V range and adjust the generator output until your 0dB point is again indicated. Switch to 100kHz and adjust the position of the piece of wire soldered to tag 5 (S5a) relative to C22 (0·1μF), see Fig. 3.4. The spacing between these two items makes up the capacitor Cx shown on the circuit. Only a fraction of a picofarad is required for correction and care is needed.

Switch off the meter and fit the attenuator screen. Switch the meter on again and re-check the frequency response as before. Further slight adjustments may be required due to the extra capacitance of the screen affecting the wiring.

The setting-up of the voltmeter section is now complete. The "A" weighting filter response can be checked out and compared with that shown in Fig. 2.4, apart from possible faulty components no problems should be found.

Bridge Section Setting-up

Switch the selector switch S2 to SET. Inject a 1kHz signal at a level of 5V and then adjust the SET level control for full-scale deflection (the input level may need adjustment if f.s.d. is not reached, or the "%" range can be changed to 10 per cent). Try to keep the SET level control at or near its maximum (fully clockwise) position. Next, switch the selector to "%". Adjust both the FREQUENCY and PHASE controls C, F and VF in that order for maximum

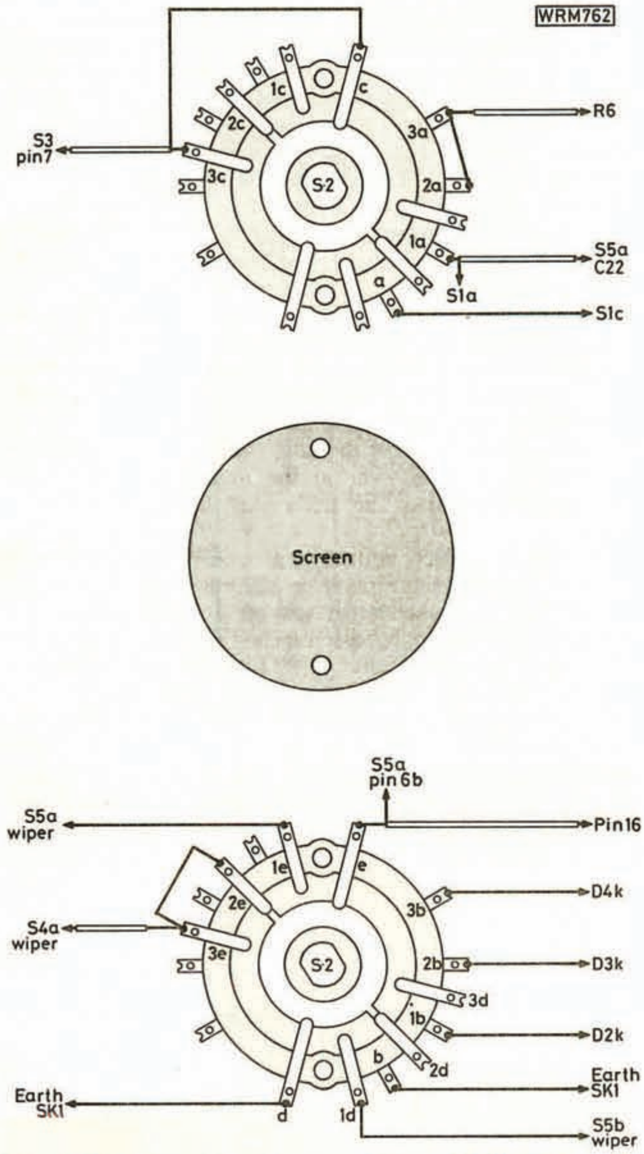


Fig. 3.2: Layout and connection details of wafer switch S2 (rear view). All three wafer switches are based on RS Components 327–894 mechanisms

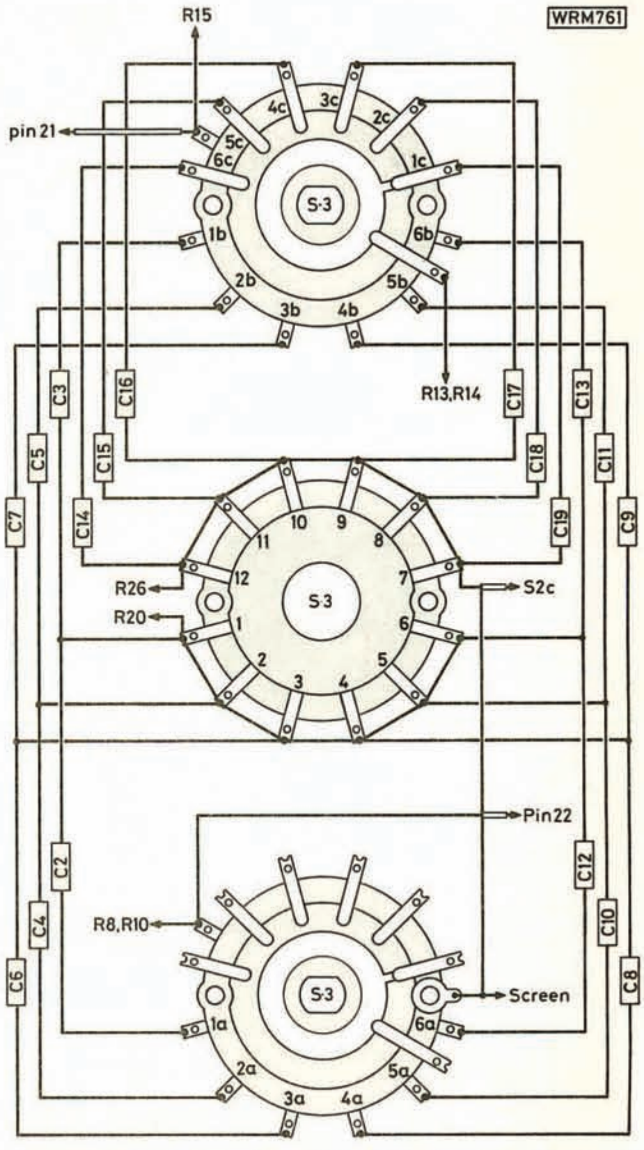


Fig. 3.3: Layout and connection details of wafer switch S3 (viewed from the rear). Note that the central wafer is a dummy section

rejection of the input signal. The "%" range switch S4 will have to be switched to progressively lower ranges as this rejection increases. The final amount of rejection obtained will depend on how low the distortion is in your signal generator. With all screens in place and the input shorted the *PW* Durley should have a residual reading of less than 0·0014 per cent or 15µV.

The bridge can be checked out on its other frequency ranges in a similar way. An oscilloscope may be connected to the output socket SK2 and this will show the signal remaining after the bridge has been nulled. The harmonic content of the signal (if any) will be clearly seen and an estimate made as to its content: i.e. if mainly second or third harmonic etc. It could be compared with the original frequency as a Lissajous pattern display.

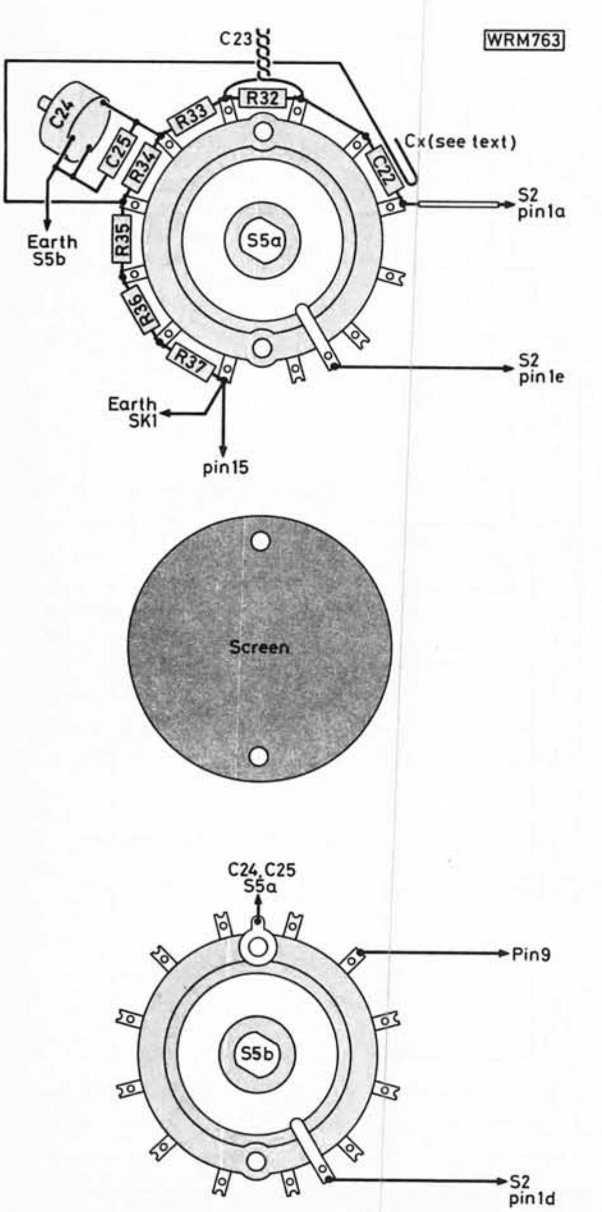


Fig. 3.4: Layout and connection details of wafer switch S5 (viewed from the rear)

General Notes

The various l.e.d. indicators should light up as the switches are changed to different settings and will be found an aid to ease of operation. The LOAD switch S1 may be used when a load is required across the input but it is very important to remember the limitation on power dissipation.

Finally, fit the case and re-check calibration etc. Keep the mains lead away from other internal wiring and do not leave it draped about inside the case after this is fitted; make sure the lead comes directly through the back of the case. The instrument is now ready for general use.

General Uses

Specific details of both SINAD and IHFM measurement techniques will be given in Part 4, but first a few comments on the general use of the instrument.

Bearing in mind that the final accuracy is only as good as the source used to calibrate it, the meter can be used to measure voltages over a range of frequencies from below 10Hz to well above 100kHz and will give useful indications, although with progressively less accuracy, up to around 250kHz. The minimum voltage that will give a sensible reading is around 20µV or so, but on this range (0·1mV) the accuracy is reduced as the high-frequency response will be around −1dB at 100kHz, compared to 0·25dB on the other ranges. The error could, of course, be checked out against a known standard if required.

To measure voltages, select VOLTS on the selector switch followed by a suitable voltage range and use as any normal voltmeter. The meter is protected against overload from excessive inputs but these should only be of short duration. Frequency response tests can be made by measuring the output of the unit under test and noting the variation in level shown on the meter. The overall accuracy will be that of the meter plus that of the generator used.

If, for example, your signal generator is rated as ±0·5dB and the meter has been calibrated to a standard of 0·25dB the combined error will be 0·75dB plus any additional error added by attenuators etc. Each instrument error **must** be added together to find the overall error. In practice, such accuracy is often not wanted but if you are trying to make absolute measurements, **all** possible errors must be added together to find the total possible. The author mentions this because it is surprising how often we all fall into the trap of reading more accuracy into a reading than is really there.

THE CONCLUDING PART *OF THIS* ARTICLE WILL PROVIDE DETAILS OF AUDIO AMPLIFIER DISTORTION MEASUREMENTS TOGETHER WITH A DETAILED EXAMINATION OF BOTH SINAD AND IHFM RECEIVER SENSITIVITY MEASUREMENTS

With circular polarisation and the construction of helical antennas forming Part 3 of this series, Part 4 commences with an examination of the methods used to express antenna gain

Although many radio amateurs do construct antennas of one kind or another there is a greater tendency these days to purchase them ready made and as a consequence many different but popular designs have become available and are widely and consistently advertised.

Unfortunately adverts rarely provide any detailed information concerned with performance and of course there are cases where this is highlighted beyond reality by misleading statements and doubtful performance specification figures etc. It would seem therefore that more detailed and truthful information might be obtained by writing to manufacturers and/or suppliers.

Accordingly a letter was sent to each of twelve different, but reasonably well known, manufacturers/suppliers who regularly advertise in journals devoted to amateur radio. The letter requested the following information: General details of their range of antennas together with specifications of gain and front to back ratio (where applicable), nominal feed impedance, v.s.w.r. against bandwidth performance and radiation patterns, for both vertical and horizontal modes of transmission.

Out of the twelve **only four replied** and of these only two were able to supply the information requested, which proved to be acceptable and truthful. The greatest confusion seems to be concerned with "gain" figures quoted with respect to directional antennas e.g. colinears and parasitic beams and which in many cases—**are not what they should be.**

Antenna Gain

The concept of *power gain* from directive antennas was dealt with in depth in the article *"Power Gain from Transmitting Aerials"* published in *PW* August 1980.

There are two references to which power gain due to directivity of antennas can be related. The first is the half-wave ($\lambda/2$) dipole, which itself has directivity and the other is the totally omni-directional but purely hypothetical isotropic antenna, sometimes known as a point source radiator.

If we take the *power gain* of the isotropic antenna as *absolute zero,* then expressed in decibels this will be 0dBi, or 0dB "isotropic". If the $\lambda/2$ dipole is used as the 0dB reference this is only qualified when expressed as 0dBd, or 0dB "dipole". *The power gain factor of directive antennas simply given as "so many dB" without a stated reference is quite meaningless.*

So we have two reference antennas, either of which may be and are commonly used. It should be noted however that because the $\lambda/2$ dipole is a *directive* antenna it has a *power gain* of 1·64 over the hypothetical isotropic radiator. In decibels this is 10Log_{10} 1·64 or 2·1484, usually accepted as 2·15dBi.

Now let us see how gain factors given in dB can be misleading. If we take an imaginary beam antenna with a measured or calculated *power gain* of 3·981 over a $\lambda/2$ dipole, the gain in dB could be expressed in four different ways:

Gain 6dB	:	Meaningless, no reference.
Gain 6dBd	:	Correct, with reference to a $\lambda/2$ dipole.
Gain 8·15dB	:	Meaningless, no reference.
Gain 8·15dBi	:	Correct, with reference to an isotropic radiator.

Taking the last example, correctly expressed, we have only to subtract 2·15 to obtain the gain relative to a $\lambda/2$ dipole, in this case 6dBd. The third example, given above as 8·15dB (without reference), does of course look very impressive and is why some manufacturers deliberately quote a gain factor this way, with reference to an isotropic antenna, *but omit to say so.*

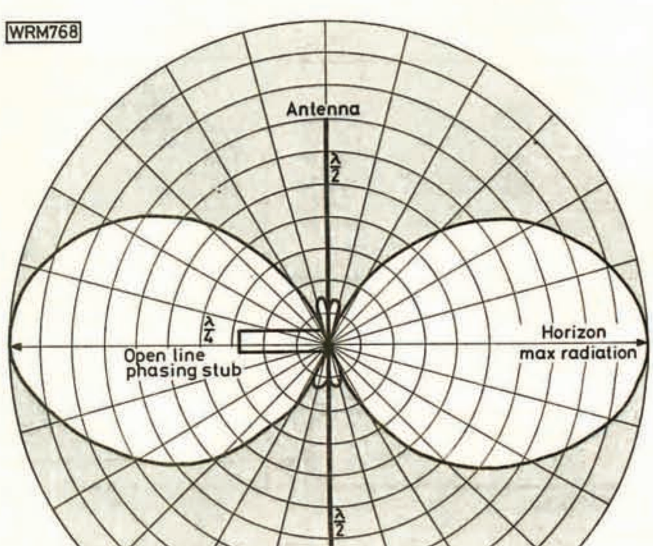


Fig. 4.1: The normal radiation pattern of a two-element omni-directional vertical colinear antenna consisting of two $\lambda/2$ elements driven in phase by the use of a $\lambda/4$ phasing stub

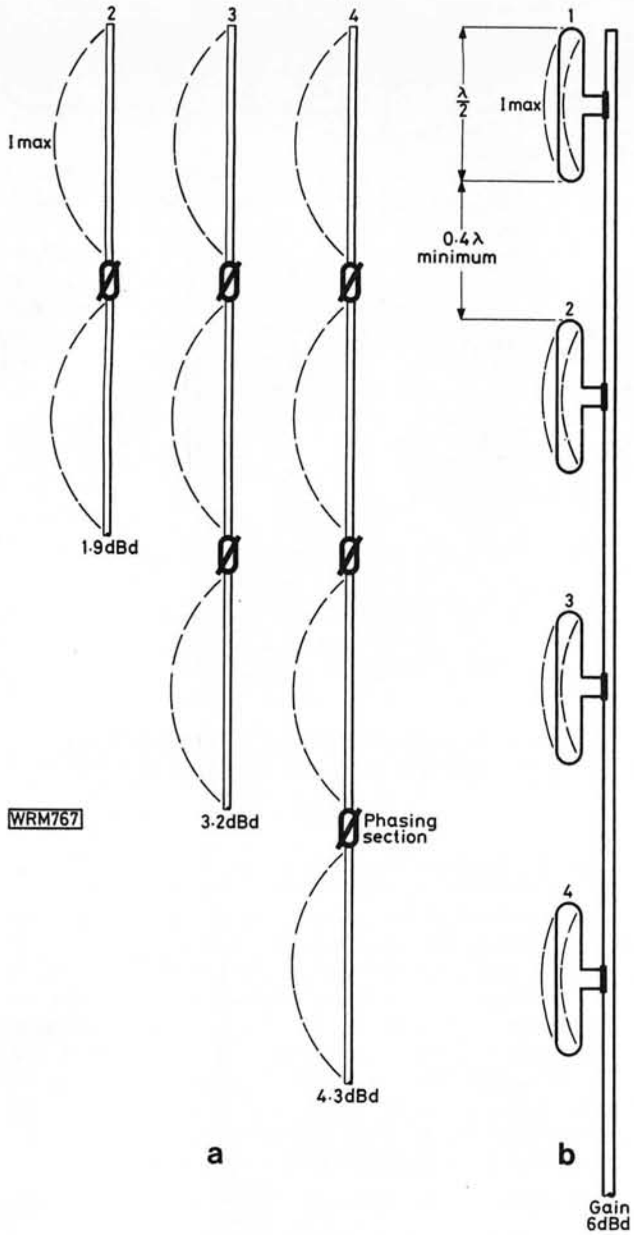


Fig. 4.2: (a) Configurations of close-spaced-element vertically polarised omni-directional colinear antennas and their gain factors, with reference to a single λ/2 dipole. (b) To achieve a gain of 6dBd with a four-element omni-directional colinear antenna, each λ/2 element must be driven in phase and spaced not less than 0·4λ apart. Folded dipoles are generally used in antennas of this nature

On the other hand we have the totally impossible or otherwise false claims advertised for antenna gain such as "14dB" for a conventional three-element Yagi type beam. Then there is the λ/2 vertical mobile antenna advertised with a gain of *3dB over a half-wave*. **So do not be fooled by antenna gain figures given in dB.**

Colinear Antennas

These devices have become popular for v.h.f. and u.h.f. operation and gain figures given in dB for some might well be suspect. For example *close-spaced* two-element vertical colinears advertised as having a gain of "6dB"—*Not even with reference to an isotropic is this possible.* It takes *four* close spaced elements, each λ/2 and driven in phase in colinear form to achieve a gain of 4·3dBd. Such an antenna for 145MHz operation would be at least 4 metres long.

As a point of interest the gain factors for close spaced vertical element colinears are: for a two-element, 1·9dBd: three-element, 3·2dBd and four-element, 4·3dBd (see Fig. 4.2(a)). More than four elements are rarely used in vertical colinear antennas. To obtain a gain of 6dBd with a four-element colinear system the spacing between each λ/2 element must be at least 0·4λ (four tenths of a wavelength) as in Fig. 4.2(b)[1].

There is one other and very important item concerned with vertical colinear antennas and this is distortion of the radiation pattern at vertical angles which can cause loss of power in the most desirable direction—at right angles to the axis of the antenna.

Taking a typical two-element colinear as an example, each element should ideally be coupled by an open λ/4 stub thus ensuring that the current flowing in each λ/2 element is exactly *in phase*. This results in a perfectly symmetrical radiation pattern as shown in Fig. 4.1.

However, to avoid the encumbrance of a phasing stub of this nature, many commercially made colinears employ

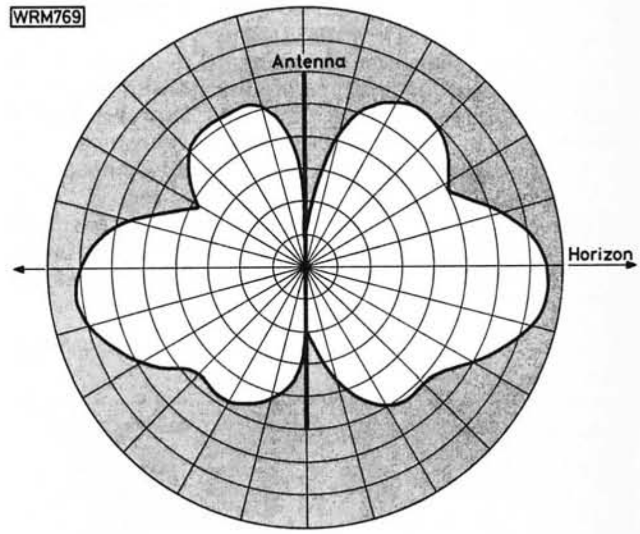
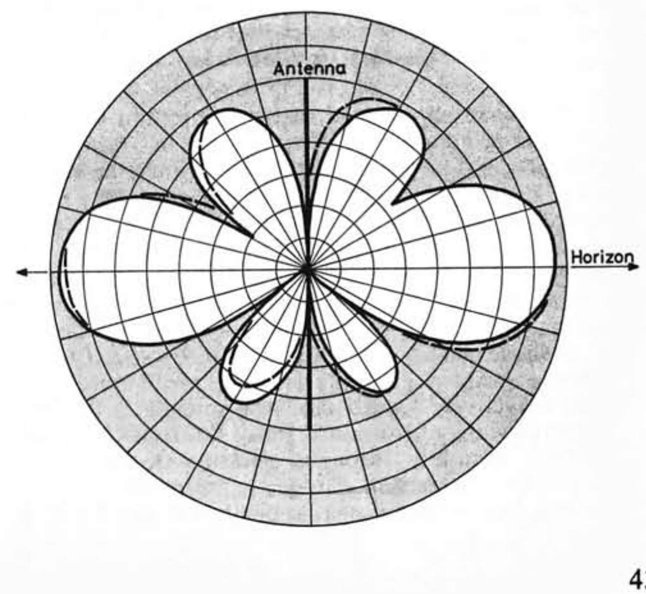


Fig. 4.3: Vertical angle radiation patterns of two omni-directional vertical colinear antennas with current in each element partially out of phase with the other resulting in a tendency to produce spurious high and low angle lobes. This results in loss of power in the main lobes and a reduction in the gain of the antenna



a semi-inductively wound phasing element, usually a $\lambda/4$ section of line wound back on itself. This normally looks like and could be mistaken for a "centre loading coil". Stray capacitive coupling across this type of phasing element can cause each radiating element to be driven partially or even completely *out of phase* so the antenna begins to behave as a full wavelength radiator. The result can be a radiation pattern similar to either of those shown in Fig. 4.3, where each is producing unwanted radiation at high and low vertical angles. This is wasted power and reduces the gain in the most desirable direction—at right angles to the antenna. The quoted examples are from advertised, commercially made, colinear antennas for v.h.f. operation. The same applies to colinear antennas of this nature for u.h.f. operation.

Multi-band Beams and Verticals

On the question of multi-band h.f. beams, so called mini-beams and h.f. multi-band omni-directional verticals, it is difficult to estimate just how efficient such antennas really are.

In the first place inductively loaded antennas of this nature are something of a compromise, although in some cases a fairly good compromise, if the claims for performance can be accepted or better still, proved.

An *efficiency* reduction of around 10 to 20 per cent is sometimes quoted for this type of antenna with respect to those with resonant full length elements. However, such a low reduction in overall efficiency stems only from very careful design, the use of really high Q loading inductances and good quality insulation wherever it is needed[(2)]. Small diameter loading inductances wound with thin wire and the use of poor insulating materials could result in the overall efficiency of any multi-band antenna being as low as 50 per cent.

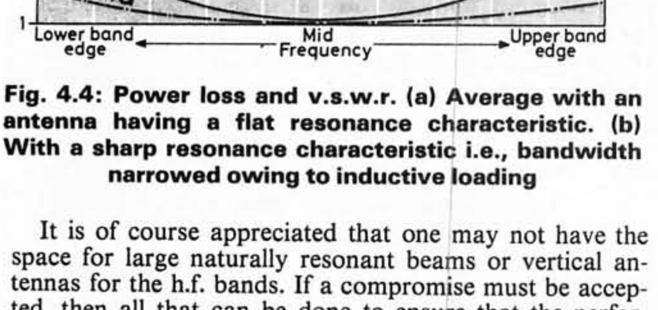


Fig. 4.4: Power loss and v.s.w.r. (a) Average with an antenna having a flat resonance characteristic. (b) With a sharp resonance characteristic i.e., bandwidth narrowed owing to inductive loading

It is of course appreciated that one may not have the space for large naturally resonant beams or vertical antennas for the h.f. bands. If a compromise must be accepted, then all that can be done to ensure that the performance will be up to a reasonable standard, is to write for the fullest possible technical information concerned with the antenna one intends buying. Any manufacturer who markets antennas of this nature, or indeed any other form of antenna, should be able to furnish specification details similar to those mentioned earlier—*If not, try elsewhere.*

One other problem generally associated with multi-band or other inductively loaded types of antenna is that the v.s.w.r./bandwidth performance may be restricted. Antennas with naturally resonant elements of full length generally exhibit a fairly flat frequency response and consequently a much lower v.s.w.r. at band ends, Fig. 4.4[(3)].

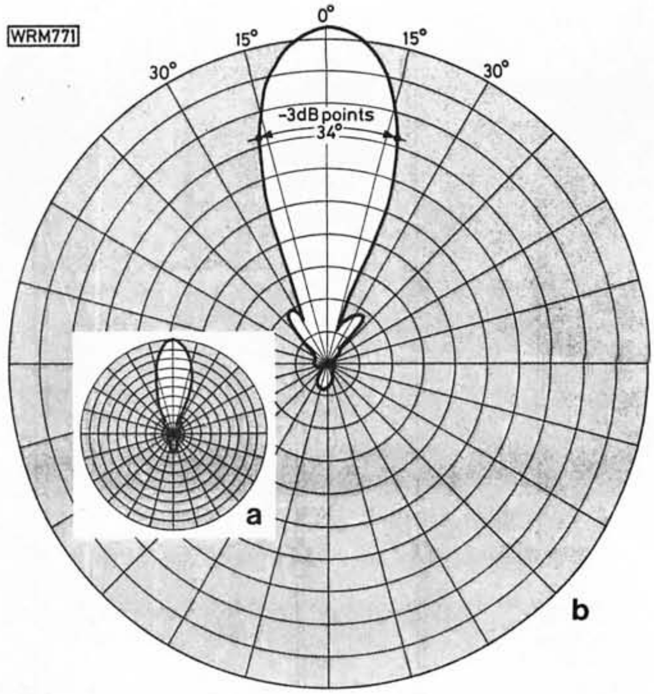


Fig. 4.5: (a) Polar pattern of a v.h.f. beam antenna supplied by the manufacturer. (b) The test plot obtained by the author

Polar Radiation Patterns

The polar radiation patterns of beam antennas can provide a fairly accurate indication of gain, particularly with v.h.f. and u.h.f. parasitic arrays. If the exact beam width in "degrees" at -3dB (0·707 of maximum forward amplitude) in both vertical and horizontal modes is known, then the gain of the antenna in dBd can be established.

For example, beam width for horizontal mode say 30 degrees and for vertical mode 32 degrees. Area of main lobe cross section at -3dB will be $30 \times 32 = 960$ square degrees. Using the figure 32027 the gain of the antenna for this example will be $10\text{Log}_{10} \frac{32027}{960} = 15\cdot2$dBd. This method was dealt with in detail in the article *"Power Gain from Transmitting Aerials"—PW* August 1980, mentioned earlier. It should be noted that this application is only reasonably accurate (to within better than 1dB) when side or rear lobes are at least 25dB down with respect to maximum amplitude of the main lobe[(4)].

However, few manufacturers provide radiation patterns of beam antennas for both modes, either in sales leaflets or with the antenna. If given at all a radiation pattern may be for horizontal mode only. Even then the -3dB point may not be indicated. It is still nevertheless possible to obtain a fair approximation of gain providing the pattern has been plotted with reasonable accuracy.

The polar pattern shown in Fig. 4.5(a) is from a well known manufacturer's catalogue and is for a v.h.f. beam in horizontal mode. The -3dB point is *not indicated* but as the maximum forward amplitude is located on the 10th concentric line from the centre, the -3dB point will be 0·707 of this, or a tiny fraction above the 7th line out from centre. This gives a beam width at -3dB of approximately 34 degrees so using the formula $10\text{Log}_{10}\frac{32027}{34 \times 34}$ we have a gain factor of 14·4dBd.

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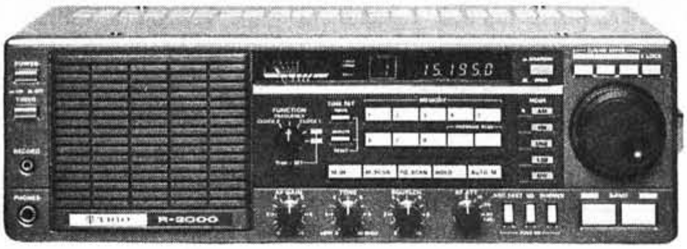
Modern Receiver Front ~ End Design



part 2

G.W.GOODRICH

Having described some of the problems associated with the more traditional receiver, and why they arose, it is time to have a look at the modern approach, and why this has become possible with modern components. However, before describing such changes let's have a quick look at the block schematic of a modern single conversion receiver front end (Fig. 3).

The first thing to notice is that the receiver uses a single conversion, and that the i.f. of this conversion is about 9 to 10MHz. In fact in most commercial receivers the i.f. is nearer 60 to 70MHz. This obviously helps deter image responses, in that the nearest unwanted image frequency is some tens of MHz away, and hopefully well outside the band-pass edges of the pre-selection circuits.

The next thing to notice is the relationship between the l.o. and the pre-selection band-pass filters before the first mixer, there are no tracked tuned circuits. The correct band-pass filter for a given band is selected either manually, or from the logic switching of the correct v.c.o. for the band in use.

The last major difference is that there is no pre-mixer r.f. amplification, so that cross modulation that otherwise might have occurred in these stages is no longer a problem. In fact an attenuator has been placed in front of the band-pass filters to reduce out of band worries getting into the receiver at all.

These then are the major changes, and I hope to make it clear as to why such a simple configuration can provide an acceptable performance.

Choice of First IF and IF Filter

The i.f. of a traditional superhet was generally quite low, the reason being that a 10·7MHz crystal filter was just about unobtainable, and cost a bomb even if you knew where to get one. These days getting an 8 pole 10·7MHz filter is no problem, and though still relatively expensive, it more than pays its way in that a single conversion superhet is now a viable possibility. Single conversion tends to be less expensive because extra circuits are not required to perform the second conversion and its filtering.

As pointed out earlier, by using a very high first i.f., image responses become less of a problem because hopefully any such signal will be well outside the pass-band of the appropriate filter being used before the mixer.

RF Pre-selection

Modern semi-conductors as a whole are a lot less noisy than their older counterparts. The immediate implication of this is that the receiver no longer needs to provide pre-mixer amplification to overcome the noise generated in the first mixer. Cross modulation and image responses also become less of a problem above 14MHz, in that you are no longer actually encouraging these nuisances to appear. Below 7MHz they are less of a problem anyway because the pre-selection circuits will have an inherently higher apparent Q anyway.

In some modern circuits any form of pre-selection seems to have been discarded altogether; this is fine where the area of interest is fairly limited. However, in the world of amateur radio the mixer would probably be very easily overloaded, so some form of pre-selection is very desirable indeed.

As far as the pre-selection is concerned, life for the modern designer is a lot easier. Since the i.f. of our superhet is say 10·7MHz it is far more convenient to provide band-pass filters for each area of the r.f. spectrum that you are interested in. Such filters should obviously be arranged so that a high degree of attenuation occurs at the image frequencies outside the band of interest.

Another advantage of using fixed band-pass filters is that the control program being used to drive either a p.l.l. or select a particular v.c.o. can be used to switch in the appropriate band-pass filter, which means one less dial to fiddle with when changing band and you won't spend a frustrating session wondering what happened to all the DX before realising that the wrong filter was switched in. I used to do this all the time when I first started using an FRG-7000.

The First Mixer

The first mixer in any communications receiver can really make or break the design, so it pays to spend a lot of time thinking about this part of the system if you are considering designing your own. Remember that any active device used in the stage detracts from the overall noise performance of the design, and that any device used should have as large a usable dynamic range as practically possible.

The current trend leans towards the use of a double-balanced mixer. The advantage of using such a circuit is that intermodulation products are naturally attenuated provided that the mixer is truly balanced. Many suitable circuits have been published, particularly by the designers of direct conversion receivers who really do need good i.m.d. rejection because they are using an effective i.f. in the audio range.

A device that should most definitely be considered is one of the Schottky diode double-balanced mixers of the SBL1 family. These devices have a standard input impedance of 50 ohms, and a 3rd order intercept point at the 7dBm mark.

A major advantage of such a device is that it is a wholly passive package and has an excellent low noise characteristic. The only problem is that it needs some 7dBm of local oscillator drive, maybe not the ideal device if the l.o. consists of a lonely BC109. However, provided that the l.o. is adequately buffered (as it should be), or a p.l.l. is used to correct the thermal drift, then the Schottky d.b.m. is a very useful device indeed.

The Local Oscillator

The basic design and construction of a v.f.o. has not really changed significantly from the amateur point of view. Any oscillator must be as free from drift as practically possible. So all the usual rules governing the design and construction of v.f.o.s still apply.

The only change to overall oscillator design is that in low power v.f.o.s there has been a general swing away from the variable toast rack (sorry, capacitor), to the varactor diode. The advantage of the varactor diode is that it can be mounted on the printed circuit board, and tuned remotely. Since the device is also d.c. controlled, there is no need for reduction type drives, to facilitate fine tuning, as a multi-turn potentiometer can perform the job equally well.

The major addition, rather than change, to the v.c.o. (if we control the oscillator with a varactor diode it becomes a voltage controlled oscillator), is that it is slaved to a p.l.l.

The p.l.l. is the basic building block on which all digital frequency synthesisers are built and is used to counteract changes in the slave v.c.o. due to thermal conditions, etc., and can be used to persuade an oscillator to run on a set frequency. I am afraid that digital frequency synthesis is not some magical technique that wipes out all oscillator instabilities forever. The synthesiser itself is prone to its own kind of instabilities, such as "jitter", and like any other electronic device needs to be carefully designed to get the optimum performance out of it.

The resolution of a v.c.o. being controlled by some form of p.l.l. is limited. It tends to tune around in definite "steps" or channels, these being defined by the reference frequency being used within the loop. This is a very useful facility in band plans where everything is channelised, but not of much use to the h.f. radio amateur. It is for this reason that some form of bandspreading across the loop defined channel is allowed for in amateur h.f. communications receivers.

The two diagrams in Fig. 4 show how interpolation of this type can be achieved. The circuit in Fig. 4(a) uses a variable capacitor/varactor diode in parallel with the reference crystal. The idea of this technique is to pull the reference oscillator a few kHz. This causes the p.l.l. to think that something drastic has happened to the v.c.o., and it tries to correct it. The net result is that the v.c.o. has been shifted across a small portion of the bandwidth of the channel. This method is quite useful where the v.c.o. only needs to be retuned by a small amount to resolve a desired signal. The circuit in Fig. 4(b) allows a far bigger p.l.l. defined band to be tuned. The output of the synthesiser is mixed with that of an interpolation oscillator the range of which only need cover the channel spacing defined by the reference frequency of the p.l.l. Of course the interpolation could be controlled by a p.l.l. as well, and in this case fine tuning would be achieved as described above. This method will actually cause more spurii in the output spectrum of the synthesiser, but with a well designed d.b.m. and filter this can be brought down to reasonable proportions.

The v.f.o. normally consists of a bank of v.c.o.s, one for each band. The outcome of this is that separate ranges are now selected by simply "powering up" the v.c.o. for the band of interest, and this can be controlled by the p.l.l. So instead of having to go to enormous trouble to route r.f. through the oscillator coil packs and selector switches etc., we simply apply power to the correct oscillator.

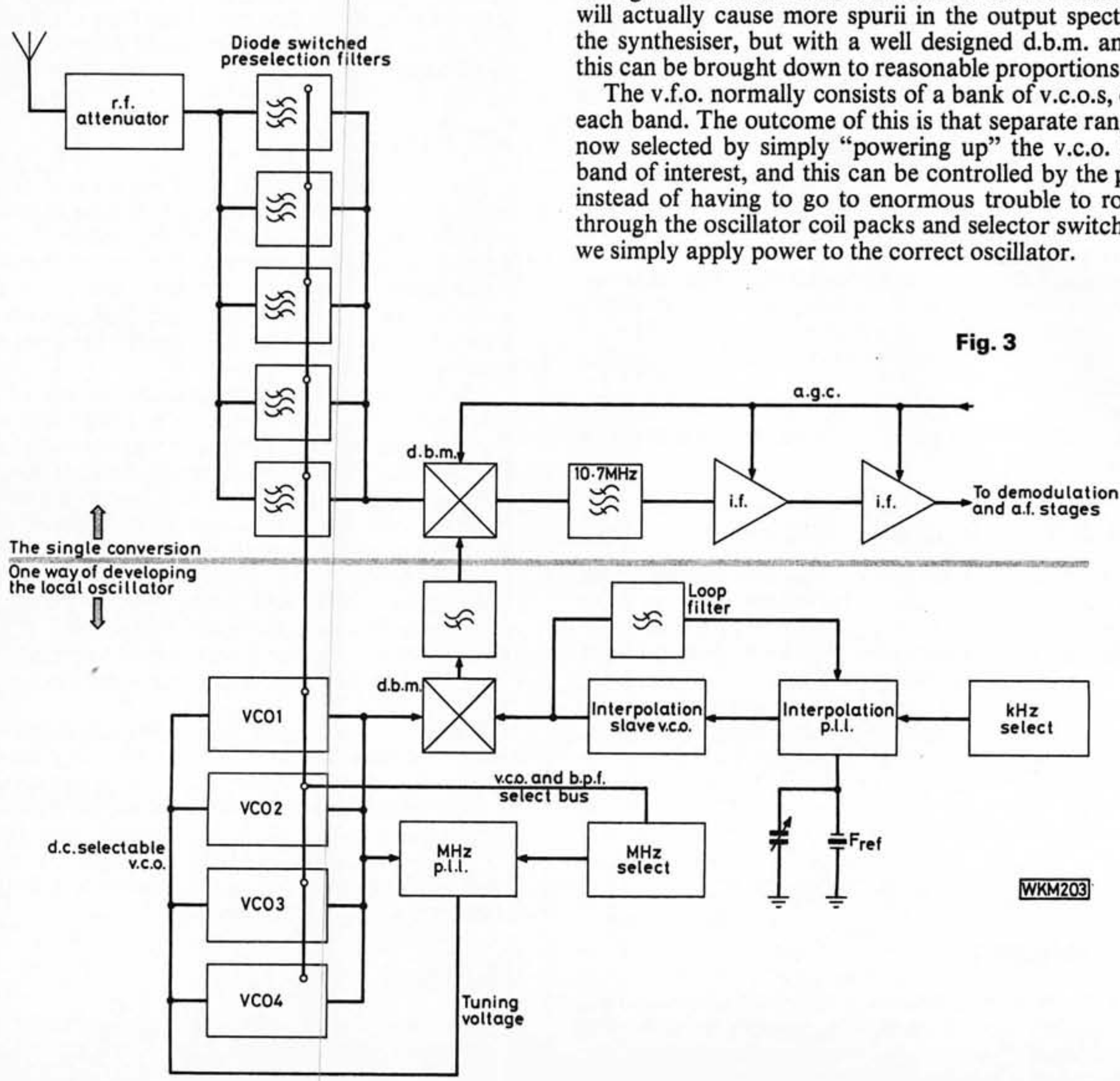


Fig. 3

Conclusions

This article has outlined how, and why, design trends have changed and how this affects the would-be designer and constructor. Comparing the diagrams in Figs. 1 and 3, I hope that the modern single conversion superhet looks a good deal simpler. In fact the whole receiver should be more efficient than its older brethren in that there is only the insertion loss of one filter in the signal path, and noise levels will be that much lower because there is only one mixer in the signal path.

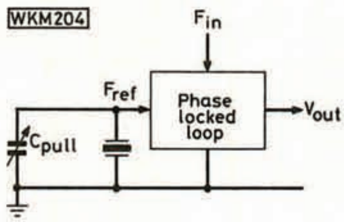


Fig. 4(a): Technique used to pull the reference crystal oscillator

The only areas that might look more complicated are that of the v.f.o., digitally controlled in both the main oscillator and the interpolation oscillator stages, and the band-pass pre-selection filters. In Fig. 1, not all the switching circuits used in the pre-selector and local oscillator coil packs are shown.

Likewise the full block schematics of the various doublers, triplers etc. in the v.f.o. have also been left out.

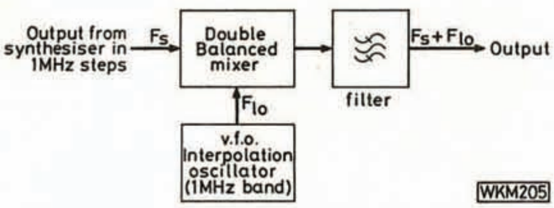


Fig. 4(b): Technique used for mixing with a separate interpolation oscillator

I have only scratched the surface of this mammoth topic, and have not talked about a.g.c. or noise limiting in the r.f. stages of a modern receiver. However, I hope that I have provided food for thought for those people considering designing and building their own equipment. I have found that simply getting my ideas sorted out, and researching the subject, has taught me infinitely more than staring at a Japanese black box. I don't want to get your hopes raised too high, so remember that it will take a lot of patience working up from the breadboard, but the satisfaction on completion will, justifiably, be enormous. Having given you some theory, I am now going to put mine into practice . . .

PW 'Severn'

QRP 7MHz Transceiver

PART 1

Rev. G.C. DOBBS G3RJV

At a time when the main tool of the radio amateur seems to have become the credit card and modern equipment does everything except make tea and give a digital readout of the operator's e.c.g. during a DX pile-up, an interesting development has been the growth of low power (QRP) operation.

For several years now an increasing number of radio amateurs have been working the world using power levels as low as 2 or 3 watts, often with simple home-built equipment and simple wire antennas.

The transmitter power used is not quite the important factor that many would believe. Think of the mathematics. Usually, one 'S Point' on the RST code is taken as a 6dB change and a simple dB/Power chart soon shows that a 6dB increase represents a power increase of four times. So, in theory, increasing a transmitter's power by four times would only give a one 'S Point' advantage.

Amongst QRP operators are those who cannot afford the current prices of h.f. equipment, together with those who simply enjoy the challenge which lower power affords. Many QRP operators have found a new lease of life in what had become a jaded hobby. The great satisfaction when making contacts with low-powered equipment is only surpassed when doing it with equipment made with one's own hands. After all, amateur radio ought not to be merely an equipment user hobby. But be warned, QRP operation, especially with home-made equipment, is addictive. Many radio amateurs with commercial equipment, building little QRP rigs, have found that their expensive grey boxes lie on the bench unused and gathering dust.

The *PW* 'Severn' represents a suitable introduction for the amateur who wishes to try QRP operation. It is a simple c.w. transceiver for the 7MHz band. Some may consider this an odd band for low power operation with its problems of small size and encroaching broadcast stations, but many QRP operators use the band. It allows contacts with UK and European stations and even the odd DX station and QRP operators can be found gathered around 7030kHz.

The project can be a useful starting point for someone who has never built a complete transceiver before, the circuitry is simple and can be built without specialist test equipment. Anyone with a little constructional experience, an existing receiver, and a multimeter should have little difficulty in getting it to work. The receiver could form a project in its own right, perhaps as a first attempt at building an amateur band receiver. Alternatively, just the transmitter section could be built and used with an existing receiver.

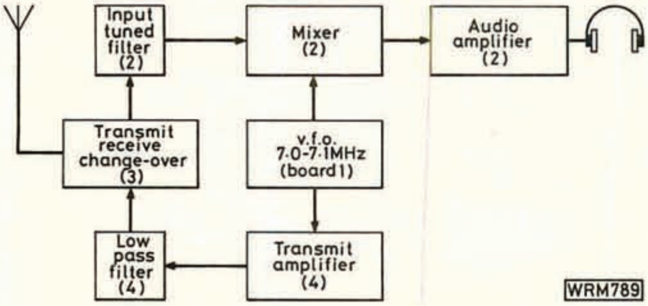


Fig. 1.1: Block schematic diagram of the *PW* 'Severn'

General Description

The *PW* 'Severn' is a direct conversion c.w. transceiver. A block diagram showing the make-up of the receiver is shown in Fig. 1.1. An obvious advantage can be spotted immediately in that a common v.f.o. may be used on the actual frequency of the band.

The principle of the direct conversion receiver has been known for many years, formerly called the Synchrodyne receiver, it has enjoyed a revival during the last few years. The chief merit of such receivers is their simplicity. The more usual superheterodyne receiver converts the incoming signal to an intermediate frequency, where amplification and filtering can take place, then demodulates the signal to recover the original information.

The operation of a direct conversion receiver is to convert the signal directly into audio frequencies where most of the amplification occurs. The top portion of the block diagram shows this action. The incoming signal, after being tuned in the input filter, is fed together with a local oscillator signal into the mixer. The oscillator (v.f.o.) is tuned to the same frequency as the incoming signal. The output of the mixer is decoupled at r.f. to remove the incoming signal and the v.f.o. signal, but the resultant beat notes that appear at the output contain the required information which can then be amplified. In effect, the action is like that of a b.f.o. in a conventional c.w./s.s.b. superhet receiver.

This method of detection means that only c.w. and s.s.b. signals can be resolved, but these are the usual modes of operation on the high-frequency amateur bands.

The receiving process is obviously simplified because only one oscillator is required and the only tuned circuits necessary are those for the signal input. This simplicity may seem to be at the expense of poor sensitivity and selectivity. However, a high gain, low noise, audio amplifier can give good sensitivity and good input tuned circuits and audio filtering can make these simple receivers very selective. My general advice to those who doubt the viability of direct conversion receivers on the amateur bands is to build one. They are simple and inexpensive to build and the results can be quite amazing for the circuitry involved.

The transmitter portion of the transceiver, shown in the lower part of the block diagram, is simplicity itself. The same v.f.o. is fed into a transmit amplifier board to raise the level to about a couple of watts. The signal is cleaned up in a low pass filter and matched into a 50 ohm impedance antenna. A transmit/receive change over board directs the signals into and out of the transmitter and receiver at the appropriate times, controlled by the operator's keying, and adds or removes power lines to the various circuit elements as required. The transceiver operates using a semi-break-in technique. That is when the operator begins to key the transmitter comes on and the receive section is switched off. At normal keying speeds this state remains until the keying stops and the transceiver switches back to receive. This operation can be adjusted for various keying speeds and the change-over board also provides a sidetone for the operator to listen to his c.w.

The Receiver Circuit

The circuit diagram for the complete receiver including the v.f.o. is shown in Fig. 1.2. The circuits all exhibit standard techniques used for direct conversion reception. For those familiar with the literature on such receivers, and there's a lot of it about . . . as they say, the mixer is perhaps the less usual of all the sections. It is three f.e.t. transistors arranged in a Y configuration similar to that used in many differential amplifier integrated circuits. Tr1 and Tr2 form a balanced mixer and the third f.e.t. in the Y, Tr3, serves as an r.f. amplifier feeding the source connections of Tr1 and Tr2. I originally saw a version of this circuit used by W0YBF in *Ham Radio* Jan. 77 using a twin r.f. j.f.e.t. device for the mixer. This circuit uses two f.e.t.s with a single balancing preset resistor R5. The two Zener diodes, D1 and D2, could perhaps be omitted, but Tr1 and 2 feed their output into a high impedance transformer T2 with lots of turns. Remember the induction coil at school? The high voltage transients generated in T2 might convert the f.e.t. from a mixer into a fast-acting fuse!

The incoming signal is filtered through three tuned stages, L1, 2 and 3, which are loosely top coupled by C27

Readers who intend to operate the *PW* 'Severn' should be in possession of the appropriate licence issued by the Home Office to those who have passed the City and Guilds Radio Amateurs' Examination. Details may be obtained from: The Home Office, Radio Regulatory Department, Amateur Licensing Section, Waterloo Bridge House, Waterloo Road, London SE1 8UA.

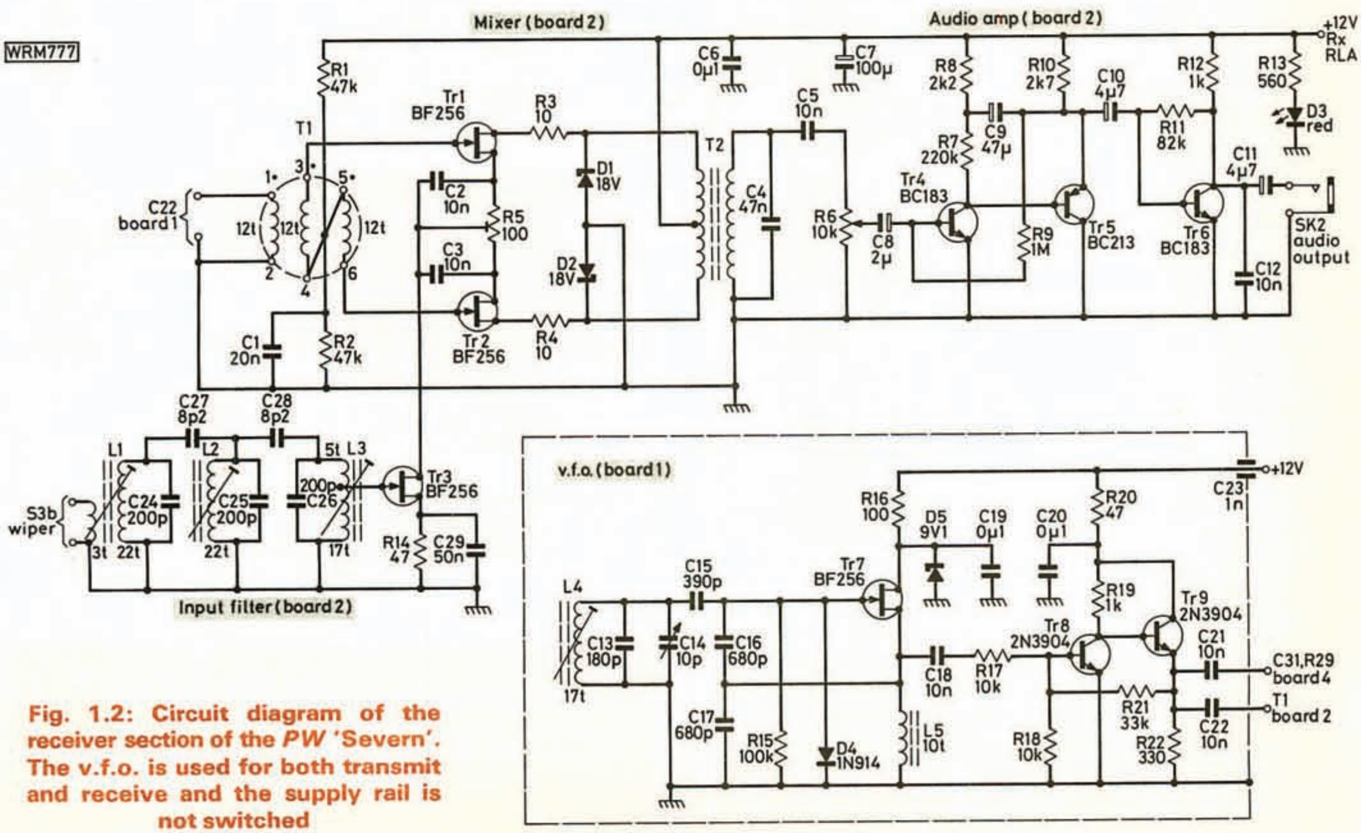


Fig. 1.2: Circuit diagram of the receiver section of the *PW* 'Severn'. The v.f.o. is used for both transmit and receive and the supply rail is not switched

AIR TEST

USER REPORTS ON SETS AND SUNDRIES

MIZUHO MX-2 144MHz s.s.b./c.w. Transceiver

The MX-2 is unusual as it is a small hand-held sideband and c.w. only rig of simple appearance and construction.

Only a limited part of the 144MHz amateur band is covered in two ranges and tuning is continuously variable by a small knob which together with the rest of the controls is sited on the top panel. The two ranges are 144·245 to 144·297MHz and 144·294 to 144·345MHz. The knob is not calibrated so that there is no way of knowing what frequency you are tuned to. The other top-mounted controls are slide switches for selecting the two bands and s.s.b./c.w. and noise blanker.

The transmitter output is a lowly 175mW into a 50Ω load when the current consumption from the six RO3 (HP16) dry cells is 190mA. An external 9V d.c. supply can be used via the 6mm socket in the bottom of the rig. Current on receive is 58mA.

For c.w. use a 3·5mm jack is provided, again on the bottom, to allow a Morse key to be connected and the side-mounted push-on-push-off p.t.t. switch allows the rig to be put into transmit mode without having to hold down a conventional p.t.t. switch.

The 50Ω "rubber duck" antenna plugs into a BNC socket on the top panel and of course a linear amplifier and external antenna system could also be fitted to this socket.

As well as the built-in speaker and 600Ω electret microphone a speaker/mike handset came with the review rig (£14 extra) and a protective carrying case is also available (£4).

The receiver was sensitive at 0·12µV p.d. for 12 dB SINAD but obviously the small output power of the transmitter will be the limiting factor on usefulness.

The overall size of the MX-2 is 155 × 72 × 42 mm and it weighs around 600gm with handset and batteries.

Price

The cost of the rig is £89.00 inc. VAT and it is available from **Waters & Stanton Electronics, 18–20 Main Road, Hockley, Essex. Tel: 0702 206835** who we would like to thank for the loan of the review rig.

Dick Ganderton

PW 'Severn'

and C28 to give reasonable input selectivity. One or two tuned circuits might be used, but for the sake of a couple of formers and some wire the three stages are an asset. Tr1 and 2 require a balanced input so the v.f.o. signal is supplied via a trifilar wound broadband ferrite transformer, T1, with a 4:1 impedance ratio. If this all seems very technical to the beginner in r.f. construction techniques, do not worry, T1 is simple to wind and proved very uncritical in the prototype receiver.

The audio component from the mixer is transformer coupled, through T2, into the audio amplifier, Tr4, 5 and 6. The audio amplifier is a simple high gain, low noise circuit which has become an evergreen in QRP circles. I first met it in the Ebor Transceiver by G3GWI in *SPRAT, the Journal of the G QRP Club,* and have used it in several receivers since that time. A complementary pair of transistors, Tr4 and 5, feed a simple output stage Tr6. The output is adequate for headphones and the circuit matches into high or medium impedance phones. I have found a whole range of surplus headphones with impedance in the hundreds of ohms which work very well in this circuit. If only low impedance headphones are available they can be used via a transistor output transformer such as the commonly available LT700. For such a simple circuit, this amplifier is ideal in this application.

The v.f.o. circuit is a j.f.e.t. version of the familiar Sieler-type oscillator developed by W2YM (*QST* Dec. 66) and used in many of the circuits which have emerged in recent years in American publications. A full discussion of this type of circuit is presented in *Solid State Design For The Radio Amateur* by the ARRL, a book that every self-respecting radio amateur constructor ought to have on his shelf. Variable frequency oscillators can be the *bete noir* of amateur construction.

The radio construction world often seems beset with tales of woe about v.f.o.s that drift, jump, growl and generally behave in an anti-social manner, but this little circuit rarely seems to give much trouble. Experienced constructors say that the way a v.f.o. is built contributes as much to its success as the type of circuit used and certainly this circuit should be built as firmly as a "brick privy", but more of that next month. The oscillator stage, Tr7, is followed by a two-stage buffer, Tr8 and 9, with two outputs being taken from the emitter of Tr9.

CONSTRUCTION RATING Intermediate

BUYING GUIDE

Would-be constructors should have no difficulty in obtaining the components for this project. Any specialised components will be dealt with as the series progresses and suitable sources indicated.

APPROXIMATE COST £30

YAESU FT~ONE HF TRANSCEIVER

The FT-ONE was the first of a new generation of all-singing, all-dancing h.f. transceivers to appear on the amateur market, and incorporates a very wide range of features indeed. It seems that Yaesu's development engineers must have sat down and listed every facility they'd ever seen on an h.f. rig, plus those they had wished they'd had, borrowed a few ideas from v.h.f. rigs, and then built the whole lot into one cabinet, most of them as standard, a few as options.

They've made more powerful use of the inevitable microprocessor than ever before, and although there's a formidable array of control knobs, switches and push-buttons, the FT-ONE struck me as remarkably simple to drive where its basic functions are concerned. In modern parlance it's "user-friendly", being more tolerant than many rigs of the order in which you change controls, and not showing too much tendency to disappear onto a frequency and mode of its own choosing should you be so careless as to touch the wrong button.

Most of the features have been mentioned in the advertisements of the Yaesu importers so I won't waste space by describing them all. Instead, I'll try to say a little more about the more unusual or interesting points.

Certainly the most outstanding feature, and one requiring quite a lot of practice to use to the full, is the frequency setting system. If you use the main tuning knob, you can wind it from 150kHz to 29·999MHz without a break—in other words there is no bandswitch. The synthesiser-controlled local oscillator uses six v.c.o.s, each covering a 5MHz segment, so there is a small "glitch" as you tune through the 5, 10, 15, 20 and 25MHz points, but this is unlikely to cause any problem whatsoever in normal use, as it's effectively just a few hertz wide.

There are three rates for the main tuning knob. Normally it tunes in 100Hz steps, covering 20kHz for each whole revolution. With the FINE button locked in, this changes to 10Hz steps (2kHz per revolution). For rapid tuning, pressing the MHZ button beneath the tuning knob brings in 1MHz steps (10MHz per revolution) whilst the "kHz" part of the frequency stays unchanged.

A similar philosophy, separating the "MHz" and "kHz" parts of the frequency setting, applies to entry via the keypad, so that you could for example change from 14·0300MHz to 14·0400MHz simply by keying in "0400 DIAL", or you could go from a sked on 14·2150MHz to one on 21·2150MHz by keying in "21MHZ". It means that you can drive the FT-ONE as if it had a bandswitch or as a continuously-tuned set, whichever is most convenient for the sort of frequency change you want to make at the time.

Frequency scanning is available throughout the coverage of the receiver and can be set to AUTO (stop scanning on receipt of a signal strong enough to deflect the "S" meter) or MAN (manual control of start and stop). Steps are 100Hz on AUTO, and either 100Hz or 100kHz on MAN. The manual mode can also be controlled from a suitable scanning microphone.

Two ten-channel memories are provided, called VFO A and VFO B, but frequencies stored in the same numbered channel of each are the same. In other words, whatever is in A1 is also in B1, and so on. You might think that's not very helpful, but the reason for giving access to two of the ten frequencies at a time is to allow split-frequency or even crossband working. Incidentally, that crossband facility can be used at the full break-in setting of the VOX and c.w. delay control. The memories can be controlled from their own selectors or from the keypad.

To make proper use of a crossband capability, you must be able to swap sidebands between transmit and receive for s.s.b., and the FT-ONE has that facility available at a couple of special positions on the MODE switch too.

To complete the frequency setting system, a digital clarifier can be switched in and varied by up to ±9·9kHz in 10Hz or 100Hz steps by the main tuning knob. The clarifier can be used in the conventional way, on receive only, or on both transmit and receive to shift operation without losing the original frequency setting. Clarifier offset is shown on a separate digital display. You can manually scan the clarifier range too.

Standard features include a very effective r.f. speech processor, a useful noise-blanker, a highly selective audio peak/notch filter (almost too selective on notch, I found), switchable a.g.c. — OFF/FAST/SLOW, separate variable r.f. attenuator (*pin* diode) and r.f./i.f. gain control, and in-built forward/reverse power monitoring. Variable i.f. width and centre-frequency controls are very helpful in reducing interference, even without the extra optional i.f. filters which you can have fitted (positions provided on the MODE switch).

An unusual feature is an automatic microphone gain control (AMGC), which is a sort of audio squelch to cut out background noise picked up by the microphone between words and sentences during voice transmission. This is quite separate from the usual anti-trip control associated with VOX circuits.

Options, apart from the i.f. filters already mentioned, include an f.m. unit (front-panel squelch control fitted), a c.m.o.s. keyer unit giving full iambic operation, and a RAM unit which keeps your memory settings safe when power is removed from the transceiver.

Rear-panel connections are provided for separate receive antenna, transverter, loudspeaker, tape recorder, f.s.k. input, sidetone, Morse keys and linear amplifier, apart from the usual antenna, earth and power supplies.

★ specifications

TRANSMITTER

Frequency coverage: 1·8 – 2·0MHz (160m)
3·0 – 4·0MHz (80m)
7·0 – 8·0MHz (40m)
10·0 – 11·0MHz (30m)
14·0 – 15·0MHz (20m)
18·0 – 19·0MHz (17m)
21·0 – 22·0MHz (15m)
24·0 – 25·0MHz (12m)
28·0 – 29·99MHz (10m)

Types of emission: A1A (c.w.), J3E (u.s.b./l.s.b.), A3E (a.m.), F1B (f.s.k.), F3E (f.m.)*

Power output (min): A1A/J3E: 100W p.e.p. (90W above 28MHz), A3E: 25W, F1B/F3E: 50W

Carrier suppression: Better than 40dB†

Unwanted sideband: Better than −50dB†

Spurious radiation: Better than −40dB†

Harmonic radiation: Better than −50dB†

3rd Order i.m.d.: Better than −31dB†

†Below peak output

Frequency stability: (After 10 min. warm-up) Less than 300Hz drift in first 30 min., less than 100Hz drift every 30 min. thereafter

Maximum deviation (F3E)*: ±5kHz

Shift frequency (F1B): 170Hz

Antenna impedance: 50Ω unbalanced

Microphone impedance: 500–600Ω

RECEIVER

Frequency coverage: 150kHz – 29·9999MHz

Clarifier range: ±9·9kHz

Sensitivity (min):

Input for 10dB (S+ N)/N

Mode (B/W)	<1·8MHz	>1·8MHz
J3E/A1A(W)/F1B(W)	5µV	0·3µV
A1A(N)*	2·5µV	0·2µV
A1A(M)*/F1B(N)*	3µV	0·25µV
A3E	30µV	2µV
F3E	—	0·6µV for 20dB quieting

Image rejection: Better than 80dB

I.F. rejection: Better than 70dB

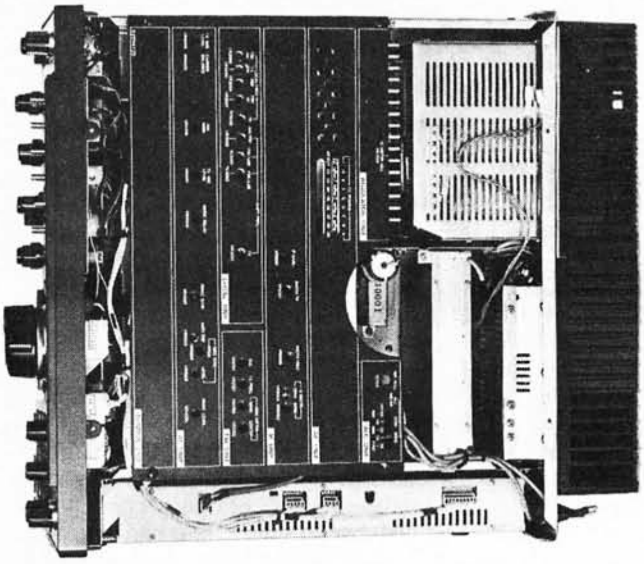
Selectivity:

WIDTH control at maximum

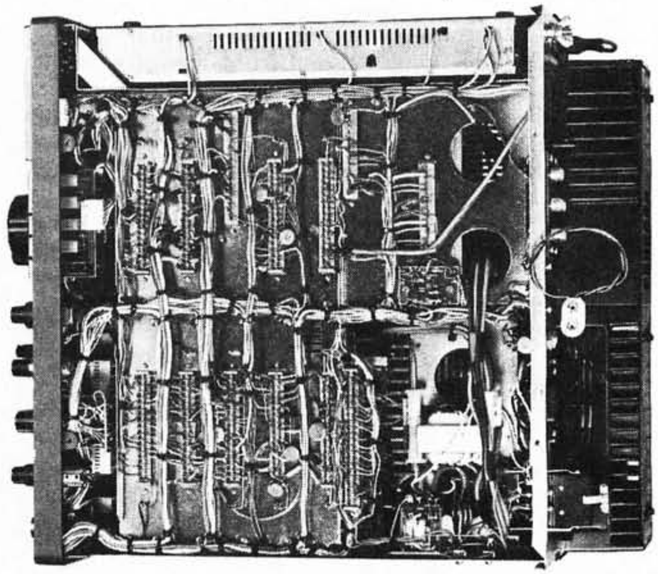
Mode (B/W)	−6dB	−60dB
J3E/A1A(W)/F1B(W)	2·4kHz	4kHz
A1A(N)*	300Hz	900Hz
A1A(M)*/F1B(N)*	600Hz	1·2kHz
A3E	6kHz	10kHz
F3E*	12kHz	24kHz

Dynamic range: Better than 90dB (standard s.s.b. filter)

Audio output: 3W min. in 4Ω, t.h.d. less than 10%



Inside the cabinet top, a cover plate identifies the modules and the main "user pre-set" controls



With the bottom cover removed, all the module edge connectors and inter-unit wiring are accessible

GENERAL

Tuning steps: Selectable 1MHz, 100kHz, 100Hz, 10Hz

Power requirements: 100/120V or 200/240V, 50/60Hz a.c., 90VA receive, 560VA transmit 13·5V ±10% d.c., negative ground, 2·7A receive, 20A transmit

Dimensions: 165 × 380 × 465mm approx. overall

Weight: 17kg approx.

* Option

Radio SPECIAL PRODUCT REPORT

★ test measurements

TRANSMITTER

Outputs in A1A mode:

Freq. Output (MHz)	Max. Output (W)	Harmonic outputs (dBc) 2nd	3rd	4th	5th
1·81	135	−62	−51	—	−70
3·51	135	−60	—	—	—
7·01	132	−59	−52	—	—
10·11	130	−46	−60	—	−66
14·01	130	−50	−56		
18·11	130	−50	−62	−66	—
21·01	130	−48	−54	−70	—
24·91	130	−53	−56	−62	—
28·01	120	−52	−59	—	—

Carrier suppression: 57dB relative to p.e.p.
Unwanted sideband suppression: 64dB (1kHz tone at 14MHz)
3rd Order i.m.d.: 32dB below p.e.p.
Spurious radiation: −70dB or better
Frequency stability: Drift 100Hz during first hour after 15 min. warm-up
Maximum deviation (F3E): ±3kHz
Maximum output at 14·1MHz:

Mode	Final stage I_c (A)	Power out (W)
A1A	17	130
J3E	16	125
A3E	5	15
F3E	10	45
F1B	10	45

Test equipment used:
2017 and 2019 signal generators, TF2370 spectrum analyser, 2435 frequency meter, TF2304 modulation meter, TF2337A distortion meter, TF2005R two-tone generator, TF893A power meter, all by Marconi Instruments; Bird model 43 power meter; Tektronix 2215 oscilloscope.

RECEIVER

Sensitivity:

Freq. (MHz)	Input e.m.f. (μV) for 10dB (S + N)/N J3E	A3E	Input e.m.f. (μV) for S9 (J3E)
1·81	0·37	0·51	27
3·51	0·33	0·49	22
7·01	0·35	0·52	20
10·11	0·37	0·52	26
14·01	0·43	0·58	29
18·11	0·45	0·61	31
21·01	0·47	0·62	33
24·91	0·48	0·6	32
28·01	0·5	0·65	33
29·61	0·52	0·65	33

FM sensitivity: 1μV e.m.f. input for 20dB quieting at 29MHz
"S" Meter calibration: (At 14·01MHz, u.s.b.)

Reading	Input μV e.m.f.	dBμV
S1	3	10
S2	4·6	13
S3	6	16
S4	8·5	18
S5	11	21
S6	15	23
S7	20	26
S8	25	28
S9	29	29
+20	170	45
+40	840	59
+60	18·5mV	85

Image rejection: Better than 85dB
I.F. rejection: Better than 75dB on 10·1MHz band (worst case)

Selectivity:
WIDTH control at maximum

Mode (B/W)	−6dB	−60db
J3E/A1A(W)/F1B(W)	2·5kHz	3·3kHz
A1A(N)	520Hz	1kHz
A1A(M)/F1B(N)	290Hz	840Hz
A3E	6·3kHz	8kHz

AGC: Output change for 110dB input change, relative to 10μV threshold: 1·5dB
RF attenuator range: 37dB at 1·8MHz; 43dB at 29·6MHz
Audio output: Distortion 10% for 3W into 4Ω

Results

During the fairly lengthy period I had the FT-ONE on test, I went through phases of liking it and not liking it, but finished up feeling that it was really rather nice. It has a couple of features I hate, but I'll come back to those later.

Reports on transmissions, either voice or c.w., were always complimentary (I didn't have the opportunity to try f.s.k. working). The rig I had was fitted with the full range of options apart from the RAM board, all performing as they should. There is a front-panel speed control for the electronic keyer but no weight control, which would disappoint some c.w. addicts.

On the receive side, the i.f. shift and width controls were

continued on page 65▶▶▶

PRACTICAL MICROWAVE OPERATING

M.W. DIXON Ph D G3PFR

Since this article was prepared, the Home Office have announced that new primary users (Project Mercury) will occupy the portion of the band from 10 150MHz to 10 400MHz and that amateur users enjoy secondary status. There is no intention of withdrawing this allocation unless serious interference to primary users occurs. It is believed that, by the nature of the band, the narrow beamwidths used and the low-power levels of the usual amateur station, such interference will be insignificant. However, the reader is advised to take note of such requirements and it might be advisable to restrict wide-band operation to the segment 10 000 to 10 150MHz where there is sufficient bandwidth to allow the use of 100MHz i.f. strips such as the *PW* "Exe" for duplex operation. If one station transmits on 10 025MHz and receives on 10 130MHz (nominal 105MHz i.f.) and the other receives on 10 025MHz and transmits on 10 130MHz, the possibility of interference with other services is eliminated. The operator should make sure that the lower frequency of transmission **is** within the band!

There is no intention of changing the present narrow-band frequencies i.e. 10 369MHz ±1MHz, which includes the present narrow-band beacon sub-band.

These changes do not affect the general operating procedures outlined in the article.

Having learned a little about the use of maps, compass, NGR and the QTH Locator system (*Practical Wireless* Jan 1982), it was felt that there are still many other practical aspects of portable (and fixed) microwave operation which should be explained to the newcomer. The purpose of this article is, therefore, to help in preparing the operator more fully and to try to enhance his or her chances of successful operation. The following remarks are addressed particularly to 10GHz operation but apply equally to operation on any other band in the amateur microwave spectrum.

As stated in the original *PW* Exe series it is useless to take equipment into the field and expect success by calling "CQ 10GHz". The state of development and occupancy of the band is such that, without exception, pre-arranged "skeds" and activity periods are the usual mode of operation. Each year the RSGB Microwave Committee nominates dates for the Cumulative Activity Contests; there are generally five or six monthly events commencing in April and finishing in September (plus one IARU Region 1 u.h.f./microwave contest, usually in October) the purpose of which is to promote activity for both the experienced operator and the newcomer alike. Each is a one-day event and, whilst directed principally at increasing 10GHz activity, is coupled with the optional use of one other microwave band (2·3, 3·4, 5·7 and 24GHz). Any mode of power within the terms of the amateur licence is permitted. The general rules are set out in Table 1.

Operation at Other Times

It is, of course, possible and indeed very desirable that operation takes place outside these set-periods from both fixed and portable locations. Microwave activity tends, at present, to centre in "pockets" up and down the country and it is usually possible to arrange skeds with other interested operators perhaps locally at first and then at greater distances later.

Contact with other groups or individuals can be most easily made by one of two routes as follows:

1) There are microwave "nets" running more or less regularly on 144MHz: for instance Sheffield, West and South Yorks, Monday evenings 8p.m. (clock-time) on 144·33MHz, s.s.b.; Cheshire, S. Lancs and N. Midlands, Thursday evenings 10p.m. clock-time on 144·18MHz, s.s.b. Simply call "CQ, Microwave Net" and listen for a reply. If several people in a given area are active or interested in microwave operation—why not start up a net? The author would be pleased to know about such nets (QTHR).

2) The *Microwave Newsletter* (RSGB HQ, £4 for 10 issues) contains much topical operating news as well as technical articles. Before each cumulative period it will contain at least a partial list of operator callsigns, telephone numbers, equipment details and expected sites of operation.

Site Selection

Some general points were made about site selection in the earlier article. Such factors as distance, height, access, "clarity" of take-off and so forth can often be predetermined from careful study of the OS maps. Local access from other than public roads is, perhaps, a matter to discuss with the farmer or land-owner of the site concerned; it is common sense and courtesy to ask permission to use a site unless this is a clearly accessible road-side site. Even there the adjacent land might be part of a Forestry Commission, National Trust or National Park holding and, as such, there may be restrictions or objections to the erection of masts. Thus it is usually a good idea to prepare the way by asking well in advance of the operating periods. Access is seldom refused if asked for in the right way; often an explanation of the purpose of one's visit is called for and it is essential to act in a responsible manner and adhere to the "Country Code" whilst on site.

This code involves common sense and may be briefly summarised by the following points:

1) Avoid climbing walls and fences
2) Always stick to footpaths
3) Always close and fasten gates
4) Leave no litter
5) Avoid damaging crops or disturbing animals
6) Ensure there is no fire risk

Finally, don't forget the common courtesy of a "thank-you" at the end of the day.

Having selected one's site and gone through the preliminaries outlined above, there is still much to be done in advance of actual operation to ensure its success!

The prudent and more successful operator will have worked out (in advance) "certain", "probable" and "poss-

Table 1—10GHz Cumulative Rules*

Time	0900–2000GMT (1000–2100BST)
Dates	Sundays, April through September
QTH	i) 2 locations (fixed or portable) permitted for each period, but only the score from the higher scoring QTH may count, although both scores must be logged. ii) Any location can be used. Different locations are allowed for each cumulative. iii) At any location, moves within a 5km radius are allowed so that local obstructions can be avoided. Such moves still count as one location.
Contest Exchange	i) Signal report R, S, (T), serial no. (001, 002 etc), QRA and (optional) NGR. NGR should be used in log entries. ii) Both sets of information (incoming and outgoing) must be sent, received and confirmed on 10GHz unless cross-band operation e.g. 144MHz/10GHz is involved.
Logging	All contacts both successful and unsuccessful, should be logged.
Scoring	i) One point per km, half points for cross-band contact (either way). ii) The final score is made up by adding the best three scores together. iii) The log for all periods in which operation took place should be submitted to RSGB HQ by the stated date on forms LSVHF and cover sheet 427 obtainable from RSGB HQ or any member of the VHF Committee on receipt of a stamped addressed envelope.
Awards	i) Best overall score, any mode + runner-up ii) Best score, WBKM, TX power less than 100mW iii) 150km award ** iv) QRA Square award ** (5 QRA squares from *one* location) v) Leading fixed station vi) Best foreign entry vii) Highest placed station who has not previously won an award

Notes on Table 1

1) * Full details of actual times, dates and additional bands should be obtained from *Radio Communication*, generally the April issue just before the first Cumulative.

2) ** These awards are available from results obtained during or outside the Cumulatives. For awards marked **, proof of contact (QSL) will be required. For the others QSLs may be required.

3) The distance award varies with band as shown in Table 2.

4) To enter the contest or claim an award, *but not to operate*, the entrant must be a member of RSGB. This does *not* apply to foreign entrants. Group or Club callsigns are acceptable from Affiliated Societies.

ible" paths, their bearings and distance plus any additional data, written these neatly on paper and slipped them (together with a copy of the licence or other amateur identification) into a waterproof, transparent stationery wallet and attached it to the log book. Loose paper has a singularly nasty habit of blowing away on a windy hillside!

The operator should also have prepared an equipment list which might read something like that in Table 3. Furthermore the equipment will have been systematically loaded into the car, with each item ticked off as it is loaded, not forgetting that it will have been checked for function, reliability, frequency setting and so on. Large items, such as dishes, should be secured to prevent damage to equipment and passengers in the case of a sudden emergency stop.

Safety

If the equipment list given seems excessive or superfluous, rest assured, it certainly is not! To ensure equipment safety it is essential to guy the tripod—the author and others have found this out by bitter experience—the dish, even at ground level, presents a high "windage" and there is nothing more frustrating than to have one's equipment damaged by a sudden gust of wind, maybe even before operation has started.

Suitable clothing, food and hot drinks are essential for the operator's safety. It is surprisingly easy to ignore the dangers and vagaries of the British climate and these vagaries are magnified by increasing altitude. Wind, rain, hail, thunder, sleet and snow cannot be ignored particularly early and late in the operating season and it is easy to succumb to the effects of exhaustion or even exposure if the operator is inadequately clad or goes without food and drink for prolonged periods whilst on a hill-top. Beware also of sun-burn—at high altitude a strong sun can appear deceptively harmless.

A word of warning about alcoholic drinks—whilst these might give a feeling of warmth and well-being they do, indeed, have the opposite physiological effect, actually lowering the body temperature rather than raising it. The best reviver is a hot, sweet cup of tea or coffee or a mug of hot, thick soup plus other "high energy" (sugary) foods.

No comment need be made about toilet paper, save to say that many people, embarrassingly, forget it! It has many other uses, of course, such as mopping water out of waveguide!

Path Plotting

Many paths which the would-be operator will use are already well proven and the operator should be aware of this fact from researches using maps and the information sources already mentioned. These paths may fall into "certain" or "probable" categories but what of the "possible" paths? Here it is advisable to carry out a path profile survey to try to ascertain whether there are (one or more) obstructions on the path.

Table 2—Distance Awards

Band	Distance
1·3GHz	600km
2·3GHz	500km
3·4GHz	400km
5·7GHz	300km
10·0GHz	150km
24·0GHz	150km

Both the QRA Squares award and the Distance awards should be claimed from the RSGB VHF Awards Manager Jack Hum G5UM, 27 Ingarsby Lane, Houghton-on-the-Hill, Leicester.

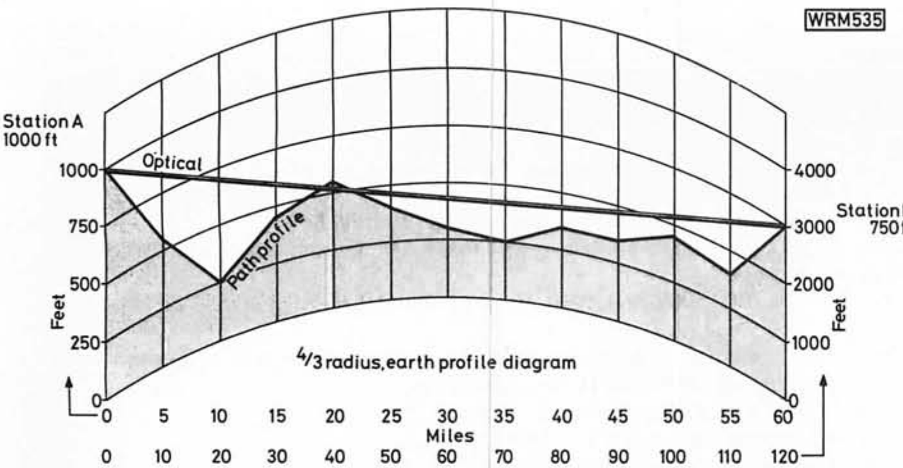


Fig. 1: Use of earth profile paper. Station A is at 1000ft (305m) a.s.l. and Station B at 750ft (229m) a.s.l. 60 miles (96km) away (left hand altitude scale and top distance scale as indicated). Joining these two points together with flat land (or sea) at zero altitude shows the path to be "optical". Contact is "certain". However the path plot (see text) shows one small obstruction at about 20 miles (32km) from station A. This path is non-optical and might, depending on the size of the obstruction, be "possible" and worth a try

The first step is to work out the path distance and bearing and plot these lightly, in soft pencil (so that it can later be erased), on the appropriate map(s). Fig. 1 illustrates the special graph paper which is designed for microwave path-plotting and is known as earth profile paper.

The actual limit of the radio horizon over the ideal flat surfaced earth is not line of sight but "line of sight plus one third" or 4/3 radius. This is because of the atmospheric effects, and is a phenomenon observable at all non-ionospheric frequencies (i.e. roughly 30MHz upwards, certainly at 70MHz and above) under normal, unstable atmospheric conditions.

Obviously this path length is effectively increased with increasing altitude and relates to the Earth's curvature where line of sight to the radio horizon under normal atmospheric conditions is given by

$$D \text{ (miles)} = \sqrt{2H\text{(feet)}}$$
$$\text{or } D \text{ (km)} = \sqrt{17H\text{(metres)}}$$

Allowing for atmospheric and other effects the curvature of the earth plus 1/3 produces one axis of the grid of the paper and the altitude of the receiving or transmitting station are plotted on the other axis. The height of each station is known and should be plotted on the paper at the appropriate distance apart. If a straight line joining these two points passes through or below the zero altitude curve, then the path is patently non-optical and unless enhanced propagation modes (e.g. super-refraction over water or rain scatter on inversion layers over land) exist, transmission and reception across such a path will not work. If the path is apparently "optical" i.e. the straight line passes above the zero line, then the path will be possible barring obstructions.

Now search along the path line drawn on the map and look for spot altitudes or contour lines at, say, 8km intervals (or maybe closer together in the vicinity of a suspect obstruction), plotting these on the graph at the appropriate distance from the "home" station. Joining these points together will produce a crude profile (section) of the land along the path. If there are any points higher than the "optical" line, then obstructions exist and the path may not be workable with simple wide-band equipment such as the *PW* Exe. Much will depend on the position and bearing of the obstruction between the two stations.

If one *small* obstruction exists the path may well be worth trying; if two or more exist then it is unlikely that it is worth trying with wide-band equipment unless use can be made of high power, enhanced propagation or the deliberate use of off-path reflectors such as large buildings, hills or other large structures. To be effective the reflector must be "visible" to each station even though each station cannot "see" the other (Fig. 2).

It is difficult to predict results without elaborate knowledge of equipment capability and system gain/loss which is outside the scope of this article. Suffice it to say that one small obstruction is worth trying, two or more are not. Similarly "grazing" paths may be worth trying at several different times during a cumulative period or successive periods, since weather, atmosphere and troposphere may all change to enhance signals and make a contact possible.

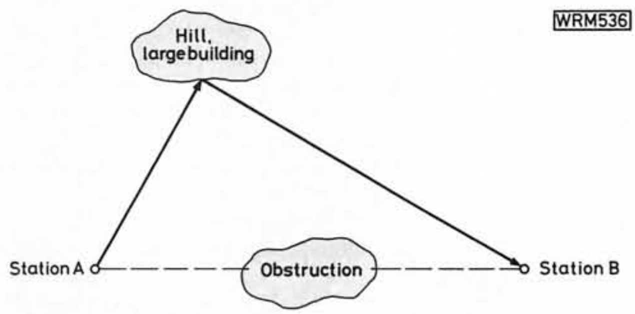


Fig. 2: Because of the large obstruction on the direct path A to B the stations cannot work each other. An off-path reflector, in this case a hill, is "visible" to both stations. Although station A cannot "see" station B a contact might be possible as shown. A classical example of this was a contact between G3PHO and G8AFC about 3km apart on Winter Hill. Direct contact was impossible but a good contact resulted from the use of power station cooling towers some 34km from each station

Also due to Fresnel zones (a different effect) it may be possible to make an obstructed path work by moving, literally, a few feet and trying again! The moral about a "possible" path is "suck-it-and-see", perhaps on several occasions.

On Site

If it is intended to operate from or near a car, then a quick compass survey on arrival on site and reference to the maps and path list will tell you where best to park the car so that it does not obscure the directions to be worked.

Next, erect the talk-back antenna and mast and the microwave equipment, guying both firmly and in such a position that both can be operated simultaneously. Terylene or Nylon heavy-duty "string" is plenty strong enough for guys and heavy-duty tent pegs or pieces of angle iron are cheap and dispensable, but don't forget a hammer! Check that all equipment is functional, not forgetting to level the dish with the spirit level.

Talk-Back

Talk-back on 144MHz is an aid to setting up the contact. Four or five years of continuous growth in microwave operating has firmly established talk-back on s.s.b., 144·33MHz calling, as the universal mode. After establishing contact it is common to move to a frequency between 144·160 and 144·190MHz so that the microwave calling channel is left vacant for others to use. The use of modes other than s.s.b. or bands other than 144MHz is not viewed with favour, as any split from the current well-established procedure can only lead to an "us and them" situation which is clearly undesirable. It may surprise the newcomer to learn that (for a variety of reasons) signals are often much weaker on 144MHz than on 10GHz, hence it is often necessary to use the 12dB plus advantage of s.s.b. over f.m. to even make the talk-back link work properly!

Operation

So now you are ready to operate — or are you? One advantage of operating from a car, especially a hatch-back or estate type vehicle, is that the talk-back equipment, log, maps, food, drinks and spare clothing can be protected from the weather by keeping them in the car "boot". The microwave gear is not quite so easy; one solution is to slip a large heavy-duty polythene bag (e.g. a discarded fertiliser bag) over the transceiver, dish and tripod, tying it in place with a length of spare guy-rope should a heavy shower occur.

Remember that, at least at the moment, wide-band transmissions invariably take place in the 10·030 to 10·130GHz range, whilst narrow-band modes occupy the sector 10·368 to 10·389GHz with "preferred" frequencies between 10·3681 and 10·3683GHz. However, the beginner is unlikely to have narrow-band equipment and should thus concentrate on the lower part of the band except perhaps for beacon reception or cross-band (144MHz/10GHz) contacts.

Start by listening on 144·33MHz for stations calling "CQ for 10GHz contacts" and reply or, if no-one is heard, put out such a call. Once you have a reply, move off onto a mutually agreed frequency and obtain the following information from the other operator:

1) Where is the station? (QTH Locator, actual location and NGR is useful)
2) Is the equipment wide-band or narrow-band?
3) What is the nominal transmit frequency?
3) Over what frequency range is reception best?

You will, no doubt, be asked for similar information. Such an exchange will allow both operators to decide whether a 10GHz contact is possible or whether it is not worth wasting each other's time. If a contact seems possible then agree who is to transmit first—usually it will be the more powerfully equipped station in terms of power or dish size or both.

Assuming it is the distant station, set your own dish on the precalculated bearing and ask for carrier plus tone. Set your Gunn oscillator to the other station's transmit frequency plus or minus your i.f., i.e. to receive a signal on 10·050GHz with a 100MHz i.f. the Gunn oscillator could be on either 9·950GHz or 10·150GHz. With most equipment (the Exe for instance) it will not normally be possible to tune the Gunn much below 10GHz, so the selection of frequency essentially becomes receive frequency desired *plus* i.f.

Tune the oscillator slowly a few tens of MHz either side of the expected signal until an incoming modulated carrier is heard. Adjust the dish slightly to optimise the incoming signal strength and then, on 144MHz, ask the other station to "identify" by switching tone on and off a few times. It is often helpful to relay the incoming 10GHz signal back to the transmitting station via the 144MHz link so that the dish setting at the transmitting end can also be optimised. Once identified and optimised the other station can pass the exchange necessary and you should confirm (on 144MHz) that this has been received.

Now reverse the procedure, resetting your Gunn oscillator to a frequency suitable for the distant station to receive and apply your tone. The other station will search for and find your signal and ask you to "identify". If all goes well, you will soon be asked for your information which, of course, must be transmitted on 10GHz.

It should be noted that whilst full duplex operation is possible with the *PW* Exe, other operators may well be using different i.f.s which will make such operation impossible—indeed duplex operation is the exception to the rule rather than the rule.

Finally, the information exchange is confirmed on 10GHz and the contact is complete. One thing which should be said about microwave contest operation is that it is a relatively leisurely affair, totally unlike the rat-race of h.f. and v.h.f. contests. The beginner will usually find that the more experienced operator is willing to spend quite a lot of time and patience in setting up a contact which could, depending on skill and accuracy of bearing and frequency setting, take anything from a few minutes to an hour or more to complete.

Table 3—Equipment List

Path list	Microwave transceiver
Licence copy/log book	Microwave dish (or other antenna)
Compass	Tripod (or other mounting) with guys
Maps	Tools (12V soldering iron, pliers, etc.)
Spirit-level	Warm wind-proof waterproof clothing and footwear (plus spares in car)
Note pad and pens	Food and hot drinks ("Thermos" or cooking stove)
Talk-back rig	Toilet paper
Talk-back antenna, mast and guys	Other items (individual preference)—binoculars, camera, cassette recorder, etc.
Fully charged batteries (operation away from car)	
Torch or hand lantern	
Large plastic bags	

During and After Operation

One exciting aspect of microwave operation is that very often the operators are breaking new ground, i.e. they are trying to contact one another over a path which is new and unproven. Despite carefully examining the maps, there may be unpredicted obstructions which turn that "probable" path into a "possible" or even "impossible" path.

Again, as already mentioned, one should not perhaps be deterred from trying the apparently "impossible" path because unpredicted conditions may just make it work—it may be less likely with wide-band modes than with narrow-band modes because of the increased sensitivity of the latter, but enhanced propagation (even rain scatter) can be observed equally well whatever mode.

For these reasons the operator is urged to keep a detailed and systematic log of all contacts, successful and unsuccessful, weather conditions and the like, which can later, at leisure, be analysed for the operator's (and other operators') benefit. By systematically accumulating such data the operator can add to our knowledge of propagation at such frequencies. This type of data is not available as a result of professional studies, for such studies are seldom undertaken on anything except a very specific path using high-performance equipment.

By contrast, the amateur will be attempting to establish communication over paths and distances not considered professionally or commercially viable and often with relatively simple and inefficient equipment. Thus operating technique is of vital importance and the keeping of such logs is part of this technique. The obvious advantage to this is that once worked out, path bearings and distances need not be calculated again.

It may be that data accumulated will provide the operator with confidence that the equipment is operating to full efficiency or perhaps reveal defects in both equipment and operating technique!

If several stations operate from one site (not uncommon) then a strict degree of discipline will need to be exercised in order that all operators can work without mutual interference; this means deciding who operates in what order and switch off all 10GHz equipment other than that in use by the one station attemping a contact. Nothing is more devastating than to have several microwave receivers searching up and down the band whilst you are searching for that elusive weak signal. This is almost certainly where the notion that "beginners are not welcome at cumulative periods" arises.

During the cumulative season (and after) it is desirable that the data accumulated be communicated to other operators. This is best achieved by making an entry for the 10GHz cumulatives (who knows, you may win an award!) or at least submitting a check log for analysis. The receipt of such information will be most welcome as a contribution to the understanding of microwave propagation and the general benefit of amateur radio.

Please do make the effort; it costs little and adds much to our knowledge and credibility. Indeed it may be said that such is the difference between Amateur radio and CB; "contributing to knowledge and self-training in radio communication techniques" are a very real part of the former hobby and not of the latter.

What of the Future?

After the first "season" of operating the newcomer should now be reasonably skilled in map reading, bearing setting, distance calculation and practical operation. What is there left to do? The answer is—plenty! There are other bands to explore, new paths to work, base station to base station experiments, encouragement and help to more new operators and so on.

By now the newcomer may perhaps be ready to undertake construction of equipment for the more elaborate but much more "potent" narrow-band modes—this itself can open up completely new horizons so to speak. Then there is the wide open subject of space communication at microwave frequencies—this is a subject which (with the advent of the UOSAT package) has only just started to be investigated. It is hoped that this thumb-nail sketch of possible activities will fire the imagination—wide-band data, TV, in-band and cross-band repeaters, beacons, propagation studies—the list is almost endless and the approach needed is certainly different to the other aspects of amateur radio!

Within a short space of time it is expected that there will be vast improvements in amateur microwave equipment resulting from the availability of cheap solid-state low noise devices and dish antennas which will inevitably arise from the growth of direct-satellite TV broadcasting. Such active devices based on Gallium Arsenide technology are already tumbling in price and are within the reach of the more dedicated amateur.

It is also expected that there will be an enormous growth in the volume of amateur microwave literature and designs; the microwave field is the one area of amateur radio in which huge growth may be expected in the next five to ten years in contrast to the h.f. and v.h.f. bands because it is probably true to say that these areas have already been fully exploited by the advent of the "black-box".

In summary, to the writer at least, microwave construction and operating will remain the challenge for some years to come: it is "true" amateur radio, strongly reminiscent of his early days with simple home-built (valved) equipment where it was possible to communicate effectively with a minimum of complication and expense. This is still true in the microwave field.

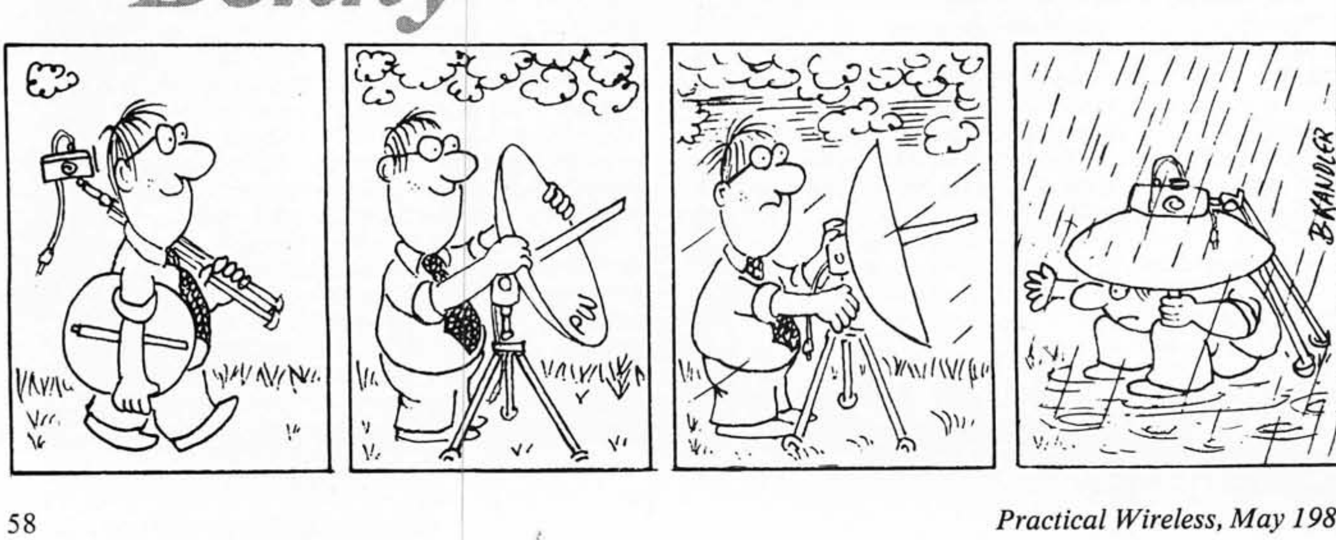
Finally, the newcomer is strongly urged to subscribe to or borrow the various sources of information briefly listed below and to contact fellow enthusiasts from whom much help will be forthcoming.

My thanks to Petra Suckling, G4KGC, for reading, criticising and correcting the draft of this article. ●

Reading List

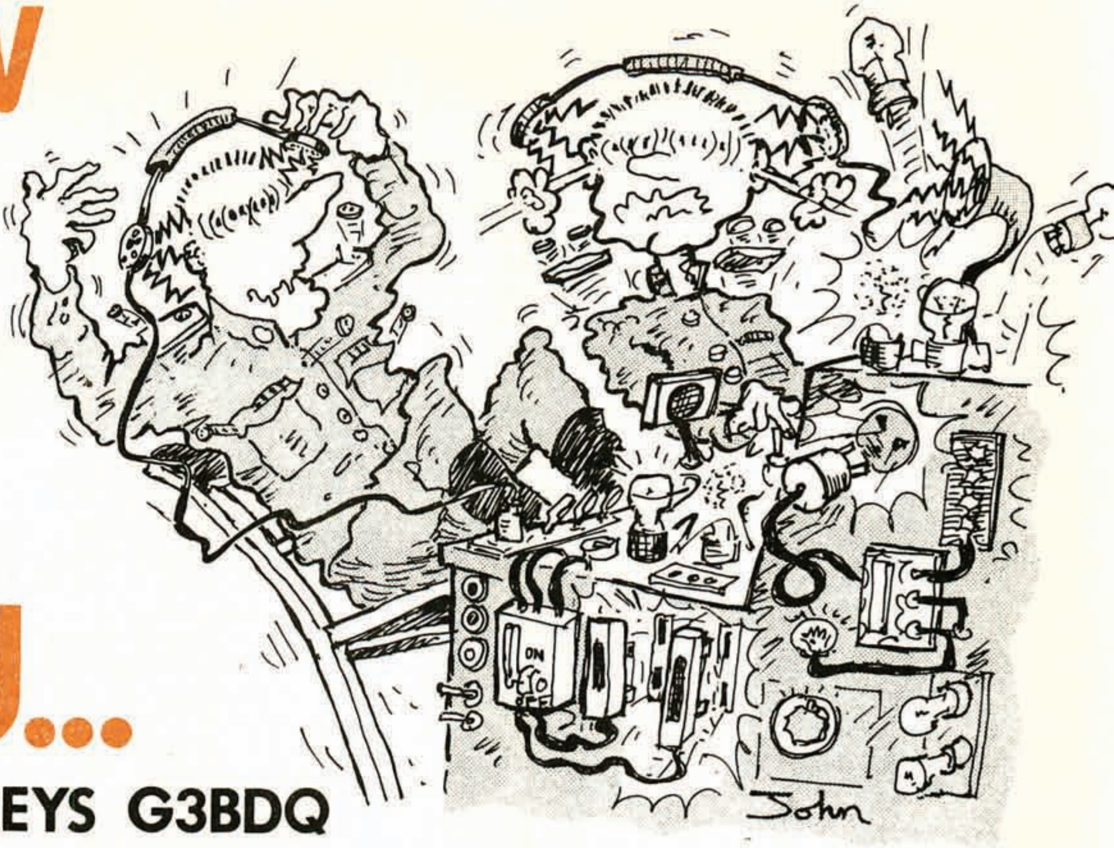
1) RSGB *Radio Communications* Microwave Column and other articles (RSGB, Alma House, Cranborne Road, Potters Bar, Herts. EN6 3JW)
2) RSGB *Microwave Newsletter* (10 issues/year, as above)
3) RSGB *VHF/UHF Handbook*, 3rd Edition
4) *VHF Communications* (4 issues per year, commercial suppliers)
5) *Dubus Info* (4 issues per year, UK Agent G3NSM)

Benny



now it can be told...

JOHN D. HEYS G3BDQ



Forty-six years ago this month an event took place which deserves more than a passing mention in the annals of amateur radio. It is odd that one of the biggest stories relating to our hobby was kept a close secret for so long, but it appears that "security" and the natural wishes of the leading participants and organisers of the affair to remain anonymous has until now perpetuated the news "blackout". All the principals in the story which follows are now dead, so it is fitting that their actions, which have had a lasting and beneficial influence upon the amateur fraternity's fight to keep, guard and hold exclusively our precious bands, should be reported.

During 1935, the German High Command, which was already under the strict control of the ruling Nazi Party, sought a cheap but effective radio system that would enable small military units to keep a listening watch with the Abwehr HQ in Berlin. The system desired was to be free from jamming and enemy interference. Eventually a scheme was approved and work began during the autumn. It soon started operations in a limited form and by the end of 1936 was virtually complete.

It was essentially a radio system based upon s.s.b. transmitting techniques and simple receivers using what is now called "direct conversion". Elegant in concept, the network used communications concepts far in advance of those extant at that time. The receivers were small, lightweight and basic. They had encapsulated pre-tuned "front-end" circuits with specially developed double-diode-triode valves to act as balanced detector and crystal controlled oscillator. The detector was followed by a high gain twin-triode a.f. amplifier and suitable filter.

The crystal oscillator could be "tweaked" a few hundred hertz about its nominal frequency, and this was the only tuning control. There were both battery and mains operated versions of the receiver, and all the valves were small metal types similar to the "Nuvistor" valves of the 1960's.

Being so simple the receivers were rugged, and with the exception of the crystals (which depended upon a secret mass importation of special quartz from Brazil) were cheap to produce. The transmitter station was high-powered and normally radiated a clean unmodulated carrier which was broken at minute intervals by the letters ABW in high-speed Morse. Single sideband telephony with much reduced carrier could be transmitted when needed and also normal c.w. telegraphy. Reception of the s.s.b. was easily accomplished by unskilled personnel, who found its resolution simpler than tuning in broadcast stations on their home receivers. The receiver antennas suggested were just end-fed five metre wires, which could be slung up into any convenient tree or fixed to any suitable vertical support. The transmissions were vertically polarised and the intent was to provide an extremely strong ground wave over the whole of Germany and most of Western Europe.

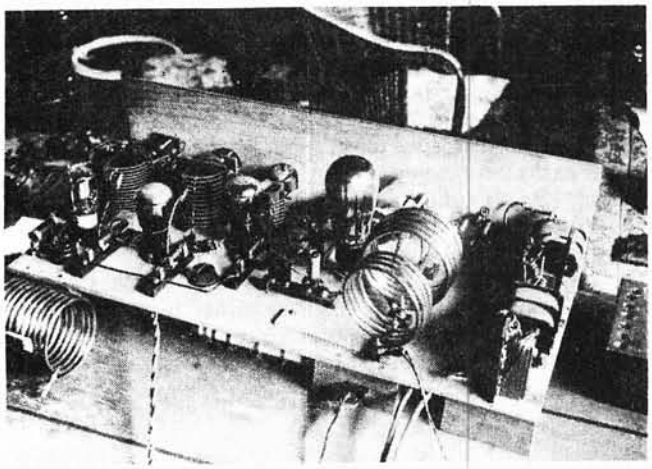
The High-Power Transmitters

Two transmitters were built and set up. Each had a staggering power output of 10MW on c.w. At that time this represented an unprecedented power level and showed that German technology was in some respects ahead of much of the world. The number one station was located on Hohen-Neuffen peak at an altitude of 742m. This mountain lies in the southern part of Germany and forms part of the Rauhe Alp in the part called Swabia. The second or "stand-by" station was on an island in a lake to the east of Allenstein, in what was then East Prussia, and was almost identical in design to the first station. Both transmitters were linked by a unique system which enabled one discrete frequency to be generated (a caesium clock with suitable dividers was the frequency source and it ensured first-rate stability) and used by both stations, although they were separated by many hundreds of kilometres.

The enormous power levels needed special cooling arrangements. At the East Prussian site water from the lake was circulated around the many output and driver valves. In addition, several hundreds of tonnes of salt were dumped into the lake to increase its effectiveness as a ground plane. It was rumoured that when the station was working the lake temperature rose dramatically, and that, together with its newly found salinity, the water acquired some of the characteristics of the Dead Sea! The transmitting antennas were simple, but massive, dipoles at the top of 270m towers and were fed by a special water-cooled coaxial cable, which was largely air spaced and had an outside diameter of a metre.

Drastic Effects

Unfortunately for all the amateur fraternity, the frequency chosen for the new ABW system was 14·141MHz! This was almost slap in the middle of the twenty metre band, the chief DX band at that time. Although the intent was to provide a powerful groundwave over the service area, much of the 10MW output power went skywards at low angles and returned hundreds or thousands of miles from Germany. The years 1936 and 1937 were the peak points of Solar Cycle 17, and the effect upon the twenty metre band can only be imagined. The so-called "woodpecker" QRM experienced at the present time is only a minor irritation by comparison. Anyone who has built and used a t.r.f. receiver must be aware of the swamp effect produced by strong signals. Fairly strong signals necessitated a judicious increase in the reaction or regeneration control and very strong signals (such as the pick-up from one's transmitter oscillator) prevented oscillation for many kHz on either side of the frequency and produced a "hole" in the band where nothing could be received.



A rig of the mid-thirties. Many such rigs were used in the anti-ABW operation

The ABW megawatts killed straight receivers all over the world and made operation on 14MHz only possible near the band edges. The rather more fortunate owners of superhets had similar problems, for the front ends of moderately priced receivers did not have an r.f. stage and big signal capabilities on even the highly priced imported American sets were limited. The Abwehr transmitters virtually closed down the twenty metre band for amateur use, and all over the globe desperate operators could not understand the reason for or what the intruder was. An official silence and a heavy veil of secrecy (which has never until now been lifted) fell over the whole business. All seemed lost!

The author, then a keen schoolboy s.w.l., was using a home-built 1-V-1 receiver, and was mystified by his inability to make the detector stage oscillate over much of the twenty metre band. There were also funny noises which seemed impossible to resolve when the German stations switched over to s.s.b. It must have been particularly frustrating for the German amateurs who lived within 160km or so of the ABW sites. The radiated power was so intense that a simple tuned circuit coupled to a half wave dipole could activate a 60W light bulb anywhere within a 30km radius from the transmitter positions. This knowledge was exploited by several experimenters, but their ability to acquire free illumination by night and day came to an end when some gaps in the transmitter radiation patterns were noticed. The free-booters were discovered and severely dealt with by the authorities.

The Meeting and a Plan

Fortunately for amateur radio, there was at that time someone who had the necessary scientific skills, drive and organising ability to counter the menace of the German Army radio system. Arabackle Oblifork[1], Albanian National with a Georgian mother, polymath, electrical engineer and amateur radio expert, must be remembered with gratitude for all time as the saviour of the twenty metre amateur band. Oblifork, licensed ZA1AO (formerly A1A) was instrumental in interesting his Head of State, King Zog of Albania, in the hobby, and set up for His Majesty (callsign ZA1Z) one of the finest stations in the world.

The story of Oblifork's humiliation of the South African Railway Authority[2] will serve to illustrate that he was a force to be reckoned with, and the tale is worth re-telling, for there must be many younger amateurs who know nothing of the affair.

During the early 1920's, Oblifork was commissioned to plan the electrification of a particularly long stretch of railway line in South Africa. For some now unknown reason, a bitter and mutual antagonism arose between Oblifork and his employers and he decided to teach the South African Railways a lesson they would never forget. He proceeded with his work and eventually the overhead electrification was completed. At the first switching on of power with no trains on the track all the fuses blew. Oblifork was then in Switzerland and could not be called upon for advice. Close examination of the 1460km of line revealed no faults or short circuits, so the Chief Engineer ordered that the fuse ratings be multiplied by the factor of four. A little later when power was re-applied the effect was catastrophic. The alternators at the newly built power station blew up, although there was seemingly no load or fault on the line. Arabackle had arranged that the total length of the overhead wires, allowing for velocity factor, made them an open-ended quarter wave stub at the supply frequency of 50Hz! The resultant replacement of heavy power plant from Manchester helped the unemployment problems of that city during the depression.

Oblifork arranged an urgent and secret meeting of the world's leading radio amateurs which was to be held at his London laboratory. The only item on the agenda was the formation of a plan to counter and destroy the effects of the ABW transmitters which Oblifork had learned about from his German informants.

The meeting took place in December 1936, and the small but influential band of amateurs there learned of Oblifork's plan. Radio propagation and the mechanics of reflection and refraction had been a pet enthusiasm of Oblifork for many years, and his "Electron density/Radiation intensity" theorem was to prove the undoing of the German threat. The now well-known impossibility of communication with returning astronauts is a phenomenon known to be brought about by re-entry friction and the generation of plasma. Oblifork's theorem can be used to determine the parameters of re-entry communications and the frequencies needed and it shows how he was many years ahead of his contemporaries in his thinking.

His assembled guests were told that nothing could be done to prevent the radiation of the ground wave signals from Germany but that with the adoption of his special measures the skywaves could be eliminated. He reckoned that the radiated power of an ABW transmitter plus a similar external power level on the same frequency would "take-out" the ionosphere and prevent all reflection and refraction of signals on that frequency for two months. After that period the effect should gradually disappear. By organising most of the amateurs of the world (outside the Axis Block) into a massive combined jamming force the worst features of the Abwehr stations would be eliminated for a time, and this would without doubt reveal to the German High Command that even their uniquely high-powered transmitters could be interfered with. Oblifork set a date for the operation and the meeting broke up on the evening of Friday, December 18. The International Freemasonry of amateur radio then secretly and without fuss swung into active preparation.

The Operation is Prepared

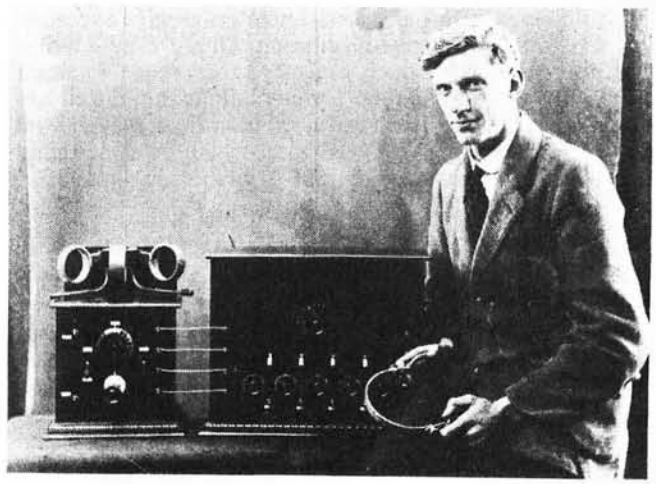
Unfortunately, many amateurs used crystal controlled transmitters at that time and could not use their normally set up rigs on the ABW frequency. Most, however, had the skill to change their oscillators temporarily into self-excited jobs, and the old t.a.t.g. (tuned anode tuned grid) circuit came once more into its own. Some were fortunate in owning a Meissner "Signal Shifter", one of the first commercially available v.f.o.s. Others resurrected from attics and lumber rooms the high-power oscillators used in former days as one valve transmitters. Even more fortunate were the really high-powered stations. For the most part they were American and even in the mid-thirties "Californian Kilowatts" were not uncommon. Here in the UK was Gerry Marcuse G2NM[3] whose very high-powered (and at first unlicensed!) station initiated the Empire Broadcasting network. Gerry, the "Caterham Wizard", was only too eager to take part in the exercise; indeed, he was one of the select few at the December meeting in London. A number of British and overseas amateurs held posts of responsibility at broadcasting and other commercial stations. They, together with many in charge of powerful military transmitters, agreed to help.

Perhaps our greatest contribution resulted from the efforts of Dr Eric Megaw G6MU[4] (later to be GM6MU when Scotland was granted a distinctive prefix). Megaw was what would today be described as an electronic "whizz-kid". He was licensed when still a schoolboy, and was one of the leading British DX chasers. During the early 30's Megaw was doing research into electron oscillators, and is now best remembered officially for work in developing the magnetron. Without the magnetron, high-powered pulse centimetric radar could not have been possible during the last war, and it was a British success story. For this important work Megaw was awarded the CBE and at the time of his death in early middle age in 1956 was Chief Officer in the Royal Naval Scientific Service. He, too, had been present at Oblifork's meeting and had promised help. In an outbuilding at his research establishment Megaw built a crude but giant magnetron device.

It filled the building, and was independent of the mains supply, using instead the mini-power station on the site. It used enormous electro-magnets and when in operation could generate pulses with a peak power of 8MW at a p.r.f. (pulse repetition frequency) of 400Hz and a pulse width of 50μs. Its effect later when used on the 14MHz band was devastating and contributed largely to the success of the final operation. To test the magnetron oscillator, Megaw used a section of nearby salt marsh as a dummy load. It is said that for many winter nights the local poachers and wildfowlers were astonished at the unseasonal night temperatures, and the thick mists which swirled around at knee height!

The Big Pile-Up

A little before 0500GMT on Thursday 1 April 1937 the author plugged in the twenty metre coils of his battery-powered t.r.f. receiver in yet another attempt to pick up Andrew Young VR6AY on Pitcairn Island. In s.w.l. circles it was well-known that VR6AY operated near the h.f. band edge well away from the mid-band QRM which we now know was from the German Abwehr stations. Andrew was reputed to QSL 100 per cent on receipt of useful reports and to log him was every young listener's dream. That morning there was nothing heard from Pitcairn and the band (apart from the "thing" on 14·141MHz) appeared quite dead. The logging of one of the Spanish Civil War "pirate" broadcasters down in the c.w. sector and an Italian operator calling seemingly endless CQ's proved that a radio blackout was not the reason for the band's emptiness.



Arabackle Oblifork. A rare study of the Albanian at his home station in Tirana 1926

At 0500 precisely a musical tone which was not strictly tunable came up and it became much stronger near the middle of the band and could be heard even in the dead section caused by the powerful intruder. This dead section rapidly extended and reached almost to each band edge. In desperation, the antenna, a simple dipole, was taken off the receiver and at once the reaction control had some effect. Without an antenna and with the detector in oscillation the amazed listener heard for about five minutes a fantastic cacophony of carriers, beat notes, clicks, hums and an all-prevailing 400Hz tone. For those few minutes most of the amateur fraternity were on or near the frequency pumping out every watt they could muster. There was also Megaw and his 8MW of pulse and hundreds of irregular transmissions from broadcast, military and other transmitters "borrowed" from their normal duties for just a few minutes and coaxed onto 14MHz. By 0505 the band suddenly was quiet and when the dipole was reconnected the receiver behaved normally. There was just one signal, a strong S9 c.w. carrier from the ground wave of ABW. Only its ground wave came in and it was possible to tune normally over the whole band. A few more minutes of fruitless tuning had to be followed by switch off, breakfast and preparations for school.

That was the last day anything was heard from either of the two German transmitters. The massive welter or barrage of QRM on their frequency, which was, of course, fixed and could not be altered, had rapidly induced the Abwehr signals chiefs, on the advice of their technical experts, to stop all further operations. The system was fallible and could be jammed. Development of another quite different system began soon after, but it is understood that when hostilities began in 1939 Germany had still not developed a satisfactory replacement for the ABW idea.

Oblifork's plan had worked perfectly, but it was only some weeks later that an interesting fact came to light. Experts concerned with m.u.f. (maximum usable frequency) observations using the new radio reflection techniques with frequency sweep transmitters-receivers discovered that no ionospheric reflections could be gained on one specific frequency. This they deduced was on 14·141MHz. Even months later, indeed to this day, there remains a "dead spot" near the centre of the 14MHz amateur band where what goes up never comes down!

Modern frequency measurements show that the exact frequency of the "hole" is 14·141407MHz. Oblifork's theorem specified that a total power radiation of approximately 20MW would produce a temporary cessation of ionospheric reflection at the ABW frequency. The total level of power hitting the ionosphere must have exceeded this amount, and after consultation, Oblifork admitted a rider to his theorem which suggested that above a certain critical power level the time became infinite and the effects would therefore be permanent. This critical power level was computed as 25·7MW, a total which most certainly was achieved or exceeded on that April morning in 1937.

Conclusion

The train of events outlined in this story must seem bizarre or even incredible to many of the present generation of radio amateurs and s.w.l.s; for the "hole" in the band is just 0·5Hz wide and is unnoticed by operators on the 14MHz band. The stability of our receivers and transmitters is not good enough to lock on to the "hole" frequency and for all practical purposes it may be ignored.

The unsophisticated may be prompted to wonder how the author gained this hitherto undisclosed information. Confession is said to be good for the soul, and it must be admitted that all the details of the operation were gained second-hand and not from anyone actually involved in its inception. There is no doubt in the author's mind that his late friend and near neighbour "Tommy" Thomas G6QB would have had no reason to re-tell the Pile-up story if he did not himself believe it.

For many years "Tommy" was the compiler of *DX Commentary* in *The Short Wave Magazine*, and perusal of those columns will reveal many references to Arabackle Oblifork. One day when the moment was propitious the author induced 'QB to tell something of that odd Albanian gentleman, and that was when the full story was revealed.

It seems that Oblifork and "Tommy" met when both were working at one of the RAF coastal radar sites during the last war. Oblifork was a "boffin" attached to the Royal Aircraft Establishment at Farnborough during much of the war and his work sometimes led him to the out-stations. The pair had a lot in common, both being pre-war amateurs for many years, and they soon began to reminisce over drinks at a village hostelry one evening. Later that night, Oblifork told his companion much of what has been re-told in these columns and made "Tommy" swear to its secrecy. After the war, Oblifork defected and slipped through the Iron Curtain to the USSR sometime during 1946. There he became actively engaged upon plasma physics, space communications, laser techniques and also surprisingly the setting up of the post-war network of Russian Klub stations over the USSR.

One day, "Tommy" showed me a QSL card relating to a contact in 1956 with Arabackle, who at that time was operating and testing a UL7K . . station. They kept in touch for many years and each Christmas '6QB received a card with scribbled greetings from him. Time runs on, and it must be assumed that ZA1AO has now joined the ranks of the silent keys. Without doubt he must also be rated a Hero of the Soviet Union and we must belatedly hail the departed Albanian as the saviour of the twenty metre band! ●

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FT-ONE

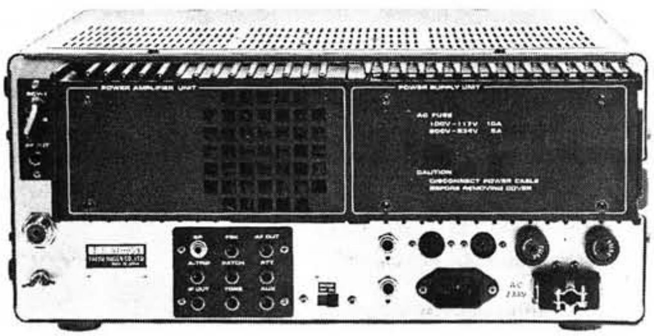
▶▶▶continued from page 53

very effective, as already mentioned. For a synthesised dual-conversion receiver, the FT-ONE seems remarkably free of spurious responses, those that are there being too weak to cause any real problems. Getting the best out of the frequency setting systems does take some practice—there are so many ways of achieving the same end.

Now to the dislikes. A minor one first, which is that the row of switches under the two meters have long cylindrical toggles which get in the way of operating the control knobs beneath them when the switches are in the "down" position. The switches are smart, but not too practical in that situation.

The second one concerns the noise from the cooling fan. This cools both the transmitter p.a. and the power supply, which is of the switch-mode type, but it runs all the time, on both transmit and receive. I found it really annoying when wanting to do a bit of quiet listening without headphones on, and wish it could be switched off or at least slowed down on receive.

I understand that as a result of similar comments from other users, Yaesu have introduced a modification to new production so that the fan runs only whilst on transmit or if the heatsink temperature should rise too high at any other time. Owners of existing FT-ONEs can get details of this mod from the Yaesu importers.



A back-panel view of the FT-ONE

Price

At the time of writing, the FT-ONE in its basic form (no options fitted) is around £1350 including VAT and carriage. However, this is very dependent on the current Yen/Pound exchange rate and you should contact the dealer of your choice to check on the latest situation. Incidentally, it is worth mentioning in view of the frequent moans about the high price of imported amateur radio equipment in the UK, that quite a bit of the fall in the value of the Pound in recent months had been absorbed by the importers.

Our thanks to **South Midlands Communications Ltd., 36-38 Rumbridge Street, Totton, Southampton, telephone 0703 867333,** for the loan of the review transceiver.

Geoff Arnold

For your Diary . . .

ELECTRONIC HOBBIES FAIR

Alexandra Pavilion, London N22

October 27–30, 1983

ARE THE VOLTAGES CORRECT?—12

▶▶▶continued from page 35

A sixteen-pin i.c. would be needed to house two of the J-Ks of the type illustrated in Fig. 12.9—seven connections each plus the two power supply connections. If SDs are omitted from both J-Ks, however, they could fit into a fourteen-pin package.

Measured logic *1* inputs and outputs are typically around **+3·4V** and logic *0* around **+0·05V.** When inputs float they usually become logic *1* and the device behaves accordingly, but when measured a typical voltage reading would be about **+0·26V,** even with an electronic meter.

To test a J-K it may be possible to disable the clock pulses and impose logic levels where desired, otherwise the i.c. can be removed and tested as described for testing gates. Again the only test criterion is whether or not the J-K obeys its truth table.

There are several variations of J-K available, the one described being considered the most common. The little circles on the CP, SD and CD inputs of Fig. 12.9(a) indicate "active *0*" while the absence of these on the other connections indicate "active *1*". The little triangle on the CP input indicates "active only during a movement between logic levels". Unfortunately, different manufacturers use (or have used in the past) different symbols and it is often impossible to be sure which type of J-K a certain symbol is supposed to represent without more information than the symbol itself.

There are no problems this month, as there are only two voltage levels normally encountered in digital circuits.

Next month we will take a look at the voltages involved in thermionic valve circuits.

ANTENNAS—4

▶▶▶continued from page 44

The larger pattern Fig. 4.5(b) is *from the same antenna* plotted independently by the author. Again the beam width at −3dB is 34 degrees which at least confirms the maker's claim for the polar pattern. The actual gain factor given by the maker of this antenna is 13·7dBd so we are within 1dB. The difference is due to the *cross section* area at −3dB being slightly elliptical and approximately 1300 square degrees which gives a gain of 13·9dBd i.e., to within 0·2dB of the maker's claim. Two other well-known v.h.f. beams have been independently tested this way and the gain factors given by the makers proved to be correct—*so some can be relied upon to provide the performance that is claimed.*

Part 5 of this series will investigate multiple wavelength long wire antennas.

References

(1) *The ARRL Antenna Handbook* (Driven arrays. Chapter 4)
(2) *The Trap Aerial—in Theory and Practice.* By Carl Mosley. RSGB Bulletin. May 1960.
(3) *Beam Antenna Handbook.* 5th Ed: by W. I. Orr W6SAI. Radio Publications Inc. (Available RSGB book dept).
(4) *HF Antennas for All Locations.* By L. A. Moxon G6XN. RSGB Publication.

Mods

IMPORTANT—The ideas presented here are suggestions only, and as they are untried by this magazine, we cannot accept responsibility for any resultant damage, however caused. Before alterations are attempted, care should be taken to ensure that any guarantee is not invalidated, and it should also be borne in mind that modifications usually have an adverse effect on resale prices. In cases where specialist skills or equipment are needed, most dealers will undertake the work for a reasonable fee.

No. 22
Roger Hall G8TNT (Sam)

For the last few months the Mods column has been devoted to the Yaesu FT-290R and this has meant that there has not been room to publish a Wanted section. Consequently this month's page will be used to try and help some of the readers who have written in with requests for mods.

Mr Kemp of Norwich has a Yaesu **FT-480R** and he would like to know if it is possible to fit a small battery so that he can retain the memories when his set is disconnected from the power supply. He also wants any other mods for this set.

Mr Gardiner has written in from Doncaster to ask if the **R-517** air band monitor can be modified to cover the 144MHz amateur band. His receiver will go up to 143MHz but no further.

Mr Ecott G8SSI of Croydon has a Yaesu **FT-270R** and a Trio **TS-700G** and he is interested in any mods for these sets, especially suggestions for improving the sensitivity of the Trio.

Matthew Cornwall (I think I've deciphered the name correctly) wrote in to ask for mods for the Yaesu **FRG-7.** He has already fitted a 2·5kHz filter and switchable a.g.c. and now wants to know if there are any other mods that he could carry out. I'm sure that there are lots Matthew and in answer to the query at the end of your letter — yes please, I certainly would like details of your mod.

Alan G3VRI wrote because he has a Trio **TR-2300** that he would like to modify. He uses it in conjunction with a linear amplifier that was designed to give 50W output for 2W input. As the TR-2300 only gives 1W, Alan is not making full use of his amplifier and he has asked if anyone knows how to make this set give out more power. He has heard that there is a mod that involves using a two-stage i.c. and a variable resistor, but he has not been able to find out how it is done.

Mike Barfoot of Treorchy wrote in following my comments in the April 1982 column when I mentioned the possibility of converting CB rigs to 28MHz (10m) operation. Unfortunately I cannot pass on any of these mods because the legal position has not yet been clarified. I wrote to the Home Office to ask if it is legal to modify legally imported a.m./s.s.b. rigs but they have not replied yet. I gather that this is a tricky legal question and until it is resolved I cannot suggest that you do it. However, modifying legal f.m. rigs is acceptable but the problem here is that the majority of rigs will not work on 28MHz, they are fixed on 27MHz. There are one or two types that can be converted and we hope to publish an article on this at a later date.

I have received letters from far too many people to mention asking about mods for **scanners.** I think that I must now close the file on the SX-200N as it seems certain that it is not possible to make this set scan out of band. The importers, distributors and numerous users have all tried to trick the SX-200N into scanning through the gaps in its coverage but, as yet, no-one has succeeded and the general consensus of opinion is that the internal programming is rigid and cannot be altered. Similarly, the new Bearcat 20/20 also seems to be fixed in its coverage. Two of the older Bearcats, the 220FB and the 250FB, can be tricked quite easily (see Mods 14). The 220FB can be made to scan from one end of its range to the other with no gaps at all but the 250FB has a gap between 91MHz and 131MHz that seems impossible to fill. The new Bearcat 100 can also be programmed to scan through some of its gaps and I hope to be able to publish the details soon.

If you have a mod that you would like to pass on or if you want me to publish a request for a mod, please write to me at the address below but please, please do not enclose a stamped addressed envelope, stamps or an IRC because, much as I would like to, I cannot reply to individual queries. If you know that the mod you want has already been published, the only way that you can get a copy of it is to write to our Back Numbers Department—the address is on the first editorial page of this issue. If you know that the mod has been published but do not know which issue it was in, Mods 15 contained an index of all the mods that had been published up to then and I will be writing another index soon, probably Mods 24.

My address is: Roger S. Hall, Room 301, Hatfield House, Stamford Street, London SE1 9LS.

Kindly Note

Active ATU, January 1983

The Veroboard track breaks shown in Fig. 4 were not clearly reproduced in some issues. The following track break listing will allow a check to be made.
B17, 20. C3, 5, 13. D5, 9, 10, 16. E3, 4, 9, 10, 12, 18. F9, 10, 14. G3, 9, 10, 13, 17. H9, 10, 19. I5, 9, 10, 12. J6, 9, 10, 12.

the things people say

1st station: "I could hear a lot of Maltese stations operating into Australia. Most of them were speaking in Maltese, and I couldn't understand a word of what they were saying."
2nd station: "Did that make you cross?"

. . . heard on the h.f. bands by G8ZVP

"You are a very strong signal into the repeater, but your audio level is very low."
"Yes, I'm parked under some trees, and they are probably attenuating my deviation, which is why my carrier is strong, but my audio is low."

. . . Brighton & District RS Newsletter

on the air

Amateur Bands

by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR
Silver Firs, Leatherhead Road,
Ashtead, Surrey KT21 2TW.
Logs by bands in alphabetical order.

I had the unhappy task recently of disillusioning a reader who thought that he was on to a good thing when he bought a secondhand Lafayette receiver with one of the control knobs having a SEND position. Not unnaturally he thought he'd bought a transceiver and he wondered which bands it covered.

Such a control was not unusual on receivers in the days before transceivers became commonplace and separate transmitters and receivers were in vogue. It was necessary to desensitise the receiver on transmit to prevent damage to the front end from the transmitter's r.f. output. This was done in a variety of ways ranging from simply chopping the h.t. line (+250V) with the aforementioned SEND switch on the receiver to, in effect, increasing the value of the r.f./i.f. gain control until the signal from the transmitter could just be heard and used as a monitor.

The changeover was frequently performed by a relay, often operated by a foot switch to decrease the changeover time. Simply cutting the h.t. to the receiver was a bit drastic and inevitably led to frequency drift.

Older readers will recall the RAF's wartime 1154 transmitter in which all the changeover functions were performed by a massive, clanking relay, including the antenna changeover, and at quite reasonable keying speeds! Needless to say, everything depended upon careful adjustment of the relay contacts for proper operation. The mechanical relay is still being used in our transceivers today with what are now known as VOX circuits holding the relay on transmit as long as one is talking, dropping back to receive after a short, variable, delay. On c.w. the delay may be made very short indeed, to give what many amateurs call "break-in."

But, break-in it is not! In true break-in the receiver returns to full sensitivity when the key is up, assuming a hand key in this instance, even between a string of dots. It is enough for the other station to send a single dot to stop the sending station and request a repeat etc., if there is QRM. Very few amateur stations have this facility yet the old 1154 was much nearer this ideal than almost any modern rig!

On a completely different tack I wonder what the chances are of getting the Home Office to up the power levels permitted on Top Band (1·8MHz)? More and more AR stations are coming up in more and more countries partly because of the great relaxation of operating conditions in the USA and the increasing use of commercial transceivers that incorporate Top Band facilities. It is virtually impossible to reduce the power input to the legal level using, say, the carrier control. With around 800V h.t. this means about 12mA or so anode current which is as good as zero on most p.a. current meters. It is a lot to ask of any operator to reduce his input to the legal figure when he has a couple of hundred watts at his disposal! Then there is the delicate matter of signing the declaration on a contest entry form that one has abided by one's licence conditions! In spite of the excellent locations and big antennas used by some stations on Top Band there is no way that some of the signals I hear can come from 10W finals! One could always stop operating for a few evenings I suppose and actually make a 10W rig for 1·8MHz!

From the Mail

From Dartford, Kent, **Paul Martin** writes to ask if any readers have carried out any worthwhile mods to the Lafayette HA700 receiver. He'd be glad to answer any letters at 18 Wilkinson Close, Temple Hill. Further adverse comment on the Realistic DX100L receiver concerning the difficulty in getting a correct frequency readout, this time from **Leslie Biss** in Knaresborough, N. Yorks, and no help forthcoming from the distributors. I'm afraid that one cannot expect anything much better with this class of set and all one can do is to try and interpolate between the dial markings, such as they are.

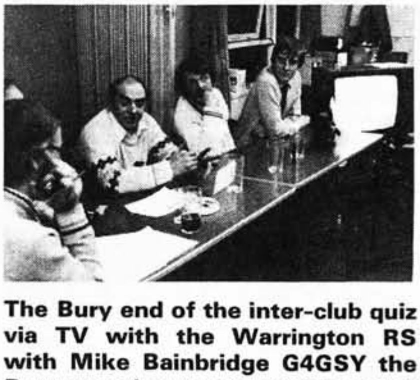
From **Andrew Wright** G4OJY of 14 Thorne Grove, Rothwell, Leeds, an appeal for manuals or circuit diagrams of some pretty old gear, the De Luxe Meissner Signal Shifter (one of the first v.f.o.s!), the Canadian Marconi No. 52 receiver, and the old favourite No. 19 MkIII transceiver. Although Andrew has a Trio TS-530S rig he still feels the urge, at 15 years old, to do some practical work. Another request for manuals, will buy or copy and return, from **John Rhodes,** Redstacks, Shilburn Road, Allendale, Northumberland, who will be taking his RAE in May and already has his code buttoned up. He has the FR50B receiver and FL200B all ready but no info on them.

A. Davies in Burton-on-Trent has just come into AR although he was in RN comms a few years ago so the code presents no problems. In fact he sent a long list of stuff heard on c.w. albeit mostly Euros on his R600, plus an antenna duly erected with the aid of the XYL. That's a good start, anyway! Following my appeal in the March *PW* **Noel Lee** of Guisborough, Cleveland, contacted me and I was delighted to know that he has become G6RYK in the meantime. Although an invalid Noel is determined to get his G4 + 3 even though he cannot write or type at equivalent speeds of more than a few words per minute at the moment. I'm sure his determination will win through and we all wish you well OM with the code.

The Bury and Warrington societies recently held an inter-club quiz from their respective clubrooms using a colour TV link from Warrington and mono from Bury, on the 432MHz band (70cm) with the sound link on 144MHz (2m), the distance being some 30km. Quite an achievement with congrats to all concerned. Warrington won by a small margin, I'm told. More on the Bury gang in club news.

DXing

A Yaesu FRG-7 receiver and 20m-long wire are the start of a station for **D. Price** of Wellington, in Somerset, who is new to the game but this did not prevent him logging some good DX like D44BJ, C31SD and CT2DL on 3·5MHz (80m), plus lots of VKs, ZL1AXU, Z21GO, ZS1ET, C53AP, 5N9ACO and VP9CP on 14MHz (20m). Only item of interest on 21MHz (15m) was 5N7HKR while 28MHz (10m) produced ZS6UF and C6ANU. Not bad for a start! Back in '79 **David Palmer** (Stowmarket, Suffolk) used to send in logs but now admits to having



The Bury end of the inter-club quiz via TV with the Warrington RS with Mike Bainbridge G4GSY the Bury question master at this end of the table obscuring team member Fred Burnett G3RSM, then Alex Bischtschuk G6HBF, Clive Hardisty G8XUR and Peter Jones G8OVT. In spite of the empty glasses Bury lost by just two points to the Warrington team of G3NFB, G4JYP, G8HYP and G6AWD. Photo courtesy G3VNQ/G4OAC

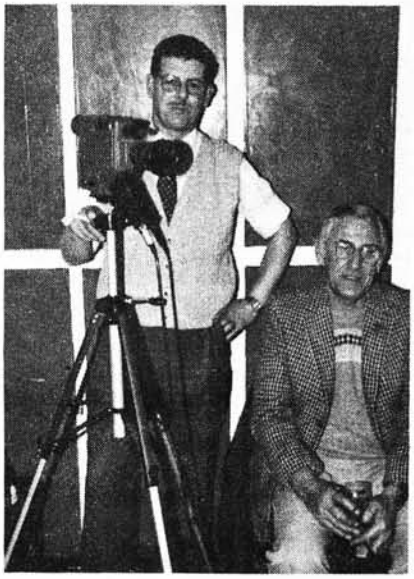
sold his JR310 when local electrical QRM had the better of him. All is forgiven for the bug has bitten again, it always does, and he has acquired a Drake 2C, with a 20m-long wire. Why, you will ask, did he not find out the source of all his QRM? Ah, well, anyway he has not lost the touch, with J6LCV, KP4DEX/V2A, VK6HD, YB0WR and 3A2EE all on 3·5MHz, HP3FL, VS6CT, and 6W8AR on 7MHz, DU7RLC, D44BC, FY7CH, KC4USV, KL7DV, VS5GA, YB5AEU, 4S7WP and 8P6OR on 14MHz. On to 21MHz and AP2MT, VS5HG, VU2GI, 5N8ARY, 6Y5SG and 9J2BO, ending with FR7CG, FY7CH, G4LJF/3B8 and HC1CP on 28MHz.

Andy Durrant in Colchester, Essex, has been active with his AR88 and wire antenna, mainly on 28, 21, and 14MHz s.s.b. On 28MHz it was C53DF, Z21GN, TU2JT (QSL F6CXV) and FY7BW while 21MHz revealed WD5CMP/SV2 and AP2P. Logged on 14MHz were EA8BS, VP8SB, G4AVW/CT3 on Madeira, 3A2EE, 5T5IRY and 7X2BK. In Callington, Cornwall, **Viv Doidge** tried most bands with his FRG-7700 and a.t.u. with a "long-wire" and caught a few on 3·5MHz such as CO2OQ, DF3NZ/ST2, EL2AK, JW5VAA, KP4DEX/V2A (POB 230, St John, Antigua), SP5KCR (first SP heard!) TI5EWL, TR8DX and a real goodie in VK7AE.FM7AQ, JA9UX, VU2RAK, ZD7BW, ZI4BO and 5Z4CI showed on 7MHz, with FM7CD, FY7YE, S83H, 5T5AP and 6W8FZ on 14MHz, leaving C53DF, VP2VA, 5T5RY and 6Y5SG to complete the log, on 21MHz.

The White Rose contest occupied **Anne Edmondson** BRS47285 Edinburgh at the end of January, managing to score a very creditable 27284 points on the 1·8, 3·5 and 7MHz bands with her DX-200 and an indoor antenna. The code test will be over by the time you read this and no problems there. A positive logging was AP1RIL but really he ought to have waited for April 1! On 7MHz Anne caught SV5FD, T42AMC thought to be in Cuba (?), UH8EAA and 7X2HM with many good ones found on 3·5MHz like CN8AR, D44BC, EA6NB, EA9IB, KG4CD (POB 585, FBPO, Norfolk, Virginia), PT2BLS, TG9VT, YV3BRF, 6W8AR, 6Y5WC and 7X5AB.

As a general point, it would be of interest to DXers on 3·5MHz if the actual times of logging some of the better catches could be given in logs. Apart from the fact that I've been concentrating on that band myself of late! An experimental full wave delta loop fed at one bottom corner with 50Ω coaxial cable gives vertical polarisation and is very effective at eliminating Euro QRM and bringing up the DX, and getting good DX reports.

At one time not so long ago it was possible to look at a callsign of the USA or its possessions and divine just where the station was located, but no longer. Some brilliant genius in the FCC has tossed the whole lot in a hat and drawn the prefixes out so that it is virtually impossible now to say where a station may be. Prefixes of what were rare Pacific islands now turn up in New York or the like. There is a plan, presumably, but why touch the system at all? I was very annoyed to work a K5 on Top Band only to find that he was indeed in New York! Now when an amateur moves from one licensing area to another he retains his old callsign! Can you believe that? Not even a suffix to identify his new QTH.



The TV equipment at the Bury end of the Bury/Warrington quiz was built by Mike Horrocks G8GTP seen here with his camera, the rig running at 30W peak sync. output on the 432MHz band to an 18-element Parabeam

Our own Home Office is not entirely blameless when it comes to issuing incorrect callsigns. Until the advent of repeaters the suffix, like 4AR, of our callsign was unique to the licensee wherever he or she was operating in the UK. Now our suffixes have been pinched for the repeater series, principally to enable the repeater location to be readily identifiable. So my old friend John Graham G3TR lost his suffix to the Torbay repeater GB3TR and, of course, there are many other such examples of this senseless bureaucracy.

Round the Clubs

Possibly due to the influx of new club secretaries after AGMs some club newsletters have been sent to both *PW* at Poole and to me at home. Please don't bother *PW* but send only one copy, to me, direct.

Acton, Brentford & Chiswick ARC G3IIU It's Members Problems being solved on April 19 at 7.30 at the Chiswick Town Hall, High Street, Chiswick, London W4 when visitors or members-to-be will be more than welcome. So says W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3.

Aylesbury Vale RS Oh, dear, "every four weeks on a Tuesday" at 8 at the Stone Village Hall, Stone, which is near Aylesbury, with next datum date being April 19 when there will be a surplus equipment sale, to put it politely, with auctioneer G4JFZ. Congrats on the elevation to post of sec of Cathy Clark, 9 Conigre, Chinnor, Oxon, but quicker by 'fone (0844) 51461. Any call yet, Cathy?

Barry College of FE RS GW4BRS GW3VKL Thursday evenings at 7.45 at the Annex, Weycock Cross, Barry with lecture or talk in the lower hall and Morse code class in the upper hall. Make a note of the Welsh Amateur Mobile Rally at the Memorial Hall, Barry on Sunday May 22, talk-in on S22 and doors open at 10am. Enquiries of Simon Lloyd Hughes, 1 Min-Y-Mor, Barry.

Bath & District ARC This growing club has been going for about a year now with visitors and potential members very welcome at the Englishcombe Inn, Englishcombe Lane, Bath, "every other Wednesday" which is not very informative until I tell you that the AGM will be held on April 6. Colin Rose G8YCV, Westfield Orchard, 10 Englishcombe Lane, Bath is the sec, or try (0272) 218279 at the office or (0225) 311687 otherwise. Hey, he must live almost next door to the Inn!

Biggin Hill ARC The Biggin Hill Memorial Library is the place to be on April 19 when Ian Daniels talks on homebrew techniques, starting at 8pm. Advance bookings only is the order of the day for the visit to the Kent Police HQ on May 10. Contact Ian Mitchell G4NSD 37B, The Grove, Biggin Hill, Westerham, Kent or try (09594) 75785.

Bristol ARC G3TAD A Spring programme includes two projects, a 1296MHz (23cm) converter with G4EIA in charge, while G4KUQ is showing members the tricks of building a 3·5MHz QRP transceiver. This is all going on every Tuesday at the YMCA, Park Road, Kingswood, Bristol, with a debate on contests "and how to win them" on April 5, club projects on the 12th, RTTY night by G4REH, better known it seems as G8BLQ, on April 19. Finally, April 26 is computer club night, among other items, although I must tell you of the night on the air with G3TAD on May 3 otherwise it will be too late next month. Club net is Sundays at 11am on 1919kHz otherwise contact Mark Goodfellow G4KUQ, 99 Somerset Road, Knowle, Bristol, or (0272) 716093.

Bromsgrove & District ARC Generally the second Friday at Avoncroft Arts Centre at 8 with April 8 being construction contest evening-of-decision for the judges. The fourth Friday is devoted to the QRP fraternity at the same QTH. Visitors are most welcome at either session. Sec is A. Kelly G4LVK, 8 Green Slade Crescent, Marlbrook, Bromsgrove, or call on 021-445 2088.

Bury RS Every Tuesday at 8, Mosses Community Centre, Cecil Street, Bury with principal gathering on the second

Tuesday. Newcomers, visitors and all welcome, says sec Brian Tyldsley G6OKE, 4 Colne Road, Burnley, or Burnley 24254 for more info.

Cambridge & District ARC The trouble with doing a job well is that one keeps getting re-elected to it, as Dave Wilcock G2FKS, Publicity Officer of the club keeps finding out. Meetings every Friday during term time in the Visual Aids Room in the Coleridge Community College, Radegund Road, a turning off the better known Coleridge Road it seems, around 7.30. However in spite of all that the grand junk sale on April 8 will be held at Comberton Village Hall. Back to normal on the 15th . . . no, hold on, it's a 144MHz (2m) DF foxhunt with mobile radios participating, no less. Ah, April 22 with an evening with John Hall G3WLD and the cryptic comment that free aftershave may be a possibility! The thought leaves me breathless! Dave Wilcock lives at 6 Lyles Road, Cottenham, Cambridge (0954) 50597.

Carlisle & District ARS New QTH for the club is the Scout Hut, Trinity School, Carlisle, all most welcome. Meets start at 7 with code class until 7.30. Items planned, in order of importance, are a trip to the local brewery, a talk on satellites, and a demo of computers in AR. Paul Boyd G8RJA is waiting to help at 13 Stackbraes Road, Longtown, Cumbria.

Cheltenham ARA G5BK Meeting place is now the Stanton Room, Charlton Kings Library, C'ham, first and third Fridays it seems, with earliest date noted being May 20 when it is junk sale night. Club mag *CARA News* for January has an excellent article on antennas for difficult locations, by G3LRM. Gill Harmsworth G6COH appears to be the new sec (?) and can be QSO'd on C'ham 25162.

Cornish RAC From club magazine *Cornish Link* I see that it meets at the SWEB Clubroom, Pool, Redruth, on what appears to be the first Thursday with the computing section having their own meet on third Mondays if I'm not mistaken, at the same venue. Big night on April 7 is the AGM, with a chat on test equipment and how to use it on May 5, with members invited to take along their own v.h.f. gear for assessment. Take your choice from the PRO S. Rodda G6DFE, Cliff Hotel, Penrose Terrace, Penzance or the sec J. J. Vinton G6GKZ, Cheriton, Alexandra Road, St Ives, for further info.

Derwentside ARC All I know is that it meets at the RAFA Club, Sherburn Terrace (I think), Consett, and that the club station is to be moved from "a nook adjoining the bar" to a more cosy environment upstairs, where, apart from being further from the beer, the feeder to the antenna will be shorter, a debatable advantage! More from P. Howes G8WEJ, 26 Hadrians Way, Ebchester, Co Durham, sec of club.

Droitwich ARC Welcome to this recently-formed group, looking for members of course, so if you want to swell the numbers get along on the first Monday at 8.30 to the Scout HQ, Station Road, D'wich. Contact is sec G4HFP on Stourport-on-Severn 3818, or Les Smith, Idlewild Stourton, Stourbridge, W. Mids, also Kinver 2341.

Edgware & District RS G3ASR Members should get in quickly if they want to join in the fun with a visit to the London branch of Lowe Electronics on Thursday April 14. Otherwise it's second and fourth Thursdays at 8 at 145 Orange Hill Road, Burnt Oak, Edgware, Middx. The club is very proud of its first licensed YL Liz whose call could not be anything other than G6LIZ! Winner of the club's constructor's cup with an electronic key was shamed into converting his G8 call into G4RND. More on the multifarious activities of this group from Howard Drury G4HMD, 11 Batchworth Lane, Northwood, Middx (N'wood 22776).

Farnborough & District RS Second and fourth Wednesdays at 7.30 at the Railway Enthusiasts Club, Access Road, off Hawley Lane, F'boro. Two different dates for April events but only right ones are April 13 when it is bring and buy time, and the 27th with subject yet to be decided. PRO is Chris French G8ZAJ, 26 Wood Street, Ash Vale, near Aldershot, Hants, otherwise Aldershot 29469.

Flight Refuelling ARS G4RFR If you're in the Poole/Bournemouth area on a Sunday evening during April you might like to attend one or more of the following FR club events. Sunday April 10 "the elements of radar", a lecture with visual support given by G2KV, 17th more "r.f. topics" from G8MCQ, 24th the Society's first anniversary will be marked with an open evening featuring live demonstrations and exhibitions of all aspects of amateur radio h.f. to microwave—everyone welcome. Further details from sec Mike Owen on Wimborne 882271 who advises that the society now hold the additional callsign G6SFR.

Five of the six successful members of the Ivybridge Radio Club in the December RAE with their tutor David Mount G3AXB top left, with Pete Allan (club's press officer) next to him and then John Veale. Bottom, left to right, Graham Smith, Reg Welsh and Andrew Edgcombe. Lowest mark was a credit and in the meantime John Veale and Pete Allan have passed the code test. Assisting tutor G3AXB were Chris Westcott G4ONC and Arnold Day G4RIM. OK, so Andrew Edgcombe looks suspiciously like someone we all know on TV!

Grafton ARS Meets at the Five Bells, East End Road, East Finchley, London on the second and fourth Fridays at 8pm. Afraid I've nothing more to tell you so better contact D. Bell G4ILU, 27 Inwood Court, Rochester Square, London NW1, the president who can fill you in on current events.

Guildford & District RS The Club House of the Guildford & District Model Engineering Society in Stoke Park, G'ford at 7.30, especially on April 8 when it is natter nite and the 22nd for the club's AGM. Sec Helen Mullenger G4OJO is your guide to future events, on Aldershot 20384.

Horsham ARC G4HRS It's congrats from us all to Nancy Hubbard now proudly sporting G4RTZ. Down to earth again with meetings on the first Thursdays at 8 at the Girl Guides HQ, Denne Road, Horsham, Sx with a Spring junk sale on April 7 with visitors and new members invited to bring their own junk along. It's Construction Contest judging time on May 5 with a request that the innards of the project submitted be readily accessible to the judges! (Sorry, but those 68 fixing screws are essential to the screening, mon judge!) Nancy resides at 33 Amberley Road, Horsham, Sx.

Ivybridge RC Celebrating passing of December RAE by six members but no plans for further RAE course unless new members enrol. Club meets Wednesdays but more of that from Jim Brayshaw on Ivybridge (Devon) 3966.

Keighley ARS Welcome to a newly-formed group, meeting on the last Tuesday of the month at 8 at the Globe Inn, Parkwood Street, Keighley, although Morse classes are held around 7.30 beforehand. Event for April 26 is a lecture on techniques of the cinema by Bill Cost. New members most welcome as are visitors, says sec Gerry Fuller G3TFF of Haworth 42977, or try hon chairman Colin Greenwood G6MCF, 86 Mytholmes Lane, Haworth, Keighley, W.Yorks, or Haworth 42601. OK, I know how to pronounce "Keighley", I listen to the rugger results!

Lough Erne ARC Second mobile rally for this N. Ireland group takes place on Sunday April 10 at the Killyhevlin Hotel, Enniskillen, with the non-radio members of the family able to enjoy a National Trust environment and a trip on the lough from the hotel, plus nearby country houses of Castlecoole and Florencecourt. For the amateur the usual wide range of trade stands and attractions, talk-in on S22. L. Sammon is sec at 11 Drumclay Road, Enniskillen and works number (0365) 4821. Let's hope the weather is fine for them!

Maltby ARS Another fairly new club for this column. Every Friday at the Methodist Church, Blyth Road, Maltby, W. Yorks, says sec Ian Able G3ZHI, 52 Hollytree Avenue, Maltby, or M'by

814911. Around 7pm will be OK, and you could be on your way home by 9.30. Members are encouraged to bring along and demonstrate their equipment, including computers.

Meirion ARS PRO is Len Bridges GW6COM, c/o Tremidris, Llanelltyd, near Dolgellau, Gwynedd, otherwise (0341) 422 568 who says the club meets on first Thursdays at 7.30 at the Nannau Country Club, Llanfachreth, said to be a couple of miles north of Dolgellau, where the AGM takes place on April 7. On May 5 it's a problems and discussion forum. If you'd prefer to talk to the sec it is Bob Halhead GW3KOR, Bryn Derw, Golf Road, Dolgellau.

Mid-Sussex ARS Second and fourth Thursdays at the Marle Place Adult Education Centre, Leylands Road, Burgess Hill, W.Sx but no info on forthcoming gatherings. Seems club AGM got its new committee without any twisting of arms. Strange! All I can tell you about is Colin Campbell G6NPY on Burgess Hill 5211 during office hours.

Mid-Warwickshire ARS Meets at 61 Emscote Road, Warwick, at 8 on first and third Tuesdays but on April 5 it is a visit to Mercia Sound, with a chat on the 19th on electronics in medicine, and I must tell you now of the demo on May 3 of a spectrum analyser. New sec is none other than Carol Finnis (Mrs-aaah!) G6LKP, 37 Stowe Drive, Southam, Warks, or (092681) 4765.

Milton Keynes & District RS Monday April 11 at 8pm at Lovatt Hall, Silver Street, Newport Pagnell, Bucks, for a talk on basic construction techniques which ought to be very interesting. More from A. R. W. Date, of no known callsign, at 23 Gilpin Way, East Street, Olney, Bucks, but you can find out on Bedford 711950.

Nene Valley RC G4NWZ G6GWZ I can tell you of a meeting of the club on Wednesday April 20 when there is the second part of a series of lectures on the use and applications of laser systems, but just where is not clear. All is in a state of flux as arrangements are being made for a permanent HQ at a local scout hall for the club and its two transmitting outfits. Other involvement soon is with special event stations GB2WGG and GB4WDS for the scouts and guides. Wonder if that should not be GB2WDS? Contact L. Parker G4PLJ, 128 Northampton Road, Wellingborough, Northants, or (0933) 79539.

Newark & District ARC First Thursday at 7.30, the Palace Theatre, Appleton Gate, Newark, with enquiries to sec R. Hiscock G4MDV, 17 The Green, Elston, near Newark, Notts. M. Gaylor G6NMP on Newark 702076 will also oblige during the evenings. On April 7 sec will deal with workshop matters with the accent on the club constructional project, whatever that is! On May 5 it is junk auction time, a change from the usual free-for-all.

Reading & District ARC Meets at the Clubroom, the White Horse, Peppard Road, Emmer Green, Reading on "alternate" Tuesdays which means April 12 when SMC will be demonstrating equipment, and the 26th when the contest committee will hold the floor. Club net is on Mondays at 8 on S13 which is 145·325MHz. QSO with Chris Young G4CCC, 18 Wincroft Road, Caversham, Reading, Berks by letter or ring Reading 471761.

St Helens & District ARC The committee has drawn up a programme for 1983 but unfortunately the events for April have not reached me yet, but go along to the Conservative Rooms, Boundary Road, St.H, Merseyside any Thursday at 7.30 and you'll be in the swim. PRO is Alan Manchester G6FJU, 67 King Edward Road, Dentons Green, St.H, also St.H 33054.

Sefton ARD G4RAQ "Alternate Wednesdays" worked out from Feb 23, which I make April 6 and 20 for current dates. On the latter Al Neilson G4CVZ will talk on and demonstrate the microcomputer in the amateur radio field. There is also a junk sale on the programme. Meeting place is the Liverpool Prison Officers Social Club, Hornby Place, off Hornby Road, Walton, Liverpool 4. It's H. J. Webb G6ICR, 33 Belle Vue Road, Gateacre, L'pool L25 2QD or try 051-487 0756.

Sheffield ARC Nice to hear from you for the first time, via newsletter *Q-BIT* from sec Bob Kugler G8VQS (0246) 31696. First and second Mondays at 8 at the Firth Park Clock Tower Pavilion with RAE class, constructional projects, club stations, lectures and just about everything. Hold on, third Mondays at Sheaf House, Bramall Lane, for a pint and a chat but seemingly one can rest on the fourth! If you'd prefer to write for club info try Peter Day G3PHO, 146 Springvale Road, Sheffield S6 3NU, or S'field 681216.

South Cotswold ARS Only formed last October the club has 30 active members and seeks more. Second and fourth Wednesdays with one of the evenings devoted to a specific lecture, or subject or demo, at Scout HQ, Dr Brown's Road, Minchinhampton. Raffles and social events are helping towards the purchase of a club rig for the h.f. bands. Can't reply to PRO J. Perry as no QTH but chairman R. J. Burnett G4RJB is on Nailsworth 2874.

South Devon RC Every Wednesday at 8, the Devonport Arms Inn, Elmbank Road, Paignton, has the admirable aim of promoting all forms of legal radio communication with a friendly and co-operative atmosphere between amateurs, CBers and s.w.l.s. The result? A spate of new calls in the club. Club nights are preceded by slow Morse tuition while if you can get along to the Brixham Community College on a Monday night you will find an RAE class in full swing. Date for diary: Charity field weekend and barbeque May 7/8. Your contact is Derek Scarr G4PTH, 12 Church Lane, Torre, Torquay, otherwise Torquay 211065.

Southdown ARS meets first Monday at Chaseley Homes, South Cliff, Eastbourne. Weatherman Ron Lobeck of TVS is lecturing on April 11, on May 9 G5CRD holds forth on RTTY matters. He is also editor of BARTG magazine. More from sec Tom Rawlance G4MVN, 18 Royal Sussex Crescent, E'bourne, or you can ring Peter Henley G8IQO on E'bourne 763123 for an update.

Sutton & Cheam RS One of the club's two venues has been changed to the Carshalton Sea Cadets HQ, TS Puma, Church Path, Beddington, Surrey, near to Carew Manor School, I'm told. The other venue remains at the Sutton College of Liberal Arts. Nothing on current events but that can be remedied by G. Brind G4CMU, 26 Grange Meadow, Banstead, Surrey.

Sutton Coldfield RS Central Library, SC, second and fourth Mondays at 7.30. April 11 is natter nite with the 25th a great chance to get rid of that junk, with 10 per cent of the loot going to the club. Note that on May 9 the visit to the Bourneville Police Comms Centre will be limited to 15 members. Contact sec Derek G8TUR on 353 2061.

Swale ARC Gets together at Nina's Restaurant, 43 High Street, Sittingbourne, every Monday at 7.30 with a lecture on resuscitation on April 18 (thought there were only low voltages on these new-fangled transistor p.a.s!). Plans call for an RAE course on Fridays and Morse course and classes on Thursdays at a local spot yet to be determined. Get your views on record at the meeting on April 11 if possible. Sec is Brian Hancock G4NPM, Leahurst, Augustine Road, Minster, Sheppey, Kent (Minster 873147).

Thames Valley ARTS First Tuesday of the month at the Thames Ditton Library meeting room, Watts Road, Giggshill, Thames Ditton, Sy, at 8. Too late for the April do but on May 3 a briefing on the forthcoming NFD will be followed by Bill Hall G4FRN on net operation in /MM conditions. Plus advance notice of your friend and mine, Pat Hawker G3VA, dealing with Clandestine Radio, on June 7. More from Julian Axe G4EHN, 65 Ridgway Place, Wimbledon, London SW19, or try 01-946 5669.

Torbay ARS G3NJA G8NJA Two more losses for the club in the deaths of Harold Jordan G2BNT and Frank Pike G3BHL. Club still meets every Friday and on the last Saturday of the month at Bath Lane, rear of 94 Belgrave Road, Torquay at 7 with AGM on April 30. Note for your diary is the Torbay Rally on Sunday August 28. More from Les Mays G2CWR, Atlantis, Clennon Avenue, Paignton.

University of Kent ARS G3UKC G8KUC At 7.30 Mondays for a code class followed by the meeting/drink/chat session in the University's radio shack behind the Maintenance Building, off Giles Lane, Canterbury. Talk-in on S15 or you can contact Clive Allen G6FRX at Eliot College at the University.

Vale of the White Horse ARS Looks like the first Tuesday of the month but only sec Ian White, G3SEK, 52 Abingdon Road, Drayton, Abingdon, Oxon can tell you where. You could try the club nets on Thursdays on 28·75MHz at 7.30 and 145·2 at 8.15. April 5 is junk sale time but on May 3 Dave G3BLS's subject is the dreaded Morse code. Forgot the sec's 'fone number which is (0235) 31559. The club has booked the calls G4VWH and G6VWH both of which look like distinct possibilities.

Verulam ARC Changes in the committee mean that the new sec is Ed Bailey G4KLQ available on Redbourn 3291 while the incoming publicity sec is Bill Thompson G6EQO, 158 Beech Road, St Albans, Herts, or St Albans 58132, either of whom will be glad to tell you of the club's activities. Bill can also be QSO'd on 01-903 1400 Ext 667 from 9 to 5.

Wimbledon & District RS Principal object on the evening of Friday April 8 will be to improve the speed of all those in the Morse classes. On the 29th it's workshop faultfinding time with an invitation to members not to be shy but to bring along that bit of gear that obstinately refuses to work. So, it's second and last Fridays at 8, at the St John Ambulance HQ, 124 Kingston Road, Wimbledon, London SW19 with Geoff Mellett G4MVS of 26 Paget Avenue, Sutton, Surrey able to supply more details. Or ring him on 01-644 8249.

Wirral ARS Go along at 7 to Minto House School, Birkenhead Road, Hoylake on the first or third Wednesdays if you want some code practice before the meeting proper starts at 8.15, otherwise they'd like you to make it 7.45 to give everyone time to settle down. Membership figures are interesting with 42 "A" licensees, 10 "B" and 26 s.w.l.s for a grand total of 78. *News & Views,* the club mag has a feature by G4ILA describing the construction of a crystal and f.e.t. checker. Sec is Cedric Cawthorne G4KPY, 40 Westbourne Road, West Kirby, or 051 625 7311.

Worthing & District ARC G3WOR G8GCP Nice list of events taking us to June. Meetings at 7.30 at the Amenity Centre, Pond Lane, Durrington, Worthing, every Tuesday. On April 5 G3VZJ talks on AMTOR, with a visit to the telephone museum on the 12th and overflow visit on the 19th if necessary. It is Spring junk sale time on the 26th. Must tell you now of G6GAW describing DF techniques on May 3, or it will be too late. Joyce Lillywhite, 41 Brendon Road, Worthing, W.Sx is your contact for further info on the club's activities.

I have concentrated on some of the smaller clubs this month but I'm sure the big ones will manage to stagger on in the interim! Only wish I had enough space to cover all the information I receive every month from clubs, but keep it coming.

Medium Wave Broadcast Band DX

by Charles Molloy G8BUS

Reports to: Charles Molloy G8BUS
132 Segars Lane, Southport PR8 3JG.

If I had to compile a list of useful accessories for DXing then headphones and a tape recorder would be at the top. The advantages of using phones are obvious once they have been tried but the benefits from a tape recorder are not so evident.

Last month we had a look at reception reporting to medium wave stations and found that the "meat" of a report is often found a few minutes before the hour and the half hour. On these occasions the tape recorder is invaluable. Switch on at the start of the announcements and make a few notes of the times when promising items occur, using abbreviations like Wx for weather, id for identification, com for commercials and so on. The tape can be played back later to extract the details.

Tape Recording and DXing

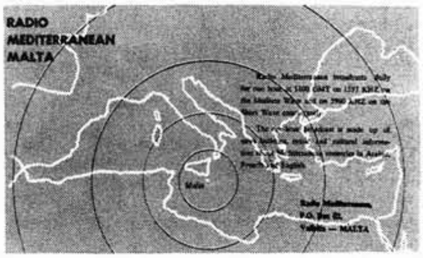
Station identification is often helped by making a tape. If you play the tape back several times you may well pick out something that was missed when listening live. When there is interference from a second station (QRM) and both are identifying on the hour then several replays may reveal the identity of both. During the fade of a strong station a tape of a weaker companion could be revealing especially if the weaker one peaks up at the vital moment. I had this experience on 1570kHz a couple of years ago. During a fade of CKLM, which is located in Montreal, an English speaking station peaked up. After replaying the tape several times it seemed likely that it was XERF at Acuna in Mexico, which is close to the border with Texas and transmits programmes in English. A frequency to watch in the future thanks to the tape recorder.

When listening to DX programmes it is often useful to make a tape of schedule and frequency information, station addresses or even short feature programmes of interest. Sometimes a presenter will ask listeners to have a recorder at the ready. Presumably it saves time that way and if you do not have one available you may miss important information. There is also the possibility of compiling a tape library of DX heard, interval signals, time signals, national anthems or anything else of interest.

How to Record

If the receiver has a tape socket then all you have to do is to obtain the appropriate lead, connect up and you are in business. There may be a problem though as the signal from a tape outlet is usually independent of the setting of the receiver's volume control. You could have to adjust two controls, one on the receiver for listening and the other on the recorder. Headphone DXers should get hold of a Y adaptor, such as those available in shops like Tandy, for 6·3mm or for 3·5mm to plug into the phones or earpiece socket. The adaptor provides two outlets, one for listening and the other for recording. The receiver volume control simultaneously adjusts the signal level to each which is quite an advantage. One hand can now be used to adjust the receiver and the other for taking notes.

QSL card from Belgium *(Richard Hunt)*



QSL card from Malta. (Radio Mediterranean is on 1557kHz at 2230)

A third way of taping DX is simply to place the microphone in front of the speaker. A little experimenting will determine the optimum separation and when this is found all you have to do is to switch on the recorder and forget about it until you are finshed. This method is often frowned on with comments about poor frequency response, distortion and background room noise. These objections may be valid when recording a symphony orchestra but I have made good recordings of DX signals this way, signals that are generally a long way from hi-fi to start with. Taping via the recorder's mic provides the non-technical DXer with an alternative to fitting a tape outlet to the receiver. My preference though is for phones and a Y adaptor which is a simple way round the problem.

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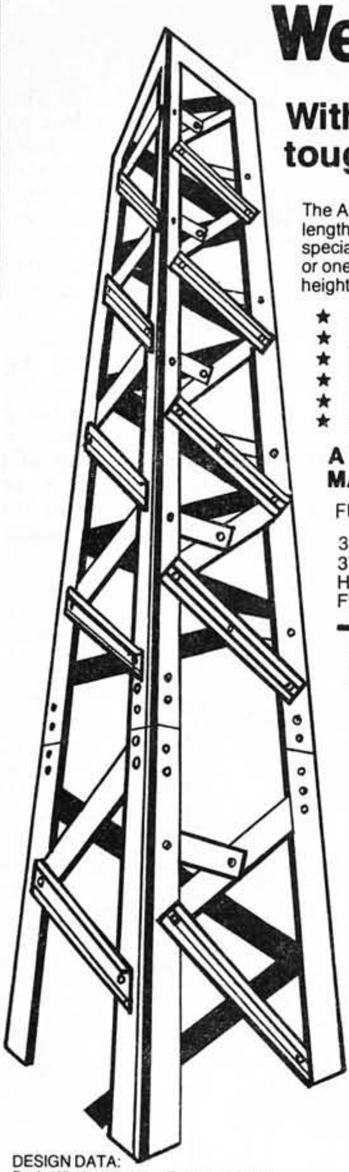

The ALUMAST is a 15" (375mm) wide triangular cross section lattice sectional aluminium mast based on a 10ft (3.05m) section length. It is supplied "knocked-down" in a tubular carton for ease of transport, but can easily be assembled needing no special tools or skills. The system includes top plate with bearing sleeve, rotor plate and a choice of a fixed base frame (FB-1) or one with hinge joints (HB-1) to enable the mast to be pivoted at ground level. Guy brackets are available for use at heights above 30ft.

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Design Wind-speed Vs=49·5mps=110mph.
Dynamic Pressure q=·0625Vs²=153Kgpm²

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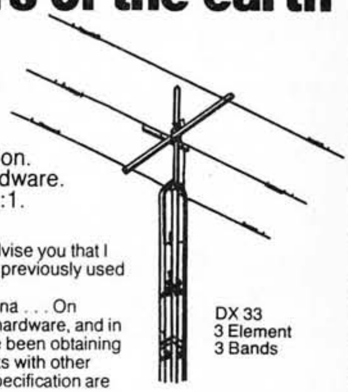
DX PENETRATOR



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PRICES (INC CARR AND VAT)

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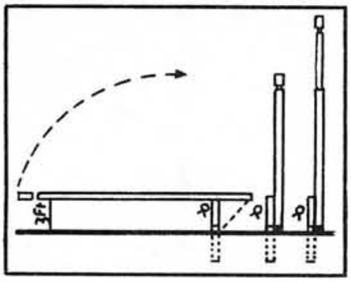
DX-32	2-element, 2kW, 10-15-20m	£102.35	DX-105	5-element, 10m	£97.75
DX-33	3-element, 2kW, 10-15-20m	£149.50	TD1/10/80	Trapped dipole, 10,40,80m	£45.42
DX-34	4-element, 2kW, 10-15-20m	£212.75	TD1/15/80	Trapped dipole, 15,20,40,80m	£45.42
DX-6V	Vertical 10-80m	£74.75			

Current plus VAT paid

THE ULTIMAST



The ULTIMAST is a tubular steel two-section mast which is telescopic and tilt-over. Constructed of two steel tubes – the lower square section and the upper round section – and hot-dip galvanised for corrosion resistance, the ULTIMAST telescopes up to 30ft (9m) and down to 15ft (4.5m). Secured to a square section tubular base post, the mast can be tilted over to only 3ft (1m) above ground for ease of access to antennas. Two head units allow clamping of rotor to 2" (50mm) dia. stub, or internal flat plate mounting.

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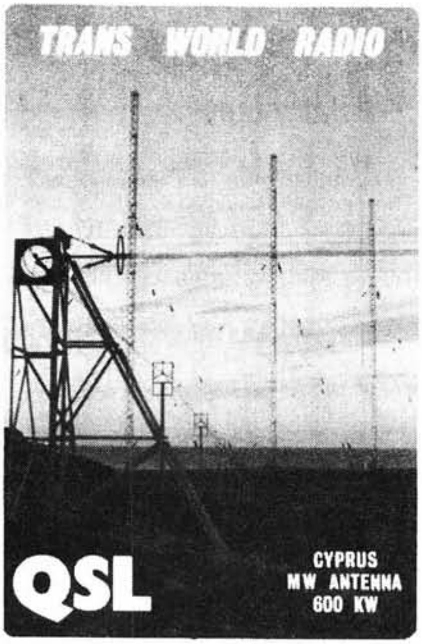
Type of Recorder

A mono cassette recorder is adequate for DXing but there are a few features to look for. A digital counter is almost a necessity. Not only does it help you locate a recording, it is also useful if you want to take notes. The time and the counter number are easy to note down and allow the DXer to concentrate on the receiver and loop. Automatic Level Control (a.l.c.) is a boon as it makes it difficult to overload the recorder. A level indicator, either a meter or magic eye, is also worth having. A jack for a remote mic is useful as this is a low level input that may be more suitable for recording weak signals from the receiver's phone jack, than the usual AUX input. A tone control is often useful on playback with some signals and a mains/battery recorder allows you to save on running costs when the mains can be used.

DXing in Summer

"The domestic service of Bulgaria is best logged at night as other stations close down, or from 0300UTC for one or two hours" writes **John Burrows** from Restenäs in Sweden. The reason for this is the different time zones. Stations to the east sign-on and sign-off earlier than those in Western Europe though the local time in the two areas may be the same. As the seasons advance and sunrise becomes earlier this DX gradually disappears. During the three months centred on the longest day the medium waves are at their quietest during the early hours and this is the time of year to go hunting for DX from the East Coast of North America, the Caribbean and South America.

The Region 2 channels are those to look for. Frequencies which are multiples of 10kHz and end with a zero. If you hear Portuguese it may be from Brazil, French from the Caribbean, Spanish from Latin America and English from North America and the Caribbean. Listen on 1610kHz for the Caribbean Lighthouse in Anguilla, on 1580kHz for the Voice of America in Antigua, 1560 for WQXR in New York City, 1510 for WMRE in Boston, 1220 Radio Globo in Rio de Janeiro, 1210 for Philadelphia or Radio Caribe in Dominica, 940 Radio Jornal in Rio, 930 CJYQ in St John's or Radio Montecarlo in Uruguay, 750 CBGY in Bonavista Bay, Newfoundland or Caracas in Venezuela, 640kHz for CBN in St John's. If static is a problem null it out with your loop. At this time of year it usually comes from tropical regions to the south.



QSL card from Trans World Radio

(Richard Hunt)

Headphones

"I still use headphones when DXing and wonder if this is still a common practice with s.w.l.s. Personally I find the modern padded headsets most comfortable" writes old timer **Eric Weaver** who goes on to say that one had to be quite dedicated to wear the phones available in the early days which had unpadded and very unsympathetic earpieces and a wide metal headband.

I have a pair of early phones, SG Brown Type F 2000 ohms, which work very well but I prefer my ex-RAF high impedance phones which are very comfortable and have a better frequency response. For low impedance I use a pair of hi-fi phones that have separate volume controls on each earpiece. These are set to maximum when DXing and the phones are plugged into the DX160 via a headphone adaptor. If stereo phones are plugged directly into the receiver then only the lefthand phone is live. The adaptor parallels the two earpieces and allows the headphones to perform a dual function. Whatever the merits of using headphones for general listening may be, there is no doubt that they are of great value to the medium wave DXer who does a lot of his listening after the family have gone to bed.

Readers' Letters

Old timer **D. Prince** of Llandyssul in Dyfed writes again to say that he has solved the problem of replacing his plug-in ferrite rod antennna (December issue). "I knew that somewhere I had an article on 'Making Your Own Screened Coils' and I found it in *Practical Wireless* 9 December 1933 by Frank Preston. I've made one up." Which goes to show that you should never throw away old copies of *PW*. You never know when you will want to refer to them.

"I came back home (from university) on December 12 and looked forward to four weeks DXing" writes **David Hyams** from Finchley who discovered that his FRG-7700 was only tuning in 980kHz steps which meant that he lost 70kHz, including band edges, from each band. In spite of this handicap David logged CJYQ in St John's, Newfoundland, on 930kHz, CBNA St Anthony on 600kHz, an unidentified US station on 1100 (probably WWWE in Cleveland, Ohio).

Short Wave Broadcast Bands

by Charles Molloy G8BUS

Reports: as for medium wave DX, but please keep separate.

Keeping a log of reception not only provides an interesting record of what has been heard, it has practical advantages as well. A log is a record of what was heard at your QTH throughout the year which could be useful for future reference. The entry in the log can be the basis of a reception report. Columns for the date when a reception report was sent and a QSL received can be included. If you have more than one antenna then the log can record which gave better reception on any occasion. If a tape was made, then a column for the counter numbers will be useful. Details of a tape library can be entered separately at the end of the logbook. Above all, notes on scraps of paper, envelopes or on station schedules will, hopefully, be a thing of the past.

A hardback notebook measuring 220mm by 180mm, with printed lines on each page, is used at my QTH. Vertical columns are pencilled in as required. Starting from the lefthand side of the page there are narrow columns for Date, Time in UTC, Frequency in MHz (or kHz if you prefer it). Next there is a wide

Sudfunk Stuttgart *(Richard Hunt)*

column marked HEARD, which gives details of programmes or announcements. A further column called STATION gives the name of the broadcaster if identified, a name plus question mark for a tentative and just a ? for unidentified. A remarks column records any special information such as QRM or QSB (fading) and finally there is space for the antenna used (I have two with a switch), and the SIO code.

There is no approved method, or right way to keep a log of broadcast band listening. You please yourself what you want to record and be prepared to change it in the light of experience.

On the Bands

Radio Canada International, with studios in Montreal, broadcasts to Europe every night at 1900UTC, summer and winter. Frequencies used are 21·685MHz (summer only), 17·875MHz, 15·325MHz, 11·905MHz (winter only). The programme is also relayed by the BBC transmitter at Daventry on 5·995MHz and 7·285MHz for reception in Europe outside the skip zone in the UK, though it may be heard in some parts of the country. From Monday to Friday the transmission lasts for half an hour and consists of news, weather and a commentary called *Spectrum*. At weekends the period is doubled. On Saturday there is *Week in Review, Cross Canada News* and *Night Music Show*. A show I try not to miss is *Sunday Weekend Magazine*. It is a mailbag type which plays listeners' requests and follows up their questions with features on various aspects of Canadian life such as polar exploration, bush pilots, Eskimo way of life. The well known *Short Wave Listeners Digest* by Ian MacFarland rounds off the Sunday evening transmission. A programme schedule is obtainable for the asking. Write to PO Box 6000, Montreal, Canada, HC3 3A8.

In contrast to RCI, Radio Kuwait is on the air daily in English at 1900 on 9·650MHz and 11·675MHz. Middle of the road music is introduced by a western style DJ and there is a well established short feature historical programme on the Muslim faith based on translations of parts of the Koran. Not everyone's idea of entertainment perhaps, but an opportunity to hear about another culture and way of life. The station verifies by QSL card. Reports should go to Kuwait Broadcasting and Television Service, PO Box 397, Kuwait.

Although beamed to parts of Asia, the Radio Australia transmission on 6·035MHz (49m band) comes in well in the UK during the evening, summer and winter. I have heard it several times on a car radio with short wave converter! Local time in Eastern Australia is either 10 hours or 11 hours ahead of us, depending on the time of year, which means we are listening to tomorrow's programme. Look at the calendar if the date is mentioned over the air. A programme schedule is available from Radio Australia, PO Box 428G, GPO, Melbourne, Australia.

Radio RSA *(Richard Hunt)*

DX Party Line

This is the name of a half hour programme for DXers, beamed to Europe on Mondays and Saturdays at 2130UTC. It comes from HCJB, the Voice of the Andes in South America.

Bayerischer Rundfunk (sticker)

Frequencies used are 15·295MHz, 17·825 and 21·480 and the signal on the 15MHz band (19m) is often so strong that it can hardly be missed. *DX Party Line* has a slow easy-to-listen-to style which is rather attractive and the programme content is wide-ranging, informative and interesting. HCJB, which has been on the air since 1931, is located near Quito in Ecuador and is operated by the World Radio Missionary Fellowship, broadcasts to the world using high powered transmitters and directional antennas. The station is a good verifier. Send your reception report with IRCs to HCJB, Casilla 691, Quito, Ecuador. A programme schedule is also available from the UK office which is at 63a Main Street, Bingley, West Yorkshire, BD16 2HZ.

KYOI

These are the call letters of a new super-rock broadcaster which beams programmes into Japan. It is located in Saipan in the Marianas, hence the US callsign and it has been picked up in the UK by **Philip Hodgson** (Stanford) using a

Radio Nederland *(Richard Hunt)*

Trio QR666 receiver with a 5 metre long antenna (short longwire!). Philip heard KYOI on 9·670MHz at 1600 and again between 2100 and 2200. The schedule that came over the air was 0700 to 1500 on 11·900MHz, 1500 to 2200 on 9·670, 2200 to 0100 on 15·405 and 0100 to 0700 on 15·190. Another frequency recently reported is 15·415, possibly a move from 15·405. In reply to **Anthony Cross,** this is probably your unidentified on 9·670 at 2100.

Readers' Letters

"What is Morse code doing in the middle of the 5MHz band (60m)" asks **Peter Gatehouse** (Stowe) who goes on to say that telegraph QRM on this band seems to consist of two high pitch rapidly alternating tones like a microcomputer programme. Peter wonders if two audio filters in series, each tuned to one of the two frequencies, would eliminate the problem. There is also a third frequency which is the rate at which the other two alternate and this may be high enough to cause problems. The Tropical Bands are only allocated to broadcasting in the tropics and some parts of Asia so telegraph QRM is something we have to live with. A directional antenna of some sort would be a better solution to the problem.

Brian Haywood (Abingdon) reports hearing a composite signal on 19·455MHz made up of two s.s.b. signals. The upper sideband usually carries the BBC World Service and the lower another BBC programme. "It is far the best signal of the WS I have been able to find and I have come to rely on it." This must be a feeder, which is a link to a transmitting site, probably abroad. Listening to this sort of link is not legal in the UK as it is not a "broadcast station" within the meaning of the Wireless Telegraphy Acts. The BBC WS is broadcast from some 8 locations outside the UK and the programme links to them are gradually being replaced by satellite links for reasons of reliability.

What are the rarest stations to be heard on the broadcast bands? asks Anthony Cross (Bath). Using a new R70 and 12m random wire he pulled in Malta, in English on 6·110MHz at 1830, Radio Paraguay at 2130 on 9·580, Radio Japan at 0700 on 15·430 and the Voice of Turkey at 2030 on 9·625. For rare stations have a look at domestic broadcasters. There are a number in Australia and Canada that are rarely if ever reported these days. Anthony wonders if there are any propagation charts published for the broadcast bands. Anyone have any information on this subject?

Reader **Peter J. Williams** has received a QSL card from China which is printed in Chinese and he wonders if any *PW* reader could translate it for him. He would like to know the location of the station as he sent reports to both of the stations on 4·865 on the same day and he doesn't know which one has replied. Can anyone help? **Paul Martin** who has been DXing for only six months tried my method of counting channels which led him to pick up Radio Australia on 9·570MHz at 0830. The receiver is a Lafayette HA700 with a 15m long wire and a.t.u. Hopefully this method will soon be a thing of the past as more and more receivers have digital readout.

广播收听证

亲爱的朋友：

兹证明您82年12月13日的收听报告，频率4865千周，符合本台节目。欢迎继续告诉我们收听情况。

甘肃人民广播电台

1983年1月11日

The mystery card from China

(Peter Williams)

The latest schedule from Radio Mediterranean in Malta quotes frequencies of 6·110MHz and 1557kHz with English/Arabic from 1800 to 1857, French/Arabic 2130 to 2230, French/English 2230 to 2330.

VHF Bands

by Ron Ham BRS15744

Reports to: Ron Ham BRS15744
Faraday, Greyfriars, Storrington,
Sussex RH20 4HE.

Forty permits issued for the 50MHz (6m) band, 432MHz (70cm) DXing from a push-bike, DXer starts in Band II, new beacons logged on 28MHz (10m) and details of auroral and tropospheric openings are just some of the interesting items in my post-bag this month.

Solar

While using his spectrohelioscope on February 2, **Cmdr Henry Hatfield,** Sevenoaks, observed 6 sunspot groups, one of which was "very large containing about 20 spots" said Henry and due to cross the central meridian on the 3rd. In view of this neither Henry nor I were a bit surprised when we both recorded a solar noise storm at 136 and 143MHz respectively, on the 3rd, 4th, 5th and 6th, and a few small individual bursts of noise on the 7th and 8th. Henry also recorded the storm on his second radio-telescope operating at 193MHz.

Using his optical equipment in Bristol, **Ted Waring** counted 24 sunspots on January 29, 25 on February 2, 20 on the 6th and down to 9 on the 9th. He also noted active areas on the sun on January 27, and February 2 and 6.

Aurora

No doubt the prevailing solar storm was responsible for the auroras which manifested during the early evening of February 4 and the afternoon of the 6th. I heard about the first event via **Ian Shaw** G4MWD, Dorking, and the latter one from **Julian Cope** G8JNV, Peterborough, who is part of the auroral alert system organised by Phil Hodson G8RBY in Leicester.

At 1815 on the 4th, **Dave Coggins,** Knutsford, heard auroral reflected signals from the 28MHz beacons in Germany DF0AAB and DL0IGI and Sussex GB3SX. At around 1800 on the 5th, he heard similar tones on the signals of GB3SX and the Norwegian beacon LA5TEN. Looking around on 144MHz (2m), with his beam pointed north, Dave heard tone-A signals from GI6ATZ and GM3WTN on the 4th and GM3JIJ, GM3WTH and GM4JLY on the 5th. Dave and I both heard crusty television synchronizing pulses on Ch. R1 49·75MHz during the events and at 1915 on the 4th, I counted 25 strong, auroral burbling, signals from European radio and television stations broadcasting between 48 and 95MHz, all with my 50MHz beam due north. This event must have been very strong because I, in southern England, could hear auroral c.w. signals on 144MHz with only a vertical dipole feeding my receiver.

"On February 5 and 6, the Anglesey 50MHz (6m) beacon GB3SIX was found to be notably auroral to the north west around 1800 on both days" writes **David Newman** G4GLT, Leicester, who also heard G3COJ at 53A from the north west at 0200 on the 6th. As your letters came in it soon became obvious that the auroras hung around by varying degrees for long periods.

The 50MHz Band

David Newman is one of the 40 amateurs to be granted a special permit to operate on the 50MHz band outside of Band I BBC television hours. By February 6, with his home-brew 3 valve crystal controlled transmitter, giving 20W on 50·099MHz, he had worked G3COJ in High Wycombe, G3OHH in Mow Cop and GW3LDH in Wrexham. Like many class A licence holders, David sometimes works crossband 50·1/3·718MHz and has completed such a contact with G3FDW in Retford, with reports of 559. "We are losing quite a lot of sleep but it's certainly very exciting" writes David. "All 40 operators would greatly appreciate any reports from s.w.l.s", so what about it lads and lasses, keep your ears open and be in at the start of another aspect of amateur radio. The 40 stations are shown in Table 1.

Hurricane force winds at the end of January wrecked the 28MHz quad antenna belonging to Dave Coggins, so, during the rebuild he is adding a driven element and reflector for the 50MHz band to feed his Yaesu 50MHz/144MHz converter.

I see from a report by the UK Six Metre Group that a suggested band plan for 50MHz is, 50 to 50·1MHz c.w. and beacons only, 50·110MHz DX calling frequency, 50·2MHz local calling frequency s.s.b. and c.w. only and 51 and 52MHz for all modes. It is further suggested that for liaison or crossband working, the frequencies 3·178MHz, 14·345MHz, 21·385MHz, 28·885MHz, 70·185MHz and 144·185MHz should be used. Also proposed activity periods should be on Tuesdays and Thursdays at TV closedown plus one hour and on Sundays from 0800 to the start of television transmissions. Note: the user of 14·345MHz must QSY after contact.

David Newman G4GLT and **Ken Ellis** G5KW, Land's End, investigated an interesting tropo path on 50MHz around 0630 between Leicester and Land's End and each morning, from February 10 to 15, they made c.w. contact with reports of 449 to 599 plus at David's end and 339 to 579 at Ken's. During these QSOs, Ken has reported hearing a slight echo effect on David's signal.

Table 1

50MHz Permit Holders			
G2AOK	G4BAO	GI3ZSC	GM4DIJ
G3COJ	G4BPY	GI4MJD	GM4ELV
G3LTF	G4CUT	GJ3RAX	GM4FDT
G3NOX	G4GLT	GJ3YHU	GM4FZH
G3OHH	G4HUP	GJ4ICD	GM4IHJ
G3PWK	G4IJE	GM3DOD	GW3LDH
G3TCU	G4JLH	GM3OBC	GW4BCD
G3USF	G5KW	GM3WCS	GW4HBK
G3VZJ	G6XM	GM3WOJ	GW4HXO
G3ZIG	GI3RXV	GM3ZBE	GW4IIL

The 28MHz Band

A near neighbour of mine, **Fred Pallant** G3RNM, gave me a list of call areas he heard on 28MHz, mainly during the mid and late afternoons. These include, WA1 on January 19, KB3 and VP2 on the 21st, W4, ZS5, ZS6 and 9H1 on the 24th, Ws 1, 2 and 3 on the 29th, Ws 3 and 4 on February 2, CX2, CN8, EA9, HC1, KA3, K1, LU5, W4, ZB2, ZS6 and 9H1 on the 12th and CT3, EA8, EL2, KP4, LA6, PY2, PY3, RA3, UA6, ZB2, ZD7, ZS1 and ZS6 on the 13th.

Both Fred and I found the band quiet on January 22 and particularly February 5. "The band was fairly lively for the first few days of February, but, on the 5th there was a complete fade-out", writes **Norman Hyde** G2AIH, Epsom Downs, who suggested it was due to a solar flare. I am sure you are right Norman because the sun was very active around that time. Strange things happened, I heard a strong signal from a VK4 at 0920 on the 4th, complete silence on the 5th, a strong VK6 at 0930 on the 6th and at 0839 on the 7th, the only signal on the band was a 539 from the Sydney beacon VK2WI. Up in Knutsford, Dave Coggins keeps an ear on 28MHz f.m. and around 1335 on January 30, he logged K1OX, RA6LXB, UB5EJP and UK6HEC.

28MHz Beacons

Regular beacon watchers, **John Coulter,** Winchester, Norman Hyde, **Bill Kelly,** Belfast and Ted Waring each reported hearing a new beacon around 28·280MHz transmitting KA1YE/B SECT between January 28 and 31. At 1455 on the 28th John heard another new beacon sending "de WA1IOB/B QSL via BOX 446, Marlboro MA, AAA 01752". This was confirmed by **Bert Glass,** Plymouth, who heard it at 1407 on February 1. A bit later at 1430 on the 1st, Bill Kelly heard a rough signal from the Gough Island beacon ZD9GI on 28·205MHz and writes, "I haven't heard Gough Island for many months". Good to hear old friends again Bill, just like the Canadian beacon heard again by Norman and Ted around January 28th. Dave Coggins says there was sporadic-E about during the evening of January 18 and 19 when he received consistent signals, peaking 569, from the beacons in Germany DK0TE and DL0IGI and Hungary HG2BHA and again at 0745 on the 26th when signals from the beacons in Germany DF0AAB and Norway LA5TEN were both 599 with Dave. Although I counted strong signals from 7 East-European broadcast stations between 66 and 72MHz during a sporadic-E disturbance at 1840 on the 21st, all was quiet when I checked the beacon section of the 28MHz band, 28·200MHz–28·300MHz. John Coulter, along with Dave Coggins, Bert Glass, Henry Hatfield, Norman Hyde, Ted Waring, and I contributed the information to make up the beacon distribution chart, Fig. 1.

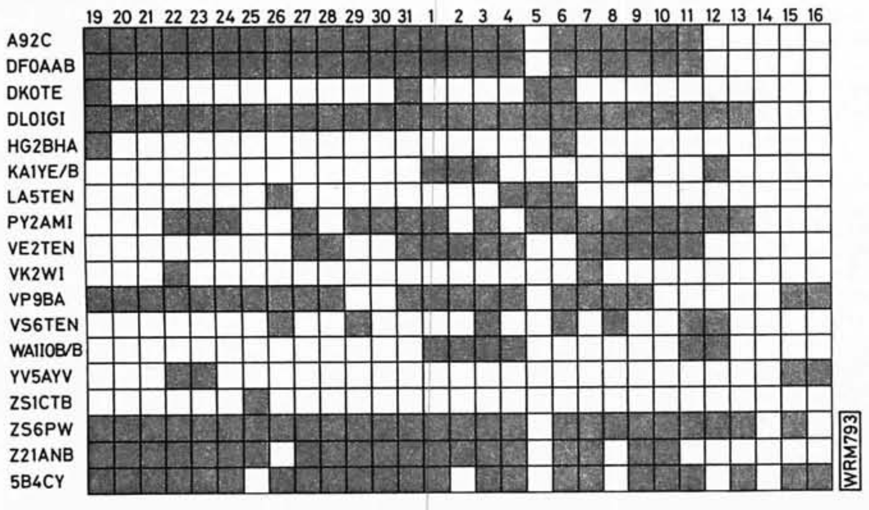


Fig. 1: Distribution of 28MHz beacon signals

Tropospheric

The atmospheric pressure, measured at my QTH, climbed from 30·1in (1019mb) at noon on January 18th to 30·6 (1036) at midday on the 20th where it stayed until 1400 on the 22nd and then began to fall gradually, reaching 30·0 (1015) by 0200 on the 29th. For the following week the pressure fluctuated between 29·4 (995mb) and 30·4 (1029mb) with the rapidly moving bad weather conditions and by midnight on February 8 it settled again at 30·1 and hovered around this level until the 15th, when it commenced climbing again. The chart from my barograph for the period January 18th to 23rd, Fig. 2, is another classic example of the relationship between falling high pressure and a tropospheric opening in the v.h.f. and u.h.f. bands.

During the opening on the 22nd and 23rd, 17-year-old **Roland Jeffery** G6DSA, Winsford, worked DD1BR, DL2KAL/A, F1CNJ, F6GLH, on 144MHz and F1DZB, F6APE, F6GNR and HB9AMH/P on 432MHz. Roland, a member of the Mid-Cheshire Amateur Radio Society, uses a Yaesu FT-225 and 8-element Yagi on 144MHz and FT-225, Microwave Modules transverter, a 50W linear and 16-element DL6WU antenna for 432MHz. Being really keen, Roland is push-bike mobile on 432MHz with a TR-2300, plus Microwave Modules transverter and a half wave over quarter wave colinear antenna on the carrier.

At 0840 on the 23rd, I heard GW mobiles working through the Bristol Channel repeater GB3BC on R6 and by 1730, northern Gs were audible via the same route. My best DX of the event came at 0122 on the 24th when I received a 539 signal from the Emley Moor beacon GB3EM on 432MHz using only a vertical dipole to feed my receiver.

Listening again on R6 at 0855 on the 23rd, I heard a G station say that 144MHz stations using s.s.b. from the west-country were working into Germany and Scandinavia. Down in Portsmouth, **Les Sawford** G6APD, using an Icom 251E, Microwave Modules linear and a 9-element crossed Tonna array, on 144MHz, worked Spain on January 16, fourteen French stations on the 17th, 1 PA and 6 Fs on the 20th, 1 PA, 6 Fs, 1 HB9 and a Y23 on the 22nd and 3 PEs and 3 Fs on the 24th. While chatting to Les I learnt that ON1BCG is on 144MHz most mornings and is looking for contacts with G stations. In 2 years on 144MHz, Les, using mainly 10W, has worked 13 countries outside of G: DJ, EA, EI, F, GI, GJ, GM, GW, HB9, OK, ON, PA and Y23.

Band II

Once again the domestic f.m. broadcast band was full of DX during the tropospheric opening which took place in the latter half of January. While tuning around, I found a host of French and Dutch stations between 88 and 100MHz during the evening of the 21st. It was on the 21st, 22nd and 23rd that **Richard Hunt,** Tadcaster, ventured into the world of v.h.f. DXing having heard a warning on BBC television about the likelihood of interference, in some areas, from television stations in France. "I had really excellent reception from France-Inter on 99·6MHz over 2 hours from 2150 to 2359 on the 22nd" writes Richard. He also heard a number of German stations including an interview with SPD leader Hans Joachim Vogel on Hessischer Rundfunk 1 on 99MHz and a debate about Franco-German relations on WDR/NDR, 97·1MHz, on the 23rd. At one time Richard heard a sports commentary from the Belgian station BRT–1 on 99·9MHz and writes "while this was very interesting, it must have caused severe problems for the Police and Fire services whose frequency allocation in the

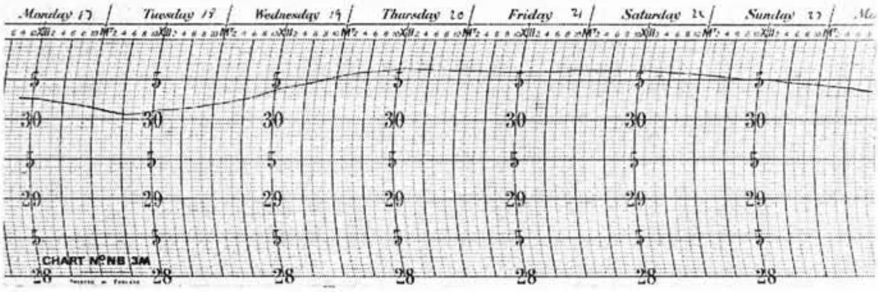


Fig. 2: Barograph chart for January 18–23

UK coincides with the upper part of the European broadcast band". Quite right Richard, as I have said before, frequency sharing works fine until there is an atmospheric disturbance which no-one can control.

Having moved to a new QTH in Stroud, **Tim Anderson** had no antenna for Band II so, not to lose out on the DX, he made a wire dipole, fixed it to the wall with Sellotape and on the 22nd, using his Sharp 7100, logged 8 French stations between 96 and 103MHz.

On the 23rd, **Simon Hamer,** Presteigne, using the Grundig S1400 and Melody Boy 500 and a Pioneer SX450, demonstrated f.m. DX to a handicapped listener, **Guy Palmer,** who enjoyed hearing folk music from Belgium in full stereo. Simon had a lot to tell Guy, because on the 22nd he heard a variety of programmes, including piano and organ music, a symphony and sport, from Belgium BRT–1 Egem on 95·7MHz, France TDF Musique from Lille on 88·7MHz, Cultor from Boulogne on 99·9MHz and Caen 91·53MHz, Inter from Niort 99·4MHz and Caen 99·6MHz and Holland NOS–1 from Smilde.

Simon, Ian Kelly and **Michael Welch,** London, report hearing signals from Radio Boulogne Littoral on 103MHz on the 22nd. Michael writes "Truly excellent high pressure conditions" after logging AFN Brussels/Everberg, Belgian broadcasts in stereo from Egem, Genk, Schoten and Wavre and IBA local stations Radio Orwell, Saxon Radio and Wiltshire Radio. His reception of Suffolk's Saxon Radio was so good that he telephoned the station and their DJ Dave Brown read out a dedication for him.

Ian, at his home in Reading, received very strong signals from the French broadcast stations, Frequence at Boulogne and Lille and Radio France at Boulogne, Caen, Le Mans, Lille and Rouen, on the 22nd and tells me that, like us all, he is looking forward to the forthcoming sporadic-E season.

RTTY

One of the regular RTTY listeners **Peter Lincoln** BRS42979, Aldershot, has replaced his Microwave Modules Model 2000, RTTY to TV converter, with a model 2001. This was mainly because it incorporates the 1200 ASCII speed, which will enable him to receive signals from the UOSAT space craft. So far Peter has only heard its beacon on 145·825MHz. During the month preceding February 7, Peter copied signals from most of the European countries plus A4XCB, EA9JZ, HZ1AB, JA3EVZ, OD5GN, PY6ACP, TU2GA and a few from the USA on 14MHz. After logging FR0GGL on 21MHz and 9N2DW on 14MHz, Peter's new countries score reached 94. Soon be the ton Peter, hi. Although my score is well below this, I did copy RTTY signals from 11 countries on 14MHz, DJ, EA, F, I, IT9, OE, OK, ON, OZ, YO and YU and 3 countries, DF, IT9 and OH on 21MHz between January 19 and February 15.

In addition to FM7WQ, HZ1AB and TU2GA, **Norman Jennings,** Rye, logged his usual couple of dozen Europeans between January 11 and February 10 on 14MHz and FR0GGL on 28MHz. Norman keeps an eye on signals from the WA1URA/4 repeater using 170/75 baud on 14·095MHz, news bulletins from the ARRL HQ station W1AW using 170/45·5 baud on 21 or 28·095MHz and the BARTG news on Sundays. He asks, "would other RTTY readers please report any other interesting skeds or bulletins", he would also like to hear from readers using a Tasco CWR-670E and would be pleased with a call on 0797 222530.

Peter Lincoln has two international call-books and is willing to give listed addresses to fellow readers if they care to ring him on 0252 317870. Peter is at home all day and pleased to have a chat on any radio subject especially RTTY and SSTV.

Station Information

Congratulations to **Phillip Racher,** Guildford, on passing the RAE and his new callsign G6MQJ. For some time Phillip has been collecting all the vintage parts required to re-construct the wireless operator's compartment of a WWII Lancaster bomber and plans to build it into a trailer which he can tow to exhibitions.

I understand that local amateurs have made it possible for one of the v.h.f./u.h.f. pioneers, **Leon Ward** GW5NF, to operate on the 144MHz band from Pontypool District Hospital where he is a patient. Well done all, this is the true spirit of amateur radio.

My opposite number in *Shortwave Magazine,* **Norman Fitch** G3FPK, has written to me with news of a contest. He has been asked by Henry Souchet 9H1CD to tell our readers about the 9H Falcon Contest. This is due to take place on the 144MHz band between 0001Z on June 1 and 2400Z on June 15. The event is organised by the recently formed 9H v.h.f./u.h.f./s.h.f. Group, and is designed to coincide with part of the sporadic-E season. It is open to all radio amateurs with a trophy and diploma for the winner, and there are diplomas for the two runners-up to work for. Briefly all modes and all types of propagation are valid, but not satellites or repeaters. The competing stations must log a minimum of ten 9H stations to be eligible to take part. Readers interested can obtain more detailed information from: The Contest Manager, 9H Falcon Contest, PO Box 144, Valletta, Malta. All logs must reach him by July 1.

TV

by Ron Ham BRS15744

Reports: as for VHF Bands, but please keep separate.

The words aurora, sporadic-E and tropo, each in their own different ways, mean extra stations for the TVDXers to sort out in Bands I, III and V. They had many opportunities to do just that on several days between January 20 and 25 and February 3 and 6.

Band I

Both **Fraser Lees,** Lewes, and I watched pictures from Poland on Ch. R1 49·75MHz between 1745 and 1800 and the USSR on Ch. R2 59·25MHz from 1800 to 1900, during a limited sporadic-E disturbance on January 21. At 1835 a YL announcer appeared with a digital clock showing 2135 followed by the Russian news caption BPEMR and an orchestral programme filmed in a hall with a giant organ. During the event, I received exceptionally strong signals on the R2 sound channel 65·75MHz using a tuneable v.h.f. communications receiver and from the many bursts of pictures which appeared on my Ch. R1 monitor between January 19 and February 16, I only identified test cards from Poland and the USSR.

Tropospheric

Although the main news is about the good conditions for TVDX between January 21 and 26, **Tim Anderson,** Stroud, received a test card from Radio Telefis Eireann in Band III (Fig. 1), most likely Ch. H 207·25MHz, with his Plustron receiver on the 11th. With the atmospheric pressure just right for DXing on the 22nd (v.h.f. bands Fig. 3) I found the Belgian BRT TV1 test card at 1434 and a variety programme between 1800 and 1830 on Ch. E10. At 1845, Fraser Lees received the BRT clock showing 1945 on Ch. E8. The repeated warnings about co-channel interference on the u.h.f. bands from the BBC and IBA, helped to alert the DXers during the life of the disturbance.

On the 23rd, **Guy Palmer** joined **Simon Hamer** at his home in Presteigne, and they saw the German ZDF Fuba test pattern on Ch. E37. They also watched the programme *Welt Spiegel* on WDR-1, Münster-Baumb., and the presenters, Hansurier Rosenborg and Wolf Hanke, interviewing people were crisp and clear. Usually Simon, when someone visits my shack there is no DX about, so you timed Guy's visit just right. On the 22nd, Simon received strong pictures from ZDF on Chs. E34, 35 and 37 and Belgium's BRT-1 and BRT-11 from Egem on Chs. E43 and 46 respectively. He also saw the test pattern BRT TV2 and at 2100 a YL announcer introduced the American film *The Blue and the Gray* with Flemish subtitles. Later Simon watched *Sport of Zatterdag,* a caption Koda, a piano and cello recital and the BRT close down clock showing 0010.

Among Simon's impressive list of UK stations seen during the disturbance were pictures of Anglia TV's clock caption with the knight from Sandy Heath on Ch. 24 and Sudbury on Ch. 41, the TVS clock and an announcement concerning the interference from Dover on Ch. 66, Hannington on Ch. 42 and Midhurst on Ch. 58.

Over in Norwich, **David Girdlestone,** had a field day, when he received a Videotext picture, Fig. 2, from

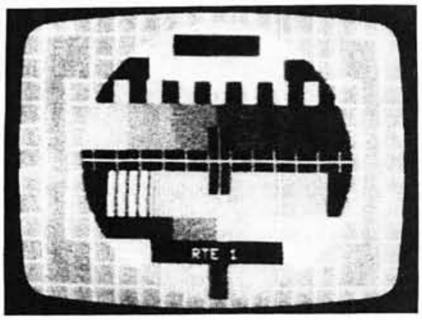


Fig. 1: Band III test card *(Tim Anderson)*

Fig. 2: German Videotext *(David Girdlestone)*

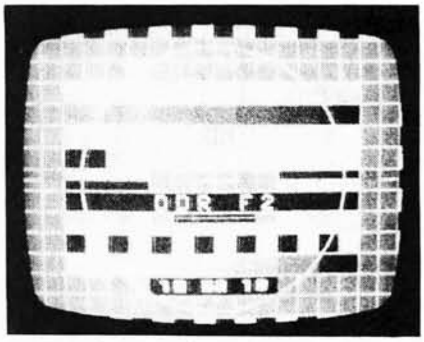


Fig. 3: East German test card *(David Girdlestone)*

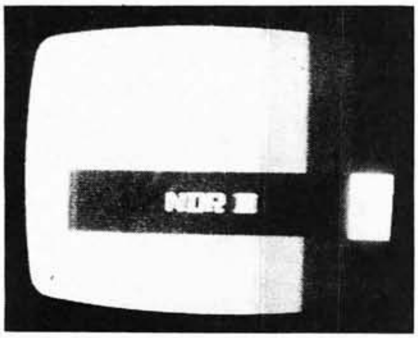


Fig. 4: West German test card *(David Girdlestone)*

Fig. 5: German caption *(David Girdlestone)*

Fig. 6: Dutch caption *(David Girdlestone)*

Fig. 7: SSTV picture received on 14MHz *(Peter Lincoln)*

Fig. 8: East German news *(Ron Ham)*

Fig. 9: Tim Anderson's portable TV station

ARD/ZDF on the 24th and between the 23rd and 26th he received u.h.f. pictures from France, East and West Germany, Figs. 3, 4 and 5, Holland, Fig. 6 and Sweden. On the 26th, NED-2 was showing *Not the Nine o'clock News* with Dutch sub-titles and ZDF, the German version of *Play Your Cards Right.* I watched a news programme on the 23rd from DDR on Ch. E6, which included such items as an anti-nuclear parade, youth employment, winter sports and the captions DKP, FDJ (Fig. 8), FDGB, Moskau and Tass—Erklarung. Among the insignias seen were DDR's OK and that of the United-Nations and well known names such as Barclays National Bank and Siemens. At 0810 on the 24th I received strong colour test cards from PTT-NED-1 on both Chs. E6 and 29 and BRT TV1 on E10.

SSTV

While monitoring the slow scan television section of the 14MHz (20m) band on January 19, **Peter Lincoln,** Aldershot, received a television CQ from EA8AHK (Fig. 7). He also received a caption from YU2CD in QSO with ON7RR and pictures from DL7WR using the special callsign DL7WCY (World Communication Year). During the month prior to February 7, Peter received SSTV pictures mainly from European stations on 14MHz and ZS6BTD on 21MHz.

Other Stations

S. H. King, a touring caravan enthusiast from Marlow, has equipped his van with a Mohawk wide-band antenna, with built in pre-amp, so that he can enjoy the local programmes while visiting different countries. When the van is stationary, he mounts the Mohawk on a 4m high pole and uses a JVC CX610GB for colour and a National Panasonic TR5030G for monochrome reception. Whilst in France, he connects his continental Edison TC3664/5 for receiving signals from Antenne 2, TF1 v.h.f./u.h.f. and FR3 on either 625- or 819-line transmissions.

Dave Lauder sent me a copy of the *DX-TV Group Newsletter* which contains a fair bit of useful gen about getting started on Band I and some technical ideas and suitable equipment for the television enthusiast. Readers interested in seeing a sample copy should send an IRC or SAE to Dave at 18 Burnside Close, Barnet, Herts, EN5 5LN. "We are not merely a publisher of newsletters, but also a group which aims to put TVDXers in touch with others in their area", writes Dave, who also offers to send copies of the April and July 1983 newsletters for the payment of 4 first-class stamps.

Because Tim Anderson has a problem with erecting antennas at his new QTH, he has established himself as a portable TVDXer and has arranged his antenna couplings in such a way that the u.h.f. beam (Fig. 9) seen in the picture on the mast by his car, can be changed for a 10-element Yagi for Band III or a single dipole for Band I.

Swap Spot

Have FRG-7 communications receiver, only 2 months old. Would exchange for CB gear or radio gear. K. McGuckin, 20 Lisnahull Park, Dungannon, Co. Tyrone, N. Ireland. *Q919*

Have 5¼in Tandon TM-100-2 double-sided disk drive. Would exchange for 144MHz synthesised hand held, 144MHz linear 10W in 100W out or better, Trio VFO-700S, Morse tutor or w.h.y. 285 Brae Court, Glenrothes, Fife, Scotland. *Q920*

Have Audio Laboratory generator 20Hz-200kHz with manual, Marconi Universal r.c.l. bridge, spectrum analyser, tuneable converter 2·3GHz-4·45GHz i.f. output 160MHz, mint. Would exchange for radio receiver general coverage or v.h.f. receiver and display unit. Tel: 0942 55948 (Wigan). *Q944*

Have Eumig Standard 8 sound projector. Would exchange for Murphy B40 or w.h.y. short wave listening equipment required. D. Clifford, 160 Goldsworthy Way, Slough, Berks. *Q964*

Have Ham Master 4500 base mic, Melos Echo box, R109 receiver non-working with spare valves and circuit. Would exchange for ZX81 plus p.s.u. or w.h.y. D. Green, 28 Compass Tower, Heartsease Estate, Norwich, Norfolk, NR7 9TW. Tel: 35458. *R007*

Have Heathkit SB101 s.s.b. h.f. transceiver, SB650 digital frequency display, SB610 monitor 'scope, G4MH mini beam, Reace s.w.r./power/mod meter, Amtech a.t.u., Tektronix 545A 'scope, Stag 357 p.s.u. Would exchange for woodwork equipment or w.h.y. Karl. Tel: 01-751 3555. *R031*

Have two Pye Vanguard a.m. radio telephones. Would exchange for any h.f. communications receiver. D. Piggott, 22 Larch Lane, Duston, Northampton. Tel: 0604 51019. *R032*

Have Audio & Design Laboratory pick-up arm plus Shure M75E type 2 cartridge. Would exchange for p.s.u. type S390 or S390B. For Eddystone type 358 receiver 1940s vintage S. G. Brown vintage phones, Avo Model 7 case w.h.y. 21 Orchard Close, Wendover, Bucks. Tel: 622725. *R033*

Have Philips N1500 video recorder, needs attention with three tapes. Would exchange for a short wave receiver, age not important e.g. CR100, HRO etc, must be working or w.h.y. 37 Parkersfield, Stevenage. Tel: 0438 50310. *R060*

Have Yaesu FR107M, FP107E p.s.u., speaker, 9 bands as new, Leak stereo 20 amplifier. Would exchange for ham gear w.h.y. Davis, 88 Goring Road, Worthing. Tel: 41109. *R086*

Have BTH 16mm sound (optical) projector. Would exchange for FT-227R or similar or 144MHz receiver or 4in reflector telescope with camera attachment. G8BSK, 290 Priory Road, St. Denys, Southampton, SO2 1LS. *R103*

Have many spares, no set. Need T1396/TR9, any rebuildable condition. Also T1083, R1116, T1117, any airforce. Have swaps: unbutchered? R1155A also T1154M, R1082, BC348L, WS17, WS52. Can obtain others through friends. D. W. Parsonage, 52 Bramble Lane, Mansfield, Notts, NG18 3NR. *R104*

Have AR88 vintage radio receiver immaculate condition. Would exchange for a pair of high power binoculars or high power telescope with tripod. Swindon 725992. *R138*

Have FRG-7 with fine tune, narrow band filter and down to 100kHz. Also FR207R complete with NiCads, rubber duck, speaker mic, charger unit, mobile power supply and case. Both boxed with handbooks. Would exchange for h.f. equipment w.h.y. Tel: Milford Haven 3991. *R139*

Have TR-2300 with matching 10W linear amplifier, MB2 bracket, PS1200 p.s.u. charger, Hanson SWR50B meter, Packer 145 a.t.u., rubber duck antenna, NiCads and carrying case. Would exchange for SX200N scanner. Patrick, 148 Wisbech Road, Littleport, Cambs. CB6 1JJ. *Q943*

Have three "handyman in the home" books. Would exchange for 209 Mk II receiver circuit, photostat will do. T. W. Brown, 75 Poplar Ave., Tividale-Warley, West Mids. Tel: Dudley 59938. *R165*

ELECTROVALUE

- 24 HOUR NORMAL DESPATCH TIME
- ESTABLISHED 1965
- ALL GOODS GUARANTEED BRAND NEW AND TO SPECIFICATION
- APPOINTED SIEMENS DISTRIBUTORS

I.Cs – DIGITAL & ANALOGUE

DIGITAL

74LS

74LS00	11	74LS161	36	7413	18	74157	30	4072	13	LM382N	115	TAB1041K	187
74LS02	11	74LS163	36	7414	20	74190	45	4081	13	LM3900N	50	TBA120AS	62
74LS04	12	74LS164	30	7420	15	74191	45	4082	13	LM3914N	250	TBA120U	72
74LS05	12	74LS165	50	7430	14	74192	45	4093	20	LM3915N	200	TBA800	75
74LS08	12	74LS166	60	7440	14	74193	45	4510	45	NE555V	18N	TBA10S	75
74LS10	12	74LS173	55	7442	32	74393	78	4511	45	NE556A	45	TBA820	75
74LS11	12	74LS174	45	7443	60			4514	110	NE567N	104	TBB1458	62
74LS14	25	74LS175	40	7444	60	**CMOS**		4516	53	RC4151NB	80	TBB1458B	40
74LS20	13	74LS191	36	7447	36	4000	10	4518	40	S041E	290	TCA105	120
74LS30	12	74LS193	40	7448	40	4001	10	4520	50	S041P	121	TCA105B	108
74LS32	13	74LS195	39	7450	14	4002	12	4543	75	S042E	364	TCA105G	140
74LS37	14	74LS196	48	7451	14	4006	50	4583	90	S042P	138	TCA250A	185
74LS38	14	74LS197	60	7453	14	4007	14	*All above prices are NET and shown in pence*		S89	11.23	TCA205K	200
74LS42	28	74LS221	48	7454	14	4008	32			S178A	16.60	TCA335A	66
74LS47	36	74LS240	55	7460	14	4009	24			S187	11.95	TCA345A	109
74LS51	14	74LS241	55	7470	24	4010	24			S566B	214	TCA345W	177
74LS73	18	74LS242	55	7472	24	4011	11	**ANALOGUE**		S576A	235	TCA671	131
74LS74	16	74LS243	55	7473	26	4012	16	709C5	49	S576B	235	TCA780	211
74LS75	18	74LS244	55	7474	20	4013	20	709C14	44	S576C	235	TCA871	114
74LS76	15	74LS245	70	7475	25	4014	46	723C14	36	S576D	225	TCA955	228
74LS85	40	74LS251	30	7476	25	4015	40	741C5	57	S1469	468	TCA965	120
74LS86	16	74LS253	30	7480	35	4016	20	741C8	16	SAB0600	302	TCA965K	170
74LS90	22	74LS257	30	7482	65	4017	32	741C8/S	56	SAB3209	425	TCA971	92
74LS92	30	74LS259	55	7483	38	4018	45	741C14	47	SAB3210	311	TCA991	80
74LS93	22	74LS266	20	7485	60	4019	25	747C14	65	SAB3211	168	TCA991K	100
74LS107	20	74LS273	55	7486	18	4020	42	748C8	35	SAB3271	329	TDA2002	120
74LS112	20	74LS279	30	7489	159	4021	40	741S	56	SAB4209	497	TDA2003	126
74LS123	34	74LS299	150	7490	20	4022	39	1458C5	62	SAB8256C	35.40	TDA2030	150
74LS125	24	74LS367	30	7491	35	4023	14	1458C14	40	SAD1024	9.00N	TDA4050B	144
74LS126	25	74LS368	28	7492	25	4024	32	7106	450	SAJ131	238	TDA4290	169
74LS132	34	74LS373	60	7493	25	4025	13	7107	500N	SAJ141	278	TDA4600	184
74LS136	23	74LS374	55	7494	35	4026	80	555	18N	SAJ205	810	TDA4700A	546
74LS137	90	74LS378	60	7495	35	4027	20	7555	80N	SAS231W	260	TDA4713A	435
74LS138	25	74LS393	45	7496	34	4028	39	556	45	SAS251	142	TFA1001W	252
74LS139	27	**7400**		74100	80	4029	45	CA3046	70N	SAS580	198	TL071CP	25N
74LS145	70	7400	11	74104	45	4030	15	CA3080E	80N	SAS590	196	TL072CP	45N
74LS148	75	7401	11	74107	20	4041	40	CA3130E	90N	SDA5680A	15.55	TL074CN	100N
74LS151	40	7402	11	74121	24	4042	40	CA3140E	45N	TAA761	104	TL081CP	25N
74LS153	40	7403	12	74123	34	4043	40	LM301AN	25N	TAA761A	49	UAA170	165
74LS155	30	7404	13	74125	29	4044	40	LM308N	60	TAA765A	62	UAA170L	152
74LS156	36	7405	15	74126	29	4046	46	LM317K	295	TAA861	103	UAA180	165
74LS157	27	7406	20	74141	52	4049	23	LM324N	32	TAA865A	59	UAA190	141
		7407	20	74151	30	4050	23	LM348N	65	TAA2761A	72	XR2206	300N
		7408	14	74154	50	4060	45	LM380N	66	TAA4761A	113	ZN414	80
		7409	14	74155	39	4069	13	LM380N8	80	TAA4765A	120	ZN424P	99
		7410	14	74156	35	4070	13	LM381N	145			ZN425E	350
						4071	13						

CAPACITORS

Polystyrene, Siemens 5% Tolerance 160V 5, 7, 10, 12, 15, 18, 22, 27, 33, 39pF **15p**; 47, 56, 68, 82, 100, 120, 150, 180, 220, 270, 330, 390, 470, 560, 680, 820pF, 1n, 1n2, 1n5, 1n8, 2n2, 2n7, 3n3, 3n9, 4n7, **10p**; 5n6, 6n8, 8n2, 10n, **13p**.

Ceramic. Very small 1.8, 2.2, 2.7 etc. up to 1n **5p each**. 1n5, 2n2, 3n3, 4n7, 6n8, **5p**; 10n, 22n, **6p**; 33n, 47, **7p**; 68n, 100n, **8p**.

Polyester Siemens Layer Type 7.5mm lead spacing 100V. 1n, 1n5, 2n2, 3n3, **6p**; 4n7, 6n8 **6p**; 8n2, 10n, 12n, 15n, 18n, 22n, 33n, 47n, **7p**; 56n, 68n, **7p**; 82n, 100n **9p**; 120n, 150n, **11p**; 180n, 220n, **12p**; 270n, 330n, 390n, 470n, **15p**; 560n, 680n, **24p**; 10mm spacing 1uF **25p**; 15mm spacing 2u2 **35p**; 22.5mm spacing 1uF 400V **56p**; 3.33uF 100V **69p**; In depth stocks.

1/63	9	1000/10	19
2.2/25	13	1000/16	26
2.2/63	9	1000/25	36
4.7/63	9	1000/40	44
4.7/100	14	1000/63	76
6.8/40	9	2200/6	9
10/6	8	2200/16	44
10/25	9	2200/25	60
10/40	11	2200/40	73
10/63	12	4700/16	72
10/100	15	4700/25	90
22/10	9		
22/25	11	**TANTALUM BEADS**	
22/40	12		
22/63	15	0.1/35	13
22/100	16	0.22/35	13
47/3	2	0.47/35	13
47/10	11	1.0/35	13
47/25	10	2.2/16	13
47/40	15	2.2/35	16
47/63	17	4.7/16	16
47/100	18	4.7/35	15
100/3	2	6.8/16	16
100/10	12	10/6.3	16
100/16	12	10/16	18
100/25	12	10/25	18
100/40	15	22/6.3	18
100/63	20	22/16	30
100/100	27	22/25	30
220/10	16	33/6.3	24
220/16	16	33/10	30
220/25	16	47/6.3	30
220/40	20	100/3	30
220/63	28	100/10	66
220/100	42		
470/10	19		
470/16	19		
470/25	19		
470/40	27		
470/63	45		
470/100	73		

For full ranges of very many other types please see Cat 82 and/or current price list.

CRYSTALS

(in MHz)

0.032768	102	4.433	128
0.100000	453	4.915	157
1.000	453	5.000	157
1.8432	320	5.026	128
2.000	268	6.000	157
2.4576	268	6.144	157
3.2768	188	6.5536	128
3.579	128	8.000	1.88
4.000	102	8.867	128
4.194	128	10.000	157
		18.432	188

ZENER DIODES

400mW/2.7-30V	7p
1.3W/3.3-100V	15p
20W/7.5-75V	£1.98

CONNECTORS

DIN AUDIO

Pins	plug	skt
2	8p	8p
3	14p	8p
4	17p	14p
5 (180°)	17p	11p
5 (240°)	20p	8p
6	18p	20p
7	19p	30p

IDC Connectors DIL

14 way	103p
16 way	117p
24 way	170p
40 way	265p

PARALLEL TYPE

	plug	skt
16 way	1.10	1.30
20 way	1.25	1.45
26 way	1.50	1.70
34 way	1.65	1.95
40 way	1.85	2.10

Plugs have retainers. Sockets have strain relief.

JACK PLUGS SKTS

MONO ¼"				
chrome	P1	53p	34p	42p
plastic	P2	32p	14p	20p
STEREO ¼"				
chrome	P3	81p		52p
plastic	P4	60p	15p	20p
MONO				
3.5mm		18p		14p
Stereo		23p		42p

IC SOCKETS

Pins	Each	25 for
8	6	120N
14	8	160N
16	9	180N
18	11	220N
20	12	240N
22	14	280N
24	15	300N
28	18	360N
40	25	500N

D – SERIES

	Plug	skt	hood
9	64p	96p	92p
15	88p	140p	96p
25	128p	205p	110p
37	176p	298p	122p

REGULATORS

				7818	40	7918	50
7805	40	7905	50	7824	40	7924	50
7806	40	7906	50	78L05	32	79L05	50
78C8	40	7908	50	78L12	32	79L12	50
7812	40	7912	50	78L15	32	79L15	50
7815	40	7915	50	78L24	32	79L24	50

BOXES

High quality Black ABS plastic or die-cast plain or stove grey.

L	W	D	ABS		Plain		Stove Gr	
50	50	25			5001P	90p	5001	123p
100	60	25	2002	96p	5002P	117p	5002	154p
113	63	31	2003	109p	5003P	143p	5003	184p
121	66	40	2004	115p	5004P	162p	5004	210p
152	82	50	2005	134p	5005P	216p	5005	268p
192	113	61	2006	236p	5006P	314p	5006	401p

VERO RANGE plastic boxes

L	W	D		
72	47	25	21024	54p
120	50	35	21390	87p
180	110	55	21391	160p

G RANGE professional instrument Cases

134	90	44	21089	£7.68
224	140	64	21090	£11.62
302	170	84	21091	£15.78

VEROBOX CASES

to give a completely professional finish to a much valued project.
ABS, light grey top; dark grey bottom + 2 anodised panels

L	D	H	TYPE	PRICE
205	140	40	21034	£4.52
205	140	75	21035	£5.02
205	140	110	21036	£6.54
180	120	39	21037	£4.11
180	120	65	21038	£4.40
180	120	90	21039	£4.69
155	85	39	21040	£3.31
155	85	60	21041	£3.31
155	85	80	21042	£4.30
125	65	30	21047	£2.48
125	65	39	21048	£3.15
125	65	50	21049	£3.56

METERS

Large range of types in stock; also probes, leads, accessories, etc.
PANEL MOUNTING in 50, 100, 500µA; 1, 5, 10, 50, 100, 500mA; 1A either model.

MU Range 50 × 45mm **£2.68**

T Range 60 × 45mm **£5.95**

MULTIMETERS

NH56A NEW – 20KΩ/V AC/DC/ RES/dB in 23 ranges: 130 × 88 × 37mm **£11.20N**

YN360TR 20KΩ/V: AC/DC/R/ dB/Transistor Test: in 21 ranges: 145 × 96 × 45mm **£16.45N**

SEMICONDUCTORS

1N914	03	2N3819	22	AA118	9	BB105B	32p	BC214	09	BFR39-41	23	E1210	76
1N914B	10	2N3820	40	AA119	9	BB204	57p	BC214L	09	BFR79-81	23	E2506	154
1N916	05	3823	60	AC126	25	BO146	30N	BC238C	09	BFT65	119	EB383	20
1N4007	06	2N3904	15	AC127	25	BO226	45N	BC239C	09	BFT66	192	MJ2955	90
1N4148	03	2N3906	15	AC128	25	B1906	38	BC258B	09	BFX29	24	MJE340	55
1N5402	14	2N4036	46	AC151R	55	BA379	25	BC267B	16	BFX84	24	MJE2955	95
1N5407	18	2N4058-62	09	AC153K	20	BAS40-03	36	BC300	32	BFX85	24	MJE3055	70
2N697	23	2N4124	25	AC176	25	BAS70-03	41	BC301	24	BFX87	28	MPF102	40
2N706	18	2N4126	25	ACY17	156	BB409	33	BC303	30	BFX88	26	MPS6531	40
2N930	20	2N4284	30	ACY18	120	BC107A,B	16	BC327	16	BFY50	24	MPS6534	42
2N1132	23	2N4286	18	ACY19	99	BC108A,B,C	16	BC328	11	BFY51	24	MPSA12	36
2N1302	110	2N4289	23	ACY20	90	BC109B,C	18	BC337	14	BFY52	24	MPSA63	38
2N1303	58	2N4291	24	ACY21	85	BC121W	30N	BC338	11	BFY90	143	NAS206S5	81
2N1304	62	2N4292	21	ACY39	170	BC122Y	100	BC413	09	BR34	70	OA47	12
2N1305	62	2N4991	62	ACY41	10	BC125	20	BC414	09	BR64	110	OA202	14
2N1306	90	2N5062	32	AD136	150	BC125	20	BC477	24	BRY39	45	OC28	75
2N1307	67	2N5192	110	AD142	90	BC140	25	BC546	10	BSX20	22	OC29	75
2N1308	147	2N5195	106	AD149	88	BC141	30	BC547	09	BSX26	22	OC35	75
2N1309	99	2N5457	32	AD161	35	BC147A	10	BC548	09	BSX63	160	OC36	90
2N1599	100	2N5458	32	AD162	35	BC149	10	BC549	09	BT106	147	OC84	25
2N1613	25	2N5459	36	AF114	37	BC154	25	BC550	10	BT108	136	PM7A2	373
2N1711	25	2N6050	380	AF115	37	BC160	25	BC556	10	BU105	170	PN70	10
2N1893	32	2N6057	375	AF116	57	BC161	30	BC557	09	BU124	85	PN72	05
2N2218A	31	6F40	12	AF117	64	BC167A	09	BC558	09	BU208	180	Q4006LT	104
2N2219A	25	16F40	166	AF124 AF125	37	BC167B	09	BC559	09	BUX26	350N	Q4010LT	115
2N2222A	25	40HF40	225	AF126	37	BC168A	09	BC560	10	BUX28	545	Q4025H	450
2N2369A	21	40362	65	AF127	37	BC168B	09	BC879	38	BUX81	325	T2700D	189
2N2484	25	40406	71	AF200	10	BC169B	09	BC880	43	BUX85	130	T2800D	104
2N2646	45	40408	95	AF239	114	BC169C	09	BCY31A	157	BUZ10A	478	TAG3-400	100
2N2904	26	40412	108	AF279	30	BC177B	16	BCY58	18	BUZ15	12.27	TAG209-400	85
2N2904A	25	40430	100	AFY12	204N	BC178B	16	BCY70	18	BUZ20	523	TAG209-600	130
2N2905A	25	40594	123	AFY16	327N	BC179B	18	BCY71	18	BUZ23	787	TIC106D	48
2N3053	23	40595	123	AFY18D	310N	BC182	09	BCY72	18	BUZ24	12.50	TIC106M	55
2N3054	56	40636	147	AFY18E	615N	BC182L	09	BD130	45N	BUZ32	625	TIC126D	64
2N3055	48	40673	146	AFY42	461N	BC183	09	BD131	48	BUZ33	844	TIC206D	54
2N3405	64	A9903	16	AU106	240	BC183L	09	BD132	48	BUZ41A	637	TIC226D	61
2N3663	15	AA113	13	AUY22	10.95	BC184	09	BD135	27	BUZ44A	9.67	TIC236D	96
3702-11	09	AA116	9	BO140	25N	BC184L	09	BD136	27	BUZ45	12.76	TIC246D	105
2N3771	180	AA117	13			BC202Y	120	BD139	30	BUZ48	18.94	TIP31A	36
2N3794	21					BC212	09	BD140	32	BUZ50A	763	TIP32A	36
						BC212L	09	BD644	42N	BUZ54A	12.50	TIP41A	45
						BC213	09	BD679	62	BUZ80	739	TIP41C	60
						BC213L	09	BD680	64	BUZ83	11.29	TIP42A	45
								BF115	35	BUZ83A	11.95	TIP42C	60
								BF167	25	BUZ84A	12.75	TIP150	75
								BF173	25	BY164	48	TIP2955	55
								BF177	25	C106D1	45	TIP3055	55
								BF178	25	C0326	460N	TIS43	50
								BF244B	40	C0340	490N	U763	50
								BF254	14	C407	17	VN10KM	55
								BF255	14	C0546	126N	VN46AF	93
								BF420	31	C762	40	VN66AF	105
								BF421	34	C1406	77	VN88AF	123
								BF457	35	D4 clip for		W02	25
								BF458	35	C1406 and		ZTX300	13p
								BF459	35	E2506	10	ZTX302	16p
								BF597	12N	D1046	88	ZTX500	14p
								BFR34A	87	E1110	76		

RF CHOKES

1, 1.5, 2.2 etc to 33µH ea. 30p
47, 68, 100 etc to 680µH ea. 33p
1000, 1500 etc to 4700µH ea. 35p

PANEL LAMPS

LED chrome, red 54
LED yellow or green 70
(high efficiency)
Filament in red, amber, green or clear.
6V 60 mA 48
14V 40 mA 54

LED's
5mm red 10
yellow 19
green 16
Mountings, B65 3

DISPLAYS

7-segment **Common anode**
MAN72A red 75
MAN82A yellow 110
MAN52A green 110

Common cathode
MAN74A red 85
MAN84A yellow 110
MAN54A green 110

5V filament
3015F 8 mA 256
3015F 15 mA 256

KNOBS

black plastic
K1 skirted with spot 16
K2 as K1, 35mm 21
K3 pointer 15
K7 19mm knurled 23
K8 as K7 + skirt 23

RECHARGEABLE CELLS
AA 109p C 249p
D (4AH) 414p
PP3 (7.2V) 449p, (8.4V) 540p

CHARGERS
PP3 NC75 £599N
For any two pairs AA, C or D No NC1230 £9.92N

POTENTIOMETERS

Carbon Rotary (P20) 100ohms – 4M7 lin 220ohms – 2M2 log. **32p each** w switch **87p**. Dual gang (JP20) 4K7 – 1M2 lin, or log **95p** w switch **£1.50**

SLIDERS
58mm, low cost 10K 1M log only **29p**. Std 58mm mono 4K7 – 1M lin. or log **74p** stereo matched **£1.25**. Graduated bezels **34p**

PRESET
Min. 10mm dia. Hrix. or Vert. 100ohms – 1M **13p**
Preset Cermet rectilinear type 89P 100ohm – 1m **£1.06 each**
Preset Cermet 10mm dia. Horiz. or Vert. 100ohm – **24p**
Plesseyu MPW 1 moulded carbon 47ohms – 2M2 **59p each**.

SOLDERING IRONS

Also large stocks of bits, desoldering devices, accessories, etc.
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Also in Manchester for personal shoppers at: 680 Burnage Lane, Burnage, Manchester M19 1NA Telephone 061-432 4945
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Whilst prices of goods shown in advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

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Plate Ceramic 50V Wkg. Vertical Mounting.
E12 22pf. to 1000pf. & E6 1K5pf. to 47Kpf.—**2p**
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.01, .015, .022, .033, .047 & 068 mfds.—**4p** 0.1—**5p.** 0.15 & 0.22—**6p.** 0.33 & 0.47—**8p** 0.68—**11p.** 1.0—**15p.** 1.5—**20p.** 2.2—**22p**

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0.47/50	5p	22/25	6p	100/25	7p	470/25	11p
1.0/50	5p	22/50	6p	100/50	8p	470/40	16p
2.2/50	5p	47/16	6p	220/16	8p	1000/15	15p
4.7/50	5p	47/25	6p	220/25	8p	1000/25	25p
10/50	5p	47/50	6p	220/50	10p	1000/40	35p
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Polystyrene 63V Wkg. E12 Series Long Axial Wires.
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 5/83

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Price includes postage etc. UK only.

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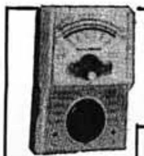

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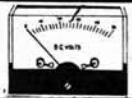

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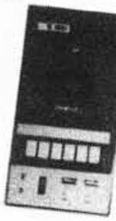

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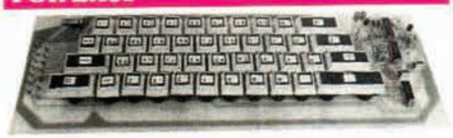

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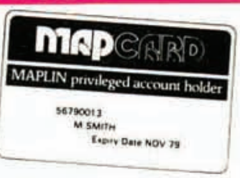

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