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Practical Wireless

The Radio Magazine

The Yaesu FT-736R VHF/UHF Transceiver REVIEWED

Valved Communications Receivers
The RCA AR77

PW 144MHz Contest Rules

HF performance you can have a real field day with.

With Yaesu's FT-757GX/II, you can enjoy full-featured HF performance just about anywhere.

On vacation. During field day. On the road. Or in your shack.

Because the FT-757GX/II packs all its HF performance into one highly compact, action-ready case. A case so small, it even fits under airplane seats.

Of course, you've probably noticed a similarity to its predecessor, the FT-757GX. That's purely intentional. And now its performance is even better.

With new features like memory storage of operating mode. Slow/fast tuning selection. Automatic step-change according to mode. IF notch-filter. 10 memories. And VFO to VFO scan.

Plus you get an iambic electronic keyer. Woodpecker noise blanker. 600-Hz CW filter. AM and FM modes. AF speech processor. And 25-kHz marker generator. All at no extra cost.

Three microprocessors. Dual VFOs. Single-button VFO/memory swap. Receive coverage from 500 kHz to 30 MHz. Transmit coverage from 10 to 160 metres, including WARC bands. All-mode coverage (LSB, USB, CW, AM and FM). 100-watt RF output.

QSK operation. Massive heatsink and duct-flow cooling system for continuous RTTY operation for up to 30 minutes.

Computer Aided Transceiver (CAT) System for computer control via optional interface.

Of course, the FT-757GX/II offers the kind of options you'd expect from Yaesu, too. Including standard and heavy-duty power supplies, automatic antenna tuner, hand and desk microphones.

So no matter where you work the DX, take along Yaesu's FT-757GX/II. The full-featured HF rig you'll have a real field day with.

YAESU

UK Sole Distributor *South Midlands Communications Ltd S.M. House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hants SO5 3BY Tel (0703) 255111*

Prices and specifications subject to change without notice.

Practical Wireless
The Radio Magazine

JUNE 1988 (ON SALE 12 MAY 1988) VOL. 64 NO. 6 ISSUE 975

THIS MONTH

NEXT MONTH

Build our RF Voltmeter

"Amateur Radio Stateside—1" G0FDV Reports on His Recent Visit

PW REVIEW of the Jaybeam VR3 Vertical Tri-band Antenna

and All the usual features

Don't miss it—place your order with your newsagent now!

On sale June 9

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The R-5000 from Kenwood

Yes, I know, you thought the photograph was of the TS-440S. Not surprising, because the R-5000 is designed to be a perfect matching unit to that very transceiver so you may say with some justification that "All these boxes look exactly the same".

Behind that impressive front panel however, the story is completely different because Kenwood engineers, widely acknowledged to be the best in the business, have made the R-5000 into one of the finest receivers you could wish to own. Not only in sheer performance but in the ease of use which is the hallmark of their careful approach to total design.

The R-5000 will satisfy the most demanding applications, whether in winkling out the weakest rare amateur DX, or listening to Radio Hanoi under conditions in a heavily congested Broadcast band. The combination of operating facilities means that the operator can match the performance of the receiver to the prevailing conditions on the air. The result – total satisfaction.

Am I alone in being so enthusiastic? I don't think so. Read what Angus McKenzie said in his review (Amateur Radio magazine). "I was most impressed with the front end, as it is far superior to much of the competition. The selectivities of the various filters on CW, SSB, and AM were excellent . . ." In "Short Wave Magazine", Ken Michaelson remarked "I used the R-5000 for some weeks and was impressed with its performance . . . I was able to resolve signals which when I first tuned them in seemed too weak to decipher." These comments give you some idea of the listening satisfaction which can come from a truly top class receiver.

The R-5000 scores on quality of construction as well as performance. Rainer Lichte says in his review:– "The entire electronics are housed in a sturdy metal cabinet. This outer barrier and elaborate shielding of critical inside parts combine to form an RF-tight enclosure. Excellent workmanship is evident everywhere, the finish is outstanding." Ken Michaelson said much the same thing:– "In passing, I must comment on the finish of the interior. The whole assembly, when the top cover was lifted off, was a picture. Gleaming plated screening and circuit boards and components all having the appearance of being carefully put together. Quite different to some I have seen."

I think that there is little doubt that the R-5000 is one of the really classic receivers of the future, but having brought it, you will then find that you can extend its usefulness by adding the internally fitted VHF converter (VC-20), giving you 108-174 MHz coverage as well, with the VHF frequencies read out on the main receiver display. There is also a selection of high specification optional filters for special needs, and even a voice synthesiser option which will announce the frequency in English (and Japanese if you prefer . . .)

As Rainer Lichte concludes:– "The multitude of functions puts the R-5000 almost in a class by itself. Undoubtedly this is the best receiver ever offered by Kenwood." Well, he likes it, Ken Michaelson likes it, and Angus McKenzie likes it. I just think it's terrific and I'm sure you will agree when you try an R-5000 for yourself at one of our branches or your nearest Kenwood approved dealer. By the way, just to keep the record straight, the ONLY Kenwood approved dealer in London (apart from our own branch at Eastcote) is Radio Shack Ltd. Anyone else trying to sell you an R-5000 has no connection whatsoever with the UK sales and service organisation, and should be treated with due caution, even if you may be getting "Forty quid off, John."

In the words of Dr. Samuel Johnson when he referred to London:–

"Prepare for death if here at night you roam,"
"And sign your will before you sup from home."

Caveat Emptor

John Wilson.
G3PCY/5N2AAC

R-5000 £875 inc. VAT
VC-20 £167 inc. VAT

LOWE ELECTRONICS LIMITED

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 580800 (4 lines)

The TM-721E from Kenwood

When I wrote about the TM-721E last month, I said that this rig re-defined the whole concept of the dual band 2M/70CM FM transceiver, but it was not until Richard Hillier our manager here in Matlock came to me and said "did you know that the TM-721E is unique?" that I realised what a revolution it was. (Well, no one can know everythng can they?)

The unique feature is the ability of the TM-721E to listen simultaneously on both 2 metres and 70 cm, the balance between the two bands being a simple audio slider control on the front panel. It's certainly an eye opener (or should that be ear opener?) to be able to monitor both bands at the same time, with two frequency readouts and two signal strength meters. Add to that the full duplex capability, cross band operation, and the Kenwood design excellence as well, and I believe – as does Richard, that the TM-721E will be extremely popular.

Remember that it has 45 watts out on 2 metres, and 35 watts on 70 cm, which makes it a particularly powerful package in either mobile or home station use. As always, a detailed descriptive brochure is available on request, and if you send off the postage shown on the coupon below, specifying particular interest in the TM-721E, we will send back a full Kenwood colour catalogue and lots more reading matter for your perusal.

TM-721E £699 inc. VAT

NOTE: TW4100E STILL AVAILABLE AT SPECIAL PRICE OF £499 inc VAT

TS940S

Top of the range, the TS940S has everything the discerning HF operator requires. Amateur bands from 160 to 10 metres, together with a general coverage receiver tuning from 150 kHz to 30 MHz. Operating modes USB, LSB, CW, AM, FM, FSK. Forty memory channels, each effectively a separate VFO. Easy keyboard frequency entry. Leadership in the field. The TS940S is the transceiver everyone wants to own one day.

TS940S . . . £1995.00 (carr. £8)

TS440S

The latest in the "4" series HF transceivers from Kenwood, the TS440S covers all bands from 160 to 10, and also has general coverage receive from 100 kHz to 30 MHz. Keypad frequency entry as well as twin VFO and 100 memories. Full break in for the advanced user, and provision for an internal automatic ATU. USB, LSB, CW, AM, FM, FSK; in other words – everything. Performance? Would you expect Kenwood to give you anything less than the best.

TS440S . . . £1138.81 (carr. £8)

TS711E

Called by many "The perfect 2 metre Base station", the TS711E is as close to perfection as state of the art can make it. All mode operation, full band coverage, continuous tuning or step tuning for FM channels. Two separate VFOs, 40 memories storing frequency, mode, repeater shifts, even whether or not you need a tone burst. Optional voice synthesiser, the list of features is almost endless. (And it too has a 70 cm brother, the TS811E.)

TS711E . . . £940.00 (carr. £8) **TS811E . . . £1094.00**

TR751E

Versatile 2 metre multi mode mobile or fixed station, the TR751E again shows that Kenwood magic touch in making a complex transceiver so easy to use. Virtually a miniature version of the TS711E, the TR751E set new standards of performance at its introduction, and has continued to win friends ever since, continuing as it did the line started by the TR9000 and TR9130. (And, you guessed, it has a 70 cm counterpart, the TR851E.)

TR751E . . £599.00 (carr. £8) **TR851E . . £699.00**

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Cambridge: 162 High Street, Chesterton. ..... Tel. 0223 311230.
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ICOM

IC-4GE 70cm FM Handportable

The IC-4GE is the first in a line of new handportables to be announced from ICOM. The small compact style provides easy operating and rugged durability. Other models for 2mtrs and 23cm will be released later this year.

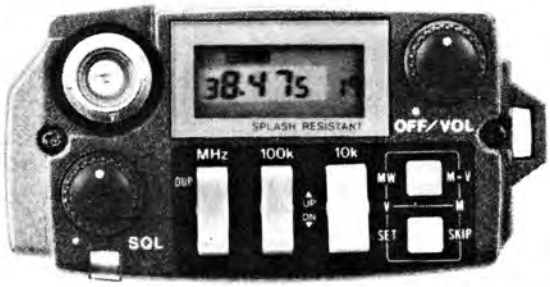
A full 6 watts of RF power is available when using the IC-4GE with the option IC-BP7 nicad pack. The IC-4GE is equipped with a total of 20 memory channels. Each memory can independently memorise frequency, offset direction and frequency.

All circuits are designed using low power dissipation techniques to create a special power save circuit in the transceiver. The power saver circuit functions if no signal is received or no switch operation is performed for more than 30 seconds. In addition, the power saver circuit can be turned off for packet communications.

Two different scans, programmed scan and memory scan are provided and in addition memory skip channels can be programmed to skip selected memory channels during memory scanning operating. The squelch monitor function allows you to monitor weak signals without having to adjust the squelch control. The high impact case is splash resistant by the inclusion of rubber gaskets. The IC-4GE is supplied with a IC-BP3 nicad battery pack, flexible antenna, AC wall charger, belt clip and wrist strap. It is compatible with many of the existing accessories for ICOM's IC-2/4 and IC-02/04 series of handportables.

Also available for the IC-4GE is a large range of optional accessories including a variety of rechargeable nicad power packs, dry cell battery pack, desk charger, headset and boom mics and new slimline speaker mics. For more information on the IC-4GE or any other ICOM handportable contact your local ICOM dealer or ICOM (UK) LTD.

◀ **Actual Size** ▶



Icom (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

Count on us!

IC-575, 28/50MHz Dual band multimode.

The ICOM IC-575 base station has been developed to meet the demand for advanced communications for the recently acquired 6m band. Similar in appearance to the IC-275/475 2m and 70cm base stations, the beauty of this new transceiver from ICOM is that it gives you the best of both worlds, 6 & 10m in one compact unit. The IC-575 covers 28-30Mhz and 50-54Mhz. Operating modes are SSB, CW, AM & FM. Power output is 10 watts (AM 4 watts) with a front panel control to reduce output for QRP operations. A pass band tuning circuit narrows the I.F. passband width, eliminating signal in the passband. A built-in notch filter eliminates beat signals with sharp attenuation characteristics.

Some PLL systems have difficulty meeting the lockup time demands placed on them by new data communications. This is why ICOM developed the DDS (Direct Digital Synthesizer) method. With a lockup time of just 5msec the DDS method allows the IC-575 to handle data communications such as packet or AMTOR. 99 programmable memories can store frequency, mode, offset frequency and direction. A total of four scanning functions for easy access to a wide range of frequencies, memory scan, programmed scan, selected mode memory scan and lock out scan. The IC-575 has an internal A.C. power supply, but can also be used on 13.8v DC for mobile or portable operation.

Optional accessories available are the UT36 voice synthesizer, the IC-FL83 CW narrow filter, SM7 external loudspeaker, HP2 communication headphones and SM8/SM10 desk microphones. Other transceivers available in this range are: IC-275E 2m multimode 25w, IC-275H 2m multimode 100w, IC-475E 70cm multimode 25w, IC-475H 70cm multimode 75w.

IC-505, 50Mhz Transceiver

The IC-505 is a 6mtr BAND SSB, CW, FM (Optional) transceiver. It can be used as a portable or like other transceivers of this type as a base station unit. When used with an external 13.8v power supply the 505 gives 10 watts RF output, 3 watts or 0.5 watts on low power is available when using internal batteries. Other features include 5 memories with memory scan, program band scan, dual VFO's with split operation.

The easy-to-read LCD readout includes frequency, memory scan and call modes. Full metering of battery condition signal strength and power output is provided. When fitted with the optional EX248 FM unit the IC-505 offers 50MHz operation at an affordable price.

Helpline: Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.
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The FT-747GX is a compact SSB/CW/Am and (optionally) FM transceiver providing 100 watts of PEP output on all hf amateur bands, and general coverage reception continuously from 100kHz to 30MHz. A front panel mounted loudspeaker and clear, unobstructed display and control layout make this set a real joy to use. Convenient features include operator selectable coarse and fine tuning steps optimized for each mode, dual (A/B) vfos, along with twenty memory channels which store mode and skip-scan status for auto resume scanning of selectable memories. Eighteen of the memories can also store independent transmit and receive frequencies for easy recall of split-frequency operations. Wideband (6kHz) AM and narrowband (500Hz) CW IF filters are included as standard, along with a clarifier, switchable 20dB receiver attenuator and noise blanker. User programming for more advanced control by an external computer is possible through the CAT (Computer Aided Transceiver) System. The transmitter power amplifier is enclosed in its own diecast aluminum heat-sink chamber inside the transceiver, with forced-air cooling by an internal fan allowing full power FM and packet, RTTY, SSTV and AMTOR operation when used with a heavy duty power supply.

All major controls are grouped together for convenience and ease of operation.

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		TXCO 747	£28.95		

FT747GX TRANSCEIVER RRP £659.00 inc VAT

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Also available from TOKYO HY-POWER a range of VHF/UHF linear amplifiers. All these units are constructed from a heavy duty extruded case for max heat dissipation and strength, allowing continued high outputs even in the harshest environments. All the linears are complete with a low noise preamp as standard (except HL30V) and need a 13.8V dc supply.

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The FT-736R is a frequency-synthesized amateur transceiver incorporating up to four band modules covering the 50, 144, 430, and 1200 MHz amateur bands. The standard model provides 25 watts RF power output on the 144 and 430. MHz amateur bands in SSB, CW, and FM modes. (10 watts output on the 50 and 1200MHz bands). Operating conveniences usually found only on HF transceivers, such as front panel adjustable IF shift and IF notch, a noise blanker, all-mode VOX and three-speed selectable AGC are included. GaAs FET receiver RF amplifiers are provided in the 430 and 1200 MHz band modules. The innovative memory system includes one hundred general purpose memories plus ten full duplex cross-band memories, one global call channel memory that can be recalled from any band or mode and up to four band-specific call channel memories, all of which store mode and receive and transmit frequencies independently. In addition, fourteen vfos are provided: two general purpose plus one PMS (Programmable Memory limit Scanning) on each band, two special-purpose full duplex vfos, and up to four clarifier memories, one per band. Each of the two full duplex vfos can be selected so that its receive and transmit frequencies and modes can be displayed and tuned independently, or linked to tune synchronously in opposite directions for satellite operation. You can retain twelve satellite uplink/downlink modes in the special vfos and ten full duplex memories at all times. Naturally, with FM the predominant mode on the VHF and UHF bands, the FT-736R includes all manner of convenient features for both FM simplex and repeater operation, like a discriminator center tuning meter, special narrow FM mode (to cut adjacent channel interference in crowded areas) and Automatic Repeater Shift when tuned to 2-meter repeater subbands. The FT736R also includes a t/r-switched DC supply line for masthead preamplifiers, activated from the front panel, and digital input connection directly to the modulator for high performance packet radio tnc interfacing (preamps, personal computers and packet tncs not supplied by Yaesu).

OPTIONAL ACCESSORIES

FEX 736/50	50MHz module	£239.00	XF455MC	600Hz CW Filter	£60.00
FEX 736/1.2	1.2GHz module	£425.00	SP767	External Spkr c/w Audio Filters	£69.95
FMP-1	AQS Message Processor c/w display	£189.00	MD-1B8	Desktop Microphone	£79.00
FTS-8	CTCSS Tone Squelch Unit	£45.00	MH-1B8	Hand Scanning Microphone	£21.00
FVS-1	Voice Synthesiser Unit	£33.00	FIF232Cvan	CAT/INC Interface for Packet & CAT	£68.95
Keyer Unit B	Internal Iambic Keyer Unit	£15.95	FIF232C	CAT Interface for RS232 O/P	£75.00
TV-736	Fast Scan TV (ATV) Mod/Demod Unit	£159.00	FIF65A	CAT Interface for Apple II series	£60.00

FT736R R.R.P. £1450.00 C/W 2M & 70cms.

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Due to the strong pound and our special purchase we can now offer for a limited period up to 15% discount on their range of antennas and 10% on their larger rotator Ham IV. Buy now whilst stocks last (from January 1st they increased their prices and if the dollar recovers prices could go up by 30% to 40%).

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14AVQ	Vert. 10-15-20-40M	£106.00	£ 95.00	£3.75
18AVT	Vert. 10-15-20-40-80M	£172.00	£146.00	£3.75
18V	Vert. 10-80M tapped coil	£48.50	£ 43.65	£4.50
TH3JNR	3 Ele. Yagi 10-15-20M	£299.00	£254.00	£4.50
TH2MK3	2 Ele. Yagi 10-15-20M	£279.00	£249.00	£4.50
EX14	5 Ele. 10-15-20M Explorer	£499.00	£449.00	£7.50
TH5MK2	5 Ele. 10-15-20M T'bird	£649.00	£575.00	£7.50
TH7DXX	7 Ele. 10-15-20M T'bird	£755.00	£669.00	£7.70

			Offer Price	p&p
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204BA	4 Ele. Yagi 20M	£420.00	£357.00	£7.30
205BA	5 Ele. Yagi 20M	£499.00	£425.00	£9.40
DB10-15A	3 Ele. Yagi 10-15M	£209.00	£199.00	£4.80
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G-600RC	Bell type, 360 deg. meter	£219.00
T2X	Bell type, meter readout	£399.00
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G-800SDX	Bell type, 450 deg. var. spd	£325.00
G-1000SDX	Bell type, 450 deg. var. spd	£368.00
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G-400	Bell type, Meter ± 180 deg.	£149.95
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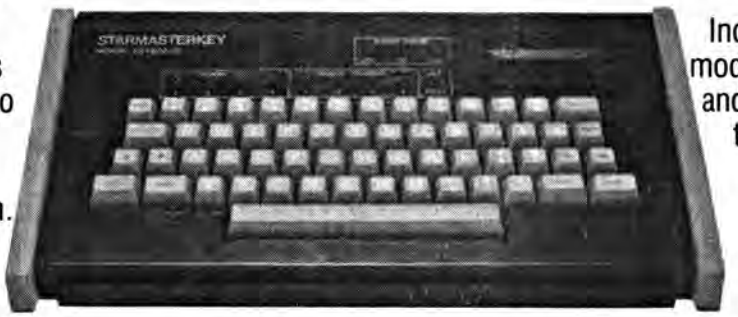

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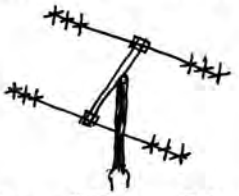

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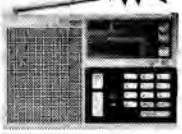

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RX - 4
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4023	16
4024	30
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4027	22
4040	39
4046	49
4047	49
4049	22
4051	45
4060	45
4066	24
4068	16
4070	20
4071	16
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OA91	10
W005	26
2N3866 Equivalent	

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BC108	14
BC109	14
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	90

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GAREX ELECTRONICS

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☆ Size: 153 × 33mm. Requires 10-14v DC supply.

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WRITE ON . . . *the page where you have your say*

STAR £10 LETTER

WT and CW

Reference the letter in last November's *PW* regarding the terms w.t. and c.w., used to designate the transmission of Morse code signals, their origin goes back several decades.

Spark transmitters were in universal use from the days of Marconi's first station at Alum Bay on the Isle of Wight, right up to the twenties. These produced an easily recognised racket (*Sometimes described as like the sound of tearing calico — Ed.*) which spread itself over quite a portion of the band, but it had one advantage — the signals could be received on a simple crystal-set.

The term w.t., short for wireless telegraphy, was always used for these spark transmissions, whilst the term c.w. — for continuous wave — only came into use during the first world war, to define the "pure" note emitted by a valved transmitter. Although occupying much less space in the frequency spectrum (metres in those far-off days!), c.w. signals could not be heard on a crystal-set if it was not fitted with a heterodyne oscillator.

So two new terms came into being — m.c.w. and i.c.w. The former stood for modulated continuous wave, and the latter for interrupted continuous wave. One rather unique means of producing i.c.w. in aircraft transmitters was to feed the h.t. supply through an "interrupter" wheel mounted on the shaft of the propeller-driven generator. This was something like a dynamo commutator, but with alternate insulating segments, and these effectively broke up the c.w. signal at an audio frequency.

Finally, the term r.t. for radio telephony also goes back to the early days of radio, for although it was impossible to modulate a spark transmitter, experiments were made before the first world war in modulating an arc. A carbon microphone — or quite often, several of them — was wired in series with the earth lead. As the microphone was live to the r.f., the speakers had to be very careful not to touch it with their lips!

Douglas Byrne G3KPO
Ryde, IoW

Interrupter systems were also used in shipboard transmitters to generate i.c.w. Another method from the days of single-valve (oscillating p.a.) transmitters was the "squegging" oscillator, a rather crafty circuit which is arranged to pulse-modulate its own r.f. output at an audible note frequency. — Ed.

It's a Date!

I was interested to read the *Comment* on page 16 of the April *PW*, about methods of expressing the date.

Looking at my passport, I find that the style YEAR/MONTH/DATE was used by Passport Control in South Africa as long ago as 1979 and also in Sweden in 1981.

Whilst visiting Stockholm, I bought two date stamps in this format, which I have since used regularly on my cheques without any query from the bank.

Alan Jarvis
Cardiff

4m in Cyprus

Please allow me to set the record straight concerning a common misunderstanding about 70MHz in Cyprus, recently repeated in David A. Dodds' article "A New Future for Four Metres" published in March 1988 *PW*.

The band at 70MHz is not authorised for amateur radio use either in the Republic of Cyprus, for which the Cyprus Government issues "5B4—" licences, or in the British Sovereign Base Areas, the Administrator of which issues "ZC4—" licences.

The last amendment to the ZC4 licence erroneously included 70MHz in the schedule. This was a printing error caused by the use of an uncorrected copy of the UK licence schedule. All ZC4 licence holders (less than 20 in all) have been informed of this mistake. The 70MHz beacon, 5B4CY, is the one exception, its licence having been specially granted by the Cyprus Government for the stated purpose of propagation studies. It is maintained by the Cyprus Amateur Radio Society (CARS) and located in the Republic of Cyprus.

We have been negotiating for some time for both 4 and 6 metre band allocations. Unfortunately, however, both bands are densely occupied by other users and at best only a small segment of each may become available. This is unlikely to happen in the immediate future, if ever.

Dave H. Rycroft ZC4DR
Cyprus Area Representative
RAF Amateur Radio Society

PW COMMENT

QUESTIONS . . . QUESTIONS!

ANY MAGAZINE SERVING A TECHNICAL HOBBY, as *Practical Wireless* does, inevitably receives loads of letters relating to the hobby in one way or other. Some of them contain comments, some of them questions—even, at times, cries for help.

Trying to answer those letters means that one or other of the editorial staff has to take time off from the normal daily task of producing the magazine on time every month.

While we are generally a reasonably good resource, the questions we receive are often the sort that require quite a bit of time and effort—frequently involving telephone calls or digging through the reference materials we have on hand. Unless it is something we know immediately, or we know where to go to find it quickly, chances are the letter will sit in a "jobs to do" basket awaiting that most unusual day when we might have a spare moment or two. That may be months later, which is not much help for you if you need the information right away.

Our problem is that we are, first and foremost, publishers —with *deadlines*. Since we also edit and publish *Short Wave Magazine*, that means 24 deadlines per year. They're always looming before us. So, often your question lays in the basket gathering dust.

In the dim and distant past, we ran a Readers' Enquiry Service, with questions being answered by outside consultants in return for a small fee. That system works quite well in the car or TV servicing fields, for example, where the need is for repair information on a fairly well-defined range of commercial products, but questions from radio hobbyists can be on any subject under the sun, including home-brew equipment and antennas, modifications, and so on. Simple things, often, but time-consuming to deal with adequately, and requiring a breadth of knowledge and experience, *and* access to a good technical reference library.

Occasionally, we put readers' requests into our "Can You Help?" column, but here again your questions may wait four months or more even to be published, let alone answered.

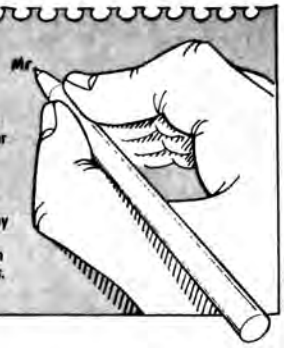
So, although we do what we can to help you in your hour of need, especially where your query concerns a *PW* project, let me urge you to use us only as a last resort for more general radio matters.

If you do write to us with a question, *please* follow the five simple rules given in "Our Services" under the heading "Queries". Also note that our FREEPOST address is for use only when sending in mail orders. Any other letters should bear postage stamps in the usual way, otherwise they are liable to be delayed.

Geoff Arnold

Send your letter to the Editorial Offices in Poole, the address is on our Contents page. Writer of the Star Letter each month will receive a voucher worth £10, to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.

Letters must be original, and not duplicated to other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.



Blush!

Many thanks for including the Beacon Chart in the April issue of *PW*. It has really put the service into perspective for me, and is now framed and on the wall for easy reference.

Practical Wireless is going from strength to strength. It is surely the most readable, practical and down-to-earth publication on the market for this somewhat "amateur" amateur!

In spite of time limitations, I have just completed the PW "Itchen" *LCR* bridge with excellent results. May we have other test gear in matching cabinets as a *PW* series? My kit from CPL was excellent! How about a small signal generator?

With sincere thanks for restoring the publication to amateur radio and rescuing the *Short Wave Magazine*.

Victor Brand G3JNB
Woking, Surrey

A small r.f. signal generator is at present being developed for us by one of our regular contributors, and I hope it will be ready fairly soon. — Ed.

News from VU2-land

Thank you for a very enjoyable magazine, which I have been reading for a long time. The change towards amateur radio is most appreciated, but I do wish to see more articles like "Confessions of a Radio Inspector"! I think that some part of *PW* should be devoted to mods and add-ons for existing commercial gear. I'm sure a large number of your readers own commercial rigs and antennas. In India, many amateurs now import their rigs under concessional duty, and this has certainly improved activity from VU's.

In the city of Bangalore, South India, we have about 40 VU's active on h.f. and many more on v.h.f., out of a total population of 5 million. We now have a repeater on 145.7MHz (–600), financed and erected by the 25 members of our group "Repeater Society of Bangalore". We hope to have a second repeater up some time next year, giving a larger coverage.

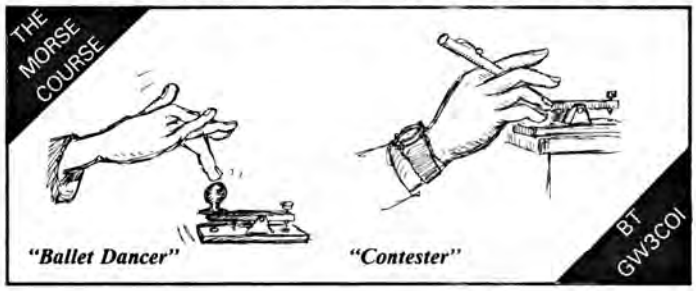
I find the "G-land" amateurs among the best operators from Europe. Your operating ethics are excellent, and I always enjoy contacts with "G" boys on c.w. or s.s.b., especially meeting the old-timers.

In 1987 we celebrated our 40 years of Independence, most of us used the special prefix of VU40 for the months August/September and November/December. Some of us use a special suffix for contests, e.g. I used VU2Z for CQWW, both c.w. and s.s.b.

Most stations are members of the bureau, but direct QSLs are also welcome with postage.

I look forward to meeting more friends in "G-land" as conditions improve on the higher bands.

G. G. Rajendra Kumar
"Raj" VU2ZAP, Bangalore



OUR SERVICES

QUERIES

We will always try to help readers having difficulties with a *Practical Wireless* project, but please observe the following simple rules:

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
4. Write to the **Editor, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP**, giving a clear description of your problem.
5. Only one project per letter, please.

COMPONENTS, KITS AND PCBS

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for our more recent projects are available from **CPL Electronics**, and from **FJP Kits** (see advertisements).The **printed circuit boards** are available from our **PCB SERVICE** (see page 44 of this issue).

CONSTRUCTION RATING

Each constructional project is 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.

Intermediate
A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

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. Definitely not recommended for a beginner to tackle on his own.

BACK NUMBERS AND BINDERS

Limited stocks of most issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.30 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW* are available Price £3.95 to UK addresses, or overseas, including post and packing. Prices include VAT where appropriate

CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** stating the county or counties you're interested in.

ORDERING

Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **PW Publishing Ltd., FREEPOST, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP,** with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders **must** be drawn on a London Clearing Bank.

Credit card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

SUBSCRIPTIONS

Subscriptions are available at £14 per annum to UK addresses and £18.50 overseas. For further details, see the announcement on page 58 of this issue. Airmail rates for overseas subscriptions can be quoted on request.

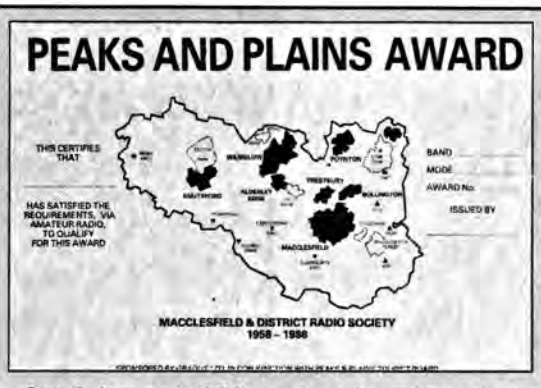
Peaks & Plains Award

This award is sponsored by Gradus Ltd., in conjunction with the Cheshire Peaks and Plains Tourist Board.

The award is available to all licensed radio amateurs and s.w.l.s on a worked/heard basis. You need to work/hear 10 Cheshire stations PLUS either of the MDRS club stations (G1MWS, G4MWS) OR any one of the special event stations organised by MDRS active throughout 1988.

All contacts must be made after 1 January 1988. The award costs £1.50 (4 IRCs for non-G callsigns) with a log extract showing stations worked/heard, date, etc., countersigned by one other licensed amateur to:

R. Thornley G1NUS,
270 Hurdsfield Road,
Macclesfield,
Cheshire SK10 2PN.



Alderney Active

On May 22, the Guernsey Amateur Radio Society will be active on 1.8 and 3.5MHz around the normal WAB s.s.b. frequencies from the island of Alderney. They will be using the callsign GU4NYT/P.

The group will be active for the first three hours of the WAB contest, but will then have to leave the island due to the return flight times to Guernsey.

It is also possible that there will be activity from "rare" parishes in Guernsey during the afternoon of May 22.

Rally Calendar

***May 1:** The RSGB VHF Convention will be held at Sandown Park Exhibition Centre, Esher, Surrey. All the usual attractions will be there. For more details, contact:
Les Hawkyard G5HD
The Eyry
Newtown St Petrock
Torrington
North Devon EX38 8LU

May 1: The Kelso ARS assisted by the Borders ARS will be hosting the 5th Anglo-Scottish Rally in the Tait Hall, Kelso. Doors open from 11am to 5pm. There will be the usual trade stands and talk-in on S22. Entrance will be £1, junior ops, YLs and XYLs very welcome and admitted free.
Mr B. Cavers GM4UIB
Tel: 0573 24654

May 2: The 1988 Doncaster Rally will take place at Bircotes Leisure Centre (near Bawtry). Talk-in will be on S22 using G4YRD.
Audrey Wilson
Tel: 0302 721259

May 2: The Dartmoor Radio Club's annual mobile rally will be held at the Princetown Town Hall. Doors open from 10.30am to 5pm. All the usual traders will be there. Refreshments are available and there is ample parking. A small entrance fee will be charged.

***May 15:** The Otley ARS are holding the 31st Northern Mobile Rally at the Yorkshire Agricultural Showground, Harrogate, in the Flower Show Hall. The rally starts at 10.45am, but the showground is open to visitors from 10am. Morse tests are not available. More details from:
G3QQ
Tel: 0943 602118

May 15: The Parkanaur Rally will be held this year in the Silverwood Hotel, Lurgan, Co. Armagh. Doors open at 12 noon and the entrance fee is £1. There will be the usual trade stands, bring and buy, RSGB bookstall, QSL bureau, etc. Talk-in will be on S22. The proceeds of the rally go to The Stanley Eakins Memorial Fund.
Sam White GI1BIW
Tel: 07622 22855

***May 22:** The Swindon & District ARC are organising a Radio, Electronics & Hobbies Fair at the Science Museum, Wroughton. It is planned to have displays of model boats, aircraft, steam engines, etc. There might even be helicopter rides over Swindon. There is ample free car parking on site and the venue is well sign-posted. Gates open at 10am.

***May 29:** The East Suffolk Wireless Revival will take place at the Civil Service Sportsground, The Hollies, Straight Road, Ipswich. Doors open at 10am and there is plenty for all the family to do.
Colin Ranson
Tel: Ipswich 688204

June 5: Spalding & District ARS rally will be held at Springfield Gardens, Spalding, Lincs. Gates open from 10am to 5pm. More details from
Terry G4TWR
on 0775 2940.

Tiger Collinear

Ant Products have introduced a dual band collinear for 145/434MHz into their range.

It follows the same pattern as the monoband collinear with a similar fully sealed coil base and socket assembly, moulded into a solid, fully-machined, aluminium housing and supporting a relatively large diameter tubular top section.

Tests by Ant Products show the v.s.w.r. characteristics of the antenna to be less than 1.25:1 on both bands. The bandwidth on 434MHz is in excess of 20MHz too. They mention an antenna gain of 7dB for the 144MHz antenna and 9dB for the 434MHz antenna.

The Tiger Collinear 145/434 comes complete with a full two years written guarantee and full instructions. The cost is £48.50 plus £5.50 post and packing. More details from:
Ant Products,
Foundry Works,
Old Great North Road,
Ferrybridge,
West Yorkshire WF11 8NN.

Low Cost Telex System

ICS have introduced a new, low-cost, error correcting radio telex system for commercial and marine applications using h.f. radio links. The TOR-1 costs £499.95.

The TOR-1 is built into a rugged diecast enclosure and is fully waterproof. Power consumption is less than 1 watt at 12 volts and 2 watts at 24 volts. It corresponds fully to CCIR recommendation 476-2.

It operates in ARQ, FEC and SELFEC modes and ICS say it has been designed to be very user friendly. Configuration information is held in non-volatile memory and can be locked by a supervisor to limit the range of choices available to the user. The system will operate with any ASCII terminal equipped with an RS-232 interface.
ICS Electronics Ltd.,
PO Box 2,
Arundel,
West Sussex BN18 0NX.

Hire, Buy, Refund

The hire division of Universal Instruments have found that many customers end up by buying the piece of equipment they have hired. To encourage this trend they refund the first week's hire charge if the unit is ordered within the first month's hire.

Equipment currently available includes the Megger PDA1 Mains Monitor for surges, spikes, drop outs and frequency.

Universal Instrument Services Ltd., Unit 62, GEC Site, Cambridge Road, Whetstone, Leicester LE8 3LH.

Home Taping Royalties

During a recent session of the European Parliament, the music industry had a postponement in their campaign for Europe-wide private copying royalties on blank tapes and equipment.

An extensive resolution outlined a blueprint for the increased teaching, promotion and dissemination of music in the European Community. The report proposed that the Community's financial intervention priorities should include tax incentives for cultural initiatives and included a controversial clause calling for private copying royalties to be levied on blank tapes and hardware for the benefit of copyright owners.

However, some objections were expressed and it was announced that the Commission's Green Paper on Copyright should have been presented to Parliament before Easter.

The music industry stress that these movements are not taking place in isolation, countries throughout the world are instituting their own legislative frameworks to curb the unauthorised exploitation of producers' rights. Spain and Portugal are to increase protection against private copying by introducing royalties on hardware and blank video and audio tape, whilst the Dutch Government has agreed to the principle of a royalty with firm legislation to follow. In Australia, the Attorney General has put on record his support for a blank tape or hardware royalty to remunerate rights owners. Finally, in the UK, the Copyright, Designs and Patents Bill has reached the Report Stage in the House of Lords and the music industry will continue to press the Government for action on the home taping issue.

Specialised Satellite Services

The Trade & Industry Secretary, Lord Young, announced that he would be issuing licences under the Telecoms Act 1984 for up to another six operators to provide specialised satellite services within the UK.

On the provision of basic telecommunication services, he made clear that the government remained fully committed to the BT/Mercury duopoly policy which comes up for review in 1990. He stressed, however, that in 1983 the government had announced that it would keep under consideration ways of introducing new specialised services by satellite.

This means that it will be a new opportunity for operators to run satellite services, transmitting voice, vision, data, film, music, etc., from one point simultaneously, to other closed user groups in the country. It should also mean that there will be less bureaucratic restraints on individuals wishing to set up satellite dishes.

Lord Young said that it is his present intention to license up to another six operators to provide point to point satellite-based third party services in the UK only. If more than six acceptable proposals are put to him in a one-month qualifying period after the consultation period has ended, he will ask the Director General of Telecommunications to advise which of the applicants to license.

He is also intending to license receive-only terminals on users' premises. So users will be licensed to receive all kinds of satellite-delivered services within the scope of the Telecommuncations Acts 1984, whether national or international. A licence under that Act will be issued shortly after the end of the consultation period. The licence will not permit users to convey the signals received onwards beyond their own premises. An announcement should be forthcoming shortly about the implications of this decision for the licensing regime under the Wireless Telegraphy Act 1949.

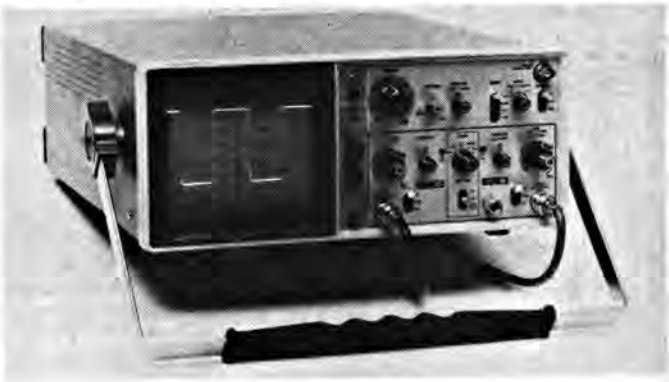
Scopes from Alpha

Alpha Electronics have become a main dealer for the complete range of Hitachi oscilloscope products.

Alpha say that both in and out of warranty service will be catered for, with full Hitachi spares being carried by their workshops.

They are offering the Hitachi V212 20MHz scope complete with probes for £399. This has two channels with a sensitivity of 1mV/division displayed on a 6in c.r.t. sweep speeds are to 20ns/division with automatic triggering, video sync and an X-Y mode.

Alpha Electronics Ltd., Unit 5, Linstock Trading Estate, Wigan Road, Atherton, Manchester M29 0QA.



934MHz CB

The Parliamentary Under Secretary of State for Trade & Industry made the following statement about the future of 934MHz CB.

"The Government in common with other administrations in Europe is to consider the introduction of a Short Range Radio (SRR) system in the band 933-935MHz. One of the existing users of this band is the 934MHz CB allocation. Approximately 3000 users have these sets out of a total of over 115 000 CB licensees.

"Once SRR becomes widely used, it is inevitable that the CB service will suffer an increasing level of interference and it is important that potential users of the band are aware of this, and that the many potential users of any new SRR service are adequately protected.

"I have decided therefore that the Performance Specification MPT1321 to which 934MHz CB transceivers are manufacturer certified should be withdrawn from 30 December 1988. This will provide warning to traders and potential users alike that no new sets should be made or imported from this date.

"It is of course only fair that existing users of the CB band get a good life from their sets. I can assure users that their existing equipment may continue to be used for its foreseeable useful life."

When further details are available about what will happen to the users on the band, etc., we will let you know.

Easiwire

A new solderless prototype circuit-board wiring system, which wraps the wire directly around the component legs or leads, has been announced by **BICC-VERO Electronics Ltd**, makers of the ubiquitous Veroboard.

Called Circuigraph Easiwire, the system uses a special 0.15mm diameter tinned copper wire to make the circuit connections. Components are first inserted into holes in a circuit board of insulating material, which might be plain matrix board or even cardboard. Using the pen-like wire dispenser provided, 4 or 5 turns of wire are tightly wound around the component lead, working up the lead from the board, then a further 4 or 5 turns are put over the top of these, winding back towards the board again. Then take the wire over to the next component lead to be connected and repeat the exercise there. When the last connection in a chain has been made, the wire is cut using a retractable knife which forms part of the wiring pen.

BICC-VERO stress that the joints are not suitable for permanent use, as they do not produce the reliability of a conventional wire-wrap joint, where a cold weld is formed between the wire and the sharp corners of special rectangular wire-wrap pins. The advantage of Easiwire is that the wiring can be removed, using a special tool provided, and the components re-used in other projects, making it particularly attractive for beginners, schools, etc.

An Easiwire "starter" kit comprising pen, unwrap tool, spare wire, and connectors for off-board leads such as power supplies, together with comprehensive instructions, will be available from BICC-VERO retail stockists during May, at an introductory price of £15.00.

Satellite TV System Demo

BT Vision, British Telecom's cable and satellite television division, have announced that it plans to demonstrate a new control system for direct-to-home satellite television.

The demonstration, scheduled for this summer, will be the first of its kind to use the MAC pan-European transmission standard. This has been chosen as the standard for the new generation of DBS. The system will use a computer software developed by BT's Research and Technology Division at Martlesham. It will enable owners of satellite dishes to receive the programmes of their choice. It will also be able to provide full facilities for billing and customer enquiries.

BT Vision are inviting programme providers to participate in the demonstration, which is planned to take place over an existing low-powered satellite.

The system will use the D-MAC transmission standard, but will also be compatible to D2 MAC. All this is being arranged in conjunction with Mullard, Plessey and the Norwegian Crypto-MAC consortium.

Ham Aid Mondial

A group of Wiltshire Radio Amateurs are setting up Ham Aid Mondial during the Bank Holiday weekend May 28/29. This is to raise money for the Disasters Emergency Committee and to provide funds to purchase a cardiac resuscitation unit (LIFEPAK 5) for Marlborough Ambulances.

It is hoped that the transmitting station will operate on all amateur bands below 430MHz. They intend to operate on all permitted modes in these bands. They have three special event calls for the event, GB75HAM, GB4HAM and GB1HAM. The station will be located between Marlborough and Pewsey near Martinsell Hill.

Agreement with RTEEB

City and Guilds of London Institute and the Radio, Television and Electronics Examinations Board have concluded an agreement on joint certification of trainees in the electronics servicing industry.

The agreement is the first result of a concerted effort to rationalise the work of the two bodies in spheres of mutual interest. Under the agreement, trainees will be able to gain a joint certificate of competence in the C & G Electronics Servicing (224) scheme. It is anticipated that other schemes, where a joint interest exists, will be brought into the scope of the agreement in due course.

Can You Help?

Mr Howard has recently acquired a Labgear field strength meter type CM6016/SM serial No. E786. Unfortunately it didn't have operating information. If you can help please write to: Mr D. G. Howard, 16 Orchid Avenue, Toftwood, Dereham, Norfolk NR19 1JT.

Two Year Guarantees

Adcola Products Ltd. have announced a two year guarantee on all equipment manufactured by the Company in the UK.

This warranty will not, however, be applied to the Ad-Iron long life soldering tips as, of course, a soldering tip life depends on conditions, temperatures, etc., that it is operating under.

Miniature Suppressors

MPE Ltd. (Liverpool) have introduced to their products a range of miniature, feed-through suppressors for filtering high frequency r.f.i. on 250V a.c. supply lines.

Rated from 1.3 to 4.7nF, 250V a.c., 50/60Hz, these units operate over −55 to +85°C and undergo a high voltage test of 2250V d.c.

All types offer a maximum through current of 10A and good insertion loss performance. The 4.7nF suppressor for example will typically provide 30dB at 50MHz, and up to 80dB at 1GHz. The unit is 9mm in diameter and 38mm long.

For more details, contact:
MPE Ltd. (Liverpool),
PO Box 11,
Hammond Road,
Kirby Ind. Est.,
Liverpool L33 7UL.

Hire and Hire

Alpha Electronics Ltd have established a Hire Division as a result of many requests from customers. They have available a wide range of products which include Energy and Mains Monitors, Chart Recorders, Cable and Pipe Locators, Micro-ohmmeters and Cable Test Sets to name a few. They now produce a brochure listing part of their hire range together with price information.

Apparently the pieces of equipment that are most popular for hire are mainly those used for electrical engineering. The say that all the instruments are kept in top condition and upon return from a customer they are put through their own service and calibration department. This step is then also repeated before the equipment is sent out on hire.

If you would like more details on this service, then contact:

Alpha Electronics Ltd.,
Unit 5,
Linstock Trading Estate,
Wigan Road,
Atherton,
Manchester M29 0QA.
Tel: 0942 873434.

BARTG Update

BARTG (British Amateur Radio Teleprinter Group) have announced that Bob Andrews G1JZJ has taken on the task of the new manager for GB2ATG.

GB2ATG is transmitted on the first and third Sunday of every month on 3.590, 14.090 and 144.600MHz. Items of interest to data enthusiasts will be welcomed by Bob at 5 Queens Road, Erdington, Birmingham B23 7JP.

BARTG are also offering free subs for Datacom in 1989 for the best article printed in each of the 1988 issues.

Can You Help?

Mr Holmes has a TS-520S and urgently requires the readout operational m/c DG5. If you can help, write to Mr. J. A. Holmes, 14 Blandford Crescent, King Head Hill, Chingford, London E4 7NT.

Special Event Stations

GB75MAL: This station will be on the air to celebrate the 50th Anniversary of the steam locomotive Mallard's world record breaking 126m.p.h. run. On July 3 and 9 the famous engine will run from London to Scarborough. Operation will be around 3.725 and 7.055MHz and the 144MHz band. Special QSL cards will be issued to commemorate the event.

GB75CIS: The International Police Association ARC (British Section) will be activating a special event station from the Island of Sark on July 18/20. The station is in support of the BBC fund for Children in Need. They will be operating on all bands from 3.5 to 28MHz as well as 144 and possibly 430MHz. Stations should QSL direct through G3UTX at 9 Greenacre, Worlebury, Weston-super-Mare BS22 9SL enclosing an IRC. All expenses of the trip are being borne by the IPA and all proceeds go to Children in Need.

GB8GS: This station is being operated for the annual Humberside Scouts camping weekend at Primrose Woods camping site (near Scunthorpe). They will be using 3.5–14MHz between May 27 and 30.
John Pullen G4TGE QTHR

GB6BH: This station will be active from Barlborough Hall, Barlborough, near Chesterfield IO93IH. They will be on air most weekdays and every weekday during the month of May. They will be using the following bands and modes: all h.f. bands as well as 50 and 70MHz, 144 and 430MHz, phone, ATV, AMTOR, packet and RTTY.
Peter McArdle G0DAG QTHR

GB4PCP: Coleshill (Llanelli) ARS will be operating from Pembrey Country Park from July 16 to 23 between 0800 and 2400±.

This will be the first outside activity for their disabled members, who will include four "white-stick" operators.

All contacts will receive the special QSL card and they especially are looking forward to cards from s.w.l.s.

GB2DWR: The Mid Lanark ARS Motherwell are starting the 1988 series of special event stations with the Distillers plc on the Malt Whisky Run. The purpose is to activate the Whisky Route by radio.

The Whisky Route is located in the Highlands of Scotland where most of the Whisky Distillers are located.

The stations will be located at four different distilleries over a period of eight days, with a day and a half at each location. All operating will commence at 1000 local time and finish at each location at 1500 local time the following day. A special QSL card and a certificate will be available.

The venues and dates are:

15/16 May	Cardu Distillery
17/18 May	Cragganmore Distillery
19/20 May	Royal Lochnagar Distillery
21/22 May	Blair Athol Distillery

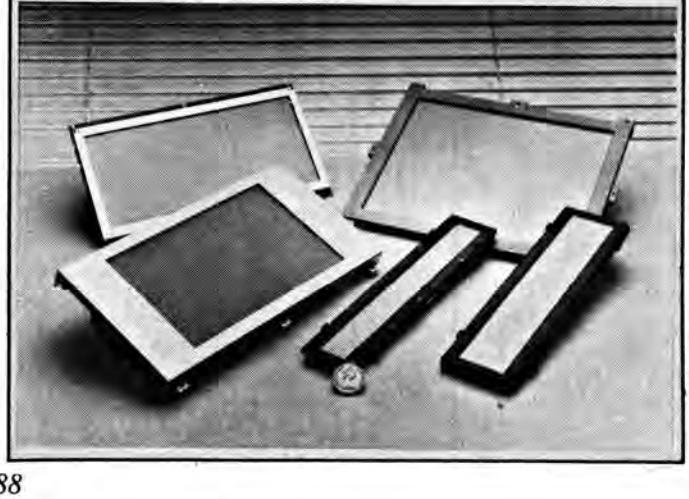
LCD Modules

Epson's range of graphic l.c.d. modules now numbers 16 models with the introduction of six new high contrast, wide viewing angle, Epson silver type Super TN LCD modules.

The six new modules cover the range 640 x 64 up to 640 x 400 dots. One module, the 8002, has cold cathode backlighting. Five of the modules use Epson's new "Chip-on-Flex" technology. This was developed from Seiko quartz watch technology. Weight is reduced as well as cost and size by mounting the l.c.d. driver on a flexible p.c.b. strip.

A brochure is available from Epson detailing the range on l.c.d. modules. Tel: 01-902 8892 ext. 258 or 313.

Other brochures available on this number are Epson Disk Drives and Epson Printer Mechanism Range.



RF Protected PSUs

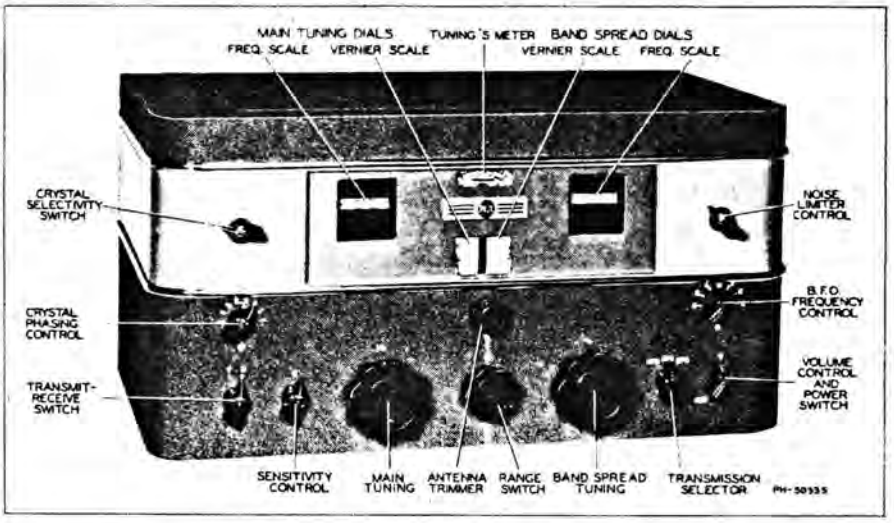
STC Instrument Services has introduced the BNOS PR Series 19in rack-mounted power supplies which offer full r.f. protection. Based on the BNOS P range and providing power up to 600W continuous, the PR Series offers output voltages in three ranges: 2–7V, 10–15V and 20–30V, with output currents up to 40A.

The series have protection against short circuit, over voltage and over current with an automatic shutdown facility. Featuring stability of better than 0.01% for 10% line change, 50Hz input frequency, 240V input voltage (a.c.) and 500μV at maximum continuous output.

For more details on the range, contact:

STC Instrument Services,
Dewart House,
Central Road,
Harlow,
Essex CM20 2TA.

Valved Communications Receivers The AR-77



Continuing his popular series, Chas. E. Miller looks this month at another famous receiver from the RCA stable.

The RCA AR-77 receiver is, one cannot help but feel, considerably overshadowed by the same company's AR-88 (see *PW*, August 1987), which is a pity since the former set has much to commend it and is still well able to stand on its own merits. It is an 8-valve (plus rectifier and voltage regulator) superhet covering 540kHz to 31MHz in six bands, with an average overall sensitivity of less than 2μV for 50mW output. More attention has been paid to audio quality than in most communications receivers, optional negative feedback being provided for reception of entertainment material. An external loudspeaker is required. Perhaps its most striking feature is, however, the excellent band-spread on the 3.5, 7, 14 and 28MHz bands, of which more later. *(Remember, the 21MHz band had not been allocated for amateur use when this receiver was designed, let alone the three bands added at WARC'79.—Ed.)*

It is a fairly large set, although not as massive as its "big brother", measuring 511 × 267 × 295mm and weighing 22kg (20.125 × 10.5 × 11.625in and 48.5lb for readers who still "think Imperial"!). A mounting kit, including a new front panel, for standard 19in rack-mounting was available as an option.

The mains transformer in the AR-77 is suitable for operation on 105–125V a.c. mains only. The export version, type AR-77E, also accepts 195–250V a.c.

Circuit Description

Sockets are provided for either dipole or single-wire antennas, which are coupled by individual r.f. transformers on all bands to the r.f. amplifier (V1, 6SK7). An antenna trimmer operates in the grid circuit of this valve. AGC is applied in the appropriate mode switch position, but no manual control is provided, the stage operating at full gain when c.w. is selected.

Amplified signals at the anode of V1 are coupled by r.f. auto-transformers to the grid of the frequency-changer (V2, 6K8). This valve has its grid returned to earth via a 150kΩ resistor and is operated at fixed cathode bias at all times. The triode section operates as local oscillator in what is basically a conventional mode. The feature which takes the r.f. and mixer stages right out of the ordinary is the astonishing multi-section tuning capacitors.

There are two three-gang units, one for the main tuning and one for band-spreading, the former having six sections, the latter no fewer than nine. The main capacitor has one section each for antenna, r.f. and oscillator tuning permanently connected into the grid circuits, with the other sections switched in to increase the overall capacitance on the lower bands. Its dial is calibrated in frequency for each band covered, viewed through a window on the left centre of the front panel. A mechanical linkage with the band-change switch displays the appropriate section of the dial for the band in use. The band-spread capacitor has its sections switched to provide suitable capacitance ranges for the bands quoted above, and has a similar dial arrangement calibrated directly in frequency set opposite the main dial. Both capacitors have subsidiary vernier dials viewed through twin windows in the centre of the panel. It will be seen that extremely accurate dial settings are possible, especially when the initial calibration is checked against known broadcasting stations.

The i.f. signal at 455kHz appearing at the anode of V2 is fed to the first i.f. amplifier (V3, 6SK7) via an optional crystal filter which gives five different degrees of selectivity when in use, or which may be switched out of circuit altogether. The response curves for the various selectivity settings are shown in Fig. 1.

A conventional transformer couples the signals from V3 anode to the grid of the second i.f. amplifier (V4, 6SK7). This valve is operated without a.g.c., unlike V3, but both are controlled by the sensitivity potentiometer R21, which varies their cathode bias voltages. The built-in S-meter is in the cathode circuit of V3 and effectively reads the change in bias brought about by a.g.c. action.

The i.f. signals are passed on to the combined detector and noise limiter (V5, 6H6) by what appears at first glance at the circuit to be an ordinary i.f. transformer. In fact, T3 and T4 are two quite separate single windings, being housed in cans on opposite sides of the chassis, and coupled capacitively. The anodes of this double-diode valve are strapped and connected to the top of T4. The first diode is the detector with its load resistor returned to earth via a 100kΩ potentiometer, which is preset to establish a balance

between the a.f. voltages derived from i.f. signals and those brought about by noise. The main control for the limiting action is a second potentiometer in the cathode circuit of the second diode (see later).

Also connected to the top of the T4 are the strapped diodes of the combined a.g.c. rectifier and 1st a.f. amplifier (V6, 6SQ7). The load resistor for the diodes is returned to the cathode of the triode section and thus no a.g.c. delay is obtained. This sort of a.g.c. circuitry appears to impose a great deal of shunt loading on the i.f. transformer winding as well as not being very good for working at low signal levels. However, as regular readers will be aware, it is entirely typical of US practice in both communications and domestic receivers. In fact, so often are the twin diodes of double-diode-triode (d.d.t.) valve strapped that one is apt to wonder why they were invented in the first place!

Yet another connection is made capacitively to T4 to couple in the b.f.o. (V7, 6SJ7). This is a perfectly straightforward oscillator brought into action by the mode switch in its c.w. position, and with fine control of frequency obtained by a small variable capacitor mounted on the front panel of the set.

The a.f. signals from the detector are fed to the grid of V6 via the volume control, which has its bottom end connected normally to earth, but in the n.f.b. (negative feedback) position of the mode switch it is transferred to the secondary of the a.f. output transformer. Conventional resistance-capacitance coupling is used from the anode of V6 to the grid of the output valve (V7, 6F6). This valve is capable of providing some 3W of audio output.

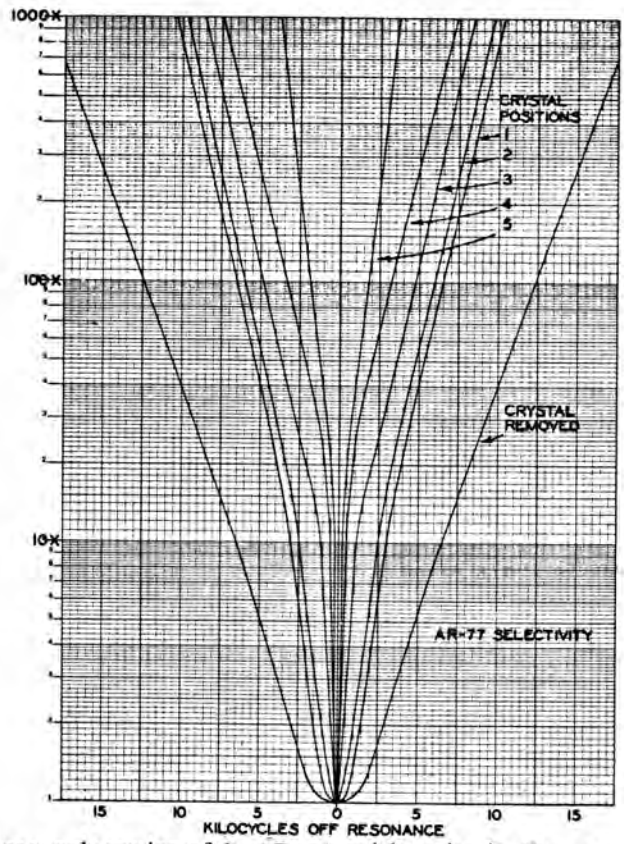


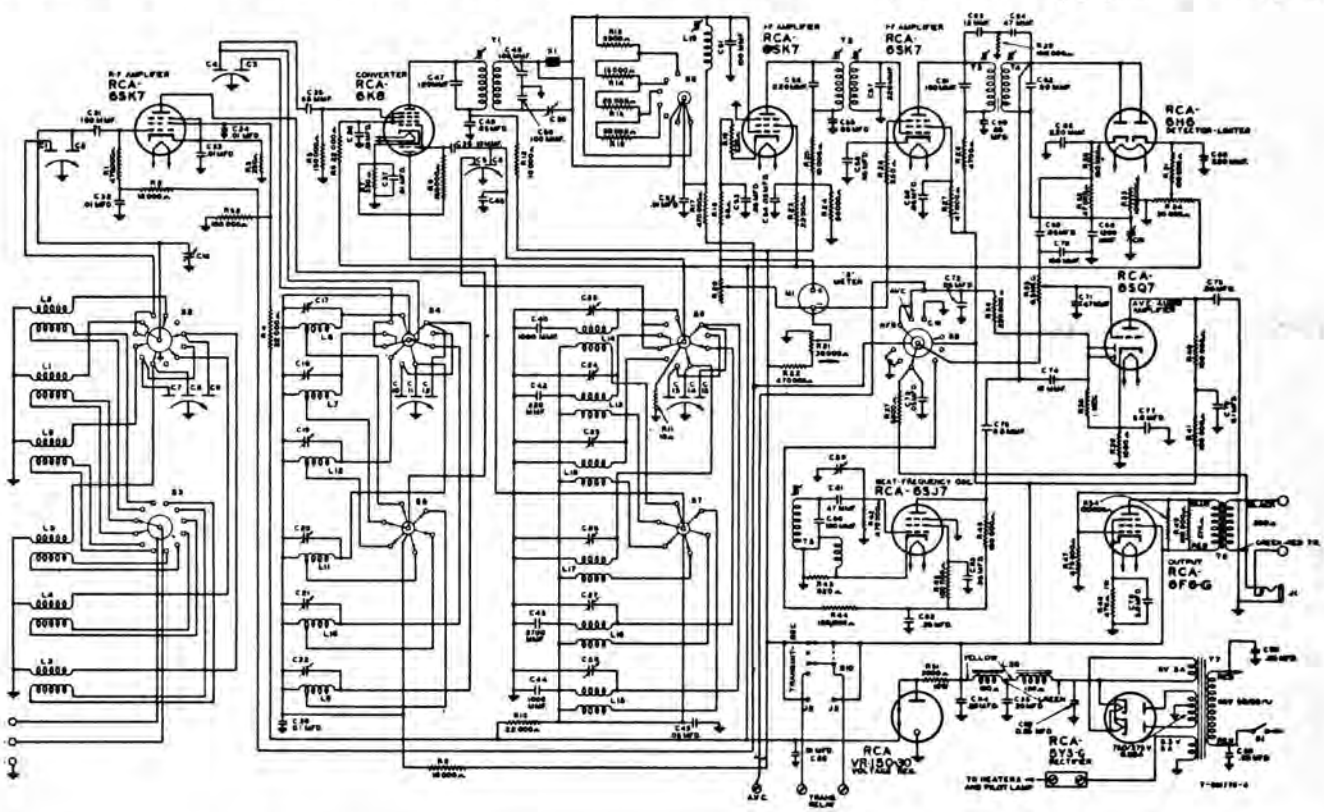
Fig. 1

The power supply section of the AR-77 employs a full-wave rectifier (V8, 5Y3) with choke-input filter followed by a second smoothing choke. A familiar type of neon voltage regulator (V9, VR150-30) is fitted to maintain a constant 150V h.t. for the anode of the local oscillator.

Note that all the valves save the audio output, rectifier and voltage regulator are of the metal-shell type (type number suffix "M"). If glass types (suffix "G" or "GT") were to be substituted, it is possible that problems might arise in the way of frequency instability in the r.f. and mixer stages, and hum in the a.f. stages.

Alignment

At the risk of being repetitious, the usual warning has to be recorded that alignment should not be attempted without the aid of a good quality signal generator. Conversations and correspondence with readers reveal that many are now using frequency counters to check alignment, which is of course commendable. It's by no



means essential, however, so long as the signal generator employed is a high grade instrument. As usual, a wobbulator and oscilloscope is recommended for i.f. alignment in order that the correct response curve shall be obtained.

There is a rather picturesque test recommended by RCA to determine whether or not realignment of the AR-77 is necessary. An output meter must be connected across the loudspeaker output terminals, shunted by a 20Ω resistor. The antenna and earth must be disconnected and the two antenna terminals shunted by a resistor of between 50Ω and 300Ω. The volume and sensitivity controls are set to maximum and the mode switch to AVC. On each band the noise voltage measured by the meter should be in excess of 0.1V. Low readings may be caused by weak valves, but if this can be discounted then realignment of the i.f. stages and at least some of the r.f. bands must be carried out.

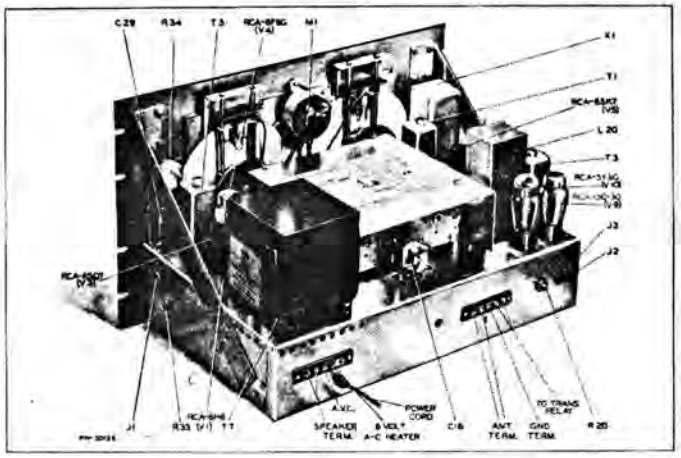
I.F Alignment

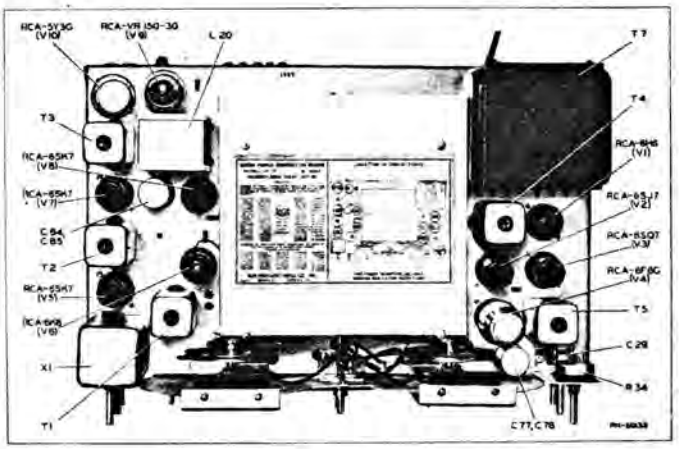
Note that there is a total of six trimmers to be adjusted: that on the primary of T1, that for L19, those for the primary and secondary windings of T2, and one each for T3 and T4. The above-chassis trimmer of T2 was originally sealed with a polystyrene cement, and should this still be present it will have to be softened either by the heat of a soldering iron or chemically (be careful in either case with fumes!). The screening plate on the chassis bottom must be removed to gain access to other trimmers.

The instructions for alignment as given in the RCA manual for the AR-77 are rather curious, and for that reason are for once quoted here verbatim:

"Tune in a steady outside signal on one of the lower frequency bands with the AVC switch in the BFO position and the crystal filter switch in position 2 or 3. The signal should be tuned for a peak response at the crystal frequency. Do not use too strong a signal. The sensitivity switch should be adjusted for approximately 1V output. Adjust T1, L19, T2, T3 and T4 for maximum output voltage. The signal should now be detuned approximately 1000Hz and adjustments T1, L19 and T2 retuned for maximum output. The intermediate frequency is 455kHz."

The exact explanation of this method is not clear, but although the i.f. is quoted only at the end, it would appear to imply that the i.f. transformers, etc., have already been tuned up at 455kHz prior to the procedure just described, or have not been seriously disturbed. When dealing with a receiver that is badly off line, a better approach would be to use the wobbulator and oscilloscope technique, injecting the signal at the top cap of the 6K8 and having the filter set to its widest position. It will then be possible to see the effect of the filter on the response curve and to compare it with that given in Fig. 1.





Instructions for the r.f. and oscillator alignment are also somewhat imprecise, no definite adjustment frequencies being quoted. Instead, frequencies "near" the high and low ends of each band are suggested, as appropriate. This is, of course, the standard method employed when working on receivers for which no manual is available. In the case of the AR-77, suitable frequencies would be about 5 per cent "in" from the band extremes. Thus, for the 540–1340kHz band the alignment points could be rounded to 570kHz and 1275kHz. Suggested alignment points for each band are therefore as follows:

Band	Alignment frequencies
540–1340kHz	570kHz and 1275kHz
1.34–3.3MHz	1410kHz and 3.15MHz
3.3–5.8MHz	3.45MHz and 5.5MHz
5.8–10.2MHz	6.1MHz and 9.7MHz
10.2–18MHz	10.7MHz and 17MHz
18–31MHz	18.9MHz and 29.5MHz

The band-spread tuner should be adjusted at the high frequency end of its travel. While the oscillator trimmers are being adjusted the metal cover should be held in close proximity to minimise any change in alteration in the alignment when the set is reassembled. As always, keep the input low to avoid a.g.c. action.

At this stage the dial shutters may be checked and adjusted if need be, either by altering the tension of the operating cord or by manipulation of the nuts and screws on the rear of the shutters.

Noise Limiter

Have the front panel control fully anti-clockwise (i.e., ineffective) and tune in a strong signal as provided by an ordinary broadcasting station. Turn the front panel control fully clockwise. Adjust the preset potentiometer R33 for minimum sound output; this will be found to be rather sharp in action. Correct adjustment is achieved when the output is low until the front panel control is backed off.

Setting the S-Meter

With no signal input to the receiver, turn the sensitivity control to maximum with the a.g.c. on and the crystal filter out of circuit. Adjust R21 for minimum scale reading. A scale reading of S1 corresponds approximately with a signal input of 0.5μV. S2 approximates to 1μV, S3 to 2μV and so on to S9. Readings above this would indicate inputs of 3mV.

When the receiver is used in the c.w. mode, the meter varies with the setting of the sensitivity control and thus gives some indication of its action.

Cleaning the Range Switch

The switch fitted to the AR-77 appears to be rather more delicate than usual. Certainly hints in the RCA manual and practical experience suggest that it should be treated with extreme caution. Attempting to clean wafers with certain solvents may well cause serious damage, and it would probably be safer to give them light treatment with a stiff dry brush unless you are certain of what you are doing. Better be safe than sorry! **PW**

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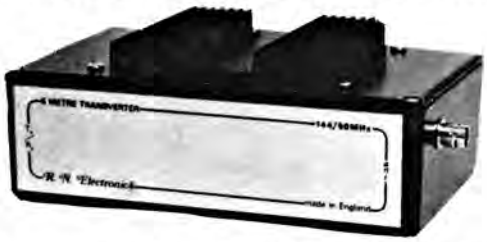

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LED Brightness Controller

How many amateurs have a mobile transceiver with an l.e.d. display that is too bright at night or too dim in daylight to be acceptable? To overcome this problem Basil Spencer G4YNM has designed this simple pulse position modulated (p.p.m.) automatic l.e.d dimmer

This simple design is based around the ubiquitous 555 timer chip, the circuit of which is shown in Fig. 1. It is capable of dimming either 7-segment displays or discrete l.e.d.s. The timer chip is connected in its astable multivibrator mode, its output (pin 3) having a variable mark space (on/off) ratio.

The "off" time is fixed approximately:

$T_{off} = 0.72 \times R2 \times C1$ or approx. 72µs

The "on" time is variable and is determined by the equivalent value of resistance presented by the photo-transistor (Tr1) which is connected in parallel with R1, together with R2 and C1.

The resistance of the photo-transistor is dependent upon the amount of light striking its junction.

The formula for the "on" time is:

1/R equivalent = 1/Tr1 + 1/R1

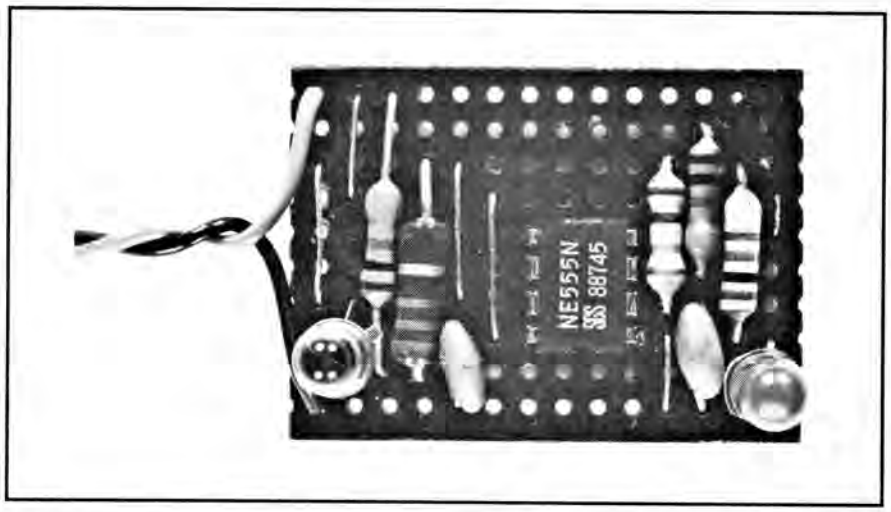
$T_{on} = 0.72 \times (R\ equivalent + R2) \times C1$

As the ambient light increases the "off" pulses become closer together, the reverse happening as ambient light decreases. Hence it is a light-controlled pulse position modulator. This is perhaps best visualised by studying Fig. 3.

This waveform is used to drive a *pnp* transistor, which inverts the signal and powers the l.e.d. The switching is done at a high frequency, so even though the l.e.d. is in fact flashing, the persistence of the human vision integrates this signal and the l.e.d. appears to be lit continuously.

With more pulses in a given time period the mean l.e.d. current increases and it becomes brighter. With less pulses, the opposite happens and it appears dimmer. The overall effect is a continually variable brightness that is always "just right" for the sunniest of days and for night driving.

Resistor R1 is included to prevent the 555 having too wide an "on" pulse in near-complete darkness, which would otherwise cause the l.e.d. to flash visibly. Only one transistor and discrete l.e.d. is shown in Fig. 1 for simplicity, although up to about six transistors can be driven from one 555 timer chip.



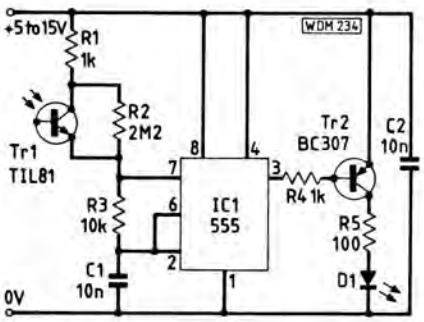


Fig. 1: Circuit diagram of controller

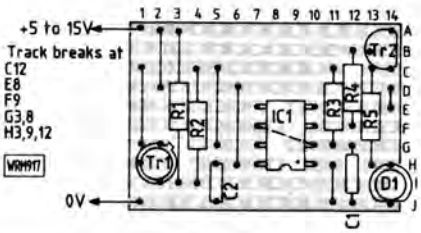
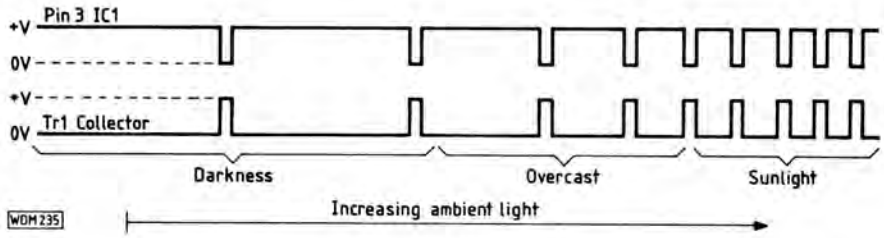


Fig. 2: Suggested Veroboard layout



▲ Fig. 3: Trace showing pulse repetition rate against increase in ambient light. Note, pulse widths are not to scale and are a diagrammatic representation only

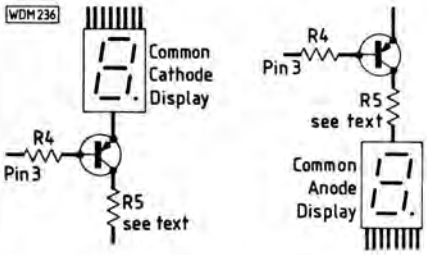


Fig. 4: Suggested technique of connecting controller to 7-segment displays

Construction

As the precise requirement will vary from one transceiver to another, no p.c.b. design is offered, just a prototype Veroboard layout (Fig. 2). The phototransistor should be facing in the same direction as the l.e.d.s, so that it can "sample" the ambient light falling on the display. Supply requirements are not critical, anything from 5 to 15 volts is fine.

It should be possible to run common-cathode or common-anode 7-segment l.e.d. displays by adapting the ideas shown in Fig. 4 to suit your needs. You should use one transistor driver per display and you may need to adjust the current limiting resistor R5 or in some cases omit it.

This design like all other pulsed l.e.d. systems produces some r.f.i. In order to contain this interference it may be necessary to decouple the supply rail to the dimmer, and in some instances place the circuit in a screened enclosure.

SHOPPING LIST

Resistors
0.25W 5% carbon film

100Ω	1	R5
1kΩ	2	R1,4
10kΩ	1	R3
2.2MΩ	1	R2

Capacitors
Sub-miniature ceramic

10nF	2	C1,2

Semiconductors
Transistors

BC307	1	Tr2
TIL81	1	Tr1

Integrated circuits

NE555	1	IC1

Miscellaneous
Veroboard; Veropins; connecting wire; enclosure.

How Much? & How Difficult? £2.50 Intermediate

Conclusion

The design conforms to the rules for "KISS" (Keep it Simple, Stupid) and performs a useful function. It's also quite nice to stun microwave enthusiasts by nonchalantly saying, "yes, just finished a 330THz project this afternoon", (330Terahertz equals 330 000GHz and 330 000GHz equals 330 000 000MHz). ***PW***

Feature

Practically Yours

By Glen Ross G8MWR

This month we respond to the requests for a computer program to calculate distances from Maidenhead locators. Suitable programs have been around for years but it seems that each new generation of amateurs finds difficulty in getting hold of them. Perhaps this is due to the fact that listings were frequently machine specific and that Oric, Dragon and similar computers are no longer obtainable. The listing given here is written specifically for the Amstrad PC or any machine that behaves as an IBM clone computer.

Moving It

The program has been designed in such a way as to be easily portable to other machines and therefore uses techniques which will make the professional feel rather ill. If you are moving it then remember that the LOCATE statement simply means the line and character position on the screen where something will be printed. The display used in the listing assumes twenty-five lines of eighty characters. Some machines may already have PI as a reserved variable, in which case omit line 30 and make line 40 P=PI/180. Do not forget to put your own locator into line 110 at the point shown.

Extra

I have available a large collection of amateur radio and electronic engineering related programs suitable for IBM clones. These do **not** include Packet or RTTY type programs. If you are interested or have any programs you think might be usefully added to the collection please drop me a line via the editor or QTHR.

```
10 CLS: REM For Amstrad and all IBM clones; copyright G8MWR, 1988.
20 LOCATE 10,18: PRINT"Calculate distance using Maidenhead locators."
30 PI=3.14159
40 P=PI/180
50 A=4000.9
60 F=(A*10)/(2*PI)
70 LOCATE 12,25:PRINT"Use your own locator...."
80 A$=INKEY$;IF A$="" THEN 70
90 IF A$="N" OR A$="n" THEN 130
100 IF A$="Y" OR A$="y" THEN 110 ELSE 70
110 E$="        ":LOCATE 12,53:PRINT E$;GOTO 140
120 REM Enter your own locator in UPPER CASE at "   "in line 110
130 LOCATE 12,25:INPUT"Enter the first locator..";E$
140 F$=E$
150 GOSUB 280
160 LE=LF;BE=BF
170 LOCATE 14,25:INPUT"Enter the distant locator.";F$
180 GOSUB 280
190 GA=LF-LE
200 B=BF-BE
210 N=SIN(BE)*SIN(BF)+COS(BE)*COS(BF)*COS(GA)
220 DX=INT((-ATN(N/SQR(1-N*N))+PI/2)*F+.5
230 LOCATE 16,25:PRINT"The distance is "DX" Kms."
240 LOCATE 19,25:PRINT"Type R to retry or M for menu"
250 LOCATE 19,56:A$=INKEY$
260 IF A$="R" OR A$="r" THEN LOCATE 14.51:PRINT"    ":GOTO 170
270 IF A$="M" OR A$="m" THEN RUN ELSE 250
280 FOR N = 1 TO 6
290 T$(N)=MID$(F$,N,1)
300 NEXT N
310 LF=(ASC(T$(1))-65)*20-180+VAL(T$(3))*2+(ASC(T$(5))-65)/12+1/24
320 BF=(ASC(T$(2))-65)*10-90+VAL(T$(4))=(ASC(T$(6))-65)/24+1/48
330 LF=LF*P
340 BF=BF*P
350 RETURN
360 END
```

Kitchen Konstruktion

This month, Richard Q Marris G2BZQ, in No. 6 of his occasional series, gives us a lead on making twisted flex.

Now, you may need from time to time a length of 2 or 3-core twisted flex. Probably just a yard or an odd metre, depending on how you think, to give that home-brew receiver the professional vintage look.

This type of cable is not easy to obtain in small quantities and before you know it, you're in to spending vast sums of money and waiting weeks for something that is so easy to make yourself.

Tucked away in your junk box you probably have some odd lengths of pvc covered wire. Why not use it? To convert these single wires into twisted flex, you first trim all the pieces of wire to the same length. Then you just loop the ends of wire around the kitchen door knob (or put the ends in a vice), while the other ends are secured in the jaws of a hand drill (Fig. 1). Next slowly turn the handle of the drill, and the wire will start twisting. To avoid kinking it is necessary to pull steadily against the shrinking length of twisted flex. It is also necessary to over-wind the length of flex, as the twist will relax a little after it has been released from tension.

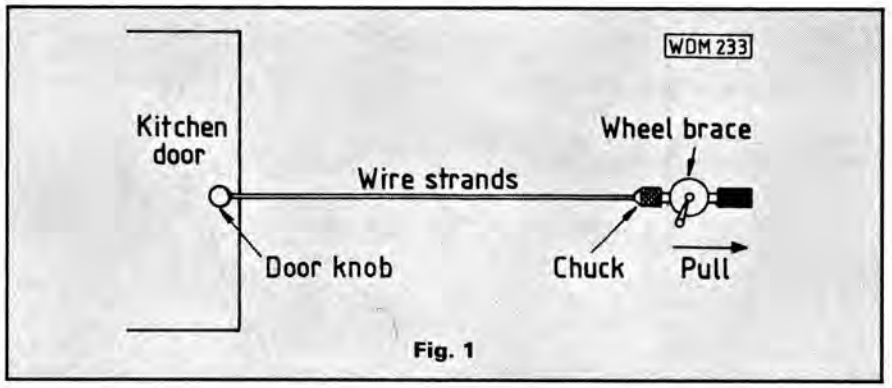
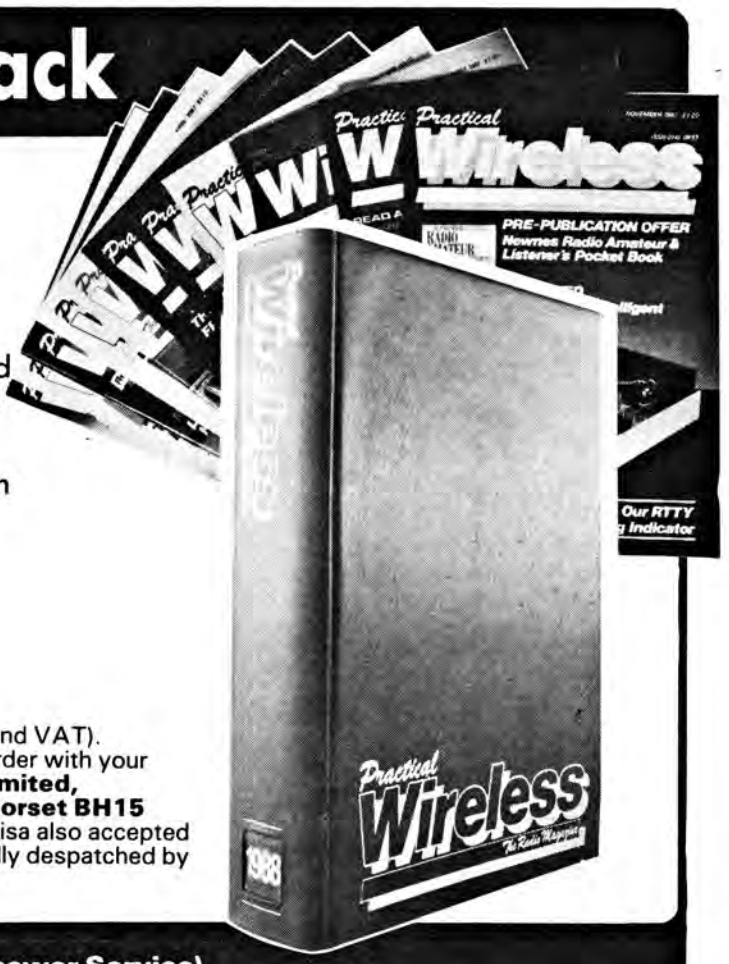


Fig. 1

The result is an immediate length of 2 or 3-core twisted flex. As a rule of thumb it is necessary to allow approximately $2\frac{1}{2}$ times as much of the single wire, as will be required length of twisted flex.

Finally, did you know that a twisted pair of 16/0.2mm pvc covered wire has an impedance of around 75 ohms?

Tidy up your shack



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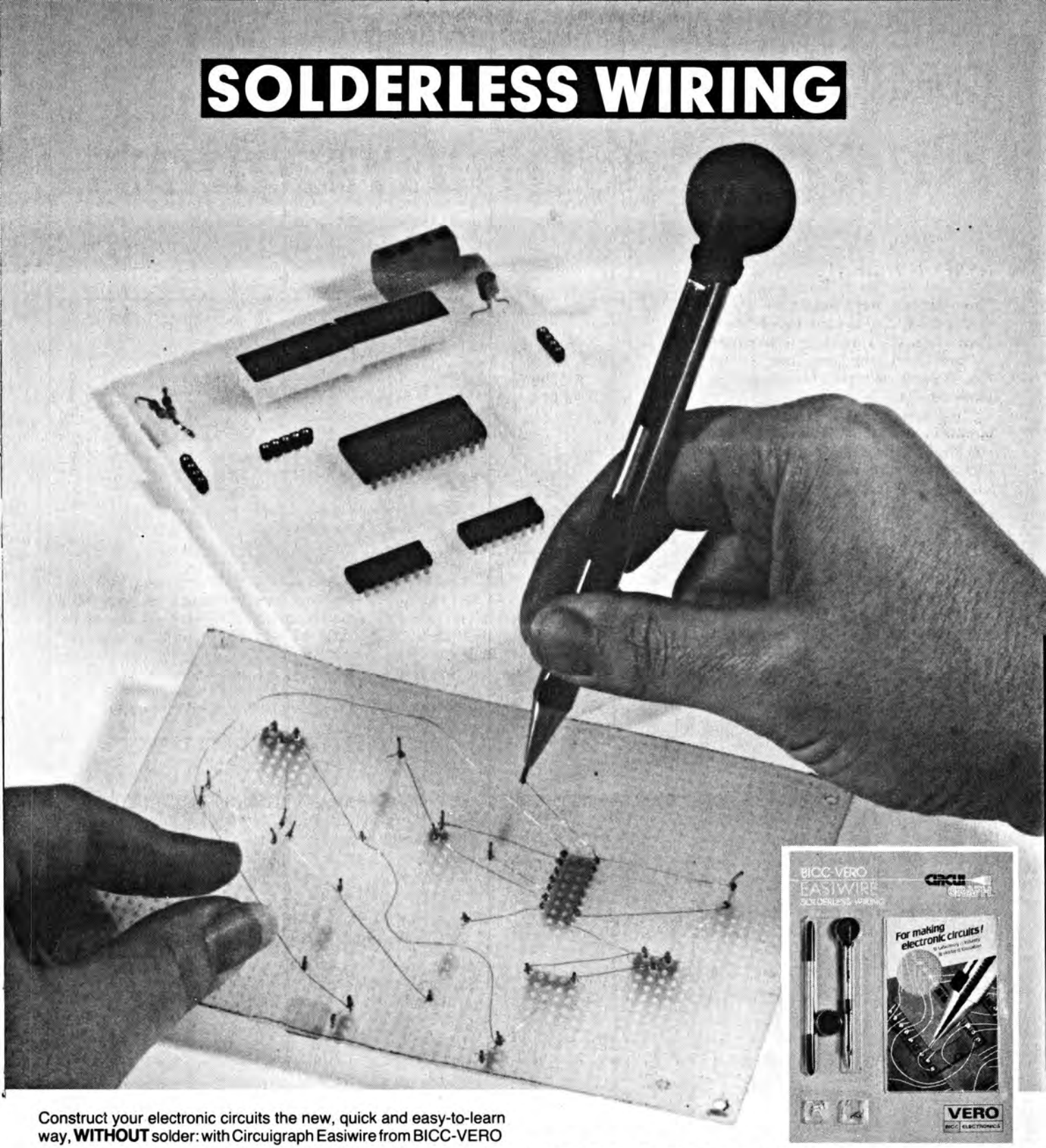

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Reading & Understanding

(with a bit of theory thrown in)

In Part 4 of this series, R. F. Fautley G3ASG takes a look at oscillators.

Before being able to recognise an oscillator when you see one, it is necessary to have some understanding of its operation—that is, what makes an oscillator oscillate.

If any amplifier stage has some of its alternating output signal connected back to its input, that fed-back signal will either add to the input signal or subtract from it. It is the phase of the fed-back signal, relative to the original input signal, which determines its effect.

What is meant by its phase? Well, if the alternating signal input to the circuit of Fig. 4.1, i.e. to the base of the transistor, is at one instant-in-time positive, then at exactly the same instant (or at least as close as to make no difference to the argument) the collector signal will be negative. Now, if a part of the amplified signal at the output of the stage at the transistor collector can be used to add to, or increase, the input signal at the base, that increased input signal will be further amplified, resulting in even more of the output signal being added to the transistor input. Finally, the input will reach a point where no more signal can produce an increase and a state of balance exists. When this happens, we have the condition where the amplifier stage is in fact providing its own input from its own output! That is oscillation.

But, you may ask, where did the initial input signal that started the oscillation come from? That's quite an easy one, as any small pulse, such as can be produced at the instant of switch-on, or just random noise generated by the transistor (even if very small) will be amplified and become sufficient to trigger the circuit into oscillation.

Next question, how does one ensure that the fed-back signal is in phase (adding) and not antiphase (i.e. out of phase and therefore subtracting)? Also, what happens if the fed-back signal is out of phase with the input signal?

Both questions can be answered together, for if the phase is incorrect, i.e. the fed-back signal is out of phase, nothing happens! This is called negative feedback and the overall gain of the stage is simply reduced. So, if nothing happens when a so-called oscillator is switched on, reverse the connections (marked "a" and "b" in Fig. 4.1 to either L1 and L2 (but not both or you'll be back where you started!) and, providing the stage gain exceeds unity, it should oscillate.

The circuit in Fig. 4.1 has been simplified by again omitting the biasing and power supply circuitry to show more clearly the operation of the stage. The energy is transferred from the collector (output) to the base (input) via the magnetic coupling (marked "M" on the circuit) existing between L1 and L2. These two coils (inductors) are mounted physically close together (perhaps even wound on the same coil former) so that the magnetic field surrounding each coil interacts with the other.

The frequency at which oscillation occurs depends principally on the values of C and L1, but will be modified to some extent by L2 and stray capacitance. What is "stray capacitance"? Well, every component, piece of wire or length of track on a printed circuit board, has some small finite value of capacitance to all the other components, wires and tracks in its vicinity. This is because each of the previous items can be considered as a plate of a capacitor. The closer it is to its neighbours, the greater is the value of the capacitance between them. In the case of valves and transistors, such capacitance also exists between the electrodes inside the devices.

Fortunately, the value of this stray capacitance is usually not great enough to modify the calculated component values in a.f. and low radio frequency circuits. In v.h.f. and u.h.f. circuits it is quite often large enough (sometimes even too large!) to be the only capacitance used in the tuned circuits.

The formula previously given for series and parallel resonance will be approximately correct for the frequency of oscillation.
That is:

$$f=\frac{1}{2\pi\sqrt{LC}}$$

Because the tuned circuit (L1 and C) is in the base circuit of the transistor, it is called a "tuned base" oscillator.

The oscillator of Fig. 4.2 operates in the same way as the tuned base oscillator, except that the tuned circuit is in the collector instead of the base circuit. So it's called a "tuned collector" oscillator.

Hartley Oscillator

In Fig. 4.3, it's not quite so easy to see how part of the output signal is fed back to the input circuit. But if we redraw it as Fig. 4.4 the similarity to the tuned base and collector oscillators becomes a bit more obvious. The only difference is that the tuning capacitor C is now connected across the whole of the coil between collector and base.

Colpitts Oscillator

This variation, in Fig. 4.5, is identical in operation to the Hartley circuit except that the tap on the inductor L is replaced by a capacitor tap. This is shown more clearly in Fig. 4.6.

Crystal Oscillator

This type of oscillator is preferred where a very stable frequency is required. The piezo-electric crystal (which is made from quartz) behaves as a tuned circuit with a very high *Q*.

What is *Q*? It's a measure of the tuned circuit's selectivity, i.e. its ability to discriminate between signals having different frequencies, and to

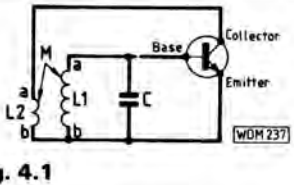

Fig. 4.1

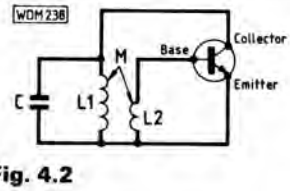

Fig. 4.2

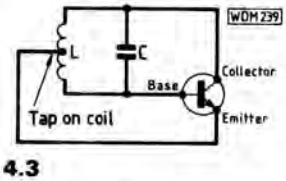

Fig. 4.3

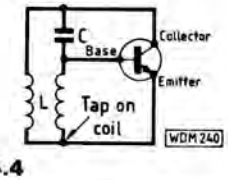

Fig. 4.4

Circuit Diagrams

accept a very small band of frequencies whilst attenuating all others. The higher the Q of the tuned circuit, the higher its selectivity. A crystal has a very high Q value and so it will tend to accept only a single frequency, and this is exactly the requirement for a high stability oscillator since it will than oscillate only at that frequency.

The circuit symbol and equivalent circuit of the crystal is shown in Figs. 4.7 and 4.8. A crystal oscillator is shown in Fig. 4.9 and Fig. 4.10 shows the circuit re-drawn to emphasise its similarity to a Colpitts oscillator. The values shown in Fig 4.8 are for a crystal for use at about 400kHz. The reactance of the 3.5H inductance is around 9MΩ at the operating frequency (400kHz), as is also the reactance of C1. With a series resistance of about 400Ω, this gives a Q value for the crystal of around 22 000 compared with about 20 to 400 for ordinary inductors (or coils).

Q is the ratio of reactance to resistance. So for the 400kHz crystal in Fig. 4.8:

$$Q = \frac{X_L}{r}$$

where X_L is the reactance of the inductance at the crystal frequency,
and r is the value of the series resistance of the crystal.
As we remember (don't we?)

$$X_L = 2\pi fL$$

$$= 2\pi \times 400 \times 10^3 \times 3.5$$

$$= 8\,796\,459.4\Omega$$

So: $Q = \frac{8\,796\,459.4}{400}$

$$= 21\,991.1 \text{ or nearly } 22\,000$$

Conclusion

What do ALL these oscillator circuits we've discussed have in common? They are all COMMON EMITTER AMPLIFIERS with enough POSITIVE FEEDBACK to maintain oscillation.

Remember why the common emitter amplifier is so-called? It's because the emitter is common to both input and output circuits of the amplifer.

What is positive feedback? It's a bit of the amplifier's output signal connected to its own input such that it is IN PHASE with the input signal.

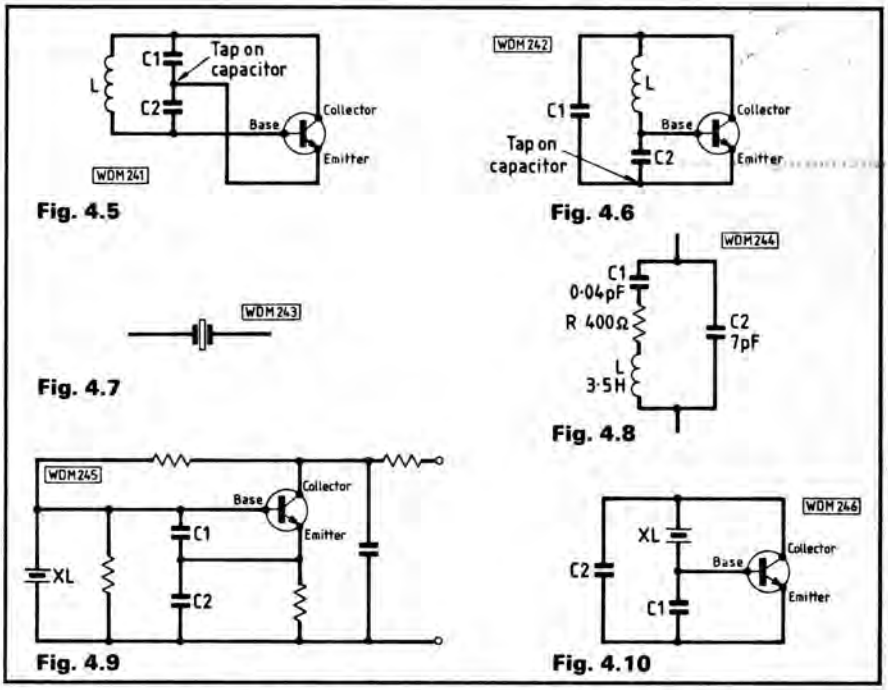

Fig. 4.5 Fig. 4.6 Fig. 4.7 Fig. 4.8 Fig. 4.9 Fig. 4.10

What's IN PHASE? Two signals are said to be in phase when BOTH their voltages (or currents) are at peak positive level, at zero and at peak negative level at EXACTLY the same instant in time.

How can these oscillator circuits be recognised? By looking for the effective EMITTER TAP on a reactive circuit connected between collector and base. In the Hartley circuit the tap is on the inductor, and in the Colpitts oscillator it's between two capacitors. The names, Hartley and Colpitts, are the names of the originators of the circuits.

In the case of the crystal oscillator the emitter tap is connected, like the Colpitts circuit, at the junction of the two capacitors, C1 and C2.

Frequency of Oscillation

The frequency at which these circuits oscillate depends on the values of inductance and capacitance used, and again will be approximately:

$$f = \frac{1}{2\pi\sqrt{LC}}$$

where for the Hartley circuit, L will be the inductance value for the whole coil, and for the Colpitts circuit, C will be the effective capacitance due to C1 and C2 in series:

$$\frac{1}{C_{total}} = \frac{1}{C1} + \frac{1}{C2}$$

NOTE: Where ONLY TWO capacitors are connected in series:

$$C_{total} = \frac{C_1 \times C_2}{C_1 + C_2}$$

The same treatment applies to ONLY TWO resistors and ONLY TWO inductors when connected in parallel:

i.e. $R_{total} = \frac{R_1 \times R_2}{R_1 + R_2}$

and $L_{total} = \frac{L_1 \times L_2}{L_1 + L_2}$

In Part 5 of this series we look at various types of power supplies

IC of the Month

Brian Dance reviews the Plessey Semiconductors SL1451 EXP, a wideband p.l.l. detector for satellite television.

The SL1451 EXP has been designed for use as a wideband f.m. detector when fed with i.f. inputs in the 300 to 700MHz range. Although it has been specifically designated for use in satellite television receivers, it obviously has many other potential applications, such as in wideband data communications demodulator circuits.

Connections

The SL1451 EXP is encapsulated in a 16-pin dual-in-line package with the connections shown in Fig. 1. Internally, it contains an input r.f. amplifier, a signal level detector, a u.h.f. phase detector, a u.h.f. oscillator and a video/loop amplifier. The internal circuit is shown in block form in Fig. 2. It may be noted that two video outputs are provided, one being positive going and the other negative going.

The SL1451 EXP can be demodulated signals with a frequency deviation of up to 28MHz peak-to-peak. The device forms a complete phase locked loop system for wideband f.m. demodulation.

Circuit

A typical practical application for the use of this device is shown in Fig. 3. This circuit provides its specified performance when operated from power supply voltages in the range of 7.4 to 9V, which is fed to both pins 5 and 13. The power supply current is typically 55mA total.

The circuit shown has been designed for the demodulation of 612MHz input signals which have a 13.5MHz peak-to-peak frequency deviation. The oscillator frequency is typically in the range 300–700MHz in circuits of this type.

The r.f. input level to pins 6 and 7 should be about 70mV in this type of circuit. The oscillator lock range was measured as 50MHz. The phase detector provided a gain of about 0.5V/radian and the voltage controlled oscillator slope was typically 14MHz/V.

The typical video output at pins 14 and 15 is 1.5V peak-to-peak when the device is fed with an input signal having 21.4MHz peak-to-peak frequency deviation.

The video bandwidth provided by the Fig. 3 circuit is typically 18MHz, while the intermodulation products are typically at the −40dBm level under specified operating conditions. (Signal 1:4.433MHz and deviation 21.4MHz peak-to-peak.)

The a.g.c. output at pin 9 is typically 300μA when no input signal is present, falling to 140μA with an input signal at the −20dBm level. **PW**

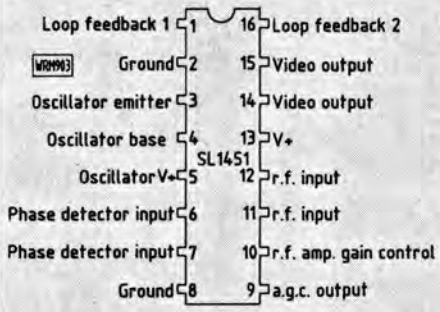

Fig. 1: The SL1451 EXP connections

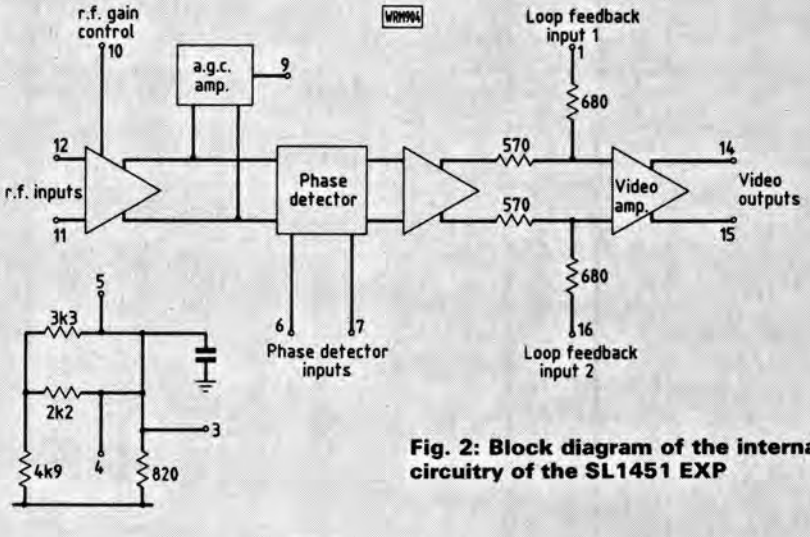

Fig. 2: Block diagram of the internal circuitry of the SL1451 EXP

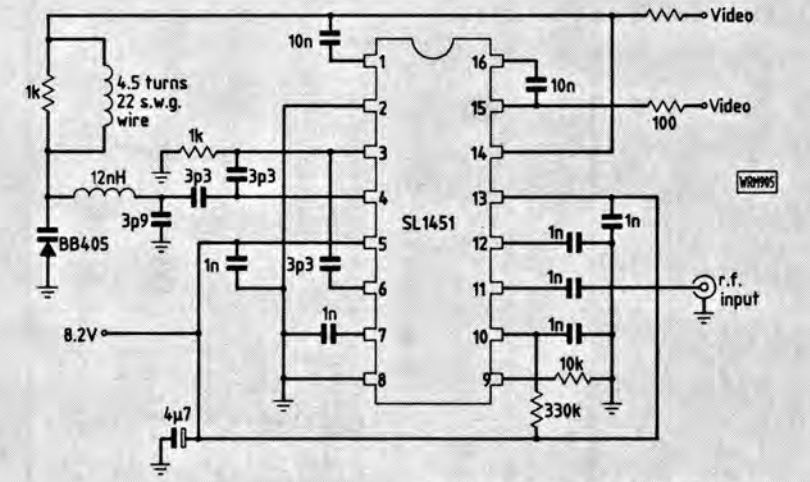

Fig. 3: A typical practical circuit using the SL1451 EXP as an f.m. demodulator

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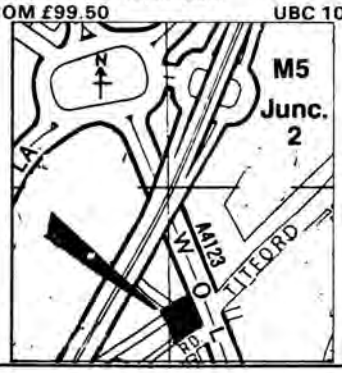

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PW REVIEW

Yaesu FT-736R VHF/UHF Transceiver

Are you looking for the ultimate in a v.h.f./u.h.f. all-mode base station? If so, the new Yaesu FT-736R could be just the ticket. Mike Richards G4WNC checks out the on-air performance while Geoff Arnold G3GSR puts it through its paces in the Lab.

The Yaesu FT-736R is the successor to the FT-726 and provides all-mode coverage on the 50MHz, 144MHz, 430MHz and 1296MHz amateur bands using plug-in modules. The facilities provided are comparable with that of many modern h.f. transceivers and should ease operation under all band conditions from contests to rag-chewing. In standard form, the FT-736R is equipped with modules for 144MHz and 430MHz, with the other bands available as optional extras.

The supplied manual comprises a 48-page A4 book which is split into four sections. Although the operation is covered in great detail there is a definite lack of a quick guide to get you on the air. I'm sure most operators are just as impatient as I am when it comes to operating a rig for the first time and a simplified operating guide can make life so much easier.

Despite the problems of getting started, the descriptions of the various features of the FT-736R proved to be very good. In addition to text, good use is made of diagrams and photographs to illustrate the operation being described.

With a rig as complicated as the FT-736R a good index is essential and this is handled by sub-dividing each section of the manual into numbered paragraphs, these are then referred to in the main index. This system works very well and enables the easy and rapid location of any item.

The supplied circuit diagrams are of good quality and very easy to read. Rather than cramp the diagrams in the manual they are supplied as four A3 and one A4 double-sided sheets with only two pages of diagrams in the manual.

Presumably because of the complexity, there is no circuit description, although one of the A3 sheets contains a small but detailed block diagram which I suspect will be adequate for most operators.

The final sections of the manual contain details of some of the more advanced features such as computer control and digital message processing.

One section that is noticeable by its absence is a trouble-shooting chart. It is very easy sometimes to get in a terrible mess when using a complicated rig. I'm sure you know the feeling where everything seems to be normal but it just won't do what you ask. When stuck in this loop a trouble-shooting chart can be invaluable for spotting the deliberate mistake and saving an embarrassing trip to the dealer!

Connecting-up

The FT-736R is a self-contained transceiver which means that the connecting-up operations are reduced to a minimum. A mains power supply is built into the FT-736R which is man enough to handle full power from any of the modules, so the standard shack power supply is redundant. The only disadvantage of this is the size and weight of the FT-736R, though there is the advantage of no extra lumps of equipment around the shack.

If you should want to run the FT-736R from an external power source, e.g. the car battery when operating mobile, this is easily achieved by removing the plug which links the internal power unit to the rig and replacing it with an external power cable.

When using mains power the supply is connected using a standard IEC three-pin socket which is fused on the rear panel.

The antenna sockets are all mounted on the rear panel with a separate socket for each band. The 50MHz and 144MHz modules use SO-239 type sockets whilst 430MHz and 1296MHz use the higher quality "N" connectors.

The eight-pin microphone socket on the front panel has all the connections necessary to handle up and down tuning and tone burst in addition to the normal p.t.t.

Headphones are catered for with a standard 6.3mm jack socket on the front panel. This socket is configured to handle both mono and stereo headphones with an impedance range of 4 to 100Ω which should cater for most common types.

The 6.3mm key jack on the rear panel is slightly unusual in that a three-contact stereo jack is fitted, the reason being that this jack is used for both normal key operation and also when the optional electronic keyer is fitted. The electrical conditions on the key jack are a maximum of 4.5V and 2mA which should prove suitable for virtually any type of key.

Those of you who prefer to use an external speaker will be pleased to note that a conventional 3.5mm speaker jack has been provided. The FT-736R can drive any speaker with an impedance between 4 and 8Ω. In addition to the basic connections, the rear panel contains some extra sockets for taking advantage of some of the more advanced features.

The first of these is the six-pin CAT socket, CAT in this case standing for Computer Aided Transceiver. This socket is basically a serial input/output

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Operating temperature range:	−10 to +60°C
Reference oscillator stability:	Better than ±1p.p.m. (+10 to +40°C) and ±5p.p.m. (−10 to +60°C) after 15 minutes warm-up
Antenna impedance:	50Ω unbalanced
Power requirements:	85–132 or 170–264V a.c. 50/60Hz 250VA max, or 13.8V d.c. ±10% negative ground, 1.5A (receive), 8A (transmit)
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Audio response (s.s.b.):	within 6dB 300–2700Hz
Microphone impedance:	200–10kΩ (600Ω nominal)

RECEIVER

Circuit type:	50*, 144MHz bands double conversion Other bands triple conversion superhet
Intermediate frequencies:	13.69MHz and 455kHz plus 47.43MHz on 430, or 133.91MHz on 1.2GHz*
Sensitivity:	s.s.b./c.w.: better than −15dBμ (0.2μV) for 12dB S+N:N f.m.: better than −9dBμ (0.35μV) for 12dB SINAD
Squelch sensitivity:	s.s.b./c.w.: better than 0dBμ (1μV) f.m. better than −12dBμ (0.25μV)
Image rejection:	60dB or better
Selectivity: (−6/−60dB)	s.s.b./c.w. 2.2/4.5kHz c.w. (N)* 600/1200Hz f.m. (N) 8/19kHz
Audio output:	1.5W in 8Ω for 5% t.h.d.
Audio output impedance:	4 to 16Ω

* Requires optional unit

★ PW LAB TESTS

TRANSMITTER

Outputs in c.w. mode:

Freq (MHz)	Output (W)	Spurious outputs (dBc)			
		Harmonics			Other
		2nd	3rd	Higher	
51.01	7.5*	−56*	—	—	—
145.01	20*	−55	—	—	—
434.01	20*	—	—	†	—
1240.01	8*	†	†	†	†

Notes: dBc = dB referenced to carrier
— = better than −60dB
† = outside frequency coverage of test instrumentation

2-tone Intermodulation products
(using 700 and 1900Hz tones)

Freq (MHz)	Output (W)	Products (dBc)			
		Order			
		3rd	5th	7th	9th
51.01	7.5	−32	−54	−55	−57
145.01	20	−28	−33	−39	−41
434.01	20	−33	−35	−38	−48
1240.01	8	−32	−45	−39	−53

Carrier suppression: 45dB (1kHz modulation)
Unwanted sideband suppression: 58dB (1kHz modulation)
Max. deviation (f.m.): 4.8kHz

RECEIVER

Sensitivity: (input p.d. in for 12dB S+N:N on s.s.b., 12dB SINAD on f.m.)

Freq (MHz)	s.s.b.		f.m. (3kHz dev.)	
	dBμ	μV	dBμ	μV
51.01	−19.2	0.11	−15.0	0.18
145.01	−18.5	0.12	−13.8	0.2
434.01	−19.6	0.1	−17.8	0.13
1240.01	†	†	†	†

Image rejection: Better than 85dB
Audio output: 1.5W in 8Ω for 4% t.h.d.

Dynamic range (s.s.b.) (two signals spaced at 20 and 40kHz from receiver tuned frequency

Freq (MHz)	Dynamic range (dB)
51.01	81
145.01	87
434.01	61 (75dB for test signals at +50 and +100kHz)
1240.01	†

Note: † = outside frequency coverage of test instrumentation

***Note**—From measurements made on other samples of the FT-736R, it appears that some of our transmitter test results are not typical: 1. Second harmonic of 50MHz, which falls in Band II, is typically more than 80dB down. 2. Power output is typically greater than 10W in the 50 and 1296MHz bands, and greater than 25W in the 144 and 430MHz bands.

port for connecting a computer so that the transceiver can be operated directly from the computer. For those of you in the know, the data rate is fixed at 4800 bits/sec and the levels are standard t.t.l.

The next socket is a five-pin DIN type which provides transmit/receive switching information for each band. This is very useful and can be used to control the transmit/receive relays in an external power amplifier, up to a maximum current of 50mA.

The final two sockets are of particular interest to the data enthusiast and comprise a phono socket giving access to the p.t.t. line and a 3.5mm stereo jack for the audio signals. The p.t.t. socket is fairly conventional in that the centre is grounded to switch to transmit. The d.c. conditions on this socket are 8V and 8mA maximum so they shouldn't present any problems.

The provision of the stereo jack for the audio signals is rather novel because no pre- or de-emphasis is added to the signals. This can lead to a much improved performance with some data terminal units or modems. The signal levels at this socket seem to be well chosen with an input sensitivity of 30mV into 600Ω and an output level of 200mV into 10kΩ. One point to note though, is that this jack is operational only on f.m.

Operation

Being a very comprehensive transceiver the front panel of the FT-736R is very busy with some 49 push-buttons and 18 rotary controls! Despite this high level of complexity, the controls were quite quickly mastered proving that Yaesu have put considerable thought into the layout.

One of the most noticeable differences between a rig of this type and its more compact rivals, is that many of the controls which normally exist as pre-sets on the rear panel or even buried inside are presented on the front panel. Although this is perhaps a little extravagant it can be very useful. A typical example of this is the monitor control which adjusts the c.w. sidetone level. On the FT-736R this comprises a good-sized rotary control on the front panel, making it very easy for the operator to set the optimum level for the ambient noise level.

Gain control is provided both at r.f. and a.f. using a concentric rotary control. As an added luxury there is a rotary tone control which can be useful to tame a harsh transmission or brighten-up a muffled one! The usual adjustable threshold squelch is provided, again using a rotary control.

For operating under difficult conditions the FT-736R has a good range of facilities to cope with most problems. When suffering interference from an adjacent frequency the i.f. shift can be brought into action to tailor the i.f. response. This is another rotary control which enables either the upper or lower slope of the passband characteristic to be adjusted. The central, inactive, state of the i.f. shift is indicated by a detent.

If the interfering signal is producing a simple heterodyne, then an i.f. notch can be enabled by pressing a front panel button. The notch frequency can then be tuned using the control mounted concentrically with the i.f. shift. In addition to the i.f. adjustments a preset noise blanker is provided to deal with impulsive noise problems.

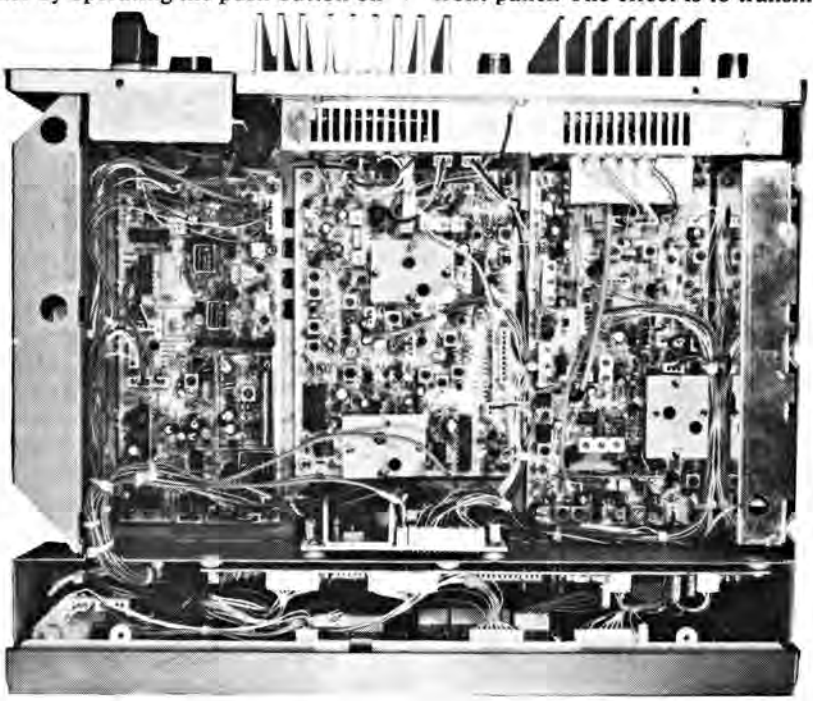
The a.g.c. decay times can also be optimised for the type of signal being received. The FT-736R has three self-explanatory positions called simply fast, medium or slow. These should be adequate to cope with virtually all signal types.

Those of you who use switchable mast-head pre-amps have not been forgotten, as the FT-736R has a pre-amp switch on the front panel. This switch, when operated, applies 13.2V d.c. at a maximum of 300mA to the centre conductor of the antenna socket corresponding to the band in use. This supply can then be used to both power and switch the mast-head amplifier.

For the keen c.w. operator the FT-736R features semi-break-in operation with an adjustable fall-back delay. Manual switching is also provided either by operating the push-button on the front panel or by connecting a switch to the p.t.t. socket on the rear panel. An optional electronic iambic keyer is also available which, when fitted, is enabled by a front panel button with the speed also adjustable from the front panel. The c.w. receive performance of the FT-736R can be enhanced by fitting the optional 600Hz bandwidth i.f. filter which is selected by pressing the CW-N button.

Phone operation is very simple with controls provided to optimise the important characteristics of the signal. The modulation level in s.s.b. and the f.m. deviation can be adjusted with the MIC control. The facility to adjust the f.m. deviation is rather unusual but could prove useful. An indication of the correct f.m. deviation is given by the BUSY indicator just glowing on voice peaks. Adjustment of the power output is achieved using the DRIVE control which is mounted concentrically with the MIC control. The output power variation is continuous from virtually zero to full power.

VOX operation is also provided both on f.m. and s.s.b. with the controls presented on the front panel. The sensitivity, delay and anti-trip are all adjustable with the sensitivity control doubling as the on/off switch. Whilst operating on f.m. with a repeater shift, automatic tone burst can be enabled by operating the BURST button on the front panel. The effect is to transmit a ½-second burst of 1750Hz every time the p.t.t. is depressed, this being the standard initial access for repeaters.



One rather useful feature of the f.m. mode is the ability to select a narrower filter for use when troubled by adjacent channel signals. The standard i.f. bandwidth of 15kHz can be reduced to 8kHz by pressing the FM-N button on the front panel.

The key to making effective use of a multi-band transceiver like the FT-736R is a good range of frequency selection options. Fortunately the FT-736R is very well equipped in this area.

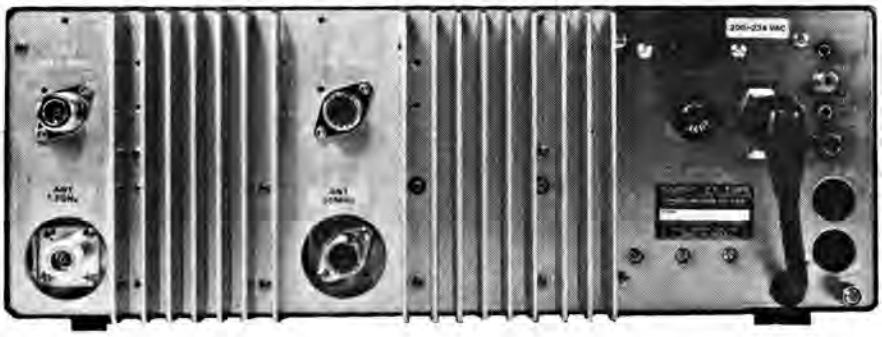
Band selection is achieved by a button fairly obviously marked BAND! Each press of this button toggles on to the next higher band, when the highest installed band has been reached the next operation of the BAND button selects the lowest installed band.

The main tuning display is of the green fluorescent variety and is very clear. In addition to the basic frequency information the display also shows the operating mode, v.f.o., memory channel and the status of the AQS. The intensity of the display can be reduced if necessary by operating the appropriate button on the front panel.

Manual tuning can be achieved using the main tuning knob which can be set to give either 10Hz or 100Hz tuning steps. An alternative method is to use the UP and DOWN buttons just above the tuning knob. Each press of these buttons increments or decrements the frequency at the same rate as the main tuning dial. If a compatible microphone is connected then the UP and DOWN buttons on the microphone also perform this function. If these buttons are held down for more than ½ second then scanning commences. The scanning is halted either when a signal above the squelch threshold is received or when the UP or DOWN button is depressed again.

To enable rapid changes of frequency within a band, a second set of UP/DOWN buttons, located to one side of the main tuning dial, alter the frequency in 1MHz steps.

A very useful addition is the provision of channelised manual tuning. This is enabled by pressing either the FM CH button or SSB CH button on the front panel. When activated the main tuning dial is disabled and tuning is achieved using the UP/DOWN buttons or the rotary channel control adjacent to the main tuning knob. The tuning steps



in channel mode are 2.5kHz or 5kHz in s.s.b. and 5kHz, 10kHz, 12.5kHz, 15kHz, 20kHz, 25kHz, 30kHz or 50kHz in f.m., the most useful being 2.5kHz for s.s.b. and 25kHz for f.m. Scanning can be achieved in this mode by holding either the UP or DOWN button operated for more than ½ second.

An alternative method of frequency selection is to use the keypad to enter the frequency directly. This is achieved very simply by pressing the ENT button whereupon the least significant MHz digit on the display will flash. Pressing one of the numerical keys will then enter that digit and the next least significant digit will flash. Once the desired frequency has been entered a second press of the ENT button transfers the selected frequency to the v.f.o.

The FT-736R is equipped with two basic v.f.o.s for manual use and split frequency operation is available, with either of the v.f.o.s available for transmit or receive. Those of you with a desire for unusual operating modes can even transmit using f.m. and receive s.s.b., either on the same frequency or using split frequencies!

One of the attractions of a multi-band v.h.f./u.h.f. rig is the possibility of full duplex operation, i.e. talking and listening at the same time, just like a normal conversation. The FT-736R is well equipped with full duplex operation possible between any two bands fitted. If satellite operation is your particular interest then the FT-736R will serve you well. When operating in the satellite modes, the full duplex v.f.o.s can be set to track either normally (in the same direction) or reversed (in opposite directions). Another essential feature is the ability to tune either the transmit or receive frequency independently. This enables operation through all the current v.h.f./u.h.f. satellites. The FT-736R has ten memories that are dedicated to storing full duplex information.

There are 100 basic memories on the FT-736R, fortunately these can be used in a variety of ways. Each memory can store not only the frequency the operator programs but also the mode and any repeater shifts required. The programming of memories has been made extremely simple, once the operator has chosen the required channel to be programmed it takes only two key depressions to enter the frequency.

To scan between two frequencies, e.g. 145.000 and 145.750MHz, is easy using the FT-736R. There is a button on the function keypad called PMS—programmable memory scan. Two sets of limits per band can be stored in the ten PMS memories. This is particularly useful for storing the c.w. or data segments of the bands.

There are many other options available using the memories, the one I found most useful for my type of operating was CALL 1. This is a separate memory outside the 100 previously mentioned. The frequency programmed into CALL 1 can be immediately recalled when the button is pressed. It doesn't matter if you are in a different band or mode. This can prove very useful if the operator has a favourite operating frequency or repeater that they like to keep half an ear on. To return to the previous frequency, only the VFO button needs to be pressed.

The usual multi-function meter is supplied on the front panel which can be set to display output power, signal strength, a.l.c. voltage or centre-zero f.m. tuning.

The FT-736R features an advanced AQS which enables selective calling and message handling between similarly equipped stations. This facility is available only whilst operating in f.m. mode. The main use of AQS is to enable stations with AQS to call each other on the main calling frequency without having to listen to other calls. In order for this to work you have to enter your own call and that of your colleagues into the internal memories. In addition to simply calling one other station you can call groups of stations or even put out an automatic CQ to AQS equipped stations. The callsign data is actually sent as a 200ms burst of data every time the p.t.t. is operated, provided of course that AQS has been activated.

The entry of callsigns is achieved by using the keypad to enter the ASCII value of each character into the memory. Fortunately there is a table of ASCII equivalents in the manual so this operation, although time-consuming, is quite simple.

When using AQS, any non-AQS calls are rejected by enabling the digital squelch. This prevents the squelch opening unless a valid AQS call for your station has been received.

Although a fast-scan TV adaptor is advertised it is unfortunately only available for the American standards using a.m.

The last of the advanced features is the CAT (computer aided transceiver). This is where all the main transceiver functions can be controlled by a separate computer. This facility is only possible if the computer concerned is running suitable software, though there is sufficient information in the manual to enable the accomplished enthusiast to write his own software.

System Description

I'm not even going to attempt to give a full circuit description as it would probably take up most of this magazine! Instead I will give an overview of how the FT-736R works.

As mentioned earlier the various band options are provided by installing plug-in modules, one for each band.

The common sections of the FT-736R comprise a 13.69MHz double-conversion receiver and a 13.79MHz transmit unit. In addition there is a control unit which drives the display and the p.l.l.s (phase locked loops).

The 13.69MHz receiver contains a roofing filter at 13.69MHz with the main selectivity achieved using 455kHz filters in the final i.f. The i.f. shift facility operates at 13.69MHz while the i.f. notch works on the 455kHz i.f.

The 13.79MHz transmit unit first generates s.s.b. signals at 10.7MHz using the common filter method. This signal is then converted to the required 13.79MHz by mixing it with either 24.4885MHz or 24.4915MHz depending which sideband is required.

When using f.m., a 13.79MHz v.c.o. is employed which is directly modulated by the speech.

The band modules each contain their own p.l.l. and local oscillators. This is necessary in order to allow the full duplex facility to operate.

The 50MHz and 144MHz modules use a single conversion to convert to and from the 13MHz i.f., whilst the 1296MHz and 430MHz modules use double conversion.

Performance

The FT-736R was evaluated over several weeks in the shack and gave a very good account of itself. The strong signal performance was very good and survived the March RSGB v.h.f./u.h.f. contest with flying colours.

Despite the apparent complexity of the FT-736R it was actually a pleasure to use, in fact when I actually counted the number of front panel controls I was surprised at the quantity.

The main tuning knob is a very comfortable size which, when combined with the well-chosen tuning steps, makes for a very pleasant feel.

I was particularly fond of the channel tuning which allows rapid scanning of the band for activity as well as very convenient frequency changes.

The ability to reduce the f.m. bandwidth is also useful but only if the other station has the same facility. The problem is that the transmit deviation of the FT-736R is reduced from 5kHz to 2.5kHz which may nullify any improvement gained from changing the receive bandwidth.

The various reception aids were very effective with the i.f. notch proving to be excellent.

I did experiment with the AQS and digital squelch but unfortunately was unable to contact anyone else who was similarly equipped. This meant that I couldn't evaluate the system on the air.

The full duplex working was very good and allowed any combination of the four bands fitted to be used for transmit or receive. The ability of the v.f.o.s to track either together or opposite to each other makes satellite working very simple indeed.

The general audio quality was good in both transmit and receive, with the built-in speech processor providing that useful extra punch when operating under difficult conditions.

Summary

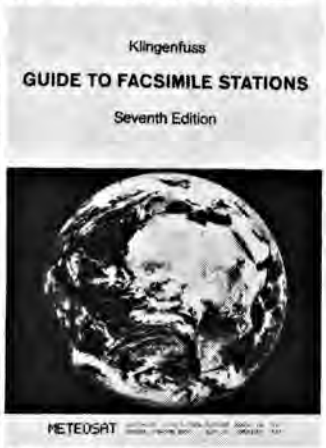
The FT-736R has proved to be a very popular rig during the review period, in fact I shall be rather sad to see it go. The normal complaints levelled at all-band v.h.f./u.h.f. rigs are that they represent at best a poor compromise. In the case of the FT-736R this is definitely not true. The very effective band scanning and simple full duplex operation represent a big advantage. Overall I think the FT-736R is a well-organised rig which is a pleasure to use.

The FT-736R costs £1450.00, the 50MHz module costs £239.00, the 1296MHz module costs £425.00, the AQS message unit costs £189.00, for other units contact SMC.

My thanks to **South Midlands Communications Ltd, SM House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hampshire SO5 3BY, telephone 0703-255111,** for the loan of the review model. ***PW***

BOOKSHELF

GUIDE TO FACSIMILE STATIONS—SEVENTH EDITION
by Joerg Klingenfuss
Published by Klingenfuss Publications
Available from the Practical Wireless Book Service
170×240mm, 252 pages. Price £12.00 plus 75p P&P
ISBN 3 924509 67 0



This publication, which is in its seventh edition, is aimed at the FAX enthusiast and contains a wealth of information in a well indexed fashion.

The first section contains a mouth-watering selection of current FAX decoders with a brief description of their features. The following two sections deal with the basic principles of FAX transmission along with comprehensive technical specifications of standard commercial transmissions.

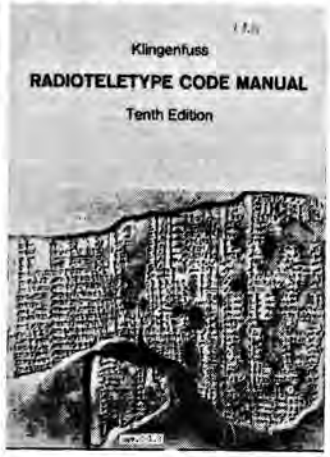
Satellite enthusiasts are not forgotten as there are details of a wide range of satellites and a very useful table for decoding the positional data broadcast from some meteo stations.

The section most used is probably the frequency list which contains 374 frequencies between 53kHz and 28MHz. This latest edition includes an additional 28 frequencies over the previous edition. As well as the frequency and station name the list gives the callsign, transmission mode and alternative frequencies for the station.

One really useful item is the inclusion of full schedules for all the main FAX stations. The schedules are arranged in country order and detail the frequencies, transmission mode, time and chart description. This section ends with a description of the meteosat dissemination schedule.

The book is rounded off with a selection of sample charts (167 in total) and their interpretation. This information is often very useful when trying to interpret an unusual chart. *G4WNC*

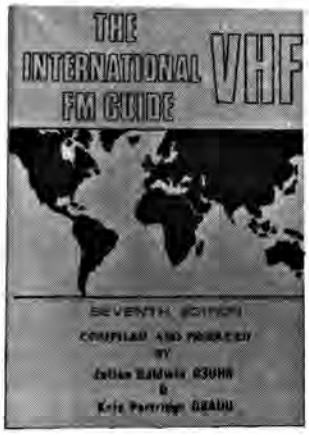
RADIOTELETYPE CODE MANUAL 10th Edition
by Klingenfuss
Published by Klingenfuss Publications
Available from Practical Wireless Book Service
170 x 240mm, 96 pages. Price £8.00 plus 75p P&P



This book contains detailed descriptions and explanation of the following alphabets, codes and systems: ARQ, FEC, SITOR/AMTOR, VFT and NAVTEX; Arabic, Cyrillic, Hebrew; third-shift Amharic, Cyrillic, Greek, Japanese, Korean and Thai, four-shift ATU-80 Arabic RTTY; Arabic, Cyrillic, Greek, Hebrew and Japanese c.w. Also CCIR/CCITT definitions and an introduction to cryptology and MFSK.

This book makes essential reading for anyone interested in understanding the workings of the wide range of signals on today's crowded bands.

THE INTERNATIONAL VHF FM GUIDE 7th Edition
Compiled and produced by Julian Baldwin G3UHK & Kris Partridge G8AUU
Available from the Practical Wireless Book Service
146 x 209mm, 70 pages. Price £2.85 plus 75p P&P
ISBN 0 9506523 3 4



This book contains details on repeater channels, reciprocal licensing, the national society and licensing addresses for 40 countries. Each set of details is accompanied by an outline map of the country concerned to help with identification.

There is also a section on the new International Locator System (Maidenhead). Seventy different 144MHz UK repeaters are detailed. Each gives the coverage map and history of the repeater and/or repeater group as well as details of the treasurer's address.

The repeaters on 430MHz haven't been left out, there is a map of the UK with them all plotted on and a full list of their channels, callsigns and locations on the opposite page.

Just in stock this month from the USA:
Radio Amateurs Prefix Map of the World
Radio Amateurs World Atlas
The Radio Amateurs DX Guide
pages 46–48 for details

CW Operation for Beginners

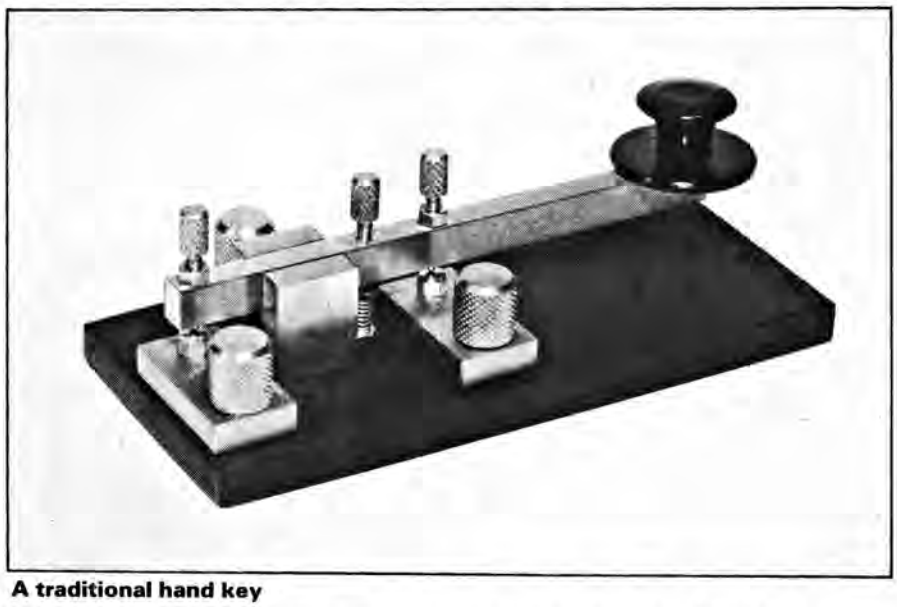
You've passed the Morse test and after further practice you've upped your sending rate. The extra few words per minute mean you are more confident and ready to explore the bands. But there's more to c.w. operating than sending the Morse code and you should be aware of these techniques, says Stan Crabtree G3OXC.

Bad habits, possibly formed unknowingly, will limit the scope of your operations. You need to become accustomed to the many contributing factors that result in efficient c.w. operations.

It is feasible that you have already progressed to an electronic keyer or possibly a semi-automatic "bug" key. The hand key served its purpose in the learning process but only the purists will retain it as their sole means of communicating. This is not meant as a derisory statement. I have the greatest admiration for the few operators who can make a hand key "speak". But it can be tiring over long periods and high speeds are more easily obtained with an automatic device.

Electronic keyers are available across a wide price range. The dot/dash ratio is usually fixed but all have a variable "weight" control. It is most important that this is correctly adjusted as the transmitter output keying is affected by it. At one end of the range the effect is of slightly slurred characters. This can have a rather pleasant, lazy characteristic if not too pronounced. The other end of the control setting results in harsh "clicky" keying which should be avoided at all costs. With modern transceivers using sidetone, a separate reciver is useful to assess the true quality of your keying characteristic but the two conditions mentioned above can be determined from the keying monitor. It is suggested the centre position of the weight control providing regular, correctly defined characters should be used to start with. You can always experiment with the limits of this control when you have further increased your speed and confidence.

Even the most inexpensive commercial keyers provide an acceptable working output. This is not always the case with the paddle. To get the most satisfying results, a good keying paddle is essential. Unfortunately they are not cheap but only by investing in a quality mechanism can you hope to produce good, fast Morse. Bencher and Vibroplex are the top of the range with the former serving, if required, in the "squeeze key" mode with separate drive for dots and dashes. This can take a bit of mental co-ordinating at first. Japanese offerings are acceptable but beware of some of the non-brand names that appeared on the market a few years ago. I purchase one that had the basic springs and brass strips but was most insensitive and could never have been used at speed. Remember, that by using a paddle you are manipulating a lever or levers between the thumb and forefinger; possibly the most sensitive part of the anatomy. The responding mechanism must also be sensitive to deal effectively with the lightest possible touch. With the "up and down" hand key, Morse is produced generally by a wrist movement. With an electronic or "bug" key, the whole operation is different and the movement more subtle. To start with, it can be useful to have sufficiently large gaps between the dot and dash contacts. But you should gradually aim to reduce these widths and at the same time reduce the tension on the retaining springs. Only in this condition can you hope to produce high-speed Morse.



A traditional hand key

The semi-automatic "bug" key—so termed apparently from the beetle which is the trade mark of Vibroplex—seems to have taken second place to the electronic key these days. The novelty of the bug is that you key the dashes but the dots are produced by a vibrating reed. When you have mastered the technique you can produce first-class Morse and at the same time retain some characteristic of individuality. There are a number of Japanese models available but keep your eyes and ears open for the McElroy or J36 key. This type was produced in masses just prior to WW II and used by US service stations all over the world. They are similar to the Vibroplex.

You've mastered the keyer and are ready to brave the airwaves. Before any attempt is made to even tune your transmitter—LISTEN ON THE FREQUENCY. It is essential you know it is not already in use. A minute or so is necessary as a QSO could be in progress where a distant station is inaudible to you but his contact could be S9 when he replies. A technique used nowadays is to transmit a brief QRL? (Are you busy?). In this way a station not actually transmitting at the time could break in with YES and you would know the channel was in use. Do be careful of this situation, as to blandly tune up and call without checking the frequency shows a complete lack of consideration to others and is decidedly not in the spirit of Amateur Radio.

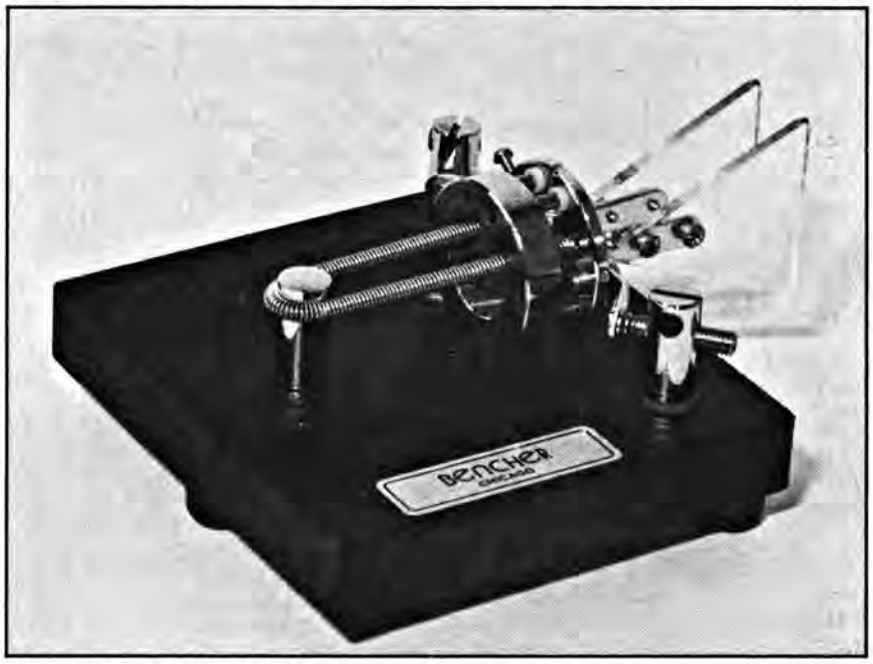
Whether you call CQ or answer a call is really up to you and the prevailing conditions. On a relatively quiet band it may be best to call CQ, whereas during busy periods you would be wise

to answer someone else's call. The length of the call is really a matter of common sense. The thing to remember is that it is your callsign that is important. Therefore a long string of CQ's is totally unnecessary and can be very frustrating to a prospective communicator who is waiting to respond. Even on an apparently quiet band, 5 CQ's should be the absolute limit. Ideally your call should be "CQ CQ CQ de (your own callsign 3 times)". If you feel you need a longer call, send your own callsign 5 times but far better to pause briefly and then repeat the operation.

If you're fortunate enough to have two stations coming back simultaneously your best procedure is to go back to the one who signed first—otherwise he may start calling again—jamming your transmission. All things being equal you would be wise in selecting the strongest of the stations calling.

In replying to a distant station's CQ call, you obviously pick the most interesting call and a station calling at a speed you feel you can handle. However, do not let speed be the deciding factor. By replying at a Morse speed you feel more comfortable with, the other station will almost surely adjust his speed accordingly. He would be foolish not to.

Limit your first "over" to RST, QTH and your name. The QSO can then continue with comments on the weather (WX) and the antennas and equipment in use. If the station worked is likely to be English-speaking, you can make the running. Ask a question or make a comment. This could refer either to his QTH (perhaps you passed through there last summer on holiday) or his equipment (you too have been thinking of changing to Kenwood or whatever). Anything to get the ball rolling. In 'phone work you have the opportunity of assessing the caller by his voice but in c.w. working you must rely on the content of the messages exchanged to form an idea as to your contact's like and dislikes. It is strange how sometimes a personality comes across fairly quickly and after a few minutes you really feel you are on the same wavelength. Be careful not to make your transmissions too long. Apart from not giving the other station the opportunity to answer queries, conditions may be subject to change or excessive QRM. When you finally turn the session over to him he's gone and he probably just heard you slowly fade away into the noise a couple of minutes earlier.



The Bencher Iambic Paddle

Use of abbreviations help the communicating process. The "Q" Code of course goes far beyond QSO and QRM but in addition it can be useful to reduce word length to a form of shorthand. You must be prepared to interpret TT (that) GG (going) VY (very) and HR (here) amongst other shortened words. There are other contact exchanges you will soon learn to identify in addition to BCNU. HW (how are you working?) used by seaboard operators is believed to have originated in the landline telegraph service along with 73. SU (see you) is an end of QSO signal used by ex marine operators. To signify mirth or laughter the Morse combination for the comma is used - - . . - - or simply HI.

On the receiving side you should try and develop the technique of reading slightly behind. This is only really possible during long lengths of text during a ragchew but the ability to do so will give you more confidence and less anxiety. It will also help you to increase your speed.

In the early days you must learn to be self critical of your keying. Any difficulties should be analysed and corrected. One problem source may be the position of the speed control. You may be trying to send at a higher rate than the control setting will allow —pushing it beyond its capability. Similarly, the speed of the electronic key (or adjustment of the reed in the case of "bug") may be set at a rate you are not yet capable of. Both of these state of affairs will result in keying mistakes. ***PW***

Short Wave Magazine Short Wave Magazine

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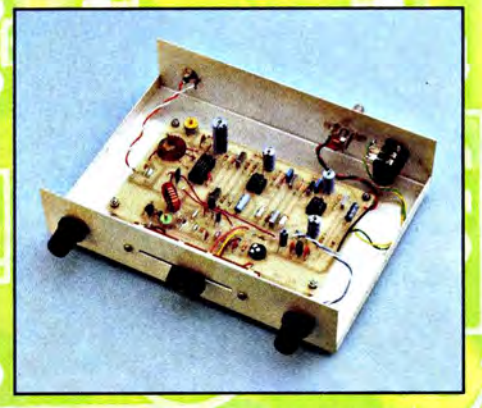
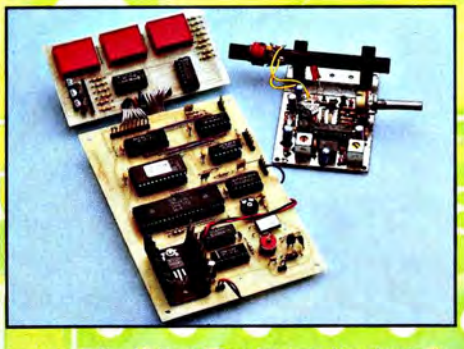
14MHz RECEIVER



The RC 14 is a simple direct-conversion receiver for the 14MHz amateur band. The design has been originated by the RSGB as an introduction to home construction. The RC14 nevertheless offers a very good specification with sensitivity of 1uV, wide dynamic range, a stable VFO and a steep-sloped audio filter.

RC14	41-03412	£30.69

MSF RECEIVER



Lock into the National Physics Lab Atomic clock with the Rewbichron II and MSF receiver. The 60KHz receiver will tune to the MSF transmitter from Rugby, the data is played on the Rewbichron II and 12 or 24 hour format with day and date information. Bright 6 digit LED display.

MSF	40-06002	£13.20
RewII	41-00506	£36.00

5 WATT AMPLIFIER

Very compact 5w audio amplifier kit for use with existing equipment or as a stand alone unit. Its supply requirements (12v) make it ideal for use in mobile equipment possibly a replacement output stage.

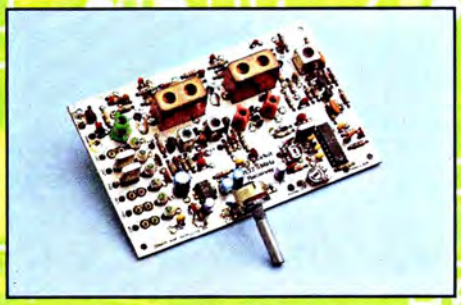
5Watt Amp	41-01406	£5.80

FET DIP OSCILLATOR KIT

One of the most important items of test equipment in the amateurs' arsenal. The new MKII design offers enhanced performance in both dip and wavemeter modes with an extended low frequency range. The FDO covers 0.8-170MHz in 6 ranges.

FDO MKII	40-16216	£30.08

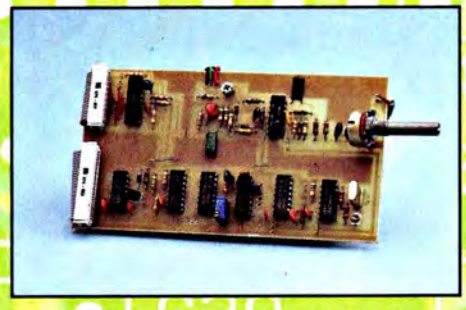
VHF WEATHER SATELLITE RECEIVER



Reception of the Polar Orbiting Weather Satellite can be surprisingly easy. The 6 channel VHF receiver kit offers a high specification especially tailored for the weather satellite, which in conjunction with the interface and Satpic software (and aerial) is all that is required to receive and display the picture on a BBC computer.

Sat RX	40-02300	£42.52

BBC INTERFACE KIT



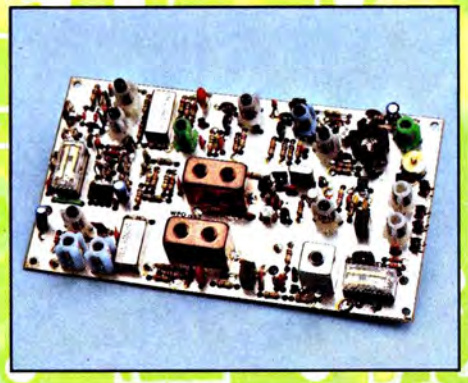
For use with the above receiver and Satpic software, features careful filtering, demodulator, fast A to D converter and sync pulse.

SATPIC

A sophisticated ROM based software package to display virtually all VHF and UHF weather satellite transmission as well as HF and VLF fax transmissions. Pictures may be saved directly onto Disc.

Sat IF	41-03416	£33.83
Satpic ROM	40-90090	£32.50

6m TRANSVERTER KIT



A quick, and low cost way to explore the 6m band. A linear (all mode) transverter from 28 to 50MHz with 1W (CW) output, drive level as little as 1mV, low IMD, sensitive receiver section and auto RF switching.

4m version is also available

6m Trans	41-03006	£50.43
4m Trans	41-03004	£50.43

LOWER POWER ATU

A correctly matched antenna will result in a considerable improvement to your signal, this HF ATU kit can be used with receivers or low power (max 20w) transmitters. 50 ohms impedance.

ATU	41-03404	£36.00

SCANNER

Uniden Bearcat handheld scanning receiver, the 100XL, covers 66-512MHz in 9 bands, with 16 programmable channels, direct channel access, priority channel and keyboard lock. Supplied complete with manual, NiCads and charger.

100XL	40-00100	£165.21

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HM203-6 20MHz 'SCOPE

Dual channel, 20MHz general purpose but versatile oscilloscope with sensitivity down to 2mV/cm, a timebase expandable to 20mS/cm, a built in component tester and supplied complete with 2 x 1/x10 probes.

HM203-6	56-52036	£314.00

LSG17

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LSG17	56-90017	£131.00

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A complete package containing all the basic tools needed for electronic construction, it includes Antex 17w iron with 2 tips, real solder, precision cutters and pliers, miniature screwdriver, heatshunt and - last but not least - a mains plug.

Tool Kit	40-00007	£19.95

DM105

Small but rugged pocket multimeter with large 0.5" LCD, overload protection on all ranges and low battery indicator. Ranges: DC volts 2V-1KV, AC volts 200V-750V, DC current 2mA-2A, resistance 2Kohm - 2Mohm. Supplied complete with manual, battery and leads.

DM105	56-00105	£18.96

HC6040

The best value in digital multimeters, the HC6040 offers, 3½ digit 13mm LCD, a basic accuracy of 0.25%, full overload protection and a 2000hr battery life. Ranges ; DC volts 200mV-1KV, AC volts 200mV-750V, AC or DC current 200uA-10A, resistance 200 ohm - 20 Megohm. Supplied with manual, battery and leads.

HC6040	56-06040	£30.44

HC774

Autoranging pocket multimeter with fully automatic (or manual) range selection on DC volts, AC volts and resistance ranges. AC or DC current is selectable between 200mA and 10A ranges. The meter also features display memory and hold, 3.5 digit 10mm LCD, low battery and range indication, high and low power resistance measurement.

HC774	56-00775	£31.00

METEOR 600

600MHz Frequency Counter with bright 8 digit LED display, switchable gate times, switchable LF filter, dual inputs: 5Hz - 100MHz and 40-600MHz, sensitivity is less than 25mV over entire range.

Meteor 600	56-00600	£126.00

80m RECEIVER KIT

A low cost introduction to the 80m HF band, being a direct conversion type will receive CW, SSB, DSB and AM signals and has a high dynamic range and a sensitivity of 1uV (for 10dB S + N/N)

80m RX	41-03414	£13.87

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PP3	0.11	01-84054	£3.90

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KB-18DF

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KB-68DF

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CX4	01-02205	£7.65
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KB-68DF	01-02207	£5.50

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DIGITAL TRAVEL ALARM

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40-20007	£4.30

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(ôrdêr'vr; *or* -v) *n.* Extra dish served as appetizer before or (occas.) during meal.

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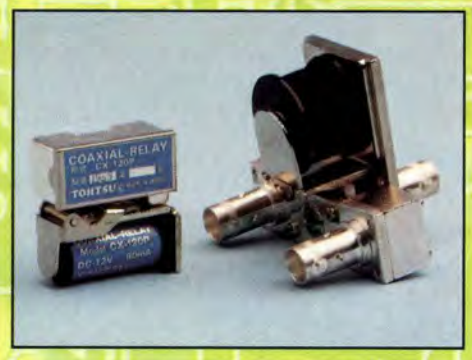

Quality, high power, low loss co-axial relays for operation up to 2.5GHz. Power rating (PEP) : PCB mounting 150W, BNC/N type 300W.

PCB Mtg	46-90120	£17.96
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TC200 LCR METER

Invaluable for fault finding and determining values of unmarked components. Bright 11mm LCD. Ranges : Capacitance 200pF - 200uF, Inductance 200uH - 2mH, Resistance 200 ohms -200 Megohm.

TC200	56-00200	£95.00

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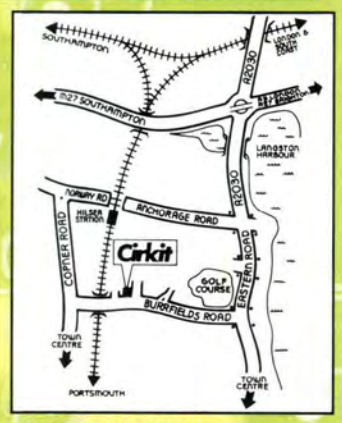

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Getting to Know Your End-Fed λ/2 Antenna

For those who feel they would like to know about their antenna system, but are put-off by the thought of expensive test equipment and difficult to understand theory, take heart. This practical article by P. B. Buchan G3INR will make you think again and hopefully set you on the path to some interesting and rewarding investigation.

The first thing to establish is your test gear, *Practical Wireless* has in the recent past run several constructional articles for test equipment. The most recent was the *"PW* 'Itchen' *LCR* Bridge"[1] a very useful and versatile instrument. Earlier there was the *"PW* FET Dip Oscillator"[2], another very useful addition to the station instrumentation, and rather longer ago was the "RF Noise Bridge"[3,4], this being the most useful out of the three instruments mentioned, for investigating antenna systems.

Often these instruments remain unused on the shelf, and this is really a great shame because there is much that may be done with this simple trio. For example, what do we really know about our end-fed antennas, particularly half-wave (λ/2) types? Do we have, for instance, any idea what the antenna looks like, impedance-wise, when presented to a matching unit? For those who are curious about such things and enjoy experimental work, the following investigation is written up to show what can be discovered, and also to suggest a means of benefitting from the hobby, while adding to one's knowledge of radio communications.

Of all the many facets of amateur radio, nothing is more fascinating than the antenna, and indeed nothing is more mysterious, often attracting all sorts of misconceptions and folklore. A statement made in an amateur radio journal that "only an idiot would attempt to feed r.f. to a half wave, end fed, resonant antenna" acted as a catalyst towards the investigation to be described. End fed antennas are still occasionally to be found among the ubiquitous G5RV and trap dipoles, and good though these two centre-fed antennas are, there is still a great deal to be said for the sheer simplicity of an end fed system.

Objections that with an end-fed half-wave, the shack is full of r.f., can be met by pointing out that many stations operate successfully with the whole antenna indoors. During this investigation the matching unit was placed close to the point of entry of the antenna into the station, something that could be met in the majority of station layouts. Remotely-controlled matching units are featured from time to time, see "A Remotely Operated a.t.u."[5].

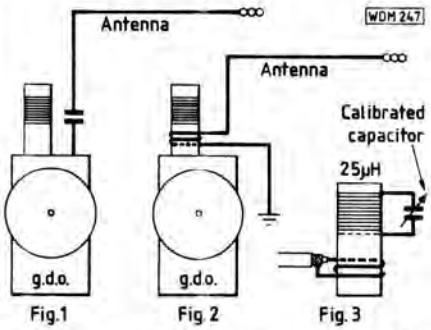

Fig. 1: Capacitive coupling of g.d.o. to antenna

Fig. 2: Inductive coupling of g.d.o. to antenna

Fig. 3: Indicates the way in which the link coil is wound, and that the lower turn of this winding is connected to the coaxial braiding. For best results the link may be wound directly over the coil

Equipment

For the investigation a number of items are required, these include the instruments already mentioned, plus a half-wave antenna which can be erected at a height of, say, 2.5 to 3 metres above ground if the station is on the ground floor.

Calculate the half-wave length from the formula (468/f [MHz] = Feet); or 142/f (MHz) = Metres, and arrange that the length cut is a little greater than required, to enable pruning to be carried out later. Other items used in the experiment are as follows:

(1) Communications receiver, preferably general coverage.
(2) Antenna matching unit, parallel tuned and link coupled, with a calibrated tuning capacitor.
(3) Two calibrated linear carbon variable resistors, 10kΩ and 25kΩ.
(4) An r.f. earth with as short a run as possible.

Calibration of the capacitor and variable resistors is carried out using the *LCR* bridge. If possible, use a capacitor that is variable in a linear fashion. These are recognisable by the centrally placed rotor spindle; rotors of the other two types of variable capacitor (straight line wavelength, and straight line frequency) have their spindles mounted off-centre. The frame and rotor are generally connected electrically together and should be considered as the earthy side of the capacitor, i.e. the side which should be connected to the earth terminal of the bridge.

Scales for the capacitor and variable resistors can be cut from white card. Avoid mounting these components on metal chassis because this will add to stray capacity and prevent the capacitor being reduced to its minimum value. For convenience, connections between these components were made with crocodile clips with leads as short as possible.

An inductance of about 25μH (28 turns on a 50mm dia former, winding length approximately 120mm, 16 s.w.g. enamelled copper wire) together with a 100pF variable capacitor will enable a start to be made on the 3.5MHz system.

Start Here

First using the g.d.o. and the receiver, establish the approximate resonant frequency of a λ/2 length of wire cut for use at the low end of the 3.5MHz band.

There are two ways of doing this, one is to couple the antenna directly via a small capacitor to the g.d.o tank circuit (Fig. 1), this may be done with the Kenwood DM81 dip meter, or alternatively couple via a two turn link around the g.d.o. coil and then down to earth (Fig. 2). For a length of 41m (135 feet), resonance should be at a frequency of about 3.46MHz. Capacitor coupling to the g.d.o. showed resonance at 3.36MHz, whereas the inductive coupling suggested resonance to be at 3.4MHz. Not that the inductive coupling of the antenna through an earthed two turn link will show a

resonant point at a frequency of 1.7MHz. This is due to the earth acting as an image and making the point of measurement "look like" the centre of a 1.8MHz dipole. Because of end effect this measurement can only suggest, as previously stated, that the wire will resonate as a $\lambda/2$ at a frequency of 3.4MHz. These figures are close enough for the purpose of experimentation. It is instructive to note that if the g.d.o. coils are changed for the higher frequencies this wire will show resonance at 6.5, 13.0, 19.6 and 26MHz for capacitive coupling, 5.0, 8.5, 12.0 and 15.3MHz for inductive coupling, and indeed above that frequency if measurements are taken.

To continue; connect the 25uH coil and 100pF calibrated capcitor in parallel. The frame/rotor of the capacitor is considered the "earthy end" of the circuit, at this end a two-turn link is made, winding the turns of the link in the same sense as the coil is wound. The link turn which is nearest the earthy end of the coil is the one to which the coaxial cable braiding should be connected. The remaining connection to the link is to the coaxial centre conductor. Note: do not earth the coaxial cable to the earthy end of the coil (see Fig. 3).

Noise Bridge

Connect the earthy end of the coil to the r.f. earth, the other end to the antenna. Between the two turn link and the receiver connect in the r.f. noise bridge (Fig. 4). The coaxial cable used should have the correct impedance for the equipment in use, nowadays 50 ohms is very common.

The frequency for antenna resonance is known approximately, therefore tune the receiver to 3.4MHz using the a.m. mode, switch off the a.g.c. if possible, if not reduce the r.f. gain to prevent the a.g.c. working. Switch on the r.f. noise bridge and set the dial to read 50 ohms. A high noise level should be heard from the receiver, though the level will depend upon the setting of the calibrated capacitor; tune this capacitor for a null in the noise level. Persevere at this until the noise is barely perceptible, the null is likely to be sharp. With the values suggested, 100pF variable, and 25µH a good deep null should be found for a 50Ω system at the frequency of 3.4MHz.

If there is any uncertainty of what a null should be, connect, instead of the link and matching unit, your station 50Ω dummy load. If the bridge is correctly calibrated and set to 50 ohms you should witness a very sharp and deep null. Vary the noise bridge setting around the 50Ω calibration mark. Reconnect the system to the link and matching unit. Having obtained the best possible null remove the antenna and connect across the parallel tuned circuit one of the calibrated variable resistors. Adjust this resistor to obtain the same depth of null as was obtained with the antenna, the calibrated capacitor may have to be adjusted for best results. If the 10kΩ variable resistor does not produce the required null change it for the 25kΩ. The value that produced the deepest null at this QTH was between 7.5 and 9.0kΩ. Write down the value obtained.

Now, remove the variable resistor and replace the antenna, tune the receiver to a frequency of 3.3MHz, at this frequency obtain the deepest null possible using the variable capacitor.

Write the value of the capacitance down, remove the antenna, connect the variable as set at 3.4MHz across the circuit, and re-tune the capacitor for best null in the noise. write down the value of capacity. Continue making these measurements in steps of say 25kHz up to and including 3.6MHz.

Table 1

Freq. (MHz)	C ant. (pF)	C r (pF)
3.300	86.0	78.5
3.325	84.0	77.0*
3.350	80.0	74.0
3.375	77.0	73.0
3.400	75.0	72.0
3.425	72.0	72.0
3.450	70.0	70.0
3.475	67.0	70.0
3.500	63.0	67.0
3.525	60.0	65.0
3.550	57.0	63.0
3.575	53.0	62.0
3.600	50.0	60.0
3.625	------	50.0*

* Calculated value using HP-11C calculator (linear regression)

Table 2

Freq. (MHz)	C ant. (pF)	C r (pF)
3.300	61.0	54.0
3.325	59.0	52.0*
3.350	57.0	52.0
3.375	55.0	50.0
3.400	53.0	48.0
3.425	50.0	48.0
3.450	48.0	47.0
3.475	46.0	46.0
3.500	45.0	46.0
3.525	43.0	45.0
3.550	40.0	44.0
3.575	38.0	43.0
3.600	36.0	42.0
3.625	------	41.0*

* Calculated value using HP-11C calculator (linear regression)

Tabulate

From the recorded results construct a table as that in Table 1. The variable resistors may be left at the setting found on 3.4MHz. It will be found that at 3.3MHz capacitance will have to be reduced in the circuit to obtain a null in the noise, when the resistor replaces the antenna. At 3.6MHz the capacitance will need to be increased for a null in the noise. At a point about midway between 3.3 and 3.6MHz it will be found that virtually no change is required in the capacitance needed to obtain a null. From the results recorded in the table construct a graph of capacity against frequency for the null settings, for both the antenna and the variable resistor. This has been done for the results in Table 1 and shows two linear graphs with negative slopes (Fig. 6). The steeper of the slopes belongs to the antenna connected settings, at one point the graphs intersect and it is here that the antenna has least reactance and looks like a resistance to the matching unit. The resistance presented to the matching unit is also very close to the variable resistor setting of 8.5kΩ

Interestingly enough this value is predicted by Les Moxon's antenna book[6].

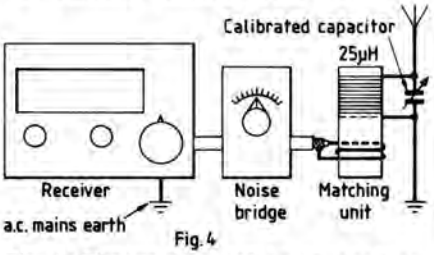

Fig. 4: Shows connection of receiver to noise-bridge and on to the matching unit. Note the use of r.f. and a.c. mains earthing

Counterpoise

However, what was not found in antenna literature was that if the same antenna was used, but tuned against a counterpoise instead of the r.f. earth, the end impedance/resistance at resonance increased from 8.5kΩ, to 14kΩ. Exactly the same procedure was used to find this value and the results are shown in Table 2 and the graphs in Fig. 7. For a counterpoise, a 4 metre length of insulated wire was connected to the earthy end of the matching unit. Such a short length has been found to be very satisfactory providing the antenna is a half-wave. The counterpoise can easily be accommodated within the station.

What has become clear is that the average matching unit described in many publications does not provide terminating impedance for a half-wave end fed antenna. This can now be rectified by using the information from the experiment.

An inductively coupled matching unit has always been favoured at this

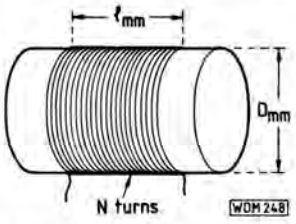

Fig. 5: Coil former showing dimensions used in calculating its inductance, dimensions in millimetres

QTH. It is possible to provide excellent isolation of the antenna from the equipment and the mains wiring. For example a Faraday screen can be used between the link winding and the matching unit coil which of course reduces to a very low level any capacitive coupling and hence prevents unwanted currents flowing into the domestic mains wiring.

For a parallel tuned matching unit at resonance it can be shown that the loaded Q of the circuit is equal to the load resistance divided by the capacitive reactance[7]. The load resistance is now known. Optimum Q is given at about 10, therefore the capacitive reactance works out to be 850Ω. This requires a capacitor of 55pF to be in circuit at 3.4MHz, and an inductance of about 40μH, nearly 50 percent greater than the one used in the experiment. For a matching unit suitable for use with the counterpoise, very different values are necessary.

Location

In order to build upon these findings it was decided to construct a matching unit which met the requirements of the end-fed antenna system at this QTH. The values obtained during the investigation may well be unique. It is certain that antennas erected close to domestic premises, in terms of wavelength, are going to be affected by the electrical enviroment. It is not difficult to imagine the skeleton of mains wiring rising to some 5 to 7 metres being within the near field of an antenna cut for any band up to and including 50MHz. The relatively poor performance of an open-wire centre-fed antenna prompted some investigation from first principles. One of the findings to emerge was that the feeder currents were out of balance by more than 8 to 1 on some frequencies, but more of that some other time.

Suffice to say that at least up to 14MHz most antennas will not perform as predicted by text books, either as a lumped electrical circuit, or as a radiator of r.f. energy. Antennas erected at a height of at least half a wavelength and separated from structures by several wavelengths might approach the predicted performance, but we are still left with the totally unknown performance of the ground, beneath, and surrounding the system. Radiation patterns and angles are based on perfectly conducting ground.

Matching Unit

The design and construction of a matching unit is not particulary difficult but does require some attention to working with figures. Emphasis is placed upon designing for the particular case, where the impedance to be matched is found, as described earlier. No attention to miniaturisation is made, neither is multiband performance considered, just a simple one-band device.

Continuing therefore with the figures obtained for an earthed, parallel-tuned matching unit suitable for use with a half-wave, end fed antenna. Values of inductance and capacitance already stated are 40μH and 55pF; a 100pF variable will be satisfactory. The only other consideration would be that the capacitor must handle the intended output power. The coil may be designed using this formula[8].

$$L = \frac{N^2 D}{10.1\,[{}^{l}/_{D} + 0.45]}\ \mu H$$

(Formula 1)

Where,
N is the number of turns
D is the former diameter in mm
l is the length of the winding in mm

Dimensions used must be in millimetres, see Fig. 5. This formula is very reliable and has been chosen from a considerable number, some of which only gave answers to within 50 percent of the correct figure.

Coils that have a winding length to diameter ratio of one are considered most efficient[9]. Therefore rearranging the formula for N we have:

$$N = \sqrt{\frac{L\,(\mu H) \times 10.1\,[{}^{l}/_{D} + 0.45]}{D}}$$

(Formula 2)

Four values for D = l = 40, 60, 80 and 100mm, gives the number of turns required as 37, 30, 26 and 23 for 37μH, of these the most sensible choice would be either 60 or 80mm. Wire gauge up to 14 s.w.g. could be used for the

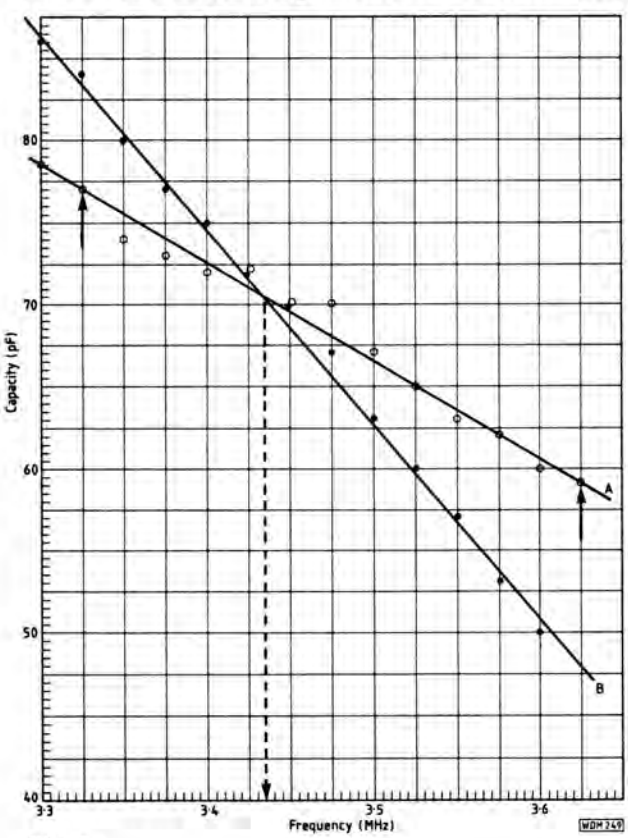

Fig. 6

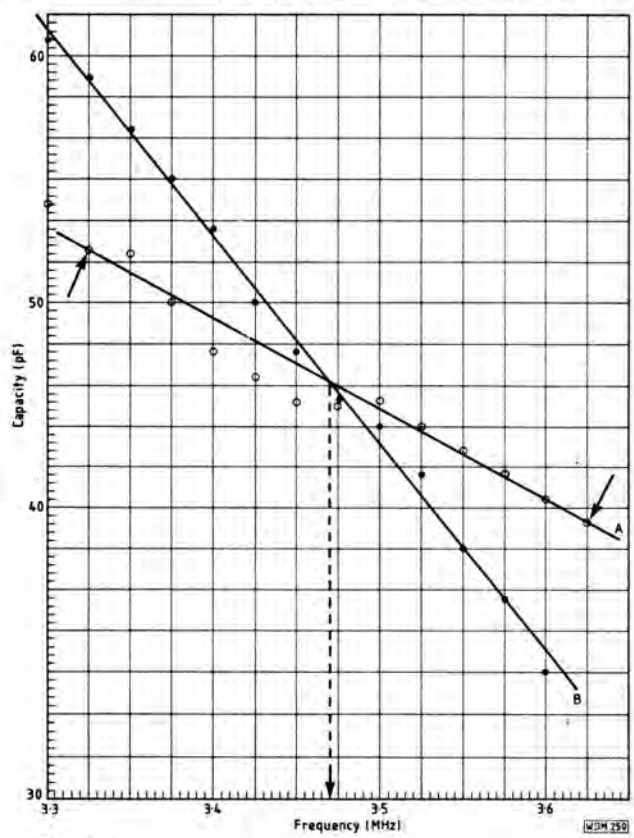

Fig. 7

Fig. 6: A graph showing variations in tuning capacity of the matching unit versus frequency, r.f. earth as reference. Line A is the curve for capacitance value with resistor load, the arrowed points are calculated from a linear regression program using HPLC-11C. Correlation Coefficient r = 0.989

Fig. 7: A graph showing the result of using a counterpoise as reference instead of the r.f. earth. Similar shape but different values of capacitance. The arrowed points were calculated using the same program as in Fig. 6, r = 0.987

60mm coil, and up to 16 s.w.g. for the 80mm coil. Make the former about 30mm longer than the winding length, to enable terminations to be made. For these matching units calculating the number of turns for the link gives good results and very little adjustment is required, the source resistance Rs, 50Ω being the output impedance of most transceivers.

The value of the link X_L ohms is optimum when it is equal to the source resistance Rs [7], therefore,

$$X_L = 50 = 2\pi fL \text{ ohms,}$$

and hence,

$$L = \frac{50}{6.28 \times 3.4 \times 10^6} = 2.3\mu H$$

Using formula number 2, four turns in each case would be satisfactory. The values calculated are for 3.4MHz which is the frequency used throughout, therefore the calculated values are slightly greater than those needed for the higher end of the 3.5MHz band. However, the matching units work very well over the entire band without major adjustment, apart from tuning. Perhaps a system could be centred on 3.6MHz. Your location might yield quite different values to those found at this QTH. Why not give it a try? ***PW***

References

(1) "Itchen" LCR Bridge. J. Thornton Lawrence GW3JGA. *PW* April 1987
(2) FET Dip Oscillator. J. Thornton Lawrence GW3JGA. *PW* October and December 1985
(3) RF Noise Bridge. E. A. Rule. *PW* January 1982
(4) Using the *PW* RF Noise Bridge. E. A. Rule *PW* December 1985
(5) A Remotely Operated ATU. M. Kirk G4XMK. *PW* July 1987
(6) *HF Antennas for all locations.* L. Moxon G6XN
(7) *ARRL Antenna Handbook*, 13th Edition 1977, page 97
(8) *Radio and Electronic Laboratory Handbook*, 8th Edition 1971, page 519
(9) *Radio Engineering*, 2nd Edition 1937, page 39

NEWS DESK EXTRA

GB3GH

We have received a report on the progress of GB3GH from the Gloucester Repeater Group.

The repeater has now completed three months of on-air activity. As with a lot of 430MHz repeaters, GB3GH is not used 24-hours per day. Peak traffic apparently occurs during the usual "rush hours", when there is a lift and, for some odd reason, between 0200 and 0600, the latter being allocated to people on night shift in the Forest of Dean, Gloucester, Redditch, Birmingham and Cardiff.

During the three month period there have been a number of technical problems which have been cleared up within a day or so. The problems included, flooding of the room, mains supply interruptions, failure of supply wiring, death of one cell of the standby batteries, spurious output due to a cracked trimmer in the p.a. and failure of a transistor in the 600Ω line amplifier. They hope the gremlins have now left.

They have also put in an application for a packet digipeater, GB7GH. For more details on this proposal or for details where to send donations, contact:
Gloucester Repeater Group,
41 Oxstalls Lane,
Longlevens,
Gloucester GL2 9HP.

75 Years of Radio

Seventy years of radio is the theme behind a special day celebrating the 75th anniversary of the RSGB. The event will take place at the FE Centre, Tower Hill, Haverfordwest, Pembs on May 21. Doors will be open to the public from 11am.

On the day the Pembrokeshire Radio Society will be operating under the special callsign GB75PRS. In common with most special event stations, members of the general public may send messages of greetings to different countries, under supervision.

The station hopes to have three transceivers in operation, h.f. phone, h.f. Morse and a v.h.f. station. The society will be making a point of putting the callsign on c.w. as well as s.s.b. Morse operators may like to listen between 3.515 and 3.540MHz.

There will also be a fascinating display of vintage radio equipment on show. Many of the items in the static display will be on loan from local radio historian Eric Down GW0DDK.

More details from:
B. Smith GW0IER
Milford Haven 2825

CQ WW VHF WPX Contest

The 4th annual CQ Magazine sponsored VHF WPX Contest is scheduled for July 16–17.

The rules will be published in full in the May edition of CQ.

Contest Period: 48 hours for all stations, single or multi-operator. Operate any portion of the contest period you wish.

Bands: the 50, 70, 144, 220, 432,902 and 1296MHz bands may be used, as authorised by local law and licence class.

Type of Competition: Single operator (a) all band (b) single band (c) all band low power (d) single band low power. Multi-operator (a) all band (b) single band. Portable (with temporary power source only). FM only. The "portable" category is for single or two-operator stations. Low power is defined as 30 watts p.e.p. output or less. Stations may select one category of competition only. All transmitters must be located within a 500 metre diameter or within the property limits of the station licensee's address. The antennas must be physically connected by wires to the transmitters.

Exchange: callsign and "Maidenhead" locator grid square (4 digits, e.g. FN20). If grid square is not known, station location with enough specificity to determine the proper grid may be recorded instead. Signal reports are optional and need not be included in the log entry.

Scoring: One point per QSO on 50, 70 and 144MHz; 2 points per QSO on 220 and 432MHz; 4 points per QSO on 902 and 1296MHz. Work stations once per band, regardless of mode. Multiply total QSO points by the total number of prefixes worked.

Logs must be postmarked no later than August 31. Send to:
CQ VHF WPX Contest,
c/o SCORE,
PO Box 1325,
Eatontown,
NJ 07724,
USA.

The World of Amateur Radio

The World of Amateur Radio exhibition will take place in the URC Church Hall, Rock Street, Thornbury on May 21 from 10am to 4pm.

The purpose of the exhibition is to present to the general public the fascinating world of amateur radio. Aspects of radio to be seen at the exhibition will include:

Short wave listening.

A complete working s.w.l. station, equipped with both high performance and economy communications receivers.

Computers.

This section will illustrate the use that is made of home computers in radio communications.

Amateur Television.

Television pictures using the BBC/IBA 625 standard will be shown, these pictures will be transmitted on u.h.f. 430MHz.

Microwaves.

The part of the exhibition showing the mechanical and "plumbing" skills of amateur radio enthusiasts.

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NC11C	Charger		10.50	(2.00)
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YHA15	2m Helical		7.50	(2.00)
YHA44D	70cm 1/2wave		12.50	(2.00)
YM49	Speaker Mike		23.00	(2.00)
MMB15	Mobile Bracket		14.55	(2.00)
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FT73R	70cm Mini H/H		243.50	(3.00)
FNB9	Nicad Battery Pack (23/73)		27.60	(2.00)
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NC29	Base Charger (23/73)		57.50	(3.00)
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MH12A2B	Speaker Mic		29.75	(2.00)
MH18A2B	Speaker Mic Miniature (23/73/727)		27.00	(2.00)
FT227R	2m/70cm H/H		425.00	(3.00)
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FNB5	Empty Cell Case		10.00	(2.00)
FRG9600M	60-950MHz Scanning RX		509.00	(—)
PA4C	Power Supply for 9600		21.00	(2.00)
MMB10	Mobile Bracket		10.00	(2.00)
NC9C	Charger		11.50	(2.00)
PA3	Car Adaptor/Charger		21.85	(2.00)
YM24A	Speaker Mike		21.05	(2.00)
FRG8800	HF Receiver		639.00	(—)
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MH18B	Hand 600 8pin mic		21.00	(2.00)
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FT2311R	23cm FM Transceiver		475.00	(—)

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IC490	70cm 10W M/Mode	617.00	(—)
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Drae	3 way 'n' Skts Switch	21.91	(2.50)
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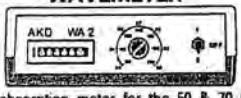

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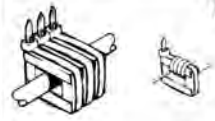

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F. C. Judd wrote this book for radio amateurs new to the 144-146MHz band. The range of antennas described will cater for most situations, particularly those where space is a problem. *157 pages* **£5.95**

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Antenna and propagation theory, including NBS Yagi design data. Practical designs for antennas from medium waves to microwaves, plus accessories such as a.t.u.s, s.w.r. and power meters, and a noise bridge. Dealing with TVI. *160 pages* **£3.00**

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Designed to make you proficient in Morse code in the shortest possible time, this book points out many of the pitfalls that beset the student. *87 pages* **£4.95**

Competition Result

In our March 1988 issue, readers were given the chance to win a Cap.Co Electronics Ltd AMA 5 Magnetic Loop Antenna. Entry involved tackling eight questions, and all the answers were to be found in articles appearing in that month's *Practical Wireless.*

The Answers

A. *Q: Which is the only antenna to have a bandwidth of 1.5kHz on the 1.8MHz (160m) amateur band?*
A: A Cap.Co Magnetic Loop AMA 4.

B. *Q: You live in the centre of a city in a second-floor flat, with no garden, and you are forbidden to put up any outside antennas. You want to operate on 15, 20 and 40m—which antenna could you use inside your room?*
A: A Cap.Co Magnetic Loop AMA 6.

C. *Q: You are standing on a clifftop, 200ft above the sea. How far away will the radio horizon be, using the 4/3 earth radius rule?*
A: 20 miles—see "Making Waves—A Guide to Propagation, Part 4" (page 18, March *PW*, 3rd column) where the 4/3 earth radius condition is discussed.

D. *Q: You live in the stockbroker belt and have about an acre of fabulous garden, but you cannot put up a tower, a beam or even a dipole. What antenna could you get away with using if it was only 0.8m tall and could stand on the floor of your patio?*
A: A Cap.Co Magnetic Loop AMA 3 or AMA 6.

E. *Q: What is the reactance of a lossless series LC (acceptor) circuit at its resonant frequency?*
A: Zero—see "Reading and Understanding Circuit Diagrams, Part 1" (page 37, March *PW*, 3rd column) where this circuit is explained.

F. *Q: You have a tiny garden measuring only 3 metres square, and you want to operate on all the h.f. bands. Which antennas could you use?*
A: Cap.Co Magnetic Loops AMA 3 and AMA 5.

G. *Q: You can go on the air only at weekends on the 3.5 or 7MHz bands, but there is always too much QRN from electric drills, motor bikes and noisy TV timebases, and another amateur over the road operates on the same bands. Which antenna could you use in order to get rid of the QRN and your fellow operator?*
A: A Cap.Co Magnetic Loop AMA 1 or AMA 5.

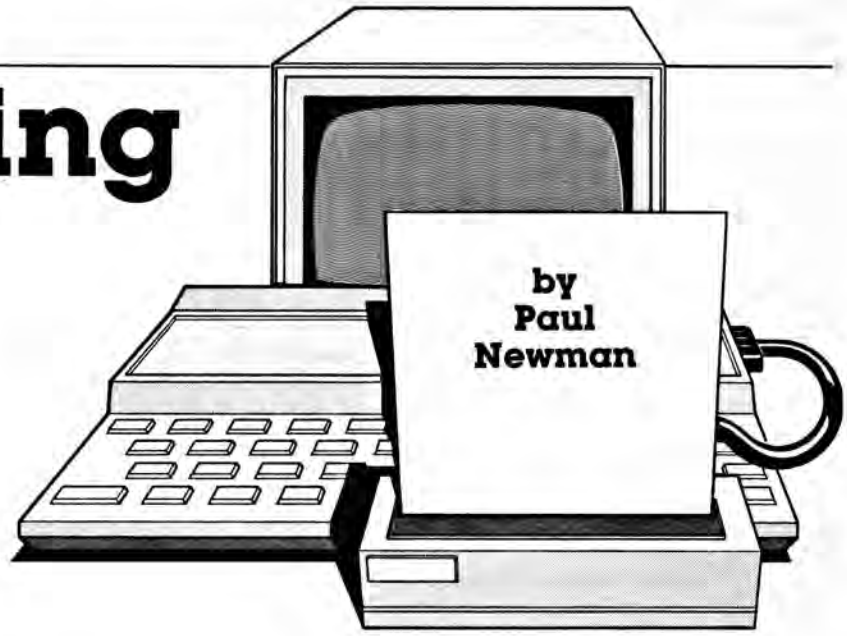
H. *Q: You add a whistle filter to your medium wave broadcast receiver to cut out heterodyne interference from European stations operating on adjacent channels. To what frequency should you tune the filter?*
A: 9kHz—see "*PW* 'Orwell' Medium Wave Receiver, Part 2" (page 44, March *PW*, 3rd Column) which describes how to adjust the 9kHz whistle filter to remove the heterodynes between the carriers of m.w. broadcast stations transmitting on adjacent channels. European stations operate on a bandplan which puts them on multiples of 9kHz; 1053 and 1062kHz, for example.

The Winner

Each entry with all-correct answers was considered for the aptness and/or wit of the reply to the tie-breaker question: Why would you like to win a Cap.Co AMA 5 Magnetic Loop? The answers were judged by Tony Johnston G4OGP of Cap.Co Electronics Ltd and Geoff Arnold G3GSR of *PW*, and the lucky winner was Mr C S Kentch of Worthing, who said: "Because I could operate on 80m and 40m from my postage stamp sized back yard!". ***PW***

Feature

Computing Corner



A very interesting item arrived recently which although being just a little out of the ordinary has relevance to most amateur radio Morse-tutor programs.

Ian McGarrigle G4JIU writes —"Many amateurs use a home computer as an aid to learning Morse code and this is fine whilst learning the basic alphabet. Most of the programs I have seen produce random letters in such a way that "Z" is just as likely to occur as "E". This is obviously not true in normal text so I wrote the attached program to produce random letters in groups of 5 with the distribution found in normal English (well, American English actually)!

The data is taken from Brown's *Corpus* which was an analysis of a vast database of the English Language in the USA."

```
10 A$="ABCDEFGHIJKLMNOPQ
   RSTUVWXYZ"
20 DATA 0.0805, 0.0513, 0.031,
   0.0397, 0.125, 0.0231
30 DATA 0.0195, 0.0542, 0.0729,
   0.0016, 0.0066, 0.0414, 0.0254,
   0.071, 0.076, 0.0202, 0.0011,
   0.0613
40 DATA 0.0655, 0.0925, 0.0272,
   0.01, 0.0188, 0.002, 0.0172, 0.001
50 CLS:DIM P(26):FOR J=1 TO
   26:READ P(J):P(J)=P(J)+
   P(J-1):NEXT
60 R=RND:FOR J=1 TO 26:IF
   R>P(J) THEN NEXT
70 L$=MID$(A$, J, 1)
80 PRINT L$;:B=B+1:C=B/5:
   D=INT(C):IF D-C=0 THEN
   PRINT " ";:REM 3 spaces
90 GOTO 60
```

The listing above will work on the Amstrad range although the original listing was for a Commodore Pet 3032. For this range change only the CLS to the appropriate symbol and add (0) immediately after the RND.

By substituting this routine into Morse tutors you simply pass the "sending" routine the character in "L$" and this could conveniently be done at line 70.

I wonder how many Morse tutors take account of the letter distribution? I certainly never thought of that aspect and I thank Ian for an interesting item.

Sat-track

I understand that a number of readers, chiefly VIC-20 and Commodore users, tried unsuccessfully to obtain information on Neil Hill K7NH's "sat-track" system for rotor control in satellite work.

Bob Howard WA6DLI wrote to tell me that the December 1987 edition of *Ham Radio* magazine carried complete constructional information for the system, written by Neil. The components list and p.c. layouts are included. (I don't have this article.) The article points out that provided the edge connector is rearranged, the system will work with any Z80-based micro since although the connectors are different physically, electrically they are identical. Likewise the software would only require different address decoding for output.

Saku OH1KH's Packet Terminal program from the April '88 *PW* was quite well received judging from the post. Shortly after its publication a newer version was received and this contained a number of improvements. This version doesn't need a printer which some may find more convenient.

I'm grateful to several correspondents for their pointing out that the published program would probably not work on the "MKII" Amstrad RS232 interface which has a built-in "Comstar" modem program. Both the original and the newer versions will, so far as I'm aware, work only with Amstrad original RS232 interface.

I'll gladly pass on copies of the newer version but only on the clear understanding that both the medium (disk or tape) plus return postage are enclosed. Without either you will get no reply I'm afraid![1]

J & P Electronics'[2] new catalogue brought some interesting news for Atari ST users in the form of the Matrix Systems SSTV receiver program and interface. According to the nicely produced manual, the program has a wide range of facilities including disk-saving of received pictures. Perhaps a user of this program would like to let us know his/her views? Incidentally, I applaud Matrix Systems' blunt warning about piracy—"any piracy and we stop writing software".

Meteosat

The January 1988 item concerning the Meteosat system on the C64 and IBM PC-compatibles (Cameroni and Morellato[3]) apparently raised almost 1000 direct enquiries! Giancaria I2AED and Giuseppe I2CAB ask that you enclose return postage. (I echo that sentiment on my own behalf! —G4INP).

For overseas replies simply obtain an International Reply Coupon from your local main Post Office. Be sure that it is franked in the left-hand box (NOT the right-hand) otherwise it is invalid.

The Meteosat picture system is interfaceless and has facilities for dumping enlarged and rotated (for polar-orbit) pictures onto normal dot-matrix printers. Pictures up to 200mm square are possible and may include user "memoes". A picture enhancement facility is included. Up to 5 pictures may be replayed in fast motion to show cloud movements. Temperature, humidity and illumination may be shown in "false colour" to aid visualisation.

I2AED/I2CAB also sell a range of C64/128 and IBM PC-compatible radio software including interfaceless FAX TX/RX, Meteosat RX, and RTTY TX/RX. The latter features audio input via the game-port and includes a frequency-meter program permitting accurate set-up of RTTY tones.

I also gather that October 1986 *Electronics and Wireless World* contained an article describing a C64 SSTV transceive system, although I have not seen the item in full. If we have any users amongst us, please write to me. If you are in a hurry, you can get a photocopy of the full catalogue by sending me a stamped addressed envelope plus a 13p stamp!

It's always interesting to get items which explore the potential of some aspect of a micro in rather more detail, and this from Hil G4YNV is no exception.

Anyone who has written software for tracking the sun, moon or artificial satellites will be aware of the hassle involved in manipulating dates and times and formatting them for screen output. Fortunately the QL's DATE$ function is not limited to returning the setting of the internal clock; by supplying a suitable parameter it will provide a nicely formatted character string which can easily be juggled.

The parameter is the number of seconds since the start of 1961 which sounds daunting, although the following function does all the hard work in calculating an initial value; if we keep subsequent time calculations in seconds epoch 1961, life then becomes easy!

```
6000 DEFine FuNction edat(ye, mo, da, hr, mi, se)
6010 REMark seconds epoch 1961 January 1
6020 LOCal a, b, m, y
6030 y=ye:m=mo:if m<3:y=y-1:m=m+12
6040 b=2-y DIV 100+y DIV 400
6050 a=INT(365.25*y)-716306
6060 m=INT(30.6001*(m+1))
6070 RETurn 86400*(b+a+m+da)+3600*hr*60*mi+se
6080 END DEFine edat
```

Only two points to be careful with; DATE$ is a function not a variable and so cannot be sliced. If we require, say, time only as HH:MM we need to do something like

```
t$=DATE$(n) : PRINT t$(13 TO 17)
```

which is still simpler than trying to provide a calculation routine ourselves.

Keeping the maths simple, DATE$(n) runs from 1961 Jan 01 00:00:00 to 2029 Jan 19 03:14:07 before crashing with "overflow", although this should suffice for most amateur purposes. Since DATE$(n) treats "n" as a signed four-byte integer, those with a penchant for cryogenics can juggle the maths a little further to extend the range to 2097 Feb 06 06:28:15!!

Monitor Matters

Some time ago, several enquiries asked about the "extra" 12V socket on the Amstrad GT65 monitor panel and

Fig. 1: Plug viewed from solder end

at the time I could not provide an answer. According to Ross G4DTD the 12V is used to power the disk-drive when the monitor is used with the CPC6128 machine. My thanks to Ross—now why didn't I think of that!

The next few paragraphs were published elsewhere[4] and attracted a great deal of interest at the time, so I felt they would be interesting to a wider audience. I am grateful to Geo G2LL for information concerning the monitor outputs.

It seems fairly commonplace for amateurs to own and use more than one micro, and the Sinclair/Amstrad combination figures fairly highly. Since the Amstrads come complete with monitor, I thought it would be good if I could use the CTM 644 colour monitor with the Spectrums (Plus-2, 128K, Plus-3) and the QL, all of which have monitor outputs. It proved to be easier than I expected!

An 8-pin DIN plug is required, together with a "CPC extension lead set" obtainable from Boots or W. H. Smith computer counters. This contains a video cable extension lead.

Remove the MALE end to expose the wires; trim and prepare the ends for soldering. Open the 8-pin DIN plug, the pinout of which is shown in Fig. 1. Connect—RED wire—7, WHITE—6; braid—8; YELLOW—4; BLACK—2.

This provides an extension lead compatible with the Video outputs on Spectrum 128K, Spectrum Plus-3 and QL. Note that Spectrum BRIGHT 1 commands will have no effect upon the Amstrad video display. Turn down the brightness when using the QL. The mods proved highly worthwhile since I immediately gained valuable space on my desk formerly taken by a TV set!

Terminal and Communications software for the Sinclair QL seems to be in short supply but I know that "QCODE" is in use very effectively by US QL-users on Packet Radio. I wonder if any reader can tell me if this product is still available in UK? I've been unable to locate a source of supply so far. Please let me know if you can help.

I am pleased to say that, following my plea for help in the last *PW* computing column, a volunteer came forward and the ZX81 Comlink II unit is now being tested in a live situation. I hope to feature the results in the next column.

Help

I'm constantly being asked for information about operating various modes with a wide variety of micros and in many cases I can help, either by providing direct experience or by making reference to other information sources. By direct and other means, it is clear to me that some enquiries seem under the impression that I'm trying in some way to limit their activities or am being just plain unhelpful.

I wish these people would realise that I'm here to try to reflect the current trends in amateur software and to provide a forum for developments and news. The advice I give is honestly given. You may not like the fact that I'm telling you to forget what you are trying to do with your particular micro because it's not practical. But then, you wouldn't thank me if I said go ahead with an impractical project which cost a small fortune.

If you have serious, well-defined needs in radio computing terms then do your research BEFORE purchasing a micro. Just because someone does wonderful things with Meteo-fax on an IBM compatible does NOT mean it will ever be possible with your XYZ Mk II micro.

Whilst I get hundreds of letters for "can my XYZ do . . . . ?" I don't ever remember being asked about "which micro do I buy if I want to do . . . . ?". I must admit that I'd feel much happier if I had some of the latter!! Perhaps it's time we put as much effort into researching which micro we buy as we do into which transceiver? Until next time 73.

References

1. Paul Newman G4INP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ
2. J & P Electronics, New Road Complex, Kidderminster, Worcs DY10 1AL
3. G Cameroni I2CAB & G Morellato I2AED, Via Damiano Chiesa 26, 27029 Vigevano, Italy.
4. SARUG newsletter July 1987.

ERRORS & UPDATES

PW "Orwell" Medium Wave Receiver February/March 1988

To ensure the correct orientation of T3, a continuity check of its internal windings should be made (Fig. 1). Winding B, which straddles one of the two screening can lugs, must face point 20 on p.c.b. WR239, Fig. 2.2.

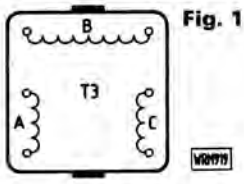


Fig. 1

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★ 2M/70cm
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★ Small size/21 memories

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ALR-22E 2M FM MOBILE

THE RADIO COSTS £249

THE SCANNER COMES FREE!

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★ 21 Memories
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ICF2001D	150kHz-30MHz rx + Air-band	329.00
ICFSW1S	Micro HF receiver kit	249.00
ICFPRO-80	150kHz-225MHz portable all mode	329.00
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HF125	Lowe hf receiver	375.00
WIN 108	Airband scanner 108-136mHz	175.00
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SONY PRO-80	As above but 150KHz-225MHz	329.00
R537S	Tunable plus 2 xtal positions	69.50
R535	VHF/UHF Airband Monitor	249.00
LCBP	Nicad pack & case	42.75
R7000	ICOM All-mode rx 25MHz-2gHz	957.00
AOR2002	25-550/800-1300MHz scanner	487.00
AOR2001	25-550MHz scanner	325.00
IF323C	Computer interface for 2002	255.00
MB2001	Mobile mount for 2001/2002	11.50
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Tel: (04024) 44765
Visa and Access by telephone. 24hr. Answerphone.

Following the publication of the PW "Blenheim" in September 1987 it was noted by the author Bryan Robertson G4POL, that there was signal break-through in the i.f. passband, emanating from strong local radio and p.m.r. transmitters in Band II. To overcome this problem he developed this additional filter.

Stopband Filter for the *PW* "Blenheim"

In the original article a seven-element Chebyshev high-pass filter was placed ahead of the converter to attenuate signals below 116MHz. Unfortunately, the degree of attenuation it provides seems to have fallen short of that needed to keep out strong local radio and p.m.r. transmissions in the region of 96-108MHz.

These, albeit attenuated, signals appear in the middle of the aircraft band, and are a result of unwanted crystal-i.f. products. Although not serious they are annoying, as many constructors will no doubt have found. The relationship between domestic Band II transmissions and the airband frequencies covered by the "Blenheim" is shown in Fig. 1.

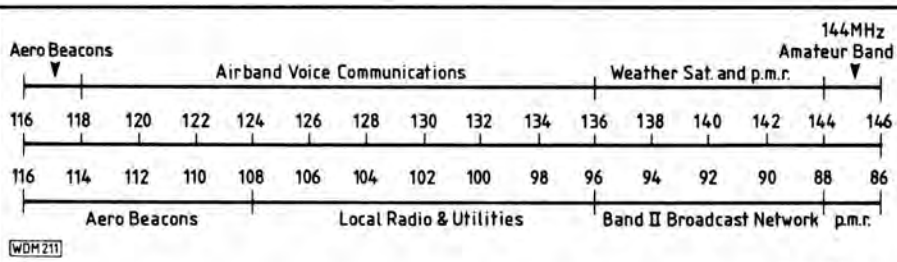


Fig. 1

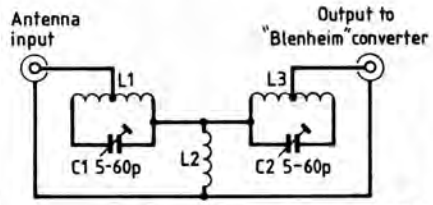
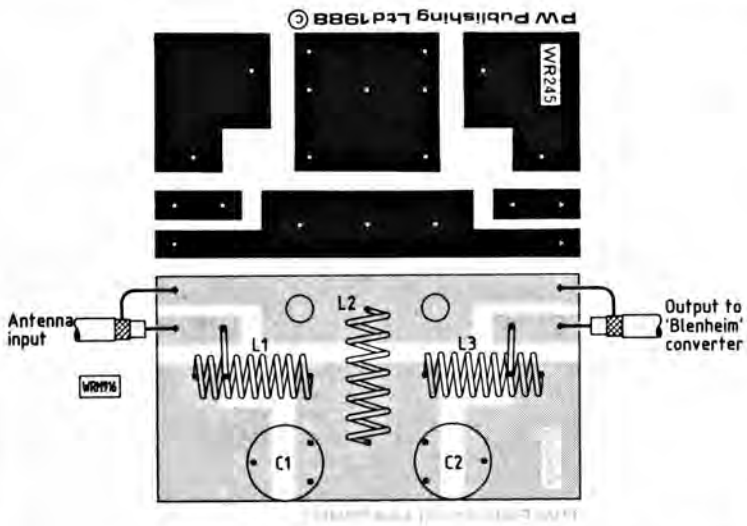


Fig. 2: Circuit diagram of stopband filter

Although the p.m.r. traffic found in this part of the band is due to disappear as a result of reallocation under the WARC '79 agreement, this move will probably worsen the situation as the available spectrum is taken up by more powerful local radio stations. It was therefore decided to produce a stopband filter centred on approximately 98MHz to eliminate the problem.

The circuit diagram of the filter is shown in Fig. 2. and the track pattern and component layout in Fig. 3. The layout and design of p.c.b. should be adhered to in order to give repeatable results, avoiding the de-tuning of L1 and L3.

Once the board is completed, if space permits the filter can be installed inside the same box as the *PW* "Blenheim" using screened connecting leads, or in a separate screened box with suitable connectors. Capacitors C1 and C2 should be set so that their vanes are 40 per cent meshed, this should suffice for most applications. However, if a particular station is causing a problem, capacitors C1 and C2 should be adjusted with a plastics trimming tool. This should have the effect of either eradicating the offending signal, or if you live next door to a large p.m.r. installation, greatly attenuating it.



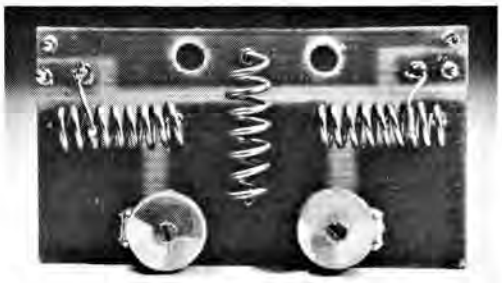
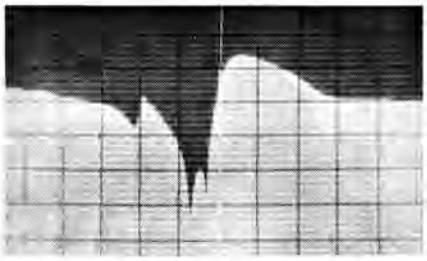


Fig. 3: Full size, single-sided, track pattern and component layout

Acknowledgments

Many thanks to Kevin Murphy ZL1UJG who suggested a mod which will effectively increase the sensitivity by 3dB. This entails building a second (116MHz) Chebyshev high-pass filter, like that used in the original project, and connecting it in place of C7 using screened leads from its input and output. The author has tried this and it does make a difference, but for simplicity and effectiveness the stopband filter is a must. ***PW***



Response to prototype filter, horizontal scale 10MHz/div., vertical scale 10dB/div., bright line at 100MHz

Shopping List

Capacitors

Trimmers

5-60pF 2 C1,2

Inductors

L1,3 9 turns of 22 s.w.g. tinned copper wire, internal diameter 4mm (use drill bit of same diameter as a mandrel). Space to 15mm overall, tap at 2½ turns from outer edge of p.c.b.

L2 7 turns of 22 s.w.g. tinned copper wire, internal diameter 4mm. Spaced to 17.5mm overall.

Miscellaneous

6 Veropins; p.c.b.

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Board Number	Title of Article	Issue Dated	Price (£)
WR068	AF Speech Processor	Jan 80	5.20
WR095	Transceiver Power Supply	Sep 80	3.85
WR126	"Exe" 10GHz Transceiver	Aug 81	7.70
WR144	Iambic Keyer	Mar 82	6.50
WR143	ATV Converter	Apr 82	7.10
WR156	Repeater Time-out Alarm	Nov 82	5.20
WR160	LMS Regenerative Receiver	Feb 83	5.20
WR167	RTTY Terminal Unit for ZX81	June 83	7.80
WR165	"Severn" (VFO)	June 83	5.20
WR166	"Severn" (Receiver/Audio)	Jun 83	6.50
WR168	"Severn" (Ch.over/Sidetone)	Jul 83	6.50
WR169	"Severn" (Transmitter)	Jul 83	6.50
WR165 etc set	"Severn"	—	14.90
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WR183	Top-band DF Receiver	Apr 84	6.50
WR184	Simple Top-band Receiver	Jun 84	6.50
WR185	Auto-notch Filter	Jun 84	6.50
WR187	Morse Sending Trainer	Jul 84	4.50
WR190	Mod FRG-7 (Switching)	Oct 84	4.50
WR189/192 pr	Bug Key with 528-bit memory	Oct 84	8.50
WR194	Mod FRG-7 (FM/squelch)	Nov 84	4.50
WR195	Stable Toneburst	Nov 84	2.60
WR196	"Teme" (Transmitter)	Nov 84	3.70
WAD246	"Dart" Follow-up	Dec 84	4.00
WA001	"Teme" (VFO/Doubler)	Dec 84	2.80
WA002	"Teme" (Receiver)	Jan 85	4.30

Board Number	Title of Article	Issue Dated	Price (£)
WAD280**	Triambic Keyer	Feb 85	7.10
WAD249	Mod FRG-7 (BFO)	Feb 85	3.00
A004	"Colne" (RF Amp)	Apr 85	3.10
A005	"Colne" (VFO)	Apr 85	3.10
WR198	"Colne" (Product Det/Audio)	May 85	3.90
WR197	"Colne" (Oscill/Converter)	Jun 85	3.90
WAD302	Battery Charger Controller	Jun 85	3.00
WR200	Low-cost Crystal Tester	Jul 85	2.50
WR201	Add-on BFO	Aug 85	2.50
WR202	Economy UHF Pre-scaler	Sep 85	3.70
WR199	"Meon" 50MHz Transverter	Oct 85	6.70
WR203	Simple Capacitance Meter	Oct 85	2.80
WR204	WQ Medium Wave Loop	Nov 85	3.00
WR205	RTTY/Morse Modem	Jan 86	5.40
WR206	RTTY/Morse Modem (plug-in)	Jan 86	2.80
WR207	Crystal Calibrator	Jan 86	2.10
WR208	RF Speech Processor	Mar 86	4.10
WR209	Simple Audio Oscillator	Mar 86	4.30
WR211	"Meon" Filter	Apr 86	3.10
WR210	"Arun" Parametric Filter	May 86	8.10
WR213	Mod FRG-7 (Carrier Osc)	Jun 86	2.70
WR215	Simple 50MHz Converter	Sep 86	3.60
WR217	Automatic NiCad Charger	Oct 86	2.40
WR220	Get Started Low-cost Converter	Oct 86	2.40
WR216	LF Bands Active Antenna	Nov 86	2.40
WR222	"Taw" VLF Converter	Nov 86	2.80
WR223	High-imp MOSFET Voltmeter	Dec 86	2.90
WR214	Mod SRX-30D (Audio)	Dec 86	3.00
WR224	"Westbury" Basic Wobbulator	Jan 87	3.50
WR218	Masthead Pre-amp for 144MHz	Feb 87	4.20
WR219	Masthead Pre-amp PSU	Feb 87	2.50
WR225	"Woodstock" SW Converter	Mar 87	4.10
WR298	"Itchen" LCR Bridge	Apr 87	3.40
WR226–8 set	"Blandford" Rcve Converter	Apr 87	9.70
WR230–2 set	"Axe" Signal Tracer	May 87	9.20
WR233	"Downton" F-V Converter	Jun 87	3.90
WR234	Side-tone Oscillator	Jun 87	2.70
WR235	Mains on/off for Batt Radios	Sep 87	3.00
WR236	"Blenheim" VHF Converter	Sep 87	4.50
KANGA	High Stability VFO (see issue)	Oct 87	—
WR237	RTTY Tuning Indicator	Nov 87	5.20
WR238	"Otter" 50MHz Receiver	Jan 88	7.10
WR239–241 set	"Orwell" Medium Wave Recvr	Mar 88	9.10
WR242	"Orwell" Varicap Tune Option	Mar 88	2.90
WR243	VHF Monitor Receiver (Audio)	Apr 88	2.30
WR245	Stopband filter for PW Blenheim	Jun 88	2.90

In Part 6 we considered polarisation and its effect on the reflection of waves. Now we move on to look at the effect of reflection on the radiation pattern of antennas and also surface wave propagation, says A. J. Harwood G4HHZ.

Making Waves—A Guide to Propagation

Part 7—On the Surface

To begin with, let's look at the case of a horizontal antenna which, as we saw, has a negative image antenna located at the mirror image position. That means an image situated immediately below the antenna and as far below the ground plane as the antenna is above. This is shown in Fig. 7.1, and we can see that at an angle θ, the direct wave is ahead in phase and the reflected wave lags when using the centre line as a reference. The combination of the direct wave and the ground reflection is usually referred to as the space wave.

When we take into account the fact that the image is in antiphase we can calculate, by the same sort of reasoning as we used in Part 4 to calculate the radiation pattern for a pair of driven dipoles, that the radiation pattern of the antenna and image is given by:

$$E=2E_0 \times \sin\frac{2\pi \times h}{\lambda} \times \sin\theta$$

This assumes that the ground below the antenna is a very good conductor and hence has a reflection coefficient close to 1, and the phase of the reflection is sensibly 180 degrees. We can see from this that the horizontal antenna above a good reflector cannot radiate in directions close to the horizontal as the direct and reflected signals cancel. Radiation at relatively low angles of elevation is also difficult to obtain unless the antenna is quite high. The direction of maximum radiation occurs at an angle given by:

$$\text{Sin}\ \theta = \frac{\lambda}{4h}$$

from which we can see that, for an antenna which is a half wavelength above the ground the direction of maximum radiation is at an angle of 30 degrees elevation. Raising the antenna to three-quarters of a wavelength reduces this to 19.5 degrees. The power gain of the antenna and reflection is 4 as is explained later.

For h.f. communications at frequencies between 2 and 30MHz, use is made of the different layers of the ionosphere to reflect signals into the target service area. Since the height of these layers varies, control of the vertical direction of radiation is important when designing h.f. arrays. The angle of take-off can be adjusted by choosing the correct height above ground to give the optimum angle for a given path and ionospheric conditions. Another interesting point about horizontal antennas above a reflecting ground is that the combination can radiate energy at angles above the horizon in the direction along the length of the dipole. In this case the radiation is in effect vertically polarised as can be seen from Fig. 7.2.

For a vertically polarised antenna above a good conducting ground, the image and antenna are effectively in phase and the combined pattern is that of two collinear dipoles spaced by twice the height of the antenna above ground as discussed in Part 5, but also with a power gain of 4. If the ground is a poor conductor, at angles of elevation below the Brewster angle (which I'm sure you all remember) the reflection is in antiphase and so radiation from the antenna and image tend to cancel out. This means that it is difficult to obtain low angle radiation from a vertically polarised antenna, unless it is over a reflecting surface of extremely good conductivity such as the sea or wet ground.

One important point about the combined signal from an antenna and its reflection is that the greatest magnitude is 2 (corresponding to a power gain of 4) as compared to the $\sqrt{2}$ (power gain of 2) we saw for a driven pair of dipoles. This apparent gain can easily be explained as all the power radiation is contained in the hemisphere above the ground, whereas for the driven dipoles (in free space) the same amount of energy is distributed over a sphere. The power density throughout the hemisphere averages twice the value existing throughout the sphere. This, combined with the power

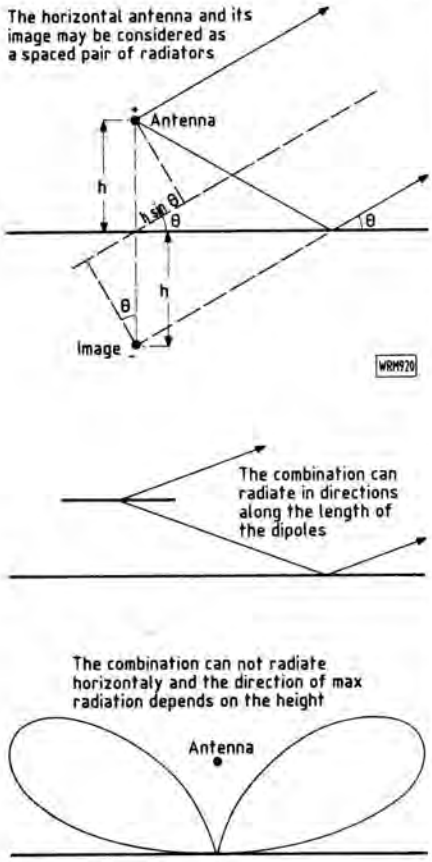


Fig. 7.1: A horizontal antenna above a good conducting ground behaves like a pair of spaced radiators in antiphase. The power gain in the direction of maximum radiation is 4

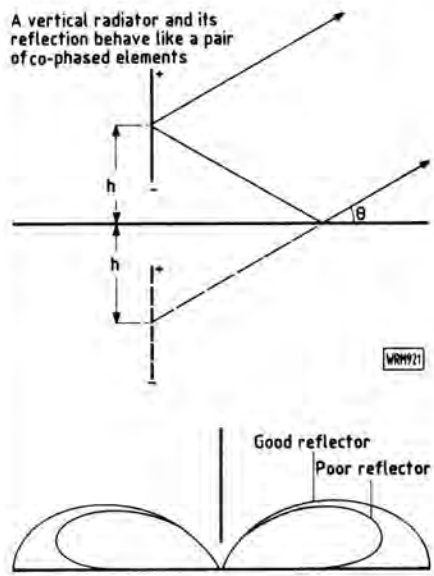


Fig. 7.2: A vertical radiator can produce horizontal radiation when the reflectivity is high. The power gain is also 4

gain of 2, due to dipole image combination, gives the overall power gain of 4.

When dealing with reflected waves, we must always remember the importance of the Fresnel zone which must be uncluttered if a good reflection is to occur. In the case we have just considered, if the antenna itself does not enter the Fresnel zone of the reflection point and the ground does not enter the Fresnel zone of the antenna, we are limited to cases where the antenna is at least a quarter wavelength above the ground since this is the radius of the first zone at the antenna.

What then of the case of the monopole or ground plane antenna where the ground is itself part of the antenna system?

To consider this we need to know a little about how the antenna actually converts electrical and magnetic energy into an electromagnetic wave system. This problem was studied in some detail by Schelkunoff. He was able to show that for an antenna, such as a dipole, the radiated wave system originates entirely from the fields which occur across the gap between the two halves; and that the two halves of the dipole do not themselves radiate, but act as a wave guide which couple the fields in the gap to free space. (This does incidentally knock on the head some of the ideas of current induced or voltage induced radiation, which are bandied about by some armchair theorists). Not surprisingly, the size of the gap and the geometry of the antenna have a significant effect on its characteristics as a radiating system. Schelkunoff was able to get good correlation between the theoretical and actual performance of antennas, particularly for dipoles where the half elements are conical with the points of the cones at the feed point.

When we consider the monopole, a similar situation occurs with the difference that one of the two sides of the antenna, the earth, in effect carries on to infinity and is instrumental in supporting the wave as it propagates along its surface. This is surface wave propagation as opposed to the free space propagation we have been considering so far.

Up to now we have also looked at those fields well away from the antenna in what is called the far field region and which are transverse to the direction of propagation. Here, the electric field is parallel to the dipole and the magnetic at right angles to it, both being in phase. In the immediate vicinity of the antenna the situation is much more complex, particularly in the case of the electric field which also has components radial to the dipole (and hence along the direction of propagation) as well as those components which eventually form the radiated field. These near fields can be divided into two sets, those where the electric and magnetic are in phase and which transport energy, and those where the phase difference is 90 degrees which store energy.

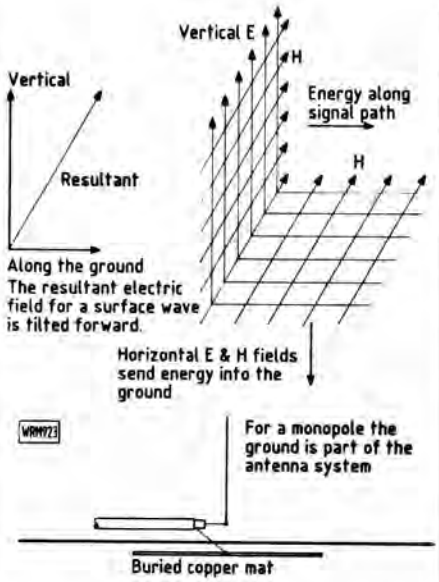


Fig. 7.3: An antenna such as a monopole generates a surface wave. Horizontal components of the E and H fields drive energy into the ground where it is lost as heat. This causes additional attenuation of the wave front

A monopole over a good conducting ground also produces a complex set of fields, one of which is travelling away from the antenna in a manner similar to the space wave produced by a dipole well removed from the ground. There is also a radial electric field parallel to the surface of the ground which is also associated with the magnetic field. This combination is in phase and hence carries energy from the wave front into the ground where it is dissipated as heat due to the finite resistance of the ground material. The net electric field is that due to the vertical radiated component and the horizontal component of the wave travelling into the ground and hence is tilted forward. A mathematical analysis shows that energy is constantly extracted from the wave front and passed into the ground and the system is self sustaining. Good conductivity in the immediate vicinity of the antenna is necessary to establish the surface wave and this is usually provided by burying an earth mat of copper radials in the ground immediately around the antenna. Once established the surface wave propagates in the manner which depends on the nature of the ground immediately below the path.

In Part 1, we saw how to relate the radiated power and the field strength produced at a distance for an isotropic source and a dipole which, using the more practical units of millivolts, kilowatts and kilometres, gives:

$$\text{isotropic } E = \frac{173 \times \sqrt{P}}{D} \text{ mV/m}$$

$$\text{dipole } E = \frac{222 \times \sqrt{P}}{D} \text{ mV/m}$$

It would be useful to have a similar connection for the surface wave case and this can be done. First, we need to specify the antenna system. In practice it is quite difficult, not to mention expensive, to build a quarter wave monopole for frequencies of below about 2MHz. At these frequencies, where surface wave propagation is the predominant mode, the reference antenna is usually a short monopole, where "short" means under about 0.2 wavelengths high.

When we looked at the dipole we saw that its power gain over an isotropic source is 1.64. An analysis of a short dipole shows that its isotropic gain is 1.5. This would result in a field strength of:

$$E = \frac{212 \times \sqrt{P}}{D} \text{ mV/m}$$

using millivolts, kilowatts and kilometres and assuming that the wave is attenuated in inverse proportion to the distance. In the case of the short monopole again, all energy is contained in a hemisphere and hence, in a similar manner to the antenna and reflection which we looked at earlier, there is an additional power gain of 2 to be taken into consideration. This would result in the relationship:

$$E = \frac{300 \times \sqrt{P}}{D} \text{ mV/m}$$

which implies that the field strength varies inversely with distance as in the free space case.

However, we also have to take into account the additional losses due to the energy which is transported into the ground by the radial field. These losses depend on a number of factors. First, there are the electrical parameters of the ground itself, its conductivity and permeability or dielectric constant. At lower frequencies, the conductivity is the predominant cause of attenuation and ground of high conductivity produces less attenuation that that of poor conductivity.

In general, material which is geologically younger tends to have higher conductivity, so surface wave propagation is better at medium waves over areas such as East Anglia where the ground is relatively young than over older areas such as the Highlands of Scotland or Dartmoor. As the frequency increases into the h.f. region, permeability becomes of increasing importance. Attenuation is also greater as the frequency increases and above 2MHz the attenuation of the surface wave is great enough to mean that the wave can only be used for communication over relatively short distances. For a good medium wave broadcast service during the daytime when surface wave propagation is used, a low frequency and a service area with high conductivity ground give the best results.

The variations in attenuation, due to ground constants and frequency, are too complex to combine into a simple equation governing surface wave propagation. Calculations of field strength

Practical Wireless 144

0900-1700UTC (GMT), 12th June 1988

For the sixth year, the PW QRP contest will provide v.h.f. enthusiasts the opportunity to enjoy the challenge of low power operation, as well as giving users of simple 3 watt transceivers the chance of competing effectively. If you've not tried it before, give it a go; year after year contestants write of their surprise at the distances covered by their low power.

The 1988 event is again scheduled for a Sunday in June, but this year a week earlier than previously, in order to avoid the clash with the RSGB 10GHz Cumulative Contest which has coincided with the PW QRP contest on each of the five previous events. Weekends in the summer are generally busy with amateur radio events, and it is impossible to find a date which will suit everyone, but we will now avoid the QRM to and from 3cm operators (who use 144MHz s.s.b. for talk-back). The new date has been fixed after discussion with the RSGB VHF Contests Committee.

The leading station will receive the winner's cup, the leading Scottish station will be awarded the PW Tennamast Trophy (kindly donated by Tennamast), and certificates will be awarded in many other categories, including the leading station in each locator square, and the leading station using a single antenna.

Please will all entrants read the rules carefully, even though there are few changes this year. It makes the adjudicators' job so much easier if entrants will submit their logs and covering information in the standard format required. Let's hope this year we are lucky enough to experience a spell of good propagation conditions. Good DX and enjoy the contest.

G4HLX

RULES

1. General

The contest is open to all licensed 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 groups, clubs, etc. The duration will be from 0900 to 1700UTC on 12 June 1988.

All stations must operate within the terms of the licence. Entrants should observe the band plan and keep clear of normal calling frequencies (144.300MHz and 145.500MHz) and those used by GB2RS during the morning (144.250MHz and 145.525MHz). Keep clear of any other frequency that is obviously in use for non-contest purposes.

The station must use the same callsign throughout the contest and may not change its location. Special event callsigns may not be used.

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) locator (i.e. full 6-character Universal Locator for the location of the station).

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. Simultaneous operation on more than one frequency is not permitted.

If a non-competing station is worked and is unable to send his full universal locator, his old-style QTH locator ("QRA") or his location may be logged instead. However, for a square to count as a multiplier (see rule 4), either a full 6-character Universal Locator, or full 5-character QTH 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 a higher power, the power shall be reduced and measured by satisfactory means. The simplest way is often to apply a (variable) negative voltage to the transmitter a.l.c. line, reached via the accessory socket. The output power can be accurately measured using the simple circuit of Fig. 1. Connect this to the 50 ohm output of the transmitter and adjust the power so that the voltmeter does not exceed 16.7V on a good whistle into the microphone.

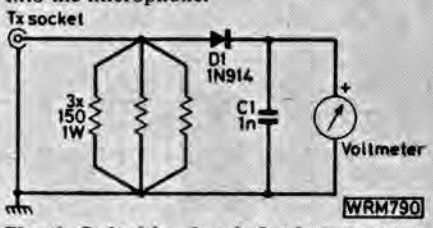


Fig. 1: Suitable circuit for low power measurement in a 50Ω system. The resistors should not be wirewound. All leads (except those to voltmeter) should be as short as possible (10mm maximum). The meter will read ($\sqrt{100P}$)–0.6V for a power of P watts (16.7V at 3W)

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 locator squares in which contacts were made (a "square" here is the area defined by the first four characters of a Universal Locator).

Example: 52 stations worked in IO81, IO90, IO91, IO92 and JO01 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 still be recorded in the log, and clearly marked as a duplicate.

5. Log

The log submitted as an entry must be clearly written on *one side only* of A4 sized (210 × 297 mm) paper (the normal way up, not sideways), ruled into columns showing:

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

Underline or highlight the first contact in each of the locator squares worked.

are usually performed by determining the performance of a given antenna in terms of the field strength it would produce from 1kW at 1km (which would be 300mV per m for a perfect short monopole) and calculating the field strength over the whole path from a set of graphs, such as those shown in Fig. 7.4. Nowadays such data is, of course, contained in data banks and the calculations performed by computer.

One other term often heard in relation to the surface wave is ground wave. Strictly speaking, the two terms are not synonymous (although they are frequently used as if they are). There can also be propagation of energy over the path by means of a direct wave and reflected wave which together form a space wave. The ground wave is the combination resulting from the space wave and the surface wave although for practical purposes, the space wave can usually be ignored at medium frequencies.

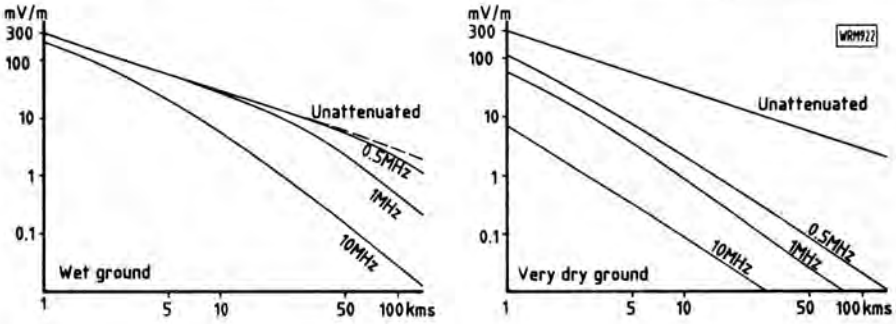


Fig. 7.4: Propagation curves for good conductivity (wet) and poor conductivity (very dry) ground. The losses increase with frequency and reduced conductivity

MHz QRP Contest 1988

PRACTICAL WIRELESS 144MHz QRP CONTEST

Date	Callsign	Locator	Sheet N° of

Time GMT	Callsign	Report & serial N°		Locator
		Sent	Received	

At the top of each sheet, write:
(a) callsign of your station
(b) your locator as sent
(c) sheet number and total number of sheets (e.g. "sheet no. 3 of 5").
The sample shown here illustrates how each sheet should be headed.

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) as it is to appear in the results table
(b) callsign used during contest (including any suffix)
(c) name and address for correspondence
(d) details of location of station during contest; for portable stations, a national grid reference is preferred
(e) locator *as sent*
(f) whether single- or multi-operator (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 locator squares worked
(h) list of the locator squares worked
(i) a full description of the equipment used including TX p.e.p. output power
(j) if the transmitting equipment 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 loss of points or disqualification. For example, omission of item (h), and failure to highlight the first contact in each square in the log, usually leads to a 5 per cent deduction from the total score.

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, 46 Hunters Field, Stanford in the Vale, Faringdon, Oxon SN7 8LX. Please note that **this address has changed** since last year's contest. A large s.a.e. should be enclosed if a full set of contest results is required.

Entries must be postmarked no later than 27 June 1988. Late entries will incur a heavy points penalty.

Any other general comments about the station, the contest and conditions during it are welcome, but should be written on a separate sheet of paper. Photographs of the station are also invited (but please note that these cannot be returned); if these are not available by the time the entry is submitted they may be forwarded later, to arrive by 5 August 1988.

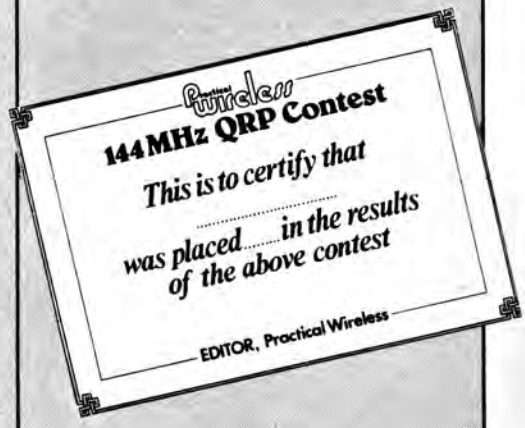
7. Miscellaneous
When operating portable, obtain permission from the owner of the land before using a site. Always leave the site clean and tidy, removing all litter. Observe the Country Code.

Take reasonable precautions to avoid choosing a site which another group is also planning to use. It is wise to have an alternative site available in case this problem does arise.

Make sure your transmitter is properly adjusted and is not radiating a broad or poor-quality signal, e.g. by overdriving or excessive speech compression. On the other hand, be aware that your receiver may experience problems due to the numerous very strong signals it will have to handle, and that this may lead you to believe that another station is radiating a poor signal. Before reaching this conclusion, try heavy attenuation at the receiver input. The use of a high-gain r.f. pre-amplifier is likely to worsen strong-signal problems, so if you do use one, it is best to be able to switch it off when necessary.

8. Adjudication
Points will be deducted for errors in the information sent or received as shown by the logs. You can avoid this by careful logging, and by sending callsigns etc., clearly in contacts; use standard phonetics, and always give the whole callsign—never drop the /P suffix if there is one (a common error in previous contests). Unmarked duplicate contacts will carry a heavy points penalty, so during the contest maintain a check-log of stations worked and keep it up-to-date, refer to it for each contact to avoid duplicates.

A breach of these rules may lead to disqualification. In the case of any dispute, the decision of the adjudicators will be final.



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On The Air

On The HF Bands

Reports to Paul Essery GW3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1AR.

Last time out, I mentioned that I had the rotator down. The problem, in the end, proved to be a matter of the control unit, but of course I had to disassemble the masthead unit and run it on the bench to prove the point. I wonder just what is the active ingredient in the grease used in the rotator; a blacker, stickier, person-attaching mixture I never came across.

The Bands

Considering the phase of the sunspot cycle, the general feeling says "Not at all bad!"—there have been decent openings on 28MHz on several occasions, people have reported things of interest on Top Band and everywhere in between. Can't be too bad! On the other hand, we have had the odd bad day; again just enough to give a savour to the medicine.

Coming & Gone

News thanks to W1WY, *DX News Sheet, The DX Bulletin, The Canadian Amateur* and your letters.

Jim Smith VK9NS and others are mounting an expedition to Howland, KH1, which has been steadily climbing up the "wanted" listed for a long time, there having been no operation since the days when the op could sign either VR1 or KB6. Licensing, or landing permission, are not problems, but the US Fish and Wildlife people insist on one of their group going along to this reserve, so a reasonable boat is said to charter for around $1500–2000 a day, with a 1130km each way trip from Tarawa, in Western Kiribati.

The QSL address for the HD5X, Ecuadorian expedition by KQ2M is: Robert L. Shohet KQ2M, PO Box 640, Stony Brook, NY 11790. Seems that though Bob passed the word to the Call Book people, on several occasions, his QTH is still unaltered. Seems as though, as a result, disgruntled postal people have been ditching packets of mail instead of redirecting. Note that the above address covers HD5X, P4/KQ2M, VP2V/KQ2M and HC5/KQ2M.

April 1 saw the start of a ten week swingaround by WB2LCH of the Caribbean; first stop is St. Kitts V47KLC, to be followed by VP2MCH, J37XD, PJ2/WB2LCH, PJ4/WB2LCH for around a fortnight at each stop. QSLs will go either to WB2LCH or via W2GHK.

Work requirements got in the way of the JD1, Minami Torishima exercise of KA2CC at the last minute. However, it is hoped to re-schedule the activity for later in the summer.

One who never seems to miss is Amir 4X6TT. The Sleepless Wonder, this one; Amir has been on from all sorts of places; at the time of writing Tuvalu. We also note Tuvalu being activated by DL1VU (QSL via DJ9ZB), and JF2MBF (QSL via JR2HCB) has just left the place.

Mariana Is KHO, will be operational in the form of NY6M/AHO, 1.8 to 28MHz, over the May 27–30 period.

There are buzzes, emanating apparently from UA9YE, that there will be an operation from Vietnam by UA9OB in October. I also hear that those who chase the Oblasts will be gladdened by the activities of UA9OJ and Co., who will be activating Oblasts, 3 in U18 and 2 in UH8, including the very rare UI8V.

The Spratly expedition, as previously mentioned, is off in its existing form; however, I understand a group of DUs are still working on this one.

Top Band

This is a band on which there has been quite a deal of activity. **VK2AU** (Greystanes, NSW) notes the activity between there and the USA.

The s.s.b. from **GW0IER** (Milford Haven) includes C31OF and PA3DWD, while c.w. worked to UA3, UP2, UW3 and LZ1XL.

The s.s.b. of **G3BDQ** was applied to LZ1KOZ, C31LU, T77V, T77T and 4X4NJ, while a quick blast or two on the key resulted in RV9CFU and SV1DO. That being said, John says he understands the band has been very good for those who could get up early enough!

Now **G3BRD** (Seaford) where it is all Top band, with the star turn being a QSO with VK5BC—the opening lasted about nine minutes there. Two-way s.s.b. was the route to HH7PW, D44BC, J56AS, SV1DO, OY9JD, TI8CBT, YV3AZC, YV3AGT, FY5YE, PJ2FR, TI2CC, VP2MU, 4U1UN, P40V, TG9NX; and c.w. dealt with VK5BC, RF6FIN, UI8BWE, UG6GCK, UC2SD, UD6DBN, RA9SSN, RV9CFU, UA9CVK, UA0YO (Zone 23), J52US, PZ1DT, J6LTA, K5XX, WB5AKY, W0CD, W0IFH and about twenty Europeans. John added TA2KC and PA3AXU/SU on c.w., plus CP8HD on phone; this gives John 117 Countries in 29 Zones since the start of this year.

G2HKU (Sheppey) worked on s.s.b. ON7BW, while c.w. yielded VE1ZZ, OK4CPZ/MM, and OZ1W.

Still with Top Band, the WAB Top Band Contest on February 6 resulted in a win for G4BWP who pulled well ahead of G4OGB and G4HPU, respectively second and third. The WAB organisation will be represented at RSGB's VHF Convention, Northern Rally, Longleat Rally, the RSGB National Convention, the Anglian Rally, the RSGB Mobile Rally, the Red Rose Rally and Telford Rally between now and mid-September. Thanks G8XTJ for the information.

The 3.5MHz Band

VK2AU notes the presence of lots of Ws at 59 plus and lots of other DX too.

G4XDJ runs 5–50 watts c.w. or 80 watts s.s.b. to his FT-200; this yielded him QSOs with GOGKH, G4ITL, G4ZIB, G4HSB/M, SP7LFT and G0HCR.

Turning to **G3NOF** we find Don made a couple of s.s.b. contacts on the band, with J6LB and J73SK. Another one who didn't try to wear the propagation out was G3BDQ, who notes just the two s.s.b. contacts with JA6XMM.

The next three deadlines are: June 1, June 29 and July 27

It was c.w. all the way for **GM3JDR**; Don mentions working UA1ODX, VK6HD, ZL1PF, ZL1BEK, ZL3OE, ZL4IE, W7FU, PZ1AV, OH0MB/OJ0, PT7AO, PY1DHG/4, YV5HL, 5H1HK, TA2Z, K8WW/VP9 and K2SG/NP1.

Our last reporter on this band is GW0IER who offers c.w. with UO5ON and KY2O.

The 7MHz Band

Let GW0IER lead off this time: Brian found his c.w. effective on UT5UAA, UY5XP, BY5HN, PV0RV, W3UM, WA4ICK, W200KVI, W8FJ and W9VNE.

This was the favoured band at GM3JDR: Don mentions some 65 JAs for a start, then LU1MOE, UM8MBA, UZ0FWA, PZ1AP, RZ9OWA, W200ACW, TA1A, PP2ZH, ZL4IN, HK3MZM, PY5FB/PP8, PP6SS, VE6UX, VE6SF, UA0BFF, UW0CU, VS6UO, UA0JB, PZ1DV, KB6MVY/DU3, PT7AC, KX6/DL1VU, UW0LT, UZ0QWF, ZS6QU, UI8AFI, UA0BEZ, XE2ALZ, PT7SY, HJ3MEL, VU2IIT, ZS6DM, JY9FF, ZL0AFZ/9, ZL9AMO, AI5AA, KH6LE, PY3AVF, VU2GLL, OA4ZP, VU2ZAP, FJ5BL, AX2AKY, VP2E/N6RA, PY1ITA, ZL2VS, OK1XC/JT, K2SG/NP1, LU4NH, YV4AU, CE3PO, CE2BZU, J34WG, ZS6DF, RI7KU, UA0ZC, PP1IR, VK5OH, ZP5AL, UA0IW, 4K1J, HK1KXA, ZL2UV, J6LTA, VK2CCP, UW0FB, UA0ZC, VK9LM, FY5FE, ZL2BIF, YB4FN, ZL2LI, CI8HO, VK6PP, ZL2SQ, PY0FC, K6DC, N6AW, N6BAA, W6XR, WA6VNR, KI6MS, NE6I, N6IG, K6DJ, K6KSI, K6ZO, KA7T, W4JFE/7, W7CMO, KD7SO, WA2TMP/7, W6THN, K7GE, W7NA, W6ERS, N6TG, KL7CYL, N0GN, KJ6F, AC6G, N6RN; all the Ws were worked low power, between about 1400–1530Z. Now who says there isn't much to be found on 7MHz?

Another list in the same vein from G3BDQ: John offers c.w. with CU2BU, JA1NUT, JA1UQP, JA3CSZ, JA3DY, JA3EAP, JA3BCT, JA3PIS, JE3IHC, JA3BRB, JA4JND, JA3AQ/4, JA5RH, JH7BRG, JA0DAI, YC6JRV, VU2FOT, UH8BBQ, UI8OAE, UL7YAO, VK2KM, VK5KL frequently, PY1AF, PY7DH: PLUS s.s.b. to VO1MP and TP0CA.

Don at G3NOF mentions HK0HEU as his only victim on this band.

On to G4XDJ, who managed IS0LMM, W1KRV, SM6LJU, W9VNE, NE2P, K2POF, G4ITL, SM3SGP, KA3NIL, K3YOV and EC1CSI.

As for G2HKU, Ted mentions ZC4AP, WQ5W and PY0FC (Fernando do Noronha).

The 10MHz Band

As always a certain dearth of reports on these bands. While Don GM3JDR (Wick), seems to have given 7MHz a good working-over this time, he did manage to get on 10MHz c.w. to see off VK3NC, JA1BWA, JA2SQF, W1, W2, W3, W4, W8 and W9.

Lastly, a report from G4ZAU (Oswestry), Dudley stuck to 10MHz, on which band he found CT3DJ, 4X1LL, J6LAD/9Y4, KP4TIN, VK3DQ, EA8, Ws and VEs, 3A2EM, 4Z4DX, PZ1DV,

VK5FE, ZL4QY, 5B4OG, TI2CCC, CU2AR, UA6EAZ, UA9MM, UA9TS, FT5ZB (Amsterdam Is.), JW0B, UA1HT, UZ6EWA and RI8BN and various smaller fry.

The 14MHz Band

GW0IER notes that during the month he worked four more towards the 100 countries. On c.w. yielded CN8VE and ZC4EE.

The GM3JDR contribution was, on c.w., AL7GP, UA0QN, UA0KAT, TR8JLD, UZ0KWP, 4K0E, VK8CW, 3D2VU, while s.s.b. made it to ZL9BQD.

At G3BDQ it was mainly c.w., including HC1GC, HK3RQ, KL7PJ, WL7BDK, TP0CE, SJ9WL, VK8MQ, YB0DPO, VE7XM, 9M2FP and 9M2FS. There were just ZLs and VKs on s.s.b.

The G3NOF analysis shows VK/ZL most days on the long path, 0730–1000, with short path between 1000–1200Z. Over the North Pole into the Pacific was good 0730–1000 and again around 1900 to KH6, KL, VE8. West Coast Ws peaked around 1600, but the States generally were to be found between 1100 and band closure, sometimes in the small hours. There was s.s.b. made it to A35PP, BY4AA, C56/DL6NA, CI8CW, G3AYO/TF, GM4DMA/VE8 (Ward–Hunt Is.), JA4KFA, JA5RH, JT5AA, KL7WK, NI7J (Montana), NL7JZ, PS7KZ/AM over Brazil, T25TT, UJ8JX, VP9LL, W7IHI (Utah), many VKs, YJ0APE, VO1SA/UA0 (The VE/UA Ski-trek), ZL5BKM (Scott Base, Antarctica), ZL2AUR, ZL2AXC, 3B9FR, 4K0D at the N. Pole, 4X6TT/FW and 5T5EV.

The G4XDJ crop included EA5AM/7, PT2DMS, VE3OCP, VE3LXJ, YB0XX, OE8KMK (QRP), 4Z4OX, UM8AV, K1JDP, W2OOTLC, SM5PDS (QRP), VK5ZN, AX6ZH (QRP both ways), W1MOZ, 4Z4MY, WB4AWQ and W2OOQ.

VK2AU comments that from his QTH the long path into Europe is wide open, while the short path produces briefer but strong openings, with A1 G3FXB one of the strongest signals. The short path to USA has also been super with people dishing out reports of S9 plus 40—obviously uncalibrated S-meters!

The QRP from GM4ELV yielded JW8FG (Bear Is., QSL direct), CN8SF, 6W100ME, EA0ENA, CN8ST, TV6GEN, VX1CYL, 5T5CJ (QSL via W4BAA), TP2CE (QSL via F6FQK and from the c.w. end, VK6WT.

The 18MHz Band

G2HKU looked at 18MHz for LZ1DZ and YU5FAD, while on 24MHz he found FY4EE and N2BTO.

GW0IER was trying out a keyer passed on by GW3DEX, and found WB2PTH, K4UL and W8EGB.

The 21MHz Band

A likeable band this. GW0IER mentions s.s.b. with TU2NA, SV1VS, VE5IJP, YB8ZA, YC9HMU, and c.w. out to LU2KB, N4NO, N5IZY, PZ1AV, UL7EC, VE1, VE5, PY2OW and W6QJI.

GM3JDR has been using c.w. here, where AI5AA, HL1IXP and a gaggle of Ws and JAs were booked in.

On the other hand, no c.w. from G3BDQ: John used s.s.b. for A4XYT, A92BE, A92EM, OK1XC/JT, RA0AW, EL7X, TA1AR, TA1Q, TZ6VV, TU4CT, HR3JJR, W6KG/4S7, VS6EF, CN8ST, TI2HL, T15MRC, CX4ABY, XE1HOS, FR5DX, VP9LJ, VE3OSN/VP9, Z21BP, F2JD/A6, KH0AC (Saipan, N. Marianas), VE7AUC, VE7DGI, VE7FDR, VE7TG, VE8ID, YB1AQC, YC1JNJ, YC1QL, YC7JK, YC0FEX, YC0DKX, YC0USJ, YC0UTP, JA1TTY, JP1NWZ, JH1CCN, JJ3LLT, JI6POZ, JF8CNU, JA8EPO, 3V8ALI, 5Z4SS and 9K2RA.

G3NOF says the long path to JA has opened most mornings around 0800Z for an hour, with the short path opening 1000–1200Z. S. America was in evidence from 1100 on, VK/ZL 1100–1300. Don made s.s.b. contact with A4XKB, AX4NSB, CI8CW, F2JD/A6, FR5DX, FY5EM, HC1HT, HL1XP, HL2INX, K2NG/PJ4 (Bonaire), K6VI (Arizona), KC0CU (N. Dakota), many JAs, JT0NP, JT0TJ, P29KGW, P29NAC, P40V, T25TT, UA1OT (Franz Josef Land), VE7AGC, VE1G, W7CFL, WB0CQF (Colorado) and 9Q5DG.

G4XDJ offers VS6WA, W8NPF, G8PP/VO2, W5XJ, CU2BU, YC0TMZ, VE3BSA, W9QYH, K3BMI, N2OOBC, W8KIQ, WA3PGO, W2RP, KA1LBH, VE3OID, KP4TIN, KJ1C, W3BYI, SV1AIP, CN8FC, RA0JD, JA8EPO, HK3RQ, YB4FN, VE1CHP, WA6YOU and AA4VX.

Finally, the list from GM4ELV, which includes TP2CC, JW6EDA, KW3X, KT3S, VX3XU (via VE3CGO) and UI8ZAA.

The 28MHz Band

G4XDJ (Billingham) offers ZC4AP, G4TYF, EA5FTE, VO1MP, CE1HBI, UA6YA, with VKs as prime Gotaways.

G3NOF (Yeovil) says the band has greatly improved as far as he is concerned; USSR signals have appeared during the mornings and around noon, 4X-5B-ZC4. Africans and South Americans have been around throughout the day, while North Americans, mostly from W4 and W5, were on from about noon. Don himself heard nothing of VK or the Pacific but others are known to have worked these. In the few days before his letter, Don noted the Ws were in evidence as late as 2130Z. He made s.s.b. contacts with A4XZK, CE2BMU, CP6RP, DJ2ST/EA8, FR5DX, FR5EL, FY/FD1MAY, HB9CUZ/5N9, J28EV, J52US, JY9LC, K2NG/PJ4, KP4GN, OD5PL, OD5VT, P40V, PA3AXU/SU, PY1ZFO/0F, PY0FC, S0RASD, SM0OIG/LU, TJ1DL, TU2QQ, V31HQ, V47NXX, VP2EC, Z21JE, ZC4EE, ZD7XY, ZD8RP, ZF2KN, ZP5JCY, ZS2AAN, ZS6BJH, 3B8FB, 4X4JU, 4X6DK, 5H3RB, 5T5JM, 8P6SA and 9Y4DR.

Now to GM4ELV (Glasgow), who offers QSOs with SV2FE, PJ6/WA3ZBI, NP4CC, TR8JLD, TI8CBT, EA9IB, 5H1IK, OX3SG, 9J2AL (QSL via WD0HHM), S0RASD, ZS6BQ, PY8CL, ZD8MB, 5B4TI, ZC4ET on c.w., ZC4AP, YV6BXW, TA2AO, TU2QQ (QSL via F6FNU or PB 54, Abidjan), VK6MV, PA3AXY/SU, J28EV (QSL via F6FTD) and LU3DOV.

G3BDQ (Guestling) stuck to s.s.b. on this band and made contacts with AP2FI, FP5HL, FR5DX, J28EV, PY5CA, PY5EG, EA8BPX, TA3D, SV0DX, UL7OB, UA9ZZ, ZP5JCY, Z21GU, VK6ADP, VK6CI, VK6PTC, VK6CP and 4S7NMR.

Final comments on this band from VK2AU; John notes that the Ws have been 59, UAs, EAs, H44, FM5, T22TT, T22JJ, 3D2, XEs, KH6, KH2 but no G stations!

Contests

Just a reminder: the Russian CQ-M Contest is 2100 Sat to 2100Z Sun, May 14/15, c.w. or s.s.b., 3.5 to 28 MHz. We give RST plus 3 figure serial number, Russians give their report and Oblast number. Don't forget it's a world-wide job, so work everyone. Multiplier is countries worked on the Russian list, which is similar to DXCC plus Oblasts 2, 13, 14, 56, 84-5-6-7-8-9, 90-1-2-3-4-5-6-7-8, 159 and UA1 Novaya Zemlya, UA0 Kuril Is. and UA0 New Siberian Is. Usual prizes and trophies to the various winners and a badge to everyone who works more than ten USSR stations; contest QSOs credited towards Russian Awards if you ask at the time you submit the log. Mailing deadline July 1, addressed Krenkel Central Radio Club, CQ-M Contest Committee, PO Box 88, Moscow, USSR.

May 28–29 is the CQ WW WPX weekend. Rules are the same as for the s.s.b. leg back in March. Mailing deadline July 10, and all logs this year to CQ Magazine, WPX Contest, 76 N. Broadway, Hicksville, NY 11801, USA.

VHF Up

Reports to Norman Filch G3FPK
40 Eskdale Gardens, Purley, Surrey CR2 1EZ

With a quarter of the year gone, there really has been nothing very exciting to report on the v.h.f. bands, at least via tropospheric mode. To offset this, there have been a few Auroras in which the more northerly stations, in particular, have worked some respectable DX. Apart from the exceptional Ar on Feb 22, however, the more southerly stations have only managed to work the usual GM, GI, LA and SM stations.

The Beacon Scene

Brian Bower G3COJ (BKS), in his capcity of IARU Region 1 v.h.f. beacon coordinator, has sent a status report of all UK beacons in the 28 to 430MHz bands. The following list is in order of frequency/call/locator/e.r.p./antenna/QTE (antenna beam heading) and status as in mid-March.

50.020	GB3SIX	IO73TJ	100	3-ele Yagi 270° Temp. QRT
50.0225	GB3CTC	IO70OJ		proposal
50.050	GB3NHQ	IO91VQ	15	turnstile Omni
50.0575	GB3NGI			proposal
50.060	GB3RMK	IO77UO	30	folded dipole 0/180°
70.030	GB3CTC	IO70OJ	40	2-ele Yagi 45°
70.040	GB3REB			not yet operational
70.050	GB3BUX	IO93BF	20	2 turnstiles Omni
70.060	GB3ANG	IO86MN	100	3-ele Yagi 160°
144.915	GB3CTC	IO70OJ	40	3-ele Yagi 45°
144.925	GB3VHF	JO01DH	40	2 × 3-ele 315°
144.945	GB3EGI			not yet operational
144.965	GB3LER	IP90JD	50	3-ele Yagi 22°
144.975	GB3ANG	IO86MN	20	4-ele Yagi 160°
432.890	GB3SUT	IO92CO	10	2 × 8-ele 0/135°
432.910	GB3MLY	IO93EO	50	8/8 Yagi 150°
432.970	GB3CTC	IO70OJ	5	4-ele Yagi 45°
432.980	GB3ANG	IO86MN	100	9-ele Yagi 170°

GB3WHA is no longer operational due to the loss of the site. The 70MHz GB3WHA will be replaced by GB3REB while the 432MHz 'WHA will move to a new site when a suitable one is found.

The pests on 144.950MHz f.m. continue to make a mockery of the beacon band in the London area and when GB3EGI in Ulster comes on, it will not be heard.

Awards News

Congratulations to **Ela Martyr G6HKM** (ESX) who was awarded her "150" sticker for her 144MHz QTH Century Club certificate no. 47 on March 8. Three of the 25 new squares confirmed were worked via Sporadic-E mode; IC8EGJ (HA),

LZ2KSL (NE) and EA7ERS (WX), the remainder on tropo. The tropo ones included GM4DMA/A (AS), OZ1EVA/MM in BM and BN, SP3JMZ (IM), SP7GO (JL) and OY9JD (WW).

Ela asked if there are *PW* awards for the 1.3GHz band. Yes, both the QTHCC and VHF Century Club cover the microwave bands. Any reader wanting details of these two series of awards should send an s.a.e. to the Poole address.

Contest Notes

The next two legs of the 10GHz Cumulatives are on May 15 and June 19, 0900–2100UTC; see notes in the May VHF Up. On May 29 there is the 432MHz Trophy and s.w.l. event from 0900 to 1700. This is a three section affair, F being for single-op, fixed stations, O for all other and L for the s.w.l. fraternity. Entries go to GM8MJV at 2 Dudley Avenue South, Edinburgh EH6 4HH.

The 432MHz f.m. contest is scheduled for June 12, from 0800 to 1200 with the same F and O sections. Usual radial ring scoring but with county multipliers. Last year only eleven entries were received so this could be the last of the series if it is not better supported this year. The entries go to G4FRE at 15 Ferry Lane, Cavendish Park, Felixstowe, Suffolk IP11 8UR.

Worked All Britain

John Fitzgerald G8XTJ (BKS), the PRO of the WAB Group, has supplied the latest information on recent v.h.f. awards. Bob Nixon G1KDF (LNH) has the first Large Squares Class 2 award for 432MHz s.s.b., this for contacting 40 of the 100km squares.

In the Islands Award category G1SMI now has 110 worked, and has activated 90 himself on 144MHz s.s.b. Bob is also up to 2200 areas on the Honour Roll for v.h.f. G8XTJ has now completed his 1500 areas and 72 counties quest to achieve his v.h.f. Diamond Award. An s.a.e. to G4KSQ (QTHR) will bring full details of the WAB organisation.

Meteor Shower Data

There are a few potentially useful meteor showers in the offing the first being the Omicron Cetids which should peak around May 14. Its Right Ascension and Declination figures are 22° and –4° respectively and its radiant is above the UK horizon between about 0500 and 1500UTC. The best times should be; NE/SW 0900. E/W 1000, NW/SE 1200 while the N/S path, not quite so efficient, has a couple of peaks at 0700 and 1300.

The next significant shower is the Arietids on June 11 (RA/DEC 39/24°) which is above the UK horizon between 0100 and 1800UTC. Best times; NE/SW around 0700 and 1430, E/W 0900, NW/SE 1200 with a lesser peak around 0430, N/S 0600 and 1300. The radio reflexion rate-ZHR-is about one per minute.

The June Perseids peak around the 13th with a ZHR of about 40 per hour. (RA 63°, DEC 27°). This shower is over our horizon between 0200 and 2000 and best times are; NE/SW 0900 and 1600, E/W 1100, NW/SE 0600 with a good peak around 1300 and N/S two equal peak times around 0700 and 1500.

The peak times are suggested but reasonable success should be possible for an hour or two either side. In m.s. operation it has to be appreciated that because the geometry of the shower and participating stations might be optimum at a particular time, there is no guarantee that a schedule will be completed. Some years a certain shower might be well above average in the number of reflexions, other years well below par.

The 50MHz Band

The UK Six Metre Group has sent details of the ZD8MB beacon I mentioned last month, the frequency of which is 50.0325MHz and not as stated previously. It was designed, built and tested by Mike Walters G3JVL (HPH) and funded from the Group's beacon kitty. Hardware was supplied by Yaesu, South Midlands Communications and Nevada Communications. Randam Electronics provided the 5-ele Yagi.

The TX power is 50W from push-pull transistors and all harmonics are greater than 80dB down. For maximum reliability the p.a. transistors are fan cooled in addition to their being mounted on large heat sinks. The power supply is stabilised at 11V with 15A capability.

The keyer p.c.b. and technical assistance were provided by Dave Robinson G4FRE (SFK) and sends the callsign, "Ascension Island Locator II22TB AAAAAA" then the callsign again. The Group has also supplied a beacon for 28.29MHz ZD8HF with 50W output using a vertical antenna. Both are keyed simultaneously so that arrival time comparisons can be made in propagation studies.

Now some more overseas news from ZS6WB's *VHF News*. The first t.e.p. reception of the Cyprus beacon 5B4CY was by ZS6XJ (KG33) at 1435UTC on Feb 22 and lasted 20–30 minutes. 9J2WS in Zambia has a transverter but only a dipole antenna. These are 50MHz items.

Hal reports a fine signal from KG6DX in Guam on 28MHz and learned that Joe is QRV on 50MHz using an Icom IC-551D, Tempo 6N2 p.a. and 5-over-5 Yagi array.

In spite of the published details of French 50MHz licensing, nobody seems to have any Fs on the band yet. There are some rumours that several other European countries may grant permission for limited 50MHz operation but I will not publish anything until I hear something official.

At home, **Dave Ackrill G0DJA** (WMD) had started to build a 3-ele Yagi destined for mounting on a newly repointed chimney stack. He hoped to be QRV in the April 2 contest. **Peter O'Dowd G0HLT** (NOT) notes increased activity which he hopes will now continue.

Welcome to **Mike Gotch G0IMG** (ESX) who enters the Annual Table. **Tony Wayland G1HJW** (ESX) hopes to be QRV by now. He has a Yaesu FT-726R with 10W to a 5-ele Yagi by Tonna at 9m.

Adrian Gee G1IMM (CBE) should have a Spectrum 30W amplifier soon but is still waiting for some DX to arrive. One new county was Shropshire. **Gerry Schoof G1SWH** (MCH) added four more counties since his last report; G6ILY (CHS), GW6ARL (GDD), GD4HOX (IOM) and G1PAM (SPE).

Gerard Elliot GI4OWA has put Londonderry on the 50MHz map. He lists QSOs with GI6FHD (ARM), GM0EWX (HLD) and GM8COX (SCD). **Keith Boleat GJ6TMM** has installed a new Altron mast after last October's hurricane. He has a 4-ele Yagi thereon for the band and down below a Yaesu FT-690R Mk 2 and Nevada amplifier. In 1987 he worked seven countries on 50MHz.

Calum Macpherson GM0EWX on the Isle of Skye has entered the Annual Table with 26 counties and seven countries. The

QTH Locator Squares Table

Station	Band (MHz) 1296	430	144	Total
G3JXN	82	129	175	386
G3XDY	81	137	185	403
G6DER	76	110	183	369
G3UVR	75	125	224	424
G4FRE	63	136	84	283
G8PNN	62	97	128	287
GJ4ICD	59	119	253	431
G6MGL	59	89	138	286
G4NBS	59	103	102	264
HB9AOF	55	80	141	276
G8GXP	45	151	331	527
G3COJ	44	103	186	333
G4DEZ	44	38	246	328
G8ATK	42	89	138	269
G4RGK	38	106	260	404
G3IMV	35	119	405	559
G1EZF	32	93	241	366
G1KDF	32	91	149	272
G8HHI	31	106	148	285
G4ZTR	29	29	37	95
G4MUT	28	90	145	263
G1DOX	28	34	53	115
G6HKM	27	101	177	305
G6XVV	25	64	211	300
G6STI	21	58	124	203
G4FVK	20	46	75	141
G8XVJ	18	88	236	342
G6MXL	10	36	66	112
G6AJE	5	57	95	157
G8LHT	2	58	100	160
G4AGO	1	41	103	145
G2DHV	1	6	31	38
G4KUX	—	80	345	425
G4XEN	—	106	251	357
G4DHF	—	—	307	307
G4TIF	—	107	187	294
G4SWX	—	—	293	293
G0DAZ	—	91	183	274
G4SSO	—	78	195	273
I4YNO	—	—	270	270
G1LSB	—	126	125	251
G1EGC	—	77	172	249
G6DZH	—	87	149	236
G3NAQ	—	75	154	229
G1GEY	—	68	158	226
G3FPK	—	—	224	224
G4IGO	—	—	223	223
G4SFY	—	—	222	222
G4MJC	—	33	184	217
GM4CXP	—	31	184	215
G4MEJ	—	—	211	211
G8LFB	—	—	202	202
GM0BPY	—	57	129	186
G8MKD	—	49	137	186
G4XEK	—	—	178	178
G3ZDS	—	43	129	172
EI5FK	—	35	137	172
G4DOL	—	—	172	172
GJ6TMM	—	38	133	171
ON1CAK	—	—	167	167
G4CQM	—	52	100	152
GW4FRX	—	—	152	152
GW8VHI	—	48	102	150
GI1JUS	—	—	149	149
G4TGK	—	—	118	118
GW6VZW	—	6	106	112
G8XTJ	—	—	107	107
G1IMM	—	13	94	107
GI4OWA	—	—	78	78
G1SMD	—	—	77	77
PA3EUS	—	18	57	75
GM0HBK	—	—	74	74
G0FEH	—	2	70	72
GM0GDL	—	17	54	71
G1CRH	—	—	62	62
G0HDZ	—	—	61	61
G8PYP	—	5	52	57
G1VTR	—	23	32	55
GU4HUY	—	—	54	54
G1NVB	—	—	49	49
GM8DFX	—	—	20	20

Starting date January 1 1975.
No satellite or repeater QSOs.
"Band of the month" 1296MHz.

counties you asked about, Calum, are GW3XYW (GNW), EI9Q (Waterford), G1IWV (HBS), G0GZI (CHS), G3AWL (DHM), GM8COX (SCD) and G0FSF (SFD), four of which I have added to your claimed 22.

Paul Baker GW6VZW (GWT) now has his 2-ele Yagi outside at 9m a.g.l. Up to March 22 he had 18 counties worked and selects the best as G1HOW (BKS), G4ZFQ (IOW), G6XHQ (LDN), G1VXW (WMD), G1YOU (DVN) and GJ4ICD. He hoped to be on in the April 2 contest.

The 70MHz Band

George Haylock G2DHV (LDN) has entries in the Annual Table and c.w. Ladder and hopes to take advantage of contests to improve his scores from a poor location.

John Jennings G4VO2 (LEC) was dismayed by no reports in the April issue. However, he reports lots of new calls heard recently but notes they come on for a while then just vanish.

He highlights the following QSOs: Feb 28 GW3WOS/P (GWT) and G4YNL/P (WLT) on s.s.b.; G8MLA/M (NHM) on Mar 1 and G8SSL (NOT) on Mar 7, both on f.m.; G6YZC/P (CHS) on s.s.b. on the 13th; G4KUX (DHM) on c.w. on the 15th and G6DER (YSS) on the 16th. That last was quite a struggle as Keith was QRP so completed on c.w. at RST419.

Welcome now to **Bill Cook GW1IVS** (PWS) who has just competed a *PW* "Meon" transverter which he finds excellent. A 25W p.a. feeds a dipole. He is QRV on all modes and hopes readers will turn their beams to mid-Wales. Bill is so delighted with his Meon that he plans to build one for 50MHz too.

The 144MHz Band

Eddi Ramm DK3UZ (EN20c) has sent in a list of stations worked in this year's Ar events, the last one being that on Feb 22. He started at 1138 with SM4CFL (GT) and ended at 1623 with SM5EFP (HT).

He listed 31 QSOs with stations in 23 squares and 14 countries, most being very choice DX in anyone's log. I would pick out SM3AKW (JW31h), OH1NSJ (KV50h), UA1XM (NR19g) and the most southerly contact OE3UP (IH12g). By far Eddi's best DX was UA1ZCL (RC08c) at 1450 with a QTE of 10°, the QRB being 2132km. Reports were RST52A each way. All QSOs were on c.w. mode.

Johan Vande Velde ON1CAK (Liedekerke) reports poor propagation, apart from the Feb 22 Ar in which on s.s.b. he worked GM0EXN (YS), GM8DFX (XS) and GM1SZF (YS). He operated between 1500 and 1908. His brother **Geert ON1CDQ** worked 16 stations in a dozen squares. Apart from OZ8UW, SM6RWY and OZ1IPU, all were in the UK and on s.s.b.

G0DJA continues his QRP c.w. operation and measures his success by the number of miles per watt. Dave has 48 on the band for the c.w. ladder so far. **Ian Rose G0HDZ** (ESX) had antenna problems—his dog chewed through the coaxial feeder. That apart, he added five more counties, including DHM and DOR, and PA for a new 1988 country.

G0HLT uses a Kenwood TS-711E and 9-ele Tonna Yagi at 12m, the QTH being 140m a.s.l. In generally flat tropo conditions, Peter mentions QSOs with G4NPM (DVN) and G0ABB (HPH) on c.w. from Nottingham. G1HJW also reports quiet conditions from Essex with just, ". . . the usual PAs, Fs, ONs and DLs up to the 30 lines . . ." worked lately.

G1IMM's best DX so far from Cambridge is G6YEK (CNL) and Adrian already has 42 counties worked this year. **Bob Nixon G1KDF** (LNH) commented upon the mediocre tropo conditions since the Ar on Feb 22. Even so, he is doing very well in the Annual Table, as always, as is G1SWH. Gerry has worked down to G0GRW/P (SXS) and over to EI7BJB (Kildare) and ON4ASL in the March 5/6 contest and down to G4YRY (DOR) on the 13th, from Manchester.

G2DHV also took advantage of the contest to help his table scores along. **Ian Cornes G4OUT** (SFD) has joined the FISTS CW Club which I mentioned in the May issue. He says many c.w. contacts are now giving their membership numbers and that many have expressed interest in our c.w. ladder.

G6HKM has replaced her storm damaged antenna with a 15-ele Cue Dee Yagi. Ela is pleased to get back into contesting again and was QRV in the Derby Club's effort on Mar 13. The antenna is working very well and she has been getting to Ulster with QSOs with GI4KIS and GI0GDP. On March 20 she worked G4MTR (CBA) and successfully tried f.m. mode as well as s.s.b.

Ian Harwood G8LHT (YSS) is determinded to keep to our copy deadlines but has little to report apart from a couple of periods of contest activity. Back on Jan 14 in an Ar he worked his 100th square —GM0HBK (XR). He has received a QSL from RB5EF (KN78EQ) in RI square, worked via Es on July 10 1987. The Russian was using 5W and I make the QRB about 2520km from Sprotborough.

G8XTJ has just received confirmations for AS, FH and VD squares, and John only needs two more for the 100 and his QTHCC application. He found new 1988 counties in the March 5/6 contest.

GI4OWA reckons the contest ". . . was a disaster . . ." with very few stations heard from Londonderry. The odd thing was that what were heard were mainly from the far south-east and very weak. As observed from G3FPK, conditions were pretty poor, as I mentioned last issue.

GM0EWX has ten counties from Skye so far this year. These include I1ANP (EE) and SP9EWU (JK) which I assume were m.s. contacts. Your counties queries are: G1EZF (YSW), G0DAZ (HWR), G0HLT (NOT) and G1VKT (LNH).

Another new contributor is **Colin Robertson GM0HBK**, another Skye resident in XR71a, who has been a *PW* reader for several years. His main interest is v.h.f. DX and in the last two years, s.s.b. mode has provided 74 squares in 20 countries via tropo, Ar, Es and s.s.b. m.s.

His station comprises a Yaesu FT-290R and Microwave Modules MM100-LS amplifier giving 70W, the antenna being a 19-ele Yagi by M.E.T. The Ar events of Jan 2, 16 and Feb 22 brought many of his 44 counties this year. Colin and Calum keep in telephone contact so as not to miss any openings. He is also active on 50MHz.

John Lincoln GM8DFX (HLD) has worked someone in his own square, XS, at last. That was GM0/DL8KCW on an early vacation some 500 metres distant in Bettyhill. All the table counties except three have been worked via Ar on s.s.b. mode, the exceptions being GM0EXN (HLD), GM1RQD (OKE) and GM3JIJ (WIL).

During the early March contest, GW6VZW worked GM0FRT (YR) for an all-time new square and county and the furthest north station by tropo. Other contest QSOs included ON1CBQ (CK) ON4ASL/A (BK) and PE0MAR/P (CL).

Annual c.w. ladder

Station	Band (MHz) 50	70	144	430	Points
G4ZEC	—	—	207	—	207
G0HGA	—	—	165	—	165
G0HLT	9	—	117	—	126
G4OUT	—	—	123	—	123
G4ZVS	—	—	80	—	80
G3FPK	—	—	60	—	60
G0DJA	6	—	48	—	54
G0GKN	—	—	52	—	52
G2DHV	—	12	20	—	32
G4VOZ	5	14	—	8	27
GU4HUY	—	—	3	—	3

Number of different stations worked since January 1.

After the deadline for letters there was a period of good Auroral propagation. I had a telephone call at 1545 from GM0EXN that it was already under way on March 26 and that John reckoned it would build up to something significant.

I was unable to get on the band till about 1800 when there were some c.w. signals around, but not many in south London. By contrast there were several very loud s.s.b. signals but which were extremely difficult to read.

By far the strongest signal was SM4GVF (JO79NC) but that is not surprising bearing in mind Kjell's e.m.e. capability. The usual GMs were nothing like as loud as usual though, but I did hear GM4YXI and G4KUX working Finnish stations which were inaudible in ZL60j. It did not help that a local toy computer was in use in the next road with its Ar-like noises to increase the band noise.

I left the c.w. end of the band around 1915 when the signals were getting too weak to copy. There was a second phase from about 2245, so John Hunter G3IMV (BKS) informed me, and Paul Pasquet G4RRA (SRY) said it went on till about 0300. SMs were available and Paul said that RQ2GAG was very loud at 0147. His best DX was SK7JD (IR).

Band conditions on h.f. were quite appalling the next morning so it was no surprise that another Ar occurred later on the 27th. I missed this as I was writing this copy. G3IMV said that SM4GVF was QRV again from about 1730. I look forward to receiving your reports for next month's VHF Up.

The 430MHz Band

G1IMM reports very quiet conditions on the band but Adrian did work a few new 1988 counties in the March 5/6 contest. G1KDF did not mention what he had worked but Bob's table score has already reached the 50 points mark.

G1SWH used the contest to find four new ones; G4BVY (HWR), G7AAB/P (YSN), GM4ZUK (GRN) and GW0FRE (GWT). On the 11th Gerry worked G1IMM and on the 18th GW3KJW (GDD). The only QSO G3COJ noted was with G1GEY (TWR) the first contact with ZO square since 1975.

G4VOZ reckons 430MHz, like 70MHz, to be a "super band" So John is very disappointed at the low level of activity so far. G6HKM's additions for this month were mainly contest QSOs and Ela has added another eleven this way.

The next three deadlines are: June 1, June 29 and July 27

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DF96	0.85	ECF82	0.55	EL82	0.70	GZ37	3.95	PY81/800	0.85
DH76	0.75	ECF802	1.00	EL84	1.35	KT77**	14.00	PY82	0.75
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EBF80	0.95	EF83	3.90	EM87	3.00			UBF80	0.70
		EF85	0.60						
		EF86	1.45						

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UCC85	0.70		
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GJ6TMM has an 18-ele Yagi on the new mast now and Keith hopes to have a single 4CX250B amplifier on the air soon and to make an entry in the 430MHz column in the Annual Table.

The Microwave Bands

G0DJA was looking forward to the first contest and had planned to give his 10GHz gear a final check-out on the March 26/27 weekend. Dave hopes to be active on 10GHz and 24GHz from the Wrekin, near Telford.

The only contact in March, up to the 23rd, for G6HKM was with G6KHW (BFD) to give Ela her 6th county for the year.

The last time I published the 2.3GHz All-time Table was in December 1987. Since then only G6DER and G3XDY have amended their entries. If G3JXN, G8TFI, G8PNN, G6YLO, G1DOX, G8GRT and G6OYL read this, please let me know your latest scores. If I hear nothing I propose to drop this table so that the space can be better used.

Annual v.h.f./u.h.f. table
January to December 1988

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Total Points
G1KDF	6	3	—	—	62	10	44	6	9	3	143
G4XEN	18	3	—	—	48	12	37	7	—	—	125
G1SWH	13	3	—	—	52	7	29	5	—	—	109
G6HKM	—	—	—	—	51	9	33	3	6	1	103
G1IMM	8	1	—	—	42	5	28	2	—	—	86
G1EZF	—	—	2	1	56	18	—	—	—	—	77
GW6VZW	18	3	—	—	47	8	—	—	—	—	76
G3FPK	—	—	—	—	63	13	—	—	—	—	76
GM0HBK	12	6	—	—	44	13	—	—	—	—	75
GW4FRX	—	—	—	—	49	16	—	—	—	—	65
GM0EWX	26	7	—	—	20	10	—	—	—	—	63
G6MGL	10	1	—	—	41	7	—	—	—	1	60
G0IMG	10	2	7	1	28	5	5	1	—	—	59
G8LHT	—	—	—	—	22	5	27	2	—	—	56
G4VQZ	10	3	21	3	—	—	11	2	—	—	50
G8XTJ	—	—	—	—	41	5	—	—	—	—	46
G2DHV	—	—	8	1	22	6	7	1	—	—	45
G4ZVS	—	—	—	—	34	5	—	—	—	—	39
ON1CDQ	—	—	—	—	26	10	—	—	—	—	36
ON1CAK	—	—	—	—	27	8	—	—	—	—	35
G0HGA	—	—	—	—	30	5	—	—	—	—	35
G0HDZ	—	—	—	—	30	5	—	—	—	—	35
G8PYP	4	2	—	—	16	4	4	1	—	—	31
GM8DFX	—	—	—	—	20	8	—	—	—	—	28
GJ6TMM	1	1	—	—	13	7	—	—	—	—	22
G6MXL	1	1	5	1	4	1	5	2	—	—	20

DXpeditions

G1KDF is planning to operate in the Irish Republic during a short vacation from May 28 to June 4 using his EI3VVN callsign, 144.260 and 432.190MHz are the QRGs to listen on.

Bob will activate some rare EI counties on the main travelling days, 28/5 and 4/6. Main operation will be from County Mayo in UO square at the beginning of the week and at the end from County Donegal in VP square.

He will not be taking any advance skeds as it is a holiday trip. Anchor man in the UK will be Dave Lee G6YGP in Ormskirk (LNH) who will be kept informed of Bob's whereabouts and of any problems. His telephone number is Ormskirk (0695) 76387. Most operation will be in the afternoons and early evenings.

GJ6TMM will be operating portable from near St. Nazaire in French department No. 44 in YH square during the last two weeks of July.

The Square Bashers Group is planning a trip to the Rock of Gibraltar this year, from which they hope to operate from June 1 to 13 inclusive. Tim Kirby G4VXE (GLR) told me that there will be ten in the party and that they will take gear for 50, 70 and 144MHz.

They will be on the European v.h.f. net frequency around 14.345MHz and also the talk-back QRGs of 28.885 and 28.385MHz for 50MHz liaison. The 50MHz working frequency will be 50.165MHz with general listening on 50.200MHz using an Icom IC-551 and a 3-ele Yagi.

On 70MHz the same decimal frequencies which will be sensible for band hopping. They will have a 100W solid state amplifier on this band a 3-ele Yagi. On 144MHz the working QRG will be 144.265MHz and if there are any Es openings they will be around 144.300 plus/minus 10kHz. For c.w. m.s. 144.032MHz has been chosen.

Rather than make lots of skeds by letter and telephone, later to find half of their partners never show up, they will make arrangments for m.s. skeds on the v.h.f. net. An innovation will be an answerphone service which will provide daily updates about the ZB2 activity. The number is Worcester (0905) 23607.

Given this group's track record, we should expect a fine performance from ZB2IQ. Es openings on 50MHz and 70MHz ought to be frequent in this period and on 144MHz my records suggest at least one opening on average every two years.

They should enjoy some good DX along the Mediterranean and IT9 and 9H should be workable from time to time. There is evidence of a double-hop Es-type propagation from Iberia to Israel, so they might end up with some "firsts" from ZB2.

There are other fascinating possibilities to the Azores, Madeira and the Canary Islands while t.e.p. on 50MHz could bring some surprises.

CW on 144MHz

My remarks on this topic in the April issue brought a response from G3COJ, a member of the RSGB's VHF Committee. Brian wrote: "January *RadCom* is wrong in implying that 144.25 and 145.25MHz were selected for slow Morse broadcasts at a recent VHF Committee meeting. In fact these frequencies have been specified for this in the band plan for a long time."

However, Brian appreciates that it may be time to reconsider the GB2RS news broadcasts and slow Morse sessions on 144.25MHz in the light of current band occupancy. He assumes the Committee will consider the matter in consultation with ". . . the Slow Morse Organiser when he is appointed."

This is all very well, but we need some action now before the Es season gets under way. By the time an SMO is appointed and meetings are arranged, it could be months before anything gets into print. Surely all it needs is for the C-in-C of each "teach-in" on 144.25MHz to QSY to 144.475MHz or some similar frequency, well away from the likely DX? Just because 144.25MHz is "designated" in some out-of-date band plan does not mean that it must be used!

Eric Woolley GU2FRO (SRK) wrote: "I entirely agree with your remarks and hope that something can be done to keep c.w. below 144.150MHz, particularly since all UK beacons are now above 144.800MHz."

My own conclusion is that the London problem has not been appreciated by the VHF Committee, mainly because only one member lives in London and should be aware of the situation. What this Committee needs is at least a corresponding member living in a well-sited London area, who is operating most every day. He or she would be the best person to give the facts.

Australia on 52MHz?

The GB2RS News Bulletin on March 6 included an item that LA6QBA (JP61) claimed to have heard the beacon VK6RTT on 52.300MHz between 8 and 9 o'clock local time on Feb 21. There is an operational beacon with this callsign but it is on 52.320MHz from a place called Wickham. I cannot find Wickham on any of my maps.

The solar flux that day was about 110. Using a modified version of the "Emuf" program in amateur Radio Software I found the h.p.f. from Norway over the short path to VK6 would be below 29MHz and below 43MHz from VK6 to LA.

For F-layer propagation the solar flux would need to be around 245, the value possible at the peak of a very good sunspot cycle, to achieve an h.p.f. of 52MHz at the Norwegian end.

There seem three explanations: 1) LA6QBA was mistaken in what he heard. 2) It was a hoax. 3) There exists a type of propagation across the polar region of which we are ignorant. A tape recording could reveal a lot, of course, but no mention was made of any such evidence.

RTTY

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS

I have received yet another plea for Atari 800XL software, this time from **N. A. Ashby** in Wembley. Fortunately, I have been doing some digging and have discovered a little bit of good news for owners of these computers. The Winter 1987 BARTG (British Amateur Radio Teleprinter Group) magazine DATACOM contains a very interesting article by Mike Bowthorpe G0CVZ.

In his article, Mike has listed some 26 programs ranging from simple radio formulae to RTTY transceive. All the software is written for systems running disks and you will probably have to type the

programs in too. Back issues are available to BARTG members from Pat Beedie GW6MOJ, Ffynnonlas, Salem, Llandeilo, Wales SA19 7NP. This is also the address to write to for any other details about BARTG, such as membership, etc.

While on the subject of BARTG, the 1988 rally date has been announced. It will be August 28 at Sandown Park Racecourse, Sandown, Sussex.

Readers' Letters

I have received some news of a new DX club which is know as 34DXC. The name stems from all the members being on the 34 degree parallel. **Colyn Brookes** (Cape Town, SA), their President/Treasurer has written with the details. Although the club is still very small, with only 22 members, it is expanding rapidly. There have even been enquiries from the States. They are concerned with all transmission modes, including RTTY, AMTOR and FAX.

The station Colyn runs comprises a HAL ST6000 terminal unit and the HAL DS3000KSR. The station computer is a Commodore C65C, but unfortunately Colyn finds the software expensive to get hold of in SA. Incidentally, the rig used is a NRD-515.

Glynne John Hather has written giving details of his RTTY station. Glynne uses a Sony ICF7600D portable receiver which is linked to a Microwave Modules MM2001 RTTY to TV Converter. The output of this MM2001 drives a TV directly without the use of a computer. He reports very good results with this very simple set-up.

Mr M. S. Hughes has posed a question asked by many newcomers to the hobby. What is the best method to start a RTTY system? So, I would like to hear from readers as to what they used to get themselves started in the hobby. How many took the route I did and built their terminal units from kits, or how many designed their own. Let me know and I can pass on your advice to others.

Around the Bands

The highlight this past month was the BARTG h.f. RTTY Contest on March 19/21. **John Barber G4SKA** has sent in his very comprehensive contest log. It looks like he started operating at 1941 on the 19th, signed off at 2200 that day, started again at 0751 and kept going then until 2356 on the 20th. He reports that the band conditions seemed to be very good, particularly for stateside stations. The leading station appeared to be NG7P who had made 560 contacts with only three hours left to go. John commented that is the highest number of contacts he can ever remember being worked during a BARTG contest. No doubt the results, when they appear in *DATACOM*, will let John know whether he is right or not.

John Jones G4PKP in Liverpool was heard going well on Sunday afternoon, so perhaps there will be a G-station well up in the placings. Last year's winner, Roy Gould KT1N, was also scoring well then.

In addition to the stations worked during the contest, John has a couple of "gotaways"; they were 4U1UN in New York (QSL via NA2K) and J39BS in Grenada (QSL via WB2LCH). Two weeks later John worked 3C1MB on Malako Bioko Island, Equatorial Guinea (QSL via EA7KF, PO Box 8035, Seville, Spain).

I had been intending to operate in the BARTG Contest this year, that was until I was loaned out to the local radio club for an open day. The idea was to encourage new blood into the hobby by inviting local sixth formers to attend. Unfortunately, this does tend to restrict the amount of operating you can do, especially when working with a temporary half-size G5RV antenna.

Despite the handicaps, I did manage to work some quite interesting stations. I started on 14MHz (where else) where I worked an assortment of European and Eastern Bloc stations. After getting bored with this, I thought I would have a look at 28MHz. Lo and behold, it was wide open. I worked A22BW (Botswana) and heard 3C1MB (the one John worked later) as well as a selection of PP and PYs (Brazil). Not bad for a temporary lash-up, I only wish I could have got at a good antenna.

On to packet radio now, where I have a report from **John Wiliams GW4TSG** (Llanrwst). He runs a BBC Master computer with an EAE PK-232 terminal unit. The transceiver is a Yaesu FT-757GX which feeds a 3-element Tri-bander. His log covers the period between March 17 and 21 where he includes 15 different and unusual prefixes. You can see the range of stations he picked out as being the best from the chart, as he is the only packet entry this month.

Don't forget to write in with your logs for the 22nd Alessandro Volta RTTY contest that I'm sure you all had a go at on May 7/8! If you wonder who Volta is, he was the Italian who discovered electricity.

Radiocom

Some of you may remember that I recently mentioned a new RTTY/ASCII/c.w. program for the IBM PC and clones. **Julian Moss G4ILO** is the author of this program and kindly sent me a copy for me to look at. The program in its present form supports the following modes:

RTTY (ITA No. 2)

45 Baud
50 Baud
57 Baud
75 Baud
100 Baud
110 Baud

(all with 1 or 2 stop bits)

ASCII

110 Baud
150 Baud
300 Baud

(all with 1 or 2 stop bits; odd, even or no parity and seven or eight data bits)

c.w.

6–40 w.p.m.

The program is supplied on a 5.25in disk as a "share-ware" package. This means that the program can be freely copied to other users in its original form, but if you register with the author you are guaranteed a copy with the latest enhancements. Registration with the program's author, at the moment, costs £12.

As with most "share-ware" programs, the manual is supplied as a text file on the disk which you have to print out yourself. In this case it comprises 24 pages, each neatly laid out and indexed.

The hardware requirements are quite straightforward, being a IBM PC XT or compatible with either a monochrome display adaptor or a colour graphics adaptor or the ability to emulate one of these. The communication between the computer and the terminal unit requires a serial port COM1.

Probably one of the most popular IBM clones is the Amstrad PC1512 and as the program was written on one of these there should be no problems. One point to note is that the serial interface uses true RS-232 levels so you will need a terminal unit that can handle these voltages or alternatively use a convertor.

	Band (MHz)			
Prefix (Country)	3·5	14	21	28
A,K,W (USA)		APR	R	
A22 (Botswana)				R
DA,F,J,K,L (W.Germany)		R		
DU (Philippines)		P		
EA,C (Spain)		R		
EA8 (Canary Is.)		P		
F (France)	P			
G (England)	P	R		
GI (N. Ireland)	P			
GU (Guernsey)		P		
HA (Hungary)	R	R		
HB (Switzerland)		PR		
HK (Colombia)		P		
I (Italy)	R	R		
IT9 (Sicily)		R		
LA (Norway)		R		
LU (Argentina)		P		
LZ (Bulgaria)	R	R	R	
OE (Austria)		PR		
OH (Finland)		R	R	
OK (Czechoslovakia)		R		
OZ (Denmark)		R		
PP,T,Y (Brazil)		AR		
RT (USSR)		R		
SG,K,L,M (Sweden)		R		
SO,P (Poland)		R		
TF (Iceland)		P		
TI (Costa Rica)		R		
UA,V,Z (USSR)	R	R	R	
VE (Canada)		P		
XE (Mexico)		P		
YB (Indonesia)		P		
Y (East Germany)		R		
YO (Romania)		R		
YU (Yugoslavia)		R		
YV (Venezuela)		R		
ZF (Cayman Is.)		P		
3C1 (Malako Bioko Is.)			R	R
4N (Yugoslavia)	R	R		
4X (Israel)		P		
6Y (Jamaica)			P	
9K2 (Kuwait)		P		

In use, the program has a good professional feel to it with a very comprehensive screen display. The top line lists the main commands and acts as a very useful reminder, whilst the bottom line shows the status of the program indicating the time, mode and speed, etc.

The centre of the screen contains two areas, one of which is the monitor screen whilst the other displays the type ahead buffer.

In order to simplify the selection of the various options, extensive use has been made of pull-down menus. This results in the very easy and fool-proof selection of parameters.

To speed the transmission of common details there is a configuration file which can hold 14 macro keys, these are similar to programmable memories. If more information is required to be stored then each of the ten function keys can also be used to recall text.

The contest operator is well looked after with a facility to store and easily update a serial number.

Finally, the keen DXer will be pleased to see an auto-CQ facility which will automatically send a pre-compiled CQ call at the start of each minute, ideal for 430MHz RTTY!

To conclude then I think that Radiocom is a very well thought-out program which should satisfy the needs of virtually all RTTY operators. My congratulations to Julian for a fine effort. If you are unsure of how to obtain your copy of this package then I'm sure Julian[1] will oblige if you send him the £12 registration fee and a formatted 5.25in disk.

RTTY Mailboxes

Another question asked by Glynne John Hather was what are RTTY mailboxes and how are they used? These mailboxes are run by amateurs and normally comprise a computer system with disk storage and suitable software which is coupled to a standard RTTY station. Both the computer and radio station are usually left running 24 hours a day. The main use of the system is to enable amateurs to leave messages for other amateurs.

The mailbox is accessed by typing the mailbox callsign followed by your own callsign. Once the mailbox has received your call it searches its memory to see if there are any messages waiting for you. If it finds a message, it will tell you and give you the option of reading or storing the message. Once you have dealt with the outstanding messages you can then enter your own message. Although this may sound complicated, mailboxes are actually very easy to use as you just follow the instructions and prompts given to you by the mailbox. Some mailboxes will allow you to look through an assortment of files which are often filled with all sorts of useful information, e.g., modifications to rigs.

The mailbox I use most is G3PLX on 3.59MHz, which is AMTOR and not RTTY. I would be interested to know which mailboxes you listen to most regularly and what kind of useful information can be obtained from them.

And Finally

I don't know why it is, but the 1st Monday in the month always seems to fall wrong for me. I am determined to eventually listen to the amateur FAX night, but so far something has turned up each time. If you listen/watch on that night, please write and let me know the results.

Reference

(1) J. V. Moss, 21 Goodmans Lane, Marks Tey, Colchester, Essex CO6 1LU.

The next three deadlines are: June 1, June 29 and July 27

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD.

OSCAR-10

Although the exact date has yet to be defined, it is to be hoped that transponder employment will have commenced again in late April or early May. It is hoped even more that the satellite will have come through the period of power insufficiency due to poor sun alignment on the solar panels. The precise date for the re-start, and the Mean Anomaly values relating will be announced on the various AMSAT nets, which will carry the tidings long before our next column is due for reading.

Ariane & Phase III-c

The Ariane V-21 launch carrying Spacenet 3-R and Telecom 1-C lifted off at the exact start of the postponed launch window, at 2328:00UTC on March 11, from a countdown free of holds or deviations. It was totally successful in every respect and now gives the first US commercial payload, the General Electric SPACENET 3-R, to reach orbit in two years.

Other than a slotted in launch for Intelsat-5, which for seriality will now be termed V-22 (the number previously allotted to our joint mission of Phase III-c, Meteosat and Panamsat) our Ariane-IV launch is the very next, only now to be called V-23. The situation current is that if the May 11 planned V-22 launch of Intelsat-5 is held or delayed, then Ariane-IV with its payload including Phase III-c will go first and fly on May 26. If the Intelsat mission is not held up, and all goes according to plan, then our mission will fly some 3 weeks later. Thus, the exact date has yet to be confirmed. According to source variables, we have several dates forecast around the last days of May and the earliest of June, but by the time these words reach you, after the proposed date for Intelsat-5, a fairly firm commitment will have been made and available from the AMSAT nets. The only casualty may be the success of the world wide intended coverage of the "ALINS" launch network, which could occur at a time when propagation in and around Europe is far from the best. Some sources suggest a midnight launch, when the propagation is poor, but more local sources predict around midday.

Birger Lindholm has worked out the injection orbit element set for the coming OSCAR-13, assuming a launch at 0100 on June 1, a very likely close time, and gives us the following:

Epoch Year:	88
Epoch Day:	153.13886
Inclination:	9.997
R.A.A.N.	91.4956
Eccentricity:	0.73089
Arg. of Perigee:	178.148
Mean Anomaly:	36.4944
Mean Motion:	2.2600446

Only the epoch day and time need be changed to give a very near figure if the satellite goes up on a close date. The first audibility of the beacon(s) for Europe should result within six hours from launch, beaming east, lasting some six hours before "LOS" occurs again.

It will not be in that highly eccentric 200km perigee and 3950km apogee, 635 minute period, 10 degree inclination parking orbit for longer than is needed to produce and confirm the required attitude, spin rate, etc., as the drag at perigee would begin to take away much of the needed launch forward motion. Announcements will be made on the AMSAT nets of the firings of the kick-motor that will stage the new satellite into the required apogee, perigee, and the much higher inclination required to give optimum coverage. The flight plan final orbit will be 3950km perigee, 35 000km apogee, 700 minutes period 57 degree inclination intended.

New sets of Keplerian elements will be supplied regularly on the 7.00pm 3.780MHz AMSAT-UK net, the Saturday 1000 14.280MHz AMSAT European net, and on 14.282MHz from AMSAT in the USA at regular times. Updates will also appear on the Packet Radio network and bulletin boards just as fast as they arrive from source.

A date for transponder use cannot be given at this stage, as it cannot be foretold exactly how long it will take for orbit finalisation and checkout. This is apt to be in terms of weeks rather than days, and we are probably looking towards the end of June. Updates on this will also be given on the amateur radio satellite news media.

From AMSAT-DL come what may be the last picture of Phase III-c during its final testing stages. Konrad Muller (left) is seen with DJ5ZC working on the integration of Phase III-c in Fig. 1, whilst Fig. 2 shows us the whole RUDAK and electronic testing team consisting of (from left to right) Dick Daniels, W4PUJ; Werner Haas, DJ5KQ; Dr. Karl Meinzer, DJ4ZC; M. Bondivenne of ESA; Horst Wagner, DB2ZB, and Konrad Muller. From the end of March onward, the above team will be active from the Kourou launch site amateur radio station FY7KRU also using their own calls, e.g. FY7/DJ5KQ, coming up on 14.282MHz to give daily reports on progress.

Fig. 1

Fig. 2

Fig. 3

R.A.S. (Nottingham)

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Satellite Name	RS5	RS7	RS10/11	OSCAR 9	OSCAR 10	OSCAR 11	METEOR 2-15	METEOR 2-16
Int Design	81-120C	81-120E	87-054A	81-100B	83-058B	84-021B	87-001A	87-068A
Object No.	12999	13001	18129	12888	14129	14781	17290	18312
Epoch Year	1988	1988	1988	1988	1988	1988	1988	1988
Epoch Day	58.73949595	54.58437992	60.85168062	56.24410034	56.20443019	60.65989684	60.71509209	60.88724575
Inclination	82.9605	82.9631	82.9227	97.6296	27.3980	98.0664	82.4705	82.5529
RAAN	129.4834	122.9833	227.7343	85.8389	336.3739	126.0355	173.4911	234.4743
Eccentricity	0.0008492	0.0023167	0.0010489	0.0003268	0.6024815	0.0014280	0.0014208	0.0013850
Arg of Perigee	215.6470	128.0102	287.5882	64.5317	283.3908	15.0968	142.0168	84.1305
Mean Anomaly	144.4202	232.3054	72.4123	295.6276	19.5400	345.0636	218.1996	276.1443
Mean Motion	12.05064583	12.08704615	13.71889448	15.31578076	2.05879208	14.62241590	13.83579445	13.83336807
Decay Rate	$1.3e^{-07}$	$1.3e^{-07}$	$5.9e^{-07}$	$6.213e^{-05}$	$-4.7e^{-07}$	$3.20e^{-06}$	$6.0e^{-8}$	$2.5e^{-7}$
Orbit No.	27261	27293	3449	35544	3537	21332	5814	2707
Nodal Period	119.552172	119.192370	105.023672	94.081012	699.1935	98.537682	104.136345	104.154716
Long Increment	30.014986	29.924955	26.381716	23.517372	175.3533	24.635023	26.163355	26.167315
Ref EQX	06 Mar 1988	02 Mar 1988	04 Mar 1988	02 Mar 1988	02 Mar 1988	06 Mar 1988	04 Mar 1988	04 Mar 1988
Orbit No.	27349	27383	3493	35633	3549	21411	5860	2751
Time (HHMM.MM)	0105.47	0048.83	0127.46	0124.52	0046.82	0134.71	0100.01	0140.44
Longitude W	54.84	53.33	318.53	89.36	196.25	56.37	6.19	315.20
Beacon Freq	29.330MHz 29.452MHz	29.340MHz 29.501MHz	29.357MHz 29.403MHz 145.857MHz 145.903MHz 29.407MHz 29.453MHz 145.907MHz 145.953MHz	21.002MHz 145.825MHz 435.025MHz 2401MHz	145.810MHz 145.987MHz	145.826MHz 435.025MHz 2401.5MHz	137.850=APT	137.400MHz=APT

Satellite Name	METEOR 2-17	MIR	FO12	COSMOS 1766	NOAA 9	NOAA 10	METOR 1-30	METEOR 2-14
Int Design	88-005A	86-017A	86-61B	86-055A	84-123A	86-073A	80-051A	86-039A
Object No.	18820	16609	16909	16881	15427	16969	11848	16735
Epoch Year	1988	1988	1988	1988	1988	1988	1988	1988
Epoch Day	54.15840351	62.86991324	47.15879751	62.03867105	53.67672091	57.25901816	18.29101349	60.56272855
Inclination	82.5425	51.6217	50.0150	82.5255	99.0876	98.6934	97.7152	82.5335
RAAN	301.9639	255.7792	355.3960	113.6006	26.8934	89.6624	109.0383	262.8753
Eccentricity	0.0016112	0.0013153	0.0011225	0.0023830	0.0014717	0.0012932	0.0041064	0.0013209
Arg of Perigee	172.5263	166.6072	185.1862	188.8172	221.0384	188.6247	161.5737	263.3031
Mean Anomaly	187.6084	193.5143	174.8858	171.2621	138.9680	171.4706	198.6985	96.6623
Mean Motion	13.84017765	15.77724064	12.44394350	14.73624933	14.11555660	14.22550237	14.98639738	13.83773732
Decay Rate	$4.2e^{-07}$	$1.6795e^{-04}$	$-2.5e^{-7}$	$9.0e^{-7}$	$2.64e^{-6}$	$2.04e^{-08}$	$1.191e^{-05}$	$6.0e^{-08}$
Orbit No.	328	11705	6876	8573	16465	7486	41432	8895
Nodal Period	104.103498	91.208742	115.653208	97.778016	102.071470	101.283842	96.146912	104.121826
Long Increment	26.154573	23.191929	29.239341	24.574048	25.515950	25.320879	24.036452	26.159243
Ref EQX	26 Feb 1988	06 Mar 1988	02 Mar 1988	05 Mar 1988	02 Mar 1988	02 Mar 1988	23 Jan 1988	04 Mar 1988
Orbit No.	368	11755	7061	8617	16583	7554	41503	8943
Time (HHMM.MM)	0112.25	0052.96	0024.50	0037.93	0058.91	0100.30	0045.50	0048.18
Longitude W	233.52	297.81	216.43	61.62	139.41	80.74	19.24	273.93
Beacon Freq	137.300=APT	143.625MHz=voice 166.125MHz=data (a.m.)	435.797MHz 435.913MHz	137.400MHz=APT	137.620MHz=APT 137.770MHz=DSB	137.500MHz=APT 136.770MHz=DSB	136.995MHz	137.850MHz

Jesus Martin Cordoba EA4AO, who has been active on satellites since the earliest days, is all ready for OSCAR-13. The photograph Fig. 3 is that of his satellite antennas, showing his 26-element QLY for 1269MHz, the 8 turn helix for 435MHz, and the 8-element crossed Yagi for 145MHz, all on a common AZ-EL mount.

RS-10 & 11

The past month has seen considerable effect on RS-11 due to periods of escalating solar and magnetic activity. At low angles particularly, the downlink has been considerably attenuated, with many users thinking that it had been switched off. Even the 145MHz uplink has suffered high levels of "E" layer attenuation, with no return for normal uplink powers especially when the satellite is to the south in daylight passes.

On horizon grazing passes to all directions in daylight paths, the ionospheric disturbance is very noticeable, with the returned tone very auroral at times when close to or via the polar magnetic zone. The 29MHz downlink has been heard when the satellite is up to 35 degrees below our horizon, and has permitted 145MHz access even from such latitudes as the UK to the satellite when it is at elevations of as low as −7 degrees. The lower frequency RS-11 21MHz uplink access has been worldwide, with ZL, VK, W6, VU, ZS and other non line of sight exotic DX heard on the 29MHz downlink.

Andy Mironovy, operator of the command station RS3A, reports that RL7GD has been trying the 21MHz uplink on Mode "K", and was delighted with a QSO with the 4K1 Soviet Antarctic base station. The best ever 144MHz uplink satellite DX record from RS3A itself was a RS-6 Mode "A" QSO with Peter Steelheart YV3AGT, way back on 17 June 1982. Andy would be very interested in hearing from RS users their best DX QSOs. You may write to him at UL. V-Voloshinoi, D. 11 KV.72, ST.Perlovska, Moscow 141000, USSR, or (better still if you are not too modest) send your results to G3IOR so that we can put them in this column for all to see.

Using the 145MHz uplink your scribe was pleased to work via RS-11 many of the participants of the north pole ski-trek, with CI8CW, CI8HO and EX0CR at Cape Artichesky at the topmost tip of Severnaya Zemlya, all giving excellent two way contacts on both c.w. and s.s.b. GM4DMA/VE8 from the Canadian Arctic was also on (see "Project Nordski-Com" later). Also in the log were K9VCM, LZ1KWF, OE1LM, RL7GD, SM0KV/0, UA1NA, UK3A, UK0QCG, UL7CCY, UL7CR, UL7GBD, UL8CWW, UV1AP, UV9FB, UZ0ZLN, VE1BB, VE2LI, W2JV, W2TFA, Y22UL and many Europeans.

Whilst stations using both the 21MHz for DX QSOs are a plague to RS-10/11 satellite users, the propagational information gleaned from their presence is valuable. To relate to the negative aspects, of particular annoyance are stations who insist on using the ROBOT uplink frequency of 21.130MHz for earth to earth contacts when the adjacent frequencies are quite clear. They frequently block the ROBOT for an entire pass, as even when the ROBOT announces ". . . QSU 145.825MHz . . ." it is in fact still listening on 21.130MHz also. The reverse is not true, as when the ROBOT states ". . . QSU 21.130MHz . . ." it is listening to that frequency specified exclusively.

RS-12/13

News is beginning to come in of plans for a further "RADIO" satellite pair launch in the summer of next year. The spacecraft will be fundamentally similar to the existing RS-10/11 pair, but with some additions and modifications, which will be learned later, as will the intended orbit factors. The information will be published here as it transpires.

Keplerian Elements

The set provided again this month come via the good offices of **Birger Lindholm** of Dalsbruck, Finland. Birger sends his customary warning that they ". . . should not be used for precise scientific analysis . ." which is becoming even more true with the solar changes expected. Solar observers are now forecasting an unprecedented rise in solar activity, which will enhance some of the propagational factors mentioned earlier in our "RS-10/11" section.

Quite apart from the likely appearance of strong terrestrial f.m. stations on the 29MHz downlink band due to a rising m.u.f., a more serious side of the enhanced solar activity will be demonstrated, this being the atmospheric expansion effect, which will add considerably to the drag factor of the lower orbiting satellites. Dr. Patrick McKintosh, director of the NOAA Space Environment Laboratory at Boulder Colorado believes that should the current trend continue, the solar maximum could now occur as early as the end of 1988, instead of 1992 as earlier expected. If the forecast is true, then we may see UoSAT-1/OSCAR-9 burn out within the year, and even the main satellite for solar

measurement itself a likely candidate for forthcoming meteor scatter.

The first set of Keplerian elements given for Meteor 2-17 gave passes that rapidly strayed from accuracy. This was believed to be due to the NORAD radar accidentally picking out the nose cone or a fairing from the same launch. This has happened before, giving some confusion between RS-1 and RS-2, and also some of the later RS series.

We are considering moving the Keplerian elements for the weather-satellites across to *Short Wave Magazine* which caters more for the interests of those enthusiasts. If any readers have objections, then please let us know, in which case we will continue with "allsats" as at present.

Project Nordski-Com

The intrepid group of Canadian and Russian radio amateurs are moving well 'en route to the North Pole, and are in regular daily contact with the base stations CI8C, EX0CR, EX0DR Vassily, RW3DR, on Dixon Island and 4K0DC on Polar Ice Station North Pole 28. The net frequency for updates is 14.182MHz for the Soviet side, and 14.125MHz for the Canadian. Positional and progress reports are passed daily to the UK via G3IOR or G0/PA3BHF at the University of Surrey, where Michael uploads the UoSAT-2 OSCAR-11 Digitalker. A typical report reads "Number 16, Priority 000, Date March 22. Time 12 hours and 37 minutes UTC. U R at 84 degrees 18.5 minutes N, and, 97 degrees 08.2 minutes E. 73" (The priority number will escalate in cases of urgent messages).

UoSAT-2's Digitalker message is received by trekker Rev. Laurie Dexter, VE8LD, on his ICOM µ2E hand-held on 145.825MHz, who can "see" a section of every orbit. It is also being followed by many thousands of enthusiasts, in many in schools, colleges, etc., around the world who are mapping the expedition progress. One such group is centred in Lincoln, and **Wally Unsworth**, G1LKY tells us and demonstrates that they are all organised with recording forms, large scale maps, booklets, to follow the ski-trek path.

From **Richard Ensign N8IWJ**, via Wally, comes Fig 5, a copy of the original Soviet polar map, on which you may plot the path taken. "S" marks the Cape Arkticheski Severnaya Zemlya starting point, and Cape Columbia the destination via the rotational North Pole. The little square to the south of the pole is North Pole 28, and 4K0 station. The intervening lines of latitude have been omitted to help avoid positional plot marking confusion. The daily stopping points from the first on March 3 are marked, up to the time that this column was posted to meet the publication deadline.

In addition to the Russo-Canadian group, the British North Pole expedition is also on, and Laurence Howell GM4DMA/VE8 exchanged RST 589 during the first RS-11 c.w. QSO with G3IOR in mid-March. Laurence is at Ward Hunt Island, and his story is in the January *Practical Wireless*.

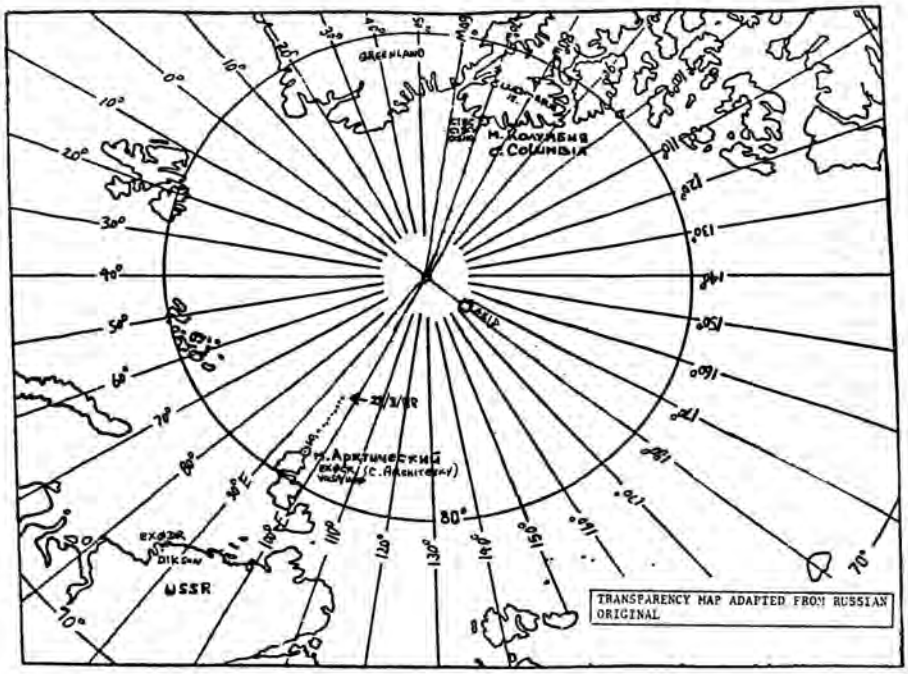


Fig. 4

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex RH20 4HE

Now that solar cycle 22 is underway, we can expect an increasing number of sunspots over the next few years. There should also be better conditions on the h.f. bands and more activity on the sun's surface to cause aurora and more frequent disturbances to the ionosphere. Do remember that the sun, like the earth, is continually rotating and sunspots appear to travel across the sun's disc as in Fig. 1. If large enough, they will remain visible on the photosphere for about 13 days, before crossing the limb. The sun takes approximately 27 days to complete one revolution and its not uncommon for a huge sunspot, or group, to re-appear for a second and third time.

NEVER VIEW THE SUN DIRECTLY WITH THE NAKED EYE, OR ANY OPTICAL INSTRUMENT. GET ADVICE FROM YOUR LOCAL ASTRONOMERS.

We still have a lot to learn about the effect of the sun's complex rays on the earth's ionosphere, so it is important for the future to get today's observations on record.

For the benefit of computer buffs, I used a Trojan light pen, coupled to my Amstrad PCW8512, to prepare Fig. 1.

Solar

At his observatory in Edinburgh, **Ron Livesey**, auroral co-ordinator for the British Astronomical Association logged one sunspot group on February 8, 16, 21, 22, 23, and 24; two groups on the 17th and 19th and 3 on the 6th. Ron learnt from the NOAA Observatory (Boulder, Colorado), that an M1 solar flare manifested at 0414UTC on the 20th.

"The mean sunspot number for February was 40.2 with a peak of 93 on the 3rd," wrote **Neil Clarke G0CAS** (Ferrybridge). His computer print out, showing the variations in solar flux level for February, with a peak on the 18th, can be seen on the graph in Fig. 2.

"Activity is increasing, but still very slowly and the various plages are still reluctant to produce anything really worth looking at! Things are much quieter than they were in 1976/7 at a similar period in the last cycle", remarked **Cmdr Henry Hatfield**, from his observatory in Sevenoaks. Henry uses a spectrohelioscope and his observations of sunspots and their associated filaments and flares, for March, are listed in Fig. 3. He also logged a small sub-flare at 1041 on the 2nd, many small quiescent prominences on the 9th and a small flare, with a bandwidth of more than 4 Angstroms at 1040 on the 24th. Henry's radio telescope recorded individual bursts of noise from the sun, at 136MHz, on March 1, 2, 16 and 24.

Magnetic

The magnetometer used by **Karl Lewis** in Saltash, was unsettled on February 5, 9, 10, 12, 13, 17, 20, 21, 24 and 26; very unsettled to storm on days 5, 15 and 16 and severe storm and storm on the 22nd and 23rd, respectively.

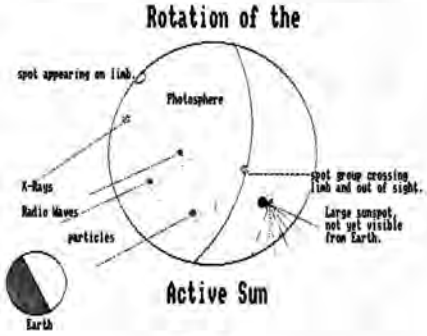


Fig. 1

That severe magnetic storm on the 22nd is clearly indicated on the Ap index chart for February, Fig. 4, prepared by Neil Clarke. "The major storm started with an Ap of 35, shot up to 123 the next day and on the 23rd fell back to 48," said Neil.

Aurora

Ron Livesey received reports of "auroral glow" and "active auroral storm" for the nights of February 19/20 and 22/23, respectively. He said, "The aurora of 22/23, related to a severe magnetic storm, was not as violent as might have been suspected."

Although the most southerly report came from Alastair McBeath in Morpeth,

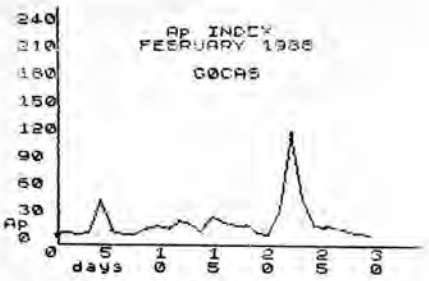


Fig. 2

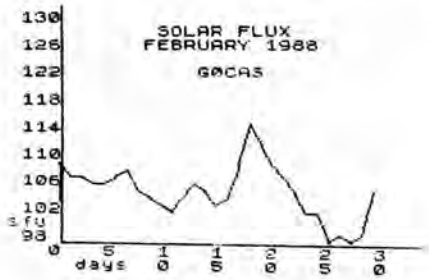
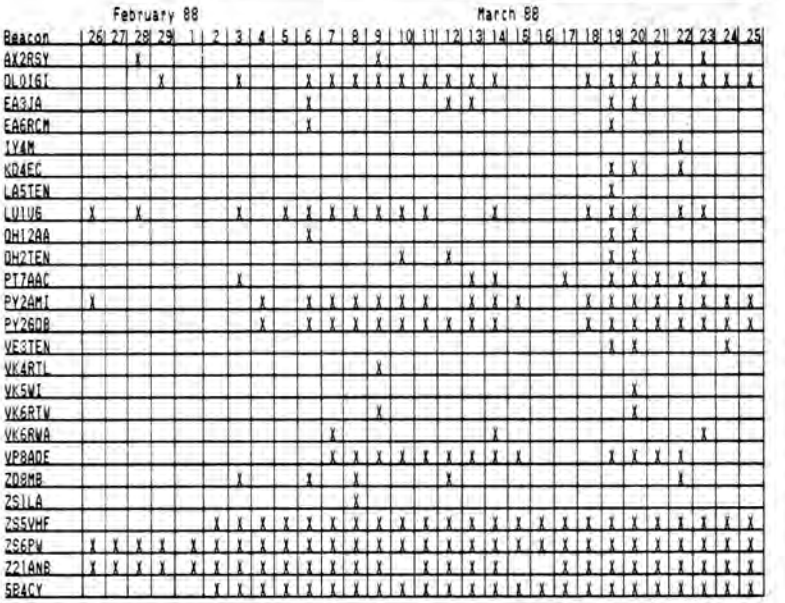


Fig. 4

Fig. 3

Date	Time	Spots	Groups	Flares	Filaments
2/3	1034	1	1 of 5 spots 1 of 4 spots	1	11
5/3	1042	1 double	1 of 11 spots		16
9/3	1012	1 double	1 of 5 spots		15
18/3	0945		1 of 5 spots 1 of 8 spots 1 of 7 spots		several
22/3	1026	1 double	1 of 4 spots 1 of 5 spots		11
24/3	1031	2 (1 double)	1 of 4 spots	1	15

Fig. 5



who saw active rays, the majority of sightings came from central Scotland and northwards to Orkney and Shetland.

In Knutsford, **Dave Coggins** keeps his 5-element, 144MHz Yagi facing north in readiness for any radio aurorea which can break out at anytime when sunspots are present.

The 28MHz Band

"28MHz is certainly looking up these days," wrote **John Coulter** from Winchester. **Don Hodgkinson G0EZL** (Hanworth) reports making DX contacts with SORASD (Saharan Arab Democratic Republic) on March 18, OK1XC/JT in Mongolia on the 21st and VP2ML on Montserrat during the afternoon of the 23rd.

"Things have certainly improved quite dramatically, especially on 28MHz. I have heard all continents on this band in the space of a couple of days," wrote Dave Coggins on March 22. In addition to Yagi and quad antennas, Dave uses a half-wave CB vertical on 28MHz and is pleased with the results, especially for beacon monitoring. Dave's DX log includes stations from Australia and Brazil on March 13, Paraguay on the 19th, India on the 20th and Argentina, Bolivia, Chile and Puerto Rico on the 22nd.

Propagation Beacons

Firstly, my thanks are due to **Chris van den Berg** (The Hague), Dave Coggins, John Coulter, Henry Hatfield, Don Hodgkinson, **Greg Lovelock G3III** (Shipston-on-Stour), **Fred Pallant G3RNM** (Storrington) and **Ted Owen** (Maldon), for their continued efforts in monitoring the 28MHz beacon frequencies which enables me to compile our monthly record chart, Fig. 5.

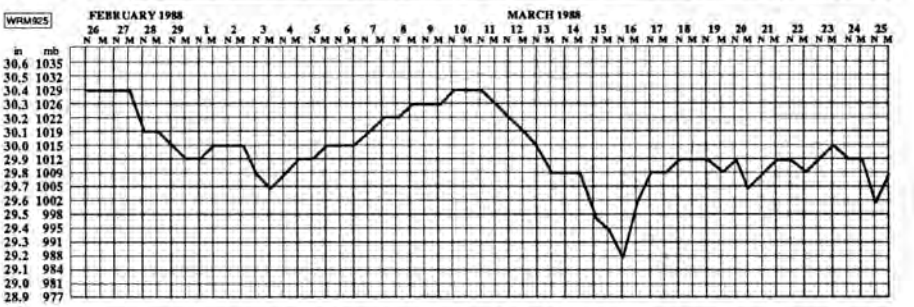
"Three new ones for me this month, OH1ZAA (28.267MHz) PA3EGD (28.306MHz) and PT7AAC (28.276MHz)," said Greg. He also added 3 more, KD4EC/BCN, KE4MS/BCN and W8FKL/4, during the late afternoon of March 22.

Chris van den Berg logged the bi-centenary beacon in Sydney (AX2RSY). John Coulter and Ted Owen both reported hearing "OH1ZAA testing in KPO1RO" (28.265MHz) on March 19 and 20 and continuous auto-calls, on 28.290MHz, from ZD8MB on the 6th and 8th respectively.

"After a quiet spell from North America, KD4EC was heard three times during the past week," wrote Don Hodgkinson on March 23. He reports that the beacon's output power is 5W to a vertical antenna and its QTH is Jupiter, Florida. Don received a QSL card from Mike Barry ZD8MB and learnt that his beacon, which Don logged 3 times in March, runs 10W from an Icom IC-745 and that Mike has a choice of antennas between a 3 element tribander and 5 band vertical. "It was a nice surprise to see the h.f. beacon chart in the April *PW*," said Don pointing out that the yawning gap across the Soviet Union requires filling with about 10 beacons.

Dave Coggins makes daily checks on the 144MHz beacons at Angus (GB3ANG) and Wrotham (GB3VHF) and although he usually hears them at S1–2, they do surge up to S4.

Fig. 6 ▼



Tropospheric

The average atmospheric pressure, taken at noon and midnight, from February 25 to March 26, Fig. 6, was 29.96in (1003mb), with highs of 30.4in (1029) on February 26 and 27 and March 10 and 11 and a "stormy" low of 29.2in (988) at midday on the 16th. The slightly rounded figures were taken from the recording chart on the Short and Mason Barograph installed at my home in Sussex.

934MHz

Although the barometer, used by **John Raleigh DW-04** in Bedford, was high at 30.4in on February 26 and again on March 10, he had no luck with DX on 934MHz. From his QTH in Bransgore, **John Levesley UK-627** chaired a network of 6 local stations on February 24 and, in addition to several contacts between 50 and 65km he worked GY-186 in Guernsey, at 160km on the 28th. "Conditions have been quite poor, with the late February anti-cyclone providing few DX contacts on 934," said John.

The majority of 934MHz operators use QSL cards to confirm their DX contacts and, like many others, the one used by John, Fig. 7, emphasises membership of The 934MHz Club UK.

The next three deadlines are: June 1, June 29 and July 27

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Broadcast Round-up

Peter Shore

Conditions on short wave have been variable during the past few weeks, with a number of severe ionospheric disturbance (s.i.d.), and generally poor reception for much of the time. This has made the collation of new times and frequencies following the two changes in March quite difficult. However, some information is included in this month's column and it is interesting to note that Radio Moscow seems not to have altered its programme times from what they were before the time change at the end of March by the usual one hour. This may reflect a new policy by the Soviet Union to keep to a UTC-based schedule, instead of altering times when the European clocks change. Meanwhile, Radio Moscow has admitted in its North American service that newscasts are recorded in advance, at least when it's night in Moscow. The station is investigating the possibility of introducing nightshifts to produce live bulletins.

There were some alarmed faces at Bush House in London during March when news leaked out that the BBC were about to start talks with Radio New Zealand in connection with the possible establishment of a joint transmitting station in New Zealand. A report on Radio Australia's *Communicator* on March 13 revealed that a station with perhaps two 500kW or four 250kW senders might be constructed, leading to the re-establishment of a fully fledged international service from New Zealand, replacing the existing relay of domestic services on two aging 7.5kW transmitters. Clearly negotiations are at an early stage, but the BBC is interested in improving reception in the important South Pacific region and a tie-up with New Zealand could prove beneficial for the Corporation.

In order to pay for a new computer system, Radio Budapest is to reduce its programming by around one third from May. The English language service will be at 1830 and 2000 to Europe from May 2, and at 2330 six days weekly, and 0030 daily to North America. The DX programme seems to have fared rather better with placings at 1515 on Monday and Thursday for Europe, as well as Saturday 1030 and Sunday 0945, with an airing for North America at 0130 on Tuesday, Wednesday, Friday and Saturday.

Vatican Radio has a new 500kW antenna at its S. Maria di Galeria transmitting station. It is a rotating antenna, 106 metres high, and consists of two wideband dipole curtains (one covering 6 to 11MHz, the other 11 to 21MHz), supported by two towers which rise at the end of a horizontal bridge about 95 metres in length, resting on four bogies. Each bogie is supported by a group of four wheels on a circular monorail about 89 metres in diameter. An important feature of this new antenna array, which joins the similar 79-metre high antenna built in the 1970s, is the very low take off angle, which is ideally suited to long distance broadcasting.

News from Radio Nacional d'Espana a Catalunya: a regular DX programme on this domestic station in Barcelona conducts an annual "Hit Parade" of international broadcasting stations. *L'Altra Radio*, the DX programme of Radio 4, Spanish National Radio in Catalonia, invites listeners to participate in third annual Hit Parade. Send a postcard or letter, with your address, saying which are your three favourite short wave stations. The card should be sent before June 1988 to: L'Altra Radio, Radio 4, P Gracia 1, 08007 Barcelona, Catalunya, Spain. The results will be announced during June, and there will be prizes for some of the voters.

Monaco has finally moved to 216kHz in accordance with the long wave plan from 218kHz. Rabat remains on 209 and Algiers is still using 200kHz.

Radio Berlin International offers members of its DX Club free monthly propagational forecasts for any circuits in the world on request. The forecasting method conforms with that used by the WARC HFBC and the station is currently developing the best possible graphic form for use in its DX bulletin. Details are available from RBI.

Europe

All times UTC (=GMT)

Radio France International has begun a new Arabic Service for listeners in the Middle East.

The RFI English broadcast at 1600 is on 6.175, 17.62 and 17.795MHz. All of RFI's English programme will be giving in-depth coverage to the French Presidential campaign during coming weeks.

A new station started on St Patrick's Day in the Republic of Ireland. Radio Millenium started at 0800 on March 17, and runs daily until 1400 on 1.278MHz and 88MHz f.m.

Deutschlandfunk features during May:

May 15 Bad Kreuznach—the start of a series on Germany's spas and health resorts.

May 19 Religion in West Germany—a look at the Protestant community

May 24 Berlin Theatre Meeting—each May, West Berlin invites the best German language stage productions of the past year to perform in the city.

Adventist World Radio in Italy currently operates on 7.257MHz with English at 0700 and 1400, and French at 1100, German at 0900 and 1300.

Trans World Radio in Monaco has English daily at 0625-0840, at 0840-0925 on Saturday and Sunday and Sundays only at 0925-1000, all on 7.105MHz.

Radio Netherlands made some changes to its programme line-up at the end of March: the English service now has on Mondays *The Research File* with Anne Blair Gould and Jonathan Marks looking at science and technology in Europe: Tuesdays *Images* with news from the arts: Wednesdays *Portraits of the Past* highlighting important events in recent history but from May 18, a new series takes over—*The Savage Beast* when Robert Green examines music making and music tastes in The Netherlands. *Media Network* continues to occupy the Thursday slot and Fridays sees the departure of the *Rembrandt Express*. Broadcasts to Europe from Radio Netherlands:

1130 on 5.955, 9.715 and 17.605MHz
1430 on 5.955 and 13.77MHz
1830 on 6.02MHz

Broadcasts at 1930 in English from Radio Bucharest are heard on 5.99, 7.145, 7.195 and 9.69MHz.

Radio Sweden's new schedule from March 27 until 24 September:

0230 on 9.695MHz
0330 on 11.705MHz
0930 on 15.39MHz
1100 on 6.065 (not Sat/Sun), 9.63 and 21.69MHz
1230 on 15.19 and 21.69MHz
1400 on 15.345 and 15.39MHz
1700 on 6.065 and 1.179MHz
1830 on 15.24MHz
2100 on 6.065, 11.845 and 1.179MHz
2300 on 9.695, 11.705 and 1.179MHz

Confirmation has been received that the Swedish s.s.b. transmissions will cease on 1 July 1988. Details of the current schedule for these broadcasts were given in last month's column.

The 1900 broadcast from Moscow to Great Britain and Ireland is now heard on 7.15, 7.25, 9.735, 9.775 and 9.865. A station announcement gave 1.143MHz medium wave as an additional channel for this broadcast, but it appears that communications between the station's transmission planning department and the programme area have broken down. This frequency carries Polish programmes at 1900!

A note of a Moscow frequency of 18.03 was included in this column two months ago. A communication from Berkshire suggests that this is not a valid frequency, but is probably a spurious of perhaps 6.01MHz.

Africa

The Voice of Kenya's General Service is noted on 4.934 from around 0200, with a later sign-on at weekends.

Morocco has broadcasts in English and French on Chaine Inter:

1400-1700 on 17.595MHz
1700-1900 on 17.815MHz
1900-0100 on 11.92MHz

Clarification of the new schedule from Radio RSA mentioned in last month's column:

0200-0400 on 9.58, 9.615 and 11.73MHz
0400-0430 on 5.98, 7.27 and 9.58MHz
1100-1200 on 9.58, 15.225, 17.755 and 21.59MHz
1400-1600 on 9.655, 15.125, 17.755 and 21.59MHz
1800-1900 on 17.88MHz
1900-2100 on 7.27, 11.9, 15.225MHz

AWR Africa via Gabon has English on Sundays only at 1200-1300 on 17.89MHz, with French Monday to Saturday at 1700-1800 on 9.625MHz.

Asia and the Pacific

Radio Afghanistan has English at 1900-1930 on new frequencies of 7.16 and 9.64MHz. The sequence begins at 1730 with Dari and German at 1830.

Voice of Free China in Taiwan has English at 2200 on new frequencies of 9.955, 11.58 and 15.44MHz.

FEBA in the Seychelles has English at 0715-0830 on 15.115MHz on Sundays, with a broadcast to Africa at 1730 daily on 11.76, with an additional weekend service to East Africa, also on 11.76 at 1800-1825.

Any reports for Broadcast Round-up should be sent to the PW offices

North and South America

The complete English service schedule for HCJB in Quito Ecuador:

0030-0130 on 9.72, 11.775, 11.91 and 15.155MHz

0130-0200 on 9.72, 11.775 and 15.155MHz

0200-0500 on 9.72 and 11.775MHz

0500-0700 on 6.23, 9.72 and 11.775MHz

0645-0700 on 6.205 (Mon-Fri)

0700-0830 on 6.205, 9.675 (to Europe)

0700-1130 on 11.925, 9.745 (to 1030), 6.13 (0830-1030)

1200-1600 on 11.74, 15.115 and 17.89MHz

1900-2000 on 11.74, 15.27 and 17.79MHz

2130-2200 on 11.74, 15.27 and 17.79MHz

Radio Mexico International is on the air:

1300-1700 on 5.985 and 11.77MHz

2000-2300 and 0300-0500 on 17.765MHz

2000-0500 on 9.705 and 15.43MHz

NEWS DESK

EXTRA

RAFARS Golden Jubilee

The Royal Air Force Amateur Radio Society was 50 years old on 1 April 1988. They were about on the air with GB50RAF, which will be used now for all kinds of events until 31 March 1989.

They have created a Golden Jubilee Award too. It is open to all s.w.l.s and amateurs for contacts made between or reports confirmed between members of the RAFARS (1.4.88-31.3.89). The basic award will be issued for the first 50 points scored and endorsements will be available if 100, 150, 200 or 250 points are scored. Points can be scored for completed contacts (or confirmed listener reports) as follows:

For contacts on frequencies below 70MHz. i: 2 points for each contact on s.s.b. with a RAFARS member in the same country as that of the claimant.

ii: 3 points for each contact using a mode other than s.s.b. (e.g. a.m., c.w., f.m., RTTY, SSTV, etc.) with a RAFARS member in the same country as that of the claimant and for each contact on s.s.b. with a RAFARS member in a different country from that of the claimant.

iii: 4 points for each contact using a mode other than s.s.b. (e.g. a.m., c.w., f.m., RTTY, SSTV, etc.) with a RAFARS member in a different country from that of the claimant.

iv: 5 points for each contact using any mode with either special event stations using a callsign GB?RAF or GB?RFC, RAF club stations or other special event stations designated by RAFARS as counting for the award. Contacts on frequencies on and above 70MHz shall be scored in the same way as for h.f. contacts except that all points scored shall be double those scored for a corresponding h.f. contact.

Only one contact with each RAFARS member may be counted, regardless of callsign used. In the case of the special event callsigns only one contact with each special event station may be counted. When the special event callsign is used by different groups, e.g. RAF St Athan and RAF Halton both use GB4RAF, both stations count for points.

Claims should be submitted in chronological order showing the following information (special logsheets are available from the contest manager).

Date, Start and finish times of the contact (UTC), Callsign of station worked, Frequency band used, Mode used, Signal reports sent and received, RAFARS number of station worked, Points claimed for the contact.

All claims must be in by 31 July 1989. No QSL cards are required but logs must be signed by a licensed amateur stating they have checked the entry.

The cost of the basic award including P&P is £1 for UK addresses or £1.50 for airmail postage. For claims and full details of the award, contact:

Sqn Ldr A. J. Gilchrist RAF G8BVJ
6 Mansion Hill
Halton
Aylesbury
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SWAP SPOT

Have Marantz PM500 d.c. amplifier, 80 watts per channel, excellent condition, complete with handbook. Would exchange for RX type AR88 in working order or needs attention or w.h.y? Harry. Tel: 0525 404165 (Bedford). *E070*

Have manual for Trio WQR666 communications receiver and CB Cybernet Service Manual RX/TX. Would exchange for air route charts, Europe and British Isles to USA. Tel: 0978 262668 (Wrexham). *E076*

Have Nevada Telecomms Delta I 934 TX/RX, in line pre-amp and mobile antenna and mag mount in v.g.c. Would exchange for Sony Air 7 in v.g.c. or scanner. Ray. Tel: 0476 66047 (Grantham). *E077*

Have Tektronix oscilloscope Type 581A with seven plug-ins, 2 trace, 4 trace and K.H.D.L. and G, needs new plug. Would exchange for second processor for BBC, nice condition. Syd. Tel: 051-334 6859. *E085*

Have National HRO receivers and vintage radio equipment. Would exchange for National Company Malden USA receivers, National "Dancing Men", toys activated by gramophone reed, microphone. Or "biscuit tin", "suitcase" and other spysets, pre war and post war military equipment, valved junk, w.h.y? Tel: St Albans 39333. *E086*

Have BBC Master 128K computer plus two VX540 modems. Would exchange for general coverage RX or 144MHz multimode i.e. FT-290R Mk2 or w.h.y? Paul G7ALW. Tel: 01-572 7217 after 6.30 p.m. or weekends. *E100*

Have Casio SK-2100 keyboard, features sampling memories, value £350. Would exchange for h.f. transceiver same value. G1LAG QTHR. Tel: New Leake 414. *E101*

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G-zero? In fact, have you got anything to trade radio-wise?

If so, why not advertise it FREE here. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless*, Enefco House, The Quay, Poole, Dorset BH15 1PP, for inclusion in the first available issues of the magazine.

A FEW SIMPLE RULES: Your ad. should follow the format of those appearing below, it must be typed or written in block letters, it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale—and one of the items MUST be radio related. Adverts for ILLEGAL CB equipment will not be accepted.

The appropriate licence must be held by anyone installing or operating a radio transmitter.

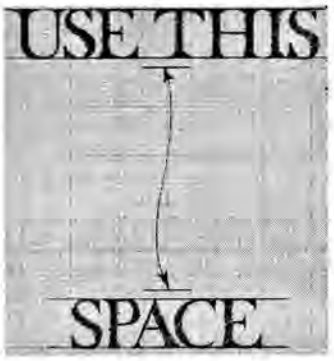
Have FT-290R, MuTek board, NiCads, charger, leatherette case, carry strap, 5-ele beam, v.s.w.r. meter, Heatherlite mic with scan buttons, worth £275. Would exchange for basic 144MHz f.m. rig, e.g. Trio 2300 plus cash balance, or scanner, w.h.y? Nigel. Tel: 01-310 4214 after midday. *E154*

Have Yashica Electro 35GTN camera kit with 3 extra lenses, filters, tripod in carrycase, as new. Would exchange for Micro reader (ERA or similar). Tel: 0324 813349 (Bonnybridge). *E188*

Have Olympus OM10 camera, f1.8 lens, motor drive, Hoya wide angle lens, e.r.c., multi-dedicated flashgun, gadget bag, all mint condition. Would exchange for good 144MHz rig, good a.t.u., RTTY set up, w.h.y? David Linnell. Tel: 0604 711647 (Northampton). *E212*

Have JVC Midi hi-fi, Model E22, has 3-band radio, twin cassette, turntable and speakers, 60 watts output. Would exchange for a hand-held scanner, PRO-32, Uniden 100XL or 70XL. Tel: 0443 755876 (Rhondda). *E249*

Have Japanese Unica UR1A solid-state f.e.t. receiver 550kHz–30MHz mains or 12V, size 300 × 180 × 140mm, ideal beginners receiver. Also have 1950–1970 *Practical Wireless*, *Practical Electronics* and *Wireless World* magazines. Would exchange for anything military radio, any condition. Tel: 0908 73114 (Milton Keynes). *E284*



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The prepaid rate for classified advertisements is 40 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £13.24 per single column centimetre (minimum 2.5 cm). Please add 15% VAT to total. All cheques, postal orders etc., to be made payable to Practical Wireless. Treasury notes should always be sent registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP.
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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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