NOVEMBER 1989 £1.30

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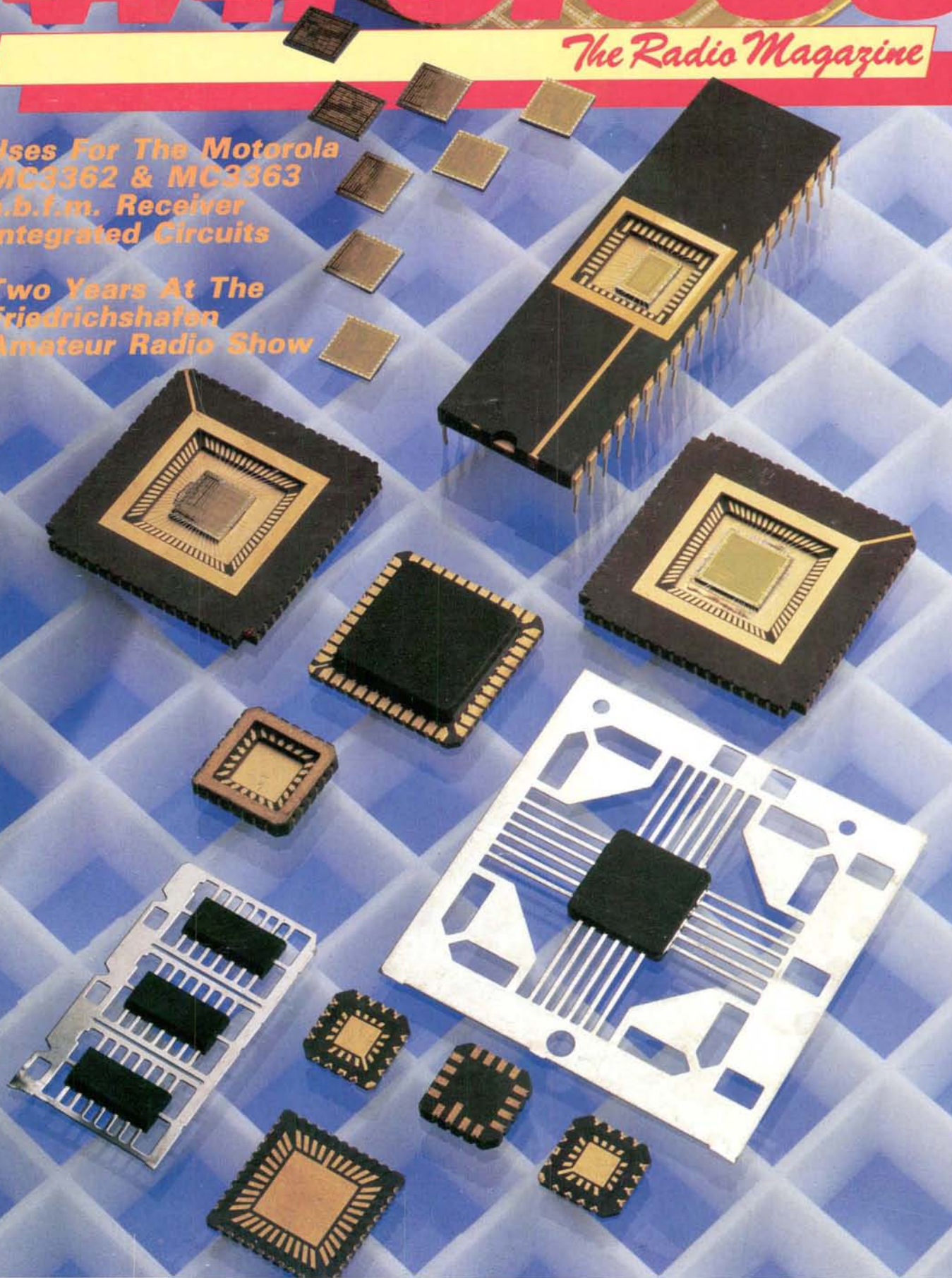
Practical Wireless

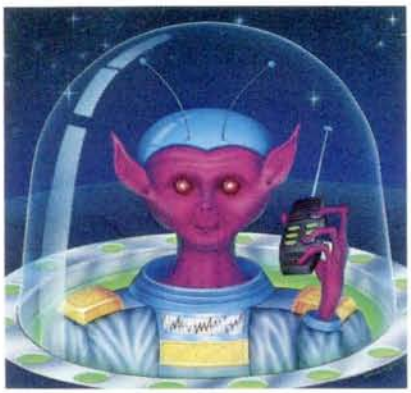
The Radio Magazine

Uses For The Motorola MC3362 & MC3363 n.b.f.m. Receiver Integrated Circuits

Two Years At The Friedrichshafen Amateur Radio Show



Yaesu's FT-736R. Because you never know who's listening.



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Prices and specifications subject to change without notice. FT-736R shown with 220-MHz option installed.

Practical Wireless
The Radio Magazine

NOVEMBER 1989 (ON SALE OCTOBER 12) VOL. 65 NO. 11 ISSUE 992

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and
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Norman.

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We are sorry to have to take this stance but, to protect our customers, we only import equipment that has been manufactured to British specification and this is the **only** equipment that we will service. Please bear this in mind when you are deciding where to buy your Standard radio.

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FEATURES

- *Fully automatic recognition of CW, ARQ-FEC and BAUDOT No. 1 and No. 2 teletype signals with automatic decoding, independently of the shift position.*
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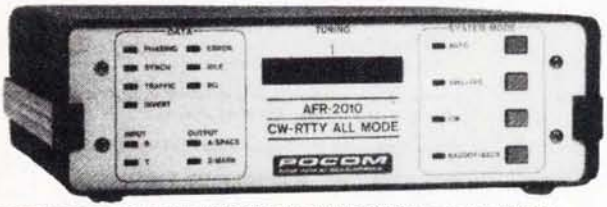

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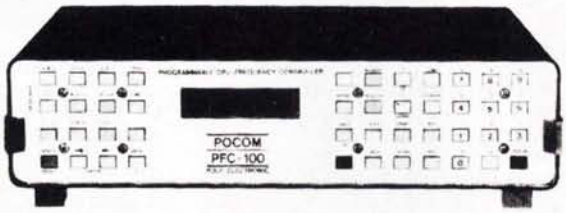

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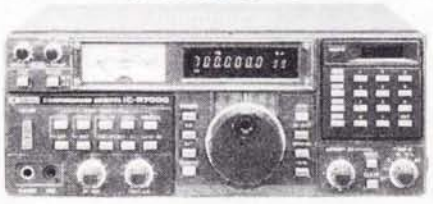

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A MESSAGE FROM THE GUVNOR
(The one on the right)

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Views from Down Under

Sir:

Thanks very much for *Practical Wireless* every month. I particularly enjoy Mr Miller's series on Classic Valve Receivers as I own an old Hammarlund (Collins) R-390A and we consider it one of the best communications receivers ever.

The May '89 issued arrived last week (end of July) and I must say that I am opposed to any coverage of CB by yourselves. In VK, CB has a bad name as we lost one of "our" bands (27MHz) to the CB fraternity. If a CB'er happens to "grow-up" and join our ranks, he keeps quiet about his former life. Believe you me, I know what it's like. I have never been interested in CB yet some of my fellow hams, who should know better, decided that I was a CBer and, for a few years at least, made my life merry hell.

I gave up ham radio altogether for a while but came back into it in 1984 when I passed c.w. and I've been more than active (h.f. only) ever since - (I talked to a station in London yesterday who told me that you are having a heatwave. I told him that he should come "down under" if he wanted to experience real heat!).

As regards "What is happening to our Society", the Wireless Institute of Australia is (it seems) currently trying its hardest to commit self-immolation. Already it is on the critical list with yearly membership fees about to rise to a phenomenal $65 (£29.25). This is more than most people can justify for what is, after all, a hobby.

On top of that, the VK3 (local) division is making life harder for us every day. The first thing they did was to relocate their offices from a inner city (Melbourne) locations where a tram passed the door, to a southern suburb that is 500 metres from the nearest railway station (I wonder if the new location was chosen because the VK3 officials all live to the south of Melbourne).

As if to add insult to injury, the inwards QSL Bureau is currently being reorganised and, according to the latest information, may not be back in business until the end of the year (or later).

But hey-ho - What have I got to complain about! It's a glorious sunny, winters' day (about 15°C) and, what with electricity rationing, I can't go on the air anyway so I may as well go and sit in the sun.

Terry Robinson
VK3DWZ
Victoria, Australia.

Sir:

Re: Antenna Clinic May and June 1989

I had noticed the error before being asked to comment on two replies given by Mr Judd. In both he appears to be under a misapprehension regarding reflected feeder power being lost. This is of course just not true, as explained in many textbooks and shown pictorially in *Technical Topics, RadCom* Jan '82. I know there are the exceptions, such as working with pulse transmission or lab use of generators with constant voltage output plus attenuators.

Whilst recently working with a signals regiment I was asked on several occasions to explain why a Bird 43 Thruline meter indicated forward plus reverse power higher than the transmitter output spec.

The answer, of course, being that the reverse power is indicated added to the forward power and requires to be deducted, the so-called power gain (reflection) having taken place at the point of conjugate match. The classical practical bench demonstration uses two power meters one before and one after the match unit. Having deducted the reverse power the two forward power indicators are virtually the same.

I am sure Mr Judd is conversant with this subject and that the statements are just a slip of the pen. However, it would be a pity to have students incorrectly quoting, "as read in *PW*".

P.T. Pitts G3GYE
Penzance

Fred Judd G2BCX replies...

With reference to the letter from Mr P.T. Pitts G3GYE

(1) In the May issue it was stated: "A v.s.w.r. of 2 to 1 is considered to be a bit on the high side and for whatever reason, it represents a power loss of

Other Hobbies

Sir:

How about the introduction of an H2 code to indicate a second hobby?

This thought came to me seeing the picture of Ted Prothero holding a possible HAC (angling, coarse) item, in the current PW.

What do experienced operators think of the idea? CQ and callsign followed by the H2.

T. Jordan MT/8 (Merchant Navy)
Plymouth

EDITORIAL COMMENT

A New Venture

This month, you can hardly fail to notice the competition on the front cover. It's a new venture for *Practical Wireless* and we hope that it will appeal to you, the readers. Don't forget Part 2 will be attached to the December issue.

To make a competition worth entering you have to have worthwhile prizes and we would like to thank two of our major advertisers - **Lee Electronics** and **Raycom Ltd** - for providing the top two prizes. When we started work on the competition we did'nt expect to come away with two such amazing radios. One of them is still so secret that we can't even tell you the model number! But with the current sunspot cycle on the upswing one lucky reader will be able to make the most of it with the 28MHz dual-band rig we have on offer from Raycomm. As for the Standard rig, there's so much in one small package that seeing is believing, although you should be able to see the radio on Lee Electronics stand at the Leicester show.

Best of luck to all those who are going to have a go at the Wordsearch.

One thing we, on the editorial staff, would be interested in knowing is how popular competitions and/or puzzles are. If you have a view on the matter why not drop us a line.

about 11%".

As in this case the "load" was an antenna. I should have perhaps stated that the 11% power loss, due to a mismatch between the feed cable and the antenna, **was power lost to the antenna.**

Reflected power due to a mismatch between the transmission line and an antenna **is not radiated.**

(2) All the tables etc. in the June issue were computer produced and checked correct.

Text book explanations of v.s.w.r. and related power loss etc. have, in numerous cases, been found to be incorrect.

Instruments such as the v.s.w.r. and/or v.s.w.r.-power meters, even the Bird Thruline meter, use by the writer for many years, will often indicate a "forward power" higher than expected but this does **not** include "reflected" power due to a mismatch. This apparently higher than expected forward r.f. power may be due to an impedance change at the transmitter output when it is loaded, particularly so with transistor output stages. Sometimes this effect is reversed, i.e. the indicated power output is lower than rated and if measured between the transmission line and the antenna (load) itself, is often thought to be due to transmission line loss, especially with coaxial cable.

My *Antenna Clinic* contributions (June 89 *Practical Wireless*) take into account numerous other anomalies that can effect the accuracy of r.f. power measurements.

Answers may sometimes have to be limited, depending on the space available. On the other hand over simplification of explanations can often mislead whilst complexity can sometimes cause the reader some misunderstanding.

F.C.Judd G2BCX

Christian Science Monitor

Sir:

In reporting on developments of "The World Service of The Christian Science Monitor" in the Broadcast Round-up section of your July 1989 edition, it seems that Peter Shore's comments could have lead your readers to conclude that the *Monitor's* entry into television caused budget cuts in radio. In fact, budget cuts in radio were concurrent with but not caused by the *Monitor's* television programmes.

Perhaps you and your readers would enjoy the following bit of clarification.

It is true that redundancy notices were sent to a number of employees in the *Monitor's* radio newspaper and non-editorial support departments. More significant, however, is that the editorial staff of the *Monitor* has increased from about 150 in 1982 to nearly 300 in 1989. It is during that same period in which *The Christian Science Monitor's* style and approach to journalism began to find expression in broadcast in addition to its 80-year-old newspaper.

It is also significant to note that, not only has the *Monitor's* editorial staff doubled, but the staffs of the various media are now sharing reporting and editorial resources, working more as a team than detached, exclusive entities.

Naturally, this cross-media sharing of resources brings budgetary savings. These are most welcome in view of the large investment the *Monitor* has committed to strengthening its global news service. These investments have taken the form of constructing two of the world's newest and most powerful short wave transmitters and upgrading a third; launching a major nightly television news programme for international distribution; publishing a new, monthly, news magazine; introducing its third public radio programme for US audiences and implementing major upgrades to production and distribution of our domestic and international newspapers.

Donald E. Feldheim, Director of Public Affairs
The Christain Science Publishing Society

Send your letters 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 any 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*.

Sir:

Following your publication of my little essay on the intrepid vicar who installed wireless apparatus in a balloon, and to forestall any further enquiries as to my sanity, might I make it clear that I did not refer to the said equipment being fitted with an "antenna" measured in "metres" and that these terms were a sub-editor's translations of my own good old British expressions, of which I have a plentiful supply? Following this disclaimer, I must say that I am puzzled as to when, how and why the order appears to have come down from on high for the excellent term "aerial" (B.S. 204 : 1960) which is derived from the Greek aerios, meaning "of the air", to be replaced by the totally inappropriate American "antenna" which comes from a Latin word meaning, of all things, "a sailyard" and which is normally applied to the sensory organs found on the heads of insects and crustaceans or to the irritable process in the male flowers of certain orchids. If *PW* is committed to Americanising itself it ought at least stick to US measurements, which are still, thank goodness, expressed in Imperial units. Much as I approve of this, I am apprehensive that the magazine then will go the whole hog and rename itself "*Practical Radio*" (the last to rhyme, of course, with "daddy-o"), price itself at $1.50, and talk of vacuum tubes instead of valves whenever these happen to be mentioned. Please tell me that my fears are groundless (or should it be earthless?)

Worried of Woodseaves

Newsdesk...*Compiled by G4LFM*

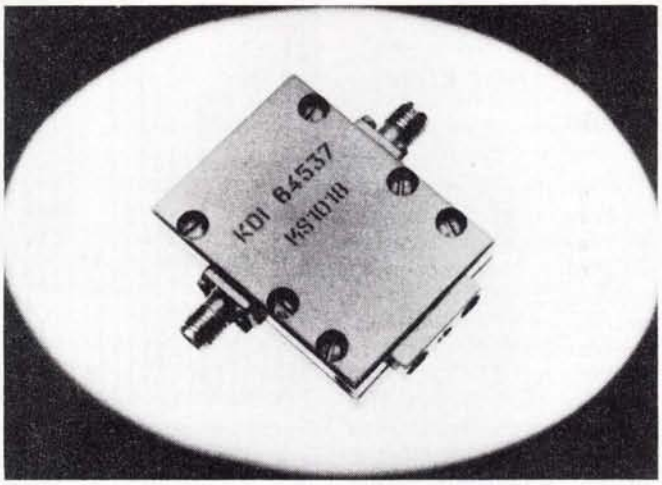
Phase Shifter

The KDI Electronics MS1018 is a screwdriver-adjustable mechanical phase shifter for use in the 1-18GHz frequency range.

A continuous 20°phase variation is provided (at 1GHz) which increases linearly with rising frequency. Its v.s.w.r. is 1.7:1 while inserion loss is 1.5dB. The screwdriver adjustment gives a resolution from 0 to 15 turns for the full phase range.

Measuring 44 x 30 x 12mm, the MC1018 has SMA connectors and is part of an extensive range of phase shifters available from Anglia Microwaves, from mechanical to stepped line types.

Anglia Microwaves Ltd., Radford Business Centre, Radford Way, Billericay, Essex CM12 0BZ. Tel: 630000.



Can You Help?

Nagesh Upadhyaya is looking for information on the communications blackout that occured on the h.f. bands on August 16 from 0100 to 0500UTC. ***Nagesh Upadhyaya VU2NUD, Technical Physics ISRO, Bangalore, India.***

Penpals are wanted by Justice Agyepong. All we know is that Justice likes football, pop music, writing letters, table tennis and exchanging gifts. ***Justice Agyepong, PO Box 64, Nkawkaw-Kwahu, Ghana, West Africa.***

A circuit diagram for a GEC BRT402D receiver is being sought by ***Mr S.J. Coines, 62 Furnival Street, Crewe CW2 7LH.*** If you can help, please drop him a line.

John Vernon has been looking for a ZX Spectrum program for the OSCAR satellites. He has been given some programs but cannot adapt them for the Spectrum, can anyone help? ***John Vernon, 9 Waterson Avenue, Moston, Manchester M10 9BY.***

BARTG's AGM

BARTG are holding their AGM on November 4 at 2pm in the Churchill Room, London House, Mecklenburgh Square, London WC1. Coffee, tea and 30th Anniversary cake will be served.

Issues to be discussed will be the future of the BARTG rally. The 1989 event was successful and the rally organiser would like to improve and enlarge it for 1990, but he cannot get enough volunteers to help.

Improved Varistors

Philips Components' range of metal oxide Varistors has recently been extended in every dimension, voltage coverage, power handling isolation and lead configuration. The type numbers are in the 2322 series.

Varistors are inexpensive devices designed to be connected across supply lines to suppress imcoming and outgoing voltage spikes - unwanted electrical pollution.

The new 2322 series, with improved voltage coverage, now 14 to 550V r.m.s. and a new lacquer encapsulation which provides 2500V insulation to isolate the Varistor from adjacent components should prove ideal for a wide variety of applications.

Philips Components Ltd., Mullard House, Torrington Place, London WC1E 7HD. Tel: 01-580 6633.

Jaybeam Distributor

TV Masters have recently been appointed the distributor for Jaybeam in Northamptonshire. Although, initially, not all the exotic antennas will be kept at the Northampton shop, as Jaybeam's factory is just ten minutes away they can obtain the antenna very quickly!

TV Masters also stock such things as coaxial cable, plugs, masts and lashing kits so you can do all your shopping in one place. The shop is open from 9 to 5.30 except Thursdays and Saturdays when it is 9 to 1pm, lunch is 1 to 2.

TV Masters, 52 St Andrews Street, Northampton. Tel: 37769.

Catalogues

TMK Instruments have a new 24-page catalogue available. This contains more than 50 instruments which are fully guaranteed and available throughout the UK.

Brand new instruments include clamp leak meters, digital thermonmeters, d.m.m.s, voltmeters, pen recorders and energy analysers. The catalogue is available free on request.

TMK Instruments, Building 3, GEC Estate, East Lane, Wembley, Middlesex HA9 7PJ. Tel: 01-908 3355.

The Radio Scout Gathering

This event will take place on November 11 and 12 at Overstone Scout Campsite, Northampton.

For many years the Scouts of Northampton have had the use and advantage of their own amateur radio station. Situated at the local Scout campsite at Overstone, it is a permanent station with the facility of most frequencies - 144, 430, 50MHz and the usual h.f. bands.

Modes used vary from 'phone through to packet and data such as SSTV and RTTY.

To promote Radio Scouting activities in all areas, the group in Northampton have compiled Scout proficiency badge course syllabuses and leaders notes for: communicator, electronics, computer and communicator (instructor). These are available for the cost of production, they can also supply handouts relevent to the syllabus covered.

Ian Rivett, 25 Masefield Way, Northampton. Tel: 715628.

New QSL Manager

As of July 1989, the Editor of *Monthly DX News Newsletter*, Mike, is the QSL Manager for contacts with TE2I and TI1S (contest activity TI2JJP).

Allcards must be sent direct to MDXN, Stormstr 126, 4130 Moers 3, West Germany together with 2 IRCs or US$1. An s.a.e. or mailing label is not required.

Honoured by King Hussein

At an informal meeting in his London home recently, His Majesty King Hussein I of Jordan was presented with a plaque signifying his acceptance of an invitation to become an Honorary Life Member of St Dunstan's Amateur Radio Society. The photograph shows Bill Shea G4AUJ presnting the plaque and Ted John G3SEJ in the background.

The St Dunstan's Amateur Radio Society has nearly 40 members, all of them blind as a result of their service in the forces. Their club station is at St Dunstan's Centre at Ovingdean, near Brighton. A nicer amateur radio society you couldn't wish to meet either! Bill Shea of Brampton near Huntingdon was blinded in Italy while serving with the Royal Marines in the Second World War, he is now a Chartered Physiotherapist. Ted John of Wallasey was serving with the Royal Navy in the Pacific when he was blinded and recently retired as an Adminstrative Officer on the civilain staff of Merseyside Police after 33 years' service.

The plaque has St Dunstan's badge in the centre and mounted on it top right is an Amateur Radio Society badge. It is inscribed, "His Majesty King Hussein Bin Talal - JY1. Made an Honorary Life Member of the St Dunstan's Amateur Radio Society in recognition of his outstanding service in promoting international friendship through amateur radio. July 1989."

The meeting was arranged by Robin Bellerby G3ZYE.

DC Supplies

Electronic & Computer Workshop Ltd have got two new d.c. power supplies in their range. The LC3012 and LC1522 Minilab power supplies offer high stability, single/multi output, low output impedance, overload short circuit protection and constant voltage/current source.

The LC3012 has a 0-30V output voltage and a 0-1A output current, whereas the LC1522 has a 0-15V output voltage and a 0-2A output current. General specifications include ±2% accuracy, 0-50°C operating temperature range, 100µs transient recovery time and 198-242V a.c. 50Hz single-phase power requirement.

The Minilabs measure 250 x 100 x 190mm, weigh 3.5kg and can be obtained mail order from:

Electronic & Computer Workshop Ltd., Unit 1 Cromwell Centre, Stepfield, Witham, Essex CM8 3TH. Tel: 517413.

Injection Moulded Components

Over 60 new products are described in the latest 4-page New Products Bulletin, now available from Moss Plastic Parts Ltd.

Divided into the various product sections, covering furniture, packaging, protection, pastener protection and miscellaneous components, the bulletin features many additions to a rapidly expanding product range.

The new bulletin also includes an up-to-date list of contact names and telephone numbers for all the company's activities, including new enquiries.

Moss Plastic Parts Ltd., Langford Lane, Kidlington, Oxford OX5 1HX. Tel: 3073.

Docking Boosters

No, nothing to do with NASA. They are new devices, marketed by Nevada, that boost the output of stadnard v.h.f. hand-held transceivers to 25W output.

By sliding the hand-held radio onto the unit, the hand-held is convered into a mobile of base radio that may be used at high or low power.

For mobile use, the "docking booster" is supplied complete with a fixing bracket for installation in a car. At home, the unit may be powered from any 12V d.c. mains adaptor.

On the body of the booster, there is an extension antenna socket, a mic holder and transmit/receiver indicators.

Model BS25 is designed to accept IC-2E, CT-1600, Kenpro and similar models/ The BS23 is for FT-23 and similar models. The price for these units is £59.95.

Nevada, 189 London Road, North End, Portsmouth, Hampshire PO2 9AE. Tel: 662145.

Portable Spectrum Analyser

The Hewlett Packard 8590A portable r.f. spectrum analyser for under £5000 (£4500), with options 021 and H18, is the latest special offer from Carston Electronics.

Fitted with an HP-1B interface, the 8590A is as equally suited for stand-alone field testing as it is for use with an integrated test system. Its wide frequency range (10kHz to 1.8GHz), large amplitude range (-115 to +30dBm) and more than 100 functions programmable from the interface, make it a very powerful analysis tool.

A flicker-free display uses a menu system to simplify operation and keep the front panel uncluttered. The unit is small enough to take just about anywhere as it weighs only 30lb.

Carston Electronics Ltd., 2-6 Queens Road, Teddington, Middlesex TW11 0LR. Tel: 01-943 4477.

Newsdesk...*Compiled by G4LFM*

Soldering Gun Kit

The Solder Division of Bib Audio/Video Products have intorduce a Soldering Gun Kit to their range. The kit comprises an instant heat soldering gun, spare tip and solder dispenser (containing Multicore MK100 general purpose solder).

The kit is packaged in a strong plastics carry case. The solder gun meets international standards and is an ideal tool for quick, fast and reliable soldering.

This kit, called the MG60, is available from leading hardware and electrical stores and has a recommended retail price of £17.99 including VAT.

Bib Audio/Video Products Ltd., Kelsey House, Wood Lane End, Hemel Hempstead, Herts HP2 4RQ/ Tel: 233233.

Satellite TV

InterTan UK Ltd, who trade in the high street as Tandy, have announced that they will now stock the Tandy SR100 Satellite TV System in all their 300 stores nationwide.

The Tandy Sr100 Satellite System includes a remote controlled, pre-programmable, 16-channel receiver. It is compact, simple to operate and will connect easily to an existing TV set. It will receive all of the eight Astra channels currently available.

The Tandy Sr100 retails at £369.95 fully installed with a 12 months on-site maintenance contract. For the customer who does want to d.i.y. the SR100 is available at £299.95, with a full range of accessories available from Tandy for installation.

Calling IC-202 Owners

The muTek Ltd RPCB 202ub is a complete replacment receiver front-end for the Icom IC-202 series of portable transceivers. It employs advanced circuit design techniques to provide a combination of low noise figure and superior dynamic performance.

The RPCB 202ub has a signal path designed for minimum noise and high dynamic range. A low loss nitrogen filled relay replaces the diode antenna switching system used by the transceiver manufacturer. This is followed by a very low noise r.f. amplifier using a modern silicon dual-gate m.o.s.f.e.t. The noise figure of this device is of the order of 0.6dB, however as this order of sensitivity is unnecessary for any terrestrial communications (as this parameter is limited by external noise) the design trades some of the noise figure for extra dynamic range.

Following the r.f. amplifier a very high performance 3-pole Chebishev band pass filter provides image rejection and feeds the mixer via a resistive pad. Considerable care has been taken to ensure that the mixer terminations are adequate as failure to do this will result in a considerable degradation of potential mixer performacne.

A high dynamic range m.o.s.f.e.t. amplifier with negative feedback folows the mixer and is also matched for low noise. The output from this stage drives the original crystal filter and noise blanking circuitry.

The cost of the RPCB 202ub will be £60 and the unit should be available from 30 October 1989 (providing no snags occur during initial production). Post and packing is £2.50.

MuTek Ltd., PO Box 24, Long Eaton, Nottingham NG10 4NQ.

Wireless Signalling Worldwide 2500BC

Edward Nye has written two booklets, one called *Ley Lines Worldwide* and the other *Wireless Signalling Worldwide 2500BC*. They have been written after seven and a half years of intensive research which he believes show that our ancient ancestors were able, in a simple way, to send wireless signals through the earth all over the world from the great Megalithic Centre at Carnac in Brittany, where there are great standing stones, etc.

This signal system could only send Morse type signals and operated on the same principle as the e.l.f. transmitters that the USA and Russia use to send signals to submerged submarines all over the world. The only difference is that the present day method require great megawatt transmitters while the ancient method used beams of the "universal force" modulated by quartz standing stones in the beam being caused to oscillate by striking it with the signal at the node nearest the top.

If you would like to know more, the books are available from bookshops or Edward Nye price £1.95 and £2.95 respecitively.

Edward Nye C. Eng, MIEE, The Hole in the Wall, 20 Hill Street, Hastings TN34 3HU.

The Alinco Range

I have recently received a whole pile of colour brochures from Waters and Stanton Electronics with details of the range of Alinco transceivers.

The DR-510E: A v.h.f./u.h.f. f.m. mobile transciever. Output power of 45W on 144MHz and 35W on 430MHz, with 5W low power selection on both bands. Fourteen multi-function memory channels, multi-coloured liquid crystal display, six channel spacing steps, scanning modes, built-in duplexer and a multi-function microphone. These are just a few of the facilities onthis rig.

The DR-110E. A v.h.f. f.m. mobile transceiver. Forty-five watts of power, fourteen multi-function memory channels, colour liquid crystal display, six channel spacing steps, scanning modes, multi-function microphone and comes complete with mobile mounting bracket, hardware and d.c. power cable.

The DJ-500E. A v.h.f./u.h.f. f.m. dual-band hand-held. With 6W on v.h.f. and 5W on u.h.f. Features almost too numerous to mention in a small space - twenty memory channels, dual priority, r.f. attentuator, one-touch squelch deactivation to mention but a few.

The DJ-100E. A v.h.f. f.m. hand-held transceiver. This has 6.5W output, ten memories, a battery save function and an easy-to-see l.c.d.

For all the details on the rigs, contact: ***Waters and Stanton Electronics, 18-20 Main Road, Hockley, Essex SS5 4QS. Tel: 206835 or 204965.***

Morsum Magnificat

Morsum Magnificat was first published in Holland, in 1983, by the late Rinus Hellemons PA0BFN. Now published from London, it aims to provide international coverage of all aspects of Morse telegraphy - past, present and future.

It is for all Morse enthusiasts, amateur or professional, active or retired and brings together material which would otherwise be lost to posterity.

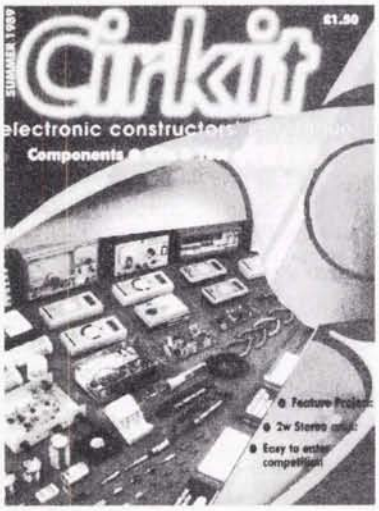
A UK sub will cost you £7 per annum, Europe & Eire is £7.50, other countries is £7.50 surface mail or £9 air mail.

The Autumn 1989 issue has a really interesting cover photograph of an Eddystone bug key that arrived on the scene in 1948. I know this because there is a very informative articel on the history of the key inside the magazine! Other authors come from all over the world and write about Morse and associated topics that have happened all over the world too.

Tony Smith G4FAI, I Tash Place, London N11 1PA. Tel: 01-368 4588.

Cirkit NEWS

OCTOBER 1989



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  Audio Signal Generator
  as 1st Prize
- £10 worth of Discount
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Herts EN10 7NQ.
Telephone: (0992) 441306

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Portsmouth, Hants PO3 5EB
Telephone: (0705) 669021

Cirkit's new range of Digital Multimeters offer a quite unbeatable combination of features and value:

- Ranges include: frequency, capacitance and temperature
- Housed in strong ABS cases
- Overload protection on all ranges
- Full one year warranty
- 3½ digit, auto zero, auto polarity LCD, plus low batt indication
- 200 hour battery life
- All meters supplied with test leads, battery and manual

TM5315B

- Remarkable value
- 18 ranges
- 10A dc current

dc volts: 200mV-1kV
ac volts: 200V, 750V
dc current: 200uA-10A
resistance: 200Ω-20MΩ

Continuity and diode test
Basic dc accuracy: ±0.8%
Size: 128 × 72 × 33mm

Price **£19.99**

TM5375

- Frequency measurement to 20MHz
- ac/dc current to 10A
- 24 ranges

dc volts: 200mV-1kV
ac volts: 200mV-750V
dc current: 200uA-10A
ac current: 200uA-10A

Resistance: 200Ω-20MΩ
Frequency: 2kHz-20MHz
Continuity, diode and HFE test
Basic dc accuracy ±0.5%

Price **£36.75**

TM5365

- 30 ranges
- Frequency and capacitance measurement
- Compact size

dc volts: 200mV-1kV
ac volts: 200mV-750V
dc current: 200uA-10A
ac current: 200uA-10A

Resistance: 200Ω-2000MΩ
Frequency: 2kHz-200kHz
Capacitance: 2nF-20uF
Logic, continuity, diode and HFE test

Price **£37.90**

TM175

- Frequency measurement to 10MHz
- Capacitance measurement from 1pF to 20uF
- 39 ranges

dc volts: 200mV-1kV
ac volts: 200mV-750V
dc current: 200uA-10A
ac current: 200mA-10A
Resistance: 200Ω-2000MΩ

Capacitance: 2nF-20uF
Frequency: 2kHz-10MHz
Continuity, diode, HFE, logic & LED test.

Price **£57.49**

TM135

- Temperature measurement
- Capacitance measurement
- 40 ranges

dc volts: 200mV-1kV
ac volts: 200mV-750V
dc current: 200uA-10A
ac current: 200uA-10A

Resistance: 200Ω-2000MΩ
Temperature: 200°-750°C
Capacitance: 2nF-20uF
Diode, HFE and continuity test

Price **£45.95**

TM115

- 0.5% accuracy
- Transistor HFE test
- 26 ranges

dc volts: 200mV-1kV
ac volts: 200mV-750V
dc current: 200uA-10A

Resistance: 200Ω-2000MΩ
Continuity, diode and HFE test
Basic dc accuracy ±0.5%

Price **£33.60**

Prices inc VAT. Please add 90p for p&p.

Access VISA

Cirkit

Cirkit Distribution Ltd.
Park Lane, Broxbourne, Herts EN10 7NQ. Telephone (0992) 444111.

Motorola's One Chip Radio

Brian Dance reviews the Motorola MC3362 and MC3363 narrow band f.m. receiver i.c.s.

These two low power, narrow band f.m., dual-conversion devices from Motorola are intended for use in CB and amateur band radio, voice and data receivers, cordless 'phones, etc.

They provide a broad-band r.f. capability to 200MHz using the internal oscillator, whilst operation at more than 450MHz is claimed when an external oscillator is employed. These devices need a power supply in the 2 to 7V range, consuming only a typical 3mA at 2V.

The use of these i.c.s greatly simplifies the design of double superheterodyne narrow band receivers, but the wide range of possible options inevitably means that some effort is required to design the optimum circuitry for their use. This article aims to take the reader through the various circuit blocks of the devices, the facilities offered and some practical circuits.

MC3363 and MC3362

The MC3363 is packaged in a 28-lead, plastics, wide SOIC (small outline integrated circuit) package. It includes an r.f. amplifier, the two mixers and oscillators for the dual-conversion circuitry, a limiting i.f. amplifier and a quadrature detection circuit. Other functions integrated onto this i.c. include received signal strength indication circuitry, a squelch circuit and a data shaping comparator for detecting f.m. frequency shift keyed (f.s.k.) data transmissions.

The MC3362 is made from the same die as the MC3363, but a final metal mask difference enables it to be optimised for cordless telephone applications. The MC3362 does not contain the r.f. pre-amplifier or squelch circuitry, but the second local oscillator provides a buffered output which can serve as a system frequency reference (normally 10.240 or 10.245MHz).

The absence of the r.f. stage in the MC3362 results in a reduced sensitivity which is quoted as 0.7µV, whereas that for the MC3363 is claimed to be better than 0.3µV, both for 12dB SINAD from a 50Ω source. However, an external r.f. amplifier can be used to improve the sensitivity of the MC3362, an amplifier circuit using the 3N211 or MFP211 m.o.s.f.e.t.s being suggested. The MC3362 is supplied in two alternative 24-lead packages, a dual-in-line and a wide SOIC mount.

Basic MC3363 Circuit

The internal block diagram of the MC3363 with basic external circuit is shown in Fig. 1. The base of the *npn* r.f. transistor is biased to about +0.8V from an internal source to simplify common emitter amplifier circuit design. If the emitter is grounded, the emitter current is about 1.5mA and the voltage gain is about 20dB with a 1kΩ collector load.

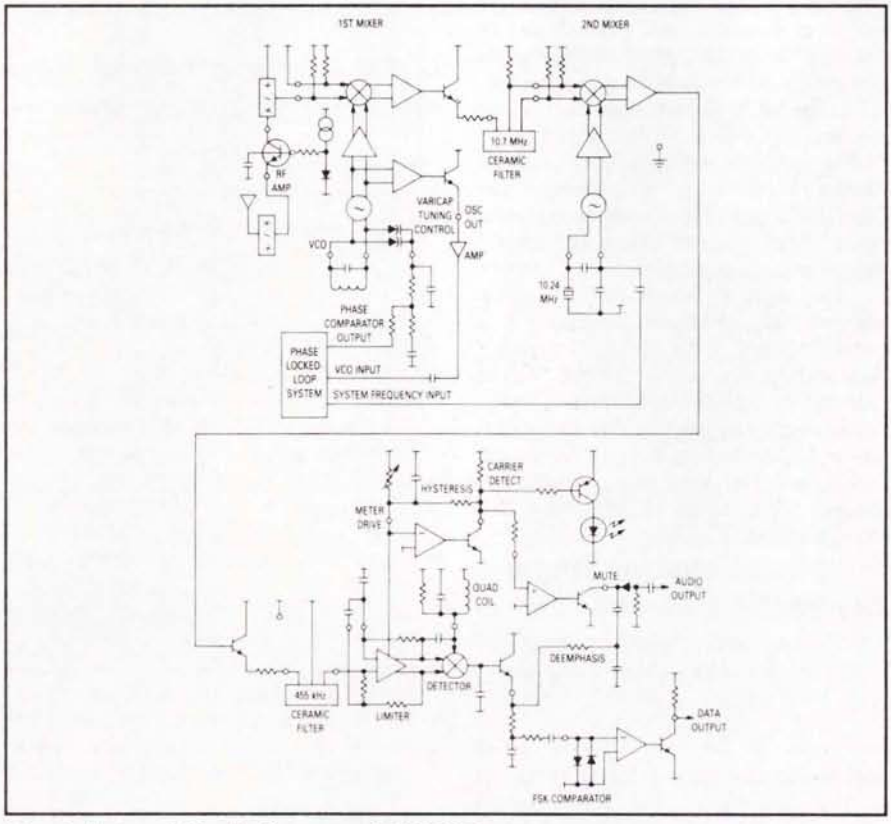


Fig. 1: Internal block diagram of MC3363

If desired, a resistor can be placed between the emitter (pin 3) and ground, with a parallel decoupling capacitor, to reduce the current drain. At a 1.5mA emitter current, the r.f. transistor provides a noise figure of about 2dB at 50MHz and a unity gain frequency (F_T) of 3GHz. The collector load may be resistive, but if a tuned circuit is used as the load and the input circuit is also tuned, great care must be taken to avoid instability; e.g. a 2.2kΩ resistor is placed in parallel with a collector tuned circuit in one Motorola circuit design.

First Mixer

The output from the r.f. amplifier is fed directly to a doubly balanced multiplier which acts as the first mixer. The first local oscillator signal is fed to this mixer through a cascode amplifier. The mixer typically converts the input frequency down to the 10.7MHz first i.f.

The input to this mixer is differential, but a single-ended input can be employed without loss in system gain provided the unused mixer input at pin 1 or 28 is decoupled. This is most simply done by connecting the pin directly to the positive supply rail, although it can be decoupled to the negative rail. The fully balanced mixer circuit shown results in the local oscillator signal being strongly attenuated (-41dB) at the r.f. signal mixer input, this helps to reduce the local oscillator radiation at the receiving antenna.

The first mixer provides a typical open circuit conversion voltage gain of 24dB which is constant up to 7MHz. Internal circuits provide roll-off above this frequency to reduce the r.f. and oscillator signals fed to the second mixer.

Typical the gain at 10.7MHz is 18dB. The mixer output circuit is an emitter follower which provides a 330Ω impedance match for driving conventional 10.7MHz ceramic filters.

If the mixer output is fed to a high impedance crystal filter, impedance matching components will probably be required to prevent the frequency response of the filter from being affected.

First Local Oscillator

The first local oscillator requires only an external tuned tank circuit. The oscillator includes internal Varactor tuning diodes for multi-channel

applications. The net capacitance across the local oscillator tank pins 25 and 26 increases from 10-15pF to 20-25pF as the voltage applied to the Varactor control pin 27 of the MC3363 falls from the positive power supply to the minimum of 0.7V. Voltages outside this range may cause the oscillator to stop functioning. The Varactor control pin should be bypassed by a 10nF capacitor unless fed from a regulated positive supply.

The buffered output from the local oscillator is suitable for interfacing to a phase locked loop (p.l.l.) frequency synthesiser. Extra current has to be injected into the local oscillator for this application by connecting pull-up resistors of 10kΩ-47kΩ from the positive supply line to each oscillator tank pin; oscillator frequencies of up to 150MHz have thus been obtained.

First Oscillator for Single Channel

The first local oscillator can be crystal controlled for single channel use. In this case for the initial alignment of the first oscillator, it may be connected as shown in Fig. 2. The core of L1 is adjusted so that it resonates some 2-3MHz below the crystal frequency. The frequency is checked by examining the buffered output using a high impedance probe or by a form of inductive pick-up which will not affect the oscillator frequency. The connection between L1 and L2 is now removed and X1 and R2 added, as in the final configuration of Fig. 3.

If an r.f. signal is applied 10.7MHz above or below the crystal frequency is applied, receiver quieting will confirm the oscillator is operating at the correct frequency. The local oscillator amplitude should be about 200mV peak-to-peak at either tank pin. The buffered output provides 200-600mV peak-to-peak, depending on the supply voltage. Resistor R2 is required to prevent oscillator latching.

Motorola states that this method has proved effective at up to 65MHz using 3rd overtone crystals, but was unreliable at higher frequencies with 5th or 7th overtone crystals. Higher frequency operation on a single channel can be achieved by the injection of a signal into the local oscillator port.

The resistors marked R1 in Fig. 3 should be 10kΩ-47kΩ in value; they add some current and gain to the local oscillator. Inductors L1 and L2 should be nominally equal in value. Resistor R2 should be 300Ω to 1.5kΩ. Crystal X1 should be a third overtone series mode crystal (no load capacitance is specified).

For frequencies around 75-200MHz, or more, where p.l.l. frequency synthesis is not required, it is recommended that this oscillator is driven from an external source. The differential inputs must be driven from a wideband r.f. transformer or balun with an input voltage at either tank pin of about 100mV to ensure correct mixer operation. Care should be taken to avoid any inductance present at the local oscillator tank pins from resonating with the internal Varactor capacitance - a resistor of 50Ω to 100Ω should prevent this. This approach ensures that no loss in mixer gain is apparent until the r.f. and oscillator inputs are taken to over 450MHz. Image frequency consideration may limit the maximum r.f. input frequency to less than 450MHz.

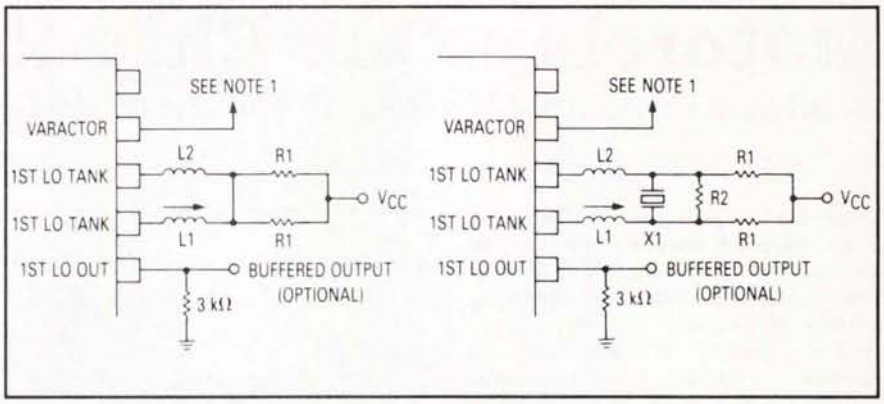


Fig. 2: Alignment circuit for first local oscillator

Fig. 3: Final local oscillator circuit for single channel operation

Second Mixer

The 10.7MHz signal is filtered by a ceramic filter and fed to the input of the second mixer. This is also a double balanced mixer to achieve minimum spurious response. It may be employed to convert the 10.7MHz first i.f. to a 455kHz second i.f. The typical open circuit conversion voltage gain is 25dB.

In low-cost applications the second mixer is typically driven from the 10.7MHz ceramic filter (Fig. 1) with one of the mixer inputs bypassed directly to the positive supply. If a high impedance crystal filter is used, impedance matching will probably be required at the second mixer input to maintain the filter response. The circuit provides second mixer output roll-off above 500kHz to reduce spurious response and idle noise.

The second local oscillator is a Colpitts circuit which may be crystal controlled at 10.240 or 10.245MHz (depending on the first local oscillator frequency). The crystal should be specified for fundamental mode operation and calibrated for parallel resonance with a load capacitance of 30-40pF.

The output impedance of the second mixer at 500kHz is 1.5kΩ in parallel with 50pF. This matches the input impedance of standard 455kHz ceramic filters with typical input and output impedances of 1.5 to 2kΩ.

Limiter-detector

The second mixer output is passed through a ceramic filter, after which the signal can be applied single-endedly to an amplitude limiter followed by a detector. The 1.5kΩ input impedance of the limiting amplifier provides good power transfer from ceramic filters. The limiter has a 10μV sensitivity for -3dB limiting flat to 1MHz. An internal 5pF capacitor couples the limiter output to the quadrature tank circuit and the detector input. The 455kHz circuit may be built using a parallel tuned circuit, perhaps 180pF in parallel with 680μH. The quadrature tank pin cannot drive typical ceramic resonators.

Meter Drive

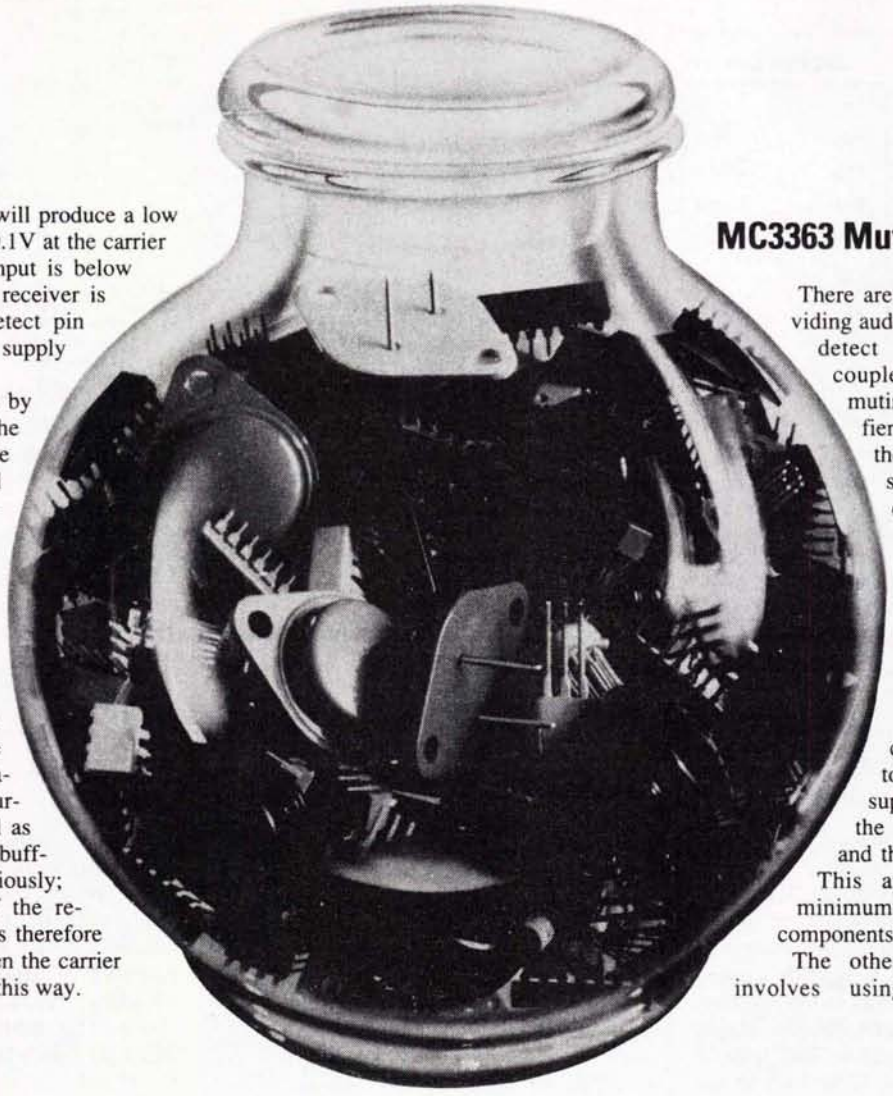
The amplitude of the r.f. input signal can be monitored using the meter drive circuit which detects the amount of limiting in the limiting amplifier. It produces a linear change in current, nominally 100nA, at the meter drive pin for each dB of change at the r.f. input. This meter drive circuit has a fairly linear response over a 60dB range.

The output must be buffered to drive a received signal strength meter. To obtain a linear received signal strength indication, the meter drive pin (pin 12 of the MC3363, pin 10 of the MC3362) should be clamped to within about 300mV of the supply voltage to prevent loading of the meter drive current source. This disables the carrier detect output (high output). The current output (typically 4-12μA) must be converted to a voltage. Negative feedback is required in the output buffer to counteract buffer amplifier gain variations; output level adjustment may be desirable.

It is also possible to configure the meter drive and carrier detect circuitry so that the carrier detect output is programmed with a resistor from the meter drive pin to the positive supply line. A pull-up resistor is required, since the carrier detect pin is an open collector output. An r.f. input exceeding the

programmed trip level will produce a low r.f. output of less than 0.1V at the carrier detect pin. If the r.f. input is below the trip level or if the receiver is detuned, the carrier detect pin will be at the positive supply potential.

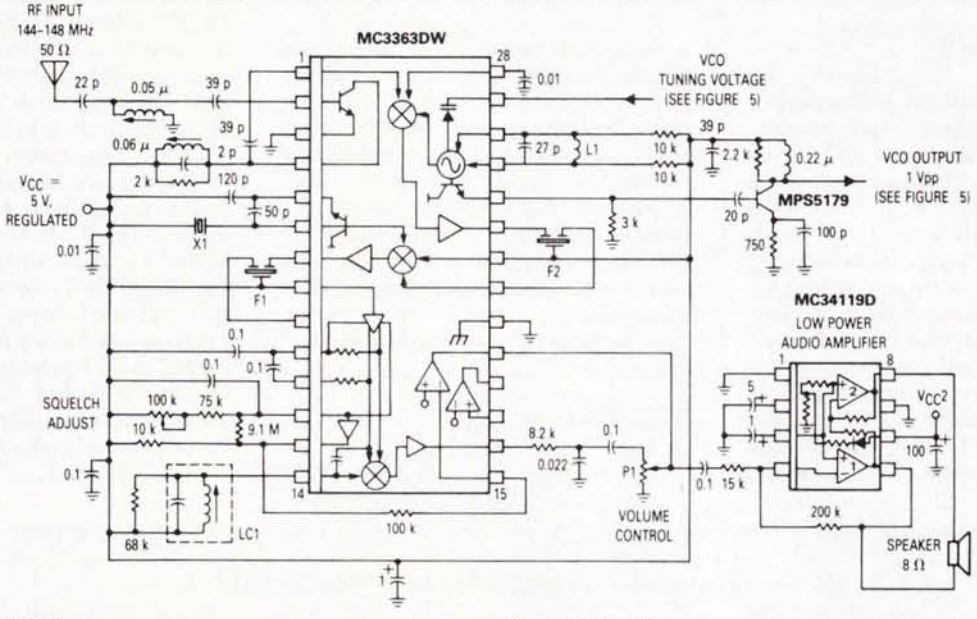
The trip level is set by the resistor between the meter drive pin and the supply. The trip level can be set to approximately -110dBm at the input to the first mixer (about the 12dB SINAD point of receivers with no external r.f. amplification) by using a 130kΩ resistor. The meter drive current will not have the same linear 100mA/dB relationship between the current and the input level as when the meter drive is buffered as discussed previously; an analogue output of the received signal strength is therefore not easily achieved when the carrier detect circuit is used in this way.



MC3363 Muting

There are two methods of providing audio muting. The carrier detect output can be d.c. coupled to the MC3363 muting operational amplifier input at pin 15 and the amplifier output can serve to mute the audio. In this case the amplifier output at pin 19 serves as a switch to ground in the audio signal path. As the carrier level decreases below its tripping point, the potential of the carrier detect pin rises to that of the positive supply line, thus causing the amplifier to saturate and the audio to be muted. This approach requires a minimum number of external components.

The other muting technique involves using the operational



LEGEND:

X1 = 10.245 MHz, fundamental mode, load capacity 32 pF.
F1 = 455 kHz ceramic filter, $R_{in} = R_{out} = 1.5$ kΩ to 2 kΩ. Part numbers are muRata CFU455X or CFW455X — suffix denotes bandwidth.
LC1 = 455 kHz quadrature tank circuit. Part numbers are Toko RMC2A 6597HM or 5SVLC-0637BGT (smaller). Ceramic discriminators cannot be used with the MC3362/3, as their input impedance is too low.
P1 = 10 kΩ, audio taper.
F2 = 10.7 MHz ceramic filter, $R_{in} = R_{out} = 330$ Ω. Part numbers are muRata SFE10.7MJ-A, SFA10.7MF5, or SFE10.7MS2-A.
L1 = 3 Turns #18 AWG, 0.25" diam., 0.125" spacing, air wound.
$V_{CC}2$ = 2–12 V, must be well decoupled from the V_{CC} source for the MC3363.

All capacitors in microfarads, inductors in Henries and resistors in Ohms unless otherwise specified.

Fig. 4: Synthesised 144MHz f.m. receiver

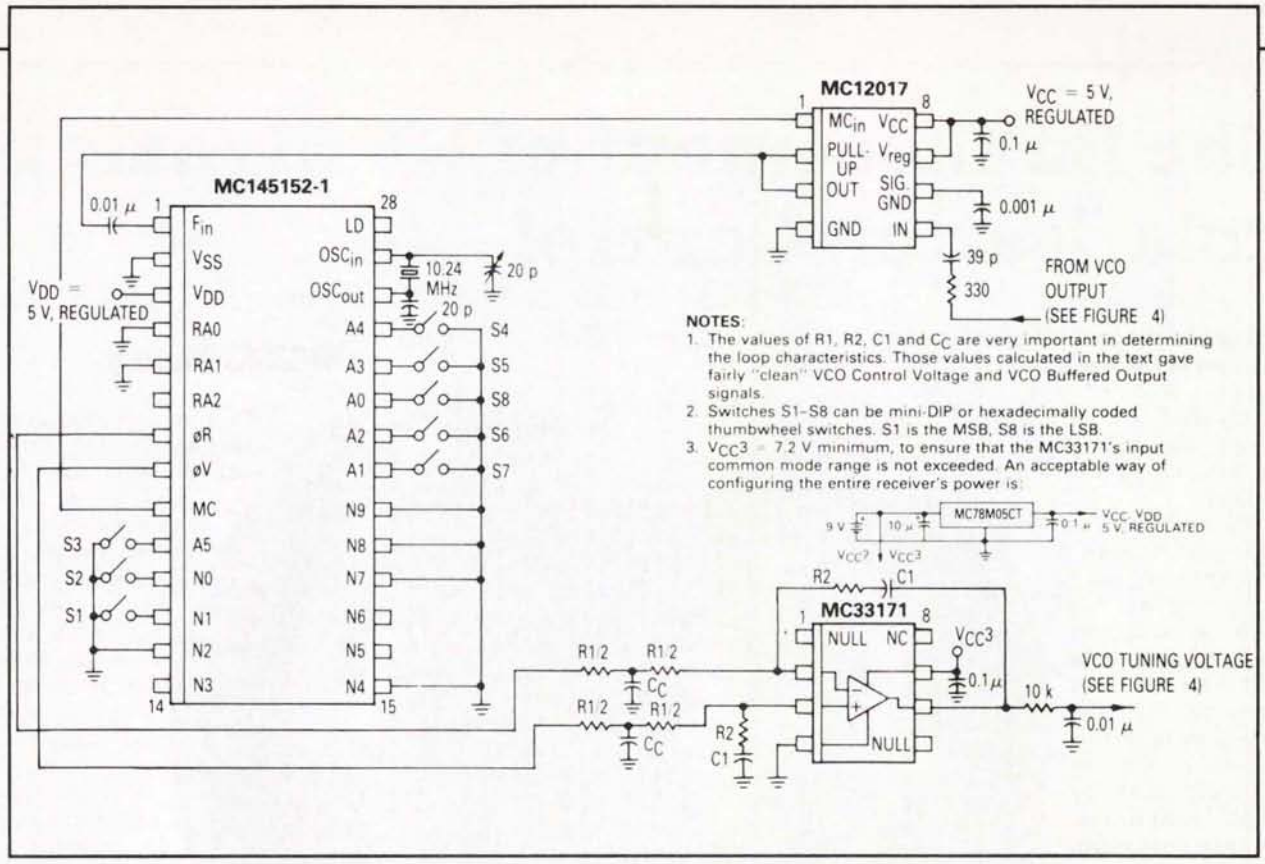


Fig. 5: The 256 channel frequency synthesiser for use with 144MHz f.m. receiver

amplifier as an active noise filter to detect noise above the audio passband. The recovered audio is fed through the active filter, rectified, integrated and compared with a reference level. If the level rises above the reference, a squelch gate is triggered. Motorola suggests that the data slicing comparator on the MC3363 might be used as a squelch gate. This type of muting circuit frees the meter drive circuit and allows it to provide a linear output.

Data Recovery

The MC3362 and MC3363 contain a data slicing comparator which provides data shaping and limiting of f.s.k. serial data transmissions. The data slicer may be capacitively coupled to the recovered audio pin through a 10nF to 100nF capacitor. Larger coupling capacitors may result in distortion of the detected output, but a pull-down resistor from the detector output pin to the negative line will reduce this problem. A pull-up resistor to the open collector comparator output is required. A high value resistor (not less than 120kΩ) may be connected between the comparator output and input to provide hysteresis. This helps to maintain data integrity as the recovered audio becomes noisy as well as for long bit strings of one polarity.

The maximum useable f.s.k. data rate for any narrow band f.m. system is typically 1200 baud, subject to i.f. and quadrature bandwidth and adjacent channel spacing limitations.

Practical Implementation

High frequency layout techniques are critical to obtain optimum receiver performance. Motorola recommends a single or double-sided copper clad board with an adequate ground plane properly earthed. Lead lengths must be kept short to minimise r.f. path lengths. Decoupling capacitors should be placed as close as possible to the integrated circuit. Poor constructional techniques may lead to reduced receiver sensitivity, impaired noise quieting and, possibly, oscillation.

Receiver

The MC3363 device has been used in the circuit of Fig. 4 with the frequency synthesiser circuit of Fig. 5 to cover the whole of the 144MHz amateur band in 256 channels, spaced at 20kHz. The MC3363 device was selected because it provides a squelch facility with the advantage of a minimum component count. The supply voltage should be above 3V, since this increases the current in the local oscillator circuit and ensures satisfactory operation of the voltage controlled oscillator (v.c.o.) of the MC3363 above 75MHz. The 10kΩ pull-up resistors in the pin 25 and 26 circuits also inject extra current from the positive line. The components shown resulted in an average v.c.o. gain of 1.5MHz/V.

The v.c.o. output from pin 24 is amplified by the MPS5179 and is then fed into the MC12017 dual modulus pre-scaler of Fig. 5. The latter drives the input of the p.l.l. frequency synthesiser which is the MC145152-1 device of Fig. 5. It has a p.l.l. parallel input format. Active integration in the loop filter is provided by the MC33171 bipolar amplifier which was chosen for its low power drain, offset adjustment capability and ability to operate from a single supply voltage.

PW

Acknowledgments and Availability

Limited quantities of the MC3363 (surface mount package only) are available from Axiom Electronics, Turnpike Road, Cressex Estate, High Wycombe HP12 3NR. Tel: (0494) 461616. Axiom Electronics can also supply the Motorola Application Note AN980 which covers both the MC3362 and MC3363 devices.

The MC3362 is stocked by Cirkit Distribution Ltd. Park Lane, Broxbourne, Herts EN10 7NQ Tel: (0992) 441306.

Lastly thanks to Motorola Limited for permission to reproduce excerpts from their Application Note AN980.

The Enhancement of HF Signals by Polarisation Control Part 1

As any amateur knows, to get the best out of your v.h.f./u.h.f. equipment you need to be able to control the polarisation. But what about h.f? B. Sykes G2HCG takes a look.

At v.h.f. and u.h.f. the ability to control the polarisation response of an antenna from the shack is very useful indeed, in fact almost essential. The polarisation of signals received from satellites is rarely known, depending not only on the attitude and spin of the satellite but by the fact that signals have to traverse one or more of the ionised layers above the earth's surface.

Polarisation at HF

Little seems to be known about the changes in polarisation which occur at h.f. when signals are reflected from the ionosphere as in normal over-the-horizon long distance propagation. Polarisation control at h.f. is unheard of, the antenna and control requirements have always seemed to be quite out of the question. The advent of the polarphaser and crossed Yagi system giving a simple means of polarisation control, has so far only be used at v.h.f. and u.h.f. Consideration of practical antenna size seem to rule the system out at h.f. but a year or so ago first experiments were conducted on 21MHz with a polarphaser made up for that band together with crossed dipoles mounted vertically in X formation. Results were encouraging but inconclusive due to the lack of directivity of the antenna system. Control of polarisation is only possible when the signal is in the beam of the antenna, and it proved very difficult practice to ensure that the dipoles were broadside to the received signal thus enabling control to be achieved.

Openings on 28MHz

When it became apparent that 28MHz was really opening regularly, a 28MHz polarphaser was made up together with a suitable antenna system. The antenna consisted of two 3-element Yagis mounted in cross formation on a common boom with the elements at 45 degrees to the horizontal. The Yagis were designed for optimum back to front ratio using 0.2λ spaced reflectors and 0.1λ spaced directors. Particular emphasis was placed on ensuring a good match to the two 50Ω feeders. The system was mounted on a rotator at a height of 7.5m.

Take off was completely clear in all directions except to the South where the presence house impeded the path. Local tests were conducted with G3BFC some 500m away to prove the effectiveness of the system and 30dB of polarisation discrimination was found to be achievable. Due to the lack of a clear path to the South, most tests were conducted to the East, using the Cyprus and Perth beacons together with numerous contacts with DX stations. The practicality of the project is always in mind with new antenna systems, in particular the vital "Gain/Aluminium" ratio. Six elements are being used and comparison must be made with the same number of elements used as a straight Yagi which would add 3dB to the gain of a single 3-element. A crossed Yagi mounted in X formation with feeders to each half, together with a polarphaser will give the following polarisations - **horizontal**, through elliptical to **clockwise circular**, through elliptical **vertical**, through elliptical to **anticlockwise circular** and through elliptical again back to **horizontal**. Slant polarisation at 45 degrees is not available, unless provision is made to switch to individual halves of the crossed Yagi.

Serious Testing

Before the commencement of serious testing it was necessary to prove that the sensitivity of the receiver did not vary with rotation of the polarisation control. The effect of altering the phase of the feeders is precisely the same as altering their length, which in many installations will be found to alter the sensitivity of the receiver. There are two reasons for this, first that although the feed system is supposed to be 50Ω; cable, s.w.r. meters, plugs and sockets, etc., are only "nominal" 50Ω and may vary widely. The other more important reason is that the input impedance of the transceiver on receive is not 50Ω. The input impedance of the transceiver in use, a Yaesu FT-757 GX2 was measured and without the attenuator switched in was found to be 60Ω. This was good enough to ensure negligible change of S-meter reading when the acid test was applied, namely adding a quarter wave to the feeder length.

Interesting Results

Results proved very interesting and very worth while particularly on reception, fully satisfying and previously mentioned Gain/Aluminium Ratio. Most QSB proved to be caused by polarisation changes and signals could be peaked up by choosing the optimum polarisation, sometimes by as much as 20dB - some 3 or 4 S-points. Only occasionally did rotation of the polarisation control make little difference and this probably reflected the lack of a 45 degree position in the system.

The most important factor is the rate of change of polarisation and whether it would be possible to compensate manually. The number of hops would appear to govern the change with the expectation that multi-hop propagation would result in random high speed change. This did not prove to be the case although tests were conducted at varying ranges to prove or disprove the point.

Single Hop

The Cyprus beacon on 28.200MHz was particularly useful as an example of single hop propagation. This beacon was the first indication that the band was opening and during the first half hour or so polarisation was changing quite slowly even remaining constant for up to a minute, with distinctly predominant polarisations differing from day to day. Although it was quite possible to constantly rotate the control to maintain optimum signal strength, tests were conducted to try and ascertain which was the best average polarisation to use. One of the two circulars with a slight advantage to clockwise was usually predominant, but often vertical was the best with horizontal the lest effective. Although the Cyprus beacon is itself vertically polarised there did not seem to be any particular difference between the beacon and other Middle East stations using horizontal polarisation.

Two Hop

Two-hop propagation to India did not differ greatly from single hop with very similar characteristics and rate of change. The Perth beacon and many contacts with Australian stations provided examples of multi-hop propagation and although there were a number of occasions when the signal could not peaked manually, quite often the signal behaved as with single hop propagation. It became apparent that the ionosphere was having a "Combing" effect imposing the prevailing polarisation on the last reflection regardless of that of the arriving signal. Again circular gave the best average signals and leaving the control set at horizontal as with a normal installation was a distinct advantage. It always proved possible to bring a weak signal out of the noise by changing to another polarisation.

The apparent "Combing" effect of the ionosphere is particularly interesting and was the subject of further tests. Two receivers were used connected to the same antenna system, with one tuned to the

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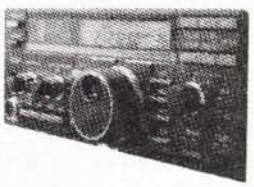

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Cyprus beacon known to be vertically polarised and the other tuned to a Middle East station using horizontal polarisation. The correlation of polarisation change between the two stations was 100 per cent. A further test between the Cyprus beacon (one hop) and the Perth beacon (multi hop) showed correlation of polarisation for at least 80 per cent of the time.

No Doubt

There is no doubt therefore that the ionosphere controls the polarisation of reflected signals and that the final received polarisation is that of the prevailing ionospheric reflection, the polarisation of the signal arriving at the ionospheric being totally irrelevant. The ionosphere can perhaps be visualised as a hanging curtain of wires, swinging in direction and reradiating the signals at the polarisation of the direction of the wires at the time of reflection.

Interferance reduction was found to be very useful. The 28MHz band seems to be very prone to man-made hash from motors and computers. Always this interference is strongly polarised and being local and unvarying can be very effectively nulled out. Even the racket from a computer in the shack can be reduced, the amount of reduction depending on the screening integrity of the feeder system in the shack.

Baluns

The use of baluns on the antennas is absolutely vital if locally induced noise levels are to be reduced. Although at first it was expected that QRM would be of differing polarisation and could therefore be reduced, the "combing" effect precluded this although local stations which had not been reflected from the ionosphere would be of constant polarisation and could therefore be nulled out. It is interesting to note that with a good receiver, when the band is open the general noise level from the ionosphere can be heard varying with polarisation change.

The system is capable of accepting transmitter power and circular is normally used. It is very tempting in a "pile up" situation to choose the polarisation giving the highest received signal strength, just as the station goes over, thus perhaps the first vital words in at enhanced signal strength. The problem is whether the received polarisation shift is the same as the transmitted shift, the "curtain of wires" analogy seems to indicate that it will be the same but investigating this aspect requires polarisation control at the other station and this does not exist at the present time.

The use of a computer to automatically choose the optimum polarisation gives considerable food for thought. The possibility of a constant 2 or 3 S-points improvement in received signals is a very strong incentive. The old adage - "If you can't hear them, you can't work them, regardless of transmitter power" is very true. The necessary software should not prove too difficult but the hardware problems would be considerable. Interference is the first though, computers are bad enough on 28MHz without deliberately connecting one to the antenna system. A very fast a.g.c. line to control the computer may be necessary bearing in mind that with s.s.b. the computer may have to sweep through all polarisations and choose the optimum, all within the envelope of a syllable of speech. Using average signal strength would be much simpler but no so effective. The ability to choose optimum signal-to-noise ratio instead of maximum interference levels are high.

Computer Control

Computer controlled active antenna systems have been used at v.h.f. for optimum reception of TV signals for rebroadcast purposes and commercial techniques at commercial prices undoubtedly exist. The concept of enhancing reception of h.f. signals by up to three S-points at reasonable prices is now evident and must be pursued.

Part 2 of this series will look at a different way of providing a fascinating and useful visual display of the characteristics of the incoming signal - using an oscilloscope

Two Years of the Friedrichshafen Amateur Radio Show

The annual radio fair at Friedrichshafen in West Germany has rapidly established itself as the European ham radio show. Amateurs travel hundreds of kilometres from all over Europe to visit this event, often staying for all three days in order not to miss any of it. We have sent Roger Hall G4TNT over there for the last two years to find out why it is so popular and we thought readers would like to hear what he thought of his two visits.

I had heard a lot about the Friedrichshafen radio fair from the various dealers that I know through my work on the advertising side of *Practical Wireless* and *Short Wave Magazine*. They had all said that it is the best one in Europe and, although it is a long way to go for a show, it is well worth a visit. I am not usually very fond of exhibitions, probably because I have to go to so many, but I thought that I should see this one for myself and I must confess that I was most impressed with it.

Friedrichshafen is situated on the shores of the Bodensee, a lake which forms part of the Swiss/German border and which is better known to us as Lake Constance. The town itself is quite small but, as it is a popular holiday resort, there are plenty of hotels for visitors. The easiest way to get there from England is to fly to Zurich, catch a train to the lake then a ferry across and into the centre of the town. It is also quite feasible to drive there as it is only about 1050km (650 miles) from London. If you can start early enough in the morning to catch one of the first ferries across the Channel, then you should arrive in Friedrichshafen by late evening.

For the amateur really worried about their s.w.r.

The exhibition centre is on the outskirts of the town and is very easy to find. A massive car park is directly opposite the entrance to the halls and there are also facilities for caravans and tents both inside and outside the grounds.

The Show

The show itself occupies three of the halls in the exhibition complex. The first hall, which is as big as the one used by the RSGB at the NEC, contains the main part of the show, all of the importers and larger dealers are there. The second, smaller hall has the overflow from the first one and the third hall, which is the same size as the main one, is the flea market. There are also quite a few exhibitors in the grounds outside and it is easy to understand why it can take three days to see everything.

Wandering around the main hall, I was impressed not only by the size of the stands, but also by their quality. The exhibitors had obviously spent a lot of time and money in order to create the right impression. Naturally, the Icom, Kenwood and Yaesu stands were very attractive but most of the other dealers had also taken a lot of care to make sure that their stands looked good, some even had their stands wallpapered by professional decorators - not the sort of thing that you would normally expect for a radio show.

On the Classic International stand I met Joe Vaartjes, the European distributor for BNOS products and Allweld towers and masts. He told me that his display had taken almost two days to set up. I could believe it too. I have never seen so many antennas on one stand. He had managed to erect everything from h.f. beams and verticals through to microwave beams. It seems that when you hire a stand at this show, it includes the airspace above it.

Joe smiled when he explained why this show is so popular with the dealers. It is because most of the amateurs who go to Friedrichshafen are there with the specific intention of spending money. This was borne out on the Saturday when Joe showed me how little stock he had left. With a day of the show still to go, he had sold almost everything that he had with him, including a kilometre of H100 cable!

I particularly liked the way that the larger dealers laid out their stands. They had rows of different models all plugged in and laid out on benches with chairs where the customers could sit and play to their heart's content. Each set had headphones, so noise was not a problem. I'm sure that this hands-on approach is what the customers want and I certainly enjoy a bit of knob twiddling far more than just looking at dead radios.

A British trader telling a customer what to do with his "endstufen"!

Two well-known British traders tucking into lunch!

The Sony CRF-V21, an all-singing, all-dancing, h.f. receiver

One radio that you may have heard about but will almost certainly not have seen yet is the new scanner from AOR Limited, the AR-3000. This was actually the hit of the 1988 show.

Years ago, when AOR released the AR-2001 it was an immediate worldwide hit, mainly because it had continuous coverage from 25 to 550MHz. They followed this up with the AR-2002 which has the same coverage as the 2001 plus 800 to 1300MHz, proper buttons and a tuning knob instead of that horrible membrane keyboard.

Their new scanner, the AR-3000, is housed in the now-familiar small slope-fronted case but similarities to previous models end there. It frequency coverage is a phenomenal 100kHz through to 2036MHz - without any gaps! The receiving modes are u.s.b., l.s.b., c.w., a.m., f.m.(W) and f.m.(N) and the tuning step sizes are user selectable from 0.05kHz to 100kHz in 0.05kHz steps. There is a tuning dial on the front panel and I liked the way that this knob incorporates a pull-out click switch, which, when activated, multiplies the chosen step size by ten.

The scanning speed is 20 channels per second, which is higher than usual but, as this set has 400 memories in four banks of 100, this sort of speed is necessary in order to check them all in a reasonable time.

As with most scanners, the AR-3000 allows upper and lower limits to be set for searching portions of the band but, as the memories are split into four banks, so four pairs of limits can be set and it it possible to switch between them instantaneously. Similarly, there are also four priority channels.

Unusual Feature

Another unusual feature of this set is the way that the attenuator can be programmed into particular channels instead of just being an on-off switch on the case. Also, up to 48 spot frequencies can be locked out for smoother dial tuning or searching. This is an unusual function and should not be confused with the usual channel lockout that enables the scanner to skip over preselected memories.

One offset frequency can be programmed into this scanner, there is a clock with an on-off timer and, perhaps the most important feature of all, there is a built-in data interface with an RS 232 communications port on the rear of the case. I saw this port in use when Mr Izumi from the Research and Developement Department of AOR demonstrated what he called a very simple program on his NEC laptop computer. The large liquid crystal display was set up with two axes. The vertical one showed signal strength and the horizontal one was for the chosen frequency range. Mr Izumi punched a few buttons on the scanner and the bottom line on the display then showed 144 at one end and 146 at the other. Within a few seconds, various height spikes had risen up from this baseline. Each spike represented a signal, its position showed the frequency and its height showed the signal strength and it was possible to see at a glance the activity of that section of the band. This was a version of the fabled panadaptor, a device that allows scanner users to watch large sections of the spectrum almost simultaneously.

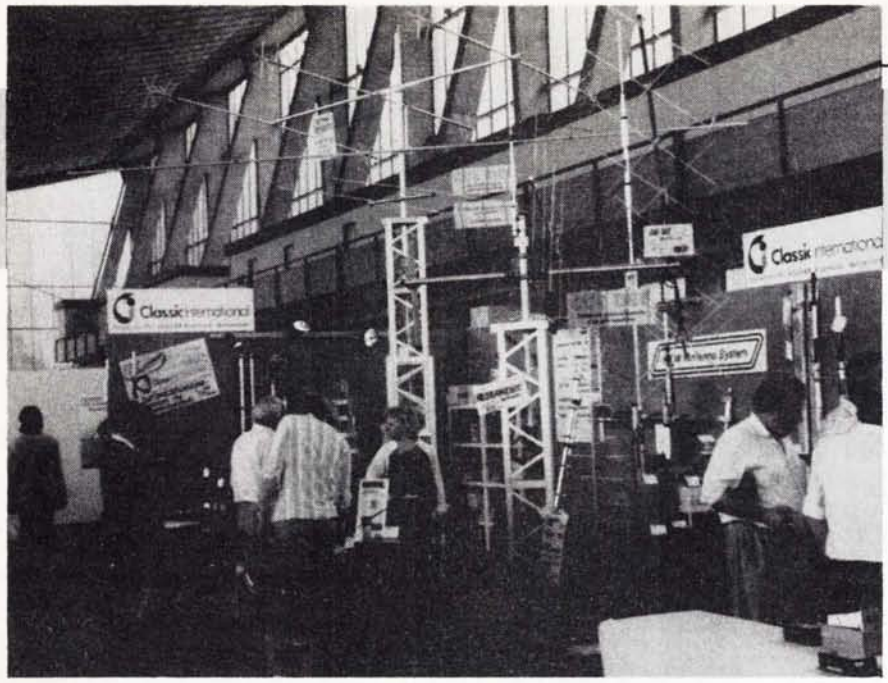
With this unit, it is possible to leave the scanner on an active channel, only changing frequency when there is visual indication that another signal has appeared. No more wasting time scanning up and down an empty band. Mr Izumi then showed me how this particular program will also give a hard copy printout of the time that the signals appeared, their spot frequencies and the signal strength. All this from a "simple" program!

Neither Mr Izumi nor Mr Takano, the President of AOR, could tell me the exact UK price but it should be less than £800. Watch out for it when it arrives in this country. It was originally promised for September 1988 but technical problems have caused delays and it will now probably be in September or October of this year.

Heathkit On Show

Another dealer who was doing good business in the main hall was Difona Communication. This surprised me, not because there is anything wrong with the company, but because they had a stand that was devoted entirely to Heathkit equipment. I have not seen anything from

The entrance to the Freidrichshafen show



The Classic International antenna display

Heathkit since they closed their shop in Tottenham Court Road. I know that Heathkit products are still available in this country from Maplin Electronics but I did not know that there was such a range on offer. Difona are obviously committed to promoting Heathkit products and as a result this brand is still very popular in Germany.

This was shown by the fact that Difona had taken 500 Heathkit catalogues with them to the show and they had sold them all at a pound each by lunchtime on the Saturday. Unfortunately, I had waited until Saturday afternoon before asking them for one, but luckily they had heard of *Practical Wireless* so they took their very last shop copy of the catalogue out of the hands of a prospective customer, which is why I can now give you a few more details.

The Heathkit corporate colours are now two tone beige, soon to be changed to charcoal grey. The radios that I saw on show were a QRP/c.w. transceiver for 3.5 to 28MHz, a 50W c.w. transceiver, two 144MHz hand-helds and a 150kHz to 30MHz receiver. There were also all sorts of useful accessories such as a d.t.m.f. decoder, a 1kW h.f. linear amplifier, various antenna tuners, wattmeters, s.w.r. and power meters, an active h.f. antenna, a dummy load, several antenna switches and much more. One item that particularly interested me was the HK-32 packet decoder. This is a kit version of the AEA PK-232 decoder that is currently on sale in this country and it appeared to be identical in every respect. Difona can be contacted on 010 49 69 846584.

The Sony Stand

Another firm that it was very nice to see taking a stand was Sony. They had all of their usual products on show - the Air 7, the ANT 1 and so on - but they also had two radios that I had not seen before. The CRF-V21 is an all-singing, all-dancing h.f. receiver. It has a built-in printer and decoders for RTTY and weather satellite transmissions and an RS232 interface. It is also a first class short wave receiver with coverage from 9kHz through to 29.999MHz in all the usual modes as well as f.m. in the v.h.f. broadcast band.

It has a very large liquid crystal display that gives all of the information that you are ever likely to need and which can also be switched to spectrum analyser mode. It will then work as a panadaptor and display all of the activity on the band in graph form. This is a very impressive radio that I am sure will sell well, even at the proposed price of more than £3000.

The other radio that caught my eye is not a new model but I have not seen it on sale in this country. The WA 8800 struck me as the ideal "holiday" radio. It is quite small, less than half the height of the ICF-2001, and it is a combined stereo cassette recorder and a.m./f.m. radio with the addition of eight short wave bands. With its built-in alarm clock, this seems to be the perfect set to take abroad. It can be used to listen to local stations, short wave transmissions or tapes and it will even wake you up in the morning.

I do not know the price for the WA 8800 in this country, but in Germany it costs approximately £250.

RSGB Attendance

Moving onto the smaller hall, I noticed that the RSGB had sensibly manned their stand with German speaking staff, but why for just two days? There was no sign of anyone on the stand on the Sunday. Fortunately, I had no trouble with my schoolboy German as almost everyone I spoke to seemed to prefer to speak English. Perhaps my pronounciation leaves something to be desired!

Also amongst the twenty or so stands in this hall was the firm of Rade who were selling enormous linear amplifiers (the German for which is strangely appropriate - endstufen). These linears appeared to be aimed at the freelance broadcaster as some of them were almost as big as a filing cabinet and were capable of producing several kilowatts.

In the connecting hall between the main exhibition area and the flea market, Navico had set up their impressive black and red stand in what was, arguably, the best position in the show. It faced the stairway leading to and from the flea market, so that everyone who went in or out of that hall had to walk right past the attractive bi-lingual girls on the stand. It was also opposite a small restaurant, which certain members of the party found very convenient.

The Flea Market

The flea market in the last hall is as big as some entire British exhibitions. Rows upon rows of trestle tables stretch out into the distance, each loaded down with goodies. Naturally, radio equipment predominates, but there was also a fair selection of other items. One stand had an assortment of accordions while another had a couple of antique flintlock and cap and ball pistols in amongst the computers and Bakelite radios.

The one disappointment in the flea market was the test gear. I strolled around this hall for a while with Andy Sharpe of BNOS Electronics who was specifically looking for test equipment. Unfortunately, the prices of signal generators, professional dummy loads and similar items were, in some cases, more than ten times higher than at a rally in Britain. Fortunately, this was not true for the rest of the flea market and there were some exceptional bargains to be had.

The retail price of new amateur equipment in Germany appears to be about the same as here in this country but most of the dealers were willing to adjust the price if you said that it was for export to England. They would almost automatically knock off their VAT (currently 14%) and then there was the possibility of further negotiations. Once the price had been finalised, payment was not a problem. Most credit cards are acceptable as are most currencies, but it pays to check the exchange rate that they are offering.

The grounds outside the halls, but still inside the gates, were full of caravans. The Friday of the show often coincides with a public holiday in Germany, so the amateurs whose families would want to spend a few days at a holiday resort such as Friedrichshafen might just as well go to the show and let the rest of the family enjoy the town.

Various dealers also set up in the

The view from above some of the stands

grounds. One enterprising firm was selling extremely long (6-7.5m) glass fibre fishing rods as antenna mounts for portable operation. Before long several were to be seen lashed to the sides of caravans.

Also outside was a firm selling magnetic loop antennas, a design that appears to be making a comeback. Next to them was an interesting display that featured a novel tower. A big problem with towers is that they are heavy and cumbersome and winding them up and down or tilting them over is a pain. The tower that I saw was designed to remain erect. It was rectangular and did not taper at all and there was no mechanism for tilting it. Instead there was a small metal cage, which was about 1m high and which fitted around the outside of the tower. It was this cage that carried the antennas and which was wound up and down. This meant that the winch was not carrying the weight of the tower, just the cage and antennas. The cage and winch were obviously quite strong as this exhibitor's party trick was to persuade one of the visitors to stand on the bottom rung of the cage and be wound up the mast!

Outstanding Memories

One of the outstanding memories I have of this show is the smell. Most British rallies, especially the larger ones, are sadly lacking when it comes to catering. At Friedrichshafen there were at least a dozen stands selling sizzling hot barbecued steaks, sausages and burgers. The smell constantly drifted across the show. There were also stands selling cold soft drinks and beer, a stand selling chocolates and sweets and another selling crepes - the smell of a cinnamon filled crepe being cooked is particularly enticing. The owners of these stands not only supplied food, they also provided tables and chairs where people could sit and eat, something that many British rally organisers could perhaps note.

This show is very popular with the America serviceman who are stationed in Germany and I noticed quite a few American accents and short haircuts. I also met Alan and Anne Whitford from Lowe Electronics, a few of the lads from SMC, Reg the Welshman who makes up 50 per cent of the amateur contingent on the nearby RAF base, Joe Apap, an amateur who is so keen on his hobby that he had travelled all the way from Malta to be there and Joerg Klingenfuss of *The Guide to Utility Stations* fame.

We have often chatted on the 'phone but this was the first time that we had met and he turned out to be a very interesting person. He told me lots of unrepeatable anecdotes about his listening activities and while we were sitting enjoying a burger and a beer, we were joined by Heiner Martin from the German *Funk* magazine, which is roughly their equivalent to *Practical Wireless*. His news on German amateur radio was not encouraging. They have approximately the same number of amateurs as here, his magazine has almost the same circulation as ours and the best word that he could think of to describe the radio scene was "stagnant". It seems that they have the same problems with trying to interest youngsters in the hobby and the average age of the German amateur now appears to be around forty.

Japanese Optimism

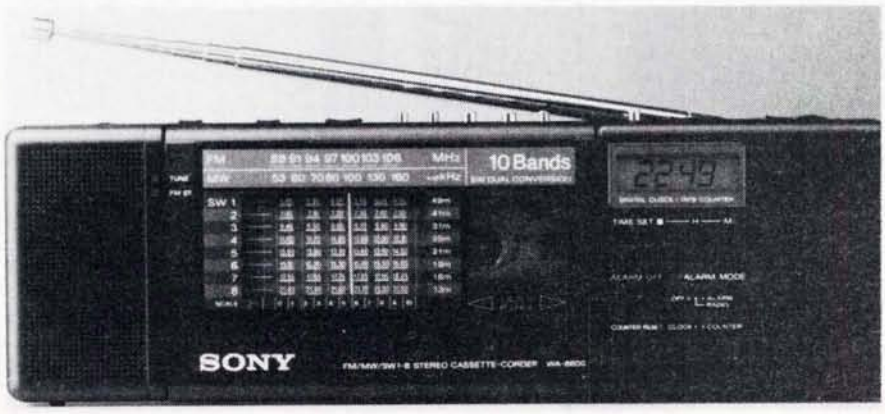
Perhaps amateur radio is dying or perhaps it has just reached a temporary plateau but the Japanese still appear to be optimistic. Most of the major manufacturers are reorganising their disbribution systems in Europe, often by opening offices that are controlled directly from Japan and the signs are that they are preparing for 1992 and the formation of the single European market. Just what this will mean for amateurs in Britain is not clear but there are sure to be some changes in the way that distribution is handled once the barriers come down.

To give you some idea of the size of the Friedrichshafen show, I had thought that the first day had been reasonably busy, but the halls were not at all crowded, so my guess for the attendance figure would have been about 2500-3000. I was therefore quite surprised to find out that nearly 7000 people had been through the gate on that day. I do not have the figure for all three days but it is bound to be at least 14 000, the sort of numbers you would expect to see at a football match, not a radio show.

All Worth It

This year, despite my arriving late in the evening, freezing cold in the pouring rain, having missed my 'plane and lost the piece of paper with the address of my hotel on it, only to find that the only cab drive on the rank did not speak English, I would still say that Friedrichshafen is a nice town with an exceptionally good radio show and I would have no hesitation at all in recommending a visit in 1990.

PW



The Sony WA-8800 cassette-corder

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WR189/92 Pair	BUG KEY WITH 528-BIT MEMORY	OCT 84	8.50
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WR068	AF SPEECH PROCESSOR	JAN 80	5.20

PW REVIEW

Azden PCS-6000 144MHz f.m. Transceiver and Airband Receiver

The Azden PCS-6000 is one of the new breed of mobile v.h.f. transceivers which seem to be including ever wider receive frequency ranges. In addition to being able to transmit from 140MHz to 150MHz the receive capability extends from 108MHz to 175MHz! Anyone familiar with the 118MHz to 136MHz air band will realise that transmissions in this band are a.m. as opposed to f.m. for the rest of the receive range. Unlike many other v.h.f. transceivers the PCS-6000 is equipped with an a.m. demodulator which is automatically selected when monitoring the air-band. This is obviously a big bonus for those amateurs with an interest in aeronautical radio. Mike Richards G4WNC reviews the transceiver.

The supplied manual comprised a sixteen page booklet with a page size of 257 x 182mm, i.e., slightly smaller than A4. The bulk of the manual described the operation of the PCS-6000 though there were very few illustrations making it rather dry reading.

In addition to the manual there was a separate double-sided sheet measuring about 520mm x 355mm which was printed with a block diagram and full circuit diagrams. Although the print was obviously quite small the quality was good so the diagrams were quite readable.

Having read the manual the next stage was to sort out the connections. The power requirements were a nominal 13.8 volts at a maximum current of 6 amps when transmitting on high power. The power connections comprised a tail fitted with insulated bullet connectors and a 10 amp fast blow fuse. The first lead connected to a second and was fitted with matching bullet connectors and ended in wire tails. I found the lead length perfectly adequate for making the connection direct to the battery.

The antenna socket fitted was the standard SO-239 type which was mounted on the rear panel.

The only other socket on the rear panel was a 3.5mm jack for the connection of an external speaker. As the internal speaker was mounted on the top panel of the PCS-6000, you are likely to need an external speaker in most installations.

The final connection was the hand microphone which used a standard eight pin microphone socket mounted on the front panel.

I'm sure that anyone hoping to use the PCS-6000 as a mobile /base station rig will miss the provision of an audio output on the microphone socket. This facility is particularly useful for the Packet radio operator who can make all the necessary connections directly to the microphone socket. With the PCS-6000 the operator will need to make an additional connection to the external speaker socket on the rear panel. The big disadvantage being that you cannot then easily listen to the packet signal.

As the PCS-6000 is primarily a mobile rig hardware was supplied to facilitate mounting in a vehicle. This comprised a "U" bracket and an assortment of screws and bolts. Unfortunately, there were no mounting instructions in the manual but as two of the supplied screws had knurled heads I assume these were to allow the PCS-6000 to be easily removed from its mounting.

Circuit Description

As the PCS-6000 is rather unique in its frequency coverage and modes I thought it would be interesting to give an outline of the circuitry techniques used.

The transmit/receive switching is accomplished using a simple relay mounted in the p.a. module. When in receive the antenna is fed to the front-end unit where it is switched using diode switches to either the f.m. or a.m. r.f. amplifiers. The f.m. r.f. amplifier comprises the now standard dual gate m.o.s.f.e.t. which in this case has some quite elaborate Varicap tuned filters on both the input and output. The a.m. r.f. amplifier is similar except that it is equipped with an a.g.c. line to help provide a more constant signal level.

The outputs of the two r.f. amplifiers are combined via diode switches and coupled to the first mixer. This stage comprises another dual gate m.o.s.f.e.t. and is used to produce the first i.f. of 16.9MHz. The output of the

first mixer is filtered by a pair of crystal filters before being fed to a multi-function integrated circuit. This device includes the second oscillator, mixer, f.m. i.f. amplifier and n.b.f.m. demodulator. The second i.f. used in this case is 455kHz. For a.m. reception a sample of the 455kHz second i.f. is extracted a passed to a separate a.m. i.f. amplifier, demodulator and audio pre-amplifier.

The outputs of the a.m. and f.m. demodulators are combined and fed to an audio power amplifier integrated circuit for final amplification.

The Controls

Being a mobile rig, the PCS-6000 has all its controls mounted on the front panel, with the main liquid crystal display taking prominence. There are only two rotary controls and they are used for volume and squelch respectively. I was pleased to see that the volume control was not combined with the power switch as this causes unnecessary wear on the volume control. The main microphone socket is mounted on the extreme right-hand side of the front panel, well away from all the other controls thus helping to keep the main control area free of clutter.

The remainder of the front panel comprises two groups of push-buttons. The main group run along the bottom edge of the panel and are used for frequency selection, secondary functions and memory mode. The remaining slightly smaller buttons give access to the other facilities such as scanning, tone-burst and reverse repeater shift.

It appears to be common practice these days to include secondary functions for most of the front panel controls so as to keep the number of controls to a minimum. The only snag being that sometimes the abbreviations used on the front panel can be somewhat confusing. Fortunately, the PCS-6000 doesn't suffer this problem and the front panel are quite clear and logical.

Operation

Frequency selection on the PCS-6000 can be achieved in one of two ways, either manually by using the UP and DOWN buttons or by use of stored frequencies in the 20 memories. To look at manual selection first, single presses of the UP or DOWN buttons change the frequency in single step increments the size of which can be set by the operator. These increments can be set to any value between 12.5kHz and 50kHz in 12.5kHz steps for f.m. With the wide frequency coverage of the PCS-6000 a faster method of tuning is required and this is provided using the function key. When this is pressed the UP and DOWN buttons change the frequency in 1MHz increments which enables the necessary rapid change in frequency. The UP and DOWN buttons remain in this mode for a few seconds as long as no keys are pressed. In addition to the UP and DOWN buttons on the front panel, duplicate buttons were provided on the supplied microphone. As expected, these exactly mimicked the main buttons. The selection of a.m. or f.m. reception modes was automatically carried out by the PCS-6000 according to the frequency in use.

The second method of frequency selection is to use the twenty programmable memories that are supplied as standard on the PCS-6000.

Before you can start you have to put the PCS-6000 into program mode, which is achieved quite simply by pressing the F and PROG buttons. Once in programme mode you next have to select which memory you want to use. In the PCS-6000 the memories are organised in two banks of ten memories called banks A and B with the sets of memories numbered 0 - 9. Once in programme mode the procedure is much the same as that used when setting digital clocks and watches, i.e. the UP and DOWN buttons effect whatever is flashing on the display.

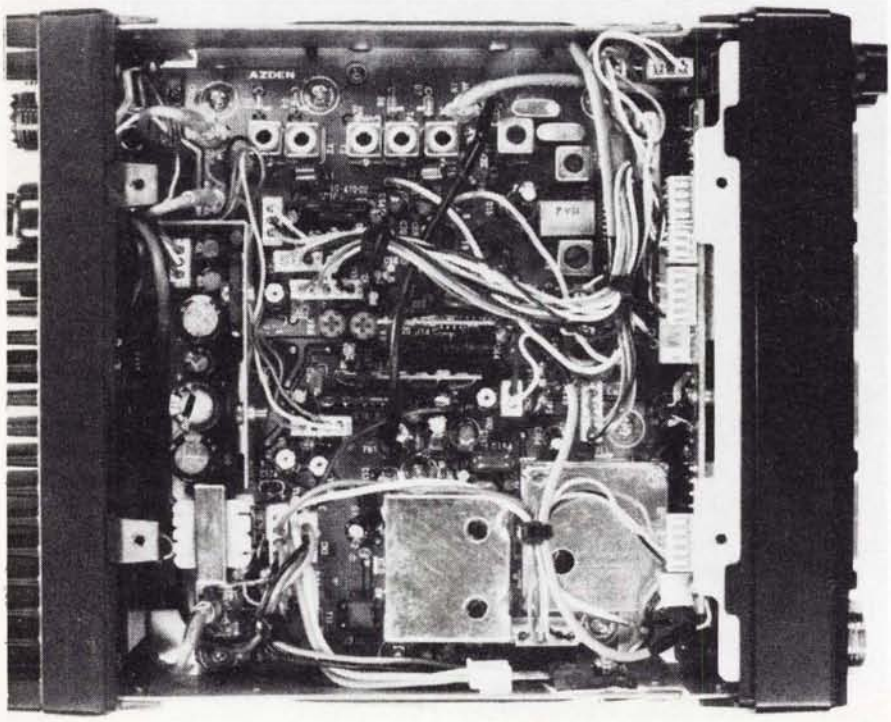
One rather unfortunate point is that you have to cycle through four options (RX frequency, RX tone, TX frequency, TX tone) even if you just want to store a simplex frequency. By the way the RX and TX tone refers to sub-audible tone calling which is available as an optional extra. One other oddity is that once you have entered programme mode the only way to return to normal operation is to turn the power off then on again, which is not very user friendly!

Fortunately the subsequent recalling of a stored frequency is somewhat easier. The procedure is to press the M-MODE button to enter memory mode and then select the required memory by using the UP and DOWN buttons.

Although the PCS-6000 has twenty memories, there are one or two special functions associated with some of these. The first is memory number A0 which is nominated as the priority channel. Any frequency stored in this memory can be recalled by a single press of the button marked A0 on the front panel. Alternatively, by pressing the PRI button, the PCS-6000 will automatically monitor memory A0 every four seconds. When a signal is detected, two beeps are emmited from the speaker to alert the operator. This is a rather unusual implementation of the priority function as most rigs simply switch to the priority channel when activity is detected. Personally I think this is a better method so full marks to Azden for a fresh idea.

The PCS-6000 is capable of band scanning by storing the required frequency limits in memories A8 and A9 or B8 and B9. By using this system two scanning bands can be stored and activated by selecting memory bank A or B. The only limitation on band scanning is that you cannot scan from an f.m. section to an a.m. section and vice versa, but this is not a real problem. It is actually rather unusual to have two scanning bands available and puts the PCS-6000 ahead of many of the simple scanning receivers which normally only feature one scanning band.

The only other memory function not yet mentioned is the temporary memory. This is a very useful feature that is the saving grace as far as the PCS-6000's memories is



concerned. As its name implies it is designed for the temporary storage of a working frequency. To store a displayed frequency and mode you simply press the F button followed by the T-M button. Recalling the temporary memory is just as easy and involved a single press of the T-M button.

The final point regarding the memories is that they are all provided with battery back-up in the form of a lithium battery with an expected life of five years. The only query being - do you loose the memory content when you change the back-up battery? Even if you do, reprogramming the memories every five years is not too much of a chore!

In addition to band scanning, you can also scan the memories. When using this you have the option to either scan all twenty memories or to split this down to one of the two banks, A or B. The only feature missing is the ability to lock-out individual memories which can sometimes prove useful.

Having completed the frequency selection options, there are a few other features that I should mention.

The first is the REV button which, as the abbreviation implies, reverses the transmit and receive frequencies when operating with a repeater shift. This obviously makes it very easy to listen on the repeater "input" to see if you could work the station simplex.

The next function is also associated with repeater working and is a secondary feature of the PRI button. By pressing F followed by PRI you can enter a positive or negative frequency shift using the UP and DOWN buttons. The actual frequency shift is determined during the setting-up process I described earlier.

The transmit power level can also be altered from the front panel, the choice being 5 or 25 watts.

Finally, if you fit the optional tone squelch unit, this can be activated on receive by turning the squelch control counter clockwise past the click stop. Enabling the transmit tone is a secondary function of the REV button.

On The Air

Once I had set-up the PCS-6000 in the shack, my first interest was to see just how well the air-band reception fared. So, using my trusty discone antenna, I tuned around the local air band channels. The performance was in fact very good, thanks mainly to the use of dedicated a.m. r.f. and i.f stages. The audio quality was nice and crisp and the sensitivity proved to be very good. With air band communications being generally very short, it is vital to have good audio if the message is to be copied. The PCS-6000 scored highly here. My only criticism of the air band performance was that the 5kHz tuning steps were a bit too small. It's not a serious problem, it just slows down the tuning and searching.

Next operation was to fit the PCS-6000 in the car and try out some mobile operation. The installation was trouble free and the supplied power lead was plenty long enough to reach from the dash to the battery. The antenna I used was a dual band collinear for 144MHz and 432MHz. Once installed, I set about programming the memories with the local repeaters and common simplex channels. It was at this point that I came across a serious omission - there's no repeater access tone burst! For the mobile operator this is a real problem and the only solution is whistle up the repeater, providing of course you can hit 1750Hz! This was the technique that I had to resort to for repeater access while reviewing the PCS-6000.

Looking on the bright side the f.m. audio quality was again very good and ideal for mobile operation. Azden have really done a good job here as it's very difficult to achieve a good audio quality which will suit both male and female voices. The transmitted audio was also of equal quality and I received several complementary comments.

I must admit though that I was not very happy with the programming logic which was definitely not user friendly. Although, given time, you can get used to almost anything, I think the manufacturers ought to think about changing the programming logic on the PCS-6000.

The PCS-6000 seemed to cope well with all the normal QRM associated with car electrics, i.e. alternator whine and general clicks and bangs. There was plenty of audio power using the internal speaker, at least for my relatively modern Japanese car.

Before I buttoned-up the review and sent the PCS-6000 back, I took it into the shack again to see how it performed on Packet radio. I'm sure most users of this type of rig expect it to serve the dual role of mobile/base station.

As I mentioned earlier, there was no audio output available from the microphone socket, so I had to connect to the ext. speaker socket on the back panel for the audio output whilst the mic socket was used for the p.t.t. and audio in. Once I had sorted out the connections I fired-up my Siskin Tiny 2 TNC (that's in for review too) and tried monitoring 144.650MHz. As usual, there was plenty of activity so I checked that I could link up with the local mailbox, this proved successful. I followed this up with several other calls and all worked fine, so the PCS-6000 seems to be OK for packet use.

PW

Summary

I must confess I had very mixed feelings about the PCS-6000. My initial reaction was not very favourable, due mainly to the odd programming logic, but as I became more familiar with the facilities its strong points started to win through. The addition of air band reception will obviously appeal to a lot of potential operators and the implementation of this feature was very good. The audio quality of the review model,both transmit and receive was also very good. The omission of tone burst on a modern mobile rig is unforgivable, so I hope the manufacturers will take note and rectify this.

So overall a basically good transceiver which has the potential to be very attractive if the operating logic is sorted out.

The PCS-6000 costs £329 and is available from *Waters & Stanton Electronics, 18-20 Main Road, Hockley, Essex SS5 4QS, Tel: (0702) 206835* who I thank for the loan of the review model.

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G924a

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PW CASSETTE OFFER NOV. 89

l Offer
ion Cassette - 1

The Making of the PW/SWM Radio Information Cassette

"It was probably the biggest aurora event on record"
"Worked into Eastern Europe on meteor scatter"
"Operation from the MIR space station was heard"
"This was the first JA - G opening on 50MHz since the band was made available"

All wonderful stuff, and the sort of things in the pages of magazines such as *PW* and *SWM* likely to set the hearts of the dedicated v.h.f. DXer beating a little faster - either through excitement of anticipation, or more likely through the frustration of having mssed the event!

For example, how many times have you heard the locals saying how brilliant conditions were on 144MHz last evening when you were outside trimming the privet? Or the real gut-wrencher - the one that turns you into a quivering blob - is when you've driven the 25 miles to your mother-in-law's and are forced to watch Bergerac because the titles show the hotel she stayed in last year, when the patterning appears on the screen, followed by the presenter who apologises for the "interference due to atmospheric conditions" and the nearest rig is miles away. Medically it's known as acute Homo-Sapien Sporadicitis, or Tropophobia - the fear of missing an opening.

Knowing the band is open and not being able to have a go is actually worse than being blissfully unaware that the HB9s are romping in as the privet gets a short back and sides.

It all boils down to the fact that most of us miss the BIG ONE and read about it a month or two later. Indeed I was talking to a very active G3Y.. at Longleat who said that in all his years on the air he had never heard an aurora. OK then, hands up who's heard the Space Shuttle? Moonbounce? The Turks and Caicos Is on 50MHz? If the answer is yes to all three then you are probably reading this on Clipperton Is swinging the 80m 5-element round to Andorra (long path) whilst rattling off a string of ZLs on 70cm.

I've heard auroras but not moonbounce, or Japan on 6m, or the MIR space station and it occurred to me that most amateurs haven't either, but would dearly like to. So it was decided to approach *PW* with a view to compiling a tape recording of "amateur radio's greatest hits" and to include some notable events in recent radio history and examples of the more unusual v.h.f. propagation modes. Being a forward-thinking lot they said, "good idea - and while you're about it our short wave data enthusiasts are asking for a tape to help identify the different modes, FEC, RTTY, FAX, etc."

Back at the office/shack/recording studio LiveWire began work on gathering in the archive material. In the true spirit of amateur radio everyone approached was extremely helpful. Chance encounters at the HMS *Mercury* Rally led me to Graham G8MBI whose enthusiasm for "big aerials" borders on insanity and has been personally responsible for peaks in the price of aluminium on the Stock Market!, to Eric G6CSX who is far more sensible and always seems to be in the right place at the right time with a tape recorder running - which I am sure is not accidental!

The visit to G8MBI will be long remembered as an evening of superlatives as the YPQ jaw dropped lower and lower hearing about past antenna arrays and watching, as well as listening to, signals off the moon. Graham records on an Apple Macintosh using digitised audio and the software enables the waveforms of the signal to be displayed as well as heard so you can see the effects of moon "wobble" on the dots and dashes. It's the ultimate shack accessory and if Graham says you have key clicks than you have key clicks!

Some of his recordings of e.m.e., aurora and meteor scatter are featured on the tape. The high speed c.w. recorded from meteor bursts are played at normal and slow speeds, again courtesy of the Apple Mac, as the software enables you to select a very wide range of playback speeds. The "star of the show" is undoubtedly the meteor burst which lasts over a minute during which there are at least four s.s.b. QSOs with OK2KZR around 144.200MHz. It just seems to go on and on, it's quite incredible and he actually had it taped - or in Graham's case floppied. He calls it the "megaburst which everyone should have the opportunity of hearing".

Another very enjoyable evening was spent with Mike G3SED and Trevor G3ZYY. The topic was 50MHz and it was fascinating to observe how two very experienced operators had been totally grabbed by the band. The tape features anecdotes and recordings of 50MHz DX including VP5D and a rare opening to JA.

As mentioned before, Eric G6CSX provided some archive recordings of the Space Shuttles with W5LFL on *Columbia* and W0ORE on *Challenger* coming in loud and clear on 144MHz f.m., and a 2-way QSO between U4MIR and Denis G8AFG in Portsmouth.

The tape is introduced by a specially commissioned piece of music for harp and Morse key. The harp - or orchestral log periodic - is played by the composer, Mrs G3YPQ, whilst no originality is claimed for the arrangement of "CQ DX" on the key!

Side B has "data" mode samples of c.w. at 15 and 50w.p.m., Baudot or RTTY at various speeds, FEC, AMTOR, FAX and packet to help the aspiring data enthusiast to find his way round the various signals likely to be encountered in the amateur bands. It was felt that "O'Moffis" might take a dim view of recordings outside the amateur bands!

See the Special Offer opposite for more details of this interesting cassette.

...by LiveWire

Hilarious Ham Radio

There is a human side to amateur radio says D. V. Pritchard G4GVO

Mind you, we took our fun seriously. When you're only ten years old, you have to. Particularly when you're struggling with a circuit diagram propped up against the teapot, and your wooden baseboard won't keep still and breaks a plate, plus the tangle of wire that wraps itself round your feet, insisting that it's a boa-constrictor.

Actually, there were two of us then, me and a school chum whose garden backed on to mine, and both of us bitten by the bug at the same time.

We put up antennas of astonishing architectural features and certainly unique from a radio viewpoint, though looking back I'm bound to say the moral angle was wrong. We needed wire, and the benign deity that looks after budding radio hams had sent a pair of electricians into our neighbours' houses armed with several drums of v.i.r. cable. We "borrowed" enough to run two wires, one from the eaves of my house to his and *vice versa*, with an intricate arrangement in between , the separation, I suppose, being about twenty feet. The best bit was that the sparks looked everywhere for their lost cable and never found it.

It was hand capacity that baffled us. As soon as you removed your hand from the knob the BBC regional programme disappeared like a genie in a bottle. Neither of us understood the phenomenon but we tackled it in a spirit of true enterprise. I pushed the dial round with a wooden ruler but not so my chum. He was more scientific. He cut two flanges on his tuning knob and made an 18-inch plywood spanner to fit it.

Then, of course, the fascination of feedback. Up to then our sets were simple t.r.f. jobs, but we carefully wound the correct number of turns on the former, fitted our reaction capacitors and went to town. In fact we went to town more literally than we expected because it wasn't long before we discovered that by turning up the reaction control for maximum smoke, all the sets for miles around took off in a howl of anguish. From this we took the next great step for man by discovering we could communicate with each other merely by swishing the reaction control, which we did for hours - until it got boring.

Scouts

Like most kids of our age, we were scouts, and apart from the once-a-year forced labour of shoving a dirty great trek cart all the way to Gilwell Park, they inflicted on us the twin tortures of semaphore and the Morse code, confidently believing that when the time came we would die gloriously for King and Country in a blazon of flags, dits and dahs.

But it was when they suggested practising at home with a friend or brother (the distinction was carefully made) that the rot set in, for both of us naturally hit on the same idea simultaneously.

We thought it was best to key the power supply, and as we both firmly believed you got the best out of a PM2A by giving it the maximum clout of 120 volts, we set to work convinced that excellent communication between us was more than possible.

..... TWO GENTLEMEN ....

Indeed it was, as most of the western suburbs found out too. We blithely continued for about a week, trying to send each other the juiciest passages from *The News of the World* blissfully unaware of our wider audience. Young science was nipped in the bud at the end of that time by two gentlemen in bowler hats (the Post Office was smart in those days) who said they were aggrieved by our efforts and in any case, where were our licences?

Now we knew nothing about licences. In our opinion the sets worked perfectly well without them, and it was only when our parents learned the heinous nature of our offence the retribution came like claps of thunder, or more accurately, several claps of thunder on our behinds.

Lisle Street

One good thing emerged from the war and its name was Lisle Street. In the early fifties, Lisle Street was the Aladdin's Cave of ham radio. When I thinks back to all those HROs, AR88s, 1155s, R107s - all brand new, boxed and going for a song - the 1154 TXs, 38 sets, 19 sets; thousands of crystals, millions of valves, countless numbers of those beautiful 100pF variables with quarter-inch shanks, Jackson capacitors, roller-coasters, tuning units, chasses and cabinets; resistors by the ton, silver mica capacitors by the cart full, tools of all descriptions .....and all for the silliest prices imaginable.

Those were the glorious days .....you could trot down there with a tenner clutched in your hot little hand and stagger back with a complete shack and still have change. Buy an HRO and have your pockets stuffed with crystals (or anything else out of the bins) as a free extra. In common with thousands of others, I made my way there and had to take a taxi back to Victoria.

I didn't know what I was going to do with all the things I'd bought, but I managed to get on a train with them (to this day I don't know how) and immediately met another chap equally loaded. It turned out he was a licensed amateur and, what was more to the point, had recently moved into my area.

Morse Lessons

From that meeting it was only a short step to near respectability. I was invited to his shack and actually spoke to an American - oh yes, you could in those days! Anybody could, provided the amateur supervised the operation and was ready to clamp his hairy hand over your mouth if he thought you might say something you shouldn't. Being the good guy he was, he got me going as a s.w.l., took me to the club and set me on the road to "Godliness" by making me swot for the RAE and sending me to Morse lessons at a certain evening institute.

The Morse classes were run by a giant

among men called Junko, otherwise Fred G2BRH of colossal fame and equal girth. His methods of teaching Morse were both highly efficient and highly hilarious. One evening we had progressed to the stage of taking down words beginning with SH.

"Be very careful here, gentlemen ....."

Junko had a shop in Seven Kings, where surprisingly, he sold junk. It was one of those fantastic places, now, alas fast dying away. It was just possible to squeeze between the piles of stuff if you breathed very shallowly, and every few weeks he would hold one of his Giant Junk Sales preceded by weeks of advertising over the air. The magnet that drew everyone to the place was his famous row of Oxo tins, where, for a copper or two, you could find everything you wanted.

The night of the Morse test arrived. You paid your ten bob and the examiner peered both ways before emerging from his safe house at St. Martins le Grand to make his way to the particular centre.

Now, that night of nights had been foreseen days before by some demon who sent us mountains of snow which had turned to ice, and as I drove my Ford 5 cwt van (with eight fairly sober chaps compressed in the back) into the driveway, I spotted a diminutive figure swathed like an Egyptian mummy and carrying a case a little distance in front of us. It was a nerve-racking experience. If I stopped I would never get going again on that ice. And even if I tried to there was a very fair chance of skidding into the bloke at a thundering rate of knots. I played a frantic concerto on the horn, but wrapped up as he was, he didn't hear it, and it was only at the final moment of prayer that he spotted us and jumped out of the way, accompanied by a chorus of blasphemy from the back of the van that would have made the Marines blush.

Yes, you're right. It was him. We assembled in the room under his baleful eye convinced the whole thing was a waste of time. Junko came in and sat next to the examiner, no more concerned than if he was about to order a pint. We took up our pencils and awaited the worst. Finally we filed out of the room to be called back one by one to convince him we really knew one end of the key from the other.

Later, we learned we had all passed. Apparently, he was so relieved at not landing up in the local hospital that he had decided to be kind to us.

Here's to the Hamfest!

The hamfest was the social function of the year and one of the first I attended still has a lot to live down. The committee had really gone to town in organising some first class nosh, but by an unbelievable oversight they had chosen un-licenced premises for its ingestion. Fifty disgruntled amateurs consumed their meals in deadly silence punctuated only by dirty looks at the Secretary, and as soon as the tables were cleared an impromptu Extraordinary General Meeting took place to decide which pub to invade.

Now, it happened that one of the members was an enthusiastic home-brew wine-maker and he invited us all to his place to sample the goodies. It was in this atmosphere of good fellowship that the Secretary, fearing a sudden change of attitude if anyone was sober enough to recall his sins of omission, slunk off homewards as fast as he stagger. In the event he was off the air for a week before he found the pin someone had pushed through his coaxial feeder!

Then there was the club whose hamfest, by another oversight, took place during National Field Day. Horror came over the Chairman when it was found that all the best c.w. operators had virtually to be carried into the tent while urgent appeals of black coffee were made to the hangers on. He needn't have worried. To this day it is agreed that they sent better Morse than when they were sober.

And to the Rally!

Who'll ever forget the rallies of the fifties! The best one for me was the Harlow Rally, (there were plenty nearer home but Harlow took some beating). Invariably held in the Village Hall at Magdalen Laver, on which a posse of enthusiastic amateurs had descended a day or two before, it was the Ascott of ham radio, especially when the runners arrived.

Traders? What traders? The only trading was the bring and buy stall which was the Hall itself. From each car came the creaking of backs and the occasional scream of a slipped disc as its owner staggered towards the Hall with an article of prodigious weight, everybody praying he would drop it and thus get it at a much reduced price. And what stuff it was, home-brew TXs, RXs, a.t.u.s, massive chunks of ex-service gear, Variacs, batteries, rotary converters, command receivers and any amount of ex-government transmitters and receivers. 813s, 807s, 6L6s and bottles of lesser breeds clinked against each other in their hundreds on the trestle tables, festoons of cable and wire ensnared you from above, and you made you wary way through the mass of Morse keys, mics and manuals growing out of the floor in profusion like a big white hunter in the jungle.

As with most rallies in those days a wise operator always checked his vehicle very carefully before driving away. Not that anyone would dream of tampering with the car itself, but the bloke's rig was always a legitimate target, and as most of them were home-brew it was often an easy matter to liven up the homegoing with a little innocent merriment. Lack of transmission was invariably traced to the bottle out of the v.f.o. or driver (the p.a. was considered sacrosanct) which was usually discovered taped behind the visor or another convenient hiding place a day or two later. The antenna of course, being easier to get at, was often the thing you went for, and a cunningly concealed strap across the loading coil often had the operator wondering why he couldn't load up.

Warning: you could only do it with valve rigs because the p.a. could stand it. Don't try it on these days with solid-state gear.

Naturally, if you had more time, and a crony to help you, more sophisticated devices were possible. Like the case of Steve who, making his way home one night after a rousing day, was flagged down by the Law. "Radio amateur, are we, sir? Well, it's very pretty, I'll not deny it, but it's a bit off-putting for other drivers, isn't it?"

"What is Superintendent?"

"Them lights on your aerial, sir"

Someone had taped miniature neons all the way up its length and when Steve modulated the rig they flared like fireworks up the Great North Road.

On-Air Gaffs

No, I'm not trying to vie with the fillers you see from time to time in PW, except to say they're probably true. The best I heard was one hot day in June thirty years ago when I was a passenger in the car of John who was pumping out 100 watts of a.m. on 80 metres as we made our way down a country lane. Suddenly we were halted by a flock of sheep whose owner was in no hurry to get home, and at the same time we found ourselves next to a girls' school where Sports Day was obviously taking place, p.a. system and all. To our horror, the system burst into life when John, unwittingly modulating it 100 per cent said in QSO: "We're held up by a lot of four-legged women who are going to get their backsides slapped if they don't get a move on".

Mind you, it wasn't only over the ham bands that you heard the best bits. I think it was the *In Town Tonight* programme in the mid-fifties in which a stiff-upper-lip gent with a two-letter call was being interviewed.

"Now, can you tell listeners exactly why you send these radio waves into the sky?"

The drawled answer was one of typical British phlegm: "Can you think of a better direction to send them?"

The thing is ham radio has made such fantastic advances during the past few years that it's hard not to admire the technology. It's also hard to service your own rig, I understand, unless you're a midget with an honours degree in physics. But ham radio can never stand still. It must march with the times and maintain the state of the art. I mean, what greater fun can you have than switching on your computerised gear before you leave for work in the morning and coming home to find out who you've worked during the day? And with any luck the printer will have chucked out a few QSL cards for good measure.

All right, all right, "sarky" old geriatric, I hear you say; times have changed and we've got to keep up with them. Fine! I'm all for it. But don't get so immersed in your all-singing, all-dancing gear with its dozens of panel controls and thousands of memories, that you forget the human side.

Programme a few memories for fun, you'll never regret it. **PW**

Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

In Part 19, R.F. Fautley G3ASG continues his description of filters with a graphical look at low pass, high pass and bandpass filters.

To visualise the "response" of a filter, where the response means the effect the filter has on signals passing through it, it is common practice to plot a curve of the output level of the filter against frequency. It's assumed, with this type of graph, that the input (or signal source) to the filter is maintained at a constant level. This is the point where many experimenters go a bit wrong and so we'll digress a little to expand this statement about a constant input level.

To allow for changes in the filter's input impedance over a wide frequency range, which affect its frequency response, the point at which the signal generator level is maintained must be as close to the a.c. source as possible. It is for this reason that a signal generator used for testing professional equipment has an internal meter for measuring and maintaining the level of the signal source.

If we were to monitor the signal generator's output directly across the filter's input terminals we would be **forcing** a constant voltage across those terminals even though the impedance between them may be nearly a short circuit at some frequencies outside the filter's operating band. So, where the input is nearly shorted out, which would correspond with frequencies which should be **attenuated** by the filter it could appear that the frequency response was very much better than it really was.

Look at Fig. 19.1. It shows how frequency response measurements should be made. The following test equipment is necessary:

(i) A signal source, normally a signal generator, either a.f. or r.f. depending on the device to be measured. Usually a voltmeter, V_{in}, is built into the generator to monitor the level of the input signal.

(ii) A resistor, R1, of value to be discussed later.

(iii) Another resistor, R_L, of vlaue to be determined later

(iv) An a.c. voltmeter, V_{out}, suitable for measurements at the frequencies in use.

Before connecting up the bits of the test set-up, it is necessary to set two very important values, R1 and RL. These two values are determined by characteristics of the device to be tested.

These characteristics are:

(i) The input impedance of the device.

(ii) The output impedance of the device.

The impedances are determined before the device is designed so, if a purchased item, it should form part of the information accompanying it. Let's assume that the device is a filter.

The input impedance of the filter is the value that should be indicated by a impedance measuring instrument connected across the filter's input terminals when a correct value of load impedance is connected across the filter's output terminals. A bit of a mouthful!

Unless the filter is **terminated** by the correct value, the value indicated by the impedance measuring device will not be correct.

In nearly all cases this impedance will be quoted as a resistance. For our example it is R_{in}. Let it be 600Ω. This does **not** mean that an ohmmeter connected across the input terminals would read 600Ω, beacuse the input ompedance (even if it is resistive) will only be correct if measured at the **frequency** at which the filter is intended to operate.

The load impedance for filters is nearly always equal to the value of the input impedance, so it will also be 600Ω. In filter parlance the device would be called just a 600Ω filter.

Where's all this getting us? Well, if we want to measure the frequency response of the filter we have to know these values because the impedance of the signal source must also match (be equal to) the filter's input impedance.

Audio frequency signal generators sometimes have their output terminals marked "600Ω" and this means that Rs in Fig. 19.1 would be equal to 600Ω. If this is so, then we can safely connect our 600Ω filter directly across them. Suppose the generator output terminals are marked "50Ω", what can we do then? For Rs would then be only 50Ω.

A simple method would be to connect a 550Ω resistor in the position marked R1 in Fig. 19.1. Why 550Ω?

Well, 550 + 50 = 600 doesn't it? Then the signal generator Rs would look like 600Ω to the filter input terminals wouldn't it?

The only other component to worry about is R_L. This is easy for a 600Ω filter - it would just be a 600Ω resistor!

Having got all the components connected together as in Fig. 19.1, all that remains is the test itself. Slowly swing the frequency of the signal generator from low

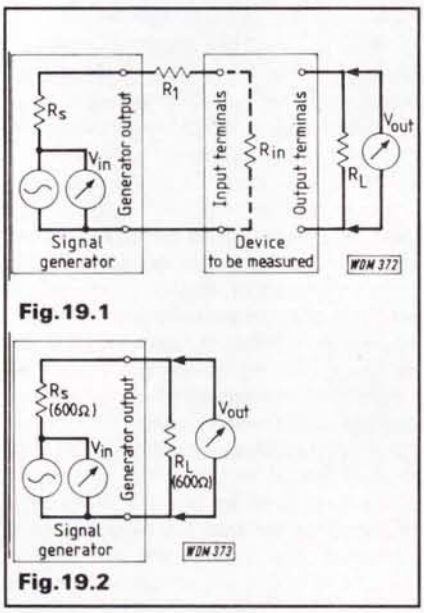

Fig.19.1

Fig.19.2

to high across the spectrum where the filter is expected to operate, whilst maintaining the input level indicated by the voltmeter V_{in} at a constant level, noting any changes in the reading of the voltmeter V_{out} across R_L. Plotting output level against frequency on graph paper will give the frequency response of the filter being tested.

Why all this emphasis on input matching? Because at frequencies **outside** the filter's passband its input impedance will probably change enormously, perhaps from nearly a short circuit to nearly an open circuit. Only around the passband of the filter is input impedance likely to be around the design value in these simple filter types. So, if you were to connect the signal generator across the filter input terminals and attempt to maintain a constant level **at that point** rather than at the point **before** the input matching resistor R1, the result would **not** be the correct frequency response of the device.

For example, if a filter had a specified input impedance of 600Ω we could replace it by a 600Ω resistor and connect the resistor across the 600Ω signal generator output as shown in Fig. 19.2.

Then, if the signal generator level indicated by V_{in} was set say to 1.0V r.m.s., what would we expect the voltmeter across the 600Ω resistor to indicate? Since no reactance is involved in the circuit (resistance only) it's quite a simple matter to get the answer.

That is what is called a "matched" condition, where the level across the output is exactly half the level of the source. This is approximately what we can expect to happen around the filter operating frequency band. Outside this band the input to the filter is likely to be anything but the nominal 600Ω resistance, perhaps near to a short circuit, possibly also quite reactive. For this reason we must **never** maintain the input voltage

$$Vout = Vin\left(\frac{RL}{RS + RL}\right)$$
$$= 1.0 \times \left(\frac{600}{600 + 600}\right)$$
$$= 1.0\left(\frac{600}{1200}\right)$$
$$= 0.5V$$

directly across the filter, but **always** at the generator source so that the effect of the input impedance of the filter is allowed to affect the filter's frequency response.

A lengthy diversion, but such incorrect methods of measurement are all too commonly encountered (even sometimes in industry!) when drawing response curves of amplifiers and filters, especially crystal filters.

Let's carry on by taking a look at the responses of the four filter types already discussed.

Frequency Response of Low Pass Filter

The circuits of the π and T section low pass filters were shown in Figs. 18.1 and 18.4. The response, theoretically, is the same for either type. As has already been shown, the filters will pass low frequencies and reject (attenuate) high frequencies. Graphically, a typical response is as Fig. 19.3. The frequency f_c marked on the horizontal axis is the frequency at which the output voltage falls to 0.707 (or about 70 per cent) of the maximum voltage output at d.c. and low frequencies.

This frequency f_c at which the voltage falls to 0.707 of maximum is called the "cut-off" frequency of the filter because at this frequency the effect of the filter is starting to make itself felt. In other words, at f_c the filter is beginning to attenuate the signal passing through it, or "cut-off" signals having frequencies higher than f_c. The required cut-off frequency is one of the bits of information necessary when designing any type of filter.

Since 0.707 of the voltage is the same as 3dB below the maximum output of 0dB, the cut-off frequency is also often called the 3dB point of the filter response. To design the filter so that fc falls just where you want it is another story, outside the scope of this series. Just to get you interested though typical amateur requirements are:

(i) Filters to prevent unwanted audio

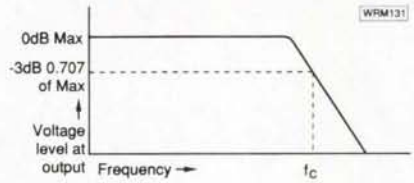

Fig.19.3

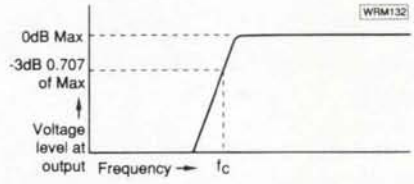

Fig.19.4

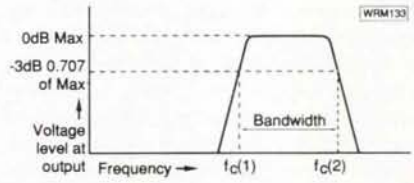

Fig.19.5

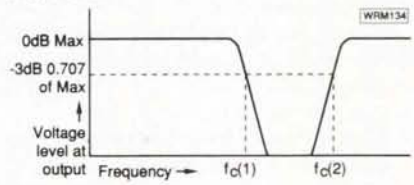

Fig.19.6

high audio frequencies, say above 3kHz from a microphone, from being transmitted. In this case the filter type would be a low pass filter (either Π or T configuration).

(ii) Filters to reduce the level of any r.f. harmonics or other spurious signals above 29.7MHz (for h.f. band transmitters) being radiated. Again, the filter required would be a low pass type, either Π or T.

In these two cases fc would be approximately 3.2kHz and 30MHz respectively.

Frequency Response of High Pass Filter

The T and Π section high pass filters were shown in Fig. 18.7 and the response of such filters are shown in Fig. 19.4.

Amateur requirements for these filters are in combating television interference (TVI) where signals from the amateur transmitter, even when spectrally pure (i.e. containing no or very, very little spurious output) still are found to cause trouble. The problem in these cases is usually due to the high level amateur signals exceeding the dynamic input range of the TV receiver; that is, it's really a TV receiver short-coming. Reducing the level of the amateur signals at the TV antenna input until they are **within** the dynamic range of the TV receiver, without losing any television signal, will usually overcome the problem.

When fitted to the TV receiver antenna socket (and it's very important that it be fitted as close to the antenna socket as possible to prevent the unwanted amateur signals being picked up **between** the filter and the TV set) it will attenuate signals having frequencies **below** the cut-off frequency of the high-pass filter, and pass signals above f_c, such as the required television signals in the ultra-high frequency (u.h.f.) range, with a minimum of hindrance. In this case f_c should be around 200 to 300MHz.

Frequency Response of Band Pass Filter

Band pass filters were seen in Fig. 18.10, with the response here in Fig. 19.5. Now, in these cases we have **two** frequencies at which the output voltage falls to 0.707 of the maximum value, that's -3dB. The numerical difference in frequency between $f_{c(1)}$ and $f_{c(2)}$ is called the passband or "bandwidth" of the filter.

Uses of the filter are:

(i) To limit audio frequencies from a microphone amplifier to a band of say, 300Hz to 3kHz. The $f_{c(1)}$ could be about 270Hz and $f_{c(2)}$ about 2200Hz. Cut-off frequencies in general are usually a little bit above or below the required actual frequencies to be passed so as to give very little attenuation in the required passband.

(ii) To attenuate sub-multiples (e.g. crystal oscillator and frequency multiplier stages) below the output frequency and r.f. harmonics above the output frequency of a v.h.f. transmitter. Cut-off frequencies for a 144MHz band transmitter band-pass filter could be about 140MHz for $f_{c(1)}$ and 150MHz for $f_{c(2)}$.

Frequency Response of Band Stop Filter

This type has been included for completeness, although in fact is not used as often as the other three. The T and Π section filters were shown in Fig. 18.12 with the response now in Fig. 19.6. It could be used to attenuate a small band of frequencies around a particularly strong unwanted signal in the output of a transmitter.

It is hoped that the reader has discovered that the subject of filters is not **quite** such a bag of mystery as perhaps he or she first thought it was. Of course, we have only looked at the simplest versions, but if **they** are now understood, or at least recognised, then they can be used as building blocks to help understand the more complicated types which, in general, are derived from them.

The next part will start to deal with impedance matching

An Experimental AM Transmitter for 1.8MHz

This article by J Cronk GW3MEO uses a small 1.8MHz a.m. transmitter as a vehicle to explore some of the nitty-gritty of designing QRP Top band equipment.

The circuit shown in Fig. 1, although simple, is very practical and at first sight not unusual, until you look at the component values of the tank circuit. It was hooked up first to enable some experiments to be made with various tank circuits, the modulator was added later.

An in depth explanation of the operation of tank circuits is available in the *Amateur Radio Handbook*. However, it is fascinating and self educational to apply the "practical test" to some of the text book recommendations, if only for ones own interest and to try the effect of deviating from them.

I hope the following, will show how some unusual component values came to be used, and the results leading to a better understanding of the energy storage property of tank circuits. Even when well armed with textual know-how or even amateur folk law, there is always plenty to find out on the bench.

The PA Tank Design

The component values used in the p.a. tank circuit are arrived quite conventionally. The output transistor TR2 is driven up to 100mA collector current with a supply voltage of 12V. The collector load impedance is given by

$Z = E \div I$, so $12 \div 0.1 = 120\Omega$. Note, this is an over simplification. At this point it can also be seen that the input power to the collector load of the p.a. stage with no losses is given by, $P = I \times E$, so $0.1 \times 12 = 1.2W$. The result of the last sum is a useful figure to bear in mind when checking efficiency. The text books recommend a loaded Q of 12 for "Class C" tank circuits, as being a compromise between bandwidth and efficiency. While this statement is true, it can however, be expanded upon when considered from a practical point of view.

It was the question of why 12, that triggered this exercise. If the constructor is really only interested in building a small transmitter, suitable values are given in the component list. But for a fuller understanding of the whole matter some experiments are highly recommended.

The loaded Q of the tank circuit is given by Q = Load Resistance ÷ Reactive Impedance of

C or L in the tank circuit.

In other words Q is the ratio of tank impedance to the load damping it. So $120\Omega \div 12 = 10\Omega$ (XL or XC) a tank impedance of 10Ω is required if the tank is to have a loaded Q of 12.

At 1.9MHz the nearest practical capacitor value with a reactance of about 10Ω is 10nF ($XC = 1 \div 2\pi FC$). To resonate at 1.9MHz the inductor must also have an equal 10Ω reactance (XL = XC at resonance). An inductance with about 10Ω reactance is only $0.7\mu H$ ($XL = 2\pi FL$) this is more like the usual coil for 50MHz rather than 1.9MHz.

Impractical Values

At this point most handbooks, on the grounds that the component values are impractical, suggest connecting the tank circuit to the collector via a tap on the p.a. coil Fig. 2(a). Transformer coupling can be used to match the device to the tank circuit as in Fig. 2(b). But tapping the collector onto the tank coil and using the coil as an auto transformer does not seem to achieve quite the same effect as direct connection to the tank circuit. When either of these techniques are used the generator sees some reactance in addition to the resistance load at resonance.

If the r.f. waveform is examined of an oscilloscope, which is easy for most scopes at 1.9MHz, the effect of varying the L/C ratio can immediately be seen. Although the spectrum display is the usual way to inspect the output of a transmitter, the time domain type of display can give a more constructive indication of the type of distortion present. Certainly a more sinusiodal output can be obtained from the directly connected tank Fig. 2(c). Remember any waveform other than a sine wave must contain energy at frequencies higher than fundamental, which a correctly designed tank will absorb. This harmonic energy will be wasted r.f., which must be filtered out, and lost forever. Thus proving the proverb, if a lamp load, is used, "all that glitters is not always the wanted r.f.".

This experiment does illustrate very well just one way, the tank circuit influences efficiency, there are also other aspects that can be investigated.

The Quality of *Q*

The effect of the Q (quality) factor, Q = Reactance ÷ Losses (resistive), of the coil in this tank, as distinct from the tank Q, can also be demonstrated very well. As it is an extremely low impedance circuit any resistance will be very significant.

Fortunately a $0.7\mu H$ coil does not require very much wire, so it is practical to use quite thick wire. The use of a core was needed to allow adjustments but as little as possible is used to reduce losses. The core also helps with the coupling to an output link by concentrating the electromagnetic field.

The specified coil is a practical compromise. Several experimental coils were made up, one consisted of a strip of copper 6.5mm wide x 20 s.w.g., five turns were wound on 25mm diameter and stretched to about 37mm long. Tuning was accomplished by squeezing the turns together. This coil gave better efficiency, but there were coupling difficulties, and as might be visualised it was out of place in this miniature transmitter. Coil losses are mainly due to resistance but radiation and induction also account for some.

The tank capacitor (10nF) was a good quality mica component, but a smaller flat polyester film type was tried without any reduction in r.f.output. A subminiature was even tried with no significant reduction in output, but not surprisingly, got warm suggesting the major losses are still due to the inductor.

Practical Significance

Before leaving the subject of inductor Q, the practical significance first became apparent to me as a schoolboy. Building crystal sets, to the designs in the popular magazines of the day, high Q coils were

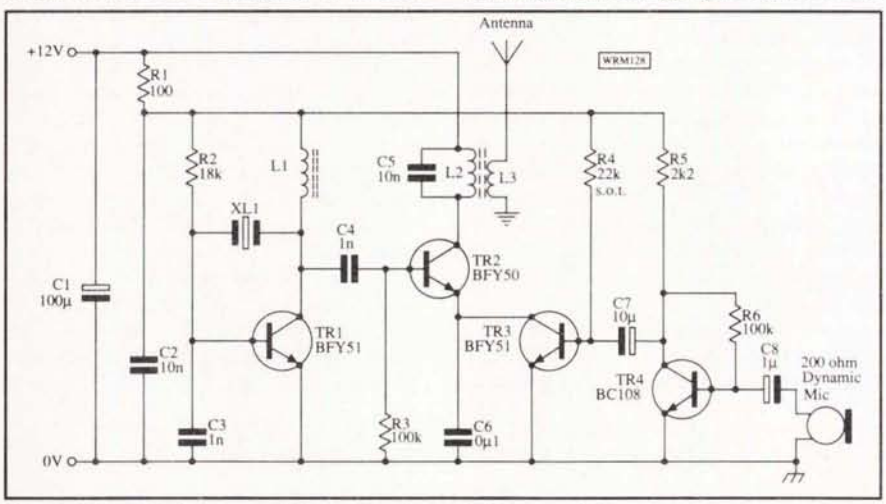

Fig. 1: Circuit diagram of the experimental transmitter

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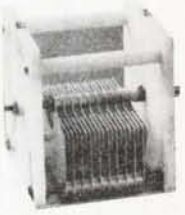

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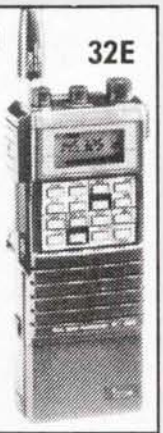

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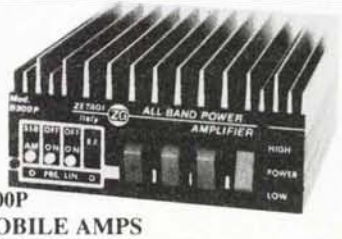

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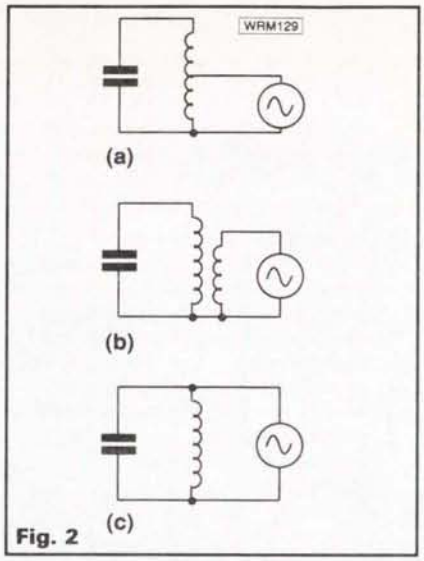

Fig. 2

usually specified but often shown as a proprietary makes. These were known as "Hi Q" dust cored coils, which of course, have a higher *Q* than a similar dimensioned device without core. However, just out of curiosity I tried a home-made coil, say 50mm dia x 76mm long of 20 s.w.g. wire and the improvement must be heard to be believed.

I seriously doubt now if the authors tested their circuits. This performance improvement with coil *Q* is even better demonstrated when it comes to antenna loading coils, where the not so obvious effect of self capacity amongst others rears its head.

A few comments about the rest of the design. A minimum number of components have been used, all of which are commonly available and allow a very compact form of construction. For c.w. the modulator can be omitted and the p.a. emitter keyed directly to 0V. Using this method a good note was obtained, but a simple *CR* filter across the keying jack will help eliminate key clicks.

Amplitude modulation is obtained by a very simple method, the r.f. output is reduced by half to allow symmetrical modulation when audio is applied. It is a very simple system and care must be taken to avoid over modulation, which will occur when TR3 turns full on or off. Good quality audio was reported.

Setting up the PA

The p.a. emitter potential should be half that of the supply voltage. It may be necessary to adjust R4 (nominal 22kΩ) to get this condition. It must be admitted TR3 is in a thermally unstable configuration but is justified on the grounds of a low component count, and that it is satisfactory in practice. It is essential for TR1, TR2 and TR3 to be fitted with heatsinks.

The output could be increased if transformer modulation is used; the modulation transformer connected in series with p.a. supply rail. However, the size of a suitable transformer and drive circuitry would mean a doubling in the overall size of the transmitter

It could still be an interesting exercise to make one. The use of crystal control is most practical for this design as the oscillator runs at high power. There are advantages to fixed frequency operation ie, your friends know where to look for you on the band.

Antenna Coupling

As the r.f. waveform on an oscilloscope can be seen to be a well -rounded sine wave, (reasonably low in harmonics) the antenna can be connected directly to the output of the transmitter via link winding L3.

Remember the impedance of the tank is very low and the link will need to have approximately the same or more turns than the tank coil L2. About ten turns of hook-up wire (7/0.2mm) will be required to light a small torch bulb load.

Construction

Most styles of construction will be suitable, the very low impedance of the p.a. minimises capacitive coupling, permitting quite close spacing between the r.f. and a.f. stages. However, multiple ground connection should be avoided, as earth loops can cause coupling problems when such low output impedances are present.

A single-sided printed circuit board design and component layout is shown in Fig. 3, although the circuit could be built just as easily on suitably sized piece of Veroboard.

The last thing to be note is that there is no provision to alter the mic gain but of course, one could be fitted. There is no intention of giving fuller constructional details, as there are many options that could be adopted. The author has enjoyed building two prototypes of the circuit, both now well developed and air tested.

So, if you want an easy to build, low-power, top band TX, then start here. ***PW***

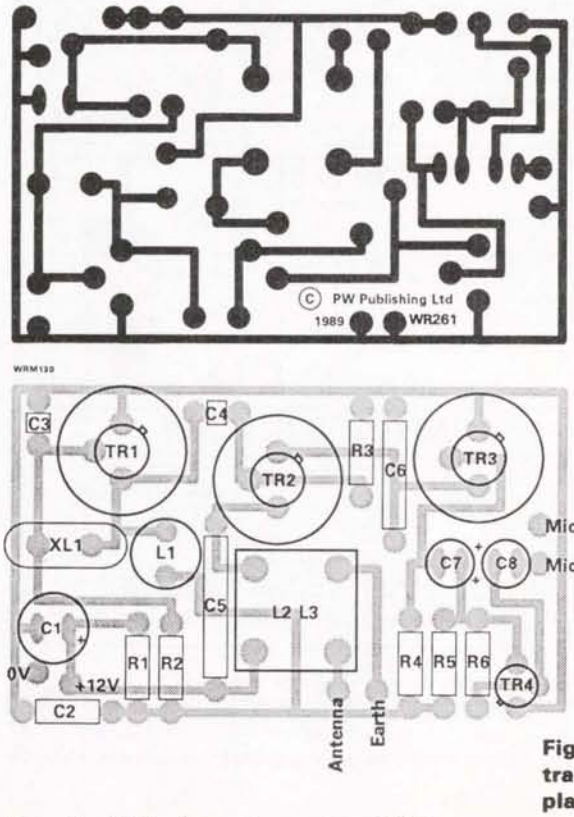

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Fig. 3: Full-size, single-sided track pattern and component placement diagram

Shopping List

Resistors

0.25W 1% metal film

100Ω	1	R1
2.2kΩ	1	R5
18kΩ	1	R2
22kΩ	1	R4*
100kΩ	2	R6,3

* Select for best modulation

Capacitors

Miniature encapsulated polycarbonate 100V d.c. wkg.

1nF	2	R3,4

Dipped polyester film 400V d.c. wkg.

10nF	1	C2
0.1µF	1	C6

Silver mica 350V d.c. wkg.

10nF	1	C5

Miniature Radial Electrolytic 16V d.c. wkg.

10µF	1	C7
100µF	1	C1

Miniature Radial Electrolytic 16V d.c. wkg.

1µF	1	C8

Inductors

Pre-wound Toko 8RB series

2.7mH	1	L1

(Cirkit 34-27201)
L2 10 turns of 16 s.w.g. enamelled on 6mm (1/4 inch) dia. fomer (RS 228-090) with RS 228-107 core.
L3 10 turns of 7/0.2mm pvc covered wire wound on top of L2 adjust to suit antenna.

Semiconductors

Transistors

BC108	1	TR4
BFY50	1	TR2
BFY51	2	TR1,3

Miscellaneous

XL1 1.843MHz HC33U crystal; connecting wire; Printed circuit board; Push-on heat sinks TO5 48°C/W (3);

Designing Passive Attenuator Networks

Passive attenuators have many uses in all aspects of r.f. technology, matching and padding levels and impedances over wide frequency ranges. The following article by S. Niewiadomski explains how to design these networks with a bias towards their use in receivers.

Switchable sets of attenuators are often found in the front ends of modern synthesised receivers. The use of broadband, rather than narrowband, front end filters in these receivers often results in considerable amount of unwanted r.f. energy reaching the first signal stage and mixer, giving rise to overload problems.

One method of reducing this type of problem is to provide the option of adding some attenuation in the signal path. This can be effective in improving reception both when the desired signal is strong and is causing overload effects, or when a strong undesired signal is masking a weaker signal.

When faced with the task of including a measure of variable attenuation in the front end of a receiver being designed, or devising a method of attenuation the input to an existing receiver, probably the simplest method is to place a potentiometer between the antenna and the front end filters. This control is then adjusted to "pot down" the input signal by a variable amount depending on the severity of overloading

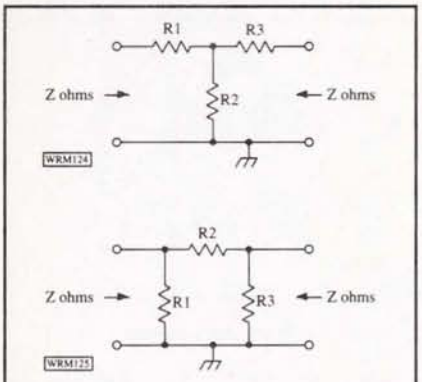

Fig.1&2

Disadvantages

The use of potentiometers as variable attenuators present two disadvantages. First, the results are unpredictable which makes calibration difficult and secondly, the front end filters are likely to see different drive impedances depending on the setting of the potentiometer. In effect, if the filters are presented with the wrong drive impedance they will not achieve their design performance.

These problems can be overcome by providing a range of constant impedance attenuate networks which are switch into circuit as required. This arrangement not only gives calibrated attention, but also the correct and constant matching impedance for the front end filters.

Designing Networks

Two simple configurations are available for unbalanced attenuators, that is, one side of the attenuator network is connected to ground. Both configuration, T and Pi-networks are shown in Fig. 1 and 2 respectively. These networks are symmetrical, in that they present the same impedance at their input and output terminals. For T-networks, the values of the resistors are given by the following equations;

$$R1 = R3 = Z\frac{(1-k)}{(1+k)} \qquad \textit{Equation 1}$$

$$R2 = Z\frac{2k}{(1-k^2)} \qquad \textit{Equation 2}$$

Where:

Z is the input/output impedance of the network.

k is the desired attenuation, expressed as a ratio.

For the Pi-network, the values of the resistors elements are given by the following equations;

$$R1 = R3 = Z\frac{(1+k)}{(1-k)} \qquad \textit{Equation 3}$$

$$R2 = Z\frac{(1-k^2)}{2k} \qquad \textit{Equation 4}$$

The attenuation required from a network is normally expressed in dB and the value of k for use in the above equation can be calculated by the following:

$$k = 10^{-(attn/20)} \qquad \textit{Equation 5}$$

Component values for several typical networks are shown in tables 1 and 2. Attenuation levels from 5dB to 40dB (in

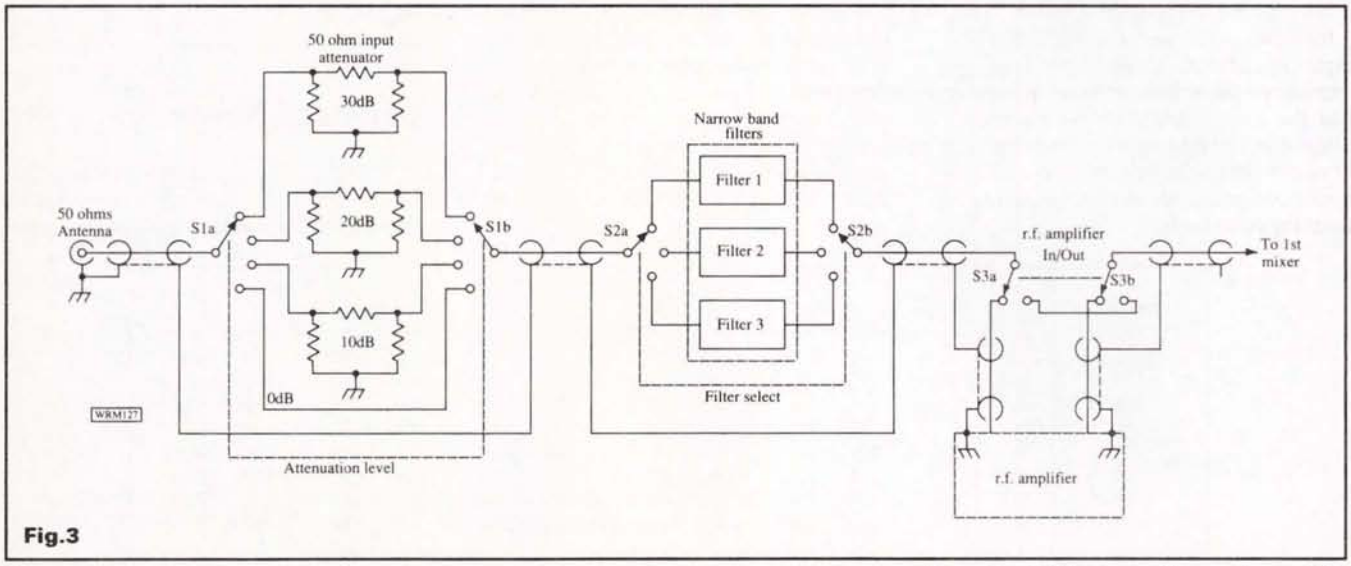

Fig.3

Table 1

Attenuation (dB)	50Ω				75Ω				450Ω			
	R1,R3		R2		R1,R3		R2		R1,R3		R2	
	exact	rounded	exact	rounded	exact	rounded	exact	rounded	exact	rounded	exact	rounded
5	14.0	15	82.2	82	21.0	22	123	120	126	120	740	680
10	26.0	27	35.1	33	39.0	39	52.7	56	234	220	316	330
15	34.9	33	18.4	18	52.4	56	27.5	27	314	330	165	150
20	40.9	39	10.1	10	61.4	56	15.2	15	368	390	90.9	82
25	44.7	47	5.64	5.6	67.0	68	8.46	8.2	402	390	50.8	47
30	46.9	47	3.17	3.3	70.4	68	4.74	4.7	422	390	28.5	27
35	48.3	47	1.78	1.8	72.4	68	2.67	2.7	434	470	16.0	15
40	49.0	47	1.00	1.0	73.5	68	1.50	1.5	441	470	9.0	8.2

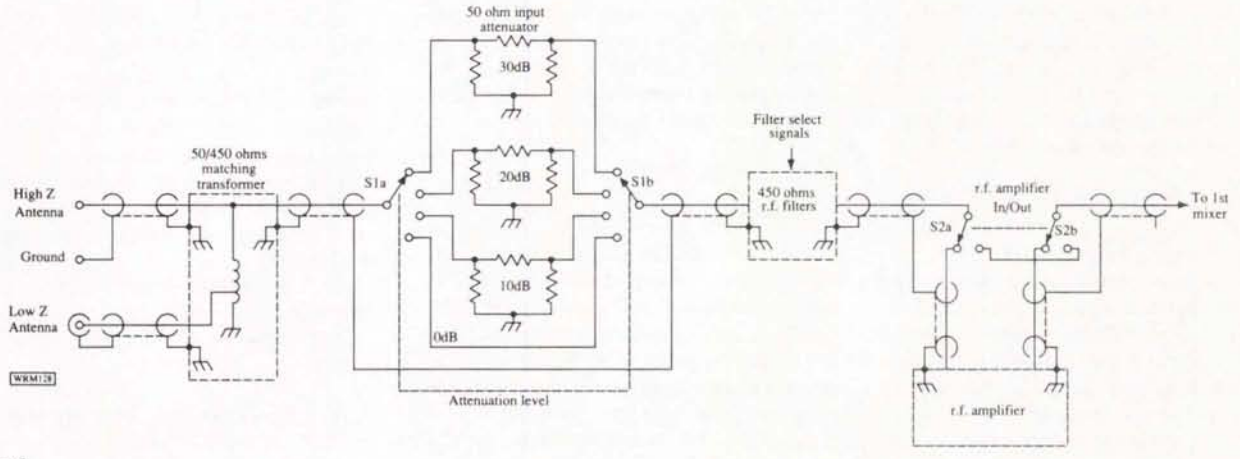

Fig.4

steps of 5dB) for impedances of 50, 75 and 450Ω are catered for. Other level of attenuation can be worked out from the formula already given. As well as the exact resistor values, rounded values are also given. In practice, the rounding of these values makes very little difference to the performance of the attenuators.

Incorporating the Networks

The choice of attenuator types is a matter of personal preference. A useful set of attenuation values to incorporate into a receiver front end would be 10, 20 and 30dB, with the option of switching the attenuators out of circuit altogether.

A typical configuration is shown in Fig. 3 for an amateur band receiver with a 50Ω input impedance. Here, three levels of attenuation (as well as 0dB) are selectable, and the narrowband filters are manually selectable. The r.f. amplifier can either be in or out of circuit, so that the front end gain configuration can be chosen to suit any set of listening conditions.

Receiver Front-end

A general coverage receiver front end is shown in Fig. 4. The broadband filters are designed for a 450Ω impedance level, and therefore the attenuator networks have to be designed for this impedance. High impedance antennas are connected directly to the attenuator switch, whereas 50Ω antennas are matched to the 450Ω system via a broadband transformer giving a 9:1 impedance transformation.

Construction

It is hardly worthwhile building a p.c.b. containing the attenuator resistors and making connections to a front panel switch. It is much easier to mount the resistors directly on to the terminals of the attenuator switch itself.

The earthy ends of the attenuator network are best connected to the braid of the coaxial cable carrying the signal to and from the switch.

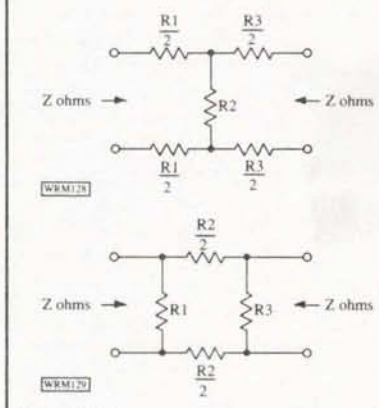

Fig. 5&6

Balanced Networks

There is a family of attenuators where neither side of the network is connected to ground, and these are referred to as balanced

Table 2

Attenuation (dB)	50Ω				75Ω				450Ω			
	R1, R3		R2		R1,R3		R2		R1,R3		R2	
	exact	rounded	exact	rounded	exact	rounded	exact	rounded	exact	rounded	exact	rounded
5	178	180	30.4	33	268	270	45.6	47	1606	1500	274	270
10	96.2	100	71.2	68	144	150	107	100	866	820	640	680
15	71.6	68	136	150	107	100	204	220	645	680	1225	1200
20	61.1	56	248	270	91.7	100	371	390	550	560	2228	2200
25	56	56	443	470	83.9	82	665	680	503	470	3988	3900
30	53.3	56	790	820	79.0	82	1185	1200	479	470	7108	6800
35	51.8	56	1405	1500	77.7	82	2108	2200	466	470	12649	12000
40	51.0	47	2500	2700	76.5	82	3750	3900	459	470	22498	22000

```
100     PAPER 7: BORDER 6: INK 0: CLS
110     PRINT: PRINT "Attenuator network calculation"
120     INK 2: INPUT "impedance level (ohms):";imped
130     INPUT "attenuation (dB):";atten
140     LET k = 10^(-atten/20)
200     REM T network calculation
210     LET r1 = imped*(1-k)/(1+k): LET r3 = r1
220     LET r2 = imped*2*k/(1-k^2)
240     PRINT: PRINT " T network exact values:"
260     PRINT "   R1,R3 = ";r1;" ohm"
270     PRINT "      R2 = ";r2;" ohm"
300     PRINT: PRINT " T network rounded values:"
320     LET res = r1: GOSUB 2000
340     LET r1 = res: PRINT "   R1,R3 = ";res;" ohm"
360     LET res = r2: GOSUB 2000
380     LET r2 = res: PRINT "      R2 = ";res;" ohm"
400     LET r3 = r1: GOSUB 3000
500     REM pi network calculation
510     LET r1 = imped*(1+k)/(1-k): LET r3 = r1
520     LET r2 = imped*(1-k^2)/(2*k)
540     PRINT: PRINT " pi network exact values:"
560     PRINT "   R1,R3 = ";r1;" ohm"
570     PRINT "      R2 = ";r2;" ohm"
600     PRINT: PRINT " pi network rounded values:"
620     LET res = r1: GOSUB 2000
640     LET r1 = res: PRINT "   R1,R3 = ";res;" ohm"
660     LET res = r2: GOSUB 2000
680     LET r2 = res: PRINT "      R2 = ";res;" ohm"
700     LET r3 = r1: GOSUB 4000
1000    REM pause subroutine
1010    INK 0: PRINT: PRINT " Press any key to continue"
1030    PAUSE 0
1040    GO TO 100
2000    REM resistor rounding routine
2010    FOR n = 1 TO 8
2020    LET dec = 10^(n-2)
2030    FOR v = 1 TO 12
2040    READ a,b,c
2050    IF res < a*dec AND res >= b*dec THEN GO TO 2100
2060    DATA 1.1,0.91,1.0,1.35,1.1,1.2,1.65,1.35,1.5,2.0,1.65,
        1.8,2.45,2.0,2.2,3.0,2.45,2.7,3.6,3.0,3.3,4.3,3.6,3.9,
        5.15,4.3,4.7,6.2,5.15,5.6,7.5,6.2,6.8,9.1,7.5,8.2
2070    NEXT v
2080    RESTORE
2090    NEXT n
2100    LET res = c*dec
2110    RESTORE
2120    RETURN
3000    REM T network attenuation calculation subroutine
3010    LET rsum = r2+r3+imped: LET rx = r2*(r3+imped)/rsum
3030    LET vx = rx/(imped+r1+rx)
3040    LET vout = vx*imped/(r3+imped): GO TO 4050
4000    REM pi network attenuation calculation subroutine
4010    LET ra = imped*r3/(imped+r3): LET rx = r1*(r2+ra)/(r1+r2+ra)
4030    LET vx = rx/(imped+rx)
4040    LET vout = vx*ra/(r2+ra)
4050    LET attenuation = -(20*LOG(vout)/LOG(10)+6.02)
4060    PRINT " attenuation = ";attenuation;" dB"
4070    RETURN
```

PROGRAM 1. T and pi network attenuator design program.

networks. Balanced T and Pi-networks are shown in Figs. 5 and 6 respectively. Component values for these balanced networks can easily be derived from their unbalanced counterparts. The values of the resistors in the upper and lower branches are simply half the value of their equivalents in the unbalanced networks. The shunt resistors have the same value as before.

Computer Generated Resistor Values

Resistor values for any impedance level and attenuation can be derived on a calculator using Equations 1-4, but if many networks are to be designed the process can be time-consuming and tedious.

However, the equations are ideally suited for programming into a home computer. The program contained in this article is written in ZX BASIC and carries out the calculations already discussed. Only simple statements have been used and the program can easily be converted to other versions of BASIC or even other languages.

The program starts by prompting the user for the impedance (in ohms) and the required attenuation (in dB). It then computes and outputs the T and Pi-network resistor values as both their exact and nearest E12 series rounded values.

Simplifying the Program

If some of these facilities are not required, blocks of the program may be omitted. For example, if the rounded resistor values and the exact attenuation they produce are not required, then lines 300-400, 600-700 and 2000-4070 can be omitted, considerably simplifying the program.

PW

SNIPPETS

Here's an interesting snippet of information recently gleaned from the American publication *Worldradio* .

Those of you that have wound p.a. tank coils on plastics former will know that not all plastics are suitable. Some plastics become hot in the presence of high r.f. field strengths, so hot sometimes they melt. Fortunately, there is a simple test that tells you the suitability of a plastics material before you put all that time into winding coils.

Take a sample of the material in question and place it in a microwave oven, along with a glass of water which acts as load for the oven to work against. Run the oven for two to three minutes, if after this period the sample feels warm, it is probably fair to say that the material is unsuitable. The warming may be more apparent if the sample is first cooled in the fridge. *IH004*

Here's another couple of uses for discarded ballpoint pen cases: stand-off insulators and p.c.b mounting spacers. The average internal diameter of a ballpoint pen case is just large enough to accommodate a 4mm thread. Cut a section of pen case to the desired length and then run a 4mm tap up it's inside. Once a thread has been cut, screw in two suitable lengths of 4mm studding, one into either end of the tube. Next take two 4mm nuts and run one up each length of studding; these will act as lock nuts. Don't over-tighten each lock nut as this will cause the tube to fracture. For added strength epoxy resin can be smeared onto the studding before insertion. The fruits of your labour will be a custom made stand-off insulator/pillar. Alternatively, short lengths of pen case can be used as spacers with normal 3.5mm nuts and machine screws. **E.P.** *F756*

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On The Air
On The HF Bands

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

Happenings

Thanks to *TDXB, DXNS, The DX Magazine, The Canadian Amateur,* and all reporters for the details below.

Another royal radio amateur to join the ranks: King Bhumiphol Adulayadej, HS1A, and as a result the old HS0A will now sign HS0AIT (Asian Institute of Technology) to avoid confusion. Still with HS calls, we understand that HS0A and HS0B are OK for DXCC, but other HS prefixes will be individually vetted. Incidentally, that gives four Heads of State to be licensed; EA2JC, HS1A, JY1 and VU2RG.

Last month I mentioned PA3CXC's expressed hopes for an Ethiopia operation; we now have the message that he doesn't have much hope, but will continue negotiating. Still with PA3CXC, we understand he can operate from South Sudan any time, but will probably wait for next Spring, in the hopes of improved band conditions.... maybe he wants jam on it too!

During the October/November period, most PA stations will be adding a 6 to their callsigns (e.g. PA0 becoming PA60, PA3 becoming PA63 and so on) to commemorate the sixty years of amateur licensing in the Netherlands. There will be a certificate going for this: PAs to work sixty of the "special prefix" stations, other EUs thirty, and DX fifteen. Send GCR List to PA0BN for this one.

The proposed Bouvet DX-pedition is still on track, and G4DYO is handling donations from UK DXers towards the estimated 200K dollars the trip will cost.

The proposal by Jim Smith to activate Conway Reef and Minerva Reef has, we understand, fallen by the wayside, owing to the paperwork difficulties in Fiji. There is also the doubt about whether Minerva would be reinstated in the DXCC listings anyway.

By now, if all goes well, Rockall will have been activated legally, QRP c.w., by GM4YLN/P, for an operation of 1-4 days duration. The only previous activity from Rockall was the illegal one by Tom McClean some years back, so this operation will fill in an IOTA reference against Rockall, the last one in the IOTA Directory to receive one. Note that while this one is OK for IOTA, it will not qualify for a new DXCC country. (Later: it is understood GM4YLN/P was worked on 7 and 21MHz on August 26.)

Did you notice that HG4P; he was a special-event station running TS-930S and a 1kW linear, into Radio Budapest's 20-element log-periodic. Perhaps more important, it seems to have been a "clean" signal with no significant spread, despite it being some six S-points above all other Europeans in USA, and S9 plus 40 in this country.

Anyone still looking for a 9H, Malta QSO? During October and November, between September 21 and October 19 we understand DL2GBGT will be active as 9H3EH; he may work split-frequency if the pile gets too high.

Surprisingly enough, despite all the upsets in China the issue of individual licences seems to be proceeding steadily with some 30 BZs about.

Another country to progress a little in this direction is Thailand, where it is understood the authorities have given tests for HF operation, according to Fred Laun K3ZO, who will be recalled as one-time HS1ABD. Fred reckons the way is open now that HS1A is operational - see above - for individuals to get licences around the turn of the year, and meanwhile HS0F is active from the old HS1WR QTH.

Still with the nasties, there are rumours that the C9MKT licence won't be renewed. Again one hears reports of people working XU1SS. Cambodia Slim again, as there hasn't been any activity from XU for some time.

Back to the Good News; an operation to Transkei, signing S89DX will start on October 7, 0500Z until 0700Z October 10, listening ten up. However, this one doesn't count for DXCC.

Top Band

Our first report on Top Band is from regular **G2HKU** (Sheppey). Ted reports working GB50MON, the Caversham Monitoring Station 50th anniversary job, plus ON7BW, both s.s.b., plus Y23TD on the key.

And that, masters, is all!..... doesn't anyone else operate the band??? What a change from the days when 90 per cent of the amateur activity in this country was on Top band, back in the fifties!

The 3.5MHz Band

Seems a bit like one of the ruins that Cromwell knocked about a bit for most of the time! However, **ON7PQ** (Kortrijk) notes that he hooked XT2CW sand FY5EW on the c.w. end of the band.

Our only other reporter is **G0HGA** (Stevenage) still tied to her two watts of c.w., which she uses mainly in the early evening, or the late evening/early morning times. Angie's quick stuff can be found in the logs of G3MRP (QRP both ways), G3XTL, G3HOH, G3GLL, G3KFB, G3MCK, G3AJP, G3JUQ, G3AMF, G2MJ, G5XV, G4SPY, G4IVK, G4SPM, G4PZF, G4OEC, G4MWP, G4ZVJ, G4WHZ, G4VNR, G4NNU, G4KGK (QRP both ways), G4FX, G0EIL, G0FYP (QRP both ways), PA3DXQ, PA3BLU/M, DF5XN, four times and finally GW3JI.

As far as I am concerned I have to admit that just about all our own activity on this band has been the regular Sunday-morning net, for various largely non-radio reasons.

Comments

G3VA has finally resolved the question of the VE callsign we mentioned in our notice of the death of G6ZO a few months back. In fact, Bill Wadsworth's 1947 QSL card to G3VA is from VE7ZM, but also shows him as having been "ex-VE5RE, VE5ZM" which seems finally to resolve the problem. On a different tack it is interesting to note that G6ZO was educated at Mill Hill School, where he followed in the illustrious footsteps of Cecil Goyder G2SZ, who made the first G-ZL contact.

The 7MHz Band

There's cunning for you... most of those who really get among the DX keep so quiet about it, particularly on 7MHz, that unless one knew about it, you'ld never find out!

G0LJB (Whitehaven) now has his Vespa back thanks to the attentions of G3APV; but now there are s.w.r. problems on some bands to hold activity down a bit. Nonetheless, using a DX100 receiver and 150Hz filter from a *PW* design, Paul managed the foollowing c.w. contacts: initially with the Drake rig, numerous Gs, GJ2FMV, SM5CF, DF9BC, then with the Vespa, DK3GR/P, PA3AFD and PA3AYF. The antenna is about 20m, end-fed. Paul says his great moan is the "characters who send that hated CQ Test" call - which is the signal for G0LJB to watch TV. Fair comment, but you should recall OM, that lots of the interesting "new ones" that swell the totals seem to be mainly active at contest times, when people go to faraway places simply to give themselves a better chance of winning. And, anyway, it certainly sharpens up your operating!

G0HCZ in the Isle of Wight says most of his activity is on 18MHz, but he does mention one contact on 7MHz, namely the one with CY0DXX on SSB.

The 7MHz band for ON7PQ was all-c.w.; CE0OGZ, TF9CW, VK2APK, VE2DWU, ZM2AGY, J52US, 9H3KO, OY/DF2PI, S79MX, XT2CW, CY0DXX, PJ2AM and H27T all went into Pat's log.

Bits & Bobs

Ron Pearce (Bungay) is a great believer in home-brew gear, as his QSL shows; this time Ron has included a list of DX and a colour photograph of his latest effort which is a combined 0-V-0 receiver for short waves, plus a Morse oscillator in a rather nice wooden cabinet with lift-up lid for portability, designed and built for a "Titanic" evening held at Denton Village Hall in Norfolk. I will mention Ron's takings with his two-transistor receiver in the sections on 14 and 21MHz.

WARC Bands

Let's make a start with **G3BDQ** in Hastings; John has been active more in the antenna-farming sense than actually on the air, having dropped the l.f. grounded long-wire system, and also having put up a small prototype wire arrangement for 21MHz at the front of the house, giving some 3dB of gain to the NW. Operation on 18MHz and s.s.b. yielded IV3YJ, W3CS and YC6KOS, while 4X4FR/M was snagged on 24MHz.

Now to G0HCZ (Newport IoW) who made it two-way to CE5BPE, CE0DFL (Easter Is), CE0MTY (Robinson Crusoe Is), C6ARC, DJ6QC, EA8BPO, F/W2SKE, HA3YCA, HC2NI, HZ1AB, I6EFP, JA5AQC, JA5CEX, J52US, LU9DJD, NH6C, OA4OS, PJ9EE (Bonaire), PY2EOQ, PY3CM, T32IO (Christmas Is), T77T, VE1BTL, VE3NYT, VE4AAQ, VK2AVA, VK5BXN, VK7GK, VP2EHF, WP4AGW, 7X3DA, 9K2DR, 9K2EC, 9Y4CD and lots of eastern and middle Ws all on s.s.b.

G3NOF of Yeovil has now put up a sloping dipole for the band, and has

pushed the score up to 56C worked, the best times seemingly being early mornings or late evenings. Thus we see s.s.b. contacts with AL7I, C31LBB, C6ARC, CE3OE, CE0DFL (Easter Is), CE0MTY (Juan Fernandez Is), CN8LG, CU3LC, EA8BPO, GD4WBY, GM0AMI, HB0LL, HP3FL, HH2MC, HZ1AB, IS0JMA, J37AJ, J6LPS, J52US, JA5AQC, JA9JFO, K6IM, KE7VM (Washington), KF7E (New Mexico), KV4AD, LU4EPN, LU5GO, OH0/DF1NE, OH0/DF1NF, T77T, TK/G4SGJ/MM, VE6WK, VK2AVA, VK3DOU, VK7GK, VP2VA, W7BBH, YB6LD, YE0AX, ZL2APW, 4X4FR/M, 5B4JE, 6Z2E, 5N9ABY, 7X3DA, 9K2EC and, of course, W and VEs.

Other than Top band it was c.w. all the way for G2HKU; on 10MHz there were VK2APD, SM0CCE, and EA8AB, while on 18MHz there were LU2IP, TA7/KU0J, ZL1WV, W2LZX, W2FC, K4KQ, K4II, OZ1LO, JA4CSH, EA8AB and K8ZH. On a different tack, G2HKU has a problem in that a tree branch is brushing the mast guys. However, the tree is "owned" by a nest of magpies who are rather upset about unwanted visitors!

The 28MHz Band

At the time of writing it still seems to be in the summer doldrums, whichever direction the beam is pointed, but by the time this reaches you things should have livened up a lot. G2HKU mentions that although he managed to work EA8AB on 10, 14, 18, 21, and 24MHz, the 28MHz one was a flop for want of a bit of propagation; which makes you think, when G0AEA over in Scilly can raise EA8 on 144MHz!

Turning to **G3NOF**, Don noted little from North America on the band, although a few East Coast Ws were noted around 2200Z. Most evenings there have been openings to South America with sometimes a few ZLs; in the mornings around 0700Z the long path to VK has opened up. Don's call was entered into the logs of CN10DKH (a special for the tenth anniversary of the passing of EA0 to CN, CY0DXX (Sable Is), S79MX and 5R8JD.

GM4ELV (Glasgow) is still using QRP, which has taken him to 210W/197C all-bands, with 156/106 on 28MHz. Dale's current offerings include 3B8DB (QSL via NA5Y), ZP5CF, 9K2DR (QSL via 9K2MJ), JY5FA, 5H3ZW, 5H3TW, V9/ZS5S, LU8ESU, PP5JD, D44BS, LU1F, A92BE, Z21GM, ZS1DL, SV0GE/M, 6V1A, FY0EK, FM5YM, ZD8BOB (Box 2 Ascensionls), ZD8RP, ZD8RJ, ZD8MAC, ZD7VC (Box 5 St. Helena), ZD9JR (Gough), ZC4BS, ZC4RF, OH7RRV/ZS3, YI1BGD, OD5MJ, OD5SK, J28DN, J28CW, EL7X (Box 538 Monrovia), TA5C (Box 210, Gar-Adana), VU2MYN, KP4EIT, 3D/AQ0BP and ED9FAS.

Turning to the list from ON7PQ we find NY6M/KH2, ZS3UM/OH7MRW, 9M2AX, TL8RM, J28CY, OD/F1LIV, 8R1J, XT2CW, HL5BDS, J52US, S79MX, HZ1HZ, ZS8MI (Marion Is), 5H3TW, VK8XX, CX8BBH and FR4FD.

The 21MHz Band

G3BDQ (Hastings) opens the bowling on this band, with his c.w. take including A41JV, KH6IJ, HL0Y/4, HL2VQ, 5H3TW, FK/JH3DJX (New Caledonia), FR4FD, FY5YE, VS6CR, SP8UFO/JW, and YC6KOS; turning to s.s.b. John made it to A92BE, BZ4RDX (Nanjing, China), UA6HZ/JW, DL2SCQ/TF7 (Westman Is), KP4DQ, EF5KB (Tabarca Is), TJ1DL, TU2UI, HL1AHS, HL2ZQ, HC1JH, HK4CCW, HR1KAS, J28DN, VU2TTC, KL7XD, ZD8BOB, CY0DXX, AP2AF, AP2DM, TA3/DL1BDA, 9V0WW, 9V1XM, and 9V1UG.

G3NOF (Yeovil) notes that conditions haven't been as good this month, but he did manage to work A22MH, A41JZ, BY5RA, BY5VZ, CE3GLD, CO2LE, CY0DXX, DL1SCQ/TF7, DL2SCQ/TF7, DU1DWD, EK2RR, FO5FO, FO5LU, HI9UD, HK6ISX, HP6FC, JAs, JT1BV, JT1KAA, KL7TC, KP4IX, NH2/JJ1TZK, PJ2MI, SU1EE, T32PO (Christmas Is), TA2AU, TA3/DL4RDU, TA/G4LJF/MM, TI2GBJ, OH6YF/OH0, UA1OIL (Frans Josef Land), UA0BEZ/UA1O, UA0FF, V85AH, VKs, YBs, YI1BGD, YK1AO, ZY0TI, 3D2AG (Fiji), 3D2RJ (Rotuma), 3D2VT (Conway Reef), 4S7EA, 8P9AF, 9M2FZ, 9M2KR and 9V1UG.

Now to ON7PQ; Pat sticks to his key, and with it he connected with CN8MC, KH6BGE, KH6IJ, KN0E/KH3, 3B8FK, SP8UFO/JW, BY4RB, JT1CD/9, HS0YDY, HI3/G3OLU, 3D2SI (Conway), KG6DX (Guam), PA0GAM/ST2, 3D2VT (Conway), VK9NS, FY5YE, NL7DU, FO0MGZ, XT2CW, and TJ/IK1JLL.

As for G2HKU, Ted found KE6ZE, W0NGB, K5NA, JA6PA, C30LBS, EA8AB, and UT5UJY.

Finally 14MHz

Whatever the state of the sunspot cycle, this is where the real action is for most people, and of course the natural result is an abundance of QRM, particularly from overdrive linears!

G2HKU notes his c.w. going to VK4LX, HK3HY, IL7/IK4JQQ, UA9CK, JA3EA, W8VSK, SM/W6DU, UW9OQ/RW9H, JH5WAK, K4FU, EA8AB, PP7JCO, UJ8JCM, R9ZF, G3GJQ/5N0, 9H3FI, and K8ZH.

For Pat at ON7PQ the keyer routed out JT1CD/9, 3D2MK, FO0MGZ, HI3/G3OLU, SP8UFO/JW, TF6CW, CY0DXX, EL7X, V31BB, and XT2CW.

G3NOF next; Don noted the odd period of fade-out or dead band, and in fact spent more time on 21MHz as we have already seen. Nonetheless, Don did put out SSb to A41JZ, A41KR, CY0DXX, DL2SCQ/TF7, JT1BJ, JT1BV, JT1BY, KL7XD, KN0E/KH3, N4VMW/DU8, OX3ZM, RA0AD/JT, TF5BW, V85NR, VKs, YK1AO, ZP5AA, 4K0F, 4L0X, 5Z4BP, and 9N1MM.

Using on average, 50 watts output, G0LJB used c.w. from the Drake TR4 to raise HB9HAE, F89/FF6KRP, UB5TAO, YT2JF, HB9FT, PY2RLQ, HA8RO, DF6Kk, LU1DHS, SP7BYG, OE3JOS, EA1KO, OX/OZ1LQH, OK1ANS, UQ2GEC, plus s.s.b. to HA0NNN, WA4WTG, W3HCW, AB4PB, VE3PDF, VE3NHA, NP2B, EA5DIT, EA7DLD, EW4AA, F/PA3EBG/P, RT5UO, and IK1CPB. Once the Vespa was back with Master, the 150 Hz audio filter attached to the DX100L receiver, and c.w. QSOs were made with UP2BKV, K1DL, RA3LV, UA3YBA, HA8RJ, UT4UWU, UP2BKV, UW3GC, UZ1ZWO K3MQH, EA8/DJ3XD, and NX2P.

Another one who doesn't spend too much time on 14MHz is G0HCZ, who notes QSOs with CY0DXX, DL2SKQ/TF5, and V31BB.

Like me, he has been in the wars with rotator problems, but did manage to scare up the odd W, an EA8 and a couple of TAs.

VHF Up

David Butler G4 ASR
Yew Tree Cottage, Lower Maescoed, Herefordshire HR2 0HP

The 50MHz Band

August marked the month when the 50MHz band took yet another turn in the propagation cycle. It can be likened to the four seasons and is very similar to the time that you notice the leaves on the trees beginning to change colour. You know that something, Autumn, in this case, is on the way. And so it is with 50MHz. The propagation seasons change, often dramatically, on the run up to solar maximum. A considerable surge in solar activity took place during August. The sunspot count peaked at 338 on August 9, with solar flux levels rising to 286 on August 12. The corresponding rise in geomagnetic activity, caused by many large flares and magnetic storms, led to a number of auroras during the month giving contacts around the UK and into Scandinavia. When the geomagnetic activity fell to quiet levels, the band opened up, on many occasions, to Africa and Southern America. Contacts were made from the UK with CX, LU, ZD8, ZS, Z23 and for the first time, into Brazil.

Ela Martyr G6HKM (ESX) worked two new countries on July 27, by contacting LU9AEA and LU2EIO (GF05) and CX4HS (GF17). Having heard that Z23JO was being worked around 6PM on most days, Ela made a managerial decision that evening meals would forthwith be at 5.30PM instead of 6PM. The very next day after implementing this, Ela was rewarded with a contact with Z23JO for a new country and square. Other contacts on the same day, August 2, included ZS6WB, 9H5AB, 9H5BN and 9H5O, a getaway being PA3DYY/MM in JN00. The only station heard in the aurora on August 17, was GM0GEI, located in IO77. Better luck was had on August 19, when the band opened up to South America, giving a contact with LU6DLB (GF05). CX1DDO (GF15) and LU1DMA were heard but the pile-ups were very intense.

Ian Harwood G8LHT, heard some very short skip stations on July 15, but no Es signals were heard on 144MHz. From his QTH in South Yorkshire, stations in Guernsey and Jersey were copied between 1458 to 1533UTC. The nearest station to be contacted was F6HRP in IN88.

Paul Feldham G7CFK (CHS) has been briefly off the air due to a loose trimmer capacitor on the driven element and problems with pigeons using the antenna as a perch. Paul reckons that since greasing the antenna, there have been no problems with the birds! Another effective method of scaring birds away is to mount a plastic owl, obtainable from gun shops, on top of the tower. Contacts during August, were made with CR8LN, F6BNX, OH1AYQ, OH1ZAA and T77C. Concentrating on crossband, Paul worked OZ9QV on August 13 and IK2GSO & OK3CM (JN88) on August 18. Gotaways have included Z23JO and CX4HS. On August 16, LU2EIO, was heard between 1405 to 1415UTC, but the signals were too weak to make to make a contact.

Despite being on holiday, I still managed to get some DX in the logbook. On August 2, Z23JO was worked at 1700UTC, followed between 1925 to

1935UTC, by LU7DZ and LU9AEA. Mal Z23JO, was worked again, on August 5, at 1708UTC. Contacts into Namibia were made on August 6, at 1855UTC with ZS3E, and on August 26, at 1710UTC with ZS3AT. An Auroral-Es opening during the aurora on August 21, gave contacts with OH1AYQ (KP12) 59 59 and OH6RJ (KP22) 56 57. The highlight of the month was the opening on August 24, to South America. At 1955UTC, LU9AEA and LU3EX were heard, both at 57. Contacts followed, from 2000UTC, with LU8YYO (FF50) and CX4HS (GF17). At 2115UTC, I heard Dale Harvey G3XBY working PY2SB, for what is believed to be the first G-PY 50MHz contact. Eventually, PY2SB (GG66) was worked, 55 bothways, for a new country and square. PY2DM and PY2GWH were heard, the last signals fading out at 2150UTC. Between 2230 to 2250UTC, the Ascension Island beacon ZD8VHF (II22) was copied, peaking 539, but nothing came of it.

The opening on August 24 was not restricted to central England. **Calum MacPherson GM0EWX** (WIL) worked CX4HS, LU3EX, LU8YYO, LU9AEA and PY2DM. The contact with Brazil, at 2125UTC, being claimed as a first between GM and PY. Another station claiming a first with PY2DM is **Alan Doherty GI8YDZ**, who worked him at 2124UTC.

The south of the country also did quite well in the recent spell of good conditions as this report from **Dick Hide G0LFF** (SXW) indicates. An opening to North America on July 3, allowed contacts to be made with K1GPJ (FN44), KA1PE (FN53) and WA4HJP (EM84). During July, most of the European countries were worked, either direct or via crossband. South American contacts included CX4HS on July 7, 18, 23 & 27, LU2EIO, LU9AEA and LU8MBL (FF57) at 11465kms on July 27. On a southerly beam-heading, contacts into Africa, included ZS3E on July 10 and Z23JO on July 23. The African contacts continued into August, with ZS6LN and Z23JO being worked on the 2nd, around 1700UTC. Sporadic-E on August 6 enabled contacts to be made with ZB0D, TK/PA0ERA and with a number of stations in southern France. Switching to the m.s. mode, Dick worked GM3WOJ and GM0FRT/P (IP80) during the shower on August 12. The Auroral-Es event, during the evening of August 21, gave T9 contacts with OH9NLO and LA9BM. It was very strange to hear stations, basically on the same beam-heading, coming in via two different propagation modes. The Finnish stations were T9 via Au-Es, whereas the Swedish stations were tone A, via the aurora.

A report from **Bob Nixon G1KDF** (LNH) sums up just how interesting the 50MHz band can be. In a good South American opening on July 23, between 1755 to 1945UTC, CX4HS, CX8BE, LU1DMA, LU2EIO, LU6DLB, LU8YYO and LU9AEA were worked. Later the same evening PA3DYY/MM in the Mediterranean Sea was contacted. Bob claimed the locator as JN12, but in a QSO I had with George PA3DYY/MM, later in the week, he said that a mistake had been made for contacts on July 23, and that in fact the locator was JN01. Conditions on the band were excellent on July 27, with Z23JO, ZS3E and ZS3KC being heard between 1530 to 1635UTC and CX4HS and LU1DMA being worked between 1917 to 1930UTC. An opening into the Mediterranean area, during the same evening, produced a contact with TK/PA0ERA (JN42). Contacts in August were made via a multitude of

Station	50MHz Countries	50MHz Countries	70MHz Countries	70MHz Countries	144MHz Countries	144MHz Countries	430MHz Countries	430MHz Countries	1296MHz Countries	1296MHz Countries	Total Points
G1SWH	61	26	64	6	87	19	57	6	—	—	326
G6HKM	56	30	—	—	77	27	39	15	23	7	274
G8LHT	53	16	20	4	77	28	49	14	7	4	272
G0IMG	66	24	39	5	51	10	27	5	—	—	227
G6NB	57	30	—	—	56	15	23	3	—	—	184
G1DOX	27	3	39	6	57	13	24	3	4	1	177
GW6VZW	58	23	—	—	75	20	—	—	—	—	176
G4XEN	21	9	13	2	63	21	33	9	—	—	171
G8PYP	32	22	—	—	54	25	24	10	—	—	167
G4ZTR	10	12	47	7	56	24	21	7	—	—	162
G4LDR	43	10	—	—	31	11	28	8	—	—	131
GM4CXP	28	11	4	1	61	19	4	2	—	—	130
GM1SZF	33	11	—	—	57	16	5	6	—	—	128
G0EHV	—	—	44	5	62	16	—	—	—	—	127
G8XTJ	40	14	—	—	54	13	—	—	—	—	121
GD4XTT	34	8	—	—	49	10	11	4	—	—	116
G0EVT	23	19	—	—	33	26	6	6	—	—	113
G1VJP	15	4	—	—	74	12	—	—	—	—	105
G0FYD	—	—	—	—	82	22	—	—	—	—	104
G3EKP	25	15	17	4	25	7	5	4	—	—	102
GW1MVL	—	—	—	—	62	20	3	4	—	—	89
G1TCH	17	14	—	—	34	12	—	—	—	—	77
G7CLY	—	—	—	—	57	14	4	1	—	—	76
G3FPK	—	—	—	—	51	19	—	—	—	—	70
G4VOZ	—	—	41	6	—	—	17	4	—	—	68
G1CEI	5	3	—	—	46	10	1	1	—	—	66
G7CFK	40	24	—	—	—	—	—	—	—	—	64
GW4HBK	—	—	44	6	—	—	6	2	—	—	58
G1GEY	4	2	—	—	—	—	34	8	2	2	52
G0HGA	—	—	—	—	32	11	—	—	—	—	43
GM1ZVJ	4	3	—	—	22	11	—	—	—	—	40
G4AGQ	—	—	12	2	7	7	6	3	—	—	36
G6MXL	2	1	4	1	7	4	8	5	—	—	33
G0HOZ	—	—	—	—	25	4	—	—	—	—	29

Annual v.h.f./u.h.f. table. January to December 1989

propagation modes. Sporadic-E accounted for numerous French stations worked on August 9, between 2000 to 2100UTC. SV1OE (KM17) was peaking 59+ between 2222 to 2245UTC, on August 10, but no contact was made. On August 12, the expedition to Foula (IP80) by GM0FRT/P, was worked by utilising meteor scatter. Auroras on August 17, 21 & 23 accounted for many GM QSO's. The event on the 21st being much stronger, allowing contacts to be made with LA3EQ (JO28), LA9BM (JP40) and SM0MXR (JO89). Also heard in this event were SM2CEW, SM6ASD and SM6CMU. TEP propagation accounted for the South American opening on August 24. Between 2010 to 2100UTC, CX4HS, LU8DJO, LU8YYO and LU9AEA were worked, with LU1DMA being heard, as were PY2DM, PY2SB and PY2GWH. Bob comments that the latter station was audible for 30 minutes but didn't seem to work anyone. In a QSO with G3JVL, I was told that PY2GWH was heard quite often from Mike's holiday home in EA8, and yet he was never able to work him.

The 70MHz Band

The band was livened up by a number of expedition stations, operating from some much wanted locator squares, during the period of the Perseids meteor shower. A number of auroras during the middle of the month, allowed operators to work around the UK. On one occasion, operators could work 70/50MHz crossband, into Scandinavia, via Auroral-Es.

Gerry Schoof G1SWH (LNH), doesn't miss much on 70MHz. His score by the end of August stood at 64 counties and 4 countries. Recent additions have included EI9FK/P (DONEGAL), GW3MHW (DFD), GW6ZMN (GNS), GM3UKV/P (SCD) and the ill-fated expedition group GM4ZAP/P (WIL). Gerry worked the Telford group expedition to Tiree (IO66), on 50 & 70MHz (GM3UKV/P) and on 144 & 432MHz (GM3ZME/P).

John Lemay G4ZTR (ESX), made good use of the expeditions stations out for Perseids, by working EI9FK/P (IO43) and GW4SEU/P (IO73).

During the aurora on August 21, I worked GM0EWX (IO67) for his only contact on the band during the event. Where were all the other enthusiasts? A few hours after the aurora started, the band opened up to Scandinavia, via auroral-Es, allowing my first Au-Es contact with Finland on 70MHz. OH1AYQ (KP12), was worked crossband, 70 to 50MHz, at 2218UTC, 59 55. The Finnish station was heard calling for some time, inviting 70MHz operators to try crossband QSO's. The only UK station that I heard calling was Gerry G1SWH. Perhaps the others operators don't have separate systems with different i.f. frequencies that makes crossband working that much easier.

Incidentally, the following Scandinavian stations are known to have 70MHz receive capability. If you hear OH1ZAA, OH2KI, OH2KT or SM6PU on 50MHz, it may be worth asking them to listen for you on the next band up. With solar activity on the increase, the conditions should be good for some very long distance work on 70MHz. During the last cycle, a number of stations worked Andy VE1ASJ, and it would not be unrealistic to work into South Africa, South America or North America, via F2, this winter. Does anyone know of stations in these continents set up for 70MHz reception? Let me know if you do.

There doesn't appear to be very much activity from Eire, so the following list of stations known to be active on the band may come in useful if you decide to arrange schedules. EI1CR Co. Dublin, EI2CA Co. Dublin, EI4CL Co. Dublin, EI4DQ Co. Cork, EI6AS Co. Dublin, EI8EQ Co. Dublin, EI9BG Co. Clare, EI9ED Co. Meath, EI9FK Co. Wicklow, EI9HD Co. Dublin, EI9Q Co. Waterford.

The 144MHz Band

Meteor showers and a number of auroras, during August, provided some excitement to a band that was relatively starved of good tropo conditions. Brief Sporadic-E openings were also available, allowing contacts to be made, typically, into Italy and Yugoslavia. Major proton disturbances, beginning on August 12 and lasting several days, were one of the causes of the auroras, which allowed contacts into Scandinavia and the nearer Russian Republics.

One of the recent highlights for Ela G6HKM, was picking up 5 wet squares,

JO14, 15, 24, 25 & 35, thanks to the dedication of Andy GW0KZG/MM. The aurora on August 17 gave s.s.b. contacts with GB2XS and GM4DHF/P, both stations being located in IO78. During the peak of the Perseids meteor shower, much time was spent listening to the bursts of activity. The results were most interesting, with IW5ABM, OE2KRS, OK3LG and YU3IV being heard. Ela says that she might be tempted to have a go some time. I suggest that the best way to approach this initial step into m.s. working is to arrange a schedule, either by letter or via the v.h.f. net on 14.345MHz. This method is infinitely better than joining the bawling match on 144.2MHz, where the majority of stations make invalid qso's.

One operator that has caught the m.s. bug is GM0EWX. During the Perseids shower, Calum made contacts with DF1CF, DL5MAE, F1HDI/P, I4YNO, IW1AZJ, LX/DL4EBX/P, OH5LK, OK1KRA, SM2CEW, SM4KYN/4, SP2JYR and TF3EJ. UR1AYY was heard but not worked. Two interesting contacts were recently made with LA0DT/MM. On August 7, he was worked via tropo, in JO07 and, later in the month, on August 15, via aurora, whilst in locator JP11.

For **John Hunter G3IMV**, the August Perseids provided the mechanism to enable his last two squares in Poland, KN19 & KO10, to be worked. In addition to working SP6AZT/8 and SP6ASD/8, contacts were also made with TK4MS (JN42) and OH1AYQ (KP12). John mentions that most of his long haul m.s. schedules, over 2000 kms, were fruitless as it is not easy to work these distances with a single 17-element Yagi.

Despite thinking that the Perseids were not very good this year, **Geoff Brown GJ4ICD**, still managed to work a fair share of the dx. All s.s.b. contacts were made on random, either on 144.400MHz or on the unscheduled frequency of 144.200MHz. Between 1300UTC on the 12th, to 0600UTC on the 13th, Geoff contacted I3FDX, I4XCC, I5JUX, IK3EVN, IK5EHN, IK5EHW, IN3TWX, IW5AVM, OE3AP, OK3BIL, YU2EZA, YU2KK, YU3DDC, YU3ZV and YU3ZW.

Bob G1KDF completed four m.s. contacts with DJ7KL, I0UZF, IK3CBU and OE3JPC, on August 12. In the aurora on August 17, QSO's were made with GB2XS and GM4DHF/P. In a similar event, on August 23, at 1725UTC, GM6RGN (SLD) in IP90, was worked.

Paul Baker GW6VZW (GWT) reports on the Sporadic-E earlier in the year. In a two minute opening, at 1647UTC, on July 12, YU2AKL (JN83) was contacted. The next day saw an opening, at 1325UTC, to the Balearic Islands. EA6FB (JM08) was worked on s.s.b. for a new country. Although Paul missed the first session of the early morning Es on July 22, he soon got into gear and worked from 0730UTC, I1KTC (JN45), I4KYO (JN54), I4RHP (JN54), I0XGR (JN61), IK1JXY (JN44), IK0IXO/0 (JN52), IW0AKA (JN61) and IW0BEI (JN61).

Dick G0LFF (ex-G1CWP), also mentions some Es contacts made earlier in the year. An opening on July 12, produced a single QSO with 9H5BW. On July 16, EA6QB was heard, but unfortunately wasn't worked. More luck was had on July 22 when contacts were successfully completed with IW0AKA and IW0BTS. During the m.s. shower on August 12, Dick worked GM4CAN/P and IW1AZJ.

Paul Lock G4STB (CNL) was fortunate to catch a Sporadic-E opening on August 6. The band was open from 1752 to 1845UTC, allowing s.s.b. contacts to be made with I4OGR (JN54), I4RHP (JN54), I4SJZ (JN64), IK4DRY (JN64), IW4BNP (JN64) and I0XKD (JN52).

	Band (MHz)			
Station	1296	430	144	Total
G3IMV	48	124	429	601
G4KUX	—	120	372	492
G3UVR	82	135	246	463
G4RGK	50	124	284	458
GJ4ICD	59	119	263	441
G0DAZ	27	128	277	432
G3XDY	89	147	196	432
G3JXN	87	134	179	400
G1EZF	—	93	263	388
G4XEN	—	111	274	385
G6DER	78	110	183	371
G6HKM	45	107	215	367
G4RRA	—	80	255	335
G3COJ	44	103	186	333
G4DEZ	48	37	248	333
G4SSO	—	93	229	322
G4FRE	72	146	102	320
G1KDF	37	102	180	319
G4TIF	—	110	200	310
G1LSB	—	139	170	309
G4DHF	—	—	307	307
G1EGC	23	80	198	302
G8HHI	38	110	148	296
G6MGL	59	89	141	289
G8PNN	63	98	128	289
G4NBS	63	105	119	287
DL8FBD	—	—	280	280
G8ATK	45	91	143	279
G4MUT	31	93	153	277
G8LHT	10	88	175	273
G4PCS	—	3	258	261
G1GEY	11	77	168	256
G3NAQ	—	80	175	255
G0EVT	—	57	197	254
G6DZH	—	87	154	241
G4IGO	—	—	238	238
ON1CAK	—	33	204	237
G3FPK	—	—	236	236
G0EHV	—	75	160	235
GM4CXP	—	31	198	229
EI5FK	—	56	172	228
G6STI	24	69	130	223
ON1CDQ	—	32	182	214
G4MEJ	—	—	213	213
G8LFB	—	—	209	209
GW4FRX	—	—	204	204
G8MKD	—	49	150	199
GJ6TMM	—	48	151	199
G4YCD	—	—	197	197
G4DOL	—	—	186	186
G1SWH	—	53	128	181
GI1JUS	—	—	181	181
G4ZTR	30	45	91	176
G7ANV	—	—	153	153
G6MXL	16	45	91	152
GW6VZW	—	6	143	149
G4AGQ	1	42	104	147
G1WPF	—	29	97	126
G0FEH	—	24	101	125
G0FYD	—	—	121	121
G8PYP	—	21	98	119
G8XTJ	—	—	116	116
G1IMM	—	17	98	115
GW1MVL	—	20	95	115
GM0HBK	—	—	107	107
GI4OWA	—	—	103	103
GM0GDL	—	22	81	103
G1TCH	—	6	88	94
G1SMD	—	—	93	93
G6MEN	4	26	63	93
G4WHZ	7	—	76	83
G1DOX	4	11	61	76
G0HEE	—	—	73	73
G1CEI	—	1	72	73
GU4HUY	—	—	73	73
G0HDZ	—	—	64	64
G0ISW	—	12	52	64
G1NVB	—	—	58	58
GM0JOL	—	—	47	47
G2DHV	2	7	33	42
G7CLY	—	—	38	38
G7AHQ	—	—	34	34

G4DOL (DOR) and **G4IGO** (SOM) report that the opening, lasting about 10 minutes, was into the JN61, 62 area of Italy.

On checking to see why I had missed this event, I see from my propagation log that the 50MHz band was open at this time to Greece, with SV1AB and SV1OE coming in at S9+, that there were lots of strange noises on 70MHz, but nothing heard on Band II FM frequencies.

The only events that I participated in during the month were the auroras on August 21 and 23. The event on the 21st was first noticed at 1830UTC, giving a number of c.w. contacts with stations in northern England and Scotland. At 2152UTC, a solitary SM5BUZ (JO78) was worked, but no other dx was heard. The weak event was still burbling away when the big switch was pulled at 2300UTC. The auroral event on the 23rd, between 1630 to 1715UTC, was poorer still with only SM1MUT (JO97) and GM4UFD (IO87) being worked.

Ian Wright GW1MVL (CWD) made the best of the poor tropo conditions recently. On August 2, s.s.b. QSO's were made with EI3GE (IO63), FC1OGF (JO10) and GW3KJW (IO72). Andy GW0KZG/MM gave Ian two wet squares in the form of JO03 and JO04. Further tropo contacts made in early August included FA1ORL and FC1LHP/P (JO10), GD4XTT (IOM), GW4ALT/P and GW1PXM/P (DFD), the latter station giving Ian his 100th locator square on 144MHz.

Down on the south coast of England, **Steve Damon G8PYP** (DOR), has been working a fair sprinkling of dx throughout the summer. During a brief Sporadic-E opening, at 1914UTC on June 25, contact was made with YU1EV in KN04. Taking full advantage of the portable stations out for VHF NFD at the beginning of July, Steve worked GM3WCS/P (DGL), GD4IOM (IOM), EI4GRC/P (IO53), EI7DJ/P (IO52) and EI7M/P (IO62). The Perseids meteor shower provided an opportunity to listen to some medium distance dx. Between 2300 to 0120UTC on August 12, a number of stations were heard including I4YNO, IB3CER, IW5EM, OE5EL and YU3ZV.

The 430MHz Band

There **IS** life up on 430MHz, it just a matter of getting reports in about the activity!

Paul Brockett G1LSB (LCN) is very active on the band and is always on the look out for new countries and squares. Being ideally located to work into Scandinavia, many of his contacts recently have been in that direction. Tropo ducts forming across the North Sea, a regular occurrence on 430MHz, have allowed Paul to make recent contacts with 15 locator squares situated on the coastline of Norway, Sweden, Denmark and Germany. In a northerly direction, contacts have been made with GM4IPK (IO99) and GM4GPP (IP90).

Steve G8PYP (DOR), put some time in on the band and worked, during the VHF NFD contest, GW3THB/P, F/PA0OOM (JN09), and PE0MAR/P (JO21).

A new country and square were added to her list when G6HKM recently worked Stan GU3EJL. Ela's score now stands at 39 counties and 15 countries this year.

James Whittle G3EKP (LNH), is putting his J-Beam Yagi back on the mast and should be active on 430MHz s.s.b. by the time you read this.

Another station, that of **Peter Hirons G1CEI** (HPH), is now active on the band. Peter is using an FT-726 driving a 50 watt amplifier into a 19-element Yagi at 10m a.g.l.

The Microwave Bands

Although I don't receive very much information regarding UK activity on the s.h.f. bands, it is possible to see a trend in the increasing numbers appearing on these interesting frequencies. This increase is probably due to the greater availability of commercial gear and, perhaps, also due to the work of the RSGB Microwave Committee in encouraging Microwave Round Tables and other similar events. With all this interest being shown in Europe for microwave experimentation, I was somewhat surprised to read that the ARRL are planning to drop the *New Frontiers* column from *QST*, as apparently there isn't enough interest in the s.h.f. bands to justify a column.

A report from **Keith Hewitt G6DER** indicates that he worked LA1T (JO37) on both 1.3GHz and 2.3GHz during the good tropo conditions in July. This was during the period when the Norwegian group were hearing GB3MLE on 10.4GHz.

Only one contact on 1.3GHz, PE1EWR, on August 8, was the best that G6HKM could come up with during August. Ela is looking forward to the autumnal tropo season, when the enhanced conditions should hopefully liven up the band.

Ian Gordon G8IFT uses an SSB Electronics 10GHz transverter, driven by an FT-290, into a 560mm dish. In a recent cumulative contest, operating from a site in Radnor Forest, Ian made some 7 two-way and 3 one-way contacts, the best being with G8BJG/P and G0FDZ/P, both at 258km. Two other contacts were over the 200km mark.

Contacts over 200km are not restricted to narrowband working. **Peter Day G3PHO** recently hauled 50lb of wideband 10GHz gear to the summit of Snowdon and was rewarded with a 243km contact with GI4SQL/P.

Even better distances have been worked by **Philippe F6DPH**. During a holiday to Spain he made contacts on 10GHz, from different locations, with F6CGB/P (JN24) at 310, 330km and 375km, I4CHY/P (JN54) at 675km and with IW5ADB (JN53) at 600km and 675km. Pretty impressive results.

With path lengths in excess of 200km now becoming commonplace on 10GHz the need for high power talkback on 144MHz will soon be mandatory. A more serious problem is the actual frequency or even the band that should be used for liaison purposes. Stations in DL and PA prefer to use 430MHz whereas UK operators seem to use either 144.175MHz or 144.330MHz. Usage of the UK preferred frequencies within Europe is not without its' problems as in many countries these channels clash with other specialist user groups. One suggestion put forward is that 144.390MHz should be used as the European microwave calling channel.

VHF News

Towards the latter part of August, UK bases on Cyprus, ZC4, obtained 50MHz operating privileges. The licence conditions are believed to be based on the UK system.

Another Asiatic country, favourable to the issuing of 50MHz permits is Turkey. Hopefully a number of you managed to work TA4/G3SDL during the first week of October.

Meanwhile, Luxembourg is the latest European country to gain 50MHz permits, coming on stream in August.

With the departure of Band I TV in Spain, several operators in the country have applied for 50MHz permits. Also in the pipeline is the possibility of operating privileges to stations in Belgium. The prospect of operation in this country is quite interesting as, if my memory serves me right, it was concern over interference to some Belgian TV systems, that the DTI had to tread very carefully over the power allowed in the UK.

Hal Lund ZS6WB, editor of *VHF NEWS*, reports that 50MHz equipment has been sent to Botswana and that **A22BW** will be the recipient. It is 2 years this month since A22 was first worked from the UK. On October 22 1987, between 1535 to 1700UTC, A22KZ worked G2ADR, G4HBA, GM4DGT, G1AWP, G4GAI and G3CCH. Incidentally, the contact with GM4DGT was the first recorded contact between GM and Southern Africa on 50MHz. None of the other UK prefixes, apart from G, have yet worked A22. It could be you!

	Band (MHz)				
Station	50	70	144	430	Points
G4ASR	79	5	253	1	338
G4OUT	—	19	155	—	174
G0HGA	—	—	171	—	171
G4XEN	7	—	144	9	160
GM4CXP	29	1	114	1	145
G0FYD	—	—	67	—	67
G3FPK	—	—	32	—	32
G0FYD	—	—	31	—	31
G4VOZ	—	27	—	4	31
G4AGQ	—	10	11	—	21
GD0ELY	1	—	14	—	15
GW4HBK	—	15	—	—	15

Annual c.w. ladder

GM6TKS is being posted, in October, to Gibraltar for a 3 year period. Mark is a keen v.h.f. operator and plans to activate 50, 70 and 144MHz. He may use the visitors callsign **ZB2/GM6TKS**.

It is pleasing to note that **TF3EJ** is now active, on meteor scatter, with 150 watts into a long Yagi.

Expedition Round-up

The expedition by the Derbyshire Hills Group to the Island of Harris suffered a severe setback when tremendous gales devastated their campsite and stations. Fortunately none of the group were injured, but regrettably much of the equipment was irreparably damaged.

In more sunnier climes, the low key expedition to Gibraltar, by Dick ZB2/G0LFF, was a great success. Using an FT726R, 10W p.e.p. and a wire delta loop, over 600 QSO's were made on 50MHz, with 18 countries and 53 locator squares. On 144MHz, 10W into an HB9CV antenna on the balcony, produced contacts into Sardinia, Italy and Germany.

Martyn Vincent G3UKV reports on his expedition to the Scottish Island of Tiree. Highlights on 50MHz, included hearing ZS3E between 1824 to 1830UTC and ZS3VHF between 1645 to 1840UTC on August 2. Contacts were made on the same day with PA3DYY/MM, TK/PA0ERA, F6BNX and 9H1CG. On August 4, T77C was worked 599 at 1520UTC. Conditions were not very good on 70MHz, with only fifteen stations being worked.

Another expedition group, the infamous Squarebashers, were out operating as GB2XL, from a site in IO71. Most activity concentrated on 50MHz although equipment was available for the other v.h.f. bands. Many m.s. contacts were made on 50MHz. Some of the stations worked included G4IFX, GB2XR, GM0GER, GM3WOJ, PA3BFM, PE1JPX and SM6CMU. Results on 144MHz m.s. were disappointing with activity on random c.w. being practically non-existent. Random s.s.b. was marginally better, although reflections seemed rather poor. A number of contacts were completed, DL5MAE, I5JUX, IW5AVM and OE3JPC, being among those worked.

Dave Robinson G4FRE, decided to operate as a splinter group of the Squarebashers, from a location in the Scottish Highlands. The expedition went very well. Operating as GB2XR, contacts on 50MHz were made with Cyprus and South Africa as well as the more usual European theatre.

Bandplans

With all this news regarding 50MHz, it is a perhaps timely to remind you of the correct usage of the calling frequencies. Great concern, shared by many operators, is being shown in the mis-use of the inter-continental calling frequency 50.110MHz. Inter-continental means between continents, it does not mean, for example, the UK to Finland. Secondly, it is a calling frequency and **NOT** a working frequency. Nobody would consider having a QSO on 144.300MHz, so why do it on 50MHz? The correct frequency to use for inter-European calling is 50.200MHz. It was also disconcerting to hear a number of UK operators, during the Perseids shower, using 50.110MHz. A cursory glance at the bandplan will show you that the correct frequency for s.s.b. meteor scatter is 50.350MHz. Bandplans are there for a reason - please use them correctly.

WAB News

As many of you may know, conditions on 50MHz, to South Africa, were very good during the recent winter period and **Leroy Dale ZS6XJ**, has produced the following awards, all of which are firsts for a station outside the UK on 50MHz. The Overseas Introductory Award, for working 25 areas and 10 counties; the Basic WAB Award, for working 50 areas; and the WAB Bronze Award, for working 100 areas. Leroy is also the first non-UK station to gain the Counties Award for working 55 counties, as well as 100 bookholders and also gained the first Overseas Bookholders Award. In recognition of this outstanding achievement, he has also been awarded with a Certificate of Merit.

Alan Harrison G1NRM, has claimed the first 430MHz Bookholders Award, by working 100 bookholders on the band. He was also the first to work 100 3rd series bookholders on 50MHz.

Meteor Showers

The period October through to December contains a number of very good showers, which should provide for the m.s. enthusiast, the opportunity of working some real dx. I would suggest that before you rush off and start blasting the ionised trails, that you send to me an A4 s.a.e. so that I can provide you with an 8 page information pack detailing the latest regulations and the 'ASR guide to practical m.s. working.

Major showers in BOLD type. Day of maximum activity shown in brackets. Cassiopeids: October 10-15 (Oct 13) **ORIONIDS**: October 17-26 (Oct 21) Taurids: October 11-Dec 4 (Nov 4) Cassiopeids: November 7-13 (Nov 8) **LEONIDS**: November 13-19 (Nov 16) **GEMINIDS**: December 6-14 (Dec 12) Ursids: December 16-23 (Dec 21)

QRZ Contest!

Oct 13 432MHz cumulative Oct 21 1.3/2.3GHz cumulative Oct 29 432MHz cumulative Nov 4-5 144MHz CW Nov 6 432MHz cumulative Nov 12 SSTV, all bands Nov 14 432MHz cumulative Nov 22 1.3/2.3GHz cumulative Nov 30 432MHz cumulative.

VHF Tables

Another reminder that I will be introducing, in the January 1990 issue, an all time 144MHz QRB table detailing furthest distances that you have worked via Tropo, Aurora, Sporadic-E and Meteor Scatter. Because of the lead times involved I require your results by October 31, so that the table can be successfully launched.

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS

Readers Letters

Rob Innes, Harwich is a keen short wave listener and currently uses a Spectrum +2 computer with decoding software from Technical Software in the form of their RX-4 program. Like many people who use computers for RTTY, Rob suffered a lot of r.f. interference to the point where he was thinking of giving-up. After reading an article about the reduction of r.f. interference which mentioned the use of ferrite beads he decided to have a final attempt at curing the interference. Having searched through the junk box for ferrite beads he discovered that the only ferrite he had was a few ferrite rings and a 200mm length of ferrite rod. He tried the rings on the lead between the computer and TV but unfortunately the moulded plug on this lead was too big to pass through the ring. The next stage was to try winding the lead around the full length ferritte rod and securing it with insulating tape.

You can imaging Rob's pleasure when he discovered that the interference had been significantly reduced. Being a true experimenter Rob was not satisfied with a partial solution so he decided to try slowly with drawing the ferrite rod from the coiled lead. To his surprise and delight he found a point, with the rod about 3/4 removed, where the interference dissappeared as if it had been turned off! The easiest way to make a permenent job here would be to remove turns from the ferrite rod until the point of minimum interference is reached.

As you can see from this example interference cures can often be simply a matter of experimentation and a little lateral thinking. If you have any experiences of simple interference cures, please drop me a line and I will pass on the details to other readers via this column.

Hardware Update

Having visited a selection of software decoding programs last month, I thought that this month it would be appropriate to continue on the same theme but covering the hardware.

I also attended the Telford rally on September 3 and was able to spend some time examining the cost of various computer systems and periphials.

Computing Equipment

The good news is that there still seems to be a plentifull supply of low cost computers at rallies.

Starting at the bottom end of the price range, Dragon 32s can be had for about £25.00 and this machine is well suported by G4BMK and to a limited extent by J & P Electronics. Another good value computer is Commodore VIC 20 which is again available for £25.00 and is supported by software from J & P Electronics.

Moving up in price slightly is the Commodore +4 at about £30.00, though the software support for this machine is somewhat limited.

Probably one of the most popular of the Commodore computers for amateur radio use was the C64 and these are generally available at rallies for a very reasonable £100.00. Software support for the C64 is very good and there is plenty of Public Domain (i.e. free) software available for a variety of radio related functions.

Final computer from the Commodore range is the Amiga 500 which was available for about £250.00. This computer is capable of some very good graphics and has a fair amount of software support.

The Spectrum computer has always been popular with radio enthusiasts and consequently has very good support. A standard Spectrum can be bought for about £40.00, which when combined with the software interface decoding programs that are available, makes a very economical way of starting.

Finally on the computer front, there is the IBM PC range and compatibles which are becoming increasingly popular. The cheapest I spotted was £480.00 complete with monitor and twin disk drives. There is a wide range of software for these computers available from the Public Domain Software Library making them very popular for a wide variety of tasks.

One important item that is rarely included in a computing package is a printer. A popular printer is the Citizen 120D which is a standard 80 column dot matrix type. At the Telford rally these were available for about £130.00 which again seems pretty good.

That's it for the computing hardware, but if you know of any sources of cheap computers then drop me a line with the details.

Terminal Units

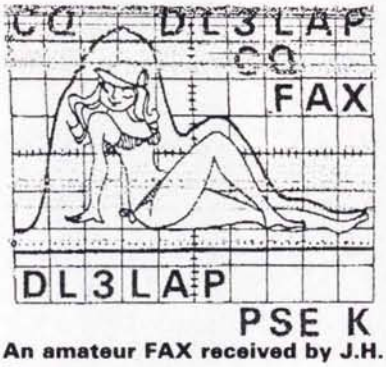
When choosing a terminal unit there are two basic options - either an intelligent terminal unit or a basic terminal unit, the choices depending on your requirements and the depth of your pocket! The term intelligent terminal unit is usually used to describe a unit which can transceive in several different modes with all the decoding and encoding being carried out within the terminal unit. These terminal units still require a computer in order to display the output and to get input from the operator. The beauty is that the computer only needs a very simple terminal program and serial interface - this is available on virtually every computer worthy of its name.

Basic Terminal Units

By this I mean units which accept an audio output from the receiver and converts this into a d.c. signal which follows the mark and space changes of the RTTY signal. The need for this type of terminal unit is of course dependant on the software you are running and the instructions supplied with this software normally make the requirements quite clear.

Now on to a few units that are currently on the market. The first comes from J & P Electronics and is available in several forms. For the listener a receive only unit is available for about £45.00, while the full transceive unit costs about £75.00. One of the important points to consider when selecting a terminal unit is the number of facilities that are available. The J & P unit scores well on this point as it is fitted with a six options as shown here:

850Hz tone - c.w.
1275Hz - space tone
170Hz shift RTTY normal
850Hz shift RTTY normal
170Hz shift RTTY reversed
850Hz shift RTTY reversed



An amateur FAX received by J.H. Carter

If the options you want are not included as standard, J & P will supply the terminal unit set up to a number of different standards at no extra cost, which seems very fair.

The terminal unit need a 12 to 16 volt power supply and the maximum current drawn is approximately 160mA. The input sensitivity is in the region of 10mV and it can accept a very wide variation in input level as it has been designed, like many others, to operate from the external speaker socket of the receiver. On the computer side there are three outputs - audio, t.t.l. and open collector. The audio output is very useful for feeding other utility equipment such as a "Toni-Tuna". Having said that, there is a tuning indicator in the form of a panel meter on the front of this terminal unit.

Another popular range of terminal units is produced by BARTG (4). Probably the most famous of these is the ST5, though it is beginning to show its age. The standard ST5MC costs about £79.00 and features basic RTTY operation using 170Hz and 425Hz shift and European "Low tones", i.e. 1275Hz and 1445Hz. The output can be configured for t.t.l., RS-232 or Teleprinter according to your requirements.

A more recent offering from BARTG is the Versaterm which I reviewed in this column in the August edition. This unit was designed as a replacement for the ST5 and is much smaller, neater and includes features designed to make life easy for the computer operator. The Versaterm is particularly appropriate if you are using a BBC computer for RTTY decoding. The basic modes provided are 170Hz and 425Hz RTTY plus a c.w. facility. On the computer side, it can be configured for t.t.l. or RS-232 making it pretty versatile - hence the name! The only slight drawback is that it is only available in kit form at around £51.00

Intelligent Terminal Units

The latest name for this type of device is a Multi-mode Communication Controller and is used to describe the growing range of decoders which can convert a number of different modes into ASCII data for display on a computer.

One of the most famous of these is the PK-232 from AEA Electronics the current version of this costs about 300.00 and is capable of resolving RTTY, ASCII, c.w., Packet, AMTOR, WEFAX and NAVTEX. These features combined with a wide range of support software makes it very versatile unit. As is common with these units, a l.e.d. bargraph type tuning display

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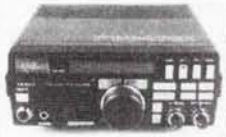

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Send SAE for COMET CATALOGUE....

COMMENT

I don't often blow Arrows "Trumpet," but if you are buying a new piece of equipment this year, either at the exciting LEICESTER show (27th & 28th OCTOBER) or any other time, it will pay you (AND I DO MEAN PAY YOU) to call ARROW. (STAND 33 LEICESTER).
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73's from us All. Peter G3LST.
(PS: This is my & OUR 24th year in the Amateur Radio Trade).

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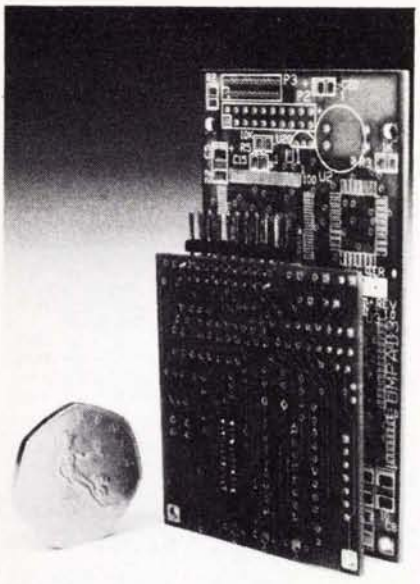


Le TNC p.c.b. from Siskin Electronics

is provided on the front panel.

Another old favourite is the Kantronics KAM which is available for around 265.00 and feature the following modes:

h.f. and l.f. Packet, c.w., RTTY, ASCII, AMTOR, WEFAX and KA-NODE.

One of the advantages of these intelligent terminal units is that the number of modes is controlled by software which is stored in an e.p.r.o.m.. This means that extra facilities and new modes can be added very easily with an e.p.r.o.m. change.

The final intelligent terminal unit is the MFJ-1278 which is handled by AMDAT. This features many modes as shown here:

Packet, RTTY, AMTOR, ASCII, c.w., FAX and SSTV. The inclusion of SSTV is rather unusual and likely to appeal to many.

The MFJ-1278 costs around £230.00 from AMDAT.

Packet TNCs

There are a wide range of Packet TNCs on the market, so I will only look at a few of the most popular here.

Siskin Electronics have become well established in this field and have a comprehensive range of TNCs. The TNC-320 leads the range and is a development of the TNC-220 which was probably one of the most popular TNCs. The TNC-320 featurs dual port operation, allowing changeover from v.h.f. to h.f. to be a software operation. The TNC-320 includes a full range of AX-25 commands along with a very sophisticated personal mailbox system all for £179.00. For h.f. operation a bargraph tuning indicator is included which is very useful. One rather interesting development is provision for the reception of AMTOR and RTTY on a future software release (no date available yet). When this feature is released, the TNC-320 will bridge the gap between a full intelligent terminal unit and a simple TNC.

If you only require v.h.f./u.h.f. operation the Siskin Tiny-2 is a good choice with most of the features of the TNC-320 but with only a single port and a price tag around £125.00. If you want a high spec. - low power TNC the Micro-2 at about £149.00 could be a good choice.

The latest news I have from Siskin is they they will be announcing a new minature TNC appropriately named "Le TNC". The unit is actually a miniturised Tiny-2 including personal mailbox system and the size can be gauged from the photo in this column. The reason for producing such a small TNC is to match with the small rigs available and the growing use of portable computers like the Z88 and PSION Organiser. The price has not yet been fixed, but I have been assured that it will be under £200.00. By the way, the p.c.b. does come with components attached and boxed not the bare board in the photo!

If you are an IBM PC owner the Siskin PC-320 is a PC compatible TNC card which slots into the standard expansion ports of this popular computer.

AEA Electronics, the makers of the PK-232 multi-mode communications controller also produce a single port TNC called the PK-88. This TNC costs around £137.00 and features full AX-25 version 2 level 2 commands.

Kantronics also have a range of TNCs with the KPC-2 being a single port h.f./v.h.f. unit at £160.00 whilst the £225.00 KPC-4 features two port operation. The gateway feature of the latter works even when you are connected on one port.

AMDAT are the sole agents for packet products from the American company DRSI. This company produces a range of TNCs. for use with IBM computers or compatibles. There are three cards in the range each allowing for different modem options. The prices range between £139.00 and £169.00.

DRSI are also entering the micro-t.n.c. market and their offering will be in the region of £250.00.

I think that just about finishes this feature, but I would like to thank Siskin Electronics (1), AMDAT(2) and J & P Electronics (3) for supplying the information.

If you have any other items you would like me to cover please drop me a line and I will do my best.

(1) Siskin Electronics Ltd., 2 South Street, Hythe, Southampton SO4 6EB.

(2) AMDAT, Crofters, Harry Stoke Road, Stoke Gifford, Bristol BS12 6QH.

(3) J&P Electronics Unit 45, Meadowmill Estate, Dixon Street, Kidderminster DY10 1HH.

(4) BARTG (Versaterm), Peter Adams, 464 Whippendell Road, Watford, Herts WD1 7PT. (0923-220774).

(4) BARTG (ST5MC), Stuart Dodson, 63 Malvern Ave, South Harrow, Middx HA2 9EU (01-422-4153).

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD

Data Space 1989

The AMSAT-UK Colloquium, part of DATA-SPACE '89 held at the University of Surrey from July 27 to 31 inclusive was a great success, with over 200 attendees from 20 countries and four continents.

The first day was taken up with an international meeting to determine co-operation and mutual project assistance, and a discussion on the formation of "AMSAT-Europe". Whilst the idea had considerable support backed up by positive proposals, it was generally agreed that international co-ordination should remain with the IARU, who already supports the necessary infrastructure. The meeting urged that smaller satellite interest groups join one of the larger existing AMSAT groups in order to obtain regular updates on the Amateur Radio Satellite programme for local dissemination rather than duplicate existing facilities, rather than to attempt to create a costly new organisation.

Cees van Dijk PA0QC, Chairman of IARU Region 1 spoke on the importance of frequency band planning, and that whilst national administrations look to amateur radio organisations to organise their own affairs and frequency allocations in a responsible manner, the work is best performed by international consultation and co-operation.

Dr. Bandi Geshwindt HA5BH, of the progressive Technical University of Budapest, told of the ongoing co-operation between the USSR and the Eastern European countries in building and arranging the launch of a series of future amateur radio satellites, for which some 3 - 4 launch opportunities will occur in the next five years. The first satellite is likely to fly in 1991, and will have Mode "A" and "J" transponders aboard.

Dr. Martin Sweeting explained how the construction of scientific satellites combined with amateur radio activities could provide the basis of funding and the infrastructure for a sound amateur radio satellite development programme, and how by using these to prove new technological concepts, which later find use in commercial applications, the hobby would benefit and a pool of expertise would be created.

Hans van de Groenendaal ZS6AKV, stressed the need for interest creation in electronics among young people at school, and gave the Ski-Trek project on OSCAR-11 as a perfect example of this approach in action.

Richard Ensign N8IWJ, seen in Fig. 1with Junior de Castro PY2BJO, are together organising the AMSAT-Brazil Dove project. It was pointed out that although the project had yet to reach practical fruition, a considerable level of interest and activity had already been created in schools.

The intervening two days were devoted

Fig. 1

to the packet radio side of our hobby, with, of course, considerable emphasis on the forthcoming new micro-sats, but the really big day for satellites was on Sunday July 30.

Papers were presented on many topics, including the Microsats by Doug Loughmiller KO5I and Bob McGwier N4HY; the UoSAT Fadsoft operating system and packetised data by Michael

Fig. 2

Meerman PA3BHF, and the proposed protocol for PACSATS by Howard Price, NK6K and Jeff Ward G0/K8KA. Bob McGwier spoke on Digital Signal Processing (DSP) applications in Amateur Radio,

Freddy de Guchteneire ON6UG, not only gave a superb presentation on antennas for portable amateur satellite ground stations, but set up a fully functional OSCAR-13 Mode "B" and "L" station at the event, which made good contacts with many stations around the world. This is shown in Fig. 2, where I am working old friend JA4BLC on Mode "L", with Doug KO5I on his left, and Freddy ON6UG facing on the right.

I gave the details of the proposal for a lunar beacon and transponder experiment, whilst Ray Soifer W2RS talked on low power e.m.e. communications. Peter Cleall G8AFN produced a comprehensive treatise on the sun's effect upon OSCAR-9, a topic of high current interest. Hans van de Groenendaal ZS6AKV, President of AMSAT-SA, talked on balloon carried amateur radio projects, whilst Chris Meadows G4KWH gave a presentation on the satellite earth station at Luton College of Higher Education.

A future Indian amateur radio satellite was detailed by VU2MY, and Leonid Labutin UA3CR gave the details of RS-12 and 13 which were provided in last month's column, and that the European built RS-15 would probably fly in 1993. In addition to our listing, a considerable number of other presentations of general interest arose.

With all the inter-lecture talks, the personal contacts, the meetings with many old friends, the whole event was highly productive, enjoyable, and well organised, with all participants now looking forwards to next years session. For those who were unable to attend this year, the major papers presented at the meeting have been compiled into proceedings, available from AMSAT-UK.

"Mystery Satellites" - no more?

The pair (or more) of satellites discovered by GM4IHJ transmitting on 435.974MHz detailed in our last few columns have now been identified. **John Branegan GM4IHJ** explains that one of these appears to be the Polar Bear Arctic communications experiment, built by the Johns Hopkins Institute of Baltimore, Maryland, using a surplus NAVSAT frame. Another is possibly the Hilat experiment, and both are in use for Polar Auroral research. John writes that they have identical transmitters, and radiate continuous unmodulated carrier phase coherent signals on 137.676 and 413.028MHz, thus providing the basis for detailed ionospheric studies when any pair, either or both primaries, and/or one secondary signal is received.

He explains that they constitute one leg of a major series of experiments being conducted by the University College of Los Angeles from it's polar research base near Fairbanks, Alaska. He states, "Far from being covert clandestine military activity, these signals are legitimate and are following in the footsteps of several famous predecessors, e.g. P-76, the Space Shuttle v.l.f. Plasma Monitor Relay, and a host of Get-Away-Specials experiments, which have used the 70cm band...". "The scintillation of the signal is a good indication of the degree of disturbance of the Polar Aurora".

Ron Pearson G3CAG, and **Dave Rowan G4CUO** both spotted a manifestation of this effect when the satellite came over the North Pole heading south through the activated auroral zone in the late August period of intense solar magnetic activity. "For four minutes the signal was split, giving two carriers 2.2kHz apart, the higher one being weaker and noticeably disturbed," said Dave. This phenomena has been noticed on earlier amateur satellites, when the two meter uplink splitting has provided two separate signals on the 29MHz downlink, one with a noticeable lag and far rougher quality due to multi-doppler spread.

John points out a likely reason as to why the signals switch off when the satellites leave the Arctic area. He suggests that the reason may be hidden in the title "Communications Experiment". "United States bases in the Arctic are too far from civilization to get terrestrial TV," writes John. "They cannot see GEOSATS because they are too low on their horizon. One test proposed for Polar Bear is Time Compressed TV, a one hour television show compressed to a ten minute transmission burst. The satellite receives this time compressed TV signal from a GEOSAT, then, as it passes over the US Arctic bases, it down loads the TV to them during it's ten to twelve minutes in range pass. The Arctic ground stations then decompress the TV back to a one hour show and transmit this over the local Armed Forces Television Network. Naturally, Polar Bear must switch off it's noisy beacons as it crosses the Equator so that it can load the very wideband time compressed TV signal".

There could be other harmonically related frequencies emanating from these satellites, as the fundamental would appear to be 22.496MHz, so any multiple is well worth watching. Furthermore, a third possible satellite has yet to be identified.

OSCAR-9

UoSAT-1 was seen to be de-orbiting fast during the intense late August burst of solar activity and the solar flares of August 29. Measurements taken by Dave Rowan G4CUO indicated a loss of period of some 1.5 seconds per day, down to a reducing 91 minute 20 second period. G3ENY reported a drop of 100 metres per day, increasing rapidly. The Royal Greenwich Observatory reported a mean motion of 15.75154632 orbits per day, with a drag of 0.00196947 at Epoch Day 89-232.17248940, on orbit 43901. This remarkable little satellite has exceeded it's three year design lifetime by a factor of almost three, and will have completed over 44,000 orbits by it's demise, a distance of over 1,100,000,000 miles, equivalent to half way to the planet Neptune. The satellite may well still be in orbit and the transmitters still functioning by the time you read this column, but only just! Estimates show that it will change to a meteor at an altitude of 100 miles, a velocity of 7.8km per second, and a close to 89 minute period. It may just see it's eighth birthday, having been launched at 1127UTC on 6 October 1981, but, the very latest stop press reports coming in at the time of writing at the end of August are not good, indicating a total loss of the signal, which had not been heard since August 23!

If it returns, and the silence has been only temporary, then observers without decoders may wish to listen to the Digitalker speaking telemetry, which is giving many channels of interest in decay determination. Channel 08 is the battery pack A temperature in degrees C, channel 18 the same for battery pack B. Channel 23 is the +14 volt battery reading in volts, 29 the spacecraft's -Y facet temperature in degrees C, 35 the 145.825MHz beacon output power, 39 the +Y facet, 49 that of the +Z and 59 that of the -Z facet spacecraft's temperature, all in degrees celsius.

OSCAR-11

No such incineration terrors face UoSAT-11, which continues to give good service. The Whole Orbit Data is giving channels 2 and 61 each Sunday; 1, 2, 3 and 61 each Monday; 53 on Tuesdays; 19 on Wednesdays; 1, 2, 3 and 61 again Thursdays; 0, 10, 20 and 30 on Fridays, and 10, 11, 19 and 29 out on Saturdays. The 145.825MHz beacon has been turning off for 10 second periods following the DCE message title transmissions. This was planned and intended.

MIR

Readers will be pleased to know that a good Progress supply docking was accomplished at 0310 on August 28. The new type SOYUZ-TM-8 launch is expected to take up two new cosmonauts at 2206UTC on September 5, docking on the late evening of September 6 some 49 hours later. Nico Jannsen PA0DLO reports from Chris van den Berg that the crew has been changed again, and the module specialist mentioned earlier will not be flying for the coming six month mission. This indicates that a further delay, possibly due to economic rationalization, has been effected to the earlier plan to attach a new large specialist module. It may have it's compensations, as the new crew member may be more keen on practising the MIR amateur radio experiment. Watch 145.550MHz f.m., and be prepared to operate split frequency.

OSCAR-13

The elliptical orbiter has really been sounding well, as the pointing angles have been good and the main use has been moderate this past month. Users report both the B and L modes as "excellent", "the best ever". Rod Clewes G3CDK, a committed Mode L user says "There seems to be a major improvement

in Mode L whilst G4JY said, "There is no doubt but that L mode is giving terrific returns, just as good as Mode B now".

The same is now said of Mode S, which, if you recall, was demanding uplink powers far in excess of those calculated. The problem appeared that the Mode S beacon could not be shut down as planned during normal pass band communication periods when the transponder was on, and those wanting to use the mode has to "push" their signals past this high level of attenuation.

As a result of conversations with ON6UG, DJ4ZC, G2BFO and DF5DP at the University of Surrey meeting, Peter Guezlow DB2OS was able to find a way to do this, and re-programmed the Internal Housekeeping Unit of OSCAR-13 accordingly to automatically turn off the beacon. The result is self evident, as Bill McCaa K0RZ reports that it is now possible to have an excellent downlink using only 300 - 500 watts e.i.r.p. of uplink, and that signals on his 1.2m diameter dish with a 1dB NF pre-amplifier were 10 -15dB above the noise floor. In other words, what you use for Mode B will do very nicely now for Mode S.

Bill says, "As an additional surprise, is that in addition to the normal Mode S uplink, a portion of the Mode B downlink also appears in the Mode S downlink, and the uplink powers required are the same. Cross-mode QSO's have been effected, but there is as yet no explanation for this. Mode S uplink frequencies do not appear in the Mode B downlink". Bill lists the preliminary operating frequencies with the Mode S passband on.

Mode S Uplink: 435.601 to 435.637MHz.

Mode B Uplink: 435.471 to 435.507MHz.

Mode S downlink: 2400.711 to 2400.747MHz.

The corresponding Mode B downlink frequencies for the Mode B uplink listed above is 145.927 to 145.981MHz.

DF5DP recommends using u.s.b. in the Mode S uplink to assist Mode S users in distinguishing between Mode B and Mode S'uplink stations. Since the Mode S transponder is non-inverting, Mode B uplinked signals will be on l.s.b., and Mode S uplinks will be found on u.s.b.

DB2OS reports the s.h.f. schedule as follows:

Mode S beacon ON and passband OFF: MA 146 to 149.

Mode S beacon OFF and passband ON: MA 150 to 159.

Mode S beacon OFF and passband OFF: All other MA values.

The general A-O-13 spacecraft mode operation given in last months column stated to be current until November 16 is now stated to be changed, and the new plan is given as follows:

Mode B: MA 3 until MA 160. Mode JL: MA 160 to 200.

Mode B: MA 200 to 240. Off: MA 240 to 03.

The Mode S schedule is given in this version as being from MA 210 to MA 222, with the beacon on until MA 204, and the transponder from MA 204 until 217, so no small degree of confusion exists! Observation will confirm that which is practised, or a copy of the beacon information.

GM4IHJ joined the experiment set up by AMSAT when all users were asked to keep off the OSCAR-13 Mode JL transponder for the day so that investigation could proceed into some of the interference on the downlink. Listening on his best L downlink, he noted a very odd feature. The downlink was empty of obvious signals, but whenever he turned his antenna away from the satellite, the noise level went down. John writes, "I turned my antenna back and forth in azimuth, up and down in elevation, and found that I got a 2dB rise in noise as I pointed directly at the satellite". John thinks it is transponder noise, but also that it might be a re-transmitted wideband ground signal. Could it be computer hash? John would like to know other's findings and thoughts on this matter.

WB6LLO is trying p.s.k. packet on Modes B and J and would welcome contacts and schedules. He is to be found on a downlink of 145.870MHz resulting from a 435.550MHz uplink, and on 435.990MHz, from his 144.460MHz uplink.

As regards confusing and opposing statements that have been made in some journals regarding the use the of Mode J 144MHz uplink giving a 435MHz downlink, Peter Guezlow DB2OS, makes the following official statement:- "In response to some misinformation given in a previous bulletin, AMSAT-DL wants to stress that the Mode J frequencies of OSCAR-13 do not violate any regulations of the v.h.f. band plan". In other words, no logical reason exists as to why any amateur licenced to transmit in the 144 - 146MHz band should not use and enjoy the benefits of OSCAR-13 Mode J Just be sure that you do not cause QRM to any terrestrial user of the uplink band frequency, and monitor and confirm that the 144MHz frequency you have selected for the uplink is not in use, as one would normally do, and be particularly careful should you move your uplink frequency.

RUDAK

A final attempt to resurrect the experiment will be made in December, when the spacecraft temperatures will be higher naturally, the power plentiful, and adjacent systems can be switched to to heat up the RUDAK system. It is hoped that the expansion so resulting may be sufficient to permit a contact to occur to permit operation. The chance is small, but worth trying.

Microsats

AMSAT, via N4QQ, sends in the following good news on the finalising of the microsats project at the Boulder Colorado AMSAT Laboratory. Jim White WD0E took on the task of installing two complete packet radio PSK stations, integrating the transceivers and computers, plus the building and testing of the TAPR demodulators. They are now off to the Kourou launch site for use with the thermal vacuum testing of the four microsats whilst they are in the laboratory for the final checkout, and for and last minute software updates. After this journey, they will be used by AMSAT ground command stations to monitor the telemetry and to perform daily housekeeping requirements. Kenwood kindly donated a pair of 711/811 transceivers, and Heathkit/Zenith Data Systems a pair of XT-class computers, with other gifts such as the MFJ-1270 TNC-2's came from MFJ, PSK demodulators from TAPR, and an assortment of needed parts and accessories from Gateway Electronics of Denver.

Stop Press

Yet another mystery satellite has now appeared. This time is in on 432.881MHz and can be heard at considerable strength - some S9 +20dB - "Dopplering" from the GB3SUT beacon frequency of 432.890MHz down to 432.870MHz. It has a continuous rough carrier with no discernable modulation, a 112.2 minutes period and an inclination of about 92°.

NASA are unable to give parameters of this satellite as it is beleived to be a military satellite. More next month.

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex R20 4HE

Radio Observation of Meteors

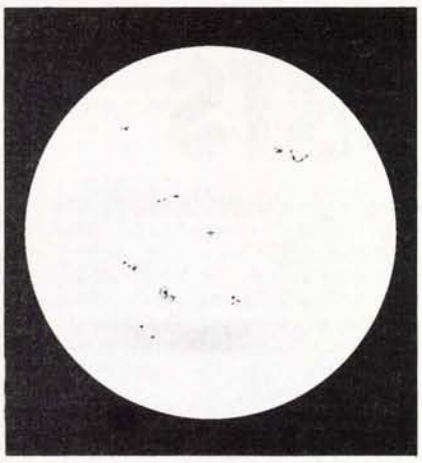
Last month I referred to the "shooting-stars" that are often seen on a clear dark night and that their bright trails (radiants), briefly seen, are regions of ionised gas created by the minute solid particles from interplanetry space that collide with the earth's atmosphere. The life of the trails depends entirely on the size of the particle, so take a look sometime and you will see that these "shooting stars" are a wonderful sight and multitudes of these, known as meteor showers, are high on the list of natures spectaculars. I emphasised dark because the full glory of these often colourful displays cannot be seen if the moon is too bright or the skies are overcast.

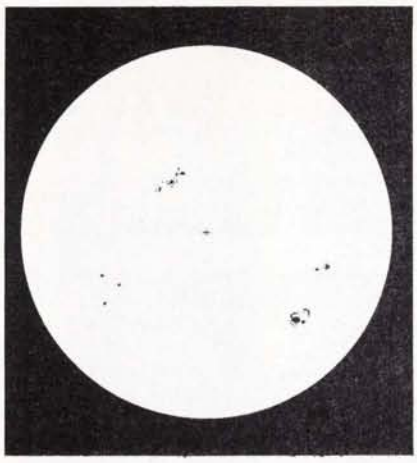
However, there is a way of using the ionised trails to estimate the numbers of meteors that enter our atmosphere irrespective of local weather conditions or the hours of daylight. This excludes thunder static, HI! The rapidly decaying trails, left by the meteors, provides a short-life reflector which can bounce v.h.f. radio signals over hundreds of kilometers. I first tried this during the Geminid meteor shower on December 13, 1968, by tuning my receiver, with a crystal controlled converter, to the frequency of the RSGB's beacon at Thurso (GB3GM) on 70.305MHz. The majority of beacons transmit a continuous tone with their Morse coded idents frequently inserted. From my home in Sussex a 70MHz 3 element beam faced north and GB3GM's frequency was monitored for 3 hours from 2000. Many tiny "pings", no doubt from minor trails, of the beacon's tone were heard while the experiment was in progress and at 2049 a bigger trail enabled "GB3" to be clearly read and sometime later, at 2205, a similar sized burst produced "3GM".

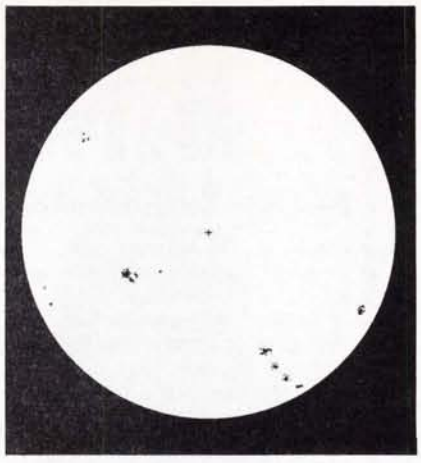
Solar

From his observatory in Selsey, **Patrick Moore** sent the drawings that he made of the positions of individual spots and groups that he projected from the sun's disc at 0830 on July 22, Fig. 1, 1200 on the 30th, Fig. 2, and 0740 on August 3, Fig. 3. Do keep in mind readers that not all sunspots are "active" as far as our radio interests are concerned.

"Solar activity appears to be dropping back, temporarily at least," wrote **Ron**







Livesey from Edinburgh. Ron, using his 4in projecting screen, identified four active areas on the sun on July 2, 3, 9, 10 and 29; five on days 11, 14, 15 and 16; six on 12, 17 and 23 and seven on the 20th. In Bristol, **Ted Waring** counted 35, 54 and 40 sunspots on August 1, 8 and 15 respectively and as a bonus to the observations listed in Fig. 7, made by **Cmdr Henry Hatfield** with his spectrohelioscoipe in Sevenoaks, is the photograph he took of the filaments, Fig. 4, on August 20 which were on the sun for several days. Henry also recorded bursts of solar radio noise at 136MHz on August 6, 12, 15, 17 and 20 and at 1297MHz on days 6, 7, 9, 12 and 15. The violent burst at 1400 on the 12th, hit the upper stops of his pen recorder as shown in Fig. 6.

"The mean sunspot number for July 1989 was 126.8 with a daily high of 305 on the 23rd and a low of 135 on the 27th," wrote **Neil Clarke G0CAS** (Ferrybridge) who kindly sent his computer print-out, Fig. 5a, showing the daily number of solar flux units for July. **Ern Warwick** (Plymouth) heard the background noise on 28MHz surging at 1738 on August 4, 1515 on the 5th, 0915 and 1115 on the 9th, 1230 on the 10th, 0940 on the 11th and 0942 on the 13th.

Aurora

Looking back to the great aurora of March 13/14, Ron Livesey, the auroral co-ordinator for the British Astronomical Association says, in his monthly report to the Association, that "At the peak of the storm the magnetic observatory at Lerwick recorded a gross field deviation of eight degrees, at Eskdalemuir it was six and a half degrees and at Hartland it was three degrees. The horizontal deviations were well measured on a "jam-jar" magnetometer at Maldon, Essex, by **Edward Owen** [known to us as Ted Owen of our beacon chart fame], who found the whole affair so exciting that he had little time to look outside for the aurora." Many of us knew that feeling Ted. Ern Warwick reports echos on signals in the 10MHz band on July 31 and the 28MHz band at 2225 on August 5 and 0907 on the 8th and **Dave Coggins** (Knutsford) heard a few 21MHz broadcast stations with fluttery and "ghostly" type signals at 0600 on the 15th and an echo on a 28MHz Brazilian station at 2126 on the 1st. Whilst beaming north at 2030 on the 12th, Dave noted a rapid auroral type flutter on the signal from the Rutherford Appleton Laboratory (GB3RAL) beacon (28.215MHz) at Slough, plus bursts of its signal via meteor trail reflection.

Magnetic

"The geomagnetic activity was also low with numerous quiet days with the Ap index below 10," wrote Neil Clarke and enclosed his usual graph, Fig. 5b, of the daily variations in July. In Saltash, Karl Lewis, using a fluxgate magnetometer, only noted storm conditions on the 1st and 6th, Doug Smillie (Wishaw), with his Hall effect magnetometer, reported possible activity on days 1, 3, 8, 11, 14, 18, 19, 21, 24, 28 and 31 and, with his "jam-jar" instrument, Ron Livesey noted apparent disturbed conditions on days 1, 4, 5, 11, 13, 14, 15, 18, 19, 20, 22, 30 and 31.

Sporadic-E

Clive Grey (West Kirby), using a Tokyo Crusader six band v.h.f. receiver with digital readout, logged East-European f.m. stations between 66 and 73MHz during the afternoon of July 13 and in less than an hour after 0800 on the 22nd he identified at least 13 Italian stations in Band II and remarked, "Virtually every gap between the English nationals was occupied with Italian." He also heard France Musique on 87.95MHz from Ajaccio, Corsica and at 0909 and idents from Scandinavia and Spain on 88.25MHz, with the Spanish announcer saying "RNE1". Although these exotic signals dropped out after 0945, Clive logged a Spanish station again at midday on 87.95MHz. For my part, I counted 10 of the East-European broadcasters while a Sporadic-E disturbance was in progress at 1730 on the 19th and 40 of them early on the 22nd. At 0900, the tuneful ident of Radio Moscow came up around 72.5MHz and, I too noted that the opening had spread to Band II and at 1000 I found at least 6 Italian voices between 98 and 101MHz. The 66Mhz band was open again on August 2 and at 0830 I located 25 East-Europeans and more edging above the receiver noise and then, a surprising late opening around 2330 on the 10th produced eight such stations with a typical deep Sporadic-E fade between the noise and S9+. More were audible during the day on the 23rd and, in Arbroath on August 8, David Glenday was listening to BBC Radio 4 from Blackhill while decorating an upstair room when suddenly it was swamped by Spanish signals. "Downstairs I searched through the band on my Sansui stereo tuner and found many Spanish stations, in stereo, up to 104MHz," said David. Later in the day he heard stereo f.m. from the East-European stations. I heard six of these at good strength, during a Sporadic-E opening at 1945 on the 18th, plus television synchronising pulses, although the signal was too weak to resolve a picture, on Chs.R3/4 (77.25MHz/85.25MHz).

The 28MHz Band

Although the band was dead during the morning of August 16, Dave Coggins heard GB3RAL via meteor scatter and signals from stations in Scotland, via the same mode at 1242 on August 20, with his beam pointing south-west. Among the DX he logged was signals from Australia on July 30 and 31 and August 12 and 13; Brazil on August 1 and 13; Falklands on the 20th and India on July 30 and August 13. **John Levesley G0HJL** (Bransgore) received signals from various countries in Africa on August 4, 6 and 19 and south-America on days 4, 5, 14 and 19. Amidst the latter were Argentina, Bolivia, Brazil, Falklands and Uruguay. "What happened, a great dearth of signals?" commented **Fred Pallant G3RNM** (Storrington) about August 12 and a note in Ern Warwick's log for 2107 on the 13th reads, "The signals from Austria and Switzerland are the best I've heard from those areas."

Propagation Beacons

First, my thanks to **Mark Appleby G4XII** (Scarborough), **Chris van den Berg** (The Hague), Dave Coggins, **John Coulter** (Winchester), **Vaclav Dosoudil OK2PXJ** (Kvasice), Henry Hatfield, **Ken Lander** (Harlow), John Levesley, **Greg Lovelock G3III** (Shipston-on-Stour), Ted Owen, Fred Pallant, Ted Waring and Ern Warwick, for the detailed information in their 28MHz beacon logs which I used to compile our master chart in Fig. 9.

Chris van den Berg heard the lone signal from KB2BBW on August 6 and Fred Pallant tells me that Toulouse is the location of FX5TEN. Around 2050 on August 1, Greg Lovelock heard NX20/B and W3SV/BCN on 28.209 and 28.250MHz respectively and reports that PY2AMI, on 18.100MHz, is situated 600m a.s.l. and transmits a 5w signal from a ground plane antenna.

Mark Appleby heard "VVV VVV DE EA1AW EA1AW" repeated three times at 2040 on August 14 and, for a couple of hours after 0810 on the 6th, he copied R09 on 28.252MHz, any ideas?. Dave Coggins logged the Australian beacons VK2RSY, via the long path, between 2100 and 2200 on July 29 and 31 and August 2, 5, 8 and 9 and VK5WI on August 8 and 9. Ern Warwick received signals on most days from PY2AMI on 24.931 and 18.100MHz; IK6BAK, on 24.915MHz; CT3B, LU4AA, OH2B, ZS6DN/B, 4U1UN/B and 4X6TU/B on 14.100MHz and DK0WCY on 10.144MHz. At times he has noted that

B.N.O.S. PRODUCTS

2M LINEAR AMPLIFIERS

L144-3-25	*New Linear 3w input 25w output	74.75
LP144-3-50	Linear/Preamp 3w input 50w output	138.00
LP144-10-50	Linear/Preamp 10w input 50w output	138.00
LPM144-3-100	Linear/Preamp/Meter 2w i/p 100w o/p	235.00
LPM144-10-100	Linear/Preamp/Meter 10w i/p 100w o/p	205.00
LPM144-10-180	Linear/Preamp/Meter 10w i/p 180w o/p	355.00
LPM144-25-180	Linear/Preamp/Meter 25w i/p 180w o/p	305.00

4M LINEAR AMPLIFIERS

LPM70-10-100	Lin/Preamp/Met 10w i/p 100w o/p	235.00

70CM LINEAR AMPLIFIERS

L432-1-10	*New Linear 1w input 10w output	74.75
LPM432-1-50	Lin/Preamp/Met 1w i/p 50w o/p	235.00
LPM432-3-50	Lin/Preamp/Met 3w i/p 50w o/p	205.00
LPM432-3-100	Lin/Preamp/Met 3w i/p 100w o/p	355.00
LPM432-10-100	Lin/Preamp/Met 10w i/p 100w o/p	325.00

6M LINEAR AMPLIFIERS

L50-3-25	*New Linear 3w i/p 25w o/p	74.75
LP50-3-50	Linear/Preamp 3w i/p 50w o/p	138.00
LP50-10-50	Linear/Preamp 10w i/p 50w o/p	138.00
LPM50-10-100	Liner/Preamp/Met 10w i/p 100w o/p	235.00

TRANSVERTERS

TL50-28-25	6M/28MHz IF	316.25
TL50-144-25	6M/144MHz IF	299.00
TL70-28-25	4M/28MHz IF	316.25
TL70-144-25	4M/144MHz IF	299.00
TL144-28-25	2M/28MHz IF	345.00

POWER SUPPLIES

12/6A	13.8V 6A cont 7A max	90.85
12/12A	13.8V 12A cont 15A max	148.35
12/25A	13.8V 25A cont 30A max	251.85
12/40A	13.8V 40A cont 50A max	504.85
12/5E	*New 13.8V 5A cont 6A max	74.75
12/10E	*New 13.8V 10A cont 12A max	132.25
12/20E	*New 13.8V 20A cont 24A max	178.25
12/30E	*New 13.8V 30A cont 35A max	224.25

CUE DEE PRODUCTS

VHF/UHF ANTENNAS

VHF-DUO	6/5 ele 6d Bd	129.95
650A	*New 6M 6 ele 6dBd	91.15
4144A	4 ele 8dBd SO239	26.45
4144AE	4 ele end mount 8dBd SO239	27.60
10144A	10 ele 11.4dBd SO239	50.60
10144AN	10 ele 11.4dBd N female	57.50
10X144A	10 ele crossed 11.4dBd SO239	74.75
10X144AN	10 ele crossed 11.4dBd N female	86.25
15144A	15 ele 14dBd SO239	73.60
15144AN	15 ele 14dBd N female	78.20
15X144A	15 ele crossed 14dBd SO239	98.90
15X144AN	15 ele crossed 14dBd N female	110.40
17432AN	17 ele 14.5dBd N female	51.75
17X432AN	17 ele crossed 14.5dBd N female	82.80
23432AN	23 ele 15.5dBd N female	63.25

STACKED SYSTEMS

10144A2H	2 × 10 ele horizontal	228.85
10144AN2H	2 × 10 ele horizontal	243.80
15144A2H	2 × 15 ele horizontal	277.15
15144AN2H	2 × 15 ele horizontal	293.25
10144A4H	4 × 10 ele	405.95
10144AN4H	4 × 10 ele	447.35
15144A4H	4 × 15 ele	501.40
15144AN4H	4 × 15 ele	537.05
15144A8H	8 × 15 ele	1436.35
15144AN8H	8 × 15 ele	1511.10
15144A16H	16 × 15 ele	3382.15
15144AN16H	16 × 15 ele	3496.00
17432AN2H	2 × 17 ele horizontal	194.35
17432AN4H	4 × 17 ele	334.65
17432AN8H	8 × 17 ele	583.05
17432AN16H	16 × 17 ele	P.O.A.
23432AN2H	2 × 23 ele horizontal	212.75
23432AN4H	4 × 23 ele	379.50
23432AN8H	8 × 23 ele	645.15
23432AN16H	16 × 23 ele	P.O.A.

STACKING FRAME KITS

4S2	2 × 4144	39.10
10S2	2 × 10144	59.80
15S2	2 × 15144	66.70
10S4	4 × 10144	109.25
15S4	4 × 15144	123.05
71S2	2 × 17432	39.10
23S2	2 × 23432	40.25
17S4	4 × 17432	59.80
23S4	4 × 23432	63.25

PHASING HARNESSES INCLUDING POWER SPLITTER

4L2	2 × 4144A & 4144AE	72.45
10L2	2 × 10144A	74.75
10L2N	2 × 10144AN	81.65
10L4	4 × 10144A	112.70
10L4N	4 × 10144AN	129.95
15L2	2 × 15144A	77.05
15L2N	2 × 15144AN	87.40
15L4	4 × 15144A	112.70
15L4N	4 × 15144AN	129.95
17L2N	2 × 17432AN	70.15
17L4N	4 × 17432AN	109.25
23L2N	2 × 23432AN	70.15
23L4N	4 × 23432AN	109.25

POWER SPLITTERS

2-144	2 way 144MHz SO239	37.96
2-144N	2 way 144MHz N female	42.55
4-144	4 way 144MHz SO239	41.40
4-144N	4 way 144MHz N female	48.30
6-144	6 way 144MHz SO239	57.50
6-144N	6 way 144MHz N female	87.40
8-144	8 way 144MHz SO239	63.25
8-144N	8 way 144MHz N female	100.05
2-432N	2 way 432MHz N female	34.50
4-432N	4 way 432MHz N female	41.40
6-432N	6 way 432MHz N female	83.95
9-432N	8 way 432MHz N female	93.15

MONOBAND YAGIS

27G	7MHz 2 ele 5.6dBd	581.90
37G	7MHz 3 ele 7.0dBd	861.35
314G	14MHz 3 ele 7.0dBd	216.20
414G	14MHz 4 ele 8.0dBd	249.55
414	14MHz 4 ele 8.0dBd	294.40
514G	14MHz 5 ele 9.0dBd	364.55
614G	14MHz 6 ele 10.0dBd	515.20
321	21MHz 3 ele 7.0dBd	148.35
421	21MHz 4 ele 8.0dBd	169.05
521	21MHz 5 ele 9.0dBd	264.50
621G	21MHz 6 ele 10.0dBd	331.20
721G	21MHz 7 ele 10.3dBd	416.30
328	28MHz 3 ele 7.0dBd	93.15
428	28MHz 4 ele 8.0dBd	116.15
528	28MHz 5 ele 9.0dBd	161.00
628G	28MHz 6 ele 10.0dBd	207.00
628	28MHz 6 ele 10.0dBd	249.55
728G	28MHz 7 ele 10.3dBd	309.35
928G	28MHz 9 ele 10.6dBd	416.30

DUOBAND YAGIS

DUO2G	14/21MHz 5/4 ele 9/8dBd	483.00
DUO3	21/28MHz 4/4 ele 8/8dBd	264.50
DUO4	14/21MHz 4/4 ele 8/8dBd	426.65

VERTICALS

VA40	7MHz inc guy wire & ground mount	93.15
2VA40	7MHz full 1/4 wave, complete	323.15
VA80	3.5MHz inc guy wire & ground mount	324.30
2VA80	3.5MHz full 1/4 wave, complete	796.95

PHASING HARNESSES FOR CIRCULAR POLARIZATION

IC144	10 × 144A & 15 × 144A	37.95
IC144N	10 × 144AN & 15 × 144AN	52.90
IC432N	17 × 432AN	51.75

SHF PRODUCTS

SHF ANTENNAS

SHF 9644	1296MHz 44 ele	123.05
SHF 9667	1296MHz 67 ele	148.35
SHF 1693	67 ele (meteosat)	189.75
SHF 2320	2300-2350MHz 67 ele	202.40

PKW PRODUCTS

VHF/UHF ANTENNA'S

2GP58	144MHz 5/8 groundplane 3.2dBd	39.10
2GP258	144MHz 2 ×5/8 groundplane 5.7dBd	70.15
7GP58	432MHz 5/8 groundplane 3.2dBd	39.10
7GP258	432MHz 2 × 5/8 colinear 5.7dBd	59.80

HF DIPOLES

DP 01	3.5/14MHz	59.80
DP 02	3.5/7MHz	59.80
DP 03	1.8/7MHz	59.80
DP 04	1.8/3.5MHz	101.20
DP 05	14/21/28MHz	70.15
DP 06	1.8/3.5/7/14/21/28MHz	110.40

HF MULTIBAND BEAMS

THF 1E	1 ele (dipole) 14/21/28MHz	83.95
THF 2E	2 ele 14/21/28MHz	213.90
THF 3E	3 ele 14/21/28MHz	264.50
THF 5E	5 ele 14/21/28MHz	384.10
THF 6E	6 ele 14/21/28MHz	571.55
THF 7E	7 ele 14/21/28MHz	741.75
THF 8E	8 ele 14/21/28MHz	878.60
SPQ 2E	2 ele Spider Quad 14/21/28MHz	408.25
LPO 12E	12 ele Log Periodic 13-30MHz	918.85

HF GROUNDPLANE

GP 3B	14/21/28MHz	81.65
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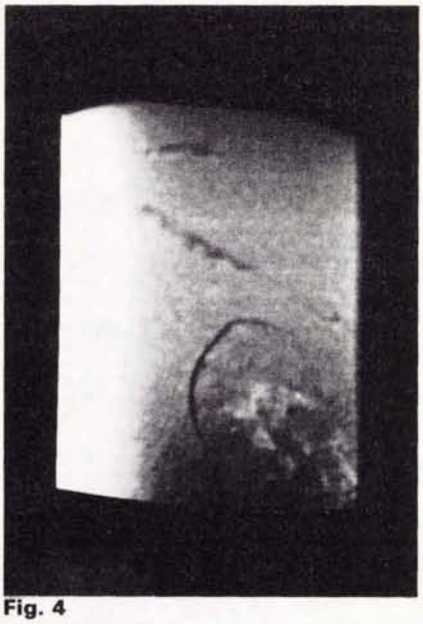

Fig. 4

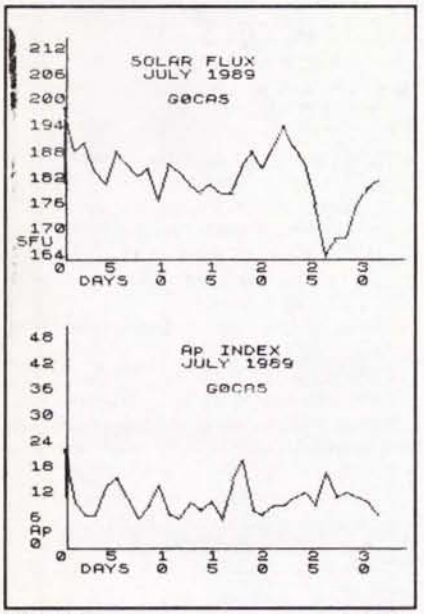

Fig. 5a **Fig.5b**

CT3B and OH2B and LU4AA and 4U1UN clash together.

Tropospheric

The slightly rounded atmospheric pressure readings for the period seen in Fig.8, were taken from the barograph installed at my home in Sussex and while the pressure was high continental and sometimes Scandinavian television pictures were seen in the UK during several tropospheric openings that occurred between July 20 and 29. While parked at Bateman's, Kiplings home in east-Sussex, at midday on August 23, I tuned through Band II, with my Plustron TVR5D and its telescopic antenna and found co-channel "warbles" around 92MHz and a strong French station near 100MHz. On arrival home, the wind was getting up and the weather was on the change and, true to form, I heard at least 12 continental voices, plus many "warbles" between 87.5 and 104MHz. Much higher up on 934MHz, John Levesley UK-627 worked or heard stations in the Channel Islands at distances around 160km on July 26 and August 3, 5, 6, 8, 19 and 20. He also exchanged words, over a difficult path, with a mobile in Selsey Bill at 72km and a fixed station in Stalbridge at a similar range on the 5th.

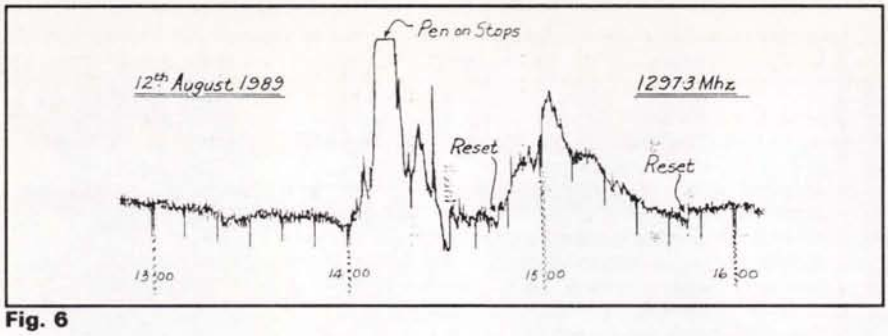

Fig. 6

Date	Groups	Filaments	Quiescent Prominences	Notes
July 21	5	22	10	
Aug. 7	4			cloud hampered observation
8	4	19	4	
12	3			3 flares seen despite some cloud
14	3	22	11	
15	3	20	4	faint loop prom and small flare
16	2	22	8	small spray on west limb
17	2	19	8	
18	2	22	10	groups look very angry
19	2	27	11	
20	3	22	11	
21	3	33	9	

Fig.7

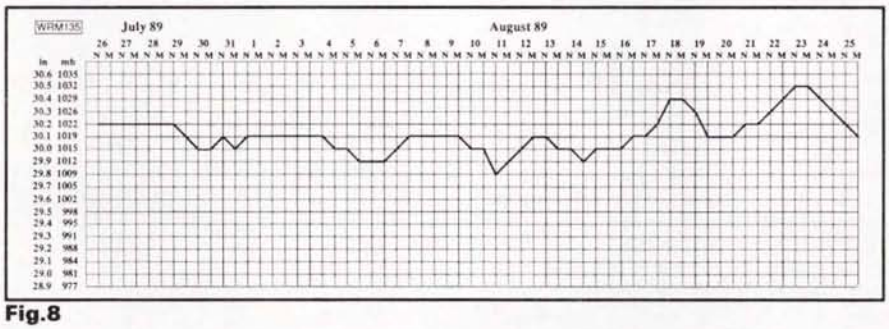

Fig.8

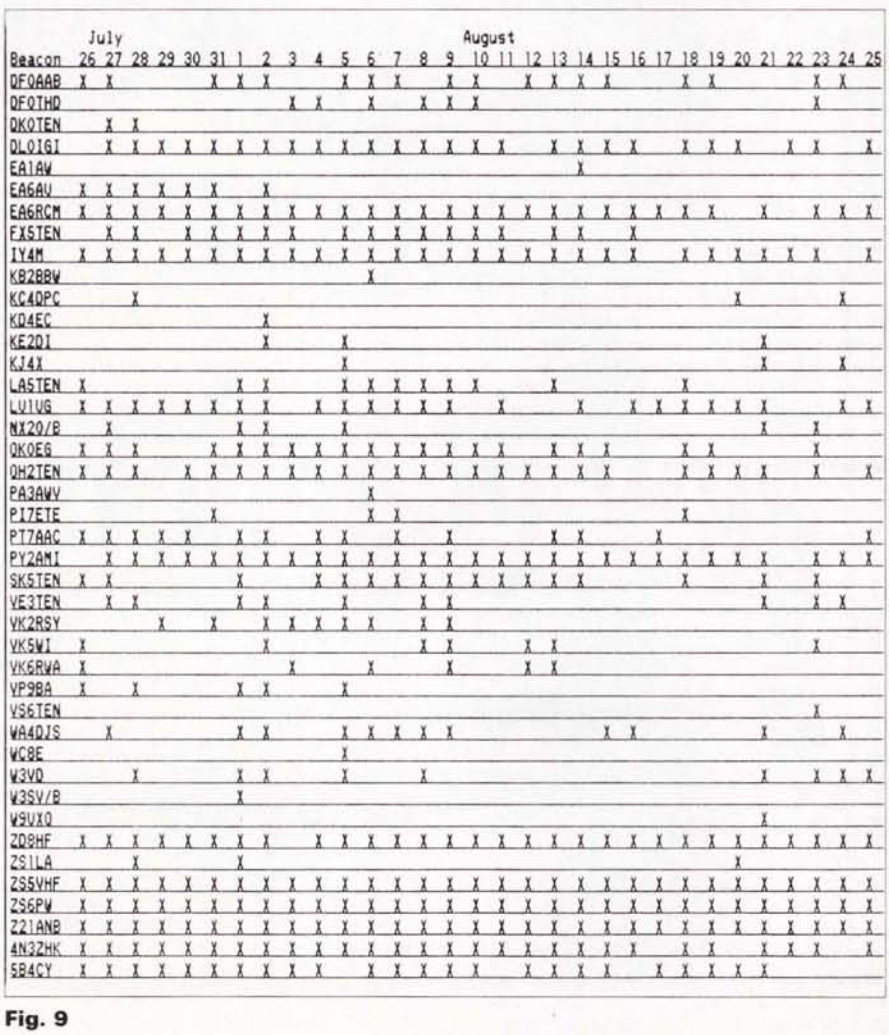

Fig. 9

Broadcast Round-up

Peter Shore

As I start to write this month's column, it is frequency change weekend at the beginning of September, and with more changes at the end of the month, it is a somewhat confusing time for short wave listeners. However, I shall try to provide as much information as I can to keep you up-to-date with what is where on the bands.

On the news front, the launch of the Irish-based Atlantic 252 happened on September 1 at 0700UTC. The station, which had been testing for some weeks prior to opening, is using something approaching its 500kW maximum power on long wave 254kHz (it moves to 252 next year in accordance with the continuing changes to long wave frequencies). The station is open daily until 1800UTC, with programmes of pop music. Reception appears to be good, even in the south east of England. In the evenng, the channel is occupied by Algiers French Network, which is clearly audible in Britain, preventing use of this channel during the night.

Manufacturing transmitters for the h.f. bands seems to be a good line to be in at present, with orders being placed in every continent.

Reports from New Zealand suggest that Radio New Zealand will have not one but two transmitters for its international service, both 100kW, with antennas capable of operating in either the range 9 to 18MHz, or 6 to 12MHz. Further news from New Zealand is that the Print Disabled Station, 2XA, in Levin, is testing on the 75m band with a 990 watt transmitter. Frequency assignment is still to be finalised, but will be betwen 3.9 and 4MHz and the station will operate on Sunday, Monday and Thursday between 0630 and 1000UTC. Could be an interesting autumn and winter catch.

Australia wants new transmitters to replace ageing equipment at Shepparton. Already, Aus$1.25 million has been alocated on new switching facilities in order to improve reliablity. The ABC is putting forward a plan for new equipment and is investigating the feasibility of establishing a relay station outside the country for broadcasts to Asia.

All India Radio is to spend more than 1 billion rupees (around £4 million) on upgrading its external services. Meanwhile Sri Lanka is upgrading its services to India which, in the words of the Minister of State for Information and Broadcasting, include "anti-India propagation. All India Radio broadcasts twelve and a quarter hours to Sri Lanka daily.

European Stations

All times UTC (=GMT)

Radio Austria International's European service frequencies for the autumn will be:

0400-2300 on 6.155MHz (300kW)
0400-1700 on 13.73MHz
1700-2300 on 5.945MHz

DLF's English service will be affected by the change of times in Europe and the UK which, as usual, are not in tandem. Between September 24 and October 28, programmes will be at 2105 local time in the UK, with the language course (heard on Wednesday and Saturday) at 2000 local time. From October 29, broadcasts will be one hour earlier (1915 local time) including the language courses (at 1900 local time). On November 2, Jerry Gerber loks at the life of Hannah Hoch, who won fame as one of the founders of the Berlin Dada movement.

A new pop music series started on September 7, where each Thursday there will be a record featured from the West German hit parade, whilst transport enthusiasts will be able to follow events and happenings in Germany on the move on October 19 and November 16.

Radio Netherlands autumn programme line-up includes a new look for Wednesdays with Mind Your Own Business which will look at the world of commerce, business and finance.

Meanwhile, Thursdays continue with Media Network and some of the features lined up during October include, on 12 October, the third part of the story of Forces Radio in Europe, looking at the Americans. On October 19, news will feature prominently, along with the demise of some of the ethnic broadcasting in Holland. On October 26, there's an examination of TV-10, a new commercial TV operation in the Netherlands.

English programmes on Sundays from Radio Norway International can now be heard on the following channels:

0600 on 15.165MHz
0800 on 25.73 & 15.165MHz
0900 on 21.71MHz
1200 on 15.165MHz
1300 on 9.59MHz (to Europe)
1400 on 21.71MHz
1600 on 21.705 & 17.84MHz
1700 on 25.73 & 17.84MHz
1800 on 15.235MHz
1900 on 15.235MHz (to Europe)
2200 on 15.265MHz
2300 on 11.785MHz
2400 on 15.165MHz

African Stations

Africa Number One in Libreville, Gabon, broadcasts in French at:

0500-0800 on 9.58MHz
0700-1600 on 17.63MHz
1600-2100 on 15.475 & 9.58MHz
2100-2300 on 9.58MHz

News headlines in English are at 1245 daily.

RTM in Bamako, Mali transmits in French and local languages:

0600-0800 on 7.285, 5.995, 4.835 & 4.783MHz
0800-1800 on 11.96, 9.635, 7.285 & 7.11MHz
1800-2400 on 7.285, 5.995, 4.835 & 4.783MHz

Asian & Pacific Stations

Domestic services from Burma come from Rangoon, and are heard:

0030-0230 on 7.185MHz
0230-0730 on 9.73MHz
0930-1345 on 5.985MHz
1430-1600 on 5.985MHz (in English)

The Voice of the People of Cambodia broadcasts two daily programmes in English beamed to Asia - 0000-0015 on 11.938, 9.695MHz and on the same frequencies at 1200-1215.

Voice of Indonesia's English service transmits at:

0200-0300 on 15.15 & 11.79MHz
0800-0900 on 15.15 & 11.79MHz
2000-2100 on 15.15, 11.79 & 7.125MHz (to Europe)

Radio Ulan Bator in English is heard at:

0810-0840 on 12.015 & 9.615MHz
1100-1130 on 12.015 & 9.615MHz
1345-1415 on 15.305 & 9.575MHz
1840-1910 on 12.05 & 9.985MHz (to Europe)

FEBA in Mahe, Seychelles, a religious broadcaster, has English:

0430-0505 on 17.78MHz (Monday) & 15.325MHz (Monday & Saturday)
0730-0820 on 17.79 & 15.275MHz (Sunday)
1500-1610 on 11.76 & 9.59MHz (daily)
1610-1625 on 9.59MHz (not Sunday)
1730-1805 on 11.81MHz (daily)
1805-1825 on 11.81MHz (Friday & Saturday)

Radio Thailand in Bangkok has English at 2300-0430, 0500-0600, 1130-1230 all on 11.905MHz and 9.655MHz.

ATV

Reports to Andy Emmerson G8PTH
71 Falcutt Way, Northampton NN2 8PH.

We return to desktop video this month, as there are some interesting developments to report. Both relate to the Commodore Amiga computer mentioned recently in this column.

Bargains Ahoy!

First of all is a price drop (of sorts) for the computer itself. The official list price of the A500 (entry level) model is £399 and most retailers throw in a pack of games programs and a u.h.f. modulator. Discounts can sometimes be negotiated, too, and many people would consider this fair value for money. But if you frequent the radio rallies you can buy the A500, with the latest version 1.3 ROM, for just £250, and at this price the computer becomes a very realistic proposition. Of course you may be able to persuade a high street retailer to match this price, but if not look out for A1 Supplies (or ring them on 0952-620188 to find out where they'll be next). These particular computers are apparently dealers' overstocks and come with six months' guarantee.

VideoStudio Revamped

The VideoStudio titling program we reviewed has been improved, sufficient to place it in the "highly recommended" category. David Wilson and I have been taking a new look at the program and a brief description of the upgrade may be of interest.

The first change is the new instruction book. The old manual was frankly atrocious and this is a great improvement. The new version is attractively printed with a plastics, lay-flat, binder instead of the earlier typed and photocopied manual.

The program itself has also been smartened up. Most of the main changes are in the caption writing part of this

package but there are a few other changes. The VT clock now cuts to black at zero minus 3 seconds instead of a fade at - 5. There is a flash frame at -10 together with 10 seconds worth of 1kHz tone between -20 and -10 seconds, as on many professional VT clocks.

The mouse pointer (cursor) now disappears when not required since most inputs are made using the keyboard. With the earlier version you had to move the mouse off screen to avoid it appearing on your captions. The mouse is still required when setting up the captions but it is not used for displaying the final results.

On time-function displays, the "insert time & date" function appears to have a box of constant width now and not the varying size of the top half of the box as seen last time. The seconds figures do not break up as occurred with version 1 of the program.

The stopwatch displays minutes, seconds and tenths of seconds although the menu still suggests that two figures after the decimal point will be displayed.

To load the program, place the vs1 disk in drive df0 and the vs2 disk in drive df1 and reboot. After the workbench has loaded, the vsl and vs2 icons appear under the RAM disk icon on the right hand side of the screen. Double click the vs2 disk icon. The disk window shows various drawers and the two main icons, "enter" and "depts". If you just want to browse through the facilities, you can double click on "enter" to get to the main menu. If you know what function is required, double click "depts" and then double click the icon for the desired program.

Thankfully, the new version (fonts disk dated 20-3-89) cuts out the 20 second wait after loading the VideoStudio title page. The "preparing VideoStudio" legend now only appears for a frac- tion of a second. The following improvements have been made to the captioning segment of the program.

I. SEQUENCE TITLE. The menu has extra functions and extra information displayed. There is an information file selected by typing I on the keyboard which explains the steps required to enter a title page of your own or to run one of the 5 demo files supplied.

When a job is selected, four boxes at the top of the screen show the colours in use and the panel below these describes the sequence, i.e. running time (only appears after the job has been run!), number of pages, type of transition, type of mask etc. This panel also tells you into which mode to set your genlock (if you can! The Rendale genlocks offer an extra mode which the cheaper Minigen cannot.).

2. SCROLL. This uses a window with a yellow bar whose length depends on the amount of text loaded. There are six demo files using both scroll directions and various masks.

3. SUBTITLE. Four demos on this part of the program.

4. COPYRIGHT notice. This is run from option 5, Captor.

5. CAPTOR. Eleven demonstration files on this one. These have various background pictures to show some effects possible. The one entitled "news" has a sequence of 12 pages running for 5 minutes showing an example of using various fonts and colours. It also explains the changes that have been introduced to the Captor program in this new version.

This program gives you a choice of three run modes: I. Normal (black background); 2. Bluescreen (blue background) and 3. Background mode (displayed over IFF picture, if supplied). The Captor program allows you to make up your own captions using a choice of the 20 fonts on the disk.

If you go back to the main menu and select option 4 (Picture in Picture) you will find that there are only two demonstration logos but, as the "news" file in the Captor demonstration explains, the new vs2 disk is really full and you will have to delete unwanted files from your working copy of the program disk (don't use the original!) to make room for your own caption files.

Still Some Bugs

A couple of words of warning might be useful! The full-screen clock with logo is very impressive when superimposed on a video background. It is full of bright colours with a neat drop-shadow effect. It can be faded in and out using the + and - keys on the keypad but (and this is a big but) when it is faded out there is still the "black hole" where the graphics should be. A similar effect occurs when the VT clock cuts to black, the black 'shadow' stays superimposed over the background.

In addition the program may misbehave if you feed it with less than perfect video signals. I was testing the program with a Rendale 8802 genlock unit (mainly using the background mode) and it appears that you get some strange effects if you do not feed it with a good clean video signal. I was using a rather noisy signal from an old v.c.r. and found that when genlocked to this the real time clocks ran at approximately half speed. Everything was normal when the v.c.r. replayed a still frame. The digital countdown, stopwatch and frame counter speeds were not affected. I cannot say whether this is just a peculiarity of my combination of equipment or not but it is certainly a reproducible fault and occurs every time this combination of equipment is used.

While the look and feel of the program have been improved significantly, the use of print styles and messages is still not consistent. No doubt this is because different parts of the program were written at different times but it detracts from the otherwise professional "feel" of the program. It deserves better!

Best Buy?

Notwithstanding these moans, VideoStudio is streets ahead of its American competitors. The new instructional is better written, while the user interface is more friendly (full-screen keyboard-choice menus instead of enigmatic pull-down mouse- menus). The actual shape of the titling fonts far surpasses those of the American programs, even if the latter have cleverer enhancement effects (neon halos and the like!). Perhaps version 3 can incorporate these suggestions!

In the meantime, if you thought the earlier program would have been a handy combination of titling and graphics functions then this improved version will be even more useful as it is a lot more user-friendly. While pricey, it is still cheaper than the American competition.

Anyone on ATV?

Yes, we have spent a lot of time off-line. Next month we get back to ATV on the air with the quarterly activity update. In the meantime please let me have all your notes and news, it saves me having to invent imaginary QSOs!

Rallies

October 15: The Bishop Auckland Radio Rally will be held in the Sunnydale Leisure Centre, Shildon, Bishop Auckland. ***Ernie G4TYF, 64 Gurney Valley, Bishop Auckland, Co. Durham DL14 8RW. Trel: (0388) 607500.***

October 15: ELHOEX89 in The Floral Hall, Hornsea, North Humberside. Doors open 11am, 10.30am for the disabled. Talk-in S22, trade stands, club dispalys, cafe, bar, Bring & Buy, etc. ***G4IGY. Tel: (0964) 533331.***

***October 27/28**: The Leicester Amateur Radio Show will be held in the Granby Halls, Leicester. There will be a second hall in use this year to cater for the huge amount of interest in this rally.

November 4/5**: The 3rd North Wales Radio Rally will be held in the Aberconwy Conference Centre, Llandudno. The rally opens at 11am on both days. The entrance fee is £1 with OAPs and children under 14 free. Talk-in will be on S22 and 430MHz. There will be computer hardware and software, data transmissions, packet radio, satellite reception, TV and video, short wave listening, amateur radio, CB radio, marine radio, p.m.r. to mention but a few. More details from: ***Edward Shipton GW0DSJ. Tel: Rhyl 336939.

November 4: The 9th North Devon Radio Rally will be in the Bradworthy Memorial Hall, near Holsworthy. Doors are open from 10am to 5pm. All the usual attractions. Talk-in on S22. ***G8MXI, QTHR.***

November 3: Bangor & District ARS are holding their Annual Surplus Sale in Bangor Technical College, Castle Park from 7pm. There will be traders, the QSL bureau, RSGB book stand in attendance. Talk-in on S22. ***Stewart GI4OCK, QTHR.***

***November 19**: The Bridgend & District ARC will be holding their 1989 rally at the Bridgend Recreation Centre, Angel Street, Bridgend, Mid-Glamorgan. Doors open at 11am.

November 19: The West Manchester Radio Club's Red Rose Winter Rally will be held in Astley & Tyldesley Miners Welfare, Meanley Road, Gin Pit Village, Astley, Tyldesley, Manchester. More details from: ***D.R. Camac. Tel: (0204) 24104.***

November 19: The MARS Birmingham Radio Rally will be held in the Stockland Green Leisure Centre, Slade Road, Erdington. Doors are open from 10am to 5pm. There is free parking and the entrance fee is 50p. More details from: ***Pete Haylor G6DRN. Tel: 021-326 7515.***

* *Practical Wireless* & *Short Wave Magazine* in attendance.

If you are organising a rally and would like it mentioned in *Practical Wireless*, then drop us a line, preferably as soon as you have fixed the date but no later than six weeks in advance (marking your envelope Rally Calendar) and we'll do the rest. Please make sure that you include all the essential details such as the venue, starting time, special features and a contact for further information.

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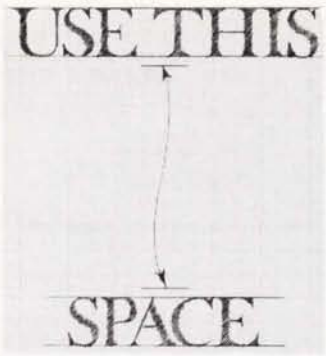

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