

Radio & Electronics

The communications and electronics magazine

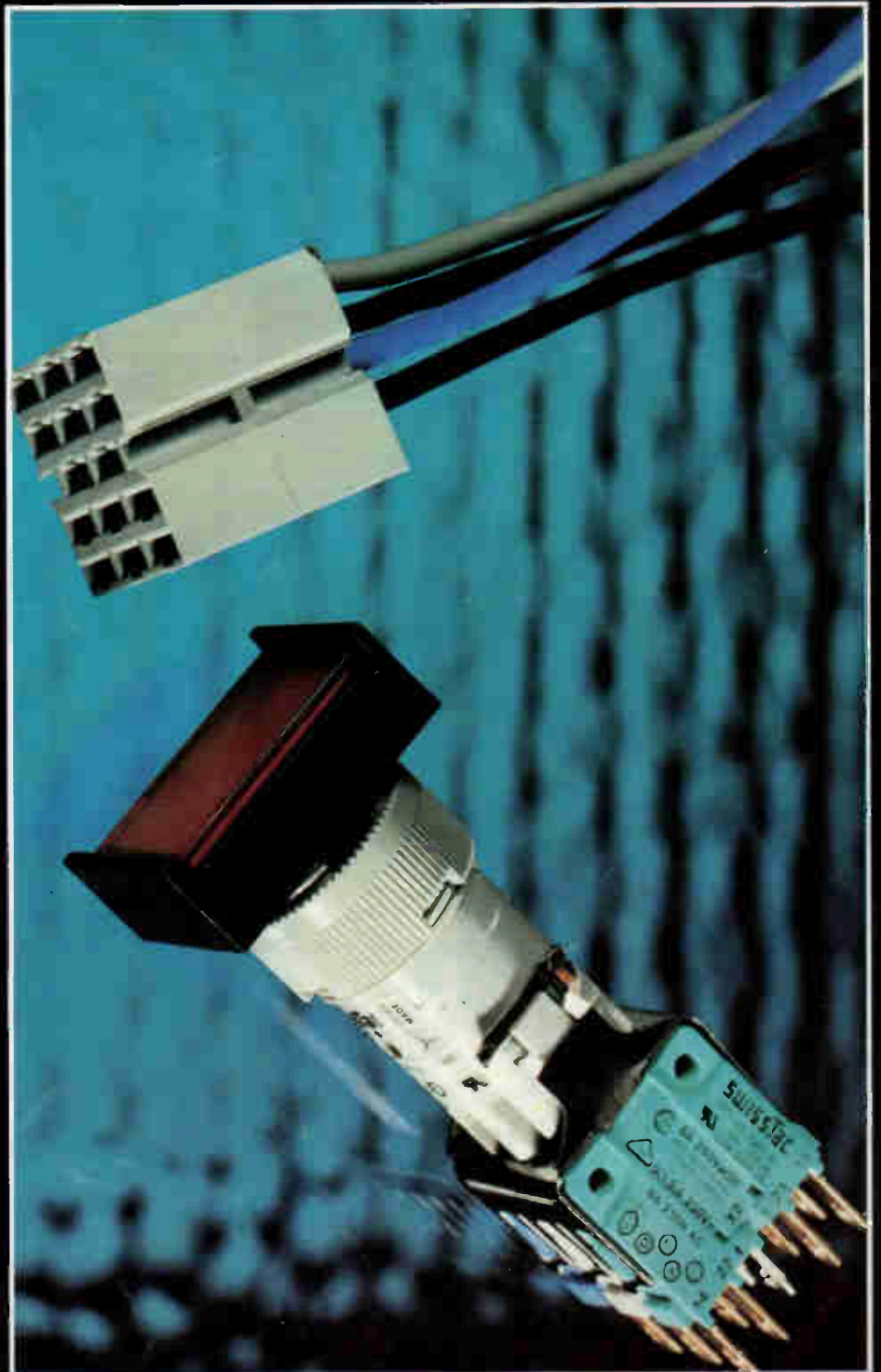
World

PHOTOGRAPHING
OSCILLOSCOPE
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USER REVIEW:
THE KENWOOD TS-140S

TRANSCONDUCTANCE
AUDIO
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DX-TV RECEPTION
REPORTS





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uniden A new concept in amateur radio . . . UNIDEN 2830

10mtr band amateur transceivers

It's here at last! A beautifully made processor controlled full feature 10w (20w PEP) multimode transceiver with LCD readout and all functions necessary to work DX with Sparadic E and in the forthcoming sunspot maxima and also for transverting to the VHF and UHF bands! Work out the facts . . . how much is a Two Meter multimode? How much is the Uniden 2830 Ten Meter multimode and a 2 mtr transverter? With the Uniden 2830 you can have two bands for the price of one, with 10 watts on each band and all modes including CW.

FEATURES:

- * All modes, AM/FM/USB/LSB/CW
- * LCD Readout of frequency/functions
- * CW with Sidetone
- * FM bandwidth compatible with VHF/UHF
- * 10 Watts continuously variable o/p AM and FM
- * Scanning feature, up and down steps on Mic
- * Selectable frequency steps, 10Khz, 1Khz, 100Hz
- * Ten meter band selectable in 500Khz steps
- * Built-in VSWR Meter and protection circuit
- * Superb receiver sensitivity <.3 uV FM

Just ten of the many reasons for choosing the Uniden 2830

* A range of VHF-UHF of matching transverters available, please enquire for models currently in stock
* This product is exclusive to Raycom



**10/2 MTR Version
Out Soon @ £399.00**

ANTENNAS & ACCESSORIES

NOW AVAILABLE AT RAYCOM: CUSHCRAFT, BUTTERNUT, HY-GAIN ANTENNAS, JAYBEAM, TONNA, MET, HAM-M ROTATORS. Call for full details, prices, availability and delivery costs.

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G8KW-TYPE as above for use with 75 OHM	£23.50
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RAYCOM DISCONE VHF 60-600MHz 8E SO239	£29.50
SUN KG205 2M 5/8 MOBILE TILT-OVER 259	£14.50
RAYCOM CAST GUTTERMOUNT C/W SO239/COAX	£8.50
GAMMA TWIN 2 METRE SLIM JIM KIT inc instr	£14.50
RAYCOM RWC HB9CV 2 METRE 2E MINI BEAM	£12.50
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The above popular products POST FREE (UK mainland only)

SCANNERS

BEARCAT by

uniden

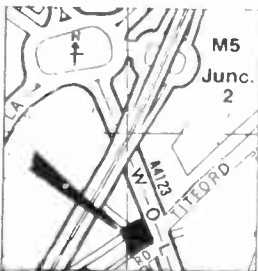
UBC 175XL



UBC 100XL

RAYCOM ARE TRADE AND RETAIL DISTRIBUTORS FOR THIS SUPERB RANGE OF QUALITY SCANNERS. THE POPULAR UBC 100XL HANDHELD IS SOLD IN THOUSANDS. BUT IS NOW COMPLEMENTED BY THE UBC 70XCL POCKET SIZED HANDHELD. ALSO THE NEW COST EFFECTIVE UBC 50XL HANDHELD. SEE THE NEW MODELS IN OUR SHOWROOMS OR SEND A SAE FOR DETAILS.

FROM £99.50



SCANNERS

YAESU FRG9600 from the company who specialises in fitting extra options, as supplied to Government-departments and professional bodies. We also upgrade existing models, please call for more details, prices, delivery and information.

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Yaesu FRG9600/RWC Mk 5 HF 50KHz-950MHz Active Mixer	£625
Package deal on above Mk 3/5 FRG9600 c/w AH7000 discone G5RV PA4 AC PSU complete receiving station HF-UHF including delivery UK mainland Add £100 to above price	£859
Icom ICR7000/AH7000 Receiver plus Matching Discone	£937.50
KENWOOD RZ1 New 500KHz-950MHz Mobile	
Wide & Narrow AM/FM	POA
Fox VHF-UHF Multi Function Mobile Scanner FM only	£139
UNIDEN BEARCAT UBC 50XL VHF-UHF 10ch H/held Scanner	£95
UNIDEN BEARCAT UBC 70XL VHF-UHF 20ch Miniature H/held	£179
Uniden-Bearcat UBC 100XL VHF-UHF-Airband H/held Scanner	£189
Uniden-Bearcat UBC 175XL VHF-UHF-Airband Desk-Top	£175
BJ200 Mk 2 VHF-UHF-Airband-Military Airband H/held	£220
AOR 2002 25-550 800-1300MHz Desk-Top/Mobile AM/FM	£469
Sony Air 7 Top Quality VHF-UHF-Airband Handheld Scanner	£245

SHORT WAVE RECEIVERS

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Yaesu FRG8800/FRV8800 as above with VHF Conv fitted	£879
Icom ICR-71 Top Grade Communications Receiver	£799
Sony PRO80 HF/VHF Handheld Scanner c/w accessories	£345
Sony 2001D Short Wave-Airband DE1 IIXF RX with ANI kit	£395

Many more makes and models in stock. PLEASE CALL FOR PRICES, DELIVERY COSTS and any advise or information, or send large SAE (insured post and packing £10.00. Carrier £12.50).

SONY - RAYCOM now appointed official Sony dealers, full range of both professional and domestic models available to order. Worth waiting for!

HANDHELDS

* = Extended Receiver coverage available, call for details

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*YAESU FT73R/FNB10 2.5W (5W) 70CM C/W CHARGER	£259.00
*ICOM MICRO 2E 5W 2 MTR HANDHELD WITH CHARGER	£209
CTE1600 (SAME AS ICOM IC2E) C/W NICAD CHARGER	£179.00

Many other types of handheld stocked, please enquire

PORTABLES

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FT690RMK2 6MTR 2.5W MULTIMODE STANDARD ACCES	£399.00
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FT790MK2 NEW 70CM 2.5W MULTIMODE DUE OUT SOON	£499

MOBILES

YAESU FT211RH 45W 2MTR MOBILE WITH FREE 1/4 WAVE ANT	£299
YAESU FT212RH NEW 45W 2MTR MOBILE DVS FEATURE OPT	£349
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ON THE COVER

This month's cover shows a new multi-pin plug connection assembly (280 series) from Highland Electronics. It allows easy installation and replacement of the company's Swisstac range of front-panel components including switches, push buttons and lamps.

With the connector unit, all the wires are pre-assembled into a 3-element contact block which includes up to 14 flat connectors. The connector assembly is plugged on to the rear contacts of the switch unit, so that switches can be installed, replaced or removed with no need for soldering.

Full details on (04446) 45021.

Publisher's Announcement

Due to severe editorial production problems, we regret that this issue of *R & EW* has to be published with fewer pages than normal.

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Safety in the shack

Some of the constructional projects featured refer to additions or modifications to equipment; please note that such alterations may prevent the item from being used in its intended role, and also that its guarantee may be invalidated.

When building any constructional project, bear in mind that sometimes high voltages are involved. Avoid even the slightest risk - safety in the shack please, at all times.

Whilst every care is taken when accepting advertisements we cannot accept responsibility for unsatisfactory transactions. We will, however, thoroughly investigate any complaints.

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AC176K	0.31	BC213	0.09	BD438	0.75	BF891	1.75	OC28	1.50	2N3053	0.40
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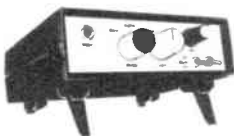
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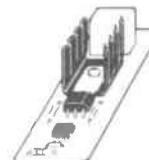
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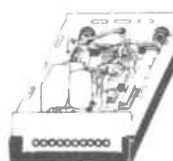


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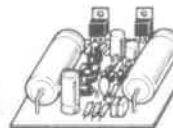
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PHOTOGRAPHING OSCILLOSCOPE TRACES

by William James

An oscilloscope with either built-in or add-on storage facilities is a highly desirable instrument. However, most home constructors and experimenters would find it hard to justify the extra expense of such sophistication. My personal experience is that I cannot retain in my memory the precise outline of an oscilloscope trace for more than a few moments.

When trying to improve the performance of a circuit by changing the value, adjustment or position of components, it can be very useful to have a record of screen patterns for future comparison. The solution is to photograph the oscilloscope traces.

The work involved is not difficult and it is surprising that more attention does not seem to have been paid to it. There

are special cameras for the purpose, but ordinary amateur equipment is quite adequate. All that is needed is a camera which has slow shutter speeds and which is able to focus close enough so that a 10cm x 8cm graticule will fill all or most of the negative.

I use Leica close-up focusing equipment, but any SLR camera with extension tubes or bellows would also be suitable. I hesitated about stating my own preference because I have found that the mere mention of Leica tends to be off-putting. However, having done so, let me hasten to add that my apparatus is the Focslide, an accessory which has been obsolete for very many years. This ingenious and beautifully constructed instrument converts a rangefinder Leica into a view camera, enabling one to focus

the image on a ground glass screen, using bayonet-fitting 5x and 30x magnifiers. The viewing section is then slid sideways to bring a camera body directly behind the lens. The image will then be precisely in the focal plane of the camera.

The lens used to produce *Figures 1 to 4* was a 30-year-old f3.5 Elmar, 50mm. The camera body was a 50-year-old Leica IIIA (focal plane shutter), a camera which still works hard for its keep, sometimes even being used with a clockwork motor running at 1½ frames per second.

However, equipment like this is not essential, and I have taken satisfactory traces on 120 film using a 60-year-old Voigtlander 6 x 9 plate camera with roll film back (Compur shutter).

Procedure

Set up your camera on a tripod so that the frame is filled by the graticule, the centre of the lens is on the centre of the graticule and the focal plane is parallel to the subject, vertically and horizontally.

Published photographs of traces are usually just white lines on a black background, but I consider it necessary to show the grid pattern clearly on the negative, and it is for this purpose especially that the close-up work is advocated.

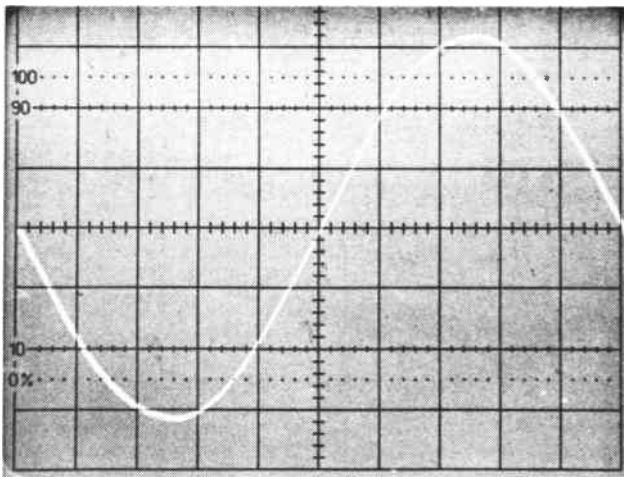


Fig 1: 10V/cm-2ms/cm

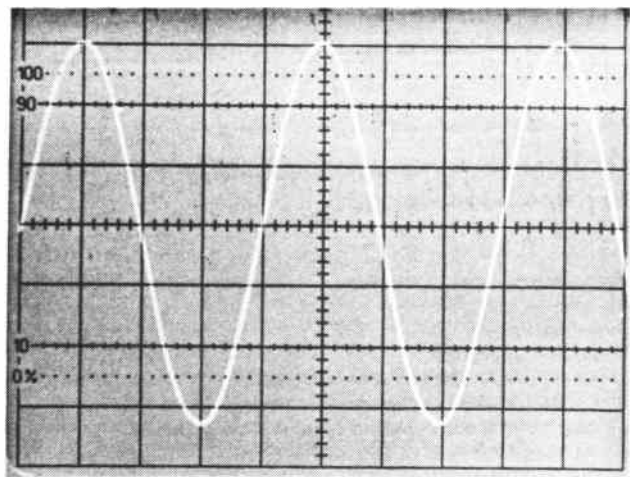


Fig 2: 10V/cm-5ms/cm

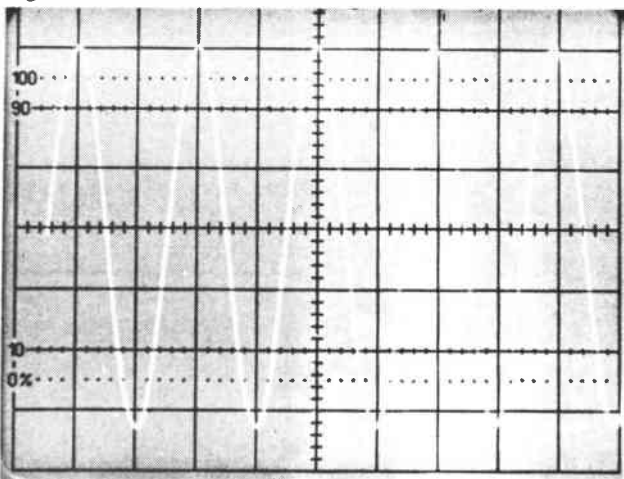


Fig 3: 10V/cm-10ms/cm

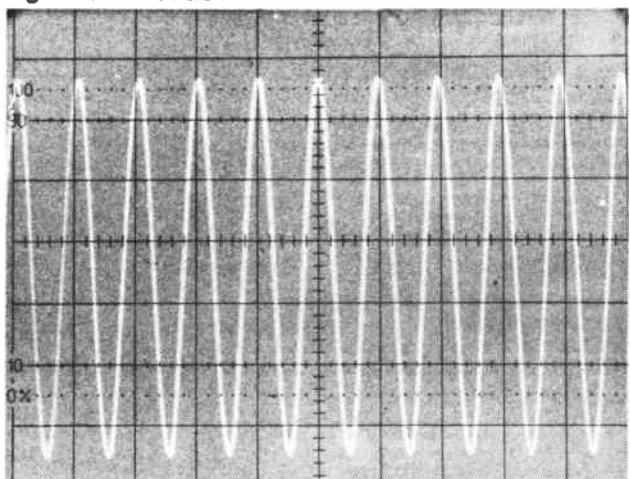


Fig 4: 10V/cm-20ms/cm

PHOTOGRAPHING OSCILLOSCOPE TRACES

Unlike a TV screen, some limited frontal lighting is required. I used an ordinary 100W household lamp in a photographic reflector, positioned immediately behind and about 2ft above the camera. The screen will be recessed, and one has to find the position for the lamp that gives the least trouble from shadows cast by the housing. It is not possible to obtain even lighting with this arrangement, but it is good enough.

The oscilloscope is then set in motion, taking care to ensure that the desired trace is locked, ie not drifting across the screen, with focus and intensity balanced to the best advantage. A thin line does not reproduce well. You might expect to see a well-defined trace of a single complete sine wave, but thereafter, there will be some pulsating shimmer, increasing in proportion to the number of complete lockable waves on display. Indeed, looking at *Figure 4* especially, you could well expect a minimum of 1/1000s would be an appropriate shutter speed. However, the shimmer will either not appear on the negative or will not prove to be troublesome.

To obtain uniformity, all the figures are of sine waves taken direct from my AC mains supply via a 10x attenuator probe.

The Y input was 10V/cm, so the trace in *Figure 1* shows a voltage of 630pp (10 x 10 x 6.30), measuring from the estimated centre of the trace, equivalent to 223V RMS. Actual mains voltage at the time as per RMS meter was 219, so the trace readings are well within the published 3% accuracy of the scope.

The film for the Leica illustrations (*Figures 1 to 4*) was developed in Ilford ID 11 for 12 minutes. Why ID 11? Simply because I had a good supply of it and knew it would work! Shutter speeds higher than 1/30 are likely to show only part of a trace, or, in the extreme, no trace at all. To coin a phrase, one could say, 'The more trace the less speed'.

It should be apparent that the film has been rated about ASA 800. A reading of the illuminated screen using a viewfinder type of meter gave an exposure of f5.6 @ 1/60. Substantially more exposure has to be used to compensate for the close-up factor, and to ensure adequate definition of the black lines on the graticule. The negatives used for the illustrations were exposed for viewing, not printing quality. The graticule has to be overexposed to look good on the negative. The exposure information is given as a guide only. I do not know how accurate the shutter speeds have

remained on the old Leica, though there is reason to believe that they are not very far wrong.

When I'm working, I take pictures from the scope as required over a period of hours or even days. I do not waste 35mm film, loading the estimated length into one of the special Leica metal cassettes (also discontinued). It is not necessary to print the negatives as it is quite convenient to look at them in the enlarger. Alternatively, they could be put in one of the various devices for viewing negatives or transparencies. In many cases it will be found that a negative of one complete wave, or even part of a wave, will suffice.

I have not so far made any reference to Polaroid cameras or apparatus adaptable for Polaroid use. I do not think the expense of producing Polaroid prints makes them an attractive proposition for photographing oscilloscope traces.

Photography does not offer anything like a complete alternative to the storage oscilloscope, however, I have derived considerable benefit from the technique described, and by keeping careful records of negatives. I hope that others will be encouraged to explore this interesting and rewarding field of close-up photography. NEW

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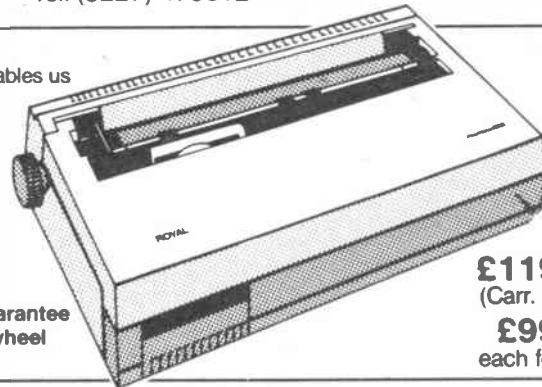
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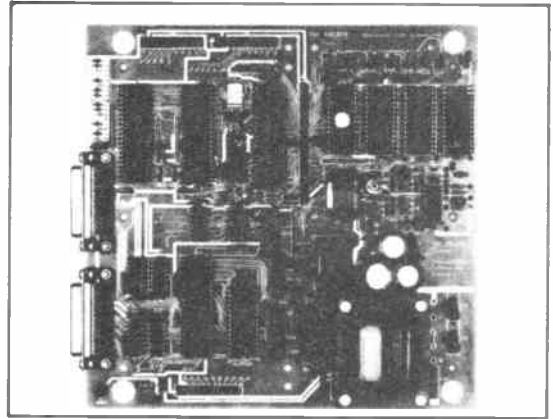
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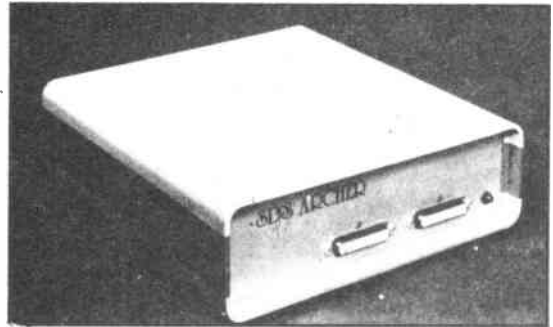
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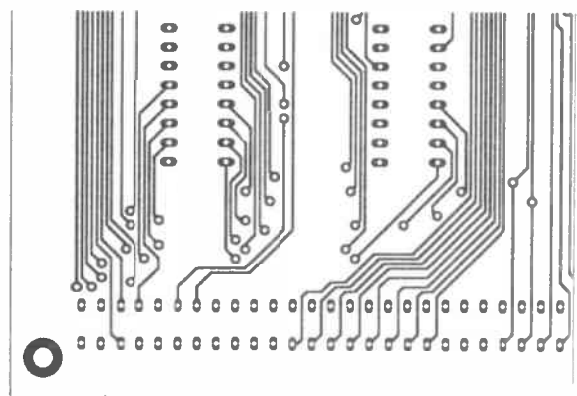
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THE KENWOOD TS-140S



by Ken Michaelson

I was interested to review the Kenwood TS-140S because it has modes and facilities similar to the Trio TS-430S which I owned and operated until quite recently. I reviewed the rig as a base station, but it can be a very efficient mobile unit – tapped holes on either side of the case accept the MB-430 mobile mount. Notice the part number is MB-430 and the external measurements of both the 430S and the 140S are similar.

This review does not pretend to show the finer points. All the information in the table is taken from the manufacturer's instruction manual and should indicate the capabilities of the rig. It covers all nine HF bands as a transceiver and 50kHz to 34.999MHz as a general coverage receiver.

The front panel

The front panel is uncluttered. The twelve microswitches are a sensible size even for those with large hands. On the TS-430S I found myself accidentally pressing two switches at the same time.

The M.CH/VFO CH knob serves a dual purpose. In the memory mode the control rotates through the memory channels, thirty-one in all since there is a channel labelled 00; in the VFO mode, the control moves the frequency either up or down in steps of 10kHz – a sort of fast tuning device.

Memories 00 to 09 each store one frequency and one mode. Memories 10 to 19 are split memories which store transmit and receive frequencies suitable for 10m operation. When these memories are in use, the word 'split' is displayed. Memories 20 to 30 are programmed band memories which store specific band segments and the mode. When these memories are in use, an asterisk '*' is displayed.

It is also possible to lock out a channel during scanning. This is achieved by selecting the channel then momentarily

pressing the clear key, though if the clear key is depressed for longer than 1.5s the selected channel will be cleared. The tuning stepping rate can be chosen by pressing the AM/FM key at the same time as switching on the rig. It is either 9kHz or 10kHz between the frequencies of 522kHz and 1620kHz, which covers the MW broadcast band. Other function selections are also available on switch-on.

To the right of the M.CH/VFO CH control are the three mode buttons, LSB/USB, CW/N and AM/FM. Whenever a mode key is depressed, the first character of the mode is sounded from the speaker in Morse code. This applies to all buttons on the rig. This also acts as an alarm which gives information in Morse code for certain conditions, such as microprocessor reset or inability to scan. The volume of the beep can be adjusted by a preset potentiometer inside the rig.

A number of transceiver functions can be changed by pressing the appropriate key at the same time as switching on the rig. In addition to having the facility to alter the stepping rate of the M.CH/VFO CH control, the 10Hz main display resolution can be switched on or off by holding down the Clear key while switching on. The RIT step frequency selection can be either 10Hz or, by holding the RIT key down when switching on, 20Hz. The stepping rate of the up and down Band switches can also be altered to be either 500kHz or 1MHz by the same means. Quite a rig.

Catering for CW enthusiasts, at the very top of this column is the CW Off/Semi/Full key. This provides two break-in methods and an off position. However, the manufacturers state that it is not possible to use their TL-922A/922 linear amplifier for full break-ins.

There is a chromium-plated bail which is pulled down when the rig is used as a base station and gives a lift of approx-

imately 7/8in. In my opinion, this was insufficient and I had to fit a 1.5in wooden block under the bail to bring the rig up to a comfortable working level.

I have no complaints about the knurled tuning knob, which has a very smooth action. It is approximately 47mm in diameter and has a means of adjusting the turning friction. The tuning rate varies according to which mode is used: 10kHz per revolution in USB/LSB/CW/CWN and 50kHz per revolution in AM/FM. When the tuning knob is turned fast it considerably speeds up the tuning rate, allowing the operator to move swiftly from one part of the band to another.

Above the tuning knob is the readable display which shows frequency in white, modes in yellow and the other functions, such as RIT and M.CH, in red. On the left of the display is the meter. During receive this acts as an S meter with a maximum of 60dB, but during transmit the function of the meter is controlled by the meter switch and will show either ALC level or PWR readings. On the far left of the panel, placed vertically from top to bottom, are the power on/off switch, the 1/4in socket for phones and the standard 8-pin socket for the MC43S dynamic microphone, which has up and down buttons on the top face for quick frequency changing.

The rear panel

On the rear panel are the antenna connection (50 ohm input SO239 socket), the vox controls (delay, anti-vox and vox gain) and a 3.5mm socket for the 8 ohm external speaker. There are four DIN connectors called Acc 1, 2, 3 and Remote. Acc 1 is intended for connection to the optional interface unit, Acc 2 is used for the connection of data communications devices and is a 13-pin DIN socket.

There are precise pin numbers given in the instruction manual for packet, RTTY,

Amtor, etc. The manufacturers state that if the F2 mode is desired for transmitting, the FM mode should be selected from the front panel. A 13-pin DIN plug is supplied with the rig, presumably since it is a very unusual one. Acc 3 is available to access the automatic antenna tuner AT-250 which can be obtained as an accessory. The Remote socket, a 7-pin DIN, could be connected to a foot-operated PTT switch as well as the ALC input from a linear.

Also on the rear panel is a six-pin socket to accept the 13.8V dc power input which requires 20A for full transmitting power. Modifications to data communications modulation level, microphone sensitivity level and the sidetone level for CW can be made by removing the sub-chassis as shown in the instruction manual. The semi break-in time for CW can be adjusted from the Delay control on the rear panel. The benefit of having these controls as preset potentiometers inside the rig is that the front panel has a clean workmanlike appearance in spite of its small size. It was a pleasure to see the immaculate PCBs. Some of the rigs manufactured today resemble birds' nests. I know they still work perfectly satisfactorily, but how much nicer it is to see a beautifully laid out PCB.

Operating the rig

I enjoyed operating the TS-140S for several weeks, once I had got used to the controls. Although it only has a 3in upward-facing speaker, the quality of AM music and speech broadcasts was quite reasonable.

The rig worked the Amtor mode perfectly satisfactorily without any modifications. I had no difficulty contacting either of the two mailboxes GPLX or GHYH; that was after I realised I should operate on USB and subtract 1.5kHz from the nominal mailbox frequency, ie tune to 3583.5kHz instead of 3588kHz. My own rig uses FSK and gives the actual frequency so there is no need to subtract anything. I am inclined to think that the delay caused by subtraction might be a little long for DX working.

It would be nice if there were a means of switching the AGC off altogether. RTTY was mainly used on 14MHz and worked perfectly well, though I had to watch the power output since the rig will give just over 100W and RTTY has a 100% duty cycle. The meter reads either ALC or power in the transmit condition, so it was an easy matter to cut the output down to about 50W using the topmost slider control. The Mic Gain also had to be watched, but was simple to adjust using another of the four sliders. I wonder how long the four sliders will last?

Selectivity was mostly sufficient and the attenuation switch helped with reception of distant stations. I liked the

TS-140S Specification


Frequency stability	Less than ± 10 ppm
Frequency accuracy	Less than ± 10 ppm
Output power	160m to 15m band SSB 110W CW 100W AM 40W
	12m band SSB/CW 100W AM 40W
	10m band SSB 100W CW 95W FM 50W AM 40W
Receiver circuitry	Double conversion superheterodyne
Intermediate frequencies	1st: 40.055MHz, 2nd: 455MHz
Frequency range	500kHz to 30MHz
Sensitivity	
LSB, USB, CW (10dB S+N/N)	Less than 3.98 μ V
500kHz to 1.62MHz	Less than 0.25 μ V
1.62MHz to 21.5MHz	Less than 0.25 μ V
21.5MHz to 30MHz	
AM	
500kHz to 1.62 MHz	Less than 3.98 μ V
1.62MHz to 21.5MHz	Less than 2.5 μ V
21.5MHz to 30MHz	Less than 2.5 μ V
FM (12dB sinad)	
21.5MHz to 30MHz	Less than 0.35 μ V
Selectivity LSB, USB, CW	-6dB: 2.2kHz, -60dB: 4.4kHz
AM	-6dB: 6kHz, -50dB: 18kHz
FM	-6dB: 12kHz, -50dB: 25kHz
IF shift variable range	More than ± 1.2 kHz
RIT variable range	10Hz More than ± 1.2 kHz 20Hz More than ± 2.5 kHz
Squelch sensitivity (FM)	Less than 0.32 μ V
Mode	J3E (LSB USB), A1A (CW), A3E (AM), F3E (FM)
Antenna impedance	50 ohms
Power requirements	12 to 16V dc (13.8V dc reference)
Ground	Negative
Current drain	Receive with no signal 1.5A Transmit mode 20A
Operating temperature	-10 to +50°C (+14 to +122°F)

IF shift control. I have come across one on several Trio rigs but I thought the TS-140S version was more efficient, although at times it was necessary to rotate the control almost to its extremes before losing an offending station. In my opinion, it does not equal the operation of Icom passband tuning. The stability of the rig goes without saying.

The rig successfully received fax transmissions at the low end of the range: Offenbach on 134.2kHz and a station between 4 and 8MHz, either Bracknell or Hamburg. No discernible drift was observed. The rig also received Navtex on 518kHz, which meant leaving the rig set to that frequency during the times between broadcasts, and every time the reception of information was 100%. Reports received during phone QSOs were always complimentary. On the rare occasions when difficulties

arose the speech processor could be brought into circuit. No particular DX was worked due, in the main, to the antenna in use. Operating on 80 metres during the daytime hours was achieved without any difficulty.

It struck me that Kenwood already have the model TS-680S HF transceiver on the market, identical in all respects to the TS-140S except that it includes an RF amplifier and components for transceiving on 6m with an output of 10W. The cost of the TS-140S is a very reasonable £850 including VAT. The extra cost of the TS-680S with 6m is £150, consequently the prospective purchaser will have to choose carefully.

All in all, I reckon the TS-140S is good value for money. For the loan of the rig, my thanks go to Lowe Electronics Ltd, Chesterfield Road, Matlock, Derbyshire DE4 5LE, tel: (0629) 580800. 

DATA FILE

Ray Marston concludes his investigation of IC audio processing circuits by looking at more amplitude control devices and applications

During the last four editions of 'Data File' we have introduced the reader to the basic concept of 'audio processing' circuitry and have shown a variety of practical linear amplifier, active filter and amplitude-regulating circuits, based on conventional op-amps and OTAs. This month, we conclude our look at audio processing circuitry by first showing three more amplitude-control applications of OTAs, and then looking at two dedicated 'amplitude-control' ICs and their applications.

Ring modulators

At the conclusion of last month's edition of 'Data File' concerning amplitude modulator circuits (Figures 11 and 12), we pointed out that the instantaneous polarity of the output signals is determined entirely by the instantaneous polarity of the carrier input signal. This has two possible states (positive or negative), and is independent of the modulation signal, which has only one possible state (positive). Thus, this type of circuit is known as a 2-quadrant multiplier. We also pointed out that there is another type of modulator circuit known as a ring-modulator or 4-quadrant multiplier, in which the output signal's polarity depends on the polarities of both the input signal and the modulation voltage (which both have two possible states).

An example of such a circuit is shown in Figure 1. This CA3080 circuit is similar to last month's Figure 11, except that the pre-settable resistor R_y is wired between input and output. R_y is adjusted so that when the modulation input is tied to the zero-volts rail, the input-derived signal currents, feeding into R_5 via R_y are exactly balanced by the inverted signal currents, feeding into R_5 from the OTA output, thereby generating zero output across R_5 . If the modulation input goes +ve, the OTA output current exceeds the current of the R_y network, giving an inverted gain-controlled output. If the modulation input goes -ve, the R_y output current exceeds that of the OTA, and a non-inverted gain-controlled output is obtained. Thus, both the phase and the amplitude of the 4-quadrant multiplier's output signal, are controlled by the modulation signal. The circuit can be used as a ring modulator by feeding independent ac signals to the two inputs, or as a frequency doubler by feeding identical sine wave signals to the two inputs.

With the R_x and R_y values shown, this circuit gives a voltage gain of $\times 0.5$ when the modulation terminal is tied to the +ve or -ve supply rail. The gain doubles if the values of R_x and R_y are halved.

Figure 2 shows how one half of an

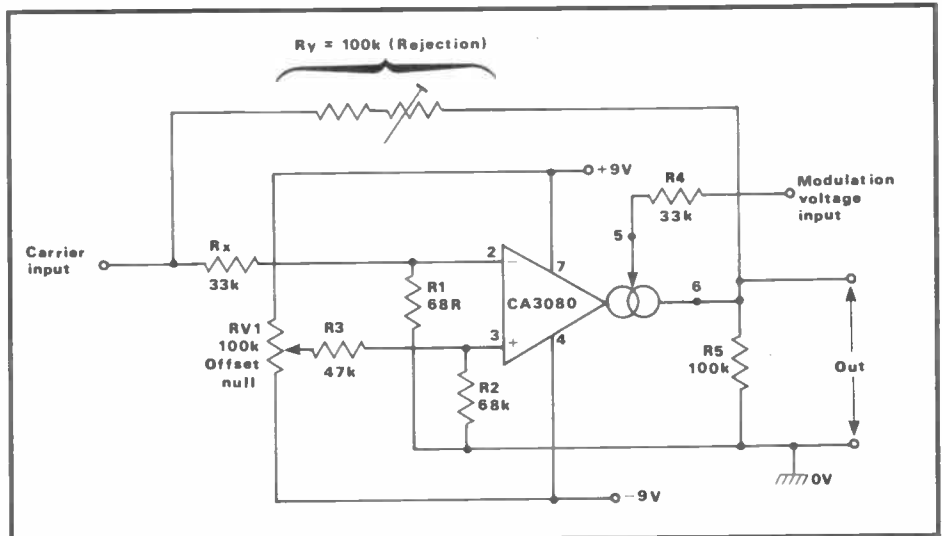


Fig 1: Ring modulator or 4-quadrant multiplier

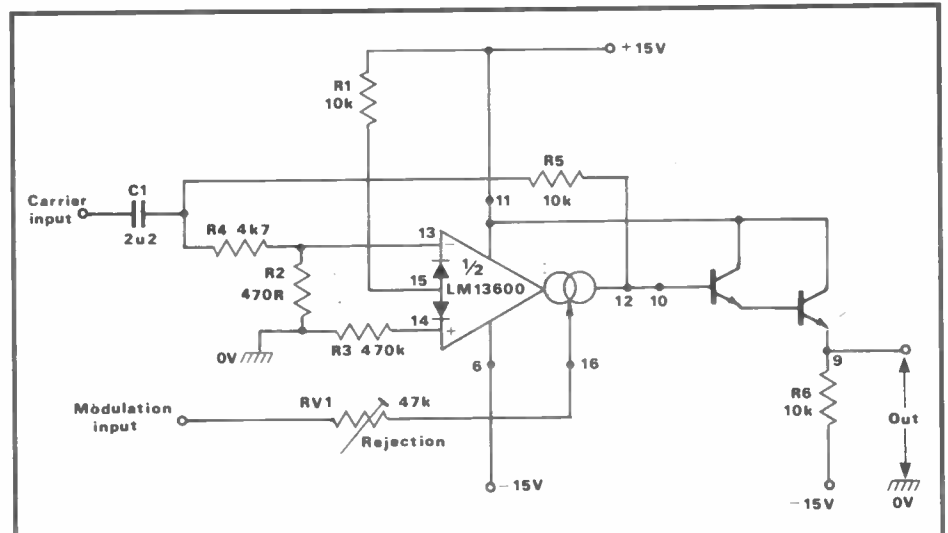


Fig 2: LM13600 ring modulator

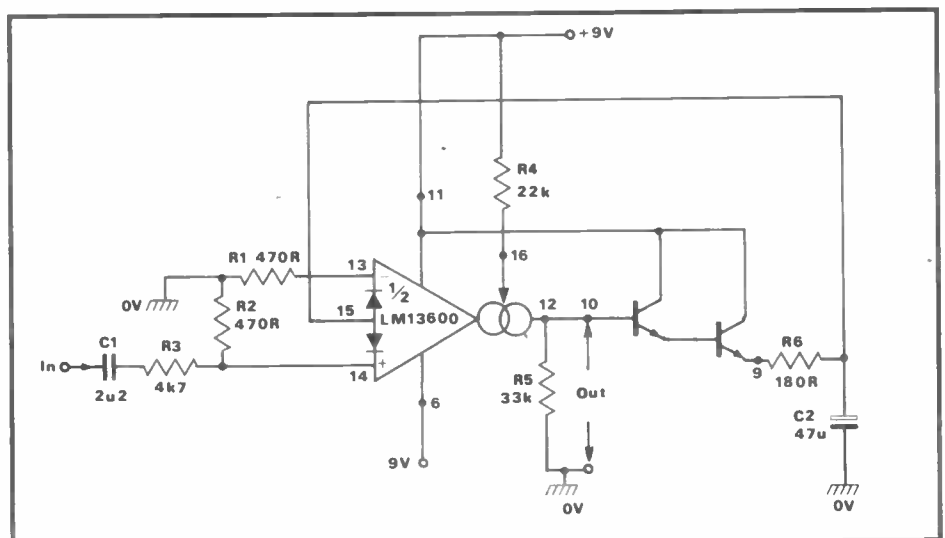


Fig 3: Circuit of an AGC amplifier

V_{IN} , pk-pk	3V0	300mV	30mV
V_{OUT} , pk-pk	6V0	3V6	1V2
A_v	2	11.7	40

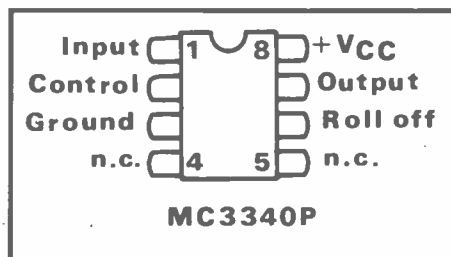


Fig 3b (above): Performance table of an AGC amplifier

Fig 4 (left and below): Outline and main characteristics of the MC3340P IC

Parameter	Min	TYP	MAX
Supply Volts	+9V		+18V
Control Pin Sink Current			2mA
Input Voltage, rms			0.5V
Voltage Gain		13dB	
Attenuation Range		90dB	
Total Harmonic Distortion		0.6%	

LM13600 can be used as a ring-modulator or 4-quadrant multiplier. This circuit is similar to last month's *Figure 12*, except that R5 is connected between the input signal and the OTA output, and that I_{bias} is pre-settable via RV1. The basic circuit action is such that the carrier input feeds a signal current into one side of R5, and the OTA output feeds an inverted version of the signal current into the other side of R5, so these two currents tend to self-cancel. In use, the OTA gain is pre-set via RV1 so that the two currents are exactly balanced when the modulation input is tied to the common zero volts line; under this condition the circuit gives zero carrier output.

Consequently, when the modulation input moves positive, the OTA gain increases and its output current to R5 exceeds that caused by the direct input signal; causing an inverted output carrier signal to be generated. Conversely, when the modulation input moves negative and the OTA gain decreases, the direct signal current of R5 exceeds that generated by the OTA output; so a non-inverted output signal is generated.

An AGC amplifier

In last month's edition of 'Data File' we pointed out that the gain of the LM13600 OTA can be varied by altering either the I_{bias} , or the I_D current of the device. *Figure 3* shows how I_D variation can be used to make an AGC (automatic gain control) amplifier, in which a 100:1 change in input signal amplitude causes only a 5:1 change in output amplitude.

In this circuit, I_{bias} is fixed by R4, and the output signal is taken directly from the OTA via R5. The output buffer and R6-C2 are used to rectify and smooth the

OTA output, applying an I_D current to the OTA's linearising diodes. No I_D current is generated until the OTA output exceeds the 1.8V peak (equals three base-emitter volt drops). This is needed to turn on the Darlington buffer and the linearising diodes, but any increase in I_D then reduces the OTA gain and, by negative feedback action, tends to hold V_{out} constant at that level.

The basic gain of this amplifier, with zero I_D , is $\times 40$. Thus, with an input signal of 30mV pk-pk, the OTA output of 1V2 pk-pk is not enough to generate an I_D current, causing the OTA to operate at full gain. At 300mV input, however, the OTA output is strong enough to generate significant I_D current, and the circuit's negative feedback automatically reduces the output level to 3V6 pk-pk. This gives an overall gain of $\times 11.7$. With an input of 3V0, the gain falls to $\times 2$, giving an output of 6V pk-pk. The circuit thus gives 20:1 signal compression over this range.

The LM13700

The circuits of *Figures 2* and *3*, and several of the circuits shown last month, are each designed around the LM13600 dual OTA IC. The LM13700 IC is a very similar device in that it is sometimes more readily available, and can be used as a pin-for-pin replacement for the LM13600 in all of these circuits. It differs from the LM13600 only in minor details of its output buffer stages.

The MC3340P

The MC3340P is very popular and has simple, dedicated 'electronic attenuator' ICs. *Figure 4* shows the outline, pin notations and basic details of the

device, which is housed in an 8-pin DIL package. Only six of these pins perform useful functions, as two of these are used for power supply connections. Of the remaining four pins, pins 1 and 7 provide input and output signal connections, pin 6 controls roll-off of the device's frequency response, and pin 2 is the device's gain-control terminal.

The MC3340P basically acts as a simple linear amplifier with 13dB of signal gain when its pin 2 control terminal is either tied to the ground via a 4k Ω resistance, or is connected to a dc potential of 3.5V. This gain decreases if the control resistance/voltage is increased above these values, falling by 90dB (to -77dB) when the values are increased to 32k Ω or 6V. The device's attenuation (or gain) can be controlled over a wide range via a resistance or a voltage.

Figure 5 shows a practical example of a voltage-controlled MC3340P electronic attenuator, together with its performance graph. *Figure 6* shows a resistance-controlled version of the device. Note in both of these circuits that large-value capacitor C2 is wired to the control terminal. This helps eliminate control noise and transients, thus giving a noiseless form of gain control and enabling the control resistance/voltage to be remotely located.

Also note in these circuits that 680pF capacitor C3 is wired to pin 6 of the IC; this limits the upper frequency response of the circuit to the high audio range. Without C3, the response extends to several MHz, and the circuit tends to be unstable. Finally, note that this IC gives very little signal distortion at low attenuation levels, but that distortion rises to about 3% at maximum attenuation values.

The NE570/571 IC

The NE570 is known as a dual 'comparator', but it can be regarded as a rather sophisticated dual VCA IC. Each half (channel) of the IC contains an identical circuit, comprising a full wave rectifier that detects the average value of the input signal, a linearised temperature compensated variable gain amplifier, an op-amp, a precision 1.8V voltage reference and a resistor network. These elements can be externally configured so that each channel acts as a normal VCA, or as a precision dynamic range compressor or expander (hence the COMP-ANDER title).

The NE571 is identical to the NE570, but has a slightly relaxed specification. Both ICs are housed in 16-pin DIL packages. *Figure 7* shows the outline and pin designations of the package, together with the block diagram of one IC channel. *Figure 8* lists the basic characteristics of the two ICs. Note in the block diagram (and in following circuits) that pin numbers relating to the left-hand channel of the IC are shown in plain

DATA FILE

numbers. Those relating to the right-hand half are shown in bracketed numbers.

Circuit description

The operation of the individual elements in the *Figure 7* block diagram, is fairly easy to understand. Input signals that are ac coupled to pin 2 (or 15) are full wave rectified and fed to pin 1 (or 16), where they can be smoothed by an external capacitor to generate a VCA control voltage on this pin.

Input signals that are ac coupled to pin 3 (or 14) are fed to the variable gain block input, which is a precision temperature-compensated VCA, with its gain controlled via the pin 1 (or 16) voltage. The gain block output is fed to the inverting input of the IC's op-amp stage. Gain block signal distortion is quite low, and can be minimised by feeding a 'trim' voltage to pin 8 (or 9).

The channel's op-amp is internally compensated and has its non-inverting input tied to a 1.8V precision reference. The inverting input is connected to the gain block output which is externally available, and is also connected to the R3-R4 resistor network. The op-amp output is available at pin 7 (or 10).

A stereo VCA

Figure 9 shows how an NE570 or NE571 IC can be used to make a practical stereo VCA, or voltage controlled amplifier-attenuator. Here, the internal rectifier is disabled via C2, and a 0 to 12V dc control voltage is fed to pins 1 and 16 via R6 and C3, to give direct control of the variable gain block. The output of the block is fed to pin 7 (or 10) via the op-amp, which has its ac/dc gain set at $\times 2.56$ via R4-R7. This generates a quiescent output of 4.62V ($= 2.56 \times 1.8V$). Both channels of the stereo circuit are identical, except that the control voltage is fed to pins 1 and 16; they give about 6dB of gain with a control input of 12V or 80dB of attenuation, with a control input of zero volts.

Compander theory

In acoustics, the term 'dynamic range' can be simply described as the difference between the loudest and the quietest sound levels that can be perceived or recorded. When listening to music, the human ear has a useful dynamic range of about 90dB ($= 50000:1$).

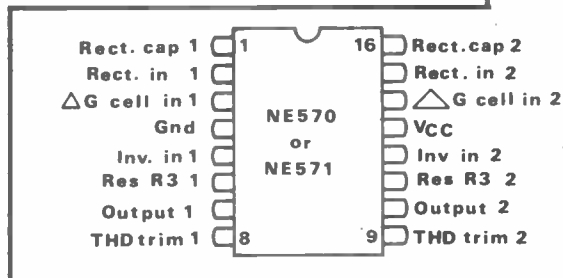


Fig 7: Outline, pin notations and block diagram of the NE570/571 dual compander IC

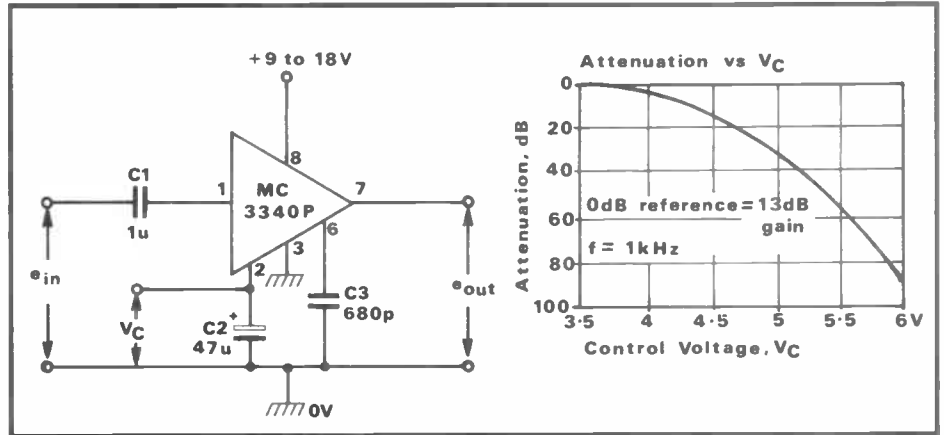


Fig 5: Circuit and performance graph of a voltage-controlled electronic attenuator

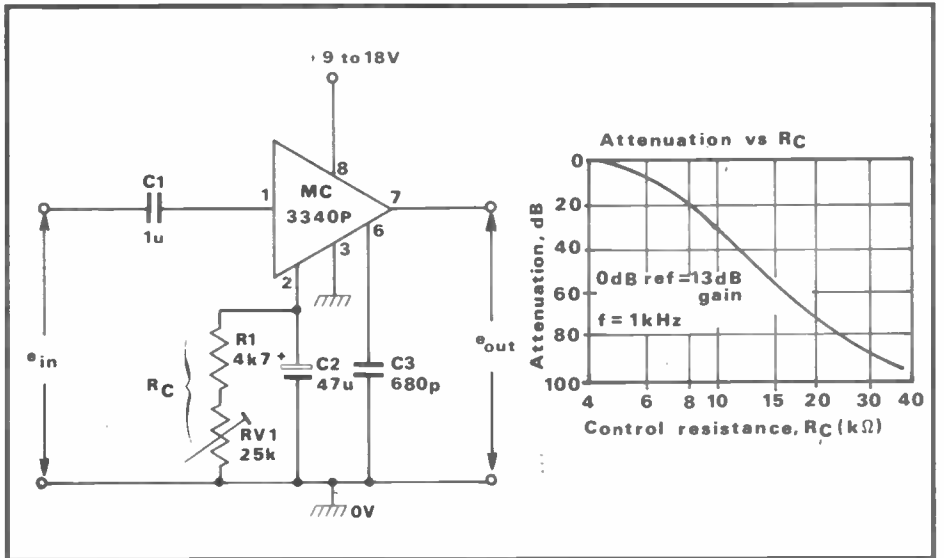
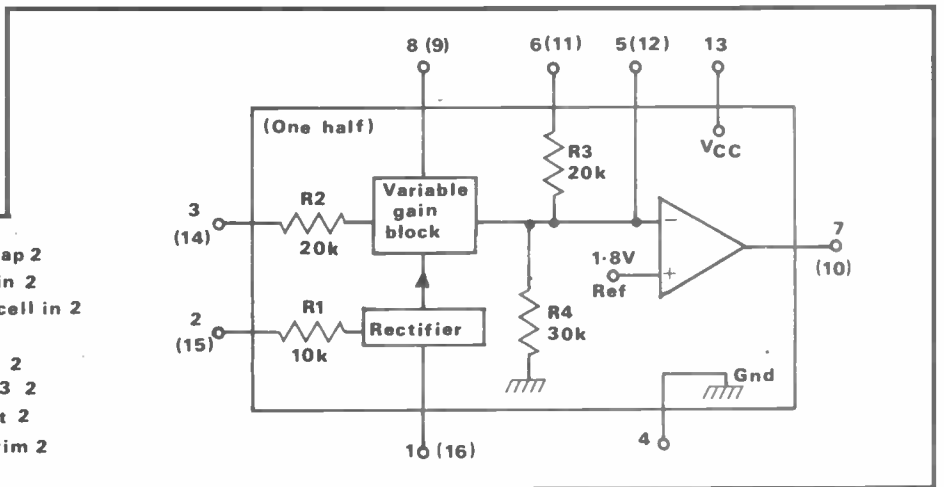


Fig 6: Circuit and performance graph of a resistance-controlled electronic attenuator

All practical recording systems generate inherent noise, which limits the minimum strength of signals that can be usefully recorded. This factor (in conjunction with practical limits on maximum signal strength) places a limit on the useful dynamic range of the recording system.

Simple tape recorder systems typically have a useful dynamic range of only 50dB, and cannot directly record or replay high quality music. One way around this problem is to use a compander system to compress the 90dB dynamic range of the input signal down to 45dB when recording it (thus giving a



PARAMETER	NE570	NE571
Supply Voltage Range	6V to 24V	6V to 18V
Supply Current	3.2mA	3.2mA
Output Current Capability	±20mA	±20mA
Output Slew Rate	0.5V/μS	0.5V/μS
Gain Block Distortion		
Untrimmed	0.3%	0.5%
Trimmed	.05%	0.1%
Internal Reference Voltage	1.8V	1.8V
Output dc Shift	±20mV	±30mV
Expander Output Noise	20μV	20μV

Fig 8: Basic characteristics of the NE570 and NE571 ICs

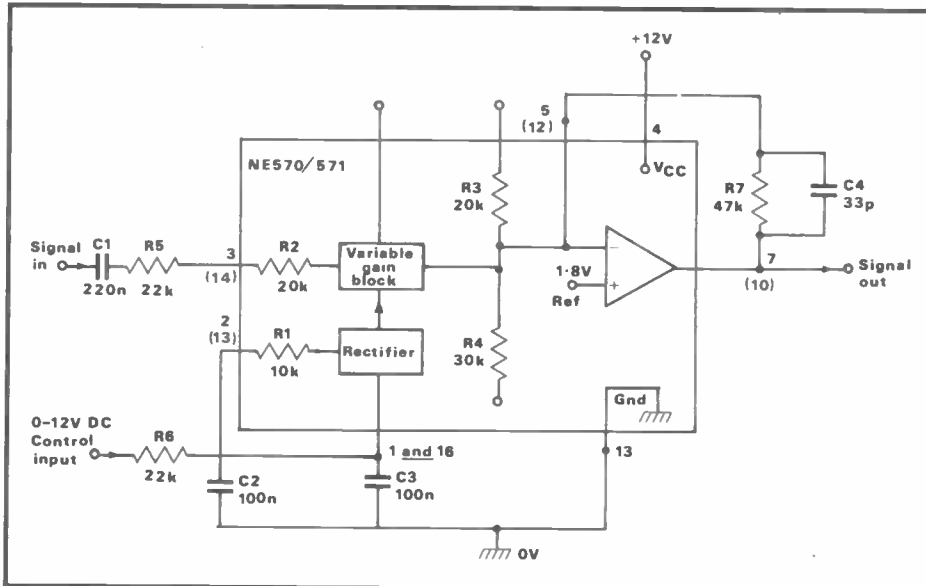


Fig 9: Stereo voltage-controlled amplifier/attenuator (only one channel shown)

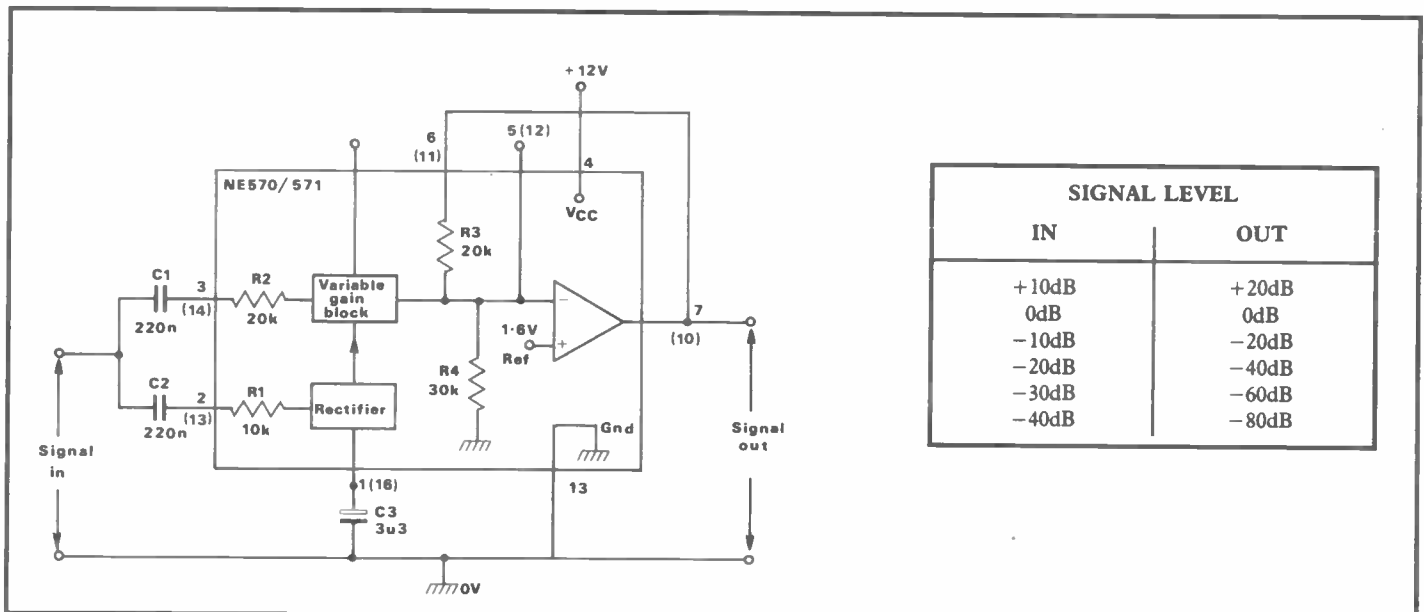


Fig 10: NE570/571 expander circuit and performance table

2:1 compression ratio), then using a matching 1:2 expander to restore its dynamic range to 90dB when replaying the signals. This same technique can be

used to improve the quality of telephone signals, etc. The NE570/571 ICs are specifically designed for use in these types of application.

A THD trimmer

Finally, to complete this *audio processing circuits* mini-series, Figure 12 shows a THD trim network that can be added to

An expander circuit

Figure 10 shows a practical NE570/571 'expander' circuit, together with its performance table. Here, the input signal is fed to both the rectifier and the variable gain block of the IC, and their action is such that the circuit gain is directly proportional to the average value of the input signal. Thus, if the input rises (or falls) by 6dB, the gain also rises (or falls) by 6dB; causing the output to rise (or fall) by 12dB, giving a 1:2 expansion ratio. Note in this circuit that (because of the R3 and R4 ratios) the op-amp output takes up a quiescent value of 3V and can only supply modest peak output signals. If desired, the quiescent output can be increased to about 6V, giving a corresponding increase in peak output levels, by wiring a 12k resistor in parallel with R4 via pins 5 (or 12) and 13.

A compressor circuit

Figure 11 shows the circuit of a practical NE570/571 'compressor', together with its performance table. The input signal is fed to the op-amp's inverting input via C4 and R3, but the variable gain block and rectifier circuitry are connected in exactly the same way as in the above expander design, and are ac coupled into the op-amp's output-to-input negative feedback loop. The circuit consequently gives a performance that is the exact inverse of the expander, ie, it gives a 2:1 compression ratio. Note that R5 and R6 are also wired as a feedback loop and are ac decoupled via C5, to bias the op-amp output at a quiescent value of about 6V.

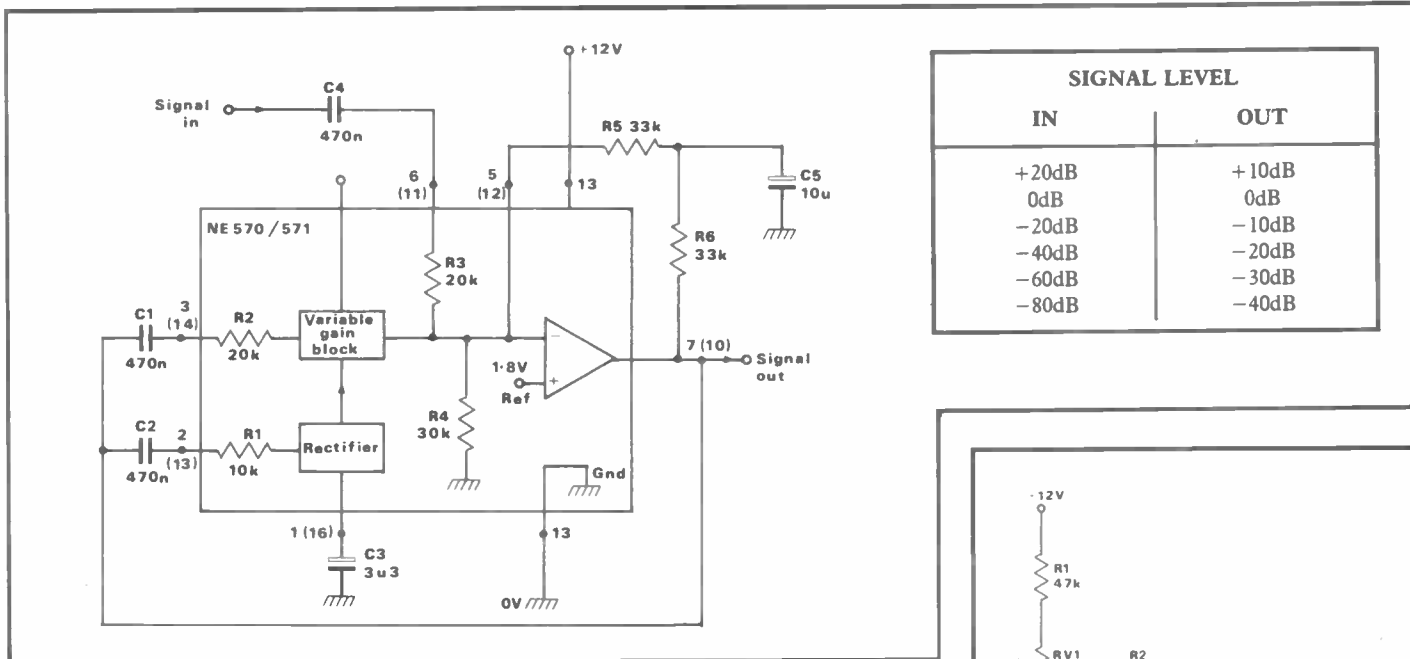


Fig 11: NE570/571 compressor circuit and performance table

the above expander or compressor circuits to minimise their total harmonic distortion figures. To adjust this trimmer,

feed a fairly strong 1kHz sine wave to the input of the compander, and then adjust RV1 for minimum output distortion. **NEW**

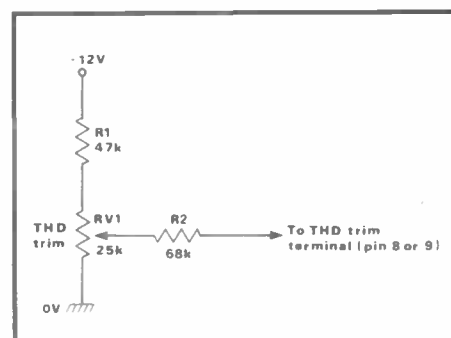


Fig 12: THD trim network

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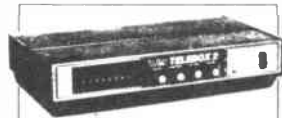
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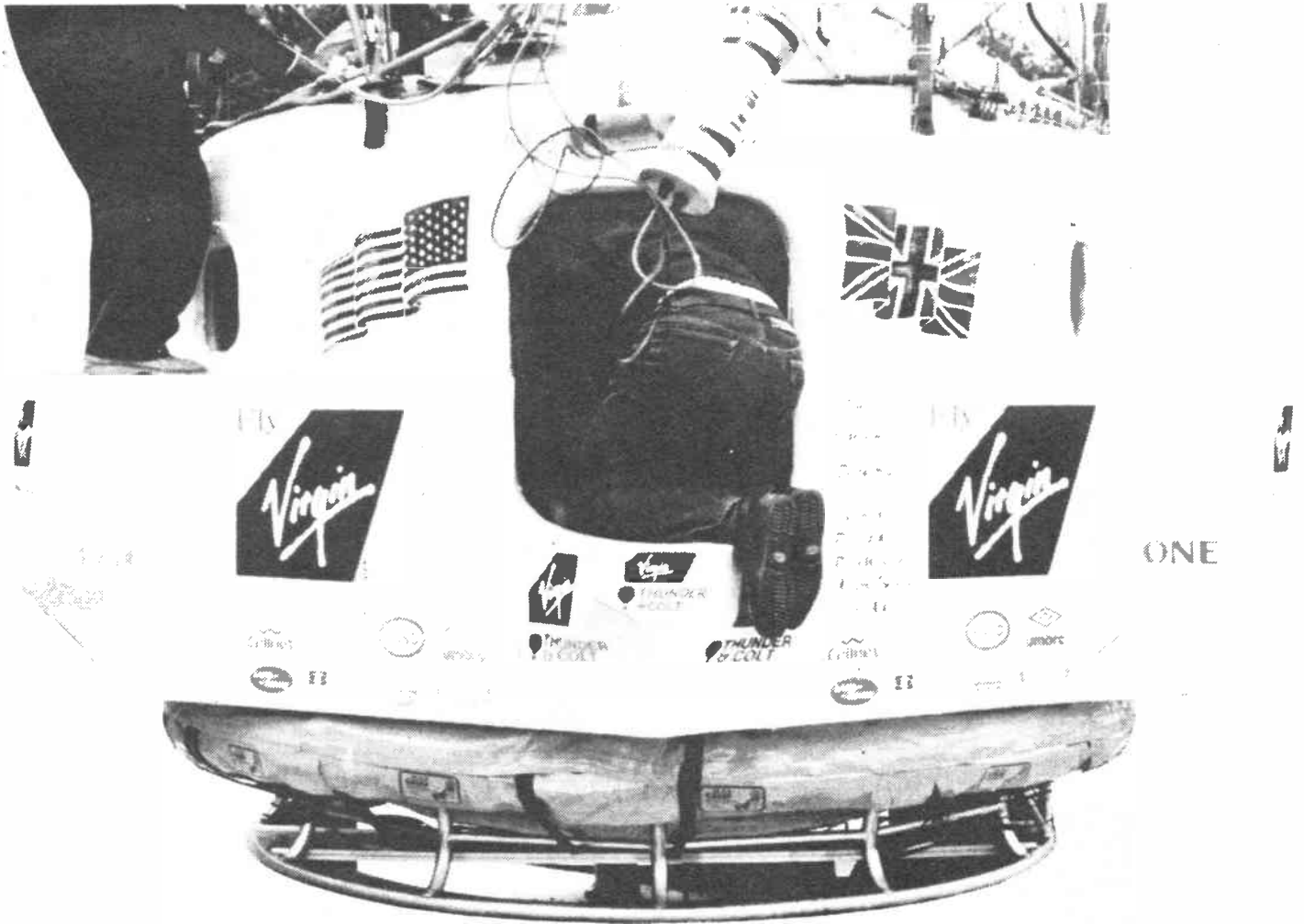
There is a choice of five scanning functions, full programmed memory, memory band and priority. The die-cast frame gives a solid construction featuring rubber gaskets for splashproof operation. The IC-32E is supplied with VHF/UHF a dual band antenna, BP3 battery pack and wall charger. OK, when are ICOM going to produce a new dual band mobile with full cross band duplex? The IC-3210E will be the answer.

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DX-TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

A steady increase in Band I activity was in evidence throughout April. Much of the reception was via Meteor Scatter reflection, with most signals lasting for many seconds rather than just the quick bursts so often experienced. This provided a more leisurely examination of the picture, which resulted in more signals being identified. Luckily most of the reception consisted of test cards or identification captions.

Sporadic-E made a brief appearance on the 2nd, 10th, 15th and 20th, but the long duration pre-season openings towards the end of the month, which most of us have come to expect over the years, did not occur.

Tropospheric DX reception provided the only means of seeing sustained signals during the month. April 4th and 24th were active in this respect with television signals arriving mainly from the Low Countries.

Nederland 3 TV

Many DX enthusiasts are able to receive the new Dutch NED-3 network on a daily basis from the Lopik transmitter on channel E30. Signals are present from quite a distance into the UK but enthusiasts living in the south of England have experienced problems from the Channel 4 broadcasts from Crystal Palace, also on channel 30. Here in Derby, the Dutch signal is present for most of the time but at an extremely low level. The only way to secure sound and vision is by using narrowband equipment, in this case, a D-100 converter system.

From what we've seen so far of the new service, the presentation is remarkably similar to the other two networks. One enthusiast has summed up his feelings about the new NED-3 programmes. In his words, 'They are as exciting as an empty car park!'. On present form, we are inclined to agree with him.

Mystery test card

On April 3rd, a mystery test card was noted in Derby via Meteor Scatter reflection on channel E2 at 0833. The test card looked remarkably similar to the one in use by the East German television service. Did anyone else see this?

DX-TV log for April

This month we are featuring the DX-TV reception log noted by the authors in Derby.

02/04/88: NRK (Norway) on channel E3 radiating the 'NORGE GAMLEM' PM5534 test pattern at 1153.

03/04/88: An unidentified test card on E2 at 0833 - see 'Mystery test card' above;

Swiss or West German FuBK test pattern on channel E2; SVT-1 (Sweden) on E2, displaying the PM5534 test card with 'KANAL 1' at the top, and 'SVERIGE' at the bottom.

09/04/88: CST (Czechoslovakia on channel R1 with the 'RS-KH' EZO test card at 1256.

14/04/88: CST on R1 showing the EZO test card; ORF (Austria) on channel E2a (Jauerling transmitter) with the 'ORF FS1' PM5544 at 1307; Unidentified FuBK test pattern received simultaneously on channels E2 and E4.

15/04/88: Unidentified Sporadic-E signal received on E2 at 1305; CST on R2 radiating the 'RS-KH' EZO test card.

16/04/88: SRG-1 (Switzerland) E2 (Bantiger transmitter) showing the '+PTT SRG1' FuBK.

21/04/88: West Germany (Saarländischer Rundfunk) on E2 displaying the FuBK with 'SR1 SAAR' identification; West Germany (Bayerischer Rundfunk) on E2 with the 'GRÜNTEN' FuBK.

25/04/88: CST on R1 using the EZO test card; SVT-1 on channel E3 broadcasting the 'KANAL 1 SVERIGE' PM5534 test pattern; unidentified FuBK card simultaneously seen on channels E2 and E4 at 1256.

26/04/88: West Germany (region unknown) on E2 with 'ARD/ZDF' logo; CST R2 displaying the 'RS-KH' EZO test card; West Germany (BR-1 Kreuzberg) E3 showing the ARD '1' logo.

27/04/88: TSS (Russia) on channel R2 transmitting the UEIT test card; unidentified programme received on channel R2; unidentified 'pulse and bar' test pattern on R1, possibly from Russia. CST R1 and R2 with the EZO test card; SVT-1 noted on E2 with the 'KANAL 1 SVERIGE' PM5534.

28/04/88: CST R2 using the EZO test card; SVT-1 E3 with the PM5534 test pattern.

29/04/88: TSS R2 UEIT test card; DR (Denmark) E3 with the 'DR DANMARK' PM5544; NRK E2 PM5534 (transmitter not identified); TVP (Poland) R2 noted using the PM5544 test pattern with dark background; CST R2 displaying the 'RS-KH' EZO test card; TSS on Band II channel R3, transmitting the UEIT test card; West Germany E2 using the ARD '1' logo at 1317. A co-channel NRK PM5534 was also present.

Reception reports

On 2nd April, Bob Brooks of South Wirral noted a singer and cabaret act in colour from Sweden. This occurred during a late evening Sporadic-E opening which lasted for well over an hour commencing at 2250 on E2, E3 and E4.

Attentive viewing on the 20th rewarded Simon Hamer of New Radnor in Powys with some Iceland reception. This was confirmed by the 'RUV ISLAND' PM5544 test card appearing on channel E4. Other signals that day included the Czechoslovakian EZO test card on channel R2 with the 'RS-KH' identification. Signals from the new NED-3 network in the Netherlands were logged on channels E30, E34, E35 and E42, during a tropospheric lift on the 24th. Several RTE-1 and RTE-2 transmissions from Eire were also noted during the opening in Band III and at UHF.

Major Rana Roy of Bikaneer in India, tells us that more TE (Trans-Equatorial) propagation has been experienced, mainly from Chinese stations on channel R1. The best time for reception seems to be from late afternoon onwards. During April there were 15 days of activity. The 26th was particularly good and his log for that date reads as follows:

26/04/88: Chinese TV on channel R1 with multiple images, although pictures became clear at 1505; the multiple images had returned by 1525. By 1700, the signals were exceptionally strong and accompanied by a loud drumming sound. At 1725 an EZO electronic test card with a circle could be made out for a few seconds. At 1730 some adverts were seen. Signals faded away at 1810. Note the reception of the 'EZO' test card. This is the same one that is used by Czechoslovakia, although a limited number of Soviet transmitters also radiate it. However, the time of reception seems rather late for a Russian station to be transmitting a test card.

Transatlantic DX reception

In recent years DX-TV reception from the Middle East has become commonplace, with exotic countries such as Iran and Saudi Arabia (Dhahran TV) appearing in TV DXers' logs. This may be due to favourable reception conditions, or simply increased vigilance on the part of the DXer. It would be fair to conclude that reception from the west must also occur, perhaps more times than we think, because certain Canadian transmitters are located at a comparable distance to the ones in the Middle East. Canadian/USA TV signals were received at least twice in the UK during the 1987 Sporadic-E season, and within the past decade at least one transmission has been identified as having originated from the Caribbean area.

Reception from across the Atlantic occurs at least once during most Sporadic-E seasons, but many DXers miss out because their aerials usually point

towards the Continent. It makes sense to keep a regular vigil to the west even when Band I seems dead; there doesn't have to be an opening to Europe. It may be worthwhile arranging for a two-element or even a three-element aerial to be directed in a westerly direction on a permanent basis rather than keep rotating the main array. Space, enthusiasm and personal finances will decide whether or not this is a practical proposition.

Monitoring the 6m amateur band around 50MHz for Canadian and North American amateurs, provides an ideal early-warning system for possible TV reception on channel A2 at 55.25MHz. This is the lowest frequency used for TV transmissions on the other side of the Atlantic. Unfortunately, the maximum usable frequency (muf) will not always rise high enough for its reception.

Different systems

TV systems which have different characteristics from those used in Europe are found on the other side of the Atlantic. System M is used throughout Canada, North America, the Caribbean and parts of South America. Some South American countries use a variant known as system N. The main characteristics of the two systems are as follows:

System M	525 lines	4.5MHz sound	60Hz field frequency	uses A channels
System N	625 lines	4.5MHz sound	50Hz field frequency	uses A channels

System M/N Sound and Vision Frequencies

Channel A2	55.25MHz vision	59.75MHz sound	(channel E3 vision frequency)
Channel A3	61.25MHz vision	65.75MHz sound	(just below E4 vision)
Channel A4	67.25MHz vision	71.75MHz sound	(slightly higher than E4)
Channel A5	77.25MHz vision	81.75MHz sound	(channel R3 vision frequency)

Band I channels A2, A3 and A4 are the most likely ones to be received via Sporadic-E propagation. However, there are many Band II (channel A5) transmitters operating along the east coasts of Canada and North America. In the Caribbean, channel A5 transmitters can be found in Cuba (Tele Rebelde), the Dominican Republic, St Kitts, the Virgin Islands and Puerto Rico.

Rolling picture

When a System M transmission is received using a normal UK/European TV set, the picture will roll rapidly on a weak signal until the frame-hold is reset. This is due to the difference in field frequency. Once adjusted, a picture with reduced height will be obtained. Tweaking the height control will correct this but a 525 line picture looks more authentic with reduced height! The line-hold control doesn't normally need adjustment because the line frequencies are very similar between the 525 line and 625 line systems. With the 525 line

system the line frequency is 15.750kHz whilst for 625 lines it is 15.625kHz.

System N is used in certain South American countries where the public electricity supply is 50Hz. If such a signal was received (without the sound), it would be indistinguishable from a European one; the vertical hold would not require adjustment because the field frequency is 50Hz. So next time you see Spanish or Portuguese captions, take a closer look as they may be from South America.

The accompanying map (see Figure 'A') shows the distribution of Band I TV transmitters along the east coast of Canada, North America and the Caribbean. Transmitter ERPs range between 5kW and 100kW. All transmissions use System M unless otherwise stated.

New Band I/II aerial

A wideband aerial system is now available to exploit the whole Band I and II tuning range of the D-100 DX-TV Converter System. The Band I/II aerial consists of two arrays sharing the same boom, thus allowing the DXer to make economical use of precious mast space. A 3-element array for Band I provides coverage of channels E2, R1, IA, E3, L2, R2, L3, E4 and L4 plus the OIRT FM band. A shared element is a feature of the

system (the Band I director forms the Band II reflector), therefore creating the equivalent of a twin-element array for Band II channels R3, IC, R4 and R5 plus the FM band up to 100MHz.

The price is £27.95 including delivery in the UK. Separate arrays for Band I and II reception are also available.

For further details of aerial systems for the D-100 DX-TV Converter and technical publications, enclose two First Class stamps (or three IRCs for readers overseas) and send to: *HS Publications, 7 Epping Close, Derby DE3 4HR.*

A new video is also available from *HS Publications*, providing an insight into TV DXing. A DX-TV installation is explored showing receiving aeriels and the equipment in action. For full details write to the above address.

Service information

France: The PM5544 test pattern with identification, is aired over each network for an hour before the start of daily programmes. The exception is the 'La

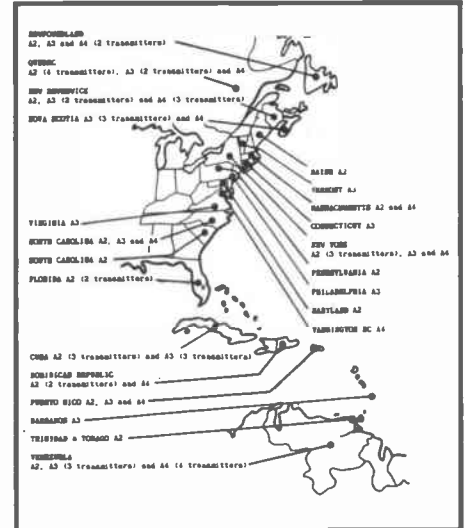


Fig A

Cinq' network where it is radiated for only 15 minutes. The programme transmission times (local time) are in the table on the opposite page.

The following transmitters are assigned to Métropole Television (M6) but channel details are still unknown: Charleville-Mezières, Bayonne (Rhune), Auxerre (Molènes), Toulouse (Pic du Midi). The latter three transmitters were due to enter service during June 1988.

The following 'La Cinq' (LA5) transmitters, are forecast to enter service before the end of 1988 (channels unknown):

Aurillac (La Bastide), Verdun, Auxerre (Molesnes), Bar-Le-Duc, Lillebone, Bergerac, Besancon (Lomont), Bordeaux (Cauderan), Dieppe (Bonne Nouvelle), Parthenay, Divonne Les Bains, Forbach, Hyères, Lisieux (Saint Desir), Rouen (Bois Du Roule), Vendome, Les Sables-d'Olonne, Fechamp.

Yugoslavia: Until September 15th, Yugoslavian TV is broadcasting a daily tourist information programme in English and German, which will be partly financed by the Yugoslavian motoring and tourist organisations. The programmes will originate from the Ljubljana and Zagreb studios.

India: The Indian TV service (Doordarshan Kendra) is regularly using the FuBK test card without a circle. It was noted during April from the new station at Agra on channel E9 with 'DOORDARSHAN KENDRA AGRA CHANNEL' superimposed over the pattern.

Denmark: Since May 9th, test transmissions have been on-air via the new Hove (Copenhagen) transmitters on channels E31 and E53 (both 600kW ERP). The DR service on channel E31 has been testing between 0800 and 1800 local time Monday to Friday using the PM5534 test pattern with 'DR' at the top and 'KBH VEST' at the bottom. After June 1st, normal programmes will be broadcast.

The new TV2 service on channel E57 is testing between 0800 and 1800 local time,

DX-TV RECEPTION REPORTS

DX-TV

Télévision Française 1 (tf1):	Mon-Fri 0645-0145	Sat & Sun 0700-0200
Antenne 2 (A2):	Mon-Fri 0645-Midnight	Sat & Sun 0900-0100
France Régions 3 (FR-3):	Mon-Sat 1030-Closedown (0000-0100)	
	Sun 0700-Closedown (between 0000 and 0100)	
Canal Plus:	Mon-Thur 0700-0300	
	Fri 0700-Sun 0300 (without interruption)	
Unscrambled Canal Plus transmissions:		
	Weekdays and Saturdays 0745-0825 (except Mondays)	
	1230-1400	
	1815-2030 (between 1815 and 2100 Wednesdays)	
	Sundays 1230-1400	
	1950-2030	
	Daily 0500-0430	
La Çinq (LA5):	Mon-Thur 0700-0200	
Métropole Télévision 6 (M6):	Fri-Sun 0700-0200 (without interruption)	

until its official inauguration on October 1st. The PM5534 test pattern is used with the identification 'TV2' at the top and 'KBH VEST' at the bottom.

West Germany: The FuBK test pattern is radiated over the WDR-3 network, initially with 'DBP WDR 3' identification. This then changes to 'WEST 3'. An analogue clock is also in use prior to the early morning programmes.

Since April 1st, a 20kW transmitter on channel E52 has been in operation near Düsseldorf radiating the 'RTL PLUS' service.

The BR-1 Ochsenkopf transmitter on channel E4, is being equipped with

facilities to provide 2-channel/stereo sound.

Sweden: A 1000kW transmitter is now operational on channel E39 radiating SVT-1 programmes.

Spain: Since the end of 1987, TVE-1 have commenced round-the-clock programming on Fridays through to Sundays; 18-hour a day broadcasts take place during the week.

Italy: The Italian private station operating on channel IA, which displayed the identification 'RADIO-TELE-UNO' across the test card, now shows just 'TELE-UNO'. To create confusion, Tele-Uno are re-broadcasting programmes

from the 'CANALE 5' network, using an on-screen logo consisting of the number '5'. The main captions are 'Tele Uno'!

A new transmitter is using channel E2. A caption has been noted but poor reception has meant that the identification has been difficult to read. One suggestion is 'Tele Radio Canale 25'. It's interesting to note that there was once a station called 'Tele Radio SA' listed on channel IB some years ago. It is possible that this network is still in existence and has expanded its coverage with further Band I channels.

An Italian private TV station is broadcasting from Swiss territory using channel ID (E5) in Band III. The station is 'Telecampione' and the transmitter is situated atop Monte San Salvatore in the Ticino canton of Switzerland. It beams programmes down to the small Italian town of Campione d'Italia, situated on the opposite side of the lake.

This month's Service Information was kindly supplied by David Bocca Corsico Piccolino (Italy), Gösta van der Linden and the BDXC (Netherlands), Simon Hamer (New Radnor, Wales), Alexander Wiese (Tele-satellit, West Germany), Bertrand Prince (France), Major Rana Roy (India) and Kevin Jackson (Leeds, United Kingdom).

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AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

Justification for the use of valuable radio spectrum space for amateur radio usually includes a reference to its value in furthering the understanding of radio propagation phenomenon. This may not seem quite so watertight a reason as it may have been in earlier days. However, the phenomenon of Sporadic E propagation has been investigated by radio amateurs in recent years. They have demonstrated that Sporadic E propagation occurs far more often and supports higher frequencies than professional literature would suggest.

Sporadic E propagation takes place via patches of highly ionised 'clouds' which form below the normal E layer of the ionosphere. They normally cover small areas, about fifty to one hundred miles in diameter and last a short time, disappearing as quickly as they form. They occur most during the mid-summer months in the northern hemisphere – though since the release of the 50MHz band in which propagation has been found Sporadic E frequently occurs – sometimes in late January and early February. Also, while normally observed during daylight hours from 10am to noon and again from 6pm to 10pm, propagation has been observed on such frequencies as 50MHz up to much later hours. It is thought to be usually 'short-skip', single hop propagation, which limits the distance covered to about 1,200 miles. However, again from experience on 50MHz, occasionally communication takes place over much longer distances, ie, across the Atlantic when propagation must be multiple hop.

Accurate knowledge of Sporadic E is still in short supply and those interested in the mode are being encouraged to monitor for it. Monitoring can be carried out by listening as regularly as possible on all the amateur bands from 10 metres through 6, 4 and 2 metres and also for DXTV and DXFM signals in the 40 to 80MHz TV bands, the 64 to 73MHz FM and the 87 to 108MHz FM broadcast bands. The new fashionable scanning VHF/UHF receivers are particularly useful in this field.

The editor of the RSGB's publication *VHF/UHF Newsletter*, David Butler G4ASR, is particularly interested in receiving reports of Sporadic E, and reports should be sent to him at Yew Tree

Cottage, Lower Maescoed, Hereford HR2 0HP.

Skitrek progress report

Enough information is now available to put together a concise account of this expedition's progress. Michael Meerma G0/PA3BHF, who was invited to attend the VIP get-together at the North Pole, has reported an exciting trip. He arrived in Moscow on 24 April after a four hour flight from England. Next morning he, and other representatives, left for a six and a half hour flight to Sredniy Island in Siberia. The following day they continued on the same plane to the Soviet Ice Island, North Pole 28. On 26 April, they were taken by helicopter to the actual North Pole. Expedition members had laid a small ring on the ground around a pillar of ice, with a flame on top, marking the actual position of the North Pole, with the sign 'Welcome to the North Pole'. The weather was excellent, with a blue sky and a temperature of minus 28 degrees Celcius. The Russians erected a few tents to accommodate a post office and radio station from which Michael made about fifty QSOs, using the calls EX0VE and C18UA. The Pole looks like a white, flat desert with no hills, only ice ridges up to six feet high. No animals were seen, although bear tracks were found.

There is a '1988 Polar Bridge Diploma' available to commemorate the expedition. To acquire this, logs must be submitted showing 3 QSOs with the North West Territory, Canada; 3 QSOs with Asiatic USSR; a QSO with one base camp station – either the Canadian or the Russian; one QSO with Ottawa and one QSO with Moscow. QSOs must be two-way and made between 15 February and 15 June 1988. Applications should be sent, in the form of a certified log entry – not QSLs – plus 10 IRCs to: CRRL National Awards Manager, Garry Hammond VE3XN/VE8XN, 5 McLaren Avenue, Listowel, Ontario, Canada N4W 3K1.

The finances for the expedition are open for contributions from anyone who might like to help. A bank account, 'Polar Bridge', has been opened with the Vnesheconombank, Moscow, USSR.

Space debris collision

Latest reports suggest the vehicle

from which RS2 and 3 were launched over four and a half years ago, exploded over India on 9 May last. It is thought that it was hit by, or collided with a 'fragment' of space hardware still in space orbit. This is thought to be the first occasion when 'fragments' of spacecraft have collided. It was said to have broken into twelve pieces, which themselves can present a hazard to other hardware still in orbit.

Weather FAX licences

We should perhaps remind readers that special licences are required for the reception of weather maps by FAX. The procedure for obtaining these is unusual. Application for a licence must first be made to the Meteorological Office (Licensing), Met 0 17, London Road, Bracknell, Berks RG12 2SZ.

The application must state the purpose for which the licence is required, ie for amateur weather forecasting, yachting, etc. Also indicated should be the equipment and frequencies to be used for reception and where the equipment is to be located.

If these broadcasts are not made 'for commercial purposes', you will receive a 'letter of permission', which you then send to the Department of Trade and Industry, Radio Licensing Department, Waterloo Bridge House, Waterloo Bridge Road, London SE1. They will acknowledge your letter with a request for the fee, which is now £10.00. It is a once only fee, so does not have to be renewed yearly. The title of the licence: 'Receiving Licence for the reception of meteorological information transmissions from Special Service Stations'. It might be as well to mention that this licence should also be obtained if you propose taking meteorological weather data in RTTY format.

Phase 3C satellite launch delay

As anticipated, the launch of the Phase 3C AMSAT satellite for 2 June was delayed to 8 June then 10 June. The previous launch, flight V23, with its Intelsat payload, was successful. The fuel operation of the joint AMSAT-NA and AMSAT-DL teams was completed without incident and the spacecraft was ready for launch as soon as the launcher itself was ready.

Phase 3C goes into general operation about one month after launch, depending on the number and timing of the on-orbit kick motor burns necessary to put it into its planned orbit. At the time of writing, operating plans had not been announced. However, based on previous discussions, it seems likely Mode JL operation will predominate. That is 2 metre uplink; 70cm downlink. The band-plan is assumed to be upper third for voice modes; lower third for digital modes such as CW, RTTY and packet radio and the middle third for mixed modes. By next month we hope to be able to report a successful launch of Phase 3C.

RSGB 75th anniversary year

Special celebrations to mark the 75th anniversary of the Radio Society of Great Britain will take the form of a three-day convention at the National Exhibition Centre, Birmingham on 15, 16 and 17 July. His Royal Highness, The Prince Philip, Duke of Edinburgh, KG, the Patron of the Society has been invited to officially open the ceremony and attend a special anniversary lunch. The convention will be open from 10am to 6pm on Friday and Saturday and from 10am to 5pm on Sunday. It will comprise the largest trade

exhibition of amateur radio equipment in the UK and a display covering the development of radio over the last seventy-five years. The trade exhibition will be held in Hall 3A and the 'Seventy-Five Years of Radio' exhibition will be in the Lucas Centre. Social evenings will be held on Friday and Saturday. It is hoped these will be in the form of lakeside barbecues opposite the Exhibition Centre.


The official opening will be held on Friday at noon, followed by the presentation of the 'Young Amateur of the Year Award'. At 1pm there will be the Anniversary Luncheon. At 2.30pm the exhibition will be open to the public. Admission will be by ticket only available at the door daily. Cost is £2.80 per day or £5.60 for three days. The events continue the following week (19-21 July) at the RSGB's Headquarters, Lambda House, Potters Bar; Hertfordshire, from 10am to 4pm. Tours of the building will be conducted for parties of ten or less and visitors will be able to see the workings of the Society and, if licensed, operate the HQ station.

An RSGB Data Symposium is being held on 22-23 July at the Harrow School, North West London. This will cater for those interested in amateur radio data

communication and will cover all modes currently in use as well as looking at future developments. There will be a series of lectures, open forums and demonstrations.

On 24 July is 'Families and Activities Day'. This will provide an opportunity for all affiliated clubs, groups and societies to celebrate the 75th anniversary in their own particular way. The Society is offering a case of champagne to the group which holds the most unusual or meritable event, which must involve 'the family' and include an amateur radio station.

Satellite Seminar

On 28 July, there is an International Satellite Seminar at the Inn on the Lake, Godalming, Surrey, held in association with AMSAT-UK's Colloquium, which takes place at the University of Surrey, Guildford on 29-31 July. This meeting is by invitation only and has been arranged in co-operation with the IARU to provide an opportunity for IARU societies, satellite groups, and individuals in the field of amateur satellites, to discuss the future of satellite projects. Finally, there will be the AMSAT-UK's third Colloquium, which looks like being even more successful than previous years. 

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MEDIUM WAVE

DXING



by Steve Whitt

Networking: radio's future?

When Independent Local Radio started in 1973, it was intended to provide a wide ranging broadcasting service to the whole of the community. It was also intended to operate on a local basis, but over the years, particularly the last four or five, major operational changes have taken place. In many ways the philosophy of providing a public service was at odds with ILR's stated commercial aims. Early casualties in the programming battle included anything that was expensive to produce and had only a minority interest.

A few stations bravely tried to make radio drama work, but it wasn't long before even the richer stations such as Capital gave up. The fact that programming was becoming narrower, and often pandering to the lowest common denominator to maximise audience figures, was largely overlooked by the IBA. It was this goal of maximum audience and consequently advertising revenue, that led to a nationwide uniformity and a criticism of the banality of ILR stations. With the exception of London, competition was almost non-existent since there is only one ILR station in each market area.

More recently, the profit motive has led to stations amalgamating across local boundaries to form substantial regional networks. Whilst programming has neatly slipped into the music and news format (with sports and phone-ins added), stations have found that networking saves on presenters as well as support staff (eg sales and marketing). Current network examples include Yorkshire Radio Network, which is a collaboration between R Hallam, Viking R and Pennine R. It has been operating just over a year now from its headquarters in Sheffield.

Another example is Great Western Radio, which was formed from R West and Wiltshire R, both of which no longer operate. GWR operates one of the most sophisticated networks involving three MW channels (936, 1161 and 1260kHz) and four VHF frequencies which can all be split to provide local coverage. Programmes are arranged so that the listener still thinks they are tuned to a local station. Both local programmes can be carried (at busy times of the day), or network

programmes are used with local automated insertion of commercials and jingles etc.

The most recent network is Midland Radio Holdings Ltd, which has an arrangement between BRMB in Birmingham (1152kHz) and Mercia Sound (1359kHz) in Coventry. So far there has been no impact on programming.

In addition to the networking concept, a number of stations have extended their financial empires beyond their broadcasting boundaries. For example, Red Rose R in Preston now controls R Aire in Leeds and Red Dragon in Cardiff. Similarly, Metro R in Newcastle owns Tfm in Stockton.

But where does it all go from here? If one views the USA as a pointer then it is quite possible that the UK could end up with unmanned fully automated stations. These stations are the ultimate in low cost operations since no local staff are employed. Programmes are satellite fed from a central programme provider, of which several already exist (eg Radio Radio operated by Virgin). Even the engineering staff are replaced by external contractors who are called in only when something goes wrong. The IBA has insisted this scenario won't arise, but when you look at the way it has allowed the Independent Local Radio rules to be manipulated, you cannot help but worry.

Last year the Government put forward some proposals concerning the future of radio, in which up to three new national networks and 300 private local stations would be created. The new legislation was originally planned for late 1988, and would have created a new Radio Authority to regulate all radio matters. As a result of this new legislation, the IBA would lose control of local radio stations, thereby opening the door to greater competition. This situation will not now take place for the foreseeable future, since the government has recently shelved all its plans due to insufficient parliamentary time. This is the second time that plans for community radio have been dropped prior to any parliamentary debate. In 1986 and now in 1988, the IBA and the local radio stations still have their monopolies intact. The future of broadcasting in the UK remains in the balance.

Medium wave and sunset

Every MW listener has noticed how well faraway signals can be received after dark, with reception becoming possible around dusk. Previously in this column, I have explained some of the mechanisms of the ionosphere that lead to this distinctive daytime/night-time divide in MW propagation. To summarise, during daylight hours the sky wave is almost totally absorbed into the ionosphere, but with the approach of sunset, this absorption decreases rapidly. Within a couple of hours of sunset, absorption has fallen to a very low level, persisting throughout the night. Even so, every time a signal is reflected back from the ionosphere at night it loses about 12dB in strength.

Newsdesk

Fire: Over the years, there have been numerous sagas involving the independent radio operators. Although not strictly legal, they have become the major force in broadcasting in this country. In yet another attempt to sort out the legal footing for radio, the Irish parliament has been considering a new Radio Bill. It was thought that legislation might be ready next year, but recent comments from Ray Burke, the communications minister, suggest that these laws might be ready before the summer recess. It is claimed that any new law will put the pirates off the air and replace them with authorised local stations. In previous years radio legislation has failed and the pirates have continued, but this time many reformers are confidently waiting to see what happens. The future plans envisaged by the Irish government only allow for two independent stations in Dublin, one in each of the other major cities and one per county; compare that with over 60 stations operating on MW today.

If you want to hear those pirates before any legislation comes into force, you'll need a good listing of operators. I can highly recommend the regularly updated list of 'Independent Stations from Ireland' published by Anoraks-UK, PO Box 539, Blackpool FY1 4RE. This list contains over 100 MW, FM and SW stations, complete with frequencies, addresses and phone numbers. The majority of the stations (over 60) operate on MW, so the list should be of use to the MW DXer. I don't have the current cost of this publication so phone the publishers (0253 882017) before you order.

Germany: Following the March issue of *R&EW*, Deutsche Landfunk (DLF) has now obtained supplies of its 'Magic Disc'. This is a simple device placed next to a portable radio to improve reception of DLF on 1269kHz. It is, in fact, a cleverly designed MW loop aerial with fixed tuning to one frequency. Unfortunately, DLF's original plans to sell these units to listeners to improve summertime reception has fallen foul of legal problems. According to Jack Weymar, Head of DLF English Service, the magic discs can only be given away as competition prizes, for the time being at least. DLF is in English

MEDIUM WAVE DXing

at 1815-1900hrs UTC on 1269kHz.

International waters: With the remnants of Laser 558 still resting on a mudbank in the River Stour (near Harwich), the sole operator from the North Sea is that evergreen Radio Caroline. This, despite widely touted rumours of various new offshore enterprises. The engineers on the merchant vessel 'Ross Revenge' have not been idle, as extensive aerial reconstruction has allowed the addition of a shortwave service and the return of a second MW service.

World Mission Radio on 6215kHz is probably very lucrative for the Caroline organisation, since it airs paid-for religious programmes. On MW however, the normal Caroline programmes continue on 558kHz. 819kHz has recently been reactivated with tests for a new Dutch service which at first sight doesn't seem to be Radio Monique any more.

United Kingdom: BBC R Gloucestershire has been testing its new MW transmitter (603kHz) since May and has been relaying BBC Radio 2. At the time of writing the BBC had not given an exact start date, however, the station is expected to be operational by August. The transmitter is only 100-150W but the low frequency ensures very good ground

wave coverage. In fact, Nick Rank in Buxton, Derbyshire, first alerted me to these tests. Even in Ipswich, where Invicta R is like a local on 603kHz, it's possible to clearly receive R Gloucestershire by using a directional loop aerial.

IBA: Tune in to 1170kHz in the north-east and you'll no longer hear Radio Tees. The station hasn't actually gone, but as part of a new image it has renamed itself Tfm.

DX File

The serious MW DXer will probably want to keep a list of all countries heard. But for the purposes of definition what is a 'country'? This has long been debated by those who wish to define countries for contest purposes. Over the years, a highly respected amateur award (DXCC Award run by the American Radio and Relay League) has spawned a regularly up-dated list of eligible countries entitled: *The DXNS DXCC Countries Guide*. This list is equally suitable for the MW DXer, although something like 50% of all the countries listed don't have any MW stations! However, the guide does include over 300 current countries, together with a 'deleted' section and a reference list of previous names of countries. This vital countries informa-

tion is available for £1 from Geoff Watts, 62 Belmore Road, Norwich, Norfolk NR7 0PU. Please don't forget to mention **Radio & Electronics World** when you write.

Stable ground wave reception

Summer DX conditions have come early this year with extended periods of stable ground wave reception. This means that with a directional aerial one can pull in a wide variety of UK local radio stations. Even with portable radio and its built-in ferrite rod aerial, it is easy to separate different stations sharing the same frequency. On a quiet thunderstorm-free day you'll probably be surprised how far signals can travel. For the best results, a loop aerial is essential, since it will boost the strength of the very weakest groundwave signals, giving very good directional characteristics. Using such an arrangement here in Ipswich, I can listen during the day to BBC R Jersey on 1026kHz (390km distant), even though BBC Cambridgeshire which is 72km away, shares the channel. If you tune around the MW band this summer do let me know how you get on. You can drop me a line care of the **Radio & Electronics World** offices. Until next time, good DXing.

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Subminiature ceramic plate capacitors 100V wkg vertical mountings, E12 series	
2% 1.8 pf to 47 pf - 3p, 2% 56 pf to 330 pf - 4p, 10% 390p - 4700p.....	4p
Disc/plate ceramics 50V E12 series 1P0 to 1000P, E6 Series 1500P to 47000P.....	2p
Polystyrene capacitors 63V working E12 series long axial wires	
10 pf to 820 pf - 3p, 1000 pf to 10,000 pf - 4p, 12,000 pf.....	5p
741 Op Amp - 20p, 555 Timer.....	22p
cmos 4001 - 20p, 4011 - 22p, 4017.....	40p
ALUMINIUM ELECTROLYTICS (Mfda/Volts)	
1/50, 2.2/50, 4.7/50, 10/25, 10/50.....	5p
22/16, 22/25, 22/50, 47/16, 47/25, 47/50.....	6p
100/16, 100/25 7p; 100/50 12p; 100/100.....	14p
220/16 8p; 220/25, 220/50 10p; 470/16, 470/25.....	11p
1000/25 25p; 1000/35, 2200/25 35p; 4700/25.....	70p
Submin, tantalum bead electrolytics (Mfda/Volts)	
0.1/35, 0.22/35, 0.47/35, 1.0/35, 3.3/16, 4.7/16.....	14p
2.2/35, 4.7/25, 4.7/35, 6.8/16 15p; 10/16, 22/6.....	20p
33/10, 47/6, 22/16 30p; 47/10 35p; 47/16 80p; 47/35.....	80p
DIODES (piv/amps)	
75/25mA 1N4148 2p, 800/1A 1N4006 6p, 400/3A 1N5404 14p, 115/15mA OA91.....	6p
100/1A 1N4002 4p, 1000/1A 1N4007 7p, 60/1.5A S1M15p, 100/1A bridge.....	25p
400/1A 1N4004 5p, 1250/1A BY127 10p, 30/45mA OA91 6p, 30/15A OA47.....	8p
Zener diodes E24 series 3V3 to 33V 400 mW - 8p, 1 watt.....	12p
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ATV ON THE AIR

Andy Emmerson G8PTH puts you in the picture

It's time once more for our three-monthly report of what's been happening on the air, plus a round-up of repeater news. First of all the activity news...

Roland G4UKL is one of our keenest SSTV correspondents (we can always do with more, though!) and hopes to get to the Dayton 'Hamvention' next year. In the meantime, he writes from Treverva (Cornwall) that this year's IVCA international SSTV contest (held at the beginning of April) was heavily contested, with stations from Sweden, Hungary and Yugoslavia leading the field. Results had not been announced at the time of writing, but Roland reckons the first three will come from the countries mentioned. He had reasonable luck in this contest, with some surprising contacts. An hour of much-QRMed two-way colour SSTV was worked via the long path with Stan VK3TE in Melbourne, Australia. He was running an FT-101 barefoot into a mono-band beam. Among other two-way exchanges were: ZS6BTD, PY5BYE, 4Z4PR, 8P6DP, JA1HHL, LU5NA, VE1AMA and ZL1ARY. In all, 33 countries were worked two-way.

Roland has also added some more remarks about the QRM caused by R/T stations working on the SSTV frequencies and the behaviour of some USA DX net 'anchor men'. We'll pick these up in a month or two, because this is a real problem which won't go away by itself.

Eric Robinson G1AIB sent a welcome letter from Poolbrook, near Malvern in Worcestershire. He writes, 'I was nominated or "volunteered" to write to you about what's happening around the Worcs/Glos borders. Every Friday night at 20.00 local time the "Three Counties Slow Scan Net" goes on air for about two hours. Frequency is 144.5MHz. The members at the moment are Leo G3CPG (Malvern); John G3CXI (Bishop's Cleeve), Terry G3TRB (Droitwich), David G3VQC (Worcester), Joe G3CLE (Malvern), Lee G1CBL (Malvern) and myself Eric G1AIB (Malvern). Leo and John both use Spectrums and the G3WCY/G4ENA system. Lee and Joe only use Spectrums. Terry uses a Wraase and David has a Robot. I am receive-only with a CBM-64 (if anyone knows of a transmit/receive program for the Commodore 64, please let me know). In the meantime, I am forging ahead with a full-blown G3WCY/G4ENA system and should be up and running by the winter.

'The net exchanges pictures in 8, 16, 24, 32 and 48 second mode, in monochrome and colour. A variety of pictures are transmitted, and various topics discussed. We are always on the lookout to make welcome new members to the net. We have been established for about six

months now and are still going (and growing) strong. In addition to all this activity on Fridays, there is also a smaller net operating on Monday evenings using Spectrums, in what is called Spec-Comms. That is transferring Spectrum machine code over the air and resolving it on-screen. It's just like loading a program off tape but in this case it's off the radio. The idea is to send good quality pictures or screens to each other. I dare say that some of our readers will not believe that there is life in this neck of the woods, but I can assure you we are alive and kicking. Carry on the good column and I look forward to keeping you in touch with what goes on in the Three Counties Slow Scan Net.'

Microwaves

Moving to the fast-scan frequencies, Bob Platts, G8OZP (of the G0AVG group), writes from Rolleston-on-Dove, Staffs, about the expanding activity on 3cm. On 15th May, he took his gear to Drum Hill (Derby) and was rewarded with a P5 two-way contact with Dave G8NND, on Barr Beacon (Birmingham). On the same day Bob G8VBA, had a P1 exchange with Dave over the same path, using a standard Solfan head and Solfan horn. On Sunday 29th May, he ventured to Yorkshire from where he had a two-way exchange of pictures, again with G8NND. This time the path was 67km between Maltby, near Rotherham, to Bishop's Wilton on the Yorkshire Wolds. The weather was very poor but the pictures were P5. Later that day he drove on to Rosedale on the North Yorkshire Moors and again worked a two-way with Dave over the 102km path back to Maltby. Signals again were P5. After removing the Caissegrain reflector and feedhorn from the dish, Dave found he could even get P0.5 to P1 pictures on open waveguide.

'I had to terminate transmissions very rapidly', continues Dave, 'when one of the most horrendous thunderstorms developed very quickly (I must have upset the gods). Lightning flashed and thunder rolled around the hilltops. I have never dismantled a seven element 2m beam so quickly. I got thoroughly soaked and was unsure whether to get in the car, under the car or as far from it as possible. It's a very good pastime, this 3cm!' Sounds kind of unusual anyway. Bob adds he is QTHR and will help if anyone is looking for a contact or for test signals on 10.25GHz.

Special event activity

John Stopford G8UWS has moved to a more elevated spot between Folkestone and Dover; he looks forward to working

French hams on 1255MHz. At the moment his receiver is with its designer, Marc F3YX for a tweak, then it's all systems go!

And now for some special event activity: GB75TV is the callsign of the station being operated over the Saturday and Sunday of the August Bank Holiday weekend. Apparently, they tried to get GB75ATV but that had already been claimed by the Home Counties ATV Group for their special event station (25th and 26th June) at the Middlesex Show, near Uxbridge. Anyway, GB75TV is being run by the GB3RT (Rugby TV Repeater) team, which means they will probably be active on 24cm as well as 70. The site is Shenington, an elevated village north-west of Banbury, Oxfordshire.

Royal occasion

Other out-of-the-ordinary ATV activity will take place on Friday 15th July, at the opening of the RSGB National Convention (NEC, Birmingham). The ceremony is being performed this year by HRH The Duke of Edinburgh and this very auspicious occasion will be recorded on TV by BATC members. The RSGB asked the BATC if they would be prepared to do this and they did not have to ask twice; it's not often that BATC members get a chance to play 'real' television (except the ones who do it for a living!). In the 'olden days' the BATC used to mount far more outside broadcast operations—why these have declined I'm not sure. Perhaps it's because lightweight home video apparatus has made it all too easy, but this job at the NEC will have full lighting, proper staging and the 'full works'. We wish them well.

Repeater news

South Wales may get its own TV repeater if plans being hatched by Phil Balaam work out. He is looking for support to build a repeater on the Wenvoe mast site, so give him a ring on (0222) 593456 if you are interested. The Severnside repeater group has offered to help and there is a possibility of a 10GHz link between the two 'boxes' if this proves licensable. Already the Severnside (formerly Bristol) repeater has good coverage of some areas across the estuary and Brian GW6BWX has joined the committee with the intention of building up the number of Welsh users. The repeater is now running full power from an Alford Slot, covering an area 60 to 70km across. The group has 50 members and is financially sound.

In Nottingham, GB3NV is now licensed and operational; they hope to move to a better site. GB3ET (Emley Moor TV tower in Yorkshire) hopes to receive its licence

soon; it should have excellent coverage. GB3TV (Dunstable) is considering a remotely-sited 10GHz 'gateway', to give users in Bletchley and Milton Keynes an alternative way of getting in. Dave G4NJU is the engineering director for this novel project.

GB3RT, the Rugby repeater, is on the air at last! The good news came in a phone call at 11.30 GMT on Friday, 3rd June and five minutes later the 'box' was on the air. It took all of five minutes, because Mike G6IQM, the repeater keeper, had to change the EPROM in the call sign generator from his own call to that of the repeater! Initial reports are good, with more than adequate coverage in most directions. Plans are afoot to move it to the top of a nearby commercial site, which should improve coverage in the directions currently shielded by Badby Hill.

Bath's GB3UT repeater is the sole AM machine in Britain, GB3VI (Hastings) having not yet come on air. A single Tx/Rx antenna is used, with 4W ERP. It has a good site on the university, although hilly terrain thereabouts reduces the coverage. Most users have home-made equipment and the instigators felt that simple reception on an unmodified TV set was paramount. Credit is given to some very dedicated users. They hope to interlink one day with GB3ZZ in Bristol.

The Stoke repeater GB3UD has been on the air some 14 months now, putting 5W to two Alford Slots. Coverage is

currently from Wigan to Birmingham. This should improve to include Coventry when the site is changed. They have a scheme for chaining through several repeaters, under tone control, once this becomes legal.

GB3HV (High Wycombe) is an odd man out. It is the country's only machine on channel RMT3, because of a 2 gigawatt ERP radar at Heathrow airport. The unique aerial system uses two 45 degree directional beams each for transmit and receive; these have some overlap at the 3dB point. On receive the antenna picking up the stronger signal switches out the other, to achieve the best signal-to-noise ratio. The beacon mode is not continuous, so that other repeaters can be seen during lifts for example. It achieves a P5 signal at 40 miles and is seen in Aldershot, Guildford, Reigate, Newbury, the South Downs and central London. The team has identified sites in its coverage area where GB3CT, TV and VR can also be received; these would make potential interlink sites, though users would have to select on the audio channel which repeater they wished to be patched through. They have also suggested to the RSGB that they broadcast the GB2RS news (reply awaited) and they are working on an on-screen P meter which comes on when you drop carrier. GB3VR (Brighton, Sussex) has applied for permission to duplicate its output on 13cm, in order to evaluate the band for links. A permanent link between VR and HV is proposed.

Concern is being expressed at the proposed bandplan allocations for packet radio (PR) on 23cm by ATVers in the London and Home Counties region, an area with the highest activity levels of ATV – and packet radio! The RSGB has proposed that PR should operate on 1240 and 1299MHz, which you might think are well out of harm's way and should upset no-one. Unfortunately the High Wycombe TV repeater, which serves this area, operates on channel RMT3 and these frequencies are inside the input and output channel passbands. PR is not (generally) affected by ATV, but PR shows up as interference on ATV. Ideally some other frequencies can be found for PR, otherwise some proper tests must be conducted to find out how real the interference is and what compromise can be achieved. We don't really want frequency wars in the 'vast open spaces' of 23cm.

It is now clear that we need much better technical co-ordination between the repeater groups. Two urgent tasks must be sorted out. One is allocating time slots for each repeater's beacon mode, so that well-sited users can try to access more than one machine. The other job is to agree link protocols and a common system for networking and remote control.

And that's it again for this month. How about some more reports for next time? I want to know, does anyone still use 70cm or is it entirely dead now? Convince me!

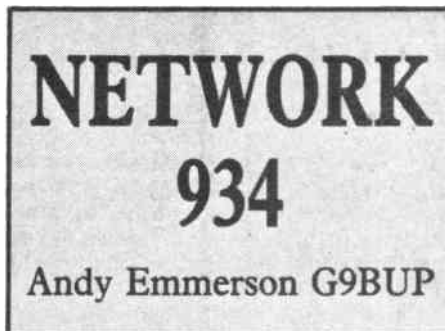
NEW

Horizontal polarisation

Terry Wyatt (HC 62, UK 845) writes from Walton-on-Thames to explain his position on this subject. All discussion is welcome, and here are his views.

'I refer to your article in the May issue of *Radio & Electronics World*. Your view is indeed interesting, but I would ask you to give further consideration to the matter, as the motive in putting my view would not appear to have been made clear or appreciated.

'I am not of course aware whether operators in the Northampton area suffer interference (they don't!), but here, on the fringe of London, considerable interference is experienced, and also perhaps to stations in large towns or cities throughout the country. I took advice from Robert Pringle of the DTI, given in reply to questions following his address to members at last summer's AGM (1987) of the UK 934 Club. Concerning interference, his advice was to change to horizontal polarisation. I of course appreciate the position as to mobile operators transmitting vertically polarised, but the argument I was advancing was that a horizontally polarised beam would be *additional* to a collinear and a vertical beam. I therefore hoped that a three-way masthead



switchbox could become available (eg with two relays.)

These are certainly fair points, assuming operators are prepared – and able – to put the extra hardware in the sky. I appreciate that some people just cannot work vertically polarised, owing to cellular interference. The trouble is that there's just no simple answer, or is there? Let's have some suggestions...

Out and about

Terry also mentions the 934 mobile operators 'meet' at Epsom Downs in Surrey. It takes place on Sunday 18th September at 1100. The precise location is the 'London View' car park, behind the grandstand. It is arranged by the UK 934

Club's representative for Surrey, Brian BH 172, of Weybridge. It's a bit far for me to visit, but I have heard consistently good reports of this meeting so you should get there if you can.

On-air news

'Plentiful high-pressure weather in recent weeks brought out quite a few stations, in particular on the evening of May 16th' (writes Terry UK 845 in another letter). He personally made contacts with six counties: Cambridgeshire, Derbyshire, Hertfordshire, Leicestershire, Norfolk and Warwickshire. It was an enjoyable evening, with the best DX conditions he can recall. It was also pleasant to make several first-time contacts with fellow UK club members and other stations.

This year's 934 Club AGM (UK) was held on May 15th at Brunel University in Uxbridge. Sierra Tango 90, Stuart, of Worthing was elected Sussex representative of the club, while Brian BH 172 (Weybridge) was elected onto the committee. Brian incidentally gives a news broadcast on alternate Mondays on channel 8 at 2030, being the Surrey representative of the club.

We've had another QSL card submitted by John GB 581 (Cannock Chase),

ATV ON THE AIR

showing how he used to operate portable, with Delta transceiver, Nicad batteries and 12-element beam before acquiring a hand-held rig.

Short Range Radio

John also wrote that he takes *R&EW* every month, but had not seen any mention of the DTI's statement on 934MHz and the new SRR system. So he kindly sent along a copy of the DTI's press notice. Here are some significant extracts, with my emphasis in italics.

'The Government, in common with other administrations in Europe, is to consider the introduction of a Short Range Radio (SRR) system in the 933-935MHz band. One of the existing users of this band is the 934MHz CB allocation. *Approximately 3,000 users have these sets out of a total of over 115,000 CB licensees.*

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

'I have therefore decided that the performance specification MPT 1321... should be withdrawn from 30th Decem-

ber 1988. This will provide warning to traders and potential users alike that no new sets should be made or imported from this date.

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

You may care to note the following points:

1. Firstly, this is the first time we have had an official statement of the number of 934MHz users.

2. It is stated that interference will be *inevitable*, yet the Government is only considering introducing SSR. This does not follow, so do I detect a foregone conclusion?

3. That said, the clear impression is that existing users will be allowed to continue using their sets, which must be a good thing. My guess is that when most of the best DX work is done, mid to late weekday evenings and on Sundays, the SSR users will not be inactive. It is said that existing users must have a fair life from their sets, so it is only reasonable they should have the same degree of 'protection' as the newcomers who have shown no previous commitment to the frequency.

4. No new sets have in fact been made for some time now, nor were likely to be, so the withdrawal of MPT 1321 is totally irrelevant.

Future mode

The DTI also states there is likely to be a big demand for SSR from small businesses - this is probably true. If there is no corresponding take-up from the general public, this may give rise to a happy co-existence where business users predominate from 9 to 5 weekdays and hobbyists continue to work simplex the rest of the time. Well, it's possible, and it could work out well; the extra demand may bring down the price of antennas and accessories.

According to the DTI, SRR is likely to prove popular elsewhere in Europe. It is hoped that the new UK system will be compatible with our European neighbours. I hope so: you can take a 2m amateur rig and use it virtually anywhere, so why not the same for CB? John also sent me the draft technical specification, which is too long to reproduce here, but if anyone wants it they can have a copy by writing to the DTI, Room 613, Waterloo Bridge House, London SE1 8UA. Tel: 01-215 2171. Ask for the CEPT digital SRR specification. NEW

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Short Wave News for DX Listeners

by Frank A Baldwin All titles in UTC, bold indicate the frequency in kHz

African stations on the 90m band (**3200 to 3400**) are always of some interest to those who rove over the Tropical Bands in search of DX transmissions. Throughout the year such stations operating from the 'Dark Continent' may be heard during our early morning and evening periods, the latter usually proving to be the most favourable.

In this update, the latest information available, with reference to African transmitters, is provided for readers interested in logging some of the signals emanating from Africa on the 90m band.

Most often heard

The transmitter providing the most often heard signals, at least as far as the writer is concerned, is the 100kW Radio Mozambique, Maputo which operates on **3210** entirely in Portuguese from 0255 to 0545 and from 1500 to 2210. From around 2100, to sign off, is the period during which most log entries of Emissao Nacional are made during our summertime period.

Another dependable signal is that of Radio Ghana in Accra. Operating entirely in English, which makes identification an easy matter, it is heard on **3366**. On this frequency it radiates GBC2 programmes from 0530 to 0900 and from 1700 to 2300 with a power of 50kW.

More difficult

TWR (Trans World Radio) Manzini in Swaziland can sometimes be heard on **3200** where it transmits German from 0400 to 0430; English from 0430 to 0530 and from 1900 to 2015; Zulu from 1700 to 1730 (Saturday and Sunday until 1745); Xhosa from 1745 to 1815 and Ndebele from 1815 to 1830 (Saturday and Sunday until 1845). The power is 25kW but I should add that TWR on this channel operates to a seasonal pattern, as far as can be determined from observations, from January to April.

Sometimes logged, if conditions for African reception on the band are good, is Radiodiffusion-Television Togolaise in Kara, Togo. Identifying as Radiodiffusion de

Kara, it radiates Home Service programmes in French and vernaculars from 0525 to 0900 and from 1630 to 2305 with a power of 10kW on **3222**. Unfortunately, the frequency is more often than not subjected to utility interference.

ELWA (Eternal Love Winning Africa), Monrovia, Liberia on **3230** is regularly heard by UK DXers. At 10kW, it is operative with the Home Service in local vernaculars from 1805 to 2222 Monday (Tuesday to Friday 1805 to 2202) and also Sunday from 0610 to 0802.

Another Liberian transmitter sometimes logged is LBS (Liberian Broadcasting System), Monrovia on **3255** which operates entirely in English. With a power of 50kW, the schedule is from 0455 (Saturday from 0520, Sunday from 0558) to 0900 and from 1900 to 2400. There are newscasts at 0700, 1900, 2100 and 2300 and a relay of the Voice of America news at 2145 Monday to Friday inclusive.

ORTN (Office de Radiodiffusion Television du Niger) Niamey, Niger can sometimes be heard when conditions on the 90m band are right for African reception. Niamey transmits the Home Service 1 entirely in French on **3260** from 0530 to 0700 and from 1700 to 2200 (Saturday and Sunday from 1630 to 2300) with a power of 4kW.

SWABC Windhoek, Namibia can often be heard on **3270**, and features programmes in the Home Service 1 in Herero, Damara and Nama from 1600 to 2200. The All Night Service 'Radio Orion' operates from 2200 to 0358 in Afrikaans, English and German, the power being 100kW.

Difficult one

A difficult one to log is Radio Madagascar, Antananarive which transmits the Home Service in Malagasy and French on **3288** from 0200 (Sunday from 0300) to 0500 and from 1600 to 2100 (Saturday and Sunday until 2400) with a power of 10kW. It is rarely reported in the SWL press.

Sometimes logged

On nearby **3289.9** (ex **3295**)

is the sometimes logged ZBS (Zambia Broadcasting Services) Lusaka, Zambia carrying the Home Service in vernaculars. At 10kW, it is on the air from 0345 to 0530 and from 1545 to 2100 (Saturday and Sunday until 2205) with English news bulletins at 0500 and 1800.

On the air

AFRICA

Benin

Cotonou on **4870** at 2300, OM with the station identification followed by an orchestral rendition of the National Anthem and off at 2302 UTC. At 30kW, Cotonou is on the air with the Home Service in French and vernaculars from 0500 to 0800 (Saturday and Sunday from 0600 through to 2300), from 1100 to 1400 and from 1600 to 2300.

Nigeria

Lagos on **4990** at 0513, religious pop songs and announcements in English during a Sunday morning broadcast. Lagos has also been heard at 0404 when featuring an English newscast of both local and world events. On this frequency, Lagos is active with the Home Service 1 in English and vernaculars from 0430 to 2310 with a power of 50kW.

Togo

Togblekope on **5047** at 0547, OM with a talk in French, tribal chants, chimes at 0600 followed by the station identification in French. Togblekope is on the air with the Home Service in French and vernaculars from 0530 to 0803 and from 1703 to 0005 with a power of 100kW. An English newscast is timed from 1950 to 2000 daily.

Uganda

Kampala on **4976** at 1905, OM with a news bulletin in English (also in parallel on **5027**) until 1927 followed by a music and songs programme in vernacular. Radio Uganda operates the Home Service in English and vernaculars on this channel from 0300 (Saturday and Sunday from 0345) to 0600 and from 1300 (Saturday

and Sunday from 1400) to 2100. The power is 50kW, the parallel frequency at 20kW featuring various programmes at no set time.

CENTRAL AMERICA

Costa Rica

Radio Reloj, Irazu on **4832** at 0532, OM with news of both local and world events. The schedule is around the clock with a power of 3kW operating entirely in Spanish. With reasonable conditions for Latin American reception prevailing, Radio Reloj puts a good signal here into the UK.

SOUTH AMERICA

Ecuador

HCJB Quito on **3220** at 0248, when featuring a religious talk in Spanish. On this frequency, HCJB transmitted programmes in Quechua from 0830 to 1430 and from 2100 to 0200, Spanish being used from 0200 to 0500. The power is 10kW. HCJB Quito has also been heard on **9675** at 0802 when presenting a religious talk during the English transmission for Europe timed from 0700 to 0830.

Guatemala

Radio Cultural, Guatemala City on **3300** at 0250, Spanish announcements followed by some light orchestral music. This 10kW transmitter is operational from 1000 (Sunday from 1100) to 0700 and sometimes to 0730. An English programme was featured from 0300 (Sunday from 2345) to 0430, the power being 10kW. Provided the co-channel utility transmitter is off the air, Radio Cultural does provide some pleasant early morning music which is easily heard in the UK.

Peru

Radio Andina, Huancayo on **4996** at 0356, YL with an impassioned political speech followed by OM with a talk in Spanish.

Venezuela

Radio Occidente, Tovar on **3225** at 0102, OM with a talk in Spanish about Nicaragua. This station is on the air from 1000 to 0400 with a power of 1kW, the frequency being variable from **3224.7** to **3225.2**.

Radio Mundial Bolivar, Ciudad Bolivar on **4770** at 0158, local pop songs and music followed by promotions, station identification and a Spanish talk. The schedule is from 0900 to around 0400 with a power of 1kW.

ASIA

China

CPBS (Chinese People's Broadcasting Station) Beijing on **17605** at 0539, a talk in Chinese during the Domestic Service 1 programme from 0103 to 1005. The power is 50kW. CPBS Beijing on **17700** at 0533, Chinese songs and music in the Domestic Service 2 programme timed from 0218 to 0800 at 50kW.

Bangladesh

Dhaka on **17870** at 1251, local style music with songs in Bengali during the English transmission timed from 1230 to 1300.

Taiwan

Taipei relay of WYFR on

15055 at 1406, choir with hymns, OM with some announcements then the station identification during the English programme for South Asia, timed from 1302 to 1502.

United Arab Emirates

Abu Dhabi on **17645** at 0625, Arabic music and songs, the station identification and frequencies then time check pips at 0600 followed by a newscast in the Arabic presentation to the Middle East timed from 0400 to 1200.

SOUTH EAST ASIA

South Korea

Seoul on **15575** at 1818 when featuring a talk about the President and his domestic policies, followed by the station identification. This English transmission to Europe is scheduled from 1800 to 1900 daily.

Sri Lanka

Colombo on **11800** at 1436 with songs, music and some announcements during the

Hindi programme for South Asia scheduled from 1330 to 1630. Also heard at 1809, when radiating a newscast in English followed by a song in Sinhala during the English-/Sinhala programme for the Middle East timed from 1745 to 1845.

EUROPE

Iceland

Ríkisutvarpid on **7933** at 1845, the station identification followed by a newscast in Icelandic. Also heard in parallel on **9986**, the schedule being from 1845 to 1935.

PACIFIC

Australia

Carnarvon on **9770** at 1412 when radiating a talk followed by the station identification, 'Waltzing Matilda' and sign off at 1428. This Chinese language transmission is scheduled to South East Asia from 1330 to 1430.

Shepparton on **15240** at 0535, OM with a rugby commentary in the English prog-

ramme for New Zealand and the South Pacific Islands timed from 2100 to 0715.

Guam

TWR (Trans World Radio) on **9895** at 1420, a talk in Tamil, interval signal, the station identification in English then into the Assamese programme at 1430.

CLANDESTINE

Radio Camilo Cienfuegos, Costa Rica on **6305** at 0257, with a La Voz del CID (Cuba Independiente Democratica) programme. OM with a talk in Spanish, the station identification then chimes followed by announcements.

NOW HEAR THIS

Emisora Regional da Cabinda, Angola on **4970** at 2050, OM with a talk in Portuguese, some folk music then off without the National Anthem at 2058. At 5kW, this one operates in Portuguese and vernaculars from 0455 to 2100.

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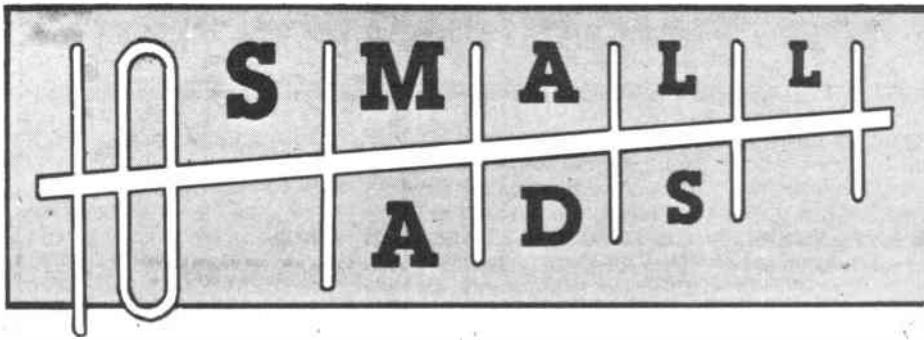
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CASE FOR 9" MONITOR

We have arranged with a metal worker to make cases for the 9" Monitor. Delivery promised for the end of May and the price £12 plus £2 post. The case will be made from coated sheet steel overall size approx 10in x 10in x 7in high which will give ample space for the Power Supply and external controls if you fit them.

PROBLEM SOLVED!

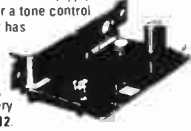
We have obtained from the manufacturers of the 9" Monitor, the TTL converter which makes it composite input suitable to work with any computer. We have had the printed circuit board made and have all the components and can supply this converter in kit form price £6. Our ref 6P4

AN ALLADIN'S CAVE

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THIS MONTH'S SNIP

ACORN COMPUTER DATA RECORDER (CASSETTE) This is a mono data recorder with switchable motor control intended for use with the Acorn Electron or BBC computers but also functions with almost any other computer and can be used for normal record and play-back of music and speech.

Six key controls give "PAUSE", "STOP" and "EJECT", "CUE/FAST FORWARD", "REVUE/REWIND" and "RECORD", last forward and re-winded (100 seconds for C60). Also tape counter with reset button. Input signal range 5mV to 500mV. Input impedance 40k ohm. Can be battery operated but is supplied with a mains adaptor. Brand new still in manufacturer's wrapping. £8. Order Ref. 8P18 add £2 postage.

VENNER TIME SWITCH

Mains operated with 20 amp switch, one on and one off per 24 hrs, repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only £2.95 without case, metal case £2.95, adaptor kit to convert this into a normal 24hr time switch but with the added advantage of up to 12 on/off's per 24hrs. This makes an ideal controller for the immersion heater. Price of the adaptor kit is £2.30.



Ex-Electricity Board. Guaranteed 12 months

AKAI RV-UM300 MIDI-RACK

Is a really excellent piece of furniture, ideal to hold your computer or audio equipment. Has three shelves in the upper section and a hinged glass fronted lower section. Height approximately 3ft, width 13 1/2in, depth 14in, on castors, dark walnut veneer finish. £15 plus £8 for Securicor delivery. Order Ref 15P11

MULLARD UNILEX AMPLIFIERS

We are probably the only firm in the country with these now in stock. Although only four watts per channel, these give superb reproduction. We now offer the 4 Mullard modules—i.e. Mains power unit (EP9002) Pre-amp module (EP9001) and two amplifier modules (EP9000) all for £6.00 plus £2 postage. For prices of modules bought separately see TWO POUNDERS.

25A ELECTRICAL PROGRAMMER

Learn in your sleep. Have radio playing and kettle boiling as you wake—switch on lights to warn off intruders—have a warm house to come home to. You can do all these and more. By a famous maker with 25 amp on/off switch. A beautiful unit at £2.50.



POWERFUL IONISER

Generates approx 10 times more IONS than the ET1 and similar circuits. Will refresh your home, office, workshop etc. Makes you feel better and work harder, a complete mains operated kit, case included. £11.50 + £3 P&P

J & N BULL ELECTRICAL
Dept REW, 250 PORTLAND ROAD, HOVE
BRIGHTON, SUSSEX BN3 5QT

MAIL ORDER TERMS: Cash, PO or cheque with order. Orders under £20 add £1.50 service charge. Monthly account orders accepted from schools and public companies. Access and B/card orders accepted Brighton (0273) 734648 or 203500

NEW ITEMS

Some of the many items described in our current list which you will receive with your parcel

SOLAR POWERED NI-CAD CHARGER 4 Ni-Cad batteries AA (HP7) charged in eight hours or two in only 4 hours. It is a complete, boxed ready to use unit. Price £6. Our ref 6P3

50V 20A TRANSFORMER 'C' Core construction so quite easy to adapt for other outputs—tapped mains input. Only £25 but very heavy so please add £5 if not collecting. Order Ref 25P4

FREE POWER! Can be yours if you use our solar cells—sturdily made modules with new system bubble magnifiers to concentrate the light and so eliminate the need for actual sunshine—they work just as well in bright light. Voltage input is .45 you join in series to get desired voltage—and in parallel for more amps. **Module A** gives 100mA, Price £1, Our ref BD631. **Module C** gives 400mA, Price £2, Our ref 2P199. **Module O** gives 700mA, Price £3, Our ref 3P42.

15A PANEL METER These have been stripped from Government surplus battery charger units made originally for army use. Unused, tested but of course rather old, diameter 2in can be surface or flush mounted. £3 each. Our Ref 3P40

SWITCH AC LOADS WITH YOUR COMPUTER This is easy and reliable if you use our solid state relay. This has no moving parts, has high input resistance and acts as a noise barrier and provides 4kW isolation between logic terminals. The turn-on voltage is not critical, anything between 3 and 30V, internal resistance is about 1k ohm. AC loads up to 10A can be switched. Price is £2 each. Ref 2P183

METAL PROJECT BOX Ideal size for battery charger, power supply etc., sprayed grey, size 8in x 4 1/4in x 4in high, ends are louvred for ventilation other sides are flat and undrilled. Order Ref 2P191. Price £2. **BIG SMOOTHING CAPACITOR**, Sprague powerlytic 39,000uF at 50V. £3. Our ref 3P41

HEAVY DUTY CURLY MAINS LEAD. Can be loaded up to 13A, stretches to almost 3 metres fitted with 13A plug. £3. Order ref 3P42

4-CORE FLEX CABLE. Cores separately insulated and grey PVC covered overall. Each copper core size 7/0.2mm. Ideal for long telephone runs or similar applications even at mains voltage 20 metres £2. Our ref 2P196 or 100 metres coil £8. Order ref. 8P19

BULK-HEAD MOUNTING LOUFSPEAKER. Metal case with chrome grill front and with mounting lugs for screwing to ceiling, 8in speaker £10 each. Order ref 10P43 add £2 post.

TWIN GANG TUNING CAPACITOR. Each section is .0005uF with trimmers and good length 1/4in spindle. Old but unused and in very good condition £1 each. Our ref B0630

13A PLUGS Good British make complete with fuse, parcel of 5 for £2. Order ref 2P185

13A ADAPTERS Takes 2 13A plugs, packet of 3 for £2. Order ref 2P187

20V-0-20V Mains transformers 2 1/2 amp (100 watt) loading, tapped primary 200-245 upright mountings £4. Order ref 4P24

BENCH ISOLATION TRANSFORMERS 250 watt 230V in and out with plenty of tappings to give exact volts £5 plus £2. Order ref. 5P5

BURGLAR ALARM BELL—6" gong OK for outside use if protected from rain. 12V battery operated. Price £8. Ref 8P2

24 HOUR TIME SWITCH 16A changeover contacts, up to 6 on/off's per day. Nicely cased, intended for wall mounting. Price £8. Ref 8P6

CAPACITOR BARGAIN axial ended 4700uF at 25V. Jap made, normally 50p each, you get 4 for £1. Our ref 613

CLEANING FLUID—Extra good quality intended for video and tape heads. Regular price £1.50 per spray can. Our price 2 cans for £1. Ref B0604

PIEZO ELECTRIC FAN An unusual fan, more like the one used by Madame Butterfly than the conventional type, it does not rotate. The air movement is caused by two vibrating arms. It is American made, mains operated, very economical and causes no interference, so is ideal for computer and instrument cooling. Price is only £1 each. Ref B0605

SPRING LOADED TEST PRODS Heavy duty, made by the famous Bulgin company very good quality. Price 4 for £1. Ref B0599

CURLY LEAD Four core standard replacement for telephone handset, extends to nearly 2 metres. Price £1 each. Ref B0599

TELEPHONE BELLS These will work off our standard mains through a transformer, but to sound exactly like a telephone, they then must be fed with 25Hz 50V. So with these bells we give a circuit for a suitable power supply. Price 2 bells for £1. Ref B0600

ASTEC P.S.U. Switch mode type. Input set at +230V. Output 3.5 amps at +5V 1.5 amps at -12V and 3 amps at +5V. Should be OK for floppy disc drives. Regular price £30. Our price only £10. Ref 10T34. Brand new and unused.

APPLIANCE THERMOSTATS Spindle adjust type suitable for convector heaters. Similar Price 2 for £1. Ref B0582

3-CORE FLEX BARGAIN No. 1 Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15mm for £2. Ref 2P189

3-CORE FLEX BARGAIN No. 2 Core size 1.25mm so suitable for long extension leads carrying up to 13 amps, or short leads up to 25A 10m for £2. Ref 2P190

CASE WITH 13A PRONGS To go into 13A socket, nice size and suitable for plenty of projects such as battery trickle charger, speed controller, time switch, night light, noise suppressor, dimmers etc. Price—2 for £1. Ref B0565

ALPHA-NUMERIC KEYBOARD This keyboard has 73 keys giving trouble free life and no contact bounce. The keys are arranged in two groups, the main area is a QWERTY array and on the right is a 15 key number pad. Board size is approx 13 x 4 1/2" brand new but offered at only a fraction of its cost, namely £3, plus £1 post. Ref 3P27

TELEPHONE EXTENSIONS It is now legal for you to undertake the wiring of telephone extensions. For this we can supply 4-core telephone cable 100m coil £8.50. Extension BT sockets £2.95. Packet of 50 plastic headed staples £2. Dual adaptor for taking two appliances from one socket £3.95. Leads with BT plug for changing old phones, 3 for £2.

WIRE BARGAIN 500 metres 0.7mm solid copper tinned and pvc covered. Only £3 plus £1 post. Ref 3P31 that's well under 1p per metre and this wire is ideal for push on connections.

INTERRUPTED BEAM KIT This kit enables you to make a switch that will trigger when a steady beam of infra-red or ordinary light is broken. Main components relay, photo transistor, resistors and caps, etc. Circuit diagram but no case. Price £2. Ref 2P15

3-30V VARIABLE VOLTAGE POWER SUPPLY UNIT with 1 amp DC output. Intended for use on the bench for experimenters, students, inventors, service engineers etc. This is probably the most important piece of equipment you can own (after a multi range test meter). It gives a variable output from 3.30 volts and has an automatic short circuit and overload protection which operates at 1.1 amp approximately. Other features are very low ripple output, a typical ripple is 3mV pk-pk 1mV rms. Mounted in a metal fronted plastic case, this has a voltmeter on the front panel in addition to the output control knob and the output terminals. Price for complete kit with full instructions is £15. Ref 15P7

TRANSMITTER SURVEILLANCE (BUG) Tiny, easily hidden, but which will enable conversation to be picked up with FM radio. Can be housed in a matchbox, all electronic parts and circuit. Price £2. Ref 2P52

ELMASET INSTRUMENT CASE

300x133x217mm deep £10.00 ea (£2.20)

REGULATORS

LM317T Plastic T0220 variable £1
LM317 Metal £2
7812 Metal 12V 1A £1.00
CA3085 T099 Variable regulator £1
LM338 5A variable £5

COMPUTER ICS

8741 Micro Ex equipment £1.30
8039 Ex equipment £1.00
4164-15 Ex Eqpt £1
27128 250n³ NEW £3.00
68008 Processor Ex-Equip £5
27256-30 ex-eqpt £3.00
2764-30 2176 USED £2
1702 EPROM ex equip £5.00
2732-452716 USED £2 100+ £1.50
2114 EX EQPT 60p 4116 EX EQPT 70p
4416 RAM £3.50
D446C (TC5517AP) £1.50
ZN427E-8 £4.00
ZN428E-8 £4.00

CRYSTAL OSCILLATOR

1.8342MHz 2/£1.50

SIL RESISTOR NETWORKS

8 pin 10K 22K 5/£1.00
9 pin 22K 5/£1.00
10 pin 68R 180R 22K 5/£1.00

SURFACE MOUNTED TRANSISTORS

BCW31 BCW72 NTAV70 1S2836 min S0/type 100/£2.50

TRANSISTORS

BC107 BCY70. Pre formed leads full spec 20/£1 100/£4 1000/£30

POWER TRANSISTORS

POWER FET IRF9531 8A 60V P channel to 220 2/£1
2N3055H RCA Home numbered 5/£2
2SC1520 sim BF259 3/£1 100/£22
TIP141, 142/146, £1 ea, TIP110, 125, 42B 2/£1
TIP35B £1.30 TIP35C £1.50
SE9302 100V 10A DARL SIM TIP121 2/£1
2N3055 Ex eqpt tested 4/£1
Plastic 3055 or 2955 equiv 50p 100/£35
2N3773 NPN 25A 160V £1.80 10/£16
BD132 5/£1

QUARTZ HALOGEN LAMPS

A1/216 24V 150w £2.25
H1 12v 55w (car spot) £1.50

NICKEL CADMIUM BATTERIES

7.2 Volts 1.8 A/hr C Cells in packs of 6 £5 P&P £1

ZIF SOCKETS

TEXTTOOL single inline 32 way. Can be ganged for use with any dual inline devices 2/£1.50

MISCELLANEOUS

BNC to croc clips lead 1 metre £1 100/£50
Small Microwave Diodes AEI DC1028A 2/£1
Moulded inductor 470uH size of a 1 watt film resistor 5/£1
To -220 Heat Sink sim RS 403-162 10/2.50
D.I.L. Switches 10 Way £1 8 Way 80p. 4/5/6 Way 50p
180 Volt 1 watt ZENERS ALSO 12V 20/£1
Olivetti logos calculator keyboard (27) key plus '12 Digit fluorescent display on driver board (ie calculator less case, transformer and printer) £1.30
Plastic Equipment case 9x6x1.25" with front and rear panels containing PCB with eptom 2764 -30 and ICS 7417 LS30 LS32 LS74 LS367 LM311 7805 Reg, 9 way D plug, push button switch, din socket £1.90
VNIOLM 80V 1/2 50hm TO-92 mosfet 4/£1. 100/£20
MIN GLASS NEONS 10/£1
RELAY 5v 2 pole changeover looks like RS 355-741 marked STC 47WB05T 2/£1
MINIATURE CO-AX FREE PLUG RS 456-071 2/£1
MINIATURE CO-AX FREE SKT RS 456-273 2/£1.50
STRAIN GAUGES 40 ohm Foil type polyester backed balco grid alloy £1.50 ea 10+ £1
DIL REED RELAY 2 POLE n/o CONTACTS £1
ELECTRET MICROPHONE INSERT £0.90
Linear Hall effect IC Micro Switch no 613 SS4 sim RS 304-267 £2.50 100+ £1.50
Hall Effect IC UGS3040 + MAGNET £1.00
OSCILLOSCOPE PROBE SWITCHED X1X10 £10

CHEAP PHONO PLUGS 100/£2 1000/£18

1 pole 12 way rotary switch 4/£1
AUDIO ICS LM380 LM386 £1 ea
555 Timer 5/£1 741 Op AMP 5/£1
COAX PLUGS nice ones 4/£1
4 x 4 MEMBRANE KEYBOARD £1.50
15,000uF 40V SPRAGUE £2.50 (£1.25)
INDUCTOR 20uH 1.5A 5/£1
NEW BT PLUG + LEAD £1.50
1.25" PANEL FUSEHOLDERS 5/£1
CHROMED HINGES 14.5 x 1" OPEN £1 ea
TOK KEY SWITCH 2 POLE 3 KEYS ideal for car/home alarms £3
12v 1.2W small wire ended 1 amps fit AUDI VW TR7 SAAB VOLVO 10/£1
12V MES LAMPS 10/£1
STEREO CASSETTE HEAD £2
MONO CASS. HEAD £1 ERASE HEAD 50p
THERMAL CUT OUTS 50 77 85 120C £1 ea
THERMAL FUSE 121C 240V 15A 5/£1
TRANSISTOR MOUNTING PADS TO-5/TO-18 £3/1000
TO-3 TRANSISTOR COVERS 10/£1
STICK ON CABINET FEET 30/£1
PCB PINS FIT 0.1" VERO 200/£1
TO-220 micas + bushes 10/50p 100/£2
TO-3 micas + bushes 20/£1
PTFE min screen cable 10m/£1
Large heat shrink sleeving pack £2
CERAMIC FILTERS 6M/9M/10.7M 50p 100/£20
TOKIN MAINS RFI FILTER 250v 15A £3
IEC chassis plug rfi filter 10A £3
Potentiometers short spindles values 2k5 10k 25k 1M 2M5 new value 5/£1
500k lin 500k log 4/£1
40Khz ULTRASONIC TRANSDUCERS EX-EQPT NO DATA £1/pr
PLESSEY INVERTER TRANSFORMER 11.5-0-11.5V to 240v 200VA £6 (£3)

ZENERS

5.6V IW3 Semikron 50K available £25/1000
Suppressor OF606 120V BI Directional Zener in 3 amp W/E package 5/£1.00

DIODES & RECTIFIERS

BAW76 Equiv IN4148 £60/10,000
1N4148 100/£1.50
1N4004/SD4 1A 300V 100/£3
1N5401 3A 100V 10/£1
BA158 1A 400V fast recovery 100/£3
BA159 1A 1000V fast recovery 100/£4
120v 35A stud 65p
12 FL10 12A 200V small stud 4/£1.50 100/£25
BY127 1200V 1.2A 10/£1
BY254 800v 3A 8/£1
BY255 1300v 3A 6/£1
6A 100V Similar MR751 4/£1
VM88 800mA 100VDIL b/REC. 5/£1
1A 800v bridge rectifier 4/£1
4A 100V bridge 3/£1
6A 100v bridge 50p
8A 200V Bridge 2/£1.25
10A 200v bridge £1.50
25A 200v bridge £2 ea 10/£18
25A 400v bridge £2.50 10/£22

SCRs

2P4M equiv C106D 3/£1 100/£20
MCR72-6 10A 600v SCR £1
35A 600v stud £2
TICV106D .8A 400v SCR 3/£1 100/£15
MEU21 Prog. unijunction 3/£1

TRIACS

NEC Triac ACO8F 600V TO 220 5/£2 100/£30
Diacs 4/£1
TXAL225 8A 400V 5mA gate 2/£1 100/£35
TRAL 2230D 30A 400V isolated stud £4 each

CONNECTORS

DIN 41612 96way socket (3row) right angle pcb pins £1.20 each
DIN 41612 64 way a/c plug right angle pcb pins £1.00 each
34 way card edge IDC connector (disk drive type) £1.25
Centronics BBC Printer lead £3.50
Centronics 36way IDC plug £2.50
Centronics 36way IDC skt £4
Centronics 36way plug (solder type) £4
USED Centronics 36W plug & socket £3

'D' 9-way £1; 15-way £1.50; 25-way £2
37-way £2; 50-way £3.50; covers 50p ea

WIRE WOUND RESISTORS

W21 or Sim 2.5W 27R 10 of one value £1
R10 0R15 0R22 2R0 4R7 5R0 5R6 8R2 10R 12R 15R 18R 20R
22R 27R 33R 36R 47R 56R 62R 75R 3R9 91R 100R 120R 180R
390R 430R 470R 560R 680R 820R 910R 1K15 1K2 1K5 1K8 2K4
2K7 3K3 3K0 5K0 10K
R05 (50 mill-ohm) 1% 3W 4 for £1
W22 or Sim 6W 7 of one value £1
R47 1R0 1R5 3R3 6R8 9R1 10R 20R 27R 33R 51R 56R 62R 68R
100R 120R 180R 390R 500R 560R 620R 910R 1K0 1K2 1K5 1K8
2K7 3K3 3K9 4K7 10K
W23 or Sim 9W 6 of one value £1
R22 R47 1R0 1R1 15R 56R 62R 68R 100R 120R 180R 220R 300R
390R 680R 1K0 1K5 5K1 10K
W24 or Sim 12W 4 of one value £1
R50 1R0 2R0 6R8 9R1 10R 18R 22R 27R 56R 68R 75R 82R 100R
150R 200R 220R 270R 400R 620R 6K8 8K2 1K0 10K 15K

WIRE WOUND RESISTORS - BOLT ON HEATSINK TYPE

10 watt 39R, 180R 40p each
25 watt R33, 1R2, 1R5, 4R7, 25R, 100R 50p each
50 watt 3R3, 5R1, 16R, 27R 60p each

PHOTO DEVICES

BPW50 Infra red photo Diode 3/£1
Slotted opto-switch OPCODE OPB815 £1.30
2N5777 50p only
TIL81 T018 Photo transistor £1
TIL38 Infra red LED 5/£1
OPI2252 Opto isolator 50p
Photo diode 50p 6/£2
MEL12 (Photo darlington base n/c) 50p
RPY58A LDR 50p ORP12 LDR 70p
GREEN or YELLOW 3 or 5mm 10/£1 100/£6.50
FLASHING RED OR GREEN LED 5mm 50p 100/£35
LEDS assorted RD/GN/YW + INFRE/RED 200/£5

SUB MIN PRESETS HORIZONTAL

1K 4K7 10K 22K 47K 1M 10M 15/£1 100/£5

CERMET MULTI TURN PRESETS 3/4"

10R 20R 100R 200R 250R 500R 50p
2K 5K 10K 22K 50K 100K 200K 2K2 2K5 47K 500K 2M2

IC SOCKETS 6-pin 15/£1 8-pin 12/£1; 14-pin 10/£1.00; 18/20-pin 7/£1; 22/24/28 pin 4/£1 40 pin 30p

TRIMMER CAPACITORS 5/50p

Grey larger type 2 to 25pF Transistors 2N4427 60p
Feed Thru Ceramic Caps 1000pF 10/£1

SOLID STATE RELAYS NEW 10A 250v AC

Zero voltage switching Control voltage 8-28v DC £2.50
40A 250V AC Solid State relays £18

POLYESTER/POLYCARB CAPS

1uF 100v 10mm SIEMENS block polycarb 10k available 1000/£80
1n/3n/5n/8n/2/10n 1% 63v 10mm 100/£6
2u2 160v rad 22mm 100/£10
33n/47n 250v AC X rated rad 15mm 10/£1.00
1µ 600V Mixed dielectric 50p ea

STC NTC BEAD THERMISTORS

G22 220R G13 1K G23 2K G54 50K G25 200K G16 1M
Res@20°C directly heated type £1 each
FS22BW NTC Bead inside end of 1" glass probe res @ 20°C
200R £1.00

BEAD TANTALUM CAPS

6UB 25V, 47U 3V, 2U2 20V, 10U 10V 12/£1... 100/£6

MONOLOTHIC CERAMIC CAPS

10n 50V 2.5mm 100/£4.50
100n 50v 2.5mm or 5mm 100/£6
100N 50V axial Shortleads 100/£3
100n ax long leads 100/£6
100n 50v RAD 0.3" centres 100/£10

STEPPER MOTOR 4 PHASE 2 9v WINDINGS

£3.50 10/£30

KEYTRONICS

MAIL ORDER ONLY

P.o. Box 634

Bishops Stortford, Herts, CM23 2RX

☎ 0279 505543 : FAX 0279-757656

ELECTRONIC COMPONENTS BOUGHT FOR CASH

MIN CASH ORDER £3.00 OFFICIAL ORDERS WELCOME
UNIVERSITIES COLLEGES SCHOOLS GOVT DEPARTMENTS
MIN. ACCOUNT ORDER £10.00

P&P AS SHOWN IN BRACKETS (HEAVY ITEMS)
65p OTHERWISE (LIGHT ITEMS)

ADD 15% VAT TO TOTAL

