

Radio & Electronics

The communications and electronics magazine **World**

NOVEMBER 1986 £1.30

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NORTH AMERICA \$2.95
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**MW MINI-LOOP:
A COMPACT AERIAL
FOR MEDIUM WAVE**

**YESTERDAY'S TV:
LOOKING BACK TO
PIONEERING DAYS**

**WEATHER PICS:
A WEFAX DECODER
FOR PERFECTIONISTS**

**DATA FILE:
RELAYS AND
CMOS SWITCHES**

**SATCOMS:
COMMUNICATION VIA
SATELLITE EXPLAINED**



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YAESU



**THE TECHNICALLY ORIENTATED
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SPECIALISTS.**

...STOP...PRESS...

RWC Ltd have now been appointed distributors for the new Bearcat-Uniden range of shortwave and VHF-UHF scanning receivers. Please contact us for further information.

Please add £2.50 p&p for accessories, £3 for psu's, £5 for transceivers, Send £1.00 for Raycom catalogue (refundable) or send a large S.A.E. for latest used list and information.

FULL RANGE OF KENPRO HANDHELDS IN STOCK

YAESU

Full Range Stocked

Model	Description	RWC Price
FAS14R	Remote ant switch (FC757AT)	79.50
FBA5	Empty battery pack	7.80
FC700	ATU/power meter/dummy 1'd	129.00
FC757AT	Auto ATU inc WARC bands	299.00
FR65	Comp. face for Apple II	54.50
FL2100Z	HF 1.2KW linear 1.8-30 MHz	749.00
FN2	10.8V nicad pk for FT208/708	24.50
FN3	Nicad for FT203/9/703/9R/RH	36.50
FN4	Nicad pack for FT209RH etc	43.50
FP700	20A power supply	169.00
FP757GX	Switched mode power supply	159.00
FP757HD	Heavy duty power unit	185.00
FRA7700	Active ant. for FRG7700-8800	44.50
FRG8800	All band RX	569.00
FRG9600/ MK2-RW	60-950 All-mode scanning RX	469.00
FR7700	Receiver ATU for FRG7700 8800	49.50
FRV7700A B C D	VHF conv. for FRG7700 8800	
FRV8800	VHF converter	85.00
FT203R-FBA5	2mtr H/H 1.5W	192.50
FT203R-FNB3	2mtr H/H 2.5W	219.00
FT203R-FNB4	2mtr H/H 3.5W	225.00
FT209R-FBA5	2mtr H/H C/W empty bicase	239.00
FT209R-FNB3	2mtr handheld 3.7W	269.00
FT209R-FNB4	2mtr handheld 5W	265.00
FT2700RH	V-UHF 25W transceiver	P.O.A.
FT2700R	VHF 25W transceiver	339.00
FT2700RH	45W 2mtr transceiver	P.O.A.
FT290R	6mtr multimode	349.00
FT690R	6mtr multimode transceiver	P.O.A.
FT703R-FBA5	70cm H/H 1.5W	219.00
FT703R-FNB3	70cm H/H 2.5W	235.00
FT703R-FNB4	70cm H/H 3.5W	245.00
FT709R-FNB5	70cm H/H 1.8W	235.00
FT709R-FNB3	70cm H/H 3W	269.00
FT709R-FNB4	70cm H/H 4W	270.00
FT726R	2mtr base station	869.00
FT757GX MK2-RWC	All band all mode 100W TXR	869.00
FT790R	70cm multimode transceiver	P.O.A.
FT980	Gen coverage + Ham band transceiver	1739.00
FVS1	Voice synthesizer for FT270/2700	23.55
LOG BOOK	YAESU amateur radio log bk	2.00
MD188	Base station desk m phone	69.95
MH12A2B	Speaker MIC for FT203/209 etc	18.95
MH1B3	H-st mobile MIC for FT757 etc	16.50
MIMB11	Mobile bktm for FT290R	29.50
PA3	Mobile DC unit for FT208, 209 etc	18.50
PA4C	AC power unit for FRG9600	13.50
OTR24D	World zone clock	37.50
SAT726	Oscar/Sat unit for FT726	112.50
SB1	Switch unit	17.50
SB2	Switch unit for YH1	15.00
SB3	Switch unit	15.25
SP55	External loudspeaker	15.50
YH1	H set boom MIC for SB1/2/3	16.50
YH2	H set MIC for FT203/209 etc	16.50
YH5	Mono headphones	16.50
YH77	Lightweight mono h phone	16.50
YHA15	Helical antenna for FT290R	6.99
YM24A	Speaker MIC for FT208/708	25.50
YM49	Speaker MIC for FT290R	18.50

PRICE RISE IMMINENT



Full Range Stocked

Model	Description	RWC Price
AH7000	25-1300 MHz TX base ant.	79.00
BC35E	50-144-432-129	69.50
BP3	Desk-top charger for all nicads	28.50
BP4	Standard Nicad pack 8.4V	8.95
BP5	Empty battery box for cells 6X	
	High capacity quick charge	
DC1	10.8V nicad	59.50
EK243	12V mobile regulator pack (2E)	16.95
EK257	Curtis keyer unit for IC735/745	55.50
EK310	FM unit for ICR71	39.50
	Speech synthesizer unit for FT717000/E	
FL63	250Hz RTTY/CW filter	41.50
HP1	Mono headphones	34.50
HS10	Headset and boom mic for use with HS10	20.50
HS10SB	Switch box assy for HS10 boom mic	19.50
IC-2KLP5	Power unit for IC2KL	399.00
IC-AH1	3.5-30 MHz mobile antenna	189.00
IC-AH2A	Mobile HF ant tuner	499.00
IC-AH2B	Mobile whip and mount for AH2	179.00
IC-AT100	100W auto ATU	329.00
IC-AT150	Matching automatic ATU for IC735	349.00
IC-AT500	500W automatic ATU	499.00
IC-CPI	Mobile charging lead c/lighter	6.50
IC-HM9	Speaker mic assy	20.50
IC-PS30	Power supply unit 25A continuous	339.00
IC-UT 16	Voice synthesizer for IC27 series	28.50
IC02E	2 mtr LCD keyboard 2W transceiver	289.00
IC120	1W 1296 MHz mobile (40MHz cov)	575.00

Model	Description	RWC Price
IC271E	2 mtr all mode 25W base station	829.00
IC271H	High power 100W version of IC271E	999.00
IC27E	25W 2 mtr FM mobile 9 memories	379.00
IC27H	45W version of IC27E	419.00
IC28E	25W 138-174MHz (144-146 TX) mobile TR	349.00
IC28H	45W mobile version of 28E	379.00
IC290D	25W version of IC290E	539.00
IC2E	2 mtr handheld thumbwheel 2W	185.00
IC2KL	1KW PEP linear auto band switching	1250.00
IC3200E	Dual band 25W transceiver	545.00
IC471E	UHF multimode base station 32 mem	915.00
IC471H	75W version of IC471E	1099.00
IC4E	70cm thumbwheel Handheld 2W	279.00
IC505	3-10W 50MHz SSB(FM) transceiver	449.00
IC735	New all mode all band transceiver	925.00
IC745E	All band SSB/AM/CW gen cov TX RX 16 mem	799.00
IC751E	All band all mode transceiver 32 mem	1450.00
IC04E	70cm LCD keyboard entry handheld 2W	285.00
ICR7000E	25-1300MHz all mode scanning receiver	925.00
ICR71	All band short wave receiver 32 mem	799.00
LC1114	Leatherette case assy for IC024E	8.99
LC1/2/3	Leatherette case for IC2/4/E	6.50
PS15	External power supply 20A	145.00
PS20	External PSU with loudspeaker 20A	199.00
PS25	Internal PSU for IC271E	99.00
PS35	IC751/IC271H 20A switch mode PSU	185.00
PS55	Matching power supply unit for IC735	179.00
SM6	Desk top microphone	42.50
SM8	Dual impedance 2-way base mic	79.00

CARRIAGE/POST FREE OVER £500.00

SAE FOR LATEST ICOM LEAFLETS, NEW MODELS EXPECTED

RWC TOP 100

Model	Description	RWC Price
ADONIS	AM303G	39.95
ADONIS	AM503G	52.50
AKD	WA1	
	Base str FM/SSB m phone	
	120-450MHz wavemeter:	
	c/w ant.	24.95
	c/w 30W amp	249.00
ALINCO	ALM-203R	239.00
ALINCO	ALM-203E	13.50
ALINCO	EDH-25	18.50
ALINCO	EM5-20	14.50
ALINCO	ESC-3	6.50
AOI-MIC	DM300	600 OHM replacement microphone
AOI-MIC	DM301N	600 OHM replacement noise can. MIC
ARM-ANT	TRAV-JIM	7.50
	Travelling jim portable	
CRITON	LS88B	7.99
	6 OHM replacement ext. loudspeaker	
DAWA	SA450M	6.60
	2 way 2.5KW coax switch 0-900MHz	
FDK	FDK 725X	17.50
FDK	2 mtr 25W FM mobile transceiver	269.00
GAMMA	2MTR	499.00
	Gamma twin slim jim type ant.	
GAMMA	S-JIM	12.50
GAMMA	3-5A PSU	19.50
	Straight key	29.25
	H-i-mount	19.25
	HK703	16.65
	H-i-mount	15.50
	HK707	49.95
	H-i-mount	49.95
	HK808	28.95
	H-i-mount	25.65
	HK703	23.50
	H-i-mount	
	MK705	7.50
	H-i-mount	25.90
	MK705	25.65
	H-i-mount	23.50
	MK705	
	H-i-mount	
	HI-Q coil	
	2X coil/formers/insulators (pat-pend)	7.50
HOXIN	70N2DX	25.90
HOXIN	70N2M	22.85
	Dual band 6/8 + 3X 5/8 mobile 144/432 dual band 1/2W + 2 x 5/8 mobile	
HOXIN	70N2V	39.00
HOXIN	HS-358	33.78
HOXIN	HS-770	19.55
	Dual b/base ant. 3'6" long 430MHz tripple 5/8 3dB 144/432 duplexer 50W 30dB isolation	
HOXIN	HS-78F	16.95
HOXIN	HS-88F	16.95
HOXIN	SMC155E	21.50
	2 mtr 7/8 fold over 4.5dB 15 mtr 8/8 fold over 5.2dB 15 mtr 130W PEP mobile ant. 1.72M long	
ICS	AMT-2	245.00
	AMTOR/RTTY/CW/ASCII terminal unit	
ICS	RM-1	69.00
	L-cost AMTOR/RTTY/CW/ASCII modem	
Jaybeam	8XY-2M	41.50
Jaybeam	LRI-2M	39.00
Jaybeam	LW10-2M	27.25
Jaybeam	MBM4B	40.75
Jaybeam	Q4-2M	33.95
	2 mtr 8E crossed ant 2 mtr omni-directional colinear 2mtr 10 element YAGI 70cm 48E antenna 2 mtr 4 element quad	

FULL RANGE OF JAYBEAM + TONNA ANTENNAS IN STOCK

Model	Description	RWC Price
MuTek	BBBA	20-500MHz low noise wide band preamp
MuTek	SLNA	2 mtr low noise RF switched preamp
MuTek	144s	Optimised preamplifier for FT290R
MuTek	145sb	High performance 2M-6M transverter
MuTek	TVV50c	12A PSU
RAYCOM	Series II	7.1MHz traps c/w instructions
RAYCOM	TRAP	7.1MHz traps c/w instructions
RCA	4146B	PA valve
REVCO	2044/5	Nest of dipoles w/band ant 26-500 MHz
REVCO	Revcone	Wide band disccone ant 30-500MHz
SUN-ANT	KG208	10 mtr loaded 1/4W tilt-over
SUN-ANT	SE10	5/8 mtr tilt-over ant
SUN-ANT	KG309	5/8 mtr tilt-over ant
SUN-ANT	SE2	Cas/c/chrome SO239 gutter mount assy c/w cable
SUN-ANT	SO239/CGM	

RAYCOM MOD KITS

Model	Description	RWC Price
Raycom	757	FT757GX fast tuning mod kit improves VFO tuning
Raycom	FBX-RWC	LC7136-7 10 mtr FM mod kit c/w ins. (Built & Tested)
Raycom	MOD	As above but kit of parts only
Raycom	LCL/DNT	LCL/DNT 10FM mod kit
Raycom	MOD (inc. post)	
NEW STORNO	COM 713 5S Channel Mod Kit to 2M inc RPTX Smt. vials - circuit instructions	29.00
NEW 2m 30W linear amp kit - parts only		29.50
Complete kit with case, heatsink, etc.		39.50

RAYCOM ANTENNAS

Model	Description	RWC Price
Raycom	1/1 G5RV	Full size G5RV m/band ant
Raycom	1/2 G5RV	1/2 size G5RV m/band ant
Raycom	1/4 wave	145MHz 1/4 wave PL259 fitting
Raycom	GP900	3db 800-1000MHz colinear c/w BNC
Raycom	HBD	Highband dipole assembly
Raycom	70cm HBSCV Inc. Post	8.50
Raycom	70cm HBSCV Inc. Post	9.98
Raycom	5/8 whip	145MHz 5/8 Spring type s/steel whip
Raycom	SO239-MAG	Magnetic mount SO239 c/w cable PL259
Raycom	SWivel	Swivel base mag-base c/w cable PL259
Raycom	Trap	7.1MHz trap dipole c/w kit

RAYCOM POWER SUPPLIES

13.8V 12A (8A continuous)	52.50
13.8V 8A (6A continuous)	49.50

RAYCOM RF POWER AMPS

Model	Description	RWC Price
Raycom	V15L-145	2mtr 15W linear amp. 1-3W input
Raycom	V25F-145	2mtr 15W linear amp. 1-3W input
Raycom	V35L-145	2mtr 35W linear amp. 1-3W input
Raycom	V45F-145	2mtr 45W FM amp. 1-3W input

SCANNING RECEIVERS

YAESU FRG-9600 MKII	very latest mod. gives improved 'S METER' on RX and extended coverage up to 950MHz	
FRG9600/MK2-RW	60-950 All mode scanning RX	469.00
BEARGAT 100	VHF/UHF Handheld (early model)	199.00
REGENCY MX8000/AOR2002		429.00
REGENCY HX2000	VHF/UHF Handheld	259.00

NEW BEARCAT DX1000 10KHz-30MHz SW RECEIVER. 10 MEMORIES, ALL MODE INC FM. ALSO SCANNING £329.00
NEW BEARCAT 100XL H/H SCANNER. 66-58MHz (AIR BAND). 136-174MHz. 406-512MHz. C/W NICADS, CHARGER + LEATHERETTE CASE £219
NEW BEARCAT 175XL DESK TOP SCANNING RECEIVER. 16 MEMORIES. SAME COVERAGE AS 100XL C/W AC ADAPTER £209

Please call in or phone for latest Bearcat information.

TONNA - Full Range in Stock

Model	Description	RWC Price
TONNA	20089N	144MHz 9 element port antenna 'N'
TONNA	20199	144/435 9 + 18 element Oscar ant.
TONNA	20149	432MHz 19 element
TONNA	20242	435MHz 21 element ATV
TONNA	20624	1296 23 element ant.
TONNA	20809N	144MHz 9 ele. fixed ant. 'N'
TONNA	20813N	144MHz 13 ele. port. ant.
TONNA	20817N	144MHz 17 ele. fixed ant. 'N'
TONNA		

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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.

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of this magazine are accurate, we assume no responsibility for any effect from errors or omissions.

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Bottom: CIL's Jay series of modular test gear (p10)

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Publication Date

Second Thursday of the month preceding cover date

A NEW BOOK WRITTEN WITH THE FULL AUTHORIZATION OF THE INVENTOR OF THE BAIRD PROCESS.

TELEVISION

TO-DAY AND TO-MORROW

By Sydney A. Moseley and H. J. Barton Chappl, Wk.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.
Foreword by John L. Baird

FULL technical details of the Baird Television Transmitter, the Baird "Television" Receiver, Synchronism, Photo-Electric Cells, etc., the Tele-Cinema and Tele-Talkies, Noctovision, Daylight Television, Colour and Stereoscopic Television, and the developments of the invention in other countries, will be found in this remarkable work. Opening with the vivid story of the discovery of Television, the book is a complete guide to the subject.

Illustrated. 7s. 6d. net. 154 pp.

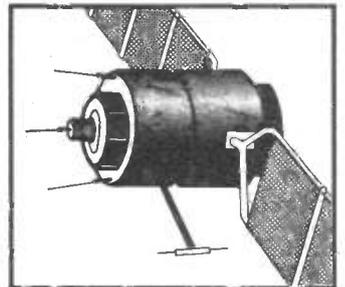
"THE DAILY NEWS" says: "Many secrets of the apparatus are revealed for the first time."

Of a Bookseller, or
PITMAN'S, Parker Street, Kingsway
LONDON, W.C.2

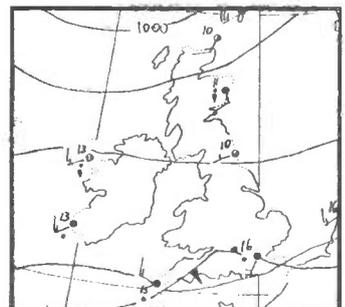
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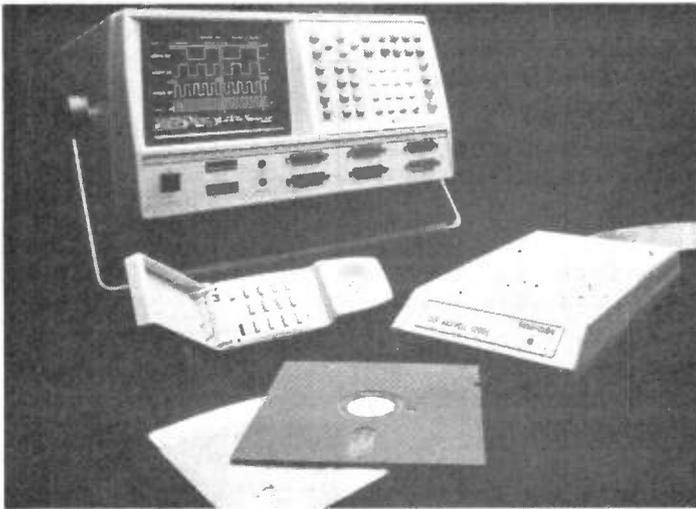


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PRODUCT NEWS

Featured on these pages are details of the latest products in communications, electronics and computers. Manufacturers, distributors and dealers are invited to supply information on new products for inclusion in Product News.

Readers, don't forget to mention **Radio & Electronics World** when making enquiries



COMMUNICATIONS TESTS

New from Farnell Instruments is the CTS520 communications test set, designed for the service or production testing of simplex or duplex radio transceivers, paging equipment and base or relay stations in frequency bands up to 520MHz.

The CTS520 provides the measurement capability of nine separate instruments, plus weighting filters and RF power load, housed in a portable case. All instruments can be used independently or in combination to provide comprehensive tests. The instruments include a synthesized RF signal generator, an RF counter, a modulation meter, an RF power meter, an AF voltmeter, a distortion analyser, an AF power meter, a sinad meter and a CTCSS tone generator. An internal loudspeaker is fitted and measurements are displayed on either LED or analogue meters.

Only four connections are necessary to the device under test, and possible receiver measurements include tuning accuracy, bandwidth, selectivity, distortion, sensitivity by sinad or quieting methods, signal to noise ratio, AF power, AF distortion and duplex filter effectiveness. An AF synthesizer allows pilot tones to be

added to the 1kHz test tone for encoding test signals to CTCSS receivers. On transmitters the measurements possible include frequency offset, power, modulation values (AM, FM or PM) for level, limiting (distortion) and sensitivity. Spurious modulations are detectable and aerial efficiency can also be measured.

The use of a synthesized signal generator design in the test set offers worthwhile benefits over free running signal sources (usually found in test sets).

*Farnell Instruments Ltd,
Sandbeck Way,
Wetherby,
West Yorks LS22 4DH.
Tel: (0937) 61961.*

SIGNAL PROCESSOR

The ETL3800A signal processor is a new product available from AB European Marketing. It has been developed to complement the teaching of the fundamental principles of signal processing and communications at universities etc.

This peripheral to the BBC Microcomputer has three modes of operation: 1. convolution/filter simulator; 2. spectrum analyser (100kHz bandwidth, dynamic range greater than 45dB); 3. oscilloscope (dual channel, max-

TELEDIAGNOSIS

Gould Electronics Ltd, Instrument Systems, has announced a new diagnostic tool, TeleDiagnosis, which allows the company's K450 logic analyser to be used for remote debugging of digital systems over conventional telephone lines.

TeleDiagnosis uses RS232 communications via a Hayes-compatible modem over standard telephone lines with pulse or tone dialling. It is intended to reduce downtime and travel expenses in the servicing of large mainframe computers, telephone exchanges, unmanned remote communications systems and industrial control networks.

The system is also suitable for the repair of smaller, sophisticated digital systems at customer sites where quick responses are required or skilled personnel are not readily available. In addition, it can be integrated with other repair tools to debug sub-assemblies at field depots.

The tool allows logic

analysers at both ends of the communication link to communicate measurement data and set-up parameters with two-way interaction. In use, the service engineer programs one analyser at his own factory, sends both reference data and set-up parameters, and commands the remote logic analyser to dial back automatically once an error is captured.

Once set-up is complete, the telephone line can be disconnected, saving on communications costs. The remote unit will call back when it has detected a bug.

The TeleDiagnosis package is supplied complete with a flexible disc containing all necessary error-checking remote commands, modem handshaking protocols and other necessary software.

*Gould Electronics Ltd,
Instrument Systems,
Roebuck Road,
Hainault,
Ilford,
Essex IG6 3UE.
Tel: (01) 500 1000.*

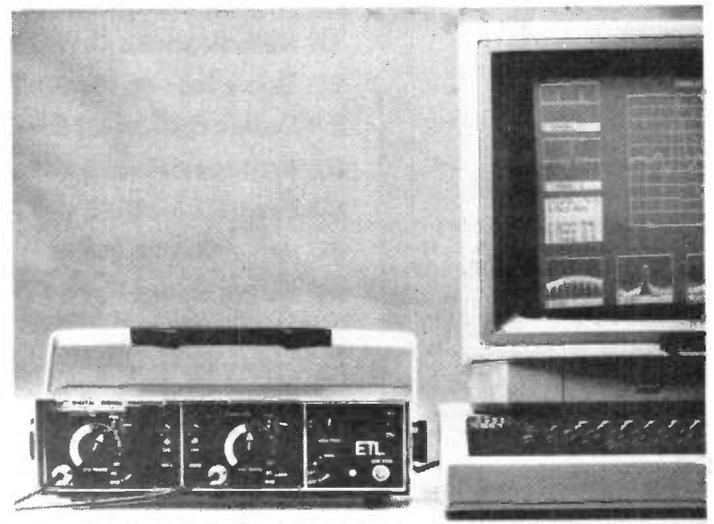
imum sampling rate 500kHz.

Concepts such as modulation, convolution and filtering can be investigated using time and frequency domain analysis. A hard copy can be obtained of any display.

The unit is priced at only

£1,250 excluding VAT.

*AB European Marketing
Division,
Forest Farm Industrial Estate,
Whitchurch,
Cardiff CF4 7YS.
Tel: (0222) 618336.*



CRYSTAL CLEAR

The Seaward SD250 is a hand-held unit generating either a pulsed or fixed tone at -10dB and 1.6kHz (variations are available) for use with a level measuring set, such as the Seaward Oscar 250 for loss measurement or the MU250 for positive core identification.

The SD250's automatic facility provides positive core identification when operating on large cable looms or exchange distribution frames. When used with the MU250 on high impedance to provisionally locate the core required, switching it to low impedance provides positive identification.

The SD250 has an auto-position which automatically changes signal when the resistance applied to its terminals is 1,000 ohms or less. The oscillator will continue to send on all cores of the cable that are capacitively coupled, and only change

signal when the correct pair is terminated.

The MU250 is a compact audio monitor with integral amplifier, loudspeaker and three selectable levels.

A particular feature of this instrument is its ability to monitor working circuitry, including modems, without interference or disturbing operation. Simply clip onto the core insulation to provide hands-off monitoring of the signal tones.

The MU250 can hold a line and indicate polarity. The selector switch will enable the unit to terminate a line when necessary, and indicator lights show when a circuit is safe to work on with no dc, ring or audio present.

This instrument costs £40.

*Seaward Electronic Ltd,
Bracken Hill,
South West Industrial Estate,
Peterlee,
Co Durham SR8 2JJ.
Tel: (0783) 863511.*

FLEXSY LOGGER

Apoloco Ltd recently announced the Flexsy Logger, the first in a range of fully configured application systems offering a 'plug-in-and-go' capability to the user.

Based on Apoloco's well established Flexsy S range of industrial microcomputer cards, the Flexsy Logger comes in a smart box with terminations for instrument connection at the rear. The system also comes complete with a Televideo 905 display and keyboard and Epson LX 86 printer.

In its basic configuration the system has 16 digital and 16 differential analogue input channels—the analogue facility having channel programmable gain to give a wide dynamic range. Thermocouple conditioning cards, used in conjunction with the analogue facility, permit it to be readily tailored for temperature monitoring applications.

The number of channels can be increased substantially by plugging in extra interfacing cards. Since the system is built to the international STD bus standard, these can be chosen from the huge range of commercially available STD cards which

cover almost any conceivable interfacing requirement.

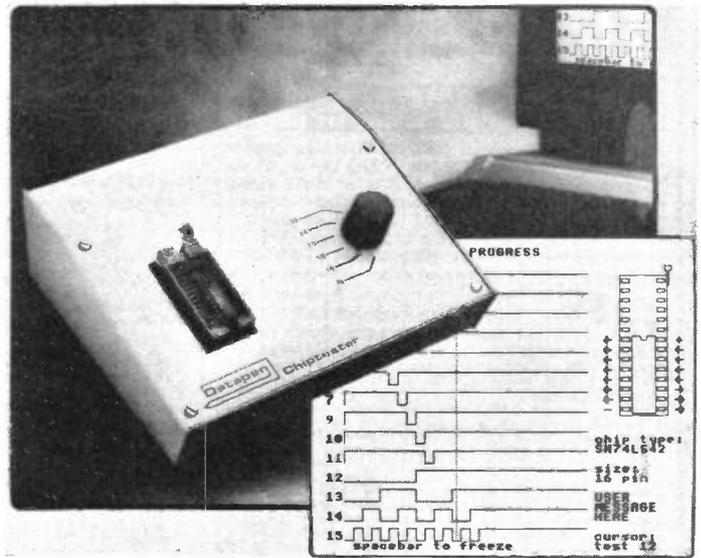
The incorporation of powerful software tools enables the system to be used in a particularly wide application spectrum, which not only covers logging and alarm monitoring but also extends to communications and plant and equipment control.

*Apoloco Ltd,
90 King Street,
Newcastle,
Staffs ST5 1JB.
Tel: (0782) 620519.*

CHIPTESTER

The Datapen Chiptester is designed for functional testing of the majority of integrated circuits in the CMOS and TTL logic families, including derivatives such as ALS, HCT, etc. Many other digital devices are supported by allowing the user to specify or modify the IC tests for himself. In addition to the library of device types supplied on disc with the unit, a users' club and update service is proposed, ensuring that the Chiptester does not become obsolete as new devices are introduced.

Chiptester is used in con-



junction with a BBC micro-computer, and software supplied with the system will work on any disc-based version of the BBC micro. Chiptester plugs into the user and 1MHz bus ports.

Testing is performed either by entry of the device type number or by an automatic search of the disc file, whereby Chiptester will identify and test the logic function of a working IC.

In batch mode only pass and fail indications are shown, giving a very fast throughput. Continuous loop testing is also possible, allowing intermittent or warm-up related

failures to be identified. The display of logic levels and waveforms on all pins is possible and the user may specify which pins are displayed.

Chiptester is housed in a grey aluminium and ABS case and is supplied with a comprehensive handbook, disc software, device library and all necessary connection leads.

*Datapen
Microtechnology Ltd,
Kingsclere Road,
Overton,
Hampshire RG25 3JB.
Tel: (0256) 770488.*

COMMS TESTER

A new communications tester, manufactured by the Scandinavian company Jet Computers, is now being marketed by Microcomms Ltd.

The Comtest is a flexible in-line communications tester, designed for engineers, computer salesmen and those who install, repair and use RS232 communications equipment.

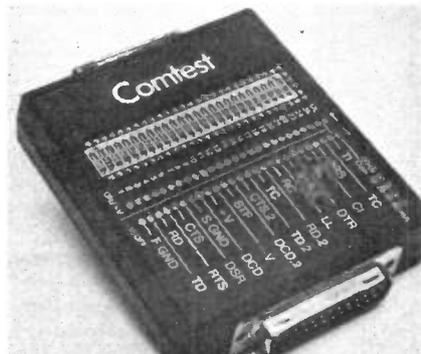
This tool contains 25 dual in-line switches with the DTE-DCE interface pins on both sides. The Comtest can break and cross-patch all 25 lines with switches and jumper cables supplied with the unit. It is designed with 26 pairs of LEDs and shows all 23 signals simultaneously with tri-state indication.

The front and back panels carry full instructions and all signals are described with

CCITT and EIA abbreviations.

The Comtest comes complete with 8 jumper cables and a small pouch for transport.

*Microcomms Ltd,
Chapel Hill,
Ponsanooth,
Truro,
Cornwall TR3 7ES.
Tel: (0872) 865060.*



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FREE

Your monitor from its computer!! For only £24.95 it becomes a SUPERB HIGH QUALITY * COLOUR * TV SET

The fabulous TELEBOX, an INVALUABLE MUST for the owner of ANY video monitor with a composite input, colour or monochrome. Made by a major UK Co. as a TOP QUALITY, stand alone UHF tuner and costing OVER £75 to manufacture, this opportunity to give your monitor a DUAL FUNCTION must not be missed!! The TELEBOX consists of a compact, stylish two tone charcoal, moulded case, containing ALL electronics tuner, power supply etc to simply plug in and convert your previously dedicated computer monitor into a HIGH QUALITY COLOUR TV SET, giving a real benefit to ALL the family! Don't worry if your monitor doesn't have sound - THE TELEBOX even has an integral 4 watt audio amplifier for driving an external speaker, PLUS an auxiliary output for superb quality television sound via your headphones or HI FI system etc. Other features include: Compact dimensions of only 15.75" w x 7.5" d x 3.5" h, latest technology, BRITISH manufacture, fully tuneable 7 channel push button tuner, Auto AGC circuit, SAW filter, LED status indicator, fully isolated 240v AC power supply for total safety, Mains ON-OFF switch etc. Many other uses.

LIMITED QUANTITY - DON'T MISS THIS OFFER!!

ONLY £24.95 OR £19.95 if purchased with ANY of our video monitors. Supplied BRAND NEW with full instructions and 2 YEAR warranty. Post and packing £3.50 *When used with colour crt.

COLOUR & MONOCHROME MONITOR SPECIALS

'SYSTEM ALPHA' 14" COLOUR MULTI INPUT MONITOR

Made by the famous REDIFFUSION Co. for their own professional computer system this monitor has all the features to suit your immediate and future requirements. Two video inputs: RGB and PAL Composite Video, allow direct connection to BBC/IBM and most other makes of micro computers or VCR's, including our very own TELEBOX. An internal speaker and audio amp may be connected to computer or VCR for superior sound quality. Many other features: PIL tube, Matching BBC case colour, Major controls on front panel. Separate Contrast and Brightness - even in RGB mode. Separate Colour and audio controls for Composite Video input. BNC plug for composite input, 15 way 'D' plug for RGB input, modular construction etc.

This Must Be ONE OF THE YEAR'S BEST BUYS. PC USER Supplied BRAND NEW and BOXED, complete with DATA and 90 day guarantee. ONLY £149.00 as above OR IBM PC Version £165.00 15 Day 'D' sct £1.00, BNC sct 75p BNC interface cable £5.50

DECCA 80 16" COLOUR monitor. RGB input. Little or hardly used manufacturer's surplus enables us to offer this special converted DECCA RGB Colour Video TV Monitor at a super low price of only £99.00, a price for a colour monitor as yet unheard of!! Our own interface, safety modification and special 16" high definition PIL tube, coupled with the DECCA 80 series TV chassis give 80 column definition and quality found only on monitors costing 3 TIMES OUR PRICE. The quality for the price has to be seen to be believed!! Supplied complete and ready to plug direct to a BBC MICRO computer or any other system with a TTL RGB output. Other features are: internal speaker, modular construction, auto degaussing circuit, attractive TEAK CASE, compact dimensions only 52cm W x 34 H x 24 D, 90 day guarantee. Although used, units are supplied in EXCELLENT condition. ONLY £99.00 + Carriage.

DECCA 80, 16" COLOUR monitor. Composite video input. Same as above model but fitted with Composite Video input and audio amp for COMPUTER, VCR or AUDIO VISUAL use. ONLY £99.00 + Carr.

REDIFFUSION MARK 3, 20" COLOUR monitor. Fitted with standard 75 ohm composite video input and sound amp. This large screen colour display is ideal for SCHOOLS, SHOPS, DISCOS, CLUBS and other AUDIO VISUAL applications. Supplied in AS NEW or little used condition ONLY £145.00 + Carr.

BUDGET RANGE EX EQUIPMENT MONOCHROME video monitors. All units are fully cased and set for 240v standard working with composite video inputs. Units are pre tested and set up for up to 80 column use. Even when MINOR screen burns exist - normal data displays are unaffected. 30 day guarantee.

12" KGM 320-1 B/W bandwidth input, will display up to 132 x 25 lines. £32.95
12" GREEN SCREEN version of KGM 320-1. Only £39.95
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Carriage and insurance on all monitors £10.00

DC POWER SUPPLY SPECIALS

GOULD OF443, enclosed, compact switch mode supply with DC regulated outputs of +5v @ 5.5a, +12v @ 0.5a, -12v @ 0.1a and -23v @ 0.02a. Dim 18 x 11 x 6 cm. 110 or 240v input. BRAND NEW only £16.95

GOULD G6-40A 5v 40 amp switch mode supply NEW £130.00
AC-DC Linear PSU for DISK drive and SYSTEM applications. Constructed on a rugged ALLOY chassis to continuously supply fully regulated DC outputs of +5v @ 3 amps, -5v @ 0.6 amps and +24v @ 5 amps. Short circuit and overvoltage protected. 100 or 240v AC input. Dim 28 x 12.5 x 7 cm NEW £49.94
Carriage on all PSUs £3.00

KEYBOARDS

Manufacturer's BRAND NEW surplus.

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AMKEY MPNK-114 Superb word processor chassis keyboard on single PCB with 116 keys. Many features such as On board Micro, Single 5v rail full ASCII coded character set with 31 function keys, numeric keypad, cursor pad and 9600 baud SERIAL TTL ASCII OUTPUT. Less than half price. ONLY £89.00 with data. Carriage on Keyboards £3.50



Double sided 40/80 track disk drives (1Mb per drive), PSU, 4K of memory mapped screen RAM, disk controller, RS232, CENTRONICS and system expansion ports and if that's not enough ready to plug into STANDARD B DRIVE port for up to FOUR 8" disk drives, either in double density or IBM format. The ultra slim 92 key, detachable keyboard features 32 user definable keys, numeric keypad and text editing keys, even its own integral microprocessor which allows the main Z80A to devote ALL its time to USER programs, eliminating "lost character" problems found on other machines. The attractive, detachable 12" monitor combines a green, anti-glare etched screen, with full swivel and tilt movement for maximum user comfort. Supplied BRAND NEW with CPM 2.2, user manuals and full 90 day guarantee. Full data sheet and info on request.

PC2000 System with CPM Etc. COST OVER £1400

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The FABULOUS CPM TATUNG PC2000 Professional Business System

A cancelled export order and months of negotiation enables us to offer this professional PC, CPM system, recently on sale at OVER £1400, at a SCOOP price just over the cost of the two internal disk drives!! Or less than the price of a dumb terminal!!

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The central processor plinth contains the 64K, Z80A processor, DUAL TEAC 55F 5 1/4" Auto answer etc. PC2000 Wordprocessor System with CPM and TEC FP25 daisywheel printer

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Ex BRITISH TELECOM full spec, CCITT, ruggedised, bargain offers. Solid TESTED with data. Will work on any MICR/O or system with RS232 interface.

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DATEL 2412. Made by SE Labs for BT. This two part unit is for synchronous data links at 1200 or 2400 baud using 2780/3780 protocol etc. Many features include 2 or 4 wire working, self test, auto answer etc. COST OVER £800. Our price ONLY £199 + pp £8.00
DATEL 4800, RACAL MPS4800 baud modem, EX BT good working order. ONLY £295.00 + pp £8.00

SPECIAL OFFER

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For more information contact our Sales Office.

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Standard VDU data entry terminals

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100's of other terminals in stock. CALL for more details.

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PLESSEY VUTEL, ultra compact unit, slightly larger than a telephone features A STANDARD DTMF TELEPHONE (tone dial) with 5" CRT monitor and integral modem etc. for direct connection to PRESTEL, VIEWDATA etc. Designed to sell to the EXECUTIVE at over £600. Our price BRAND NEW AND BOXED at only £99.00

DECCAFAX VP1 complete Professional PRESTEL system in slimline desk top unit containing Modem, Numeric keypad, CPU, PSU etc. Connects direct to standard RGB colour monitor. Many other features include Printer output, Full keyboard input, Cassette port etc. BRAND NEW with DATA A FRACTION OF COST only £55.00

ALPHANTATEL. Very compact unit with integral FULL ALPHA NUMERIC keyboard. Just add a domestic TV receiver and you have a superb PRESTEL system and via PRESTEL the cheapest TELEX service to be found!! Many features: CENTRONICS Printer output, Memory dialling etc. Supplied complete with data and DIY mod for RGB or Composite video outputs AS NEW only £125.00

Post and packing on all PRESTEL units £8.50

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4164 200 ns D RAMS 9 for £11 4116 ns £150 2112 £150 2114 £250 2102 £2.00 6116 £2.50 EPROMS 2716 £4.50 2732 £3.00 2764 £4.95 27128 £5.50 6800 £2.50 6821 £1 68A09 £8 68B09 £10 8085A £5.50 8086 £15 8088 £8 NEC765 £8 WD2793 £28 8202A £22 8251 £7 8748 £15 Z80A DART £6.50 Z80A CPU £2.00. Thousands of IC's EX STOCK send SAE for list.

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Japanese 5 1/4" half height, 80 track double sided disk drives by TEAC, CANON, TOSHIBA etc. Sold as NEW with 90 day guarantee ONLY £85.00
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8" IBM format TESTED EX EQUIPMENT.

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Unless stated all drives are refurbished with 90 day guarantee. Many other drives and spares in stock - call sales office for details.

All prices quoted are for U.K. Mainland, paid cash with order in Pounds Sterling PLUS VAT. Minimum order value £2.00. Minimum Credit Card order £10.00. Minimum BONA FIDE account orders from Government Depts., Schools, Universities and established companies £20.00. Where post and packing not indicated please ADD £1.00 + VAT. Warehouse open Mon-Fri 9.30-5.30, Sat 10.30-5.30. We reserve the right to change prices and specifications without notice. Trade, Bulk and Export

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Made to the very highest spec the **TEC STARWRITER FP1500-25** features a very heavy duty die cast chassis and **DIABLO** type print mechanism giving superb registration and print quality. Micro-processor electronics offer full

DIABLO/QUEME command compatibility and full control via **CPM WORDSTAR** ETC. Many other features include bi-directional printing, switchable 10 or 12 pitch, full width 381mm paper handling with up to 163 characters per line, friction feed rollers for single sheet or continuous paper, internal buffer, standard **RS232** serial interface with handshake. Supplied absolutely **BRAND NEW** with 90 day guarantee and **FREE** daisy wheel and dust cover. Order **NOW** or contact sales office for more information. Optional extras **RS232** data cable £10.00. Tech manual £7.50. Tractor Feed £140.00. Spare daisy wheel £3.50. Carriage & Ins. (UK Mainland) £10.00.



SUMMER OFFER ONLY £399.99!!

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Brand New surplus of this professional printer chassis gives an outstanding opportunity for the **Student, Hobbyist or Robotics** constructor to build a **printer - plotter - digitiser** etc. entirely to their own specification. The printer mechanism is supplied ready built, aligned and pre tested but **WITHOUT** electronics. Many features include all metal chassis, phosphor bronze bearings, 132 character optical shaft position encoder, **NINE** needle head, 2 x two phase 12V stepper motors for carriage and paper control, 9.5" Paper platten etc. etc. Even a manufacturer's print sample to show the unit's capabilities!! Overall dimensions 40 cm x 12 cm x 21 cm.

Sold **BRAND NEW** at a **FRACTION** of cost **ONLY £49.50 + pp £4.50.**

TELETYPE ASR33 DATA I/O TERMINALS

Industry standard, combined ASCII 110 baud printer, keyboard and 8 hole paper tape punch and reader. Standard **RS232** serial interface. Ideal as cheap hard copy unit or tape prep. for CNC and NC machines. **TESTED** and in good condition. Only **£235.00** floor stand **£10.00.** Carr & Ins. **£15.00.**

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Compact ultra reliable quality built unit made by the **USA EXTEL Corporation.** Often seen in major Hotels printing up to the minute News and Financial information, the unit operates on **5 UNIT BAUDOT CODE** from a Current loop, **RS232** or TTL serial interface. May be connected to your micro as a low cost printer or via a simple interface and filter to any communications receiver to enable printing of worldwide **NEWS, TELEX and RTTY** services.

Supplied **TESTED** in second hand condition complete with **DATA, 50 and 75** baud xtals and large paper roll.

TYPE AE11
50 Column **ONLY £49.95**
Spare paper roll for AE11 **£4.50**
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A massive purchase of these desk top printer terminals enables us to offer you these quality **30 or 120 cps** printers at a **SUPER LOW PRICE** against their original cost of over **£1000.** Unit comprises of full **QWERTY**, electronic keyboard and printer mech with print face similar to correspondence quality typewriter. Variable forms tractor unit enables full width - up to 13.5" 120 column paper, upper - lower case, standard **RS232** serial interface, internal vertical and horizontal tab settings, standard ribbon, adjustable baud rates, quiet operation plus many other features. Supplied complete with manual. Guaranteed working **GE30 £130.00. GE120 120 cps £175.00.** Untested **GE30 £65.00** Optional floor stand **£12.50.** Carr & Ins. **£10.00.**

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Mixed Semis amazing value contents include transistors digital, linear, IC's, triacs, diodes, bridge recs. etc. etc. All devices guaranteed brand new full spec with manufacturer's markings, fully guaranteed.

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TTL 74 Series. A gigantic purchase of an "across the board" range of **74 TTL** series IC's enables us to offer **100+** mixed "mostly TTL" grab bags at a price which two or three chips in the bag would normally cost to buy. Fully guaranteed all IC's full spec. **100+ £6.90, 200+ £12.30, 300+ £19.50**

CENTRONICS 710 PRINTERS

Ex **RENTAL** Heavy duty full width carriage printer up to 132 columns on 17" fan fold sprocket fed paper. 60 cps print speed with standard **RS232** or 20 mA loop interface. Supplied in **TESTED** used condition with data. **ONLY £85.00** carriage and insurance **£10.00.**

MAINS FILTERS

CURE those unnerving hang ups and data glitches caused by mains interference with professional quality filters **SD5A** match-box size up to **1000 watt 240 V** Load **ONLY £5.95.** **L12127** compact completely cased unit with 3 pin fitted socket up to **750 watts ONLY £9.99.**

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The amazing **SOFTY 2** The "Complete Toolkit" for copying, writing, modifying and listing **EPROMS** of the **2516, 2716, 2532, 2732** range. Many other functions include integral keyboard, cassette interface, serial and parallel i/o UHF modulator ZIF socket etc. **ONLY £195.00 + pp £2.50.** **"GANG OF EIGHT"** intelligent Z80 controlled 8 gang programmer for ALL single 5v rail **EPROMS** up to 27128. Will copy **8 27128 in ONLY 3 MINUTES.** Internal LCD display and checking routines for **IDiot PROOF** operation. Only **£395.00 + pp £3.00.** **"GANG OF EIGHT PLUS"** Same spec as above but with additional **RS232** serial interface for down line loading data from computer etc. **ONLY £445.00 + pp £3.00.**

Data sheets on request

20,000 FEET OF ELECTRONIC AND COMPUTER GOODIES ENGLAND'S LARGEST SURPLUS STORE - SEEING IS BELIEVING!!

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PDP 1140 System comprising of CPU, 124k memory & MMU 15 line **RS232** interface. **RP02** 40 MB hard disk drive.
TU10 9 track 800 BPI Mag tape drive, dual track system. **VT52** VDU, etc. etc. Tested and running. **£3,750.00**
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- 20 mA
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Brand New **VT100** Keyboards
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1000's of **EX STOCK** spares for **DEC PDP8, PDP8A, PDP11** systems & peripherals. Call for details. All types of Computer equipment and spares wanted for **PROMPT CASH PAYMENT.**

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Many **EX STOCK** computer tape drives and spares by **PERTEC, CIPHER, WANGO, DIGIDATA, KENNEDY** etc. Special offer this month on **DEI** Cartridge tape drives **ONLY £450.00** each.

CALL FOR DETAILS

COMPUTER/SYSTEM CABINET & PSU

All in one quality computer cabinet with integral switched mode **PSU**, mains filtering, and twin fan cooling. Originally made for the famous **DEC PDP8** computer system costing thousands of pounds. Made to run 24 hours per day the **psu** is fully screened and will deliver a massive **+5v DC** at 17 amps, **+15v DC** at 1 amp and **-15v DC** at 5 amps. The complete unit is fully enclosed with removable top lid, filtering, trip switch, power and run leds mounted on all front panel, rear cable entries, etc. etc. Units are in good but used condition - supplied for 240v operation complete with full circuit and tech. man. Give your system that professional finish for only **£49.95 + carr.** 19" wide 16" deep 10.5" high. Useable area 16" w 10.5" h 11.5" d.

Also available less **psu**, with fans etc. Internal dim. 19" w, 16" d, 10.5" h. **£19.95. Carriage £8.75**

66% DISCOUNT ON ELECTRONIC COMPONENTS EQUIPMENT

Due to our massive bulk purchasing programme, which enables us to bring you the best possible bargains, we have thousands of IC's, Transistors, Relays, Caps, PCB's, Sub-assemblies, Switches etc. etc. surplus to **OUR** requirements. Because we don't have sufficient stocks of any one item to include in our ads we are packing all these items into the **BARGAIN OF A LIFETIME.** Thousands of components at giveaway prices. Guaranteed to be worth at least 3 times what you pay. Unbeatable value and perhaps one of the most consistently useful items you will ever buy!!! Sold by weight.

2.5kls **£5.25 + pp £1.25**
10kls **£11.25 + pp £2.25**

5 kls **£6.90 + £1.80**
20kls **£19.50 + pp £4.75**

1000's of other **EX STOCK** items including **POWER SUPPLIES, RACKS, RELAYS, TRANSFORMERS, TEST EQUIPMENT, CABLE, CONNECTORS, HARDWARE, MODEMS, TELEPHONES, VARIACS, VDU'S, PRINTERS, POWER SUPPLIES, OPTICS, KEYBOARDS** etc. etc. Give us a call for your spare part requirements. Stock changes almost daily.

Don't forget, **ALL TYPES** and **QUANTITIES** of electronic surplus purchased for **CASH**



PRODUCT NEWS

BEARCAT RXs

R Withers Communications has announced the availability of a new range of Bearcat scanning receivers, manufactured by Uniden. RWC is the main distributor of this equipment for the Midlands area.

Three new models are available, one being the DX1000 digital short wave receiver. This is a synthesized keyboard/VFO short wave Rx, 10kHz to 30MHz all-mode, with three selectivity filters fitted as standard.

Powered from a 12-13.8V dc source with an internal battery compartment for portable operation, the receiver comes with a small telescopic antenna and a long wire antenna. It costs £329 including VAT.

The BC100XL hand-held VHF/UHF receiver is an upgraded version of the Bearcat 100, incorporating a new search mode scanning facility. It has an FM sensitivity of better than $.4\mu\text{V}$ for 12dB sinad and air band sensitivity

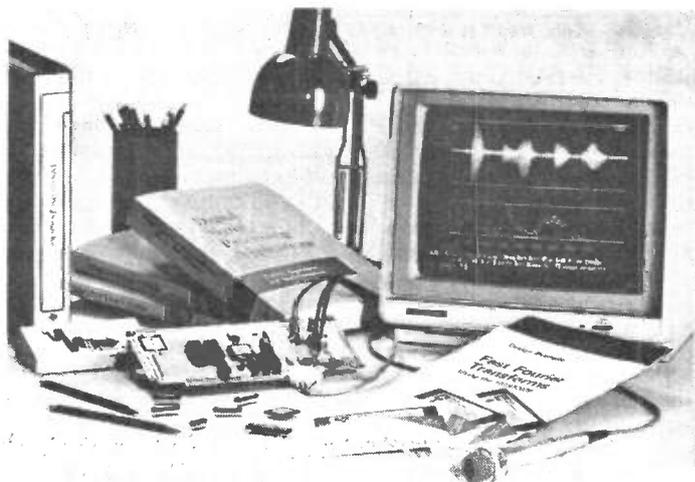
is better than $.8\mu\text{V}$. The frequency range is 66-88MHz, 108-136MHz air band, 136-174MHz FM and 360-512MHz UHF, with 16 memories.

The 100XL is supplied with nicads and a wall charger/ac supply. It retails at £219.50 including VAT.

The BC175XL desk-top VHF/UHF scanning receiver operates from 12-13.8V dc for portable and mobile operation and has a 240V ac adapter. The frequency range is the same as the 100XL and the performance specification is quoted at $.3\mu\text{V}$ FM for 12dB sinad.

The unit is supplied with an adjustable telescopic antenna and an auto-squelch circuit. It retails at £209.50 including VAT.

*R Withers
Communications Ltd,
584 Hagley Road West,
Oldbury,
Warley,
Birmingham B68 0BX.
Tel: (021) 421 8201/2/3.*



DSP DESIGN KIT

Now available from Online Distribution Ltd is a new design kit for the Texas Instruments TMS320 family of digital signal processors (DSPs).

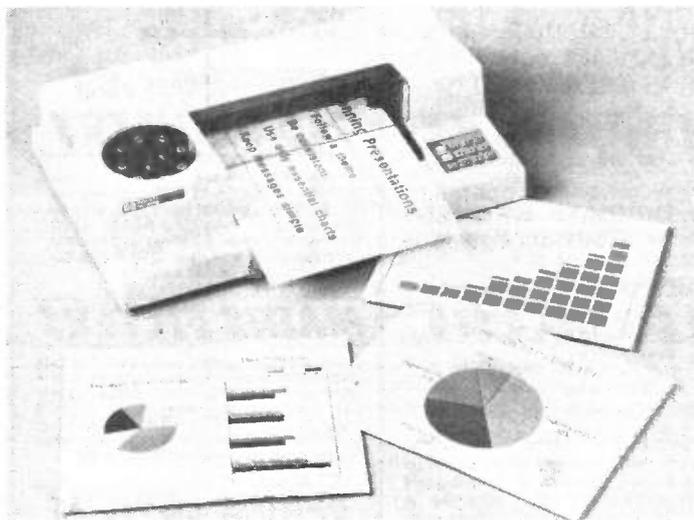
Priced at £320, the kit has all the building blocks necessary for designing and evaluating DSP systems. It comprises two sample chips plus user guides; a TCM2916J codec and data sheet; four pre-programmed PROMs (TBP38L165 and data sheet); a 735-page DSP applications manual; a software library with source code for most applications in the manual; an ADPCM speech design example using the TMS32010; an FFT design example using the

TMS32020; and a DSP newsletter.

The TMS320 family makes DSP possible for many formerly analogue or bit-sliced applications, where cost and size would previously have ruled them out. Applications include telecommunications, voice processing, graphics, control systems and instrumentation.

All devices in the TMS320 family are capable of implementing complex, numeric intensive algorithms in real-time.

*Online Distribution Ltd,
Melbourne House,
Kingsway,
Bedford.
Tel: (0234) 217981.*



8-PEN PLOTTER

Hewlett-Packard's latest compact 8-pen plotter, the ColorPro, is now in stock at Rapid Terminals.

Designed for business professionals, the ColorPro (HP7440A) operates with virtually any PC - including Apple IIe, IBM PC, DEC Rainbow, Compaq Deskpro and HP150 - and produces multi-colour text and graphics on A4 paper or overhead transparency film.

The plotter has an 8-pen carousel from which pens are

selected via software commands. When not in use, the pens are automatically capped to prolong their working life.

Features include 0.025mm (0.001in) resolution, 0.1mm (0.004in) repeatability, 40cm/s pen speed and a 60-byte communications buffer. There are five built-in character sets and the plotter supports 44 high level graphics commands in HP-GL.

The ColorPro measures 46cm x 31cm x 12.5cm, weighs only 5.5kg and has a maximum

power consumption of 20W. Baud rates are switch-selectable from 75 to 9600 (RS232C interface).

List price of the plotter is £1160, while the graphics enhancement cartridge is £174.

*Rapid Terminals,
Rapid House,
Denmark Street,
High Wycombe,
Bucks HP11 2ER.
Tel: (0494) 450111.*

FREQUENCY STANDARD

An ultra-miniature (3 cubic inch) high stability frequency standard with a low ageing rate, the Piezo Model 2850038, is now available from Anglia Microwaves Ltd.

Offered in frequencies of 10.0MHz and 10.23MHz, the 2850038 has an SSB phase

noise figure of better than -153dBc/Hz at 10kHz and an ageing rate guaranteed at $5 \times 10^{-10}/\text{day}$ at time of shipment.

A stress-compensated (SC cut) crystal is the basis of the frequency standard, which is designed for use in high-G applications. The gravitational field figure is less than 2×10^{-9} for a 1G static shift. Shock rating is 50G, 11ms $\frac{1}{2}$ sine wave.

Operating over a temperature range from -40 to $+70^\circ\text{C}$, the 2850038 requires a supply voltage of $+15\text{V}$ dc ($\pm 5\%$) and draws 1.5W of power during normal operation.

*Anglia Microwaves Ltd,
Radford Business Centre,
Radford Way,
Billericay,
Essex CM12 0BZ.
Tel: (02774) 58955.*

COMMODORE ADD-ONS

A battery back-up CMOS RAM and real-time clock plug-in module for the Commodore 64, providing reliable timing facilities unaffected by the 64's often-interrupted internal timing scheme, is now available from Electronic and Computer Workshop Ltd.

The module (K2629) can be supplied in ready-built or kit form and provides real-time clock functions that include hours, minutes and seconds together with a powerful leap year compensating calendar and a programmable daily alarm.

Space on the board is reserved for a rechargeable nicad battery. An external battery can also be used, if necessary.

The battery also backs up 50 bytes of CMOS static RAM

which can be used to store important information that is retained when the computer is powered down, such as set-up data. The data may be utilised to load automatically and run programs on start-up. Full documentation is included with the module plus an extensive demonstration programme to illustrate the workings of this versatile module.

The K2629 CMOS real-time clock and RAM module is offered at a price of £36.11 in kit form or at £50.45 ready-built. Prices include VAT and postage and packing.

*Electronic and Computer Workshop Ltd,
171 Broomfield Road,
Chelmsford,
Essex CM1 1RY.
Tel: (0245) 262149.*



OH BROTHER

Brother has expanded into the OEM market with a range of disc drives and a low-profile IBM compatible keyboard.

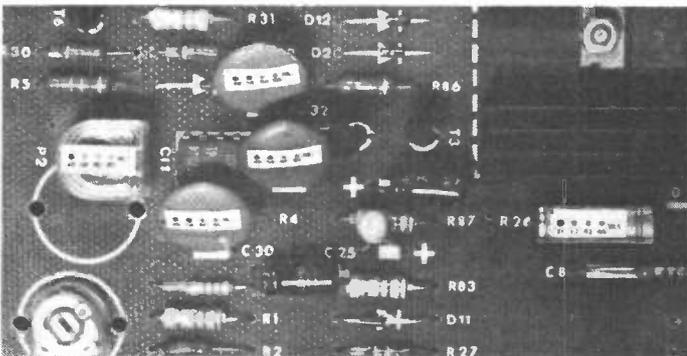
The new range of micro 3.5 inch floppy disc drives feature a one inch (25.4mm) height with a standard front loading format. This ultrathin design is expected to prove of particular benefit in the manufacture of smaller equipment. The range is unique in that it requires a single five volt supply, providing improved reliability and eliminating the cost of additional components and circuitry needed to accommodate the secondary 12 volt supply required by other disc drives.

There are four drives in the range - the FB600, FB620, FB700 and FB800 - with a

speed of access and unformatted storage capacity of 6ms 1MB, 3ms 1MB, 3ms 1.6MB, and 3ms 2MB respectively. The range is downwards compatible.

The new low-profile keyboard is for the IBM PCAT and has been ergonomically designed with the operator in mind. Brother claim to have achieved a computer keyboard layout which is more familiar and acceptable to a typist. Keyboards for other computers can also be custom-designed to suit specific requirements.

*Brother Computer Peripherals Division,
Jones & Brother,
Shepley Street,
Guide Bridge,
Audenshaw,
Manchester M34 5JD.
Tel: (061)330 6531.*



THERMAX STRIPS

An irreversible 4-level thermometer strip which can be applied to any surface has been introduced by Thermographic Measurements Ltd.

The Thermax Micro Label measures 10mm by 3mm, its small size enabling it to be used on any product requiring measurement. It changes from silver white to black upon achieving maximum temperature, four temperature levels being measured on each strip. The range extends from 40°C to 224°C in nine standard temperature groups.

The strips are self-adhesive and impervious to oil, water and steam.

They respond to heat in less than 1 second and have an accuracy of $\pm 1\%$.

*Thermographic Measurements Ltd,
Bank House,*

*Neston Road,
Burton,
South Wirral L64 5TA.
Tel: (051 336) 6265.*

TIGHT SECURITY

Riscomp Limited have announced a new control panel to their range of security products.

Known as the CA1382, the unit provides an extensive range of facilities and is easy to operate. A major contribution to the simplified operation is the automatic 'system testing' which is carried out every time the unit is switched on, with a light emitting diode indicating correct operation. Such a feature reduces the possibility of false alarms.

Additionally, the entire operation is controlled by a single key operated on/off switch. A built-in exit and entrance buzzer provides

audible warning of the unit's operation, whilst the alarm memory allows the unit to be set up without annoyance to neighbours. Provision for sounding the alarm by means of a personal attack switch, even though the unit may not be switched on, has been included.

Housed in an attractive steel case, the CA1382 is available either fully built and tested or in self-assembly form.

In either case it is accompanied by a comprehensive data sheet which simplifies its installation. The price of the self-assembly unit is £39.95 plus VAT, and the fully built and tested version is £44.95 plus VAT.

*Riscomp Ltd,
51 Poppy Road,
Princes Risborough,
Bucks HP17 9DB.
Tel: (084 44) 6326.*





FOR GOOD MEASURE

A portable carrying case is now available for the Jay series of measurement instrumentation.

In the Jay range different modules can be inserted into the front of the unit to perform many measurement tasks, eg temperature, DMM, strain, calibration and simulation.

The carrying case has rechargeable batteries (charged by the Jay unit) and a space to store up to four spare modules. The most

popular application of this system is for temperature and strain analysis.

The case and battery pack costs 235.00.

*CIL Electronics Ltd,
Decay Road,
Worthing,
Sussex BN14 8ND.
Tel: (0903) 204646.*

MUSICAL SWITCHES

Could you imagine the hit musical stage show *Starlight Express* being used to sell

SATELLITE NEWS

As a result of our little piece about a cheap satellite receiving dish last month, Comex Systems are now finalising a deal with STS to retail their low noise block-converter. At a retail price "appreciably below £200", this will perfectly complement the Comex tuner and Kord dish to give a system retail price of less than £600. Details are now also avail-

able of the add-on units available from Comex for the tuner, including a tunable sound IF kit and a digital display. Comprehensive details of the full range on offer are available on receipt of a large SAE.

*Comex Systems Ltd,
Comet House,
Unit 4, Bath Lane,
Leicester LE3 5BF.
Tel: (0533) 25084.*

switches? Well, the cover pic shows the set for this show with a custom-built Cadac sound mixer from Clive Green & Co of Luton in the foreground. This company specialises in producing high quality mixing and balancing equipment tailored to the peculiar demands of the theatre.

This info comes not from Clive Green, as you might have expected, but from Cargill Electronics. Each Cadac console incorporates around 600 light action self-indicat-

ing ITT push-button switches for level adjustment on typically 32 channels, all supplied by Cargill, "a leading distributor of electro-mechanical components".

Musicals selling switches, eh? That's almost as far-fetched as Charlie Chaplin or the Mr Men selling computers...

*Cargill Electronics,
Bridgewater Close,
Hawksworth,
Swindon SN2 1TZ.
Tel: (0793) 613201.*

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10 El Yagi	£25.00	4.00
12 El Yagi	£28.00	4.00
6 El Yagi Crossed	£23.00	4.00
10 El Yagi Crossed	£28.00	4.00
438mgs/70cm		2.00
4 F/glass Collinear	£25.00	2.00
17 Element	£18.00	4.00
Double Delta	£35.00	4.00
8 Turn Helical	£35.00	4.00
1206/23cm & 934/32cm		2.00
Mobile Collinear	£25.00	2.00
Base Collinear	£39.95	2.00
20 Turn Helical	£33.00	4.00
Para Delta	£45.00	5.00
6ft 6in Parabolic Dish		9.00

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Tel: 0480 61778;

WIRE-WRAPPING

The OK11 electrically-powered wire-wrapping tool has been developed for all wire-wrapping applications from research and development to production. The tool now has cut, strip and wrap capability and operates at higher production rates by working directly from a reel or harness without any wire end preparation. Instead, the bits cut the wire, strip off the correct length of insulation and wrap the wire onto the terminal in one operation.

The OK11's powerful motor and positive gear drive have been developed for deman-

ding production applications, and wire from 22-32awg (0.65-0.2mm) can be handled.

The tool has a tough ABS body and incorporates RFI noise suppression, making it safe for use in computer environments. Both 110 and 220V operation are offered and a back-force device, to prevent over-wrapping, is available.

*OK Industries UK Ltd,
Barton Farm
Industrial Estate,
Chickenhall Lane,
Eastleigh,
Hants SO5 5RR.
Tel: (0703) 619841.*

RF CONNECTORS

Now available off the shelf from Dage is Radiall's range of SMA 50 ohm miniature coaxial connectors.

Designed for telecomms, radar, radio communications, instrumentation and laboratory applications, the connectors offer good RF performance and reliability up to 18GHz.

Versions for use up to 26GHz are available to order, with higher frequencies due for release later this year.

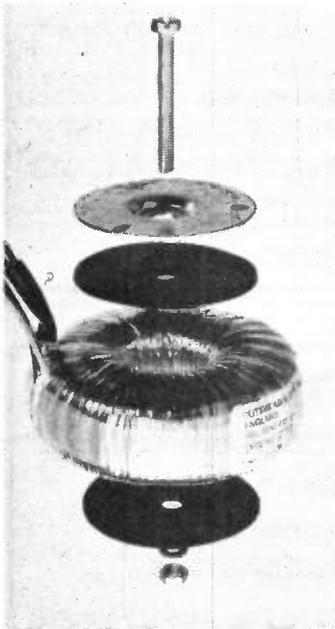
Connectors are BS9210 and CECC approved and come in numerous styles for screw thread coupling of flexible and semi-rigid cables. Styles available include straight and right-angle plugs and jacks with solder or crimp connection options, receptacles, and in-series adaptors.

Gold-plated beryllium copper or stainless steel bodies are available.

Contacts are gold-plated beryllium copper. A range of mounting options are available.



*Dage (GB) Ltd,
Eurosem Connector Division,
Rabans Lane,
Aylesbury,
Bucks HP19 3RG.
Tel: (0296) 33200.*



Class 2, and VDE0550 Class 2, enabling the transformers to withstand a 4kV flash test. The surge current is typically higher than that of a conventional transformer and the toroid should be protected on the input side with a slow blow fuse.

The toroids are supplied complete with a dished securing cap, protection pads and a fixing screw, etc.

*Cotswold Electronics Ltd,
Kingsville Road,
Kingsditch Trading Estate,
Cheltenham GL51 9NX.
Tel: (0242) 41313.*

INTERFERENCE PROTECTION

Roxburgh Suppressors recently introduced custom design PCB filters in the PC103/105/110 range. These low cost, PCB mounting filters are designed to protect digital circuits from mains-borne interference. Three standard variants are rated at 3, 5 and 10A, and units are available with 2200pF 'Y' rated capacitors to comply with European earth leakage requirements. Other options include different combinations of capacitors and values to suit customer needs.

All units can be potted in ABS boxes for environmental and mechanical protection or assembled on PC boards.

*Roxburgh Suppressors Ltd,
Haywood Way,
Ivyhouse Lane,
Hastings,
East Sussex TN35 4PL.
Tel: (0424) 442160.*

LESS STATIC

OK's static safe field service kit provides a portable static safe handling environment for the service engineer. It is available in two versions, each containing a large and small elasticated wristband, grounding cord and a unique double-sided safe work surface material which is both conductive on one side to 10^5 ohms and static dissipative on the other to 10^8 ohms.

Kit 574-086 is a tool roll with five small pockets and one large, suitable for hand tools

and materials, and it can be rolled and tied. Kit 574-080 is a service kit with the standard arrangement of two large pockets and is supplied flat. Each provides a 24x26in work surface. The tool roll kit costs £36.87 (excluding VAT) and the service kit is £34.50 (excluding VAT).

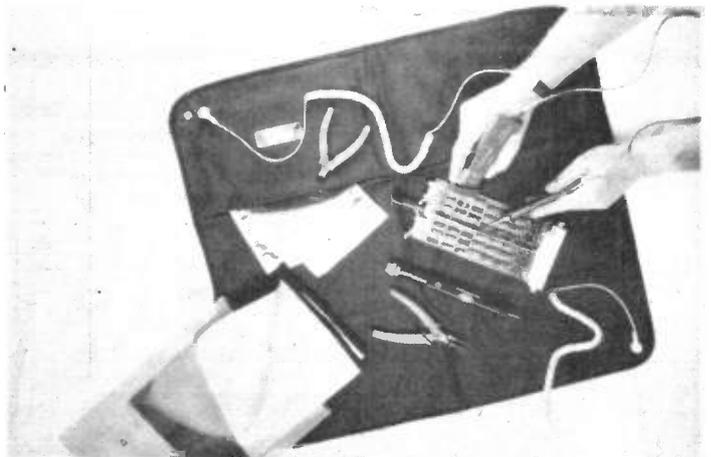
*OK Industries UK Ltd,
Barton Farm,
Industrial Estate,
Chickenhall Lane,
Eastleigh,
Hants SO5 5RR.
Tel: (0703) 619841.*

BUDGET TOROIDS

Cotswold Electronics can now supply their budget range of toroidal transformers in 15, 25 and 40VA, in addition to the standard 30, 60, 100, 160, 230, 330 and 530VA currently manufactured.

The transformers have dual separate 110+110V primary windings and dual secondary windings of 2x6, 9, 12, 15 and 18V for the 15VA types, with an additional 2x22V version in the 25 and 40VA types. The primary windings are connected in parallel for 110V operation and in series for 220V operation. The nominal frequency is 50/60Hz and the operating range is 47 to 400Hz.

Double insulation is provided to BS415 Class 2, IEC65



TRANSFORMERS

MAINS ISOLATORS		
VA	Price	P&P
720	7.06	2.18
100	11.51	2.31
60	13.43	2.59
200	19.03	3.10
250	23.01	3.24
350	28.48	3.40
500	35.45	3.66
1000	64.28	4.62
1500	82.92	5.95
2000	99.76	6.36
3000	139.39	O/A
6000	298.89	O/A

25/50V or 25-0-25V		
VA	Price	P&P
720	7.06	2.18
100	11.51	2.31
60	13.43	2.59
200	19.03	3.10
250	23.01	3.24
350	28.48	3.40
500	35.45	3.66
1000	64.28	4.62
1500	82.92	5.95
2000	99.76	6.36
3000	139.39	O/A
6000	298.89	O/A

12/24V or 12-0-12V			
12V	24V	Price	P&P
0.3	1.5	2.92	1.10
1	0.5	3.70	1.60
2	1	5.15	1.70
4	2	5.94	1.90
6	3	9.31	2.05
8	4	10.89	2.10
10	5	11.91	2.10
12	6	13.20	2.25
16	8	15.73	2.60
20	10	21.17	3.04
30	15	26.31	3.10
40	20	37.56	4.25
60	30	53.92	4.90
83	41	82.09	5.65

42/96V Pri 2x120V			
72/96	36/48	Price	P&P
0.5	1	6.51	1.50
2	4	17.81	2.54
3	6	21.57	2.75
5	10	39.08	3.70
6	12	48.94	3.99
8	16	53.39	4.20

EX STOCK

15/30V or 15-0-15V			
15V	30V	Price	P&P
1	0.5	3.88	1.41
2	1	5.24	1.70
4	2	8.47	1.92
6	3	9.82	2.10
8	4	11.72	2.20
10	5	14.49	2.31
12	6	16.40	2.55
16	8	21.95	2.60
20	10	25.32	2.84
24	12	28.07	2.95
30	15	31.66	3.51
40	20	43.22	5.95

AUTOS			
VA	Price	P&P	
80	5.86	1.70	
150	8.49	1.85	
250	10.34	1.98	
350	12.43	2.31	
500	16.12	2.68	
1000	28.79	3.25	
1500	34.17	3.68	
2000	51.09	4.82	
3000	88.89	5.72	
4000	112.78	O/A	
5000	131.33	O/A	
7500	202.71	O/A	
10000	239.53	O/A	

CASED AUTOS			
VA	Price	P&P	
20	8.34	1.76	
80	11.33	1.87	
150	14.87	2.20	
250	17.87	3.02	
500	29.32	3.19	
1000	40.29	4.34	
2000	73.33	5.28	
3000	105.26	O/A	

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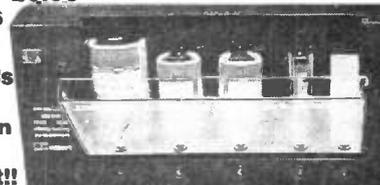
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AA/HP7-500mAh 1.2V	£1.10 each
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'D'/HP2-1200mAh 1.2V	£2.80 each
PP3-100mAh 9V	£5.50 each

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TC24 Master socket - surface type mounting box	£4.80
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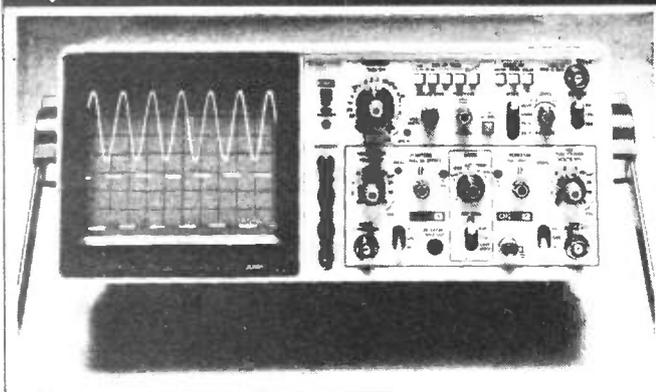
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More room for cellular

At the end of August the DTI and the Ministry of Defence announced that the number of radio frequencies available for use for cellular radio in London is to be increased by using frequencies currently allocated to the MoD. This decision should enable the maximum traffic capacity of the two cellular radio systems in the Central London area to be more than doubled.

The need for further frequencies is a result of the success of cellular radio in the UK market. The speed of uptake, particularly in the London area, has exceeded expectations. The operators have already used a number of techniques to get the most out of the existing frequencies in central London.

The frequencies immediately below those presently used for cellular radio are allocated to the Ministry of Defence. They have agreed that, subject to certain restrictions, these frequencies may in future be used by the cellular radio operators in London. Initially a further 200 channels are to become available to each operator, compared with 300 channels in use by each at present. Ultimately, if demand justifies it, a further 120 channels could be made available to bring the total in Central London up to 620 for each operator.

The cellular radio operators will be discussing a modified specification with equipment manufacturers which will enable full advantage to be taken of these extra channels.

The exact nature of the restrictions on the use of the new frequencies is still being discussed. Broadly, they will be available anywhere within 6 miles of Charing Cross. Because of the way the cellular radio system is controlled it will be possible to use these frequencies in London without the user having to take any action or being aware of the transition.

Someone sees sense?

The DTI recently published a consultative document entitled *Proposal for the establishment within the radio communications industry of an independent third party quality assurance scheme under the aegis of the National Accreditation Council for Certification Bodies*. It was launched by

Industry Minister Geoffrey Pattie, who said:

"There are three main reasons for the establishment of the scheme. First, for the radio communications industry to reap the proven benefits of good management practice for quality assurance. Second, to reduce the need for multiple assessments internationally. Finally, to provide an environment which allows devolution from the Radio Regulatory Division of the DTI and thereby increase the self regulation by the industry in the effective management of the radio frequency spectrum."

The scheme will apply not only to those who manufacture and import radio communications equipment but also to installers, maintenance and repair organisations, some categories of radio users and those who wish to supply radio communications services.

Copies of the consultative document may be obtained from the Department of Trade and Industry, Room 409, Waterloo Bridge House, Waterloo Road, London SE1 8UA. Comments should reach the DTI by 14 November 1986.

BT=Big Takings

I'm sure a great many readers are aware of the price changes announced by BT at the beginning of September, and the hostile reception this announcement received from Oftel because of the

NEWS DESK

increase it meant for ordinary domestic users. The wording of the release was rather interesting in places as it pointed out how fair and reasonable the changes were.

Take, for instance, the following passage:

"While there are difficulties in making comparisons which properly allow for usage patterns and exchange rates, the BT bills are cheaper on the whole when compared with their equivalent, at tariffs (weighted to allow for purchasing parity) obtaining in France, West Germany, Japan, Italy or New York."

Does this seem a rather selective comparison? What about the rest of Europe, or the States outside New York?

Exactly a week after this announcement, BT released details of its pre-tax profit for the quarter ended 30 June 1986. There are no prizes for guessing whether it was higher, lower or the same as the corresponding period last year. The figure was £502 million, representing a 12%

increase. What was that expression about laughing all the way to the bank?

Happy Christmas

They're a cheery bunch at the British Safety Council. In a recent press release they quite sensibly state that a well-stocked first aid box is a must for every home and car, so much so in fact that they are urging every family to put first aid high on the list of priorities this year for *Christmas presents!* Now I'll grant you that first aid can come in very useful at this time of year, especially when Dad gets a little excited and blows a gasket while playing *The Leather Goddesses of Phobos* on little Johnny's new computer, but I don't think a first aid kit makes a good present: I'd rate it a little higher than a voodoo doll.

Anyway, if you want one the BSC has put one together. Called 'Autohome', it's available for £17.95 including VAT and P&P from British Safety Council Sales Ltd, 62/64 Chancellor's Road,

Competition time!

Here's your chance to win a few bob and do a bit for crime prevention at the same time, in the form of the 'Design Against Crime' competition organised by the British Security Industry Association.

You're invited to submit a design of your own anti-crime device or invention, which can be anything that helps stop a crime being committed. The entry can be in the form of a detailed drawing, plans, photographs or just an outline description or sketch.

There are three categories for the competition: educational establishments can win up to £1500, split between the student or class who submitted the design and the establishment itself; a member of the general public

can win up to £500; and a manufacturer can win up to £5000 towards the development, marketing or start-up costs of a project (manufacturers may submit designs at the concept, pre-production or development stage).

In addition, advice will be

available concerning the commercial exploitation of winning ideas. The closing date for entries is 30 January 1987. Further details are available from the Design Against Crime Competition, 107-109 High Street, Brentford, Middlesex TN8 8BR.

DESIGN AGAINST CRIME COMPETITION

Hammersmith, London W6 9RS.

From the same address you can obtain the ideal present for people who have to put up with unsociable smokers in the workplace, in the form of a self-contained smoke detector with a built-in 85dB alarm. An LED confirms that the 9V battery is supplying adequate current and that the device is functioning correctly. The alarm is actually intended for industrial applications, and costs £20 + VAT and P&P.

Phone message service

The latest addition to the Cellnet range of cellular phone products is Voicebank, a message service which can receive and send voice messages. When cellular phone users are away from their vehicles, callers can be re-directed to Voicebank to leave a message. After returning to their vehicles they ring their Voicebank 'mailbox', which plays back any message.

Each mailbox will store 48 one-minute messages for 72 hours, and users requiring a larger message capacity can have an overflow into further mailboxes. Up to 10 callers can leave a message at the same time on Voicebank, so an engaged tone is unlikely to be received.

The Voicebank service can be linked to British Telecom's radiopaging system so that when a message is left the recipient's pager 'bleeps' immediately to alert him. A further feature is the 'broadcast' facility, which allows a manager to transfer the same message simultaneously to each member of his staff or to selected members.

The Voicebank mailbox can be activated from office or public telephones as well as cellular phones, so staff not equipped with mobile phones can still access their messages while out of the office. The user simply holds a pocket sized remote control keypad to the telephone and

presses his access code to receive his messages.

Telex for ships

British Telecom International is launching two new round-the-clock telex services for ships fitted with Radiotelex equipment. About 18,000 vessels will be able to use the world-wide services.

By using the new Phonetex service callers will be able to communicate by telex with ships at sea without needing direct access to their own telex machine. Customers simply phone BTI's Portishead radio station near Bristol and dictate their message to an operator, who will then telex it to the relevant vessel.

Portishead is also extending its Radiotelex service to relay telex messages from ships to telephone answering machines in this country. The station will accept telex messages from vessels and then telephone the contents to the recipient. Messages can be sent to the customer's Voice-

bank-BT's message manager service - or to an answering machine.

For the Phonetex service customers can dictate messages by phoning Portishead Radio on (0278) 781111. To use the Voicebank service ships should telex their messages to Portishead using the code VBTIX, stating the customer's telex number and Voicebank number.

50 years in radar

In January 1937 Cossor received its first radar order to supply the Air Ministry with displays and receivers for the Chain Home radar stations that were to play such an important role in the defence of the United Kingdom during the Second World War. Cossor thus became one of the first two British companies (along with Metropolitan Vickers) to enter a field that would revolutionise defence and navigation systems.

To celebrate this 50th anniversary, Cossor has produced a brochure entitled *Cossor Radar - the first fifty years*, which has been written specially by the historian Dr Alfred Price. It is available to anybody with an interest in the radar business.

The brochure describes the company's early history (making domestic radio and TV receivers) through to the war, when Cossor manufactured many radar related products including the GEE navigation system. It describes the post-war period when Cossor produced primary ground and marine radar, and then continues with the development of IFF (Identification Friend or Foe) and SSR (Secondary Surveillance Radar) systems in the 1950s and 1960s up to the present day.

Satellite TV workshop

A one-day intensive course is to be held on the theory and practical installation of satellite TV systems for domestic and commercial use.

The course will be held at the Gatwick Penta Hotel on 30 November, and will include a 3 course lunch, morning coffee and afternoon tea, and an extensive set of bound course notes all for the price of £48.00+VAT.

This will be the first of the

Eutelsat II TV

The Eutelsat Board of Signatories meeting in extraordinary session on 4 and 5 September 1986 has decided to request Aérospatiale, which is constructing the second generation Eutelsat satellites (Eutelsat II), to implement certain modifications to the technical characteristics of the satellites in order to provide a better response to the requirements of a number of Signatories.

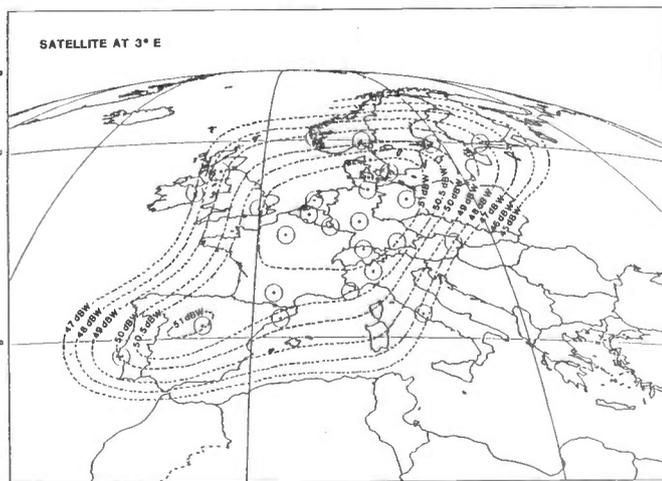
The most important modification concerns the enlargement of the service zone of the high gain beam allowing the reception of television programmes via small diameter antennas (in the order of one metre). With the modification requested this beam will provide an EIRP of 47 to 51dBW over a large part of Western Europe, from the Iberian peninsula to Scandinavia or from Italy to Iceland, depending on the

satellite's longitude on the geostationary satellite orbit. In addition, all 16 of the transponders will be able to operate on this beam instead of only 12, which was the case in the previous design.

As a result of these modifications, each Eutelsat II satellite will be able to provide up to 16 TV channels from 1989, with reception possible via small diameter antennas over virtually the whole of Western Europe. This capacity will be in addition to that already available on the Eutelsat I series of satellites.

Furthermore, the service zone of the receive beam and of one of the transmit beams providing a large European coverage (from Turkey to the Azores) will be enlarged to include the tip of southern Greenland in order to meet Denmark's requirements for that territory.

Editor's note: *This only confirms my belief that DBS will never really take off in this country. After all, what DBS operator with, say, 3 high power channels could hope to compete cost effectively with a lower power bird carrying 16 channels and serving the same area?*



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workshops that Quadrant Communications Ltd will run to inform the retail trade of the latest developments in the electrical and electronics field, aimed at keeping the retailer in touch with current developments. For more info contact Quadrant Communications Ltd, Wickham House, 10 Cleveland Way, London E1 4TR.

30-60GHz study

The Department of Trade and Industry has commissioned a short-term study on spectrum planning for terrestrial fixed radio services in the unexploited frequency range of 30-60GHz.

The study, to be carried out by Ewbank Preece Consulting Ltd, will review the future requirements of existing and potential microwave fixed radio links. It will pay particular attention to the competitive position of UK equipment manufacturers and the likely developments in technology over the next five years.

Outline planning for this frequency has been completed, but contact from those with an interest in this frequency range – particularly prospective users and equipment manufacturers – would be welcomed. Comments and requests for further information should be forwarded to: *Graham Taylor, Project Manager, Ewbank Preece Consulting Ltd, Prudential House, North Street, Brighton BN1 1RE.*

ITT Instruments

ITT have set up a new UK operation to market the range of electronics test and measurement instruments made by ITT Instruments plants in France and West Germany.

The new operation, known as ITT Instruments, is being set up alongside the company's high technology electronic component distribution division, ITT MULTICOMPONENTS, in Slough.

Business Development



Keeping up with new technology? Maybe a comment on British industry, apparently running fast but getting nowhere? In fact the pic comes from component distributor Quiller, which has been chosen to supply the keypads for Sport Engineering's Powerjog

Manager for ITT Instruments is Peter Rummer.

Products to be sold via the new operation include oscilloscopes, analogue and

digital multimeters and signal sources, as well as some specialised products such as clamp meters and panel instruments.

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SPECTRUM WATCH

NIGEL CAWTHORNE G3TXF

Ireland has played an important role in the history of the development of transatlantic telecommunications because of its unique position on the western edge of the European continent. The first transatlantic telegraph cables were landed on the west coast of Ireland in the middle of the last century. Marconi went there in the early part of this century to set up wireless stations for transatlantic traffic. Today, Ireland's coastal and air communications stations are used for vital coverage of much of the North Atlantic.

In the field of broadcasting, Ireland has several unique characteristics. Unlike most other countries, Ireland does not have any international short wave broadcasting services. With so many Irish people in all parts of the world, this is somewhat surprising.

Forty years ago there was a fiasco in which short wave transmitters were purchased and installed, only to be sold off again a few months later following a change of government.

Since then Ireland's broadcasting voice has not been heard on the short waves. Although not quite international in the same way as short wave broadcasting, Ireland is now planning a new long wave service whose programmes will be heard further afield than the Emerald Isle itself.

Telecom Eireann cellular map



Ireland goes for long wave

Ireland's broadcasting authority, Radio Telefis Eireann (RTE), hopes to install a 500kW long wave broadcast transmitter on 254kHz, which in the evenings will give good coverage across much of northern Europe, and particularly the UK.

Ireland is entitled to this long wave allocation (shared with Finland and Algeria) under the 1975 Geneva Plan. Major international transmitter manufacturers have presented offers to RTE for the supply of the transmitters and the antenna matching equipment. The specification called for 2 x 250kW transmitters. The five bidders for the transmitting equipment portion of the £4M project are understood to be Brown Boveri (Switzerland), Continental Electronics (USA), Marconi (UK), Telefunken (Germany) and Thomson (France). There was no bid from Japanese transmitter manufacturers. High power long wave transmitter systems are an area where Japanese companies have yet to make their mark.

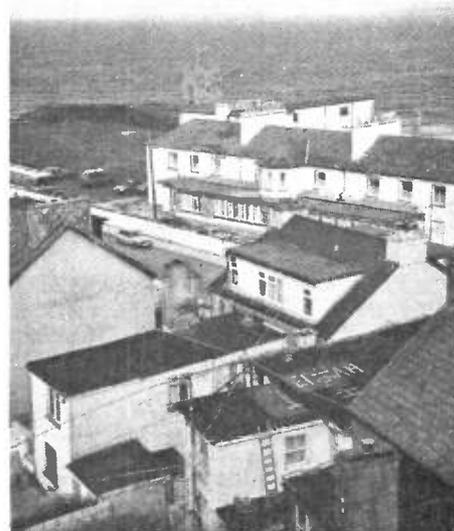
Government consideration

RTE's LW project is currently under consideration by the Irish Government. If the project goes ahead, Ireland's new long wave service will carry a commercial radio programme service that will certainly attract a listening audience well beyond the borders of the Republic.

Ireland's present radio broadcasting networks are on both medium wave and VHF FM. The two main high power medium wave transmitters are at Athlone and Tullamore in the centre of Ireland. The Athlone station houses a parallel pair of 50kW Continental Electronics transmitters and Tullamore has a pair of 250kW NEC transmitters. NEC also supplied the majority of RTE's VHF and UHF TV transmitters.

Ireland's TV network

Ireland's TV transmitter network is unique in that two programmes (RTE1 and RTE2) are transmitted nationally using Band III channels almost exclusively. In order to be able to operate a sufficient number of transmitters for national coverage within the limited channel capacity of Band III without co-channel interference problems, RTE had to use the technique known as 'precision offset'. TV transmitter frequencies are precisely set in such a way as to reduce the effects of co-channel interference. RTE claims to be one of the first



EIRAH's Ballybunion QTH is easily identifiable, not only by the tilt-over quad, but also by the callsign on the roof

organisations to have used this frequency spectrum economy technique on a national scale.

Band III continues

Ireland's continuing use of Band III frequencies for TV transmissions is in direct contrast to the UK, where Bands I and III were closed down for TV transmission two years ago and are now being reallocated to other services. In the UK these new Band III services include mobile radio. Therefore, from now on Band III frequencies on either side of the Irish Sea will be used for two different types of service (land mobile radio in the UK and TV broadcasting in Ireland).

This poses potential interference problems in both directions. There has to be careful planning for the two different services to work alongside one another without undue interference. This involves defining signal-to-interference 'protection ratios' for both the mobile radio user and the TV viewer.

Although agreement has been reached between the DTI and the UK's other close neighbour France (which also still uses Band III for TV broadcasting), the discussions between Ireland and the UK have not so far resulted in any agreement.

As RTE does not have any plans for implementing a full UHF TV network, the two different types of Band III services on opposite sides of the Irish Sea will have to tolerate each other for many years to come. According to RTE, the likely cost (estimated at about £25 million) of 'doubling-up' the present Irish

VHF TV transmissions on UHF (thus allowing the eventual closure of Ireland's Band III TV transmitters) would be just too expensive.

Ireland's 'extra' channel

In order to squeeze the maximum capacity out of Band III, RTE are using an 'extra' channel at the high end of the band which was specially allocated to Ireland at the 1979 WARC. Irish channel J (vision carrier 223.25MHz and sound 229.25MHz) is higher than the old UK top Band III channel (ch 13: 211.25/215.75MHz). Whereas the now defunct Bands I and III channels in the UK were used for 405-line black and white transmissions (6MHz channel spacing) they are today used in Ireland for 625-line colour transmissions using PAL System I, with an 8MHz channel spacing.

Although most of Ireland's national TV coverage is on VHF there is one main 800kW ERP UHF transmitter at Cairn Hill in the centre of the country, as well as a small number of local UHF repeaters. A centrally located UHF transmitter had to be used to avoid insurmountable co-channel interference problems in the middle of the country, where the other VHF transmitters' service areas all overlap.

RTE's entire transmitter network (MW, VHF FM and VHF/UHF TV) is unmanned. A centrally operated computerised monitoring system allows networks to be controlled directly from the RTE HQ in Dublin.

Irish cellular coverage

Ireland's cellular radio network got off to two false starts. The first cellular system selected was a Scandinavian type NMT-450 network. An order was placed with the Swedish supplier Ericsson to deliver the first stage of a nationwide NMT cellular network. However, soon after the NMT-450 order had been placed the Irish P&T underwent a change of status from being a government department to being a semi-state organisation. This, along with TACS-900 developments in the UK, prompted a rethink on the Irish NMT-450 decision, and it was cancelled.

Ericsson were then asked to supply the first stages of a TACS 900MHz system instead of the previously ordered NMT-450 system. That was the first false start. The second was caused by internal union problems rather than system considerations.

Telecom Eireann had originally planned to open the first TACS cell in Dublin in April 1985. However, due to an industrial dispute that was running at the time, and also to some technical problems, the originally planned start date had to be put back.

Ireland's cellular network (Eircell) was eventually opened on 11 December 1985. Although in concept a 'cellular' network,

in its early stages Eircell was not truly cellular in operation (where there is 'hand-off' between adjacent cells) because there was only one cell in operation, covering most of the Greater Dublin area.

However, further cells have been opened recently and coverage will be extended to Cork and Limerick by the end of the year. The initial prediction for the first year of operation was a market size of about 800 mobiles in a population of 3.5 million.

Half-way through the year the Irish cellular subscriber base is already over 650, and is likely to be a little over a thousand by the end of the year (by comparison, the UK, which is the only other European country using the TACS system, has over 80,000 subscribers in a population of 56 million).

Historic sites

Ireland has several sites of major interest in the history of both cable and radio communications.

The first transatlantic telegraph cables connected Valentia on the west coast of Ireland with Nova Scotia. Valentia is also the site of one of Ireland's two MF coast stations. The buildings used today by Valentia Radio (callsign EJK) are on the site used by the Marconi station which was put into service in 1914.

Today Valentia Radio handles traffic

with vessels in the North Atlantic using telegraphy (500kHz) and MF telephony at 2MHz. Valentia Radio also remotely controls two VHF stations for traffic with ships locally.

Further up the coast at Ballybunion is the site of another historic Marconi station. Unfortunately there is nothing to be seen at this site, the old Marconi wireless station buildings having burned down some years ago. However, local radio amateur John O'Carroll EI6AH is hoping that a permanent plaque can soon be erected at this historic site.

Helping history live on

John, who runs the local grocery store (as well as the 'Marconi' caravan site), has an interesting display of Marconi memorabilia for visitors to see. He has had several old photographs reprinted in post card format, showing the Marconi stations at both Ballybunion and Clifden further along the coast. It was from Ballybunion that the first east to west transatlantic radio telephone transmission was made in March 1919.

EI6AH's own QTH in Ballybunion is easily identified, not only by the tilt-over quad perched on the roof but also by the large call letters on the roof of his house! He is making a valiant effort to ensure that an important part of the early history of radio in the west of Ireland is not lost and forgotten.

REVIEW

EI6AH keeps the Marconi name alive in Ballybunion on the west coast of Ireland



John EI6AH in his shack full of Marconi memorabilia

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AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

JAS-1 heads the news this month. After the usual delays, which seem inevitable in satellite launches, it got away successfully on 12th August at 2045hrs UTC, being a secondary payload on Japan's first test launch of the H-1 vehicle. JAS-1 was a joint project between the Japanese Amateur Radio League (JARL), Japan's AMSAT organisation (JAMSAT) and the Nippon Electric Company (NEC). It cost an estimated two million dollars, provided mostly by Japanese commercial interest, and took five years of planning and building. On launch the satellite was designated JO-12, JAS-1, Oscar 12 and 'Fuji', which I believe means 'a flower'.

The 'mirror-ball'

JAS-1 was launched with a most unusual primary payload – the 'Mirror-ball'. This is a sphere, some 2.15 metres in diameter, made of fibre reinforced composite resin material and weighing 685kg. It is totally passive, with no electronics aboard, but it is covered with mirrors, the idea being that it can be spotted easily. There are mirrors for visual reflection, as well as others for radar reflection, which operate using laser reflections.

Its objective is to provide precise information on the position and movements of various observation sites on the Earth. Designated the 'Experimental Geodetic Payload' (EGP), it should be visible between fifteen minutes after sunset and fifteen minutes before dawn and can be seen with such simple optical equipment as binoculars. In fact, naked-eye observations have already been reported.

Magnetic bearing flywheel

The rocket body itself was unusual as it carried a 'magnetic bearing' flywheel – an experiment of Swedish origin, with a telemetry beacon operating on 136MHz NBFM. This was only operational for a short time, but the beacon was heard by several radio amateur listeners. The rocket body itself was seen to be enveloped in a bluish, iridescent cloud. The rocket's final stage was an advanced cryogenic stage using liquid hydrogen and liquid oxygen, and this blue cloud was thought to be due to solar radiation ionising escaping hydrogen as the rocket was vented of excess fuel. This

was activated as soon as was practical so as to cause the launcher to 'de-orbit' quickly.

The transponder aboard JAS-1 functioned perfectly and since the launch QSOs have been carried out world-wide. The uplink is 145.9 to 146.0MHz and the downlink 435.9 to 435.8MHz. The beacon is on 435.795MHz and sends groups of three figures in a sequence terminating in 'Hi Hi'. Problems have been encountered by some radio amateur operators in the use of the Mode J transponder system (ie 2 metre transmission up and 70cm reception down). This was experienced with Oscar 8, which also had a Mode J transponder aboard.

The problem is due to interference with the 70cm receiving gear and spurious 'birdies' from the 2 metre transmitter. However, by separating the transmitting and receiving aerials at the ground station, suitably screening the antenna feeder cables and the inclusion of RF filters in the system, these interference problems can be sorted out.

Doppler effects

A further snag with JAS-1 is that due to its low orbit (compared with previous amateur radio satellites) Doppler effects are marked and the time of each pass is quite short – around 20 to 25 minutes, so QSOs have to be kept short. At the moment, the satellite appears to have a noticeable 'wobble', leading to severe fading of its signals. The stabilising system on JAS-1 consists of a simple bar magnet which interacts with the Earth's magnetic field to produce a small permanent torque. In time this torque should reduce the tumbling motion of the spacecraft and keep the satellite in alignment with the geomagnetic field. The expected life of JAS-1 is approximately three years.

The other satellites

Oscar 10 is still in trouble, although signs of its rejuvenation are hopeful. The endeavours to reprogram its failed memory sections proved impossible. The main problem was that control of the transponder and other sections of the command functions had been lost, so that vital instructions to the satellite in-house control mechanism could not be received by the satellite. It was thought that if the satellite could be shut down

completely it might be possible to reprogram it using those sections of the memory that had not failed.

On 6th September one of the control stations, W0PM, succeeded in resetting the in-house control unit and closing down the transponder. The next step is to rewrite the software and attempt to feed it into the satellite. The saga thus continues, and we wish them luck with these endeavours.

Power failing

RS5 is also in trouble. Its battery is failing and, although its beacon is on continuously, its transponder is turned off for long periods. As the battery voltage drops the transponder cuts out automatically and it does not come on again until reset from the ground control station.

RS7 is functioning very well at this time and is the mainstay of amateur radio satellite QSOs at the moment.

RS9 and RS10, the next two Russian satellites, are awaiting launch facilities. Both are complete and ready for launch, but it is expected that these will not be available until next year.

The recent announcement that the USA is to go ahead with plans for a new space shuttle is a topic of some interest for the amateur radio satellite enthusiast, if only in the far distant future. It is hoped that the new shuttle will be available for the launch of small amateur radio satellites of the ISKRA type. Unfortunately, it is anticipated that it may take four years to redesign and build the next one, and may cost as much as two billion dollars.

It seems hard to believe that 12th December next is the twenty-fifth anniversary of the first Oscar, but that is in fact so. How quickly the time seems to have passed, and what development has taken place in the amateur radio satellite sphere in those years!

How to become a radio amateur

One is often asked by those who become superficially exposed to amateur radio how one gets into this 'intriguing hobby'. Whether it is the influence of CB radio or just the fact that we live in an electronic age, there is no doubt that a lot of folk are fascinated by our hobby.

It is commonly known that those who

AMATEUR RADIO WORLD

have been short wave listeners find it easier to get into the transmitting side of the hobby, and it is a good idea to suggest to a newcomer that they get a short wave receiver and learn to find their way about the bands; particularly the amateur bands, where they will learn the jargon and get to know the characteristics of the radio waves.

If they then decide to get into the hobby, they will do so knowing that quite a lot of application and enthusiasm is needed to succeed.

The stumbling blocks

There are two stumbling blocks to get over: the Radio Amateur's Examination and the morse code test. In my opinion the latter is essential, as half the interest of amateur radio is lost if you cannot use morse code.

The Radio Amateur's Examination, or the RAE as it is referred to, can be prepared for by instructional courses carried out at quite a number of colleges these days. Part-time evening study is usually sufficient. Most colleges require a minimum of twelve students before they will put on a course for the RAE, and the courses usually begin in the autumn term and run through the winter. It is advisable, however, to apply for the

course early, so that the college has some idea of whether there will be enough applicants to justify running a course.

RAE study

RAE exams are usually held in May, and students normally have to be over the age of sixteen years. Some radio clubs do courses for the RAE but it is possible to study on your own, particularly with the help of a correspondence course, of which a number exist. The requirements and regulations for the RAE can be obtained from the City and Guilds of London Institute, 46 Britannia Street, London WC1X 9RG.

Essential reading

There is also a very useful booklet entitled *How to become a Radio Amateur*, obtainable free from the Amateur Radio Licensing Unit, Post Office Headquarters, Chetwynd House, Chesterfield S49 1PF, which is essential reading.

If you have difficulty getting the information you need, the Membership Services Department of the RSGB will help. Write to The Radio Society of Great Britain, Cranborne Road, Potters Bar, Herts EN6 3JW.

UoSAT research

The UoSAT unit in support of the continuing experiments and operation of UoSAT 9 and 11 has recently received a grant from the UK Science and Engineering Research Council. This has enabled five new research staff positions to be created within the unit at the University of Surrey. These staff will be involved in UoSAT operations and research, planning, design and construction of future satellite missions, such as PACSAT, T-SAT and UoSAT-C.

Packet radio group

The Midlands AX25 Packet Radio Group has recently been formed to promote packet radio in the UK. Known as Maxpak, it is based in Wolverhampton and is made up of amateurs who are active using the AX25 Link Level 2 packet protocol data. Its aims are to assist other radio amateurs in getting on the air with packet radio and to promote its experimental features to a wider audience. The group would be happy to provide talks and demonstrations on packet radio to clubs within a reasonable travelling distance of Wolverhampton. Further information can be obtained from G1DIL, telephone Wolverhampton 743164. 



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FAX RECEPTION

The professional way

— KEN MICHAELSON G3RDG REVIEWS THE WEFAX 859 FAX DECODER —

As any reader of my articles will have noticed, I have been interested in weather forecasting for some time. Within the last couple of years or so my attention has been drawn to facsimile broadcasts. I had wondered for a long time what those peculiar cyclic grating sounds coming from stations all over the HF spectrum were, and it wasn't until I joined the Remote Imaging Group and saw on their stand at the BARTG rally at Sandown Park long sheets of paper covered with weather charts that I realised what it was all about. And so, when on a recent visit to the Meteorological Office at Bracknell to find out about the actual methods of transmitting the FAX weather maps I saw a leaflet describing a very sophisticated way of resolving the signals, I decided to make further enquiries.

Automatic running

It turned out that this was a fully professional system which could be set to run completely automatically. Meteorological charts are transmitted on the HF frequencies by stations in many countries of the world, and one could set this equipment to receive all the charts sent out by a chosen station, starting and stopping by itself.

Essentially, the unit is a small dedicated computer which has a program in it designed to convert facsimile signals into a format suitable for operating a dot matrix printer in its 'graphics' mode. The program in the 859 is, in addition, arranged to recognise the beginning and end of the FAX transmission and also to decide the IOC (index of co-operation), which is a measure of the speed of scanning at the transmitting end. There are two IOC numbers, 288 and 576, and the higher IOC number gives higher definition and takes longer to send the picture.

The 859's computer can also decode and print out radioteletype (RTTY) signals in three different types of code: Baudot, the normal five-unit code mostly used by teleprinter press broadcasts and radio amateurs and designated CCITT No.2 standard; ASCII seven-unit; and ASCII eight-unit, all with nine different choices of speed.

The FAX signals are received on a general coverage receiver, but this must be a first-rate unit with very good stability. The manufacturers mention the Trio R-600, R-1000 and R-2000, and they have also used the Icom R-71E (see *R&EW*, April '86 for my review of this). I used a Yaesu FRG-8800, which proved perfectly satisfactory (as shown by the charts reproduced here).

The input to the WEFAX 859 is at 455kHz (taken from the receiver IF) because FAX signals are transmitted in a 'frequency shift keyed' (FSK) mode, and generally speaking the audio output from general coverage receivers does not provide a suitable signal to obtain good results. In my case the IF socket was available, but I understand from the manufacturers that if there is no such output socket in the receiver of your choice they will provide one.

Compact

The WEFAX 859 is not very bulky, measuring only 90(H) × 305(W) × 210mm(D), and it weighs 2.1kg. It is made of steel and the case is in the form of two 'U's. The front panel, base and rear form one 'U' and the top and two sides the other. The top and sides are secured by four screws underneath the unit. The front, base and rear are finished in a coffee coloured crackle type paint, with the top and sides in a cream colour, and the combination makes for a very attractive unit.

There are six operative controls, and

from left to right these are: power on/off; go/stop; select/set; FAX/RTTY selection; FAX/RTTY speed; and shift (a potentiometer). Three LEDs indicate 'status' (green), 'signal' (yellow) and 'bad' (red).

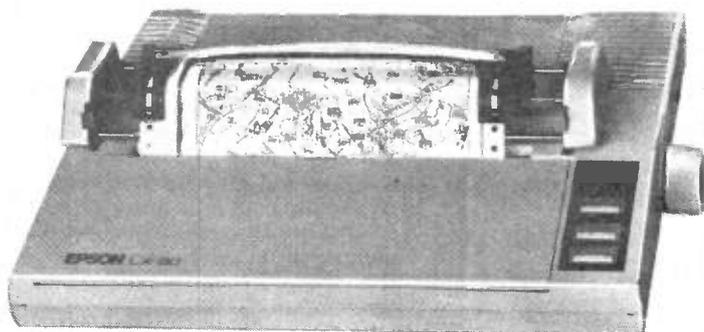
The meaning of the status LED varies according to the reception mode, of which more later. The go/stop button does what it says, starts or stops the printing of charts or RTTY data. The select/set is an ingenious feature, which again I will describe later.

IOC switch positions

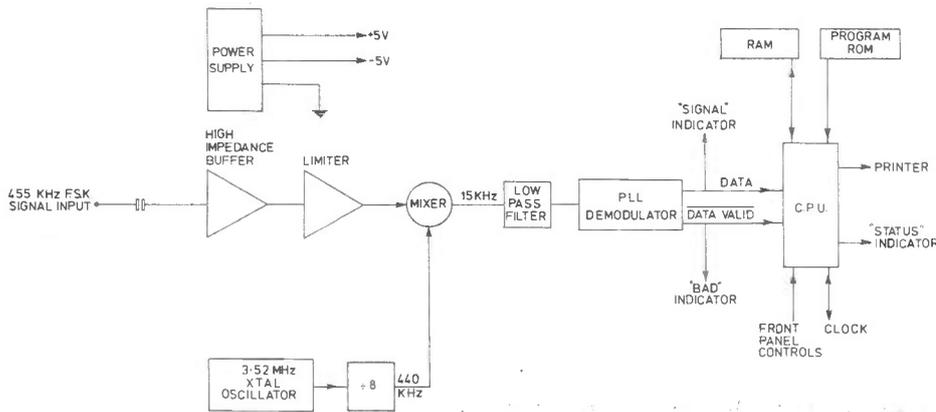
The IOC switch (FAX/RTTY selection) has ten positions, only eight of which are used. This switch selects the type of transmission to be received, either FAX or RTTY. To the right of this is the lpm (lines/minute) or baud switch, which also has ten positions. This time all ten are used, giving the nine speeds of reception mentioned above and an 'auto' position.

A few words about the technical specification. There is no restriction on the chart length. The Epson FX-105 printer supplied for the review would accept both tractor and friction paper feed, as does my own Epson RX-80 F/T. The review printer, using 14.5 inch paper and giving a 12 inch wide chart, used normal fanfold paper with perforations every 11 inches, and if the chart was longer than 11 inches it would have to go over the perforations. When I used my own printer with an 8 inch width it was possible to use normal teleprinter paper, which being continuous showed no breaks. The picture, however, was not so good.

The unit can be switched to five different rates of line scan per minute (60, 90, 120, 180 and 240). The horizontal resolution is 47 dots/cm (120 dots/inch) and the vertical resolution 28-84 dots/cm, (72-216 dots/inch). This varies with the



FAX RECEPTION



WEFAX 859 - block diagram

chart and printer type. The maximum number of dots per line is either 960 or 1448, depending on printer type. The maximum chart frequency is 4kHz, and the unit responds to two start control frequencies, 300Hz or 675Hz, for an IOC (index of co-operation) of 576 or 288 respectively.

The stop control frequency is 450Hz, and when this signal is received by the unit it prints the date and time, together with an indication of what triggered the stop action.

RTTY facility

The RTTY facility is able to decode 5-bit Baudot, 7-bit ASCII or 8-bit ASCII, FSK, at nine different speeds. The input signal must be 455kHz \pm 400Hz. This can

be varied by means of the 'shift' control. The clock/date output is controlled by an internal IC, and this has a back-up battery.

The input impedance approximates 100 megohms and the input level can be anywhere between 10mV and 5V rms. The power supply will accept 110/120V or 200/240V 50/60Hz or 10/15V dc, at which voltage it uses 7 watts.

When setting up the 859, the first thing I did was to check that the input voltage was set correctly at 200/240 volts. There is a little two-position PCB switch at the rear of the board just behind the toroidal mains transformer for 110/120V or 200/240V ac. I then observed, having removed the top of the case, that there was a four-way DIP switch behind the

front panel next to the crystal-trimming capacitor. According to the manual, the first of these switches alters the width of travel of the printing head. When it is off it is suitable for smaller printers with a maximum chart width of 8 inches (Epson RX-80, LX-80, FX-85 etc). When it is on, the travel of the head per line is increased to 12 inches, (Epson FX-100, FX-105 etc).

When the next switch is on the printer automatically turns the paper roller to the next line of perforations after completing a chart, so that each chart is separate (providing the printing of the chart commenced at the start of the form).

Printer facilities

Switch 3 is normally off, and the unit responds to any 'stop' signals. This means that when printing RTTY the 'go' button must be pressed before anything is printed. If this switch is on then the data will be printed immediately at switch-on. This means that in the event of a power failure the machine will print immediately the power is restored.

Switch 4 is merely a 'normal/reverse' switch as used in pretty well all amateur RTTY modems. It also inverts the data coming in on a FAX signal, giving the choice of making the background all black with the chart in white (very heavy on printer ribbons!) or the more usual black lines on a white background.

I tried various combinations of switch settings. However, when I attempted to use my own RX-80 I had to disable the automatic line feed by altering one of the DIP switches in my own machine, because the line feed instruction is built into the 859 program.

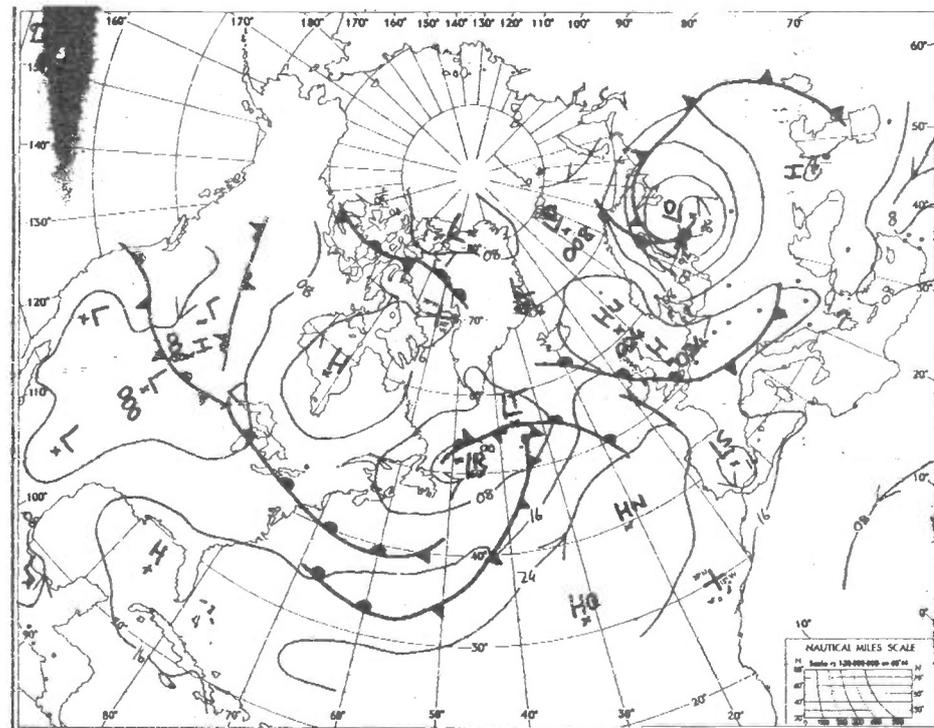
On the rear panel of the 859 are sockets for 'signal input' (BNC), 'printer' (20-way female IDC), '12 volt dc in' (3-way DIN socket) and, one above the other, 'mains input' (3-pin Euro socket) and 'mains output' (shrouded Euro female socket), to take the mains supply to the printer.

Using the 859

I switched on having made sure that switch 1 of the four-way DIP switch was on to accommodate the 14.5 inch paper. The clock and date had been set before despatch, so immediately 'FAX.65 V1 (c) ELSEC 1986' appeared, followed on the next line by the time to the nearest second and the date. The unit was now ready for reception.

I set the IOC and Ipm switches to 'auto' and then found a FAX signal on the HF band. There are a number of signals to choose from, but for the first trial I tuned in to Bracknell on 3289.5kHz. It does not matter particularly what mode you switch to on the receiver; it is merely a question of having the correct bandwidth, and the maximum required by any FAX station is 800Hz. Indeed, the transmissions from Offenbach in Germany only require a bandwidth of 300Hz.

Received from the Hamburg Meteo on 7880kHz DDK3



I turned the 'shift' control round to maximum, and tuned the FRG-8800. Both the orange 'signal' and the red 'bad' LEDs lit. I pressed the 'go/stop' button and the words 'received time' with the hours, minutes and seconds following were printed. The date, the IOC and lpm and the indication as to whether it was a tone start, phase start or manual start came next, and in this case since it was a manual start the letter 'M' was printed.

I continued turning the tuning control until the red 'bad' LED went out, then pressed the 'go' button: the printer burst into life and began printing a chart. Since I had started in the middle of a transmission the unit had no indication of either the IOC or lpm: it assumed an IOC of 576 and an lpm setting of 120.

Useful facility

A very useful facility has been incorporated for such situations. Because the 859 did not have a start tone or a phase period since I started it at random the chart did not commence at the left-hand side of the sheet, but somewhere in the middle. Using 'select/set', a two-position switch biased centre off, one can cause

the chart to 'slip' either way until the left or right-hand side moves to the correct place merely by pressing this switch for a few seconds to the left or right.

Of course, at the end of the chart when the 859 stopped and printed the time and date everything was restored to correct operation for the next chart, and because the 859 this time received the correct 'start tone' (either 675Hz or 300Hz) the chart started at the correct place and printed with the correct number of lines per minute.

All this and more

I also employed the unit for the reception of RTTY. When using this method of reception the date and time appear in 'enlarged type' on the printer to distinguish between RTTY and the reception of weather charts. In this mode I found the tuning a little more critical, and it took some time for me to get good copy.

In the first place one has to get the correct speed. This is OK in the case of amateur transmissions, because on the HF bands their speed is usually 45.45 bauds. Press broadcasts are often at a

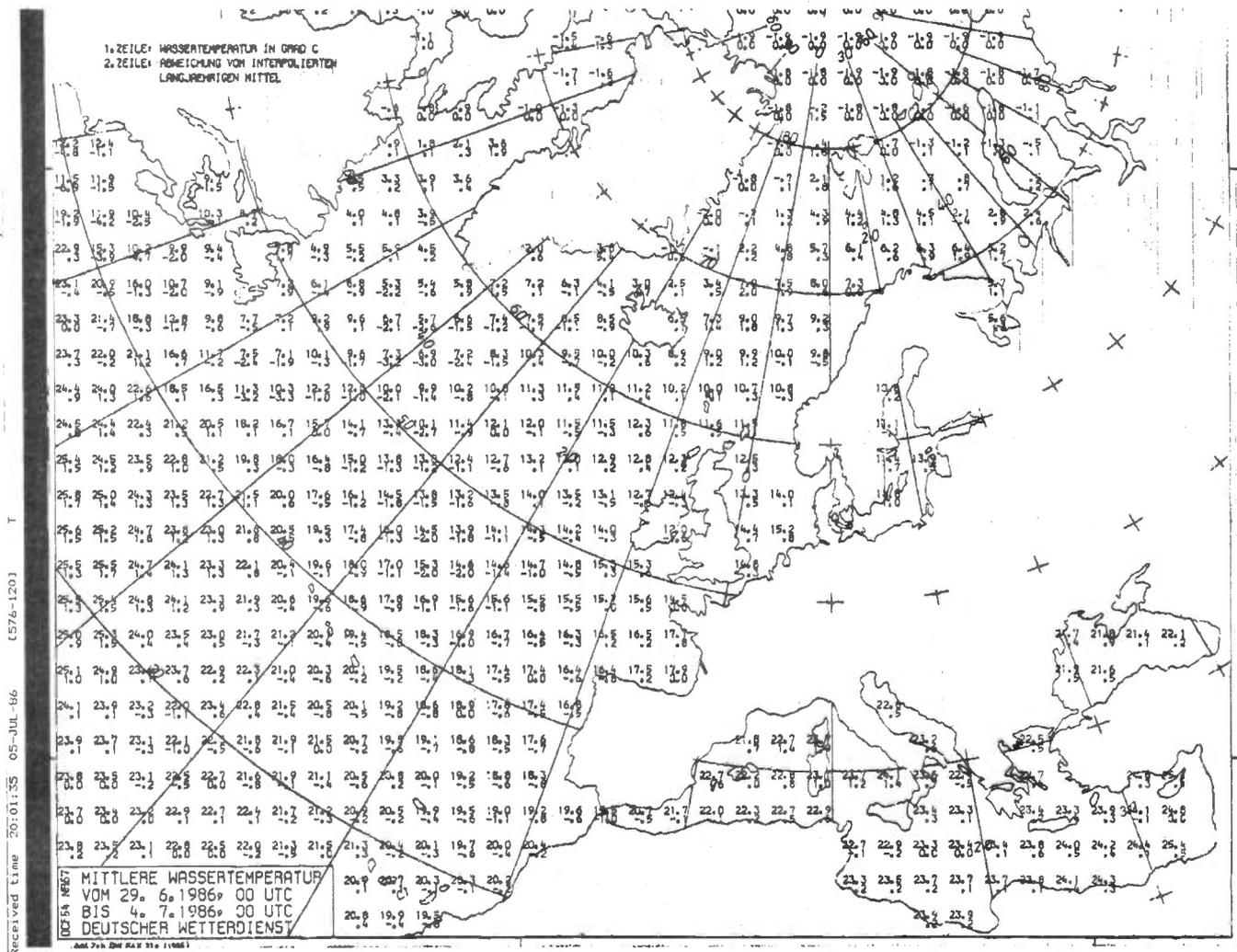
speed of 50 bauds, but a number of stations are now transmitting at greater speeds than this. In consequence I had to try the various speeds before I got a good signal. The 'shift' is, of course, infinitely variable between the limits of the rotary control, and one decreases the shift width until one has the best signal.

After a considerable time spent tuning I also managed to receive a German station on 140.30kHz sending at a speed of 200 bauds ASCII. This was interesting in that it demonstrated the 859's ability to decode at that speed.

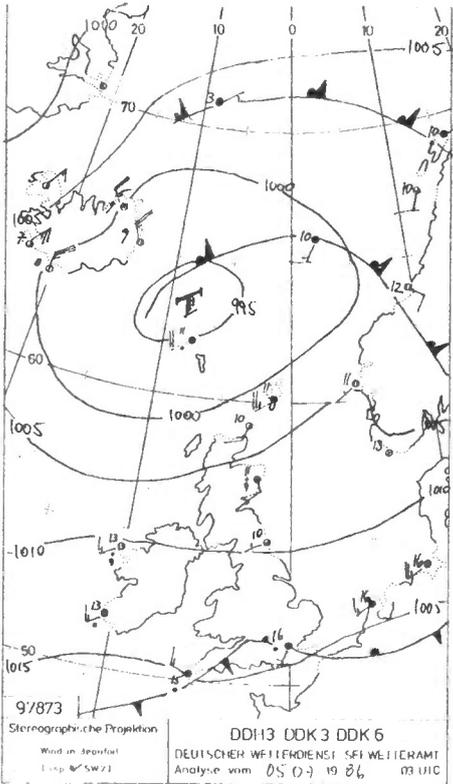
Having mastered the tuning I was able to repeat the operation more quickly the following day and get more copy. The 'status' LED is the one to watch when tuning RTTY, because if the received signal agrees with the switch settings one has chosen it will be off. If the status LED comes on it means that a bad 'start' bit or an 'over-run error' has been detected, and if this is the case one has to try a different speed (or in the case of ASCII either the seven or eight-bit byte).

I used the 859 continuously during the day and evening, and on some occasions left it tuned in to only one station. The

Received from the Hamburg Meteo DDK3 on 7880kHz



FAX RECEPTION



happens to be set!

Secondly, I'd much prefer it if the 'signal' and 'bad' LEDs were situated above the 'shift' control, as they are obscured by the shift control knob where they are. I suppose that if you placed the 859 at or above eye level this criticism would not be valid, but I used it placed on the bench and had to move to see these LEDs.

Before finishing I must bring your attention to the fact that anyone who wishes to receive these weather FAX broadcasts *must* have a licence to do so. This can be obtained without difficulty by applying to the Met Office (Licensing) MO17, London Road, Bracknell, RG12 2SZ giving the following information:

- The transmissions to be received.
- The proposed frequency or frequencies to be used.
- The apparatus to be used.
- The location of the apparatus.
- The purpose for receiving the broadcasts, eg amateur interest in the weather.

If the purpose for receiving the broadcasts does not involve any commercial use of the information but is solely for your own information, then a once-only fee of £5.00 is payable. In fact, having made application to the Met Office and received written permission,

you then send this to the Department of Trade and Industry (Amateur Radio Licensing) at Waterloo Bridge House, Waterloo Bridge Road, London SE1, who will ask you for your £5.00. In due course you will receive the licence.

For those of you who are interested in the reception of FAX signals I can recommend the *Guide to Facsimile Stations* published by Klingenfuss Publications, Hagenloher Strasse 14, D-7400 Tuebingen, West Germany. It costs DM30. I use this publication, and it gives the Meteo stations world-wide with their frequencies, times of transmission and what they actually transmit in the way of charts at any given time.

In conclusion

The WEFAX 859 is an excellent unit which does all that the manufacturers claim for it, and for someone who wants to follow the weather it is ideal. I imagine it would prove very useful in schools. The unit is priced at £740.00 plus VAT and carriage, and the Epson FX-105 printer supplied for the review (and which accepts the 14.5 inch wide paper) costs £449.00 plus VAT and carriage. They are available from the Littlemore Scientific Engineering Company, Railway Lane, Littlemore, Oxford OX4 4PZ, telephone (0865) 778563. REV

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manufacturers claim that its operation is fully automatic, and without any doubt their claims are fully justified, because automatic it was. The manual recommends that the receiver should be left switched on permanently, but I was reluctant to leave it, or for that matter all the shack power, on all night. It was quite sufficient for me to switch everything on first thing in the morning, allowing a period of about an hour for everything to settle down.

At any rate it ran perfectly for me, and I made a lot of print-outs from the transmissions of Offenbach Meteo DCF 54 on 134.2kHz. These were very interesting as this station sends computer enhanced pictures of Meteosat in both the infra-red and visual versions. I achieved perfect copies every time, and the same thing occurred when receiving Bracknell Meteo GFA 21 on 3289.5kHz. In short, I had no complaints with its operation in the FAX mode.

I have only two gripes about the 859. The first, and to my mind the most important, is the position of the 'normal/reverse' switch. This should *not* be inside the case, but should be positioned on the front panel as it would be in amateur RTTY modems. When using RTTY it was necessary for me to run the unit with the cover off so that I could change the 'sense' of the transmission without any delay. I am sure many readers know how often RTTY transmissions are sent the opposite way round to the way the unit

Received from the Hamburg Meteo on 7880kHz DDK3

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Received time 08:03:08 12-JUL-86 1576-1201 T
12.07.1986 08.03 utc - nautische warnnachrichten -
21615 utc jun 86
Nautische warnnachricht nr. 297 baw
verkehrstrennungsgebiet terachelling - deutsche bucht.
bergungsarbeiten auf 53.50n 06.23,5e 2 sm nordoesstlich
feuerschiff borkumriff. grosser abstand erforderlich.
Nautische warnnachricht nr. 283 aufgehoben.

221815 utc jun 86
Navigationl warning no. 297
traffic separation scheme terachelling - deutsche bucht.
salvage operation on 53.50n 06.23,5e 2 miles northeasterly
of lightvessel borkumriff. wide berth requested.
Navigationl warning no. 283 cancelled.

301400 utc jun.86
Nautische warnnachricht nr. 302 baw
auf 54.39n 10.15e zeitweilig eine gelbe Leuchttonne
ausgelept. kennung: blitz

301400 utc jun.86
Kiel radio navigationl warning no. 302
in 54.39n 10.15e temporarily yellow lightbuoy
established. Character: short flashing

080720 utc jul 86
Nautische warnnachricht nr. 309 baw
westlich sydt. gefaehrliches wrack auf 54.58,9n 08.02,5e
bezeichnet durch eine nord- und eine westkardinalleuchttonne.
Nautische warnnachricht nr. 306 aufgehoben.

080720 utc jul 86
navigationl warning no. 309
west of sydt. dangerous wreck in 54.58,9n 08.02,5 marked by
one north - and one west- cardinal lightbuoy.
navigationl warning no. 306 cancelled.

112040 utc jul 86
Nautische warnnachricht nr. 313 3 x
Nautische warnnachricht nr. 312 aufgehoben.

112040 utc jul 86
navigationl warning no. 313
navigationl warning no. 312 cancelled.

120330 utc jul 86
Nautische warnnachricht nr. 314 3 x
Nautische warnnachricht nr. 311 aufgehoben.

120330 utc jul 86
Navigationl warning no. 314
navigationl warning no. 311 cancelled.

d e d d h / d d k
    
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- PACK 4 15 LARGE ELECTROLYTICS. Values to 6,000uF
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- PACK 13 2 CQ89A HIGH POWER INFRA-RED EMITTERS
- PACK 15 2 FND10 MINIATURE 7-SEGMENT LED DISPLAYS. Common cathode, 0.1"
- PACK 16 2 MAM3640A 7-SEGMENT LED DISPLAYS. Common cathode, 0.3"
- PACK 22 4 HIGH SENSITIVITY OPTO COUPLERS.

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- PACK 31 20 RECTIFIERS. High current, IN400 series, top Hat etc.

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POWERFUL AIR IONISER KIT

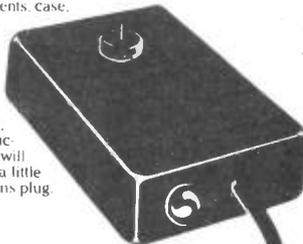
Ions have been described as 'vitamins of the air' by the health magazines, and have been credited with everything from curing hay fever and asthma and reducing high blood pressure, to improving concentration, increasing vitality, curing insomnia, and even speeding up the healing of burns! Although some of the benefits may be exaggerated, there is no doubt the ionised air is much cleaner and purer and seems much more invigorating than 'dead' air.

One of the tangible results of using an ioniser is that dirt, dust, pollen and smoke particles become charged and are precipitated to the ground, where they will be swept up during normal household cleaning. You can test this for yourself by inverting a smoke filled jar over the ioniser - the smoke disappears in seconds. Just what you need if you share an office with smokers (or if you are a smoker with unsympathetic colleagues!) The action of precipitating particles from the air is of immediate benefit to asthma and hay fever sufferers, of course, no matter how beneficial the ions themselves may be.

The kit can be assembled in three to four hours, and includes a roller tinned printed circuit board, 66 components, case, mains lead, components for a tester so that you can be sure the

ioniser is working, and full instructions. All you will need to supply is a little Araldite and a mains plug.

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I can thoroughly recommend these chaps - they deal with their signals in a brisk and efficient way, and, unlike others, they often sing in tune. Where are my little green tablets? Aaaaaaah... that's better.

What I meant to say was that I can quite safely guarantee that you'll be paying less than a third of the usual price from magazine advertisements - a more realistic estimate is that you would pay about five times as much if you bought the ICs individually. What more could you ask?

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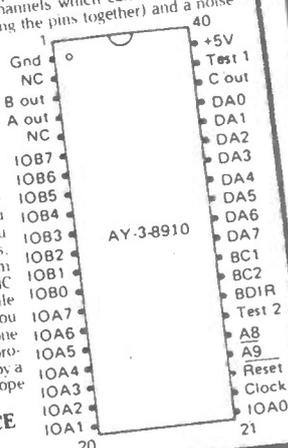


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You can have great fun experimenting with this IC, which will interface with any microprocessor or home computer (details and circuits in the data leaflet) and will produce an astonishing variety of sounds. There are three output channels which can be used separately or mixed (just by connecting the pins together) and a noise source which can be added to any of the channels. Control of pitch, duration and envelope shape allows all kinds of effects - explosions, gun shots, police sirens, helicopter noises... and even music!

The data leaflet explains how to connect and program the IC and has a number of demonstration programs to get you started. After that, it's up to you to work out your own sounds, or just program it at random and see what comes out! The IC is less than half price while stocks last, so what are you waiting for? If you don't buy one at once, I must ask you to provide a good excuse, signed by a responsible person (the Pope will do).

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TC6820BR	1.95	UPC2002H	1.95	TIP295	0.80
TC6820BS	1.95	UPC2002H	1.95	TIP295	0.80
TC6820BT	1.95	UPC2002H	1.95	TIP295	0.80
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TC6820BV	1.95	UPC2002H	1.95	TIP295	0.80
TC6820BW	1.95	UPC2002H	1.95	TIP295	0.80
TC6820BX	1.95	UPC2002H	1.95	TIP295	0.80
TC6820BY	1.95	UPC2002H	1.95	TIP295	0.80
TC6820BZ	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CA	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CB	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CC	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CD	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CE	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CF	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CG	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CH	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CI	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CJ	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CK	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CL	1.95	UPC2002H	1.95	TIP295	0.80
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TC6820CN	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CO	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CP	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CQ	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CR	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CS	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CT	1.95	UPC2002H	1.95	TIP295	0.80
TC6820CU	1.95	UPC2002H	1.95	TIP295	0.80
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TC6820DA	1.95	UPC2002H	1.95	TIP295	0.80
TC6820DB	1.95	UPC2002H	1.95	TIP295	0.80
TC6820DC	1.95	UPC2002H	1.95	TIP295	0.80
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TC6820DL	1.95	UPC2002H	1.95	TIP295	0.80
TC6820DM	1.95	UPC2002H	1.95	TIP295	0.80
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TC6820DQ	1.95	UPC2002H	1.95	TIP295	0.80
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TC6820DT	1.95	UPC2002H	1.95	TIP295	0.80
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TC6820DX	1.95	UPC2002H	1.95	TIP295	0.80
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TC6820DZ	1.95	UPC2002H	1.95	TIP295	0.80
TC6820EA	1.95	UPC2002H	1.95	TIP295	0.80
TC6820EB	1.95	UPC2002H	1.95	TIP295	0.80
TC6820EC	1.95	UPC2002H	1.95	TIP295	0.80
TC6820ED	1.95	UPC2002H	1.95	TIP295	0.80
TC6820EE	1.95	UPC2002H	1.95	TIP295	0.80
TC6820EF	1.95	UPC2002H	1.95	TIP295	0.80
TC6820EG	1.95	UPC2002H	1.95	TIP295	0.80
TC6820EH	1.95	UPC2002H	1.95	TIP295	0.80
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A2426 29.50	EBF89 0.70	M8224 4.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
A2599 37.60	EBF93 0.85	M8224 4.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
A2792 27.60	EBL1 2.50	M8225 3.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
A2900 11.50	EBL2 2.00	ME1401 29.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
A3042 24.00	EC52 0.75	ME1402 29.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
A3283 24.00	EC70 1.75	ME1501 14.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
ACT/THI 4.00	EC80 9.50	MM4 3.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
ACT/72 59.75	EC81 7.95	MLD6 4.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
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AH221 39.00	EC90 1.10	MS4B 5.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
AH238 36.00	EC91 5.50	MS4B 5.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
AL50 6.00	EC92 1.95	N7 9.85	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
AN1 14.00	EC93 1.80	N7 9.85	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
ARP12 0.70	EC95 7.00	OA2WA 2.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
ARP34 1.25	EC97 1.10	OA2 2.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
ARP35 2.00	EC157 439.50	OB2 2.85	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
AZ11 4.80	ECB10 12.00	OB2WA 2.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
BL63 2.00	ECG32 3.50	OC 2.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
BS450 67.00	ECG33 3.50	OC2 2.50	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
BS810 55.00	ECG35 3.50	OD3 1.70	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
BS814 55.00	ECG81 1.15	OD3 1.70	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
CIK 19.00	ECG81 Special 1.95	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
C3JA 39.60	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
C6A 9.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
C1112G 70.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
C1106 65.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
C1134 32.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
C1148A 115.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
C1150/1 1.50	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
C1534 32.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
CCA 2.60	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
CC3L 0.90	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
CL33 2.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
CV Nos Prices on request	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
D3a 29.50	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
D63 1.20	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DA41 22.50	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DA42 17.50	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DA90 4.80	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DA100 125.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DAF91 0.45	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DAF91 0.70	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DAF96 1.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DC70 1.75	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DC90 1.20	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DCX4-1000 12.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DCX4-5000 25.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DET16 28.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DET18 28.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DET23 28.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DET24 28.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DET25 22.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DF91 0.70	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DF92 0.60	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DF96 0.65	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DF97 1.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DH63 1.20	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DH77 0.90	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DH79 2.50	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DH149 0.60	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DK91 1.20	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DL35 2.60	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DL63 1.00	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DL70 2.50	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DL73 2.50	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DL91 1.50	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DL92 0.95	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DL93 1.10	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DL94 2.50	ECG82 0.85	OM6 3.00	QV20-30 42.50	U251 1.00	2C52 1.50	6G68 2.50	6G68 2.50	12D06B 3.50	6146A 7.50
DL96 2.50	ECG82 0.85	OM6 3.00	QV20-30 42.50						

TELEVISION

YESTERDAY AND THE DAY BEFORE

Just 56 years ago H J Barton Chapple, one of the foremost technical authors of the period, produced a book in association with Sydney Moseley called *Television Today and Tomorrow*. It ran to five editions and became the standard work for the amateur television constructor. This article takes a retrospective look at early television, revealing some little known facts in relation to the part played by radio amateurs during those pioneering days.

Prior to 1926 there were a number of contenders in the television race. Jenkins, Belin, Baird, Mihaly, and Campbell Swinton were all very active, but Baird clearly emerged as the winner, the first person in the world to demonstrate true television. Campbell Swinton, who was 2HK (no G prefix until 1928) and the first President of the RSGB, accurately predicted in 1908 the form that high definition television would ultimately take, but he could not carry out a demonstration or produce a working arrangement.

The Hastings experiments

John Logie Baird commenced his work at Hastings in 1923, and in January of the following year he demonstrated to the press simple television pictures consisting of silhouettes. Although he worked alone in the sense that no staff were employed, he did receive enthusiastic assistance from several radio amateurs living in the locality.

A photograph taken at Hastings early in 1924 shows Baird flanked by two of his voluntary helpers. One is identified as

William Le Queux, described as a well-known author. What is not revealed is that he was (G)2AZ of St Leonards, President of the Wireless and Experimental Association. The other person is Claude Frowd (G)2FS of Hastings. Victor Mills, who had a radio shop in the town and later became G5QM, played a significant role in the successful demonstration to the press. Norman Blackburne (G)2AX assisted on the radio side, while Norman Loxdale, too young to have a licence but a radio amateur nevertheless, produced the early scanning discs.

**Ray Herbert G2KU
takes us back half a
century to TV's
pioneering days**

These people were fascinated by the activities of a kindred spirit who was endeavouring to 'see by wireless', and they were pleased to be associated with the venture. Baird reciprocated by giving his first ever lecture to the Hastings Radio Society on 28th April 1924.

In the later part of 1924 Baird moved to a new laboratory in Frith Street, Soho, having received some financial backing from a certain Wilfred Lytton Day, well known to radio amateurs as Will Day of 19 Lisle Street, a purveyor of ebonite panels, cat's whiskers and Dayzite crystals.

Transatlantic television

After the historic demonstrations to members of the Royal Institution in January 1926, Baird found larger premises at Motograph House and decided to engage his first assistant, Ben Clapp (G)2KZ, who became Chief Engineer. The world's first transatlantic television transmissions were made on 45 metres from his station in Coulsdon, Surrey, during February 1928, the 30-line pictures being received in New York at the home of Robert Hart W2CVJ.

Having travelled to the United States to set up the television equipment, leaving his station in the hands of other operators, Ben Clapp returned on the SS *Berengaria* and successfully received pictures in mid-Atlantic. The transmissions from G2KZ were heard by two radio amateurs, W2BUO and W2EB, in the Jamaica district of New York, and they were able to record the vision signals on a 78rpm gramophone disc. This was not the first video recording, however, as John Baird had already produced a video disc (Phonovision) in September 1927. In addition to the transatlantic television transmissions in 1928, colour and stereoscopic pictures were demonstrated during August of that year.

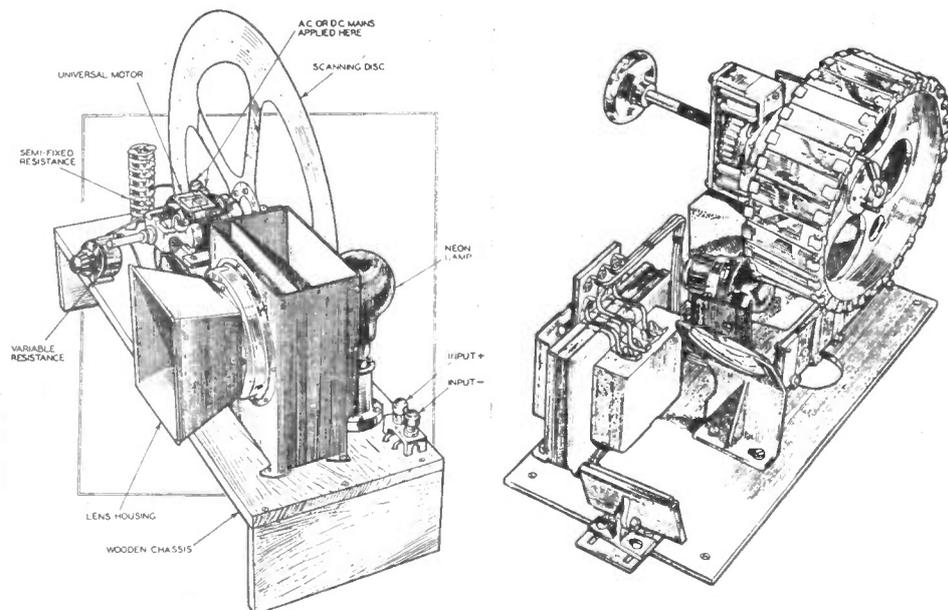
It is sometimes said that Baird tended to arrange demonstrations at every possible opportunity. This may be so, and is easily explained. At that time such supportive organisations as the National Research and Development Corporation did not exist, neither were there any grants from the Government. No help whatsoever came from public sources and only by giving demonstrations could he capture the interest of potential investors.

Experimental transmissions

The first experimental transmissions, relegated by an unhelpful authority to the inconvenient time of midnight to 1.00am, were financed entirely by the Baird Company, who had to meet the heavy cost of designing, building and operating their own studios and equipment. These programmes during 1928/9 from G2TV, situated on the roof of 133 Long Acre, London, consisted mainly of items presented by the engineering and office staff who formed themselves into a concert party. Connie King, the telephone switchboard operator, sang accompanied at the piano by a 17 year old engineer, Philip Hobson. Another engineer, AF Birch, acted as the announcer and raconteur.

The BBC could not be persuaded to allow any time at all for television

Example of a 30-line kit set and mirror drum receiver c1932



purposes, so Baird, not a person to be easily deflected from a mission, came to an arrangement with the German Post Office to transmit television from the Witzleben station after normal programme hours. A team of engineers left for Berlin early in 1929 with 30-line equipment, and subsequently these continental transmissions were received very well in the UK.



Unretouched photograph taken from a disc receiver in 1929

It is not without significance that within a few months the BBC shifted its position, but only slightly, making a paltry offer to the Baird Company for three 15 minute transmissions each week. Following justifiable protests this was later increased to five broadcasts each of half hour duration, and the first of these, with due ceremony, appeared on 30th September 1929.

Had it not been for Baird persistently prodding the authorities, the British television service could have been put back many years, and radar, so dependent on this type of technology, would probably not have been perfected in time for World War II.

The 30-line service

Initially only vision signals could be radiated from the Baird studios via 2LO due to the unavailability of an extra transmitter for the accompanying sound. This situation continued until the Brookmans Park station commenced operation on 31st March 1930.

A few receivers were produced for demonstration purposes in 1929, but it was not until 1930 that the well known 'tin box' Televisor became generally available. Commercially produced equipment tended to be quite expensive, and 90% of the sets were home constructed, often from kits of parts. A Nipkow disc (patented just over 100 years ago), motor and beehive neon lamp enabled a reasonable picture to be obtained in conjunction with a standard broadcast receiver. Pictures were small, barely the size of a credit card, but a lens could be used to give some enlargement. They were also very dim, which necessitated

viewing them in almost total darkness.

The mirror drum receiver arrived in 1932, satisfying the quest for bigger and brighter pictures, but even in kit form prices were high. A 100 watt filament lamp acted as a light source and the beam could be modulated by means of a Kerr cell. This arrangement provided a black and white picture on a 20 x 10cm frosted glass screen.

Good technical back-up

The enthusiasts who were building their own television sets were fortunate in having first class back-up in the form of technical information in various journals and a wide selection of specialised components, but the short transmission periods, generally less than 30 minutes, caused much frustration to these constructors, who barely had time to make the simplest circuit alterations before the programme finished. No test pattern generators were around in those days, although 78rpm gramophone records containing vision signals could be purchased. However, the picture quality left much to be desired.

After the completion of Broadcasting House in 1932 the BBC decided to take over the responsibility for providing a television service. The inherent limitations of a low definition system coupled with the immobility of the flying spot cameras did not prevent the producers from providing a wide variety of programmes, which included pantomimes at Christmas, singers, jugglers, instrumentalists, lessons on golf, and a dancing troupe, the Paramount Astoria Girls.

Although not part of the BBC 30-line service, mention should be made of special events organised by the Baird Company to emphasise the scope of existing techniques. There were large-screen demonstrations at the London

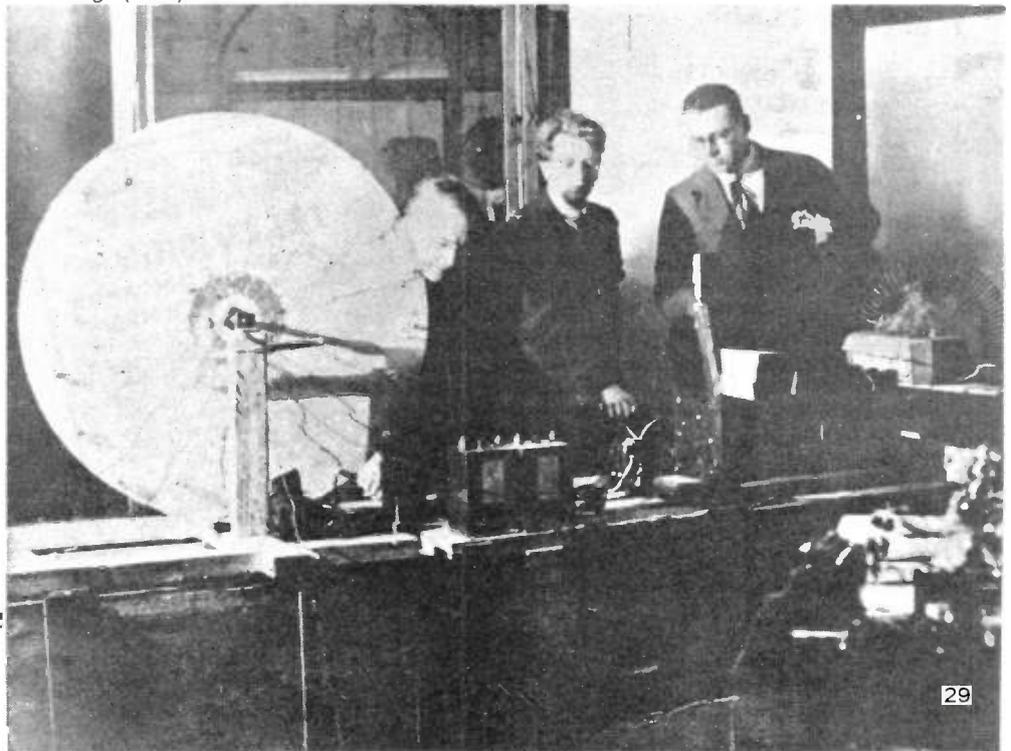


Baird engineers watching the first combined vision and sound transmission (31.3.1930)

Coliseum in 1930 and the Derby was televised from Epsom in 1931 and 1932. Also in 1932 the first television-telephone link took place in Paris between the *Le Matin* newspaper and the Galeries Lafayette, where the participants could see as well as hear each other.

The BBC terminated their contract with Baird in March 1934, but the 30-line programmes continued, although reduced to two half-hour periods a week, until 11th September 1935, when this pioneering service finally came off the air.

William le Queux, J.L. Baird and Claude Frovod with the original receiving disc at the Queen's Arcade in Hastings (1924)



The importance of the Baird 30-line era should not be underrated. It represented the world's first public television service with some 5000 receivers in use, comparing very favourably with a total of 7000 sets operating in 1947. The programmes transmitted on 261 metres were receivable throughout the UK and even on the Continent. Reports were received regularly from viewers in France, Holland, Denmark, Yugoslavia, Italy, Spanish Morocco, Germany and Madeira.

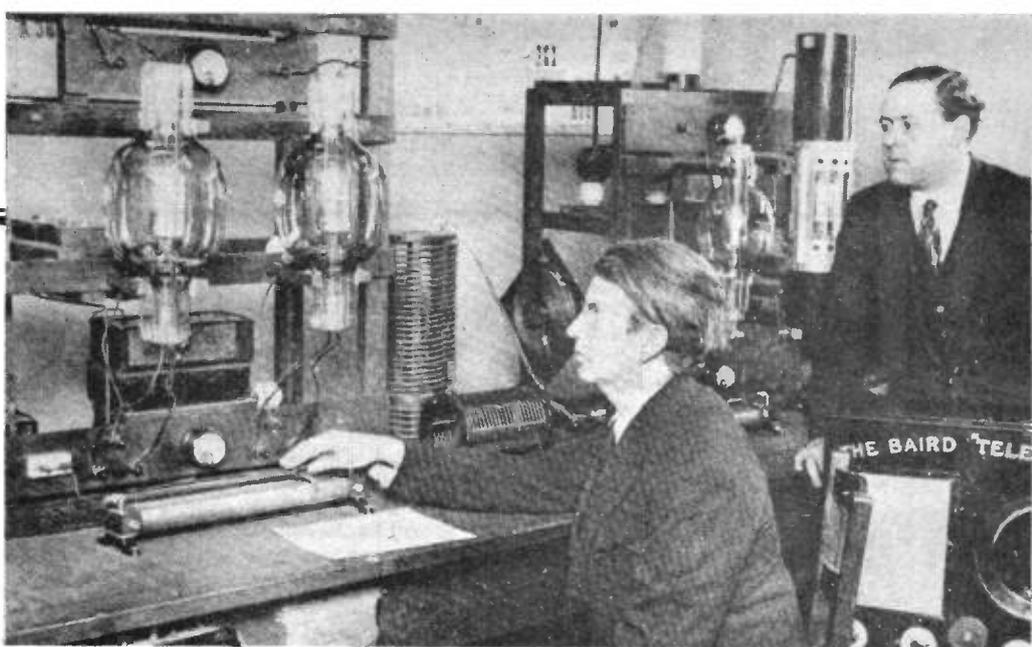
High definition

Higher definition required wider sidebands, and this entailed a move to wavelengths below 10 metres. The Baird Company had a transmitter operating from Long Acre on 6.1 metres by April 1932, and the BBC were also active on the ultra short waves.

Initially there was no official guidance relating to a standard for higher definition, and this resulted in a hotch-potch of schemes operating on 50, 60, 90, 120 and 240 lines. Various other commercial organisations entered the field - Marconi, Scophony, EMI and also Cossor, who were experimenting with a velocity modulated system. Eventually only two companies were left to battle for the BBC contract, Marconi-EMI and Baird Television.

Both contestants were in no doubt as to the crucial importance of producing an electronic camera, and this proved to be the deciding factor between the rival systems.

Marconi-EMI worked in considerable secrecy on their Iconoscope, giving



The amateur transmitter used for the first transatlantic television transmission in 1928. J L Baird (sitting) and Ben Clapp G2KZ

nothing away and providing very few demonstrations. The Baird Company, however, adopted the practical approach by leasing 60,000 square feet of space at the base of the Crystal Palace South Tower, equipping four studios and building vision and sound transmitters. Many programmes were transmitted during the next three years to a private demonstration theatre in Wardour Street from the aerials situated 680 feet above sea level on top of the South Tower. At first a definition of 180 lines was chosen, using a flying spot scanner consisting of a high intensity arc lamp and a scanning disc revolving at 3000rpm in a vacuum.

The Baird telecine equipment had already proved its worth providing excellent results from films, and in an attempt to improve the picture quality of live performances the Intermediate Film

System had been developed. This ingenious device enabled studio scenes to be shot using a 17.5mm cine camera. The film passed immediately to processing tanks for developing and fixing, which took about 30 seconds, and was then scanned still wet by the telecine equipment. Due to the time lag the sound had to be recorded as well.

Although heavy and cumbersome in its studio form, it is interesting to note that in 1939 further development enabled a miniature version to be produced capable of being used in an aircraft to transmit television pictures to the ground (see *R&EW*, February 1985).

With the approaching high definition service from Alexandra Palace the Baird Company changed to 240 lines, and an electronic camera, the Farnsworth image dissector, came into use. Unfortunately the technical difficulties proved considerable and it failed to provide acceptable pictures.

High definition service

The Selsdon Committee had recommended a trial period using both the Baird 240-line standard and the Marconi-EMI system of 405 lines, interlaced. This involved the viewers having to switch over their timebase controls on alternate weeks. After six months operation on this basis it became clear that the arrangement gave rise to considerable problems and a decision was reached to continue with the Marconi-EMI standard exclusively. For the Baird Company this represented a bitter disappointment, and although they were the losers a great deal of credit is due to them for their pioneering achievements over more than a decade.

John Baird continued experimenting from his home in Sydenham and demonstrated 600-line colour television in December 1940. Finally, in 1944, dispelling the myth that his activities were limited to mechanical devices, Baird launched another first, the all-electronic stereoscopic 600-line colour receiver, which employed his Telechrome multi-electron gun tube.

TELEVISION.

AMATEUR SCIENTIST'S INVENTION.

SECRET PLANS.

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Image Being Sent to Liner Is Recorded on Phonograph Disc With Extra Parts Costing \$15.

A record of the photograph of Miss Dora Selvy, sent by television from the Baird Laboratory in London to the steamship Berengaria in mid-ocean on March 6, was picked up by two amateur radio operators in Jamaica, Queens, during the transmission, it was learned last night at the home of Boyd Phelps, operator of radio station 2 EB at 8,505 167th Street, Jamaica. The picture of Miss Selvy was re-

corded on an ordinary phonograph disc by Phelps and Werner H. Olpe, operator of radio station 2 BUO, 14 Brooklyn Avenue, Jamaica, with the aid of an ordinary receiving set, to which parts worth approximately \$15 were added for the test. Boyd said he was mailing a copy of the photograph to the Baird Laboratories to prove his claim that he picked up the picture in transmission. Phelps and Olpe had been on the lookout for signals, but until the night of March 6 they had been unsuccessful. When Boyd detected the signals he sent for Olpe and for a professional piano tuner. In a written statement given out last night Phelps said the picture was "heard" about 9 P. M., and the transmission lasted more than an hour.

Press cuttings and adverts featured in the daily papers (c1924)

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Foreword by John L. Baird.

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63. 1 - Mullard thyristor trigger module
64. 10 - assorted knobs 1/2 spindle
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172. 10 - 12V 0W bulbs Philips m.s.
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199. 1 - mains operated solenoid with plunger 1" travel
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201. 8 - computer keyboard switches with knobs, pcb or wire mounting
209. 20 - nitro 80 ohm, standard type car air off valve
211. 1 - electric clock mains driven, always right time - not casual
216. 1 - stereo pre-amp Mullard EP9001
222. 1 - 12V solenoids, small with plunger
226. 1 - mains transformer 9V 1 amp secondary C core construction
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245. 4 - standard size pots, 1/2 mag with dip switch
248. 1 - 13A switched section on double plate with fused spur for water heater
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287. 1 - mains transformers 15V 1A secondary p.c.b. mounting
288. 50 3.5V torch bulbs
290. 3 7" reel to reel tape heads
281. 1 ten turns 3 watt pot 1/2 spindle 100 ohm
282. 50 two plate brown bakelite cooling roses
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- 2P66 - 2Kv tangential heater 115v easily convertible for 230V
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- 2P82 - 9v-0-9v 2 amp mains transformer
- 2P83 - 25m 15 twin flat flex for mains appliances
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1. 12 volt submersible pump complete with a tap which when brought over the basin switches on the pump and when pushed back switches off the ideal caravan unit.
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9. 24 x 8 ft 85-120 watt warm white tubes. Ideal plant growing. Collect or send open cheque to cover carriage.
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A relay can best be described as a remotely operated 'power switch'. This switch may be a mechanical or electronic device, and it may be remotely operated via an electric current or voltage, a magnetic field, or by opto-electronic means.

Relays can be used in a large variety of practical applications. They can be used to control signal paths in electronic gadgets and computers, to switch electric lights and heaters in the home or office, or to control lighting and ignition systems in the car, etc. In the next few pages we will outline the operating principles of the four best known types of relay device, and show basic ways of using them.

Relay basics

The four best known types of relay device are the standard electromagnetic relay, the reed relay, the so-called 'opto-coupler' device, and the CMOS bilateral switch. The first two of these types are electro-mechanical devices, and the other two are electronic.

The basic operating principle of the standard electromagnetic relay is illustrated in *Figure 1*. Here a multi-turn coil of wire is wound onto an iron core to form an electromagnet that can be used to move an iron lever or armature, which in turn can be used to close or open one or more sets of switch contacts. Thus the operating coil and the switch contacts are electrically fully isolated from one another.

Note that this type of relay comprises two essential elements, the relay coil and the relay contacts, and these elements must be independently and adequately represented in all circuit diagrams. The main characteristics of the coil are its operating voltage and resistance values, and *Figure 2* shows alternative ways of representing a 12V, 120R coil; the symbol shown in *Figure 2c* is the easiest to draw, and carries all the vital information. Practical relays may have coils designed to operate from a mere few volts dc up to the full ac supply line voltage, etc.

Contact arrangements

There are three possible basic types of relay contact arrangement, these being normally closed (n.c.), normally open (n.o.) and change-over (c.o.), as shown in *Figure 3*. In practice, relays often carry more than one set of contacts, but all sets are inevitably 'ganged'.

Thus the term 'single-pole' (sp) means that the relay carries only one set of contacts, 'double-pole' (dp) means two sets of contacts, and 'four-pole' (4p) means four sets of contacts. The term 'dpc'o' simply means that the relay carries two sets of change-over contacts. Actual contacts may have electrical ratings of up to several hundred volts at currents of tens of amps.

Ray Marston looks at electro-mechanical and electronic relay devices and circuits

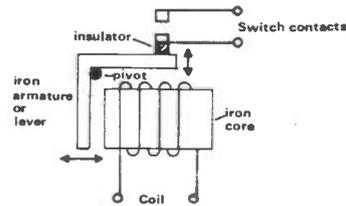


Fig 1 Basic design of standard electromagnetic relay

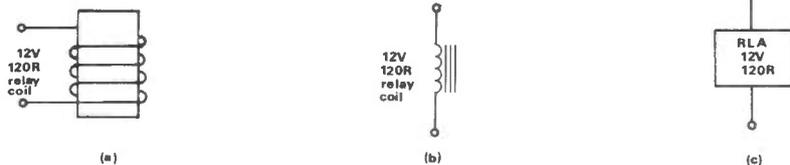


Fig 2 Alternative symbols for representing 12V, 120R relay coils



Fig 3 The three basic types of contact arrangement

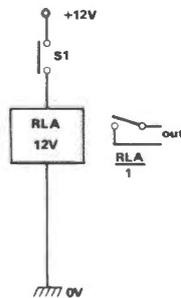


Fig 4 Non-latching relay switch

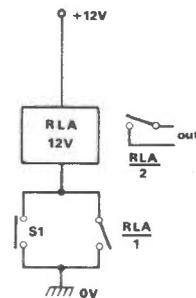


Fig 5 Self-latching relay switch

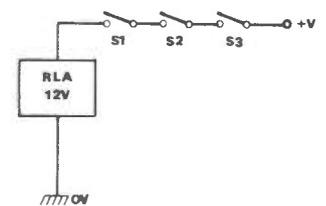


Fig 6 AND logic circuit

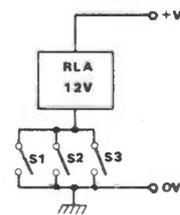


Fig 7 OR logic circuit

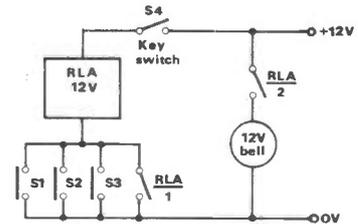


Fig 8 Simple burglar alarm

Configurations

Figures 4 to 9 show some useful basic electromagnetic relay circuit configurations. In *Figure 4* the relay is wired in the basic non-latching mode, in which switch S1 is wired in series with the relay coil and its supply line, and the relay closes only while S1 is closed.

Figure 5 shows how to modify the above circuit to give self-latching operation. Here n.o. relay contacts RLA/1 are wired in parallel with activating switch S1. Thus RLA is normally off but turns on

as soon as S1 is closed, causing contacts RLA/1 to close and lock RLA into the on state even if S1 is subsequently reopened. Once the relay has locked on it can be turned off again by briefly breaking the supply connection to the relay coil.

Figures 6 and 7 show how to use a relay in the basic AND and OR logic modes. In the AND logic circuit of *Figure 6* the relay turns on only when all series-connected switches (S1 AND S2 AND S3, etc) are closed at the same time. In the OR logic

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circuit of *Figure 7* the relay turns on only when one or more of the parallel-connected switches (S1 OR S2 OR S3, etc) are closed.

Figure 8 shows how the basic circuits of *Figures 5 to 7* can be combined to make a simple but useful self-latching 'burglar' alarm that can be activated via any one of the contact or micro-switches, S1 to S3 (any number of activating switches can in fact be wired in parallel in these positions). The alarm can be enabled or turned off via key-switch S4. When the alarm is enabled it can be turned on by briefly closing any one of the S1 to S3 switches (which can be activated by opening a window or door or treading on a mat, etc), at which point the relay self-latches via contacts RLA/1 and activates the alarm bell via contacts RLA/2.

Finally, *Figure 9* shows how to use a relay to make a low frequency oscillator or lamp flasher. Here circuit operation depends on the fact that there is an inherent and substantial difference between a relay coil's 'pull-in' voltage (the value that just makes the contacts close) and its 'drop-out' voltage (the value at which the contacts reopen). Typically, a 12V relay may pull in at about 10V and drop out at about 5V; thus the *Figure 9* circuit operates as follows.

When S1 is first closed, C1 charges rapidly via closed relay contacts RLA/1 until the relay coil voltage reaches its pull-in value, at which point contacts RLA/1 open. At this stage C1 starts to discharge into the relay coil and thus holds the RLA/1 contacts open until the C1 voltage falls to the drop-out value of the coil, at which point contacts RLA/1 close again, causing C1 to recharge as the whole timing process starts to repeat. Thus the relay contacts repeatedly open and close (oscillate) at a rate determined by the C1 and coil-resistance values and by the relative values of coil pull-in and drop-out voltages. Note that external circuitry (such as lamp LP1) can be activated via contacts RLA/2.

Coil damping

Relay coils are inherently highly inductive, and thus may generate quite large back-emfs if their coil currents are suddenly broken; typically, a 12V coil may produce a peak back-emf of about 200V! These high unwanted voltages can easily damage switch contacts or electronic devices that are connected to the coil. Consequently in many designs it is necessary to 'damp' these coil back-emfs via protective diodes; *Figures 10 to 12* show some examples of such circuits.

In *Figure 10* the coil damping is provided via a single reverse-connected diode, D1, which prevents switch-off back-emfs from driving the RLA-S1 junction more than 600mV above the positive supply rail value. This form of

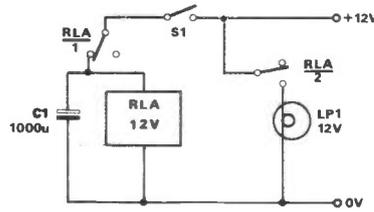


Fig 9 Low-frequency oscillator/flasher

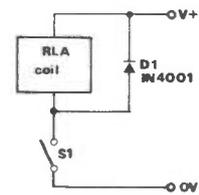


Fig 10 Single-diode coil damper

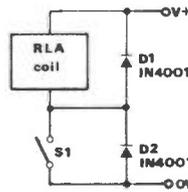


Fig 11 Two-diode coil damper

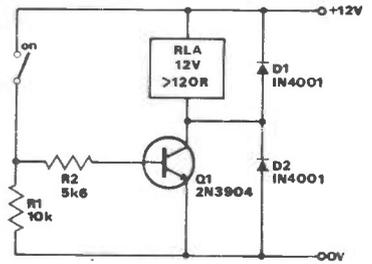


Fig 12 Transistor-driven relay with coil damper

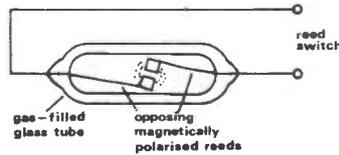


Fig 13 Basic structure of reed relay

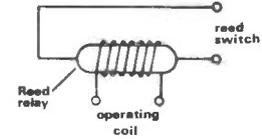


Fig 14 Reed relay operated by coil

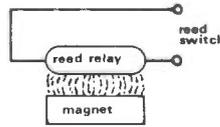


Fig 15 Reed relay operated by magnet

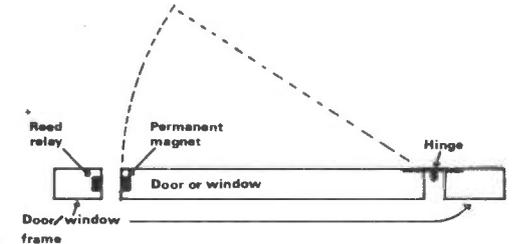


Fig 16 Method of using a reed relay/magnet combination to give burglar protection to a door or window

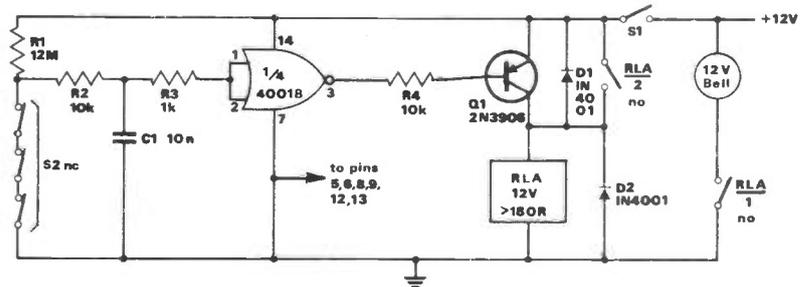


Fig 17 Simple burglar alarm, activated by series connected n c switches

protection is adequate for most practical applications.

In *Figure 11* the damping is provided via a pair of protection diodes that ensure that the RLA-S1 junction voltage cannot swing more than 600mV above the positive supply rail or below the zero volt rail values. This form of protection is adequate for even the most critical needs, and is recommended for applications in which S1 is replaced by a transistor or other 'solid-state' switch, as in the practical example of *Figure 12*.

In *Figure 12* the transistor is basically

used to increase the effective 'sensitivity' of the relay coil. If the coil were driven directly by the switch, S1 would have to pass a switching current of 100mA. By using transistor Tr1 as a current amplifier between the switch and the relay coil, the S1 switching current can be reduced to less than 4mA.

Reed relays

The second type of electro-mechanical relay is the so-called 'reed' type, which consists of a springy pair of opposite-polarity magnetic 'reeds' with

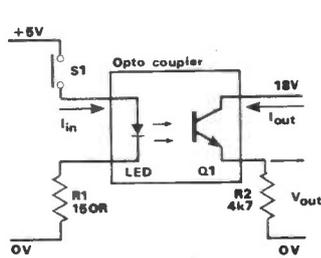


Fig 18 Basic opto-coupler 'usage' circuit

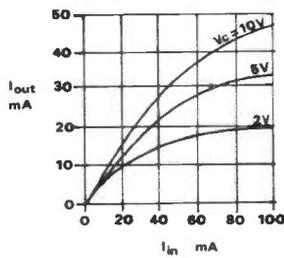


Fig 19 Typical I_{out}/I_{in} characteristics of a simple opto-coupler at various values of output transistor collector voltage

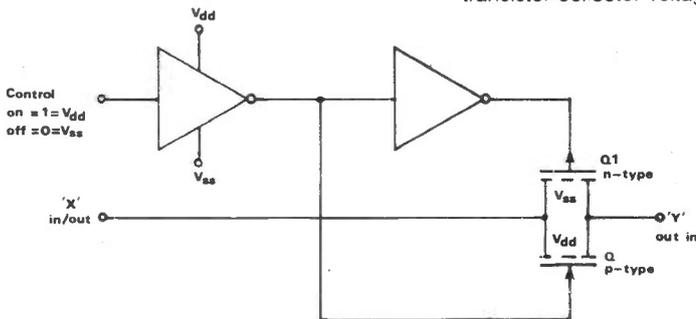


Fig 20 Basic circuit (top) and equivalent circuit (left) of simple CMOS bilateral switch

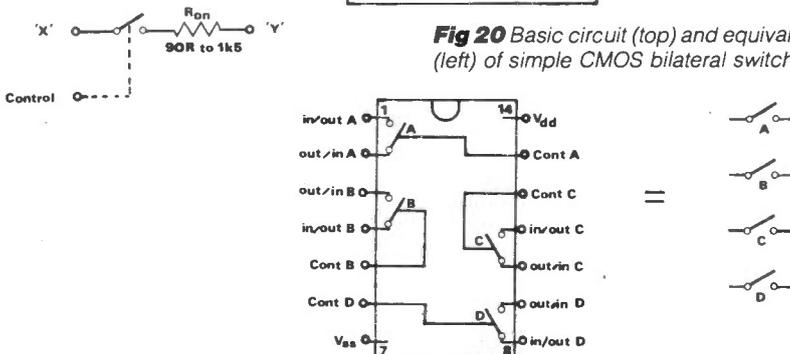


Fig 21 The 4066B quad bilateral switch acts like 4 independent SPST switches

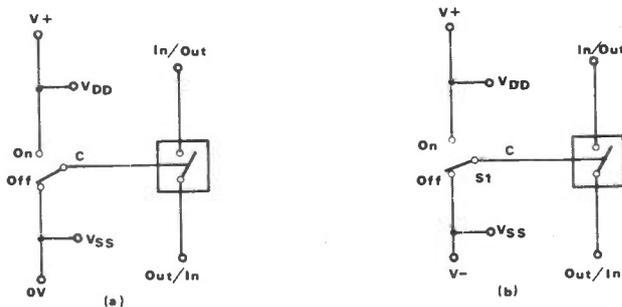


Fig 22 Bilateral switch power supply connections for use with (a) digital and (b) analogue In/Out signals

gold or silver-plated contacts sealed into a glass tube filled with protective gases, as shown in *Figure 13*. The opposing magnetic fields of the reeds normally hold the contacts apart so that they act as an n.o switch, but these fields can easily be effectively cancelled or reversed (so that the switch closes) by placing the reeds within an externally-generated magnetic field. This external magnetic field can be derived either from an electric coil that surrounds the glass tube, as in *Figure 14*, or by a permanent magnet that is placed within a few

millimetres of the tube, as shown in *Figure 15*.

Practical reed relays are available in both n.o and c.o versions. Normally the contacts of a reed relay can handle maximum currents of only a few hundred milliamps. The device is, however, very sensitive to externally-generated magnetic fields, and consequently has a number of distinct advantages over the normal electromagnetic relay. The first of these is that the coil-driven version has a drive current sensitivity that is typically ten times greater than that of a

standard relay; this fact enables coil-driven reed relays to be built in very compact form, and such units are readily available in standard 14-pin DIL 'IC' form.

Note that the coil-driven reed relay can be used in all of the basic configurations of the standard electromagnetic relay shown in *Figures 4 to 9*, and that the actual coil can be given any of the forms of damping shown in *Figures 10 to 12*.

Remotely activated

A unique advantage of the reed relay is that it can readily be 'remotely activated' at a range of several millimetres via an external magnet, which allows the device to be used in a variety of home security applications. *Figure 16* illustrates the basic principle. Here the actual reed relay is embedded in the frame of a door or window. The activating magnet is embedded in a small cut-out in the door or window itself, adjacent to the reed switch, so that the reed switch is normally closed but opens if the door or window is opened. Several of these switch circuits can be wired in series and connected to a self-latching alarm circuit of the *Figure 17* type, so that the alarm sounds if any door or window is opened.

The simple burglar alarm circuit of *Figure 17* consumes a quiescent current of a mere $1\mu A$ when it is in the 'stand-by' mode (S1 closed), with all series-connected S2 sensor switches closed. When any of the S2 switches open a 'high' voltage is applied to the input of the 4001B CMOS gate, which is wired as an inverting buffer and thus drives relay RLA on via Tr1. As RLA turns on it self-latches via contacts RLA/2 and activates the alarm bell via contacts RLA/1. Note that R2-R3-C1 act as a transient-suppressing filter network that protects the alarm against false activation via lightning strikes, etc.

Opto-couplers

The so-called opto-coupler can be regarded as a purely electronic type of 'relay' device. It consists of an infra-red light emitting diode (LED) and a similarly light-sensitive photo-transistor, optically aligned and housed in a small light-excluding package, as shown in the 'how to use it' diagram of *Figure 18*.

If zero current is passed through the LED, Tr1 will be in complete darkness and will pass zero current, but if significant current is passed through the LED (via S1 and current-limiting resistor R1) the photo-transistor will be illuminated and will also pass current (via R2). The input (LED) and output (transistor) circuits are thus optically coupled but are electrically fully isolated.

The most important parameter of an opto-coupler is its coupling efficiency, or output-to-input 'current transfer ratio' (CTR), and *Figure 19* shows three typical sets of such output-to-input current

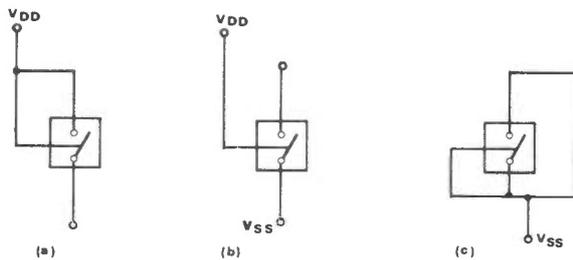


Fig 23 Unused sections of the 4066B must be disabled, using any one of the connections shown

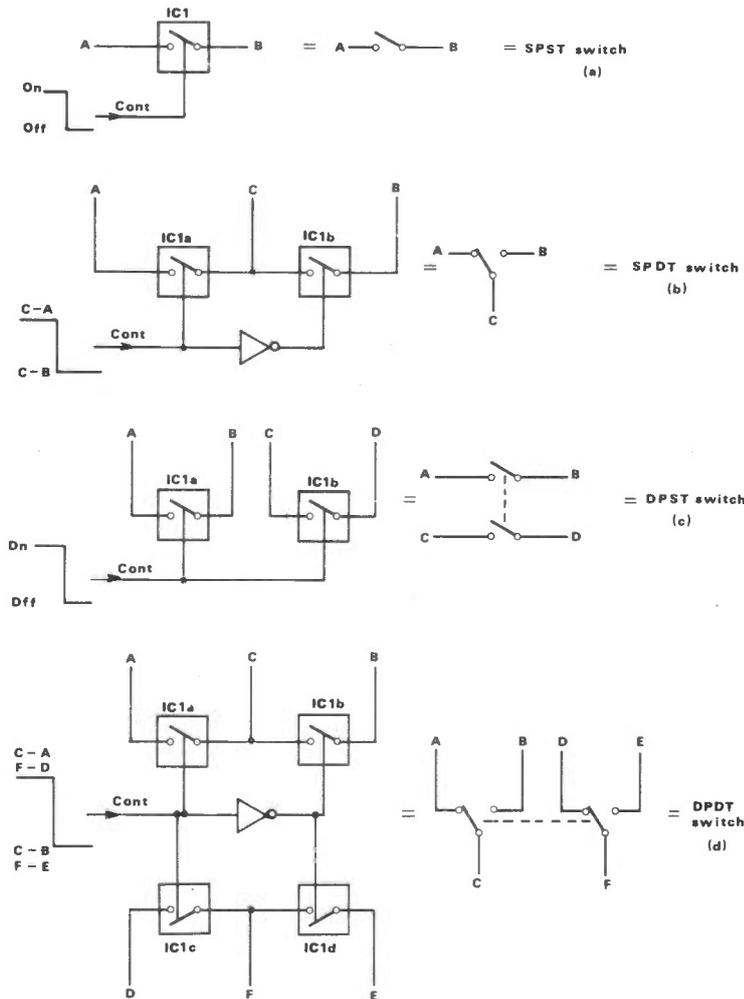


Fig 24 Implementation of the four basic switching functions via 4066B

values obtained at different values of Tr1 collector voltage. In practice, CTR may be expressed as a simple figure such as '0.5' or (by multiplying this figure by 100) as a percentage figure such as '50%'. Practical opto-couplers may use a single or a Darlington-connected pair of photo-transistors, and may typically give CTR values in the range 10% to 300%.

CMOS bilateral switches

Note that the output (transistor) of the opto-coupler 'relay' acts as a unidirectional switch that can pass current in one direction (from collector to emitter) only.

In contrast, the so-called CMOS 'bilateral switch' also acts like an electronic relay but has an output that can conduct current in either direction. Figure 20 shows (a) the basic circuit and (b) the equivalent circuit of the simple bilateral switch, which can be regarded as a low power voltage-activated relay (or remotely operated single-pole electronic switch) with a near-infinite input impedance.

The 'output' of the Figure 20 circuit comprises Tr1 and Tr2, an n-type and p-type pair of MOSFETs that are wired in inverse parallel (drain-to-source and

source-to-drain) and have their gates driven in anti-phase from the 'control' terminal via a pair of inverters. The control input takes the form of either a logic 0 or logic 1 signal. The circuit action is such that Tr1 and Tr2 are both fully cut off and an effective open circuit 'switch' thus exists between the 'X' and 'Y' points of the circuit when a logic 0 signal is applied to the control input terminal, but Tr1 and Tr2 are both driven fully on and an effective 'closed switch' exists between 'X' and 'Y' when a logic 1 control input is applied.

Note in the above circuit that when Tr1 and Tr2 are saturated signal currents can flow in either direction between the 'X' and 'Y' terminals, provided the signal voltages do not exceed the V_{SS} -to- V_{DD} supply voltage limits: each of the 'X' and 'Y' points can thus be used as either an 'in' or 'out' signal terminal. Also note that in practice Tr1 and Tr2 exhibit a finite on resistance (R_{ON}). This on resistance was as high as 1k Ω in early types of CMOS bilateral switch IC, but is typically about 90 Ω in modern types such as the 4066B (see Figure 21).

Common power lines

The 4066B is a quad bilateral switch: it houses four CMOS bilateral switches that share common power supply lines but are otherwise quite independent. This IC can thus be used as four remotely activated single-pole single-throw (spst) switches. These 'switches' can be used to control either digital or analogue signals, and Figure 22 shows the power supply and 'control' connections that should be used in each case. In the 'digital' case a single-ended power supply can be used and V_{SS} should be taken to zero volts, but in the analogue case a split power supply is needed and V_{SS} should be taken to the negative supply rail.

When using the 4066B note that all unused sections of the IC must be disabled, either by taking its control terminal to V_{DD} and wiring one of its switch terminals to V_{DD} or V_{SS} , or by taking all three terminals to V_{SS} , as shown in Figure 23.

Finally, to complete this edition of *Data File*, Figure 24 shows how the 4066B can be used to implement the four basic switching functions of spst, spdt, dpst and dpdt. The spdt function (Figure 24b) is implemented by wiring an inverter stage (a 4001B or 4011B, etc) between the IC1a and IC1b control terminals. The dpst switch (Figure 24c) is simply two spst switches sharing a common control terminal, and the dpdt switch (Figure 24d) is two spdt switches sharing an inverter stage in the control line.

Next month

In next month's edition of 'The File' we'll look at a selection of practical relay-output switching circuits. 

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 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

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 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 60p; 47/35.....80p

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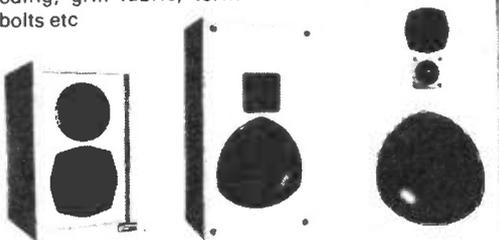
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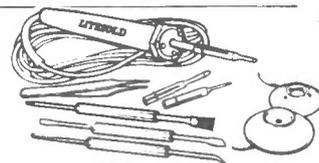


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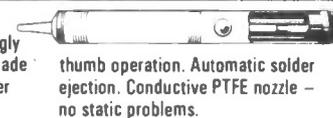


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AN INTRODUCTION TO COMMUNICATIONS SATELLITES

by Alan Pickard

The intention of this article is to provide an insight into the complex systems which are involved in satellite communications. To many people the term satellite is assumed to be a man-made device which orbits the Earth and requires a large dish aerial and sophisticated tracking and control equipment, possibly in the form of a large radio receiving station such as Goonhilly.

Recently, however, satellite television has been advertised as the latest luxury gimmick, along with such items as compact disc systems. This has resulted in many people associating satellites with the still fairly expensive domestic dish aerials and receivers costing around £1000. Thus prohibitive costs, along with the microwave frequencies

requirement, discourage potential satellite hobbyists ('home satellite users?').

As already stated, the subject of satellite communications is very wide ranging. Perhaps we could clarify the situation at this stage to enable us to look in some detail at a more 'user friendly' level.

Firstly, not all satellites operate via radio frequencies in the GHz range (thousands of MHz). UHF (hundreds of MHz) and even VHF (tens of MHz) frequencies are also employed. Secondly, relatively simple receiver/decoder systems can be purchased for around £150 'off the shelf', or even less for the dedicated home constructor (more details of this later). It follows, then, that at UHF or VHF frequencies the required aerial does not have to be expensive, unlike a microwave dish aerial.

Figure 1 is a simple representation of the physical appearance of a satellite craft.

Telecomm principles

Before going into details of particular satellite systems, it is worth being aware that many telecommunications principles are employed in satellite com-

munications, as well as microelectronics systems utilising digital techniques and, of course, microprocessors. Figure 2 provides a block diagram of a satellite's electrical and electronic systems and subsystems.

A definition

The term satellite refers either to a body which orbits another body and may be considered to be a natural satellite (eg the Moon around the Earth, etc), or a man-made artefact or artificial satellite which is placed in orbit around the Earth. Therefore, an object such as a piece of meteoric debris can be considered to be a satellite orbiting the Earth. A satellite must be under the influence of the Earth's gravitational force.

The structure of a satellite system may be grouped into the following disciplines:

1. Basic engineering
2. Science (physics, etc)
3. Astronomy
4. Navigation (including geography)
5. Telecommunications engineering (including microelectronics and microprocessors)
6. Mathematics (applied to all of the above).

As we are more interested in the information received from a satellite, we will consider satellite systems predominantly from a telecommunications and electronics angle. However, it is useful to have at least some appreciation of the engineering aspects and also the scientific ones. Perhaps more importantly, a good understanding of some basic astronomical principles and navigation methods is required.

Before looking at the telecommunications (radio and microelectronics) systems in detail, we will look at the relevant considerations for points 1-4 inclusive, as listed above.

ENGINEERING

If we are to consider the operation of a satellite, then it is useful to select a specific one and investigate its operation in terms of its engineering function (how it maintains its orbit, derives its power, what its function is). In other words, the engineering hardware.

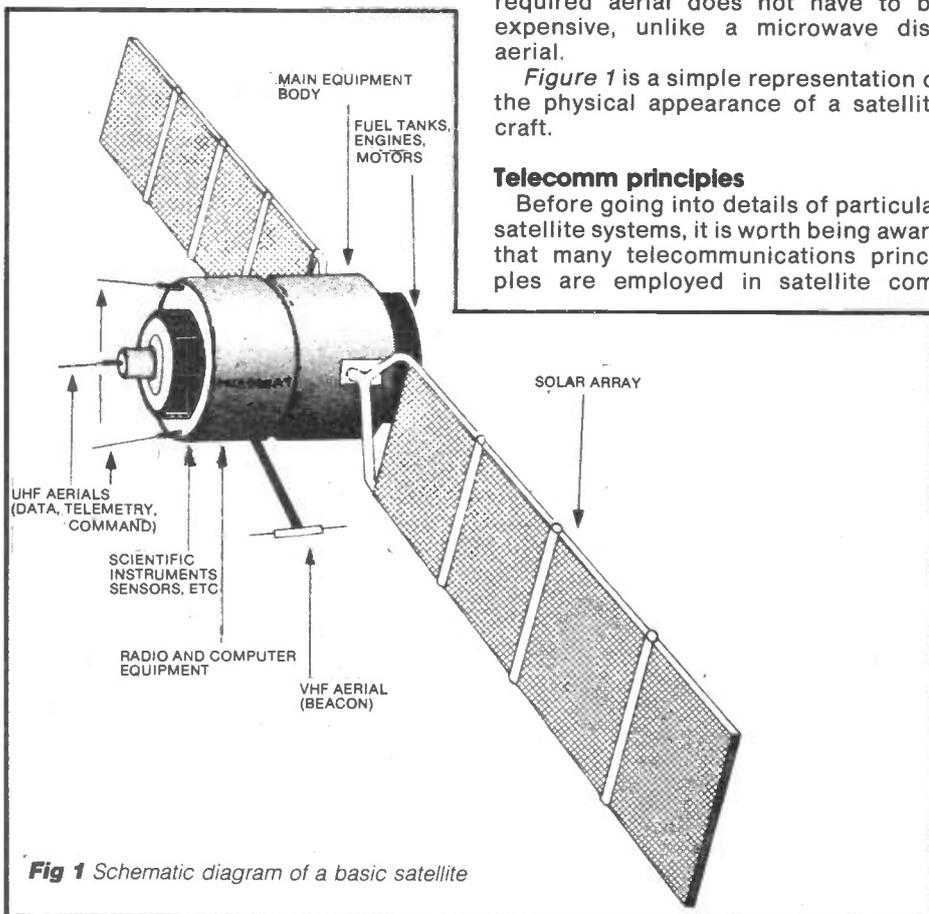


Fig 1 Schematic diagram of a basic satellite

Artificial satellites comprise sophisticated and complex engineering and communications systems and associated subsystems. The engineering task involves designing and building a space vehicle which will operate in a very hostile environment (ie facing the possible problems connected with hard vacuum, temperature extremes, remoteness from the Earth's surface and collision with space debris). The craft must also be able to withstand the forces applied when being lifted off by rocket or shuttle and be able to survive mechanically, electrically and electronically after leaving the Earth's surface and atmosphere. It must obviously remain fully functional and be able to typically perform the following functions: (i) extend solar panels or sails; (ii) rotate in respect of the dish aerial (if required) and provide de-spin for same; (iii) follow transfer orbit and then maintain final orbit (eg geostationary orbit) by operation of thrust motors as required.

By definition, an artificial satellite does not orbit the Earth naturally but uses a combination of many complex engineering systems, the existence of which are far from obvious. A satellite is placed into orbit by the use of a powerful high-speed rocket. The function of the rocket is not only to get the satellite to the required altitude (above the Earth's atmosphere), but also to provide a suitable initial speed of orbit (orbital velocity) which is then maintained. The satellite is expected to orbit at a constant velocity and altitude until it reaches the end of its useful life.

In other words, the satellite must be able to maintain a specified orbit (altitude, position and velocity) and will require correction periodically. It follows, then, that unless this can be achieved totally reliably and indefinitely, ie by autonomous control via on-board computers, then communication with a suitable Earth station is required. This link can only be achieved by radio, and this is usually done using microwave frequencies (3-30GHz).

SCIENCE

If we consider a satellite which orbits the Earth at a given altitude and speed, we can define this phenomenon as follows. To maintain an orbit at 100km requires a velocity of 7.8km per second. This velocity ensures a state of equilibrium of the mass of the satellite in respect of the Earth's gravitational force. If this speed reduces, the satellite will tend to descend and eventually pass through the atmosphere. If the speed increases, the altitude will increase and eventually the craft will leave the Earth's orbit.

Without going into a great deal of detail about the engineering and mathematical considerations of placing the satellite in its particular orbit, it is

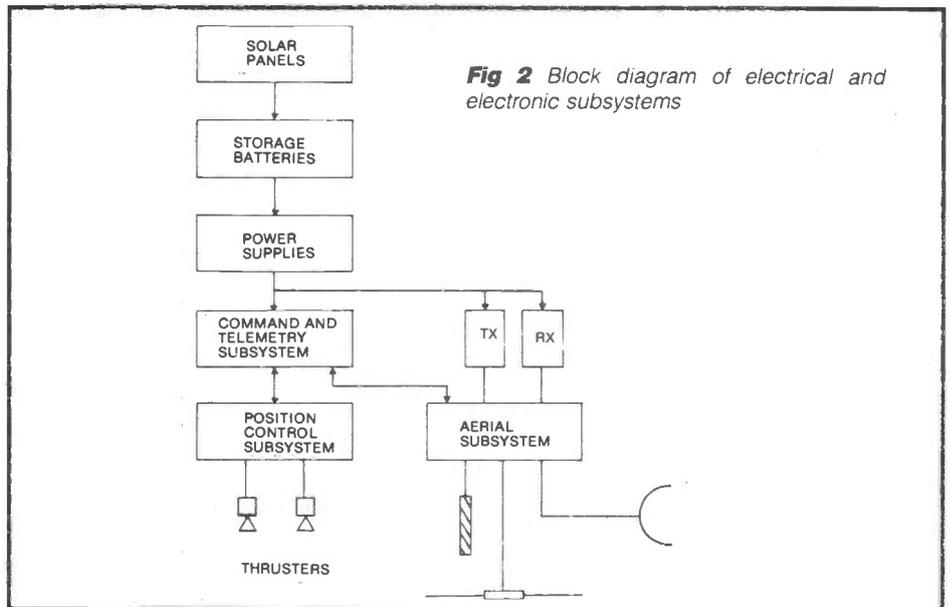


Fig 2 Block diagram of electrical and electronic subsystems

useful to be aware that an orbit is of an ellipsoidal nature rather than a circular one. This means that it will have a maximum and minimum altitude above the Earth during each orbit. The lowest altitude is known as the perigee and the highest one the apogee. The reason for the non-circular orbit is that it is more difficult to maintain a constant speed in a circular orbit due to the variation of the Earth's gravitational force, ie at the Poles (see *Figure 3*).

An example of a satellite orbit is one which has an average height of 200km and an orbital period of 88 minutes. Another example could be 1500km altitude and 116 minutes. Because the Earth itself rotates, this means that a satellite's orbital plane (see *Figure 4*) effectively shifts to the left by a number of degrees which depends on the orbital period.

To consider an example, as the Earth rotates 360 degrees per 24 hours (15 degrees per hour) if the orbital period is 1 hour, then the satellite transit path will have effectively shifted by 15 degrees (west). Similarly, an orbital period of 1.5 hours will give a transit shift of 22.5 degrees, etc. In other words, as the rotation of the Earth is anticlockwise (viewed from the North Pole), although the actual satellite orbit does not change with respect to Earth, the effect is as if it had moved westward (taking Earth rotation as west-east).

Obviously these factors must be taken into account when predicting satellite passes (or just appreciating what is happening when referring to prediction information supplied).

ASTRONOMY

The subject of astronomy is vast, almost by definition, and we shall only consider the system of sun and stars where immediately relevant.

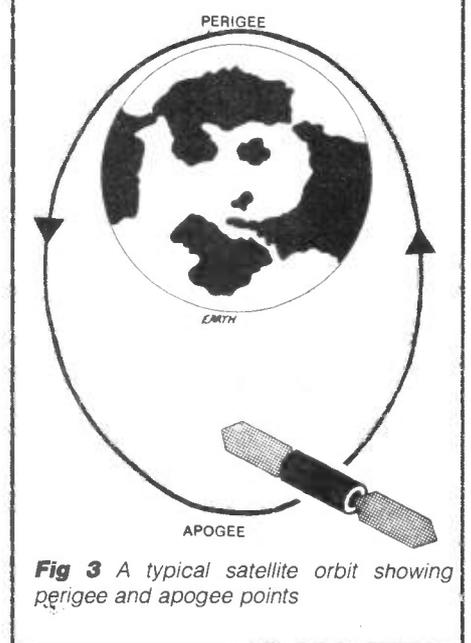


Fig 3 A typical satellite orbit showing perigee and apogee points

Simply, satellites can only be observed in the night sky, as they are illuminated by the sun in the same way that the moon is, providing us with a good 'contrast' picture. It is not easy to distinguish a satellite from a star, except by its obvious steady movement across the sky.

Satellites can be confused with night-flying aircraft, although the latter are usually recognised by their noise and quite brightly flashing lights. A knowledge of some of the more well-known star formations (and points of the compass) will assist 'spotting', along with prediction information about the particular satellite to be observed.

Figure 5 shows the limitations of satellite observations, and it can be seen that the optimum (or only) viewing periods are after twilight and before

COMMUNICATIONS SATELLITES

dawn. It can also be seen that from position P a satellite at S with an altitude of 6000km is too far away to be observed and the altitude will increase as P is moved along the Earth's surface in a clockwise direction. Careful study of the diagram should make this clear.

NAVIGATION

Navigation techniques and geographical aspects will briefly be summed up by stating the use of longitude and latitude bearings.

Very simply, longitude has a reference 'imaginary line' drawn from the North Pole to the South Pole which is marked as 0 degrees running through the Greenwich meridian. Atlases and maps are generally divided into 10 degree segments going west from 0 degrees up to 180 degrees, and also east up to 180 degrees. Similarly, latitude is marked as a grid system at right angles to longitude with reference 0 degrees going in steps of 10 degrees from the equator in a north or south direction.

Figure 6 shows a simplified map which

might be used for plotting or drawing predicted satellite 'passes' from information received. An example of predicated information which may be supplied from a newspaper is:

London - 18.20-18.24 SW 64 S SE
This means that the satellite is visible from 6.20-6.24pm, rises in the south-west, reaches a maximum elevation of 64 degrees in the south and sets in the south-east. The map would of course need to be qualified with scale details, eg km/latitude.

TELECOMMS

We can now consider the satellite in terms of its primary function, ie its communications facilities (eg television broadcasts, telecomms traffic, military, weather, spying, etc), and how these are achieved technically, ie the electronics hardware (and software).

In simple terms, an artificial satellite might be considered in the same way as a robot vehicle under the control of a microprocessor, but obviously we are now dealing in three dimensions instead

of only two.

Whereas a robot vehicle could be modelled inexpensively and produced as a working micro-controlled system employing the usual hardware and software interfacing techniques, a satellite system is rather out of reach of the average micro enthusiast or college project lab! However, when dealing with satellite systems a great deal of practical electronics, microelectronics and communications technologies can be used and demonstrated which can themselves provide a very comprehensive understanding of the systems and subsystems employed.

Assuming that we are not in a position to pay or persuade NASA or the ESA to launch a satellite craft (costing thousands of pounds) complete with communications systems, we will instead concentrate on the satellites currently in orbit which provide interesting radio signals.

There are currently in excess of 2,500 satellites in orbit, which can be categorised as follows:

- Communications (telecomms) - TV, telephone
- Weather - Earth surface pictures
- Military - intelligence for all armed forces
- Navigational - naval and commercial shipping
- Spying (surveillance) - mainly US and USSR

Before concentrating on one category, it is probably useful to pause and consider a fundamental operation of a satellite's activity.

Telemetry, tracking and command

Although many satellites transmit and receive radio signals at microwave frequencies which require expensive dish aerials, other lower frequencies are employed at UHF and also VHF. These may carry telemetry data relating to the status of the craft (eg functional tests, fuel available, solar power, sensor information, etc). Other signal information concerns tracking (position related to longitude and latitude on Earth's surface), speed of craft, etc. Control signals which effectively override computer controlled orbiting can also be effected at these lower frequencies.

Many satellites use these lower frequency (and inexpensive!) signal systems for the transmission and reception of main information (data), eg weather pictures.

Thus a microwave radio link is usually a vital part of any communications satellite system. As stated earlier, however, this does not mean that all communication must be by microwave.

Microwave radio is suited to long distance (space) communication and uses minimum transmitting power, as the radio signals consist of a very narrow and therefore highly directional beam. Thus,

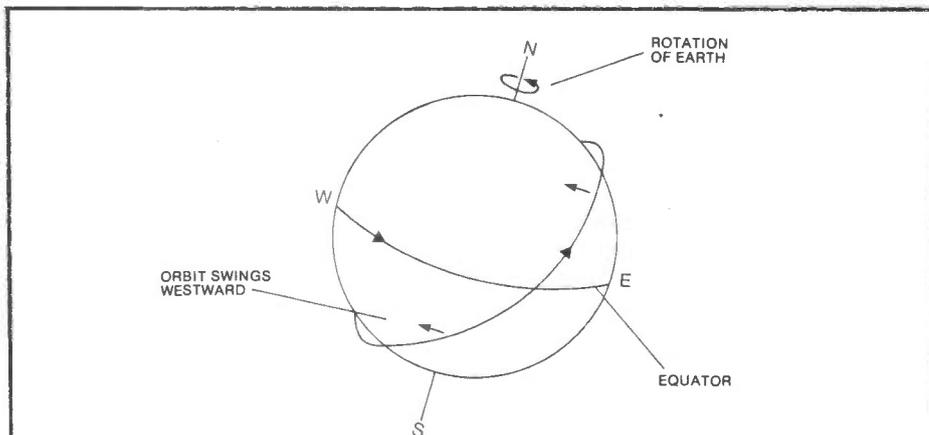


Fig 4 Diagram showing relative movement of satellite orbit as Earth rotates

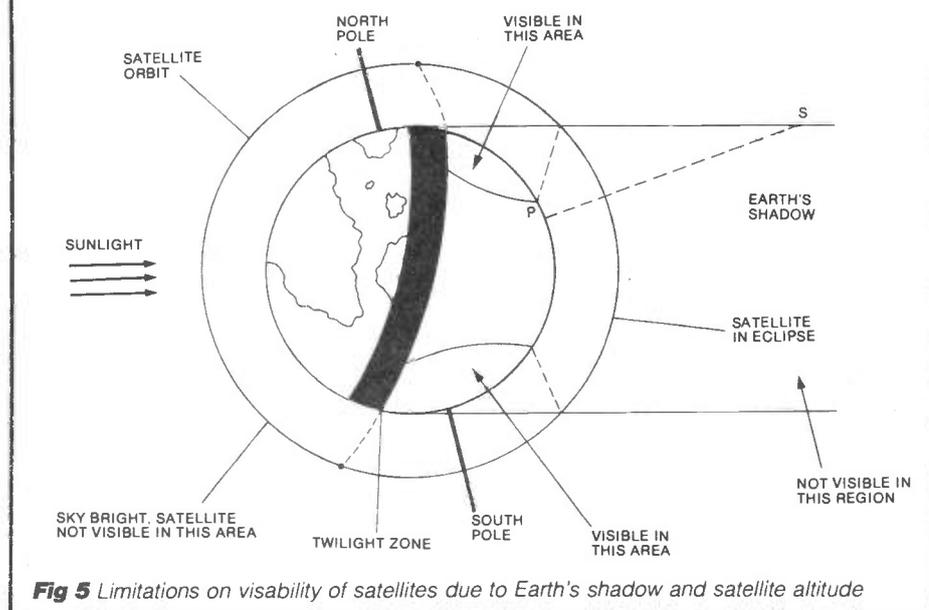


Fig 5 Limitations on visibility of satellites due to Earth's shadow and satellite altitude

it can be assumed that control of the spacecraft is achieved by microwave signals, whereas information or traffic received by or transmitted from the satellite can be in the form of microwave, UHF or VHF signals (microwave frequencies are not excluded for the carrying of actual traffic or data).

Now that we have clarified this it will be clear that we can receive radio signals from a satellite with a suitable VHF or UHF receiver and a fairly simple (dipole) aerial. Assuming for the moment that we have the equipment to receive transmitted signals from a chosen satellite, the next requirement is to decode the signals received. Although a radio receiver demodulates the RF carrier and produces an audio frequency output, the audio can actually consist of bursts or combinations of two frequencies. These correspond to logic levels 1 and 0. In other words, the demodulated audio provides digitally coded information.

This 'digital' information then requires decoding manually, or preferably using a suitable computer program. When this is achieved the computer can also be used to display the decoded information and provide hard copy on a printer. The form of the data could be a table of results or readings from a scientific satellite or a weather map from one of the weather satellites.

We have now established the basic requirements for a home-based amateur satellite receiving station. Briefly, they are: a suitable (dipole) aerial; a radio receiver (dedicated or wideband); a decoder (hardware or software); a micro-computer (with monitor and printer). Note, however, that the aerial will be wideband/omni-directional, so any 'tracking' will effectively be done manually!

Some suitable systems

Let us now concentrate on the requirements of a system which is suitable for home satellite tracking. Fortunately, from a home enthusiast's point of view, there are a number of non-commercial satellites in orbit which enable amateurs to make contact inexpensively and legally.

Two systems of particular interest are the UoSAT series (two satellites currently in orbit), which provide telemetry data outputted from various transducers and scientific instruments on board, and the NOAA series, which provide weather map data. There are also a number of Soviet satellites, one specifically for use by amateurs (allowing transmitting and receiving) and also a weather satellite.

Basic system details

The UoSAT-1 satellite (also known as Oscar 9) is the result of the work of the Department of Electronic and Electrical Engineering at the University of Surrey in Guildford (hence UoSAT). The alterna-

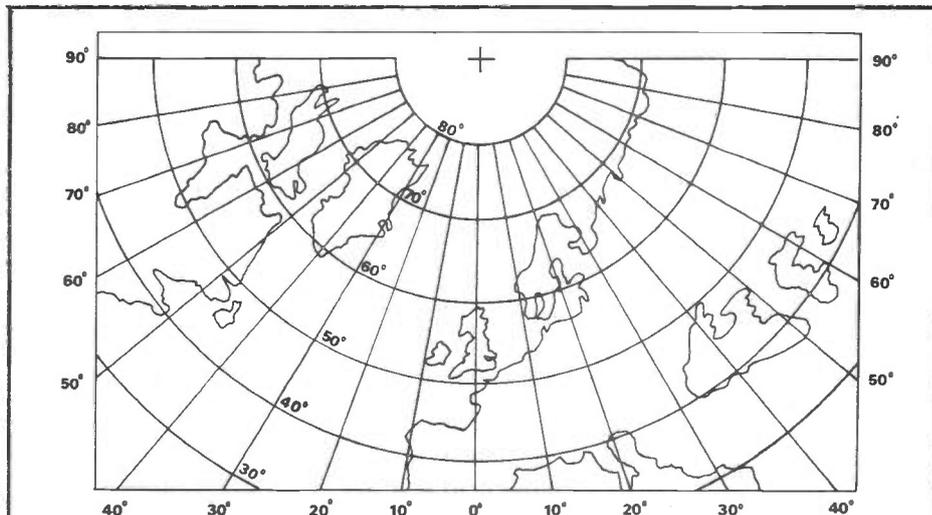


Fig 6 Form of map suitable for plotting satellite transit paths

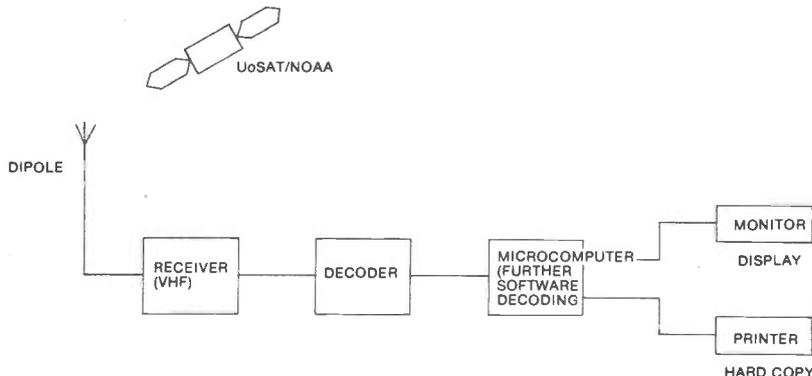


Fig 7 System block diagram for UoSAT/NOAA receiving station

tive name OSCAR stands for Orbital Satellite Carrying Amateur Radio, indicating that one of the functions of the spacecraft is to allow amateur radio operators to transmit and receive signals to each other via space. The altitude of UoSAT-1 is 554km, and its (polar) orbit is 95 minutes. Telemetry information is transmitted on 145.825MHz.

The block diagram in Figure 7 shows the equipment required to receive and decode signals from UoSAT-1.

The NOAA weather satellites transmit weather picture information. NOAA stands for the National Oceanic and Atmospheric Administration. They also have another name, TIROS, which describes their function - Television Infra Red Orbital Satellites. The NOAA satellites all have 101 minute polar orbits and transmit on 137.5MHz (NOAA-6 and NOAA-8) or 137.62MHz (NOAA-7).

The diagram in Figure 7 also applies here, but the receiver and decoder modules will be different.

Hopefully, this article will have succeeded in answering many questions about the concepts of satellite tracking and signal receiving, and will have also provided a clear overall picture of the mechanical engineering, scientific, astronomical, navigational and

telecomms systems and their interaction.

I have not attempted to over-simplify the subject but have tried to give an overall picture to whet the appetite and encourage more people to take an interest. There are several very good books available on satellite communications which tend to be very detailed and mathematical and also very expensive. However, for those who wish to explore this complex but fascinating subject further, details of relevant publications are listed in the table. REW

Further reading

1. **Communications Satellite Systems**
by James Martin. Pub Prentice-Hall Inc, 1978. £25.55
2. **Observing Earth Satellites**
by Desmond King-Hele. Pub Macmillan, 1983. £9.95
3. **Manual of Satellite Communications**
by Emmanuel Fthenakis. Pub McGraw-Hill, 1984. £30.50
4. **Satellites and Space Stations**
by Moira Butterfield. Pub Usborne, 1985. £2.50
5. **Introducing Satellite Communications**
by Bleazard. Pub NCC Publications

THE MINI-LOOP ANTENNA

by Richard Marris G2BZQ

An easy option for those living in high-rise rabbit hutches

Many excellent articles have appeared describing DX loops for the medium wave spectrum. One of the best of these is *MW/LW Loop Aerials* by the late Charles Molloy G8BUS, in the publication *Out of Thin Air*. In agreement with the majority of writers, but in more detail than most, G8BUS proves conclusively that the 40 x 40 inch loop is the most efficient for MW DX.

Putting it off

I would not attempt to dispute this at all. However, living in a small apartment already overloaded with equipment, it must be said that the introduction of a 40 x 40 inch loop plus support and base would mean that one of us would have to go! Consequently the construction of such a loop has been put off for several years.

The purchase, for 10p on a country market stall, of an old copy of the *Handbook of Technical Instruction for Wireless Telegraphists* resulted in many happy hours spent reading about old shipboard WT equipment of 1920s/1930s vintage.

This included DF equipment and DF loops. The amazing thing was how small some of these loops were, and, used with primitive receivers, they gave remarkable results over quite long distances. This was in the era when ocean liners (not airliners) travelled the

globe, and reached their destinations with the aid of DF equipment.

I then recalled how, many years ago, I spent some hours in a flying boat insecurely parked on the water in a hostile area of a war weary world. On top of the flying boat was a small MF loop, and this, with its accompanying Bendix receiver, was used to take navigational bearings on MF beacons and stations while airborne. Yet during this episode it was possible to pick up MF stations while on the water.

It must be admitted that the aim was the reception of musical entertainment, as DF bearings were not needed: we knew only too well where we were located!

The 'loop bug'

As a result of the above thoughts the 'loop bug' was triggered off again, and it had to be a small loop or nothing.

A simple experiment was made by winding a random number of turns of wire around a cardboard shoe box and connecting the ends to an old variable capacitor.

A one-turn coupling coil was wound over this and connected to the aerial input of a MW receiver, and bingo! It worked! As this lash-up worked quite well, so the 'Mini-Loop' was born.

The circuit consists of a loop coil (L1) brought to resonance at station fre-

quency by a variable capacitor (CV). This is coupled via coaxial cable to the receiver input.

From the diagram it will be seen that the loop L1 is formed from 17 close-wound turns of 24swg enamelled copper wire on a frame $9\frac{3}{4} \times 7\frac{1}{2}$ inches, with one coupling turn (L2) wound over L1. L1 is tuned by CV, which is a 2-gang miniature variable capacitor. This was obtained from Cirkit (type CY2-32172). It has two sections of 335pF, which should be wired in parallel to give a total of 670pF. There is also a 3-gang section of 20pF each plus trimmers, but all these should be ignored. Coupling coil L2 is thin PVC-covered flex.

This combination gives a highly directional tunable loop. Maximum signal strength is received off the ends of the loop, and the minimum signal, or null, is at 90 degrees.

Construction is relatively simple. All that is required is two pieces of wood each 13 inches $\times \frac{1}{2} \times \frac{1}{2}$ and one piece of wooden dowel of 10 inches in length. The two pieces of $\frac{1}{2} \times \frac{1}{2}$ should be drilled at the exact centre, then bolted together and opened up to give the necessary dimensions.

Flush surfaces

After determining the correct angles at the intersection these supports can be cut away at the join so that the surfaces are flush. When they are reassembled they can be mounted on the $\frac{5}{8}$ inch dowel, which is also cut away to give a flat surface, using Araldite and a 6BA nut and bolt.

Treat the surface with a spirit-based wood stain and mount it on a suitable base (I used one from an indoor television aerial).

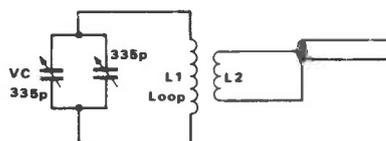
The corner bobbins for the winding consist of 4 pieces of $\frac{3}{8}$ inch diameter dowel, each $\frac{1}{2}$ an inch long. These are fixed with small panel pins and Araldite.

The 17 turns of L1 are carefully wound around the bobbins, starting and finishing the winding at the top left-hand bobbin and taking the two ends through a small hole drilled near the end of the supporting cross piece. Two coats of model makers varnish are then carefully painted onto both sides of the winding using a small pencil brush. Be careful not to disturb the turns.

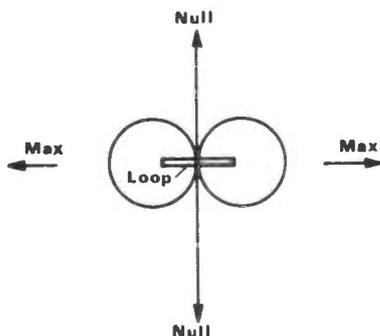
Securing

When the varnish is dry L2 should be wound over the centre of L1 with the ends terminating at the top right-hand bobbin, and the two ends again taken through a small hole drilled through the cross arm. The single turn of L2 is

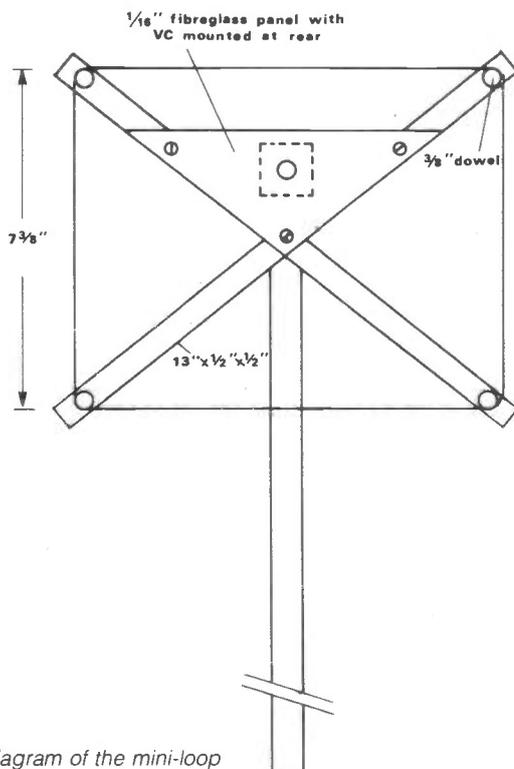
The circuit diagram



The polar diagram



Constructional diagram of the mini-loop



secured over L1 with a small blob of Araldite about every 3 inches.

A triangular piece of circuit board is cut as shown in the diagram. Fibre-glass board was used, but alternatives such as SRBP would be quite in order providing they are not of the copper-clad type. CV should be mounted on this board.

The next job is to solder the two ends of L1 to CV, and to connect the two 335pF sections in parallel.

Ordinary coaxial TV cable is unwieldy to use as a connecting lead on such a small loop, and the best alternative is screened PVC-covered audio cable. This has an impedance of around 50 ohms. The ends of L2 are soldered to the inner and outer of the cable. Fit a coaxial plug to the other end. For receivers without a coaxial aerial input socket, twin feeder could be used instead.

Using the loop

Using the loop is quite simple. A medium wave station is tuned with CV. Rotate the loop for maximum signal strength, which comes off the end of the loop. In the event of interference from another station this can usually be eliminated, or greatly reduced, by rotating the loop slowly. This is particularly useful at night, when the MW band is

loaded with competing stations.

The prototype loop covers a continuous frequency range of 521kHz to 2MHz (ie 575 to 150 metres). It also covers the 160 metre amateur band, if the receiver covers that band. The results are excellent, bearing in mind that the loop measures approximately $9\frac{3}{4} \times 7\frac{1}{2}$ inches against the recommended, and usually used, 40×40 inch MW loop!

Performance

The Mini-Loop is in everyday use at the writer's QTH, in conjunction with 1950s vintage Pye Export 9-waveband receiver which has been restored to its former glory, and which gives world-wide reception with a variety of aeriels on the LW, MW and 7 SW bands. I am not a DX chaser, being really only interested in the design and technical nature of electronics, but it is worth mentioning that around midnight it has been possible to pick up a number of east coast American stations including WMRE (Boston) on 1510kHz. Furthermore, on the 160 metre amateur band several CW stations have been heard from the USA. The results are encouraging and could, no doubt, be improved by a reader interested in MW DX reception.

Loop antennas are only satisfactory

when using a receiver with an external aerial socket and not containing an in-built ferrite rod aerial, which will only confuse the results as it is directional in its own right. This, in practice, means using a communications receiver or one of the older type valve domestic receivers, which if realigned (and re-valved?) are particularly useful. Good receiver RF amplification is necessary. If this is not already in-built then a simple external RF amplifier can be purchased or constructed.

It should be possible to build the Mini-Loop for well under £6. Many constructors may well have the necessary bits of wood and wire already. The most expensive item is the variable capacitor, which is available from Cirkit at £2.22. A good variable capacitor from an old transistor radio could be used providing it has the correct capacity.

Compensating value

If another such capacitor is substituted it should be possible to adjust the loop to compensate for differences in value. For instance, if the loop will not tune up to 2MHz you might try removing a turn from L1.

It only remains for me to wish you many fun filled hours with the Mini-Loop. **REW**

NEXT ISSUE

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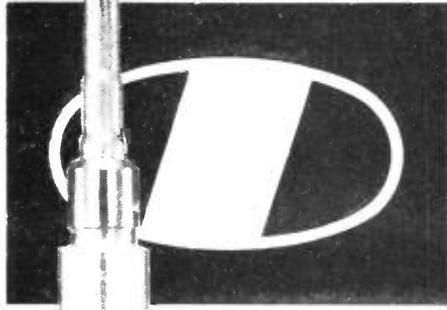
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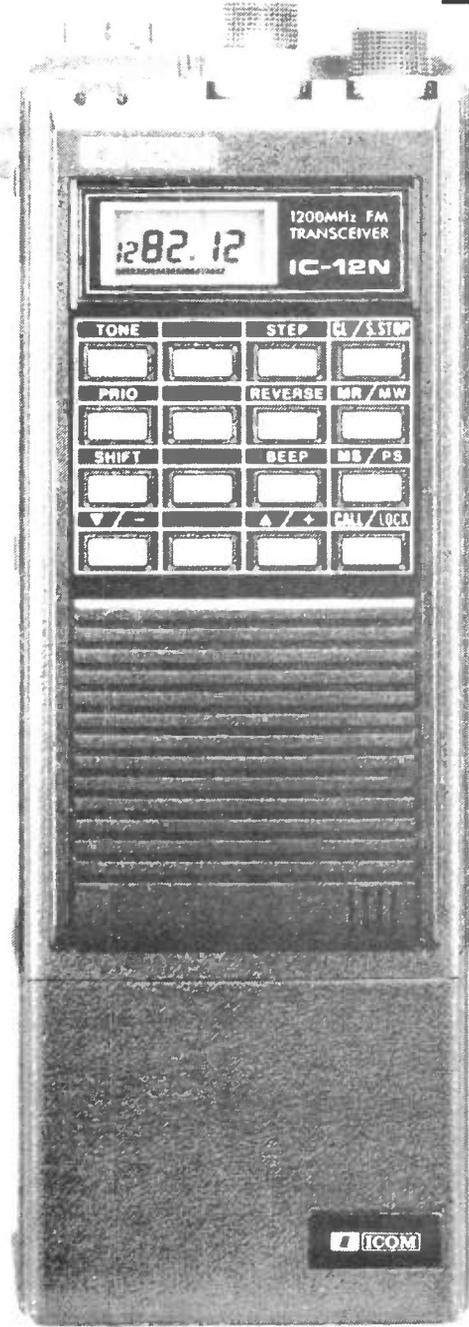
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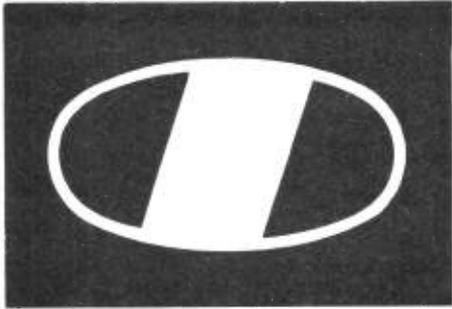
Also available for the IC-12E and other ICOM Handportables are a large range of optional extras including a variety of rechargeable nicad power packs, dry cell battery pack, desk charger, headset and boom mic, speaker mic, leatherette cases and mobile mounting brackets.

For more information on this handportable and other ICOM Amateur Equipment contact your local ICOM dealer or Thanet Electronics Limited.

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On the top panel a clear LCD readout gives frequency and memory channel number. Tuning is made easy using up/down toggle switches to select 1MHz, 100kHz or 12.5kHz steps as well as the 10 memory channels. Full repeater and reverse duplex operation facilities are featured including repeater access tone. An automatic power saving function reduces battery power consumption when in receive mode. Output power is 1 watt or 100 milliwatts (low) with the BP22 nicad pack.

The ICOM MICRO-TWO is the ultimate in 2 metre miniature handheld transceivers, yet despite it's small size the receiver sensitivity and performance has not been compromised. This handy transceiver comes complete with the BP22 nicad pack (not shown here), A.C. wall charger, helical antenna. Most existing ICOM accessories can also be used.

An optional extra, the BC50 desk charger will rapidly charge the BP22 battery in just one hour. Other options include the BP23 long-life, low-power and BP24 medium-life, high-power nicad battery packs. Contact us or your local ICOM dealer for more details on this exciting new product.

Actual Size Photograph.

This shows the non-standard low capacity battery pack. N.B. Standard battery pack is normally the higher capacity BP22 as mentioned in text.



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Dept. REW

The excitement of the previous month bubbled over into July. There weren't as many openings from Arabic countries but a deluge of interesting events continued to fill the screens of DX-TV enthusiasts. Two mystery test patterns presented themselves and a dose of Band III sporadic-E reception ensured a high level of interest. On the other hand, tropospheric activity was only marginal, with very little to show for the month.

Arabic mysteries

Perhaps the best day was 1st July. No fewer than four instances of Arabic DX came to light. Simon Hamer of New Radnor in Powys was startled to find an FuBK test card occupying channel E3 with its identification in Arabic script. There were no further clues as to its origin.

Bob Brooks of South Wirral spotted an Arabic caption on channel E4 later in the day at 1705. Meanwhile, Ray Davies at Happisburgh in Norfolk saw an Arabic news-reader shortly after 1830 on channel E3.

Kevin Jackson of Leeds went one better. At 2154BST he resolved a PM5534 test card on channel E3. The identification 'JTV' could be deciphered at the top with 'SUWEILEH' in the lower black rectangle. It would seem that this was Jordan shortly after close-down.

We can only assume that the other Arabic DX noted earlier in the day came from the same area. The FuBK test card with Arabic identification poses a real problem. As far as we know there are only two Arabic countries using this pattern, namely Tunisia and Iran. In last month's *Radio & Electronics World* we mentioned that the channel E4 outlet at Ramada in Tunisia was operational. However, Simon's reception of the FuBK was on E3 at 1240GMT, and this would indicate a late start to programmes in Iran since they are GMT +3½ hours. We do not even know whether a channel E3 transmitter exists in Iran. Practically every Arabic TV service makes use of the Philips PM5544 or variations of this pattern. If anyone can clear up this mystery, please write in with full details.

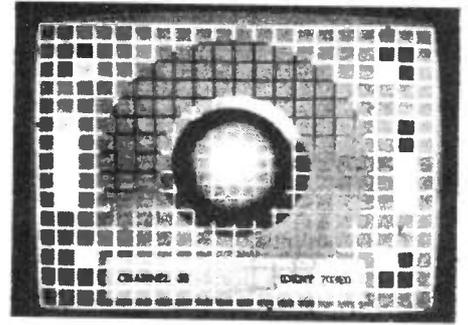
It may well be worthwhile giving a brief resumé of various Arabic transmissions in Band I: Morocco (RTM) uses channel E4 with the PM5544 test card; Tunisia (RTT) radiates the FuBK on channel E4; Egypt broadcasts the 2nd network on channels E2 and E4 (both outlets have an ERP of less than 1kW); Iran uses E2 with the FuBK, which carries a large digital clock and 'IRIB' identification, and a line of Arabic script is also included; Dubai transmits a squared version of the PM5544 and uses channel E2; Saudi Arabia uses channel E3 (from Dhahran) with the PM5544 and 'CHANNEL 3' identification.

DX-TV log for July

This month we are featuring an impressive log sent in by Mark Dent of Leeds. Many countries were noted, including Austria (ORF), Italy (RAI), Spain (TVE), Yugoslavia (JRT/RTV),

DX-TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith



Czechoslovakia (CST), Eire (RTE), Belgium (RTBF and BRT), France (Canal Plus), Russia (TSS), Sweden (SR/SVT), Portugal (RTP), Rumania (TVR), Netherlands (NOS), Hungary (MTV), Poland (TVP), West Germany (BR), Norway (NRK) and Switzerland (+PTT). The Italian private station operated by Radio-Tele-Uno was also received on channel IA. Now that newcomers to TV DX know what all the station abbreviations stand for, here is a section Mark's log.

1/7/86: ORF E2a on PM5544 'ORF FS1' at 1220; RAI IA at 1225 and IB at 1347 on programmes; TVE1 E2 on programmes at 1348; JRT E3 on PM5544 'RTV-1 LJUBLJANA' at 1604; CST R1 on Praha castle caption at 1629; TVE1 E4 on Toros programmes at 1646. RTE1-IB, IH, 40. RTE2-IH, 43. RTBF1- E8. C+ - L5.

2/7/86: TSS R2 on UEIT at 0617; SVT E2 on PM5534 'TV1 SVERIGE' at 0641; ORF E4 on 'ORF FS1' PM5544 at 0648; TVE1 E2 on programmes at 0651; RAI IA on PM5544 'RAI 1' at 0655; TVE1 E4 on programmes at 0704; SVT E3 on programmes at 0704; TSS R1 on HOBDOCTN at 0714; RTP E3 on low frequency tp (black-white-black) at 0932; TSS R1 on UEIT with Leningrad ID in Cyrillic at 0932; TSS R2 on UEIT with ID 0167 from Narva Tx at 0932; TVR R2 on TVR caption at 1806; CST R1/2 on programmes at 1845. RTBF1-E8. NED1- E6.

3/7/86: TVE1 E2/3/4 on programmes at 0736; RAI IA on PM5544 at 0832; JRT E3 on FuBK '-JRT SA-1' from Pisvir 25W relay at 1302; MTV R1 on PM5544 'MTV-1 BUDAPEST'.

4/7/86: TVE1 E2/3/4 on programmes at 1445.

5/7/86: TVE1 E4 on programmes at 1546.

8/7/86: TVE1 E2/3/4 on programmes at 0700; RAI IA on teletext at 0951; TDF C+ L3 on programmes at 1014; TVE1 E3 on teletext from 2 Txs at 1056; RAI IB on programmes at 1355; TVP R1 on blank dark PM5544 at 1356; BR-1 E2 on programmes and +PTT E2 on FuBK '+PTT SRG1' floating together at 1357; MTV R1/2 on multiburst tp at 1450; CST R1 on programmes and R2 on Bratislava castle caption at 1459.

9/7/86: TSS R1/2 on UEIT at 0926; TVE1 E2 on Esta Noche (prog sched) at 1958; TVE2 E2 on programmes at 2001.

10/7/86: RAI IA on teletext at 1012; CST R1 on EZO at 1034; TVE1 E3 on teletext and on E4 on programmes at 1108; +PTT E2 on FuBK '+PTT SRG1' at 1116; TDF C+

L3 on programmes at 1122; TVE1 E2 and E3 on teletext at 1140; JRT E4 on blank carrier, multiburst, and FuBK 'JRT ZGRB1' at 1152; TVE1 E3 on 'Esto es Aragon' caption from La Muela at 1159; JRT E3 on FuBK '-JRT SA-1' (Pisvir 25W) at 1248; JRT E3 on 'Letnje popodne' caption from TVB1 (Kopaonik) at 1257; CST R1/2 on FuBK 'DDK 2?' at 1345; ORF E2a/4 on programmes at 1345; RAI R1/2 on Praha castle caption at 1358; RAI IB on programmes at 1405; MTV R1/2 on multiburst at 1426; TVE2 E2 on b/w vert line tp at 1515; SVT E2/3/4 on PM5534 at 1552; TSS R2 on clock at 1659; R1 on BREM 165 R at 1700; TSS R1 on UEIT and CST on EZO floating together at 2313.

11/7/86: TVE1 E3 on basketball programmes at 0020; Radio Tele Uno IA on tp at 0113; SVT E2/3x2 on PM5534 at 0644; TVE1 on E2/3/4 on teletext at 1031; RTP E3 on FuBK 'RTP-LISB1' at 1249; TVE1 E4 on programmes from TVE Andalucia at 1258.

12/7/86: TVE1 E2/3 on programmes at 0602 and on E4 at 0629; TVE2 E2 on GTE at 1001.

13/7/86: TVE2 E2 on GTE at 0927; TVE1 2/3/4 at 0927; TDF C+ L3 on programmes at 1122; RAI IA on programmes at 1416.

14/7/86: TVE1 E2/4 on programmes at 0843; RTP E3 on RTP caption at 1026; NRK E3 on 'HEMNES' PM5534 at 1035; RAI IA on programmes at 1707.

16/7/86: CST R1 on EZO at 1045; RTE1-IB, IH, 40. RTE2-43. BRT1-E10, 43. BRT2- 46. RTBF1- E8. NED1- E4, 6, 39. C+ - L5, 7.

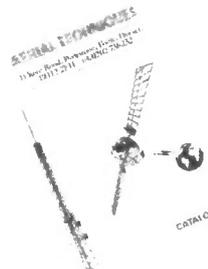
17/7/86: TSS R1 on UEIT at 0900; RAI IA on teletext at 0925; TSS R1 on YT clock at 0937; TSS R1 on UEIT with ID Leningrad in Cyrillic, and R2 on UEIT with UT 140327 at 1003; NRK E2 on 'STEIGEN' PM5534 at 1046; SVT E2x2 on PM5534 at 1115, on E4 at 1139; TSS R2 on UEIT at 1157 (CT1 was on programmes).

Our thanks to Mark for supplying this month's sporadic-E and tropospheric log.

Reception reports

Philip Heaney of Norwich tells us that Iceland is using a new clock caption. He noted it on channel E4. Basically, the clock is on the left-hand side of the screen with the identification 'RUV' to the right. Philip noted a relatively rare signal on 1st July when Rumania appeared using the FuBK test card with the identification 'BUCURESTI'.

Bob Brooks (South Wirral) is the latest DXer to spot the Finnish YLE FuBK test



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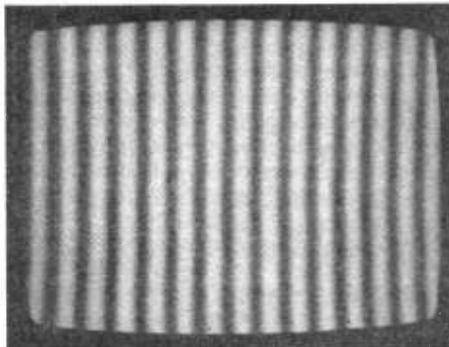
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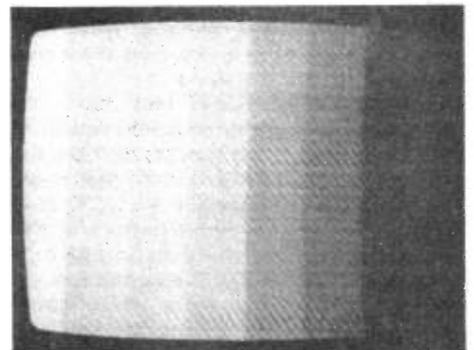
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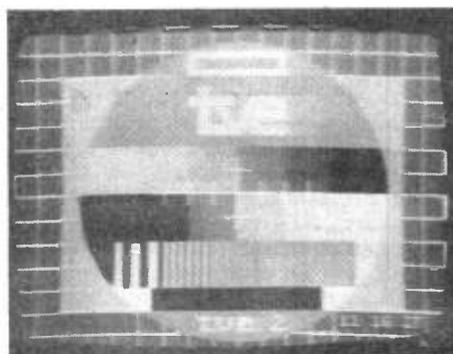
News program from TVE-1, Spain



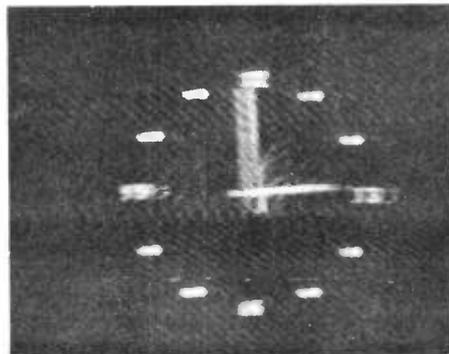
Spanish vertical-bar test pattern from TVE-2



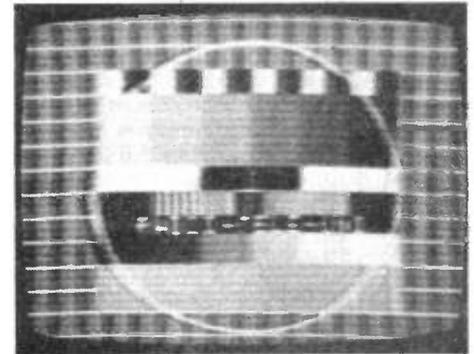
Colour bars received from the TVE-2 outlet at Santiago



Second network 'GTE' colour test card on TVE from TVE



Spain's first network clock caption received via sporadic-E



Electronic test card on channel 1A from Radio-Tele-Uno, Italy

DX-TV RECEPTION REPORTS

card on channel E2. It came through in colour on the 20th even though its reception is something of a mystery. Both the TV-1 and TV-2 outlets were taken out of service a few years ago but several enthusiasts have reported seeing the YLE test card on this channel during the past year.

Bob has also seen Czechoslovakia (CST) using the FuBK with 'DDK 2' identification on channel R1 prior to the station opening sequence. We understand that this was only aired over the second network, but the test card has been noted on the 1st network many times recently on channel R1.

Several DXers often scan the FM broadcast band on 106MHz during sporadic-E openings. Jonathan O'Farrell, of Greenford in Middlesex, heard the Southern European Broadcasting Service (SEBS) recently from the Naples area in Italy. The signal quality was excellent with reception in stereo. Harold Brodribb of St Leonards-on-Sea often scans the OIRT FM band during sporadic-E activity. 1st July was his best day, with no fewer than 59 stations being logged.

Successful sporadic-E

Kevin Jackson and Mark Dent of Leeds have both been very successful with sporadic-E. They have noted the Yugoslavian 25W channel E3 relay at Pisvir time and time again this season, which prompts them to ask whether there has been an increase in the ERP. The test card is the FuBK with '-JRT SA-1' identification. Programmes from the Sarajevo studios are radiated from this outlet.

The Radio-Tele-Uno test card on channel 1A is another frequent visitor to the Leeds area. It is a very distinctive and eye catching pattern and we have included it in this month's 'Photo File'. A test card which we can't feature at the moment was noted by Kevin on 10th July at 1636 on channel E4/1B. It consisted of a thin black circle upon a white background. Two sets of horizontal and vertical frequency wedges fanned out from the centre. Conditions were active towards the south-east at the time and Kevin is wondering if the test card, which appeared to be hand-drawn, originated from another Italian private TV station.

A particularly notable day at Simon Hamer's location in Powys was 8th July. Albanian transmissions were resolved on channel 1C and, during the period of high MUF, Russian signals were seen on channel R3. Albanian TV (RTS) appeared again on the 11th.

Simon also noted system L signals from France at various times in Band 1 on the new channels L3 and L4. These appear to carry Canal Plus programmes. The test card usually consists of a pulse and bar pattern rather than the Philips PM5544.

Another upmarket TV set

The UK seems to be awash with upmarket television sets apparently enabling reception of TV programmes from almost everywhere in the world. Note the word 'almost'. Eagle-eyed Tony Harris of Fareham in Hampshire has spotted yet another colour receiver which would make a welcome addition to any DXer's set-up. Unfortunately the price tag will result in one or two slightly depleted wallets! At almost £900, Toshiba are offering their 'complete entertainment system', known as the 289X4M. The brochure makes interesting reading. Firstly, the upmarket TV doesn't have teletext. Oh well, never mind. The good news is that Toshiba's technology allows you to tune into the local station no matter where you happen to be in the world, all within the space of a few seconds. Well, that is providing you don't happen to live in France. It won't resolve system L transmissions.

The tuning range seems fairly impressive, although the details in the brochure are rather sketchy. The lower limit of VHF channel E2 might prove a problem if the receiver is used in New Zealand. Their channel 1 is some 3MHz lower.

The 289X4M seems to be unjustifiably expensive for what it's supposed to do. Just how the V66cm flattest, squarest screen ensures a picture 'near larger than life' we're not too sure. Elephants have a nasty habit of looking smaller than life on most TV receivers!

There is also an on-screen display for volume, colour and brightness levels 'so you can see what you are doing'. This really is a leap forward in technology. It certainly beats the old-fashioned system where you turn a couple of knobs to get the exact settings for sound and colour! For those who want more information about this wonder in hi-tech, the address to write to is: *Toshiba (UK) Limited, Toshiba House, Frimley Road, Frimley, Camberley, Surrey GU16 5JJ.*

Service information

Netherlands: The FuBK test card, with individual transmitter identification, is now used by all main outlets prior to the start of PM5544 test transmissions. However, the old monochrome PM5540 electronic test card is still used by Arnhem.

There are plans to reduce test transmissions on the 2nd network in an effort to save energy. Meanwhile, on the 1st network the test card will no longer be broadcast. Sample pages of teletext will be radiated instead!

Sweden: Next summer sees the total reorganisation of Swedish TV. The services will no longer be known as SR/SVT-1 and SR/SVT-2 and both networks will operate on a national basis. From 1987, programmes originating from the TV studios in Stockholm will be broadcast by 'Stockholmskanal' (currently SVT-1). Produc-

tions from the ten regional centres will be transmitted by 'Rikskanal' (SVT-2).

Stockholmskanal will broadcast between 1300 and 2400 (local time) Monday-Friday and from 0800 until 2400 on Saturdays. Programmes on Sundays will begin at 0900. News programmes will be produced by staff of the existing 'Aktuellt'. Bulletins will be shorter but more frequent. Rikskanal will be on the air from 1730 until 2230 Monday-Thursday and until 2400 Friday-Sunday. Programmes will generally reflect Swedish culture. The news programme, called 'Rapport', will be at 1930 local time.

The PM5534 test card has been noted from the channel E2 outlet at Hörby carrying the following text: 'Televerket Radio informerar: Du tar nu emot Hörby på kanal 2. Utländska stationer stör ofta. Sändaren lägges ner 30 juni 1986. Mottagning möjlig på annan kanal. Din radiohandlare kan ge råd. Behovs mer information, ring oss: Televerket Radio, tel 90300 *****'.

The text, which moved across the test card from right to left and repeated itself every 35 seconds, translates as: 'Swedish Telecom Radio informs: you are receiving Hörby on channel 2. Foreign stations often interfere. The transmitter will close down on 30th June, 1986. Reception possible on other channel. Your radio dealer can give advice. If more information required, ring us: Televerket Radio, phone 90300 *****'. So, yet another Band 1 transmitter has been taken out of service.

Meanwhile, a new transmitter has opened on channel E39 in the southern part of Sweden. The outlet radiates SR/SVT-1 programmes.

France: A new identification has been noted on a TDF FR-3 PM5544 test card. The inscription is 'CEBECO' at the top and 'ROMANVILLE' in the lower black rectangle.

West Germany: The channel E5 transmitter at Bonn, operated by Westdeutscher Rundfunk, will be on reduced power from 1st January 1987 until its final close-down on 1st January 1988.

Denmark: A low power relay has been brought into service near Kalundborg on channel E58 with vertical polarisation. The ERP is thought to be no more than 100W.

Plans for commercial TV have been approved by Parliament. The service (TV-2) will be operated by a newly established independent company. TV-2 should start in 1988 and will be available on UHF only. Broadcasts will be on a national basis for 80% of the time. The remaining 20% will be reserved for 8 newly established local TV stations.

TV-2 will be financed by advertising plus a small increase in the licence fee.

Our thanks to Gösta van der Linden (Rotterdam) and the Benelux DX Club (Netherlands) for supplying this month's service information.

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 Plessey SL403 3 Watt amp, From Bankrupt source, hence sold as untested 4 for 60p or 10 for £1.20p
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 Mullard 5mm LED, 40 red, 30 green, 30 yellow = 100 mixed £7
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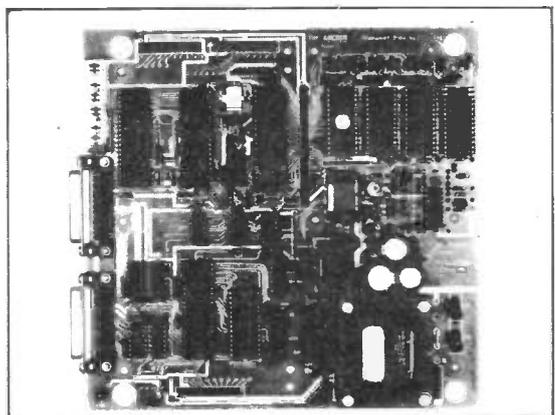
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From time to time I drop some hints about ATV operation in Continental Europe, but I don't think I have mentioned other continents before. Some information from the USA dropped through my letter-box recently, and it seemed like a good idea to contrast the Stateside scene with ours.

Vast open spaces

Yes, and in more ways than one, since as well as the huge geographical spread of the place there is also the expanse of the frequency allocations. Not only does the USA 70cm band run from 420 to 450MHz, but lucky American amateurs have an interesting 33cm band (902-928MHz). In addition, they have the 23cm band, so what do these lucky American (and Canadian) ATVers do with all this space? Not a lot would be an unfair answer, although the pattern of operation is certainly different.

In terms of national popularity fast-scan ATV does not have the appeal or exposure that it does, say, in Britain. There is a national club and magazine, but neither match up to the BATC or CQ-TV in their level of activity or professionalism. There isn't any regular ATV coverage in the national ham radio press and thus ATV does not have a particularly high profile (SSTV is different).

Despite this there are some major pockets of activity, particularly in southern California, Washington, Iowa and Chicago, and there are several TV repeaters (including the world's first ATV box). Quite a few of these repeaters are in-band 70cm machines, thanks to the generous allocation on this band. The

The first practical video recorders were demonstrated 30 years ago: David Sarnoff of RCA holds a piece of Scotch 1/2-inch tape in front of a VTR a little large for my living room!



ATV



ON THE AIR

Andy Emmerson G8PTH puts you in the picture

other repeaters use 23cm for output, and because the input is AM so is the output. Simplex activity on 23cm, confined to a few areas, is also mainly AM, although some exported Wood & Douglas products are now showing the FM light.

Emphasis on operation

Reading *Spec-Com* (formerly A5) magazine one gains the impression that most American operators are more interested in operating than sophisticated studio effects. Portable and mobile operation, particularly to assist crowd control at public events, is popular and some spectacular tropo DX is worked across the huge land mass. A lot of transmitting and receiving equipment is home-made, or constructed from kits by PC Electronics (the market leader) or Wyman Research. The first receive converters for the 33cm band have just appeared and transmitter designs are expected any day now; it will be interesting to see if this band takes off there. Indications are that it will because of pressure to vacate 70cm to other ham users.

Talking of pressure to leave 70cm, doesn't that sound familiar? Over here, too, the ATV spectrum is under threat. I know I have already bored you with the problem in this column. I will briefly return to it, because the RSGB has now officially laid to rest the hysterical fears some people were entertaining. The crazy idea that we were to lose half of 70cm to the military has been officially denied.

Back to sleep again?

Not really, for two reasons. Seventy centimetres may be secure for TV use for a while, but our higher allocations are definitely under scrutiny. A Department of Trade and Industry news release, which attracted little attention, announced that the allocation of radio frequencies for defence use was to be reviewed by a special committee. The first stage, covering the band 470MHz-3.4GHz, would commence immediately with a view to publishing a report in 18 months time. While I don't expect that the three-man committee will recommend increasing the defence allocation,

we should not be too complacent. We may find increasing use of 'our' 23cm band, for instance, by the primary users. In this case it is high-powered radar, which is already causing problems in some areas.

The second area for concern (not worry) is an announcement made earlier this year relating to a spectrum pricing study. "There is a growing demand for radio spectrum," said Information Technology Minister Geoffrey Pattie. "For example, new commercial radio communications, such as radio pagers and cellular radio telephones, are additional users of what is a finite natural resource. In some cases demand exceeds supply."

Lost frequency

In the London area we have already lost an under-utilised section of the 70cm band, and some readers will recall that less than 20 years ago our 70cm band extended from 420 to 450MHz. No, of course I can't remember that far back, but I do recall losing 1215-1239MHz soon after being licensed.

Back to the plot. While the broad allocation of the radio spectrum is fixed by international agreement, the DTI is responsible for the actual allocation of frequencies within the UK. Up until now those parts of the spectrum allocated for industrial and commercial uses have been dealt with on a first come, first served basis, with a licence fee based on administrative costs. Now, however, it is thought that the country might benefit by bringing market forces and the price mechanism into play. The study will include all radio users, including CB and amateur radio.

How much is your licence worth?

In basic terms, the minister is seeking to find out if some users would be prepared to pay over the odds for a licence. It's interesting to speculate on what would happen if frequencies were allocated to the highest bidder. It's also worth considering whether making organisations compete against each other for frequencies would make for more efficient use of the ether. No other country has introduced this kind of

NETWORK 934

Andy Emmerson G9BUP

system; nowhere do market forces decide which users gain use of the spectrum.

There are in fact many arguments against these proposals, not the least of which is the threat of monopoly which a wealthy organisation could impose. It is clear that if the present government saw a gold-mine to be made out of mobile radio licences, for instance, it could easily argue that commercial use of a scarce resource was more in the national interest than, say, the South London repeater or even the empty territories of 70cm during the daytime. Don't mistake me, I shall defend amateur TV – and radio – to the last, but we'll have to get our act together too. Disagree? Then write and tell me why...

Spooks

The inactivity of the 70 and 23cm bands makes them favourites for surveillance operations. The use of 70cm by the police for over-the-air CCTV at Southend-on-Sea a few years back is only one example. Several agencies, not all of them official, share our bands, but because these activities are very localised they tend to escape attention, and being good citizens we would not disclose what we saw anyway, unless we suspected evil was afoot (though quite how one judges is not so clear...).

Anyway, a large batch of 'creepie-peepee' video transmitters was recently shipped from the USA to Britain, and I don't suppose they are going to be used just as ornaments! The ingenuity of the people who make cameras to go with these surveillance outfits is now exceeding all bounds. I think I have mentioned previously a combined TV camera and transmitter which sat in the lamp bowl of a street lamp. Now the same German company has come up with the ultimate disguise! A miniature high-grade optical surveillance system has been built into a car aerial... Yes folks, a standard car antenna is adapted to incorporate a 5mm fibre optic lens which is quite invisible in use.

All crammed in

The observed scenes are either recorded onto video or transmitted to a base collection point up to a distance of 33 kilometres (I wonder if they use the car aerial for this? I suppose they do!). Anyway, a charge-coupled device camera and motor are incorporated into the base of the antenna, which can be rotated through 360 degrees for optimum surveillance.

If required the whole apparatus can be worked by remote control (I suppose they use the same aerial for this as well). Reportedly VHF, UHF and SHF versions are supplied.

The same firm makes a pocket photocopier which you pull across the document you are copying; it works in low

Autumn is the season of mists and mellow fruitfulness, they say; it is also traditionally one of the best times of the year to work the DX via tropo enhancement. Next month I'll deal with the mechanisms that give us this 'free ride' in more detail, but in the meantime be prepared to work considerably longer distances than normal!

Watch the weather forecasts and the weather itself: a bright day followed by a rapid drop in temperature in the evening is a good sign. This will often be accompanied by fog or heavy condensation outside on cars and such like. An evening lift in conditions will often be followed by a similar lift the next morning, so set your alarm clock to go off early!

No apology necessary

A tell-tale sign of lift activity is unusual patterning on TV pictures. You may even get a caption between programmes apologising for the foreign interference. Of course, no apology is required by us UHFers – this is just what we have been waiting for!

If you are a TV DXer (and quite a few of us are) it will be a difficult choice, for you may well be able to receive exotic TV signals as well and you can't do two things at once. I'll leave the decision to you – assuming we get the DX anyway!

Low cost meter

If you have ever examined the low cost power and SWR meters sold for 27MHz you will know the sort of rubbish which some shops stock. Apart from dubious reliability these grotty meters probably add to any SWR problems and reduce the power to be measured because of their insertion loss.

Fortunately this kind of meter has not surfaced on the 934MHz band, but users have not had a very wide choice of alternatives. Apart from the professional quality Bird meter and the advertised (but never reviewed) Daiwa crossed needle offering, there has not been much of a choice. The Nevada job (made

light levels and all you have to do is draw it across the document at a fairly constant rate. Whatever next?

By the way, if you're thinking this month's article has not enough about TV in it, you have the remedy in your pocket! Fish out that pen and put it to paper... Is 70cm still active in your neck of the woods, or have they all gone over to slow-

by Tokyo Hi-Power) is a fair product but expensive, and the only alternatives have been somewhat homebrew-looking efforts by L-Wave and Les Wallen. I have not been offered any of these to test so I cannot comment on their performance.

The cost of all these has put off many users, which is a shame. A meter is very useful for checking that the power is getting out and, since you only get what you pay for, the better the meter you can afford the better you will be able to check power and VSWR.

There was a clear need for something cheaper that worked, and this has now appeared from Telecomms in Portsmouth. Priced at £49.50 it is called the WR900, and at this price every operator should get one, if only for peace of mind.

Utility looks

Our photo this month shows (more or less) the appearance of the WR900 – the unit in the pic was a prototype and has a different meter movement from the production version. Looking at the unit, it is unashamedly a utility model. The case is stove-enamelled steel, with a sticky plastic overlay on the front panel – cheap and cheerful is the best description!

Connection to the antenna feeder and transceiver (you'll need a patch lead) is by female 'N' type connectors. These are riveted direct to a sealed sensing unit inside the main case, and I did not attempt to unsolder this. The meter movement has two switchable power scales (5 and 50 watts), as well as SWR.

Results, as closely as I can measure, are accurate (sighs of relief) – at least they agree with my Heathkit semi-pro meter! What I did not like was that the two scales are 5 watts and 50: many transceivers give out a little more than 5 watts, so you are stuck with using the bottom end of the 50 watt range. Although this part of the scale is expanded and easy enough to read I wonder how accurate it is. I would have preferred an 8 to 10 watt limit for the lower range.

That said, I see that Telecomms now sell the Welz SP-930 meter, which has 10W and 50W as its full-scale ranges. As this model is 'removable' (ie the meter itself can be mounted away from the in-line power sensor), I would have thought this was the better buy. It looks a little better made and costs just £8 more, so if the pennies will stretch a bit further get this one instead.

scan? Probably not, because I have had no letters from SSTVers lately. They must all be on 24cm of course! Are you experimenting on 10GHz yet? Did you take your TV gear out this summer? Lots of letters and photographs for the next issue please! Just send them to me care of the Editor. I'll make sure we have room for them all... 



Nevada WR900 UHF power/SWR meter

All of these meters can be safely left in-line at all times, as they won't absorb a significant amount of power, insertion loss is less than 0.5dB.

No swar please, we're British

Full instructions accompany the WR900 meter, and it really is simplicity to connect up. You must, of course, connect the antenna feeder and transceiver to the correct sockets as marked. Reversing these connections won't bend the needle backwards but the meter won't work either.

Measuring forward power is just a matter of selecting either the 5W or 50W range with the right-hand knob. During

transmission you will be able to check your power out, and if at any time it goes down you will know that something is amiss with transmitter, aerial or feeder. By disconnecting the feeder and substituting a dummy load you can check if the power now goes up again. If so the trouble is aloft, and if not you've got trouble with the rig!

Measuring VSWR (please don't call it 'swar'; it's the voltage standing wave ratio) is almost as easy, and this indicates how much of the power going up the feeder is radiated. If a lot is indicated as returning back down the feeder, you've got trouble. The rig won't like it and will either throttle back its output or blow up. Neither is desirable, and both are avoidable if you check your VSWR.

Given that most aerials are pre-tuned, the most likely cause of bad VSWR is damaged cable or a poor connector. Very often the braid connection is not properly made inside an N connector (particularly if you are using the cheaper 'MIL-spec' non-captive type plugs), or sometimes the centre pin has contracted back down the cable and is no longer making proper connection.

The ideal VSWR is 1:1 and is never achieved in real life (no matter what some people say!). Any reading below

1.5:1 is excellent, and you can live with a figure up to 1.9:1. Above this, however, you're in the danger zone - find out what's wrong!

To check out the SWR, set the right-hand knob to 'forward' and with the transmitter switched on twist the left-hand knob until the meter needle reaches the position on the scale marked 'set'. Now turn the right-hand knob to 'reflected' and read off the appropriate SWR from the lower scale. Now you see why you need a meter!

Incidentally, you will only have completely accurate readings if the transmitter is looking at a proper 50 ohms termination. The antennas and cables sold for 934MHz are all nominally 50 ohms, so this should not be a problem. Don't use 75 ohms TV co-ax though!

If you are using a 50 ohm dummy load, make sure this is rated for UHF work. The ones sold for 27MHz and two metres are seldom usable and will give false readings. It just happens that Telecomms and their dealers sell these, but you can also get UHF dummy loads at other amateur radio shops and at the rallies. They are not cheap: even at surplus prices a 5W microwave dummy load will cost £15 or £20, but like any good tool it will last a lifetime.



HART

This month we feature some fantastic bargains. Our standard range of professional quality kits and cassette decks is still expanding, along with new lines in Video heads and power supplies. Our FREE list gives details of these and many other lines.

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As promised last month, this time around I will take a look at how commercial radio got started in the UK. However, to start the ball rolling I have included a short feature on communications receivers for the newcomer to the world of MW DX.

Receivers for MW

Recently J B Jarratt of Yorkshire wrote to me asking a number of very pertinent questions relating to MW DX, one of which was "what is a communications receiver and how do I choose one?". For the benefit of J B and others I'll have a go at clarifying this subject.

There is no real hard and fast definition of a communications receiver, but by and large such a device is often characterised by its need for an external aerial, in contrast with domestic MW receivers which 99% of the time will be fitted with an integral ferrite rod aerial.

For virtually all other forms of DX listening (such as short wave or VHF) a specialised receiver will be needed, but fortunately for the MW enthusiast it is possible to get started with even the most basic of domestic receivers since they all tune to the frequencies of interest, ie 520-1605kHz.

Using this sort of equipment it is possible to look for the weak signals that are found all the way down the dial between the strong locals, but after a while the newcomer to the MW band will start to realise the limitations of a basic domestic receiver and want something better. That is not to say that under the right conditions real DX cannot be heard on a simple receiver (indeed, stations like CJYQ in Newfoundland and WHN in New York have been heard), but a communications receiver will make it a lot easier to hear.

Why is this? Well, there are several areas in which such a receiver is superior to its domestic cousin.

Superior qualities

In the main a communications receiver is distinguished by its sensitivity, its selectivity and the accuracy of its frequency read-out. Sensitivity is the measure of a receiver's ability to pick up weak signals and render them audible. This is not a great problem on MW, since many stations use such vast transmitter powers. Furthermore, the limit to weak signal reception is rarely the receiver itself since the background noise on the MW band due to atmospheric (mainly tropical thunderstorms) and man-made electrical interference is so high.

A good receiver will be sensitive but not overly so, since excessive sensitivity is often accompanied by the unwanted tendency to overload on strong signals.

The ability of a receiver to separate two radio signals on two different but closely spaced frequencies is termed its selectivity. This is a vital parameter if good MW performance is to be had from a receiver (domestic radios are usually very weak in this area), since the keen DXer will be trying to separate stations that may be as little as one or two

MEDIUM WAVE



DXING

by Steve Whitt

kilohertz apart on the dial. This is very much the case if you are hunting transatlantic DX on frequencies between those used by European broadcasters. In the Americas stations use channels which are multiples of 10kHz, whereas in Europe channel spacing is 9kHz. A good communications receiver will have several different switch-selectable selectivities ranging typically from 2 to 10kHz in bandwidth.

It is pointless for a receiver to be able to separate closely spaced signals unless the user is able to identify which frequency is being resolved. This is why most communications receivers have accurate dials or frequency read-outs. These take the form of either mechanical scales or dials or the more modern digital frequency read-out. Accuracy to 1kHz is desirable on MW.

To get started on the MW band with a communications receiver could set you back anywhere from £50 to a couple of thousand pounds, depending on the sort of equipment chosen. Over the years hundreds of different receivers have been made, all with their pros and cons, and to do them all justice would soon fill a book. However, there are some general tips worth bearing in mind when choosing a receiver.

Broadly speaking communications receivers have gone through three phases, namely the valve-based units of

the 1950s and '60s, the early solid-state receivers of the '60s and early '70s, and finally the transistorised receivers developed since about 1975. For the DXer on a budget the best bet is one of the receivers in the first category, some of which have justifiably become quite famous: for example, the RCA AR88D, the Murphy B40, Marconi R1155 or the Eddystone range of receivers.

In general one can expect these units to be heavy and robust with good dials and very good reception on MW. If they have one limitation it is that they tend to run out of steam above 20MHz, but this is of little concern to the MW DXer. Typically, receivers of this class can be bought second-hand for £50-£150, but you may end up paying more if you purchase 'professional' receivers from this era such as the Motorola R390, Drake R4, or Racal RA17.

Quite often you will see receivers such as the Eddystone EB35 or EC10 or the Realistic DX-300 advertised quite cheaply second-hand. Steer clear of these, as they represent the second category.

A problem that afflicted the vast majority of early transistorised receivers was their susceptibility to overload. By the mid-seventies transistorised receiver designs were beginning to match the performance of the valved receivers of the fifties. OK, so they had

MANX RADIO

The Isle of Man's Manx Radio was the first commercial radio station in the British Isles, commencing operation on June 5th, 1964. The very first broadcast was, in fact, a commentary on the World Championship T.T. Motor Cycle Races.

The station began transmissions on VHF only but in October, 1964 opened a medium wave service on 1594 KHz (188 metres). A second medium wave channel was added in 1965 to improve reception—1295 KHz (232 metres) — and these continued to support the service until November, 1978 when, as part of a general realignment of frequencies throughout Europe, Manx Radio moved to 1368 KHz (219 metres).

Constitutionally, the position of the Isle of Man is unique. It is not and never has been part of the United Kingdom. It is a possession of the British Crown with a very large degree of autonomy, and in 1979 held a year of special celebrations marking the 1,000th anniversary of its parliament of Tynwald, founded by the Vikings and now the oldest assembly in the world with unbroken traditions.

The Isle of Man has a national identity distinctly separate from the United Kingdom, and part of Manx Radio's job is to reflect this identity.

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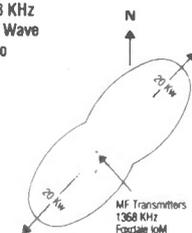
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219 MANX RADIO
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MEDIUM WAVE DXING

all the extras such as digital read-out, frequency synthesis and many other facilities to make the DXer's life easier, but in terms of true DX hunting ability they were still no better.

The latest developments, since 1980 say, have almost entirely been driven by Japanese companies (except for recent military equipment, which probably won't be surplus for another decade!) such as JRC, Yaesu and Icom. Some of these receivers are ideal for the serious MW DXer (eg the Icom R71 or NRD515), but be prepared to part with the sort of cash that would buy a second-hand car!

Station profile

Last month I posed the question 'What was the first commercial station to take to the air in Great Britain?' Hands up everyone who said LBC in London, or even the offshore pirates. Well, the correct answer is Manx Radio, operating till this day from the Isle of Man.

This pioneering station first took to the air in June 1964, long before the advent of independent local radio. Manx R was possible since the Isle of Man has its own self-government and is not constitutionally part of Britain; nevertheless it did need to obtain a licence from the Post Master General of Britain, which

was granted with some reluctance and suspicion.

To start with the station operated from a caravan just outside Douglas, with one cramped studio and a VHF transmitter. However, in November 1964 operation on 188 metres MW started, and so did commercial advertising. In the early days power output was severely restricted and the broadcasting day short.

Moving house

In May 1965 the caravan was abandoned in favour of a basement studio on the Douglas sea front, and the MW outlet moved to 232 metres. This channel was to remain in use for the following 13 years. Another move, this time in October 1969, to its current home at Broadcasting

House overlooking Douglas Bay, signalled the end of the station's Bohemian days.

Since that time Manx Radio has developed its programming to a position of strength, whereby in some areas it has achieved up to 90% audience penetration. However, in recent years there has been much stiffer competition for the audience's ears and wallets from ILR stations in the north-west and from independent commercial stations in the Irish Republic.

Manx's music policy is mainly 'easy listening' with extensive local news coverage, and they can currently be heard on 1368kHz from the Foxdale transmitter with programming from 0600-0100 hours.

REW

DX FILE

Although we are entering the winter DX season and the best reception of transatlantic DX, I shall take a quick look at some of the European signals making their way into my log. If you are new to MW DX you should find all of these signals easy to hear and identify since they are all in English.

RTA R Algiers, 981kHz at 2000hrs with news plus pop music show
VOA Europe, Munich, 1197kHz at 0000-0200 with pop mx and current affairs
Trans World R, Monte Carlo, 1467kHz at 2200-2300 with syndicated religious programming.
All times are of course GMT/UTC.

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This program has so many features that it is impossible to do it justice in this space so please write or phone for full details. Some of them are:

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LATEST LITERATURE

Clubs, manufacturers, publishers and agents are invited to send details of new books, catalogues, data sheets, etc for inclusion on this page

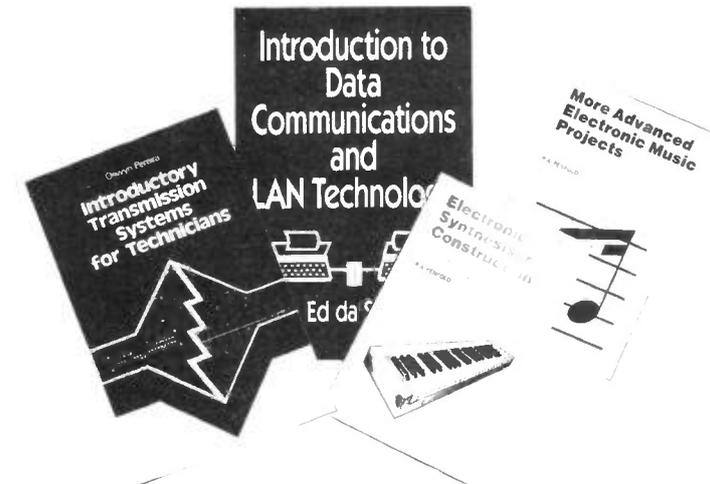
We kick off *Latest Literature* this month with a book which focusses on possibly this year's most important area in the commercial exploitation of computer technology, Ed da Silva's **Introduction to Data Communications and LAN Technology**.

This guide to computer communications is aimed at 'non-technically minded people', and I suspect that the publishers anticipate good sales amongst those computer-ignorant business types who have relatively recently come face to face with office high tech in all its bewildering complexity.

The text certainly starts in terms that anyone can relate to. The basics of communicating are spelled out using simple examples (eg an after dinner conversation between four people), with the terms used in computer speak demonstrated in relation to a human framework. Having introduced such concepts as transmission codes, synchronisation and error detection in these terms, this chapter then proceeds to outline the way in which they are applied in digital communication: ASCII and Baudot codes, parity bits, forward error correction, serial and parallel transmission etc.

Subsequent sections cover interfaces and protocols (RS232, X21, Centronics, IEEE488 etc) and networking (with case studies of each of these sections), network interconnection techniques, the Open Systems Interconnection (OSI) model, and planning and implementing LANs.

As a beginner's guide this volume has only one drawback. In his preface da Silva states, "The book may also be read in small doses..." I'd suggest that a total novice would have to read it in small doses, since without any prior



familiarity with any of the concepts he will suffer severe intellectual indigestion if he tries to assimilate the sheer volume of information here in one swallow. It is written in a manner that an 'outsider' could understand, but it's a complex subject.

The author has a tendency to a slight sloppiness in his writing. For instance, the BSI is variously described as the British Standards Institution and the British Systems Institution. There is also a tendency on his part to forget himself and get a little complex in the wording of his explanations. This is perhaps understandable considering that da Silva obviously knows so much and his intended readership so little.

It is, nonetheless, an excellent introduction to computer communications; and even if you have no interest in LANs it is well worth buying for the general description of data communications.

Introduction to Data Communications and LAN Technology is published by Collins and costs £14.95 (ISBN 0 00 383230 9).

Continuing the communications theme, Longman have just published **Introductory Transmission Systems for Technicians**, by Oswyn Pereira. It is primarily inten-

ded for students of the BTEC half-unit in Transmission Systems Level II or the CGLI 271 course in telecommunications.

It's a fairly slim volume, covering the basic concepts of information transmission by means of electricity. The treatment is more formal than most hobbyists will be used to, although it is not overly mathematical. There is a surprising amount of information in this book, due to the lack of either involved or simplistic explanations. It's as concise a text as I've read in a long time.

Beyond the introductory outline of transmission systems and the frequency/wavelength relationship it covers power calculations, EM wave theory, amplification, noise, multiplexing, modulation, filters, and pulse modulation and digital transmission. Each chapter ends with some useful self-assessment questions, with two additional sets of questions after the sixth and last chapters.

As well as its obvious usefulness to students, this volume should benefit anyone with a knowledge of radio acquired 'informally' who'd like to gain an insight into the subject by looking at it from a different viewpoint. At £3.95 it

won't break the bank, either (*Introductory Transmission Systems for Technicians*, Longman, ISBN 0 582 98809 8).

From a book intended for budding technicians to a book for practising ones, **Radio and Television Servicing**, edited by R N Mainwright. This is a compendium of manufacturers' service data, with details of adjustment procedures, fault finding, recommended mods etc. It is one of a series, this volume covering 1985-86 models, and is intended as an aid to service engineers.

It is a book which, while interesting to browse through, will really only appeal to those who have a professional (or, at least, wide ranging) interest in the service and repair of recent model TVs and radios. Its coverage is extensive but not comprehensive in terms of the models included, with TVs probably better served than radios (the radios covered are personal stereos, clock radios etc rather than the more 'serious' types).

Its fairly limited appeal and hefty size (just under 800 pages) contribute to a price of £25; well worth it if you need such a book but a little much to spend on satisfying a casual interest (Macdonald, ISBN 0 365 12359 6).

Those who regard the aforementioned tome as a little hard on the pocket will no doubt welcome the latest releases from Bernard Babani Ltd, who specialise in the cheap and cheerful end of the market.

More Advanced Electronic Music Projects by R A Penfold (dare I say the ubiquitous R A Penfold) is a follow-on to *Electronic Music Projects*, and provides circuits and descriptions of a wide range of musical effects units (flanger, fuzz, chorus, parametric equaliser, etc) and the basics of percussion synthesisers.

As you'd expect from this

LATEST LITERATURE



The new Maplin catalogue, with "several hundred new items", will be available from 4th November

author, it's competently written, and if you want the basics rather than extensive in-depth coverage of the theory you'll appreciate it (Bernard Babani, ISBN 0 85934 148 8, £2.95).

Also by Robert Penfold is **Electronic Synthesiser Construction**. This describes, step by step, how to build a fairly simple monophonic synthesiser, and in doing so gives a reasonable grounding in the principles involved in electronic music production. Unlike the music projects book above it includes PCB foil patterns, so it is a bit more useful when it comes to construction. Unfortunately the reproduction of some of these leaves something to be desired, with instances of pads touching etc.

Even if you don't want to build a synthesiser, the modular approach might be of some use if you can use any of the basic elements (ISBN 0 85934 159 3, £2.95).

Technical summaries

Motorola has announced the availability of a technical summary, BR283, for their HYPERformance cascadeable adaptive finite impulse response digital filter (CAFIR). The condensed technical summary is a tool to understanding the architecture and functions of the DSP56200, a digital signal processor (DSP) peripheral dedicated to digital filtering.

A rose by any other name... The RS Components catalogue, now available to all and sundry for a mere £2.50 from PO Box 33, Corby, Northants NN17 9EL

The new technical summary helps explain the two principle functions of the DSP56200; finite impulse response (FIR) filtering and adaptive FIR filtering using the least-mean-square (LMS) algorithm. For users not familiar with digital filtering, an appendix on this topic is also included.

The technical summary, BR282, is available upon request at no cost.

Also available from Motorola is an in-depth digital signal processor user's manual, DSP56000UM/AD, and a condensed technical summary, BR282. Both the user's manual and technical summary are intended as tools to assist in understanding the architecture of the DSP56000 digital signal processor chip.

The new user's manual includes chapters on device signal descriptions, chip architecture, data organisation and addressing modes, the instruction set, I/O interface, exception processing, and chip operating modes. Appendices A and B cover the instruction set details and DSP56000 benchmarks respectively.

The user's manual, DSP56000UM/AD, is priced at \$8.65 per copy. The technical summary, BR282, is available upon request at no cost.

Motorola Literature Distribution Centre, PO Box 20924, Phoenix, Arizona 85036, USA.

ITT Semiconductors

The latest catalogue giving details of the extensive product range available worldwide from ITT Semiconductors has been released.

Called the *Semiconductor Summary 1986*, the catalogue describes sixteen families of semiconductor devices and gives functional block diagrams of all of ITT's microcomputer products, MOS memory chips and a wide range of ICs designed for consumer, telecommunication and automotive applications.

Full data on ITT Semiconductors' other products, for example voltage stabilisers and regulators, npn, pnp and VMOS transistors, Zener diodes, silicon diodes, rectifiers and Schottky diodes is given in each case.

ITT Semiconductors, 145-147 Ewell Road, Surbiton, Surrey KT6 6AW.

US Flight Information

A range of US Department of Defense Flight Information Publications is now available from Evans Air Publications. These have been issued by the US Defense Mapping Agency Aerospace Center for the US Air Force, and typical of the selection available are the following:

Flight Information Handbook (170 pages, 5x8 inches): this details world-wide ICAO HF aeronautical stations (with all frequencies and area maps), all meteorological voice broadcast HF frequencies and times of transmission, Global Command and Control System (GCCS) stations for military flight communications, Military Airlift Command, Strategic Air Command and Tactical Air Command procedures, etc.

En route Supplement (450 pages, 5x8 inches): these contain details of a great many airfields, both military and civil, including communications facilities.

Planning Books (8x11 inches): these are for use at base, squadron and unit Operations Offices, and include all details of airspace restrictions.

Charts (Operational, Tactical,

Jet, 3½x5ft): multi-coloured charts suitable for wall mounting.

Full details of the whole range are available on receipt of a large SAE.

Evans Air Publications, 11 Hill View, Bryn-y-Baal, Mold, Clwyd CH7 6SL.

Component guide

A leading guide to the sourcing, supply and worldwide sales of European electronic components, the latest edition of the European Electronic Component Distributor Directory for 1986/7 has just been published by Benn Electronics.

The first edition to be issued since the recession of '85, the new Directory reflects all the dramatic changes in product sourcing and patterns of distribution which the slump of that year brought in its wake.

Distributors and manufacturers new to this edition of the Directory number almost 400. Of 1500 primary suppliers now listed more than one third are new, with a corresponding change in the main components now handled and the key manufacturers represented. Over half of all existing distributors, for example, have changed either their location, the components they supply or the companies they represent.

Now in its sixth year, the publication provides sourcings on over 300 distribution outlets, including principals and subsidiaries in 17 European countries. It features more than 7500 component manufacturers world-wide, listing by name their representatives in each European country. All major product applications are reviewed in depth, with 36 product categories covering semiconductors, solid-state components, passive components and circuit accessories.

Benn Electronics Publications, Chiltern House, 146 Midland Road, Luton, Beds. Tel: (0582) 421981.

Make that call

Next year is the 75th anniversary of the first public and private automatic (dial telephone) exchanges in this country, and I am engaged in research for an article to make sure the events do not go unrecorded. There are a number of uncertainties about the really early exchanges, not least, for instance, the tones provided. It was some years before the ringing tone was standardised and a dial tone provided. In consequence I would be pleased to hear from anybody who has knowledge or reminiscences of the early exchanges.

Although there are a number of museums with telephone equipment, there is limited scope for their preservation under official auspices, and private switchboards have not figured in these collections. It would be interesting, therefore, if anyone would care to nominate the oldest private exchanges still in service, and it may be possible to prevent some unique museum pieces from going to scrap.

Please write to me at the address shown or leave a message on (0604) 844130; every response will be followed up.

Andrew Emmerson,
71 Falcutt Way,
Northampton NN2 8PH.

ARMS for the poor

A new service that allows amateur radio enthusiasts to protect themselves against incurring heavy costs through expensive faults developing in their equipment has just been launched.

For an annual fee, based on a small percentage of the new retail price of the equipment, the Amateur Radio Maintenance Service will refund the repair bill, including parts, labour and carriage, from approved service agents throughout the country.

The man behind the scheme, Bernard Whitty G3HWX, says: "What we are offering is an all-inclusive maintenance agreement that protects the amateur radio user against running up high bills for the repair of his

equipment in the event of any type of failure.

"Provided that the equipment to be covered is in full working order at the start - as far as the applicant is reasonably aware - we agree to refund the cost of putting it back into service."

Mr Whitty says that a two year old transceiver costing £1000 new could be covered against breakdown for £30 per year. "Compare this with the cost of labour alone running at up to £17.25 per hour including VAT," he says.

"Of course, some faults are more expensive to repair than others, but a fair example would be replacement of PA transistors; with labour and carriage charges you could expect to pay between £140 and £160."

ARMS can be reached by writing to: *Amateur Radio Maintenance Service, Free-post, Ormskirk, Lancs L39 3AB.*

A Tangerine dream

Are there any Tangerine owners out there? Does anyone even remember such a computer? Well, a certain David Cawthorne is trying to get a newsletter going to cover software and hardware mods, users' programs and ideas, conversion of the 64K RAM card to 256K etc.

Interested parties can get more details by sending an sae to Dave at 40 Westbourne Road, West Kirby, Wirral, Merseyside L48 4DH.

Calling all bods

The Amateur Radio And Computer Club (AMRAC) was founded in April 1985 with the aim of encouraging the use of computer technology in amateur radio. Since that time the club has grown rapidly and now has members throughout the UK as well as in Europe and the Middle East.

The club produces a professionally printed bi-monthly newsletter of some 40 pages, as well as a hot news sheet in intervening months. The newsletter covers all aspects of computer communications including packet radio, ASCII, AMTOR and RTTY. All the popular makes of computer are covered.

In addition, the club has

On these pages we present details of interesting contacts from clubs and individuals. We would be happy to receive any similar items from readers

arranged special members' discounts with selected companies, and also imports packet radio TNCs at advantageous prices.

Membership is £5 per annum and further details may be obtained from the secretary, Phil Bridges G6DLJ, at 9 Hollydene Villas, Southampton Road, Hythe, Hants SO4 5HU; or on Prestel mailbox 703847754.

Happy birthday

Poole Radio Amateur Society will be running a special event station on Sunday 16th November from the Brownsea Room, Haven Hotel, Sandbanks, Poole, Dorset.

The station is being set up as part of the society's tenth anniversary celebrations, and will be mainly operating on 80m (SSB and CW) and other HF bands according to conditions, and 2m (SSB and FM) using the call GB4PRS. The station will be operational from 0900 GMT until 2000 GMT and will be in WAB square SZ08. The locator is IO90AQ (ZK21g).

In addition to the station, a few local traders have been invited to exhibit. Anyone interested in amateur radio will be very welcome to come along. Visitors coming from the Isle of Purbeck should note that, because of its annual maintenance programme, the Sandbanks to Shell Bay ferry will *not* be operating.

The Haven Hotel was used by Marconi for some of his early tests. His first land station was at Alum Bay on the Isle of Wight, which was used in conjunction with another at

Madeira House, Bournemouth, to carry out experiments with small vessels cruising off the Needles. From 30th September 1898 Marconi moved the Madeira House Station to the Haven Hotel, Sandbanks, which remained a Marconi station until 1926.

Special QSL cards will be available. More details may be obtained from Dave G0EQV on Poole (0202) 674802.

Get on down

Friday night is club night for the Mid Lanark Amateur Radio Society. Meetings commence at 7.30pm at the Wrangholm Hall, Jerviston Street, New Stevenson, Motherwell.

Regular lectures are held, and details of these are available from David Williams GM1SSA, 32/34 Carfin Street, New Stevenson, Motherwell ML1 4UQ. Tel: Holytown 732403.



Spotted recently in Tenerife by our jet-setting Editor: a copy of your second favourite magazine, R&EW, second from 'the bottom', partially obscured by your first favourite magazine...

NOTES FROM THE PAST

I have been greatly pleased to see such widespread television constructional activity not only continuing, but expanding, despite the lack of realism among those who forecast that TV receivers would be beyond amateur construction and home adjustment. Oddly enough, few of the home-built sets I have seen worked properly straight away.

Perhaps that is simply my experience, and most of those I haven't seen needed only minor adjustment before as-good-as-a-bought-set performance was obtained. With the kit sets, no doubt, the little points which needed ironing out were the outcome of departures from specified parts. Who but a millionaire could afford to buy everything new? Perhaps even the millionaires would think twice about it while there are still plenty of ex-WD EF50s and a fair amount of manufacturers' TV surplus being offered at tempting prices.

For my own part, since the war I have built four. Two were admittedly more or

less experimental, but did the others perk properly when I first tried them? Not on your life! I suppose neither of them would have taken the intelligent constructor, armed with nothing other than a meter, more than a few hours to track down the faults.

This experience, and what I have seen among amateurs generally, almost convinces me that, even with detailed instructions, TV building is not a job for the beginner unless he has the help of a friend with a fairly good background of radio experience.

Perhaps my conclusions are also coloured by hearing much of those who do have trouble in getting proper results, or of the optimists who use the most unlikely parts without making full allowance for the differences. On the other hand, much of the fascination of constructional work comes from personal experimentation, and there is certainly no better way of acquiring practical knowledge.

nect with Dave XE1 TU using a 20ft dish were unsuccessful. Full details of events appear in *Amateur Satellite Report* no 129, AMSAT's newsletter.

While on the subject of AMSAT, a new dial-in bulletin board has been established by Ralph Wallio W0RPK, Vice-President of Operations. The bulletin board will carry the latest AMSAT news and orbital data.

Users will require either a Bell 103-type modem for 300 baud service or a Bell 212-type for 1200 baud service. The modem should be connected to a local telephone line and the user's ASCII terminal, and new users must be authorised by the System Operator (SYSOP) after their first contact.

The bulletin board is located in central Iowa and can be accessed on 515-961-3325.

The newsletter is published by the Radio Amateur Satellite Corporation who can be contacted at PO Box 27, Washington, DC 20044, USA.

RAIBC

A copy of *Radial*, the Radio Amateur Invalid and Blind Club's newsletter, has fallen onto my desk and proves to be quite interesting reading.

A large section of the pamphlet is concerned with short appraisals on rigs currently available on the market that make life easy for the white stick operator.

Angus McKenzie G3OSS, himself a white stick operator, highlights the facilities on each of the rigs that are of particular interest to blind amateurs, and comments on some of the amusing Japanese pronunciations produced by the various speech synthesizers. All of the rigs mentioned have been reviewed in full by G3OSS in our sister publication *Amateur Radio*.

The club holds a selection of HF and VHF nets, details of which are available from the net controller, John Moseley G4EUU, at the address below.

Anyone interested in receiving copies of *Radial* should contact Brian Clark G1ECE, the club treasurer, c/o the RAIBC HQ, 9 Conigre, Chinnor, Oxford OX9 4JY.

Staying regular

The Chiltern Amateur Radio Club holds regular meetings on the second and fourth Wednesdays of each month. The first meeting of the month is generally a natter night, while a lecture is arranged for the next meeting. All meetings commence at 8.00pm.

Further details are available from Ron Ray G3NCL on (0494) 712020.

Radio lunacy

Tom Clark W3IWI has successfully received packets bounced off the moon (Oscar 0), an achievement which he claims is a first.

He is currently in Fairbanks,

Alaska on a temporary assignment for NASA where he is doing radio astronomy research. He has occasional access to a 65ft dish antenna which was recently put to use on 432MHz. With 100 watts he was able to copy his own packets very well after the round trip to the moon.

However, attempts to con-

```

10 RUN 1000
20 GO TO 1010
100 CLS : RETURN
350 LPRINT SR$: RETURN
1000 LET A=100: GO TO 20: REM PARABOLA
1001 GO TO 1010
1010 GO SUB 100
1020 PRINT "DIAMETER ? (CM)"
1030 INPUT D: PRINT D: " CM": PRINT
1040 PRINT "FOCAL LENGTH / DIAMETER RATIO ?"
1050 INPUT R: PRINT R
1060 LET F=R*D
1070 LET YM=(D/2)*(D/2)/(4*F)
1080 IF YM<20 THEN GO TO 1200
1090 GO SUB 100
1100 PRINT "TOO LARGE FOR THE SHEET": PRINT
1110 GO TO 1020
1200 PRINT : PRINT "FOCAL LENGTH (F) CM"
1210 LET SR$=CHR$(8): GO SUB 350
1220 FOR X=0 TO D*5 STEP 2.822
1230 LET Y=X*X/(40*F)
1240 LET Y=Y/0.4233
1250 LET HP=0
1260 LET LP=Y
1270 IF Y>255 THEN LET HP=1
1280 IF Y>255 THEN LET LP=Y-256
1290 LET SR$=CHR$(27)+CHR$(16)+CHR$(HP)
1300 LET SR$=SR$+CHR$(LP)+CHR$(136)+CHR$(10)
1310 GO SUB 350: NEXT X
1320 REM NOS BASICODE-2 COMPATIBLE
1330 REM (C)1984 PATRICK GUEULLE

```

Patrick Gueulle, of Le Havre in France, sent in this program he has written for designing parabolas such as satellite aeriels and reflectors for yagi antennas, or for infra-red communications. One half of the cross-section of the reflector is printed in 0.1 inch increments, provided that the computer is fitted with a GP100A Seikosha printer (alterations are necessary with other printers; coefficients and control codes).

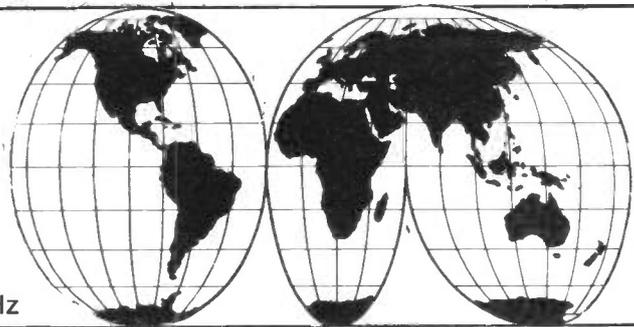
The program was written on a Spectrum 48K, and complies with Basicode-2 rules. The author believes that it can be keyed into almost any home computer, only lines 10 to 350 (4 lines) needing modification via standard Basicode routines.

Note that on the Spectrum the R in SR\$ should be omitted.

SHORT WAVE NEWS FOR DX LISTENERS

By Frank A Baldwin

All times in UTC, **bold** figures indicate the frequency in kHz



Continuing the review of Far Eastern stations currently operating on the low frequencies which commenced in the last issue, we will now progress to the out of band range within the limits **2600 to 3015**.

Fabled Cathay

Returning to the country featured last month, China – the fabled Cathay of Marco Polo – tune the receiver to **2600** and at that point listen for signals from the PLA (People's Liberation Army) Fujian Front Station, Voice of the Strait, at Fuzhou, identifying in standard Chinese (Putonghua) as 'Hai-xia-zhi-sheng Guang-bo Dian-tai'. With a power of 50kW, it carries Haixia 2 in Chinese and Amoy from 1030 to 1755, the Amoy slots being timed from 1400 to 1415, 1445 to 1500, 1600 to 1615 and from 1645 to 1700. Voice of the Strait is often heard here in Europe on this channel.

Voice of the Strait, Fuzhou on **2800** is sometimes logged here in the UK, and was heard here at 1536 last January. It is on the air with Haixia 2 in Chinese and Amoy from 0900 to 1755, the Amoy programmes being timed as shown above. The power is 50kW.

North Korea

There is one station listed as operating on the 120 metre band (**2300 to 2498**) and six stations amid the out of band limits, **2696 to 3015**, but it should be noted that official information about the regional broadcast scene is sparse to say the least, that published in the short wave press being mainly the results of monitoring observations. Those listed here are seldom heard by DXers world-wide, but just occasionally the signals from North Korea do filter through to Europe and even here to the UK.

Hyesan in Yanggang Province (Yanggang Do) carries the Home Service 1 from 1958

to 1800, except for locally originated programmes timed from 2230 to 2300, 0430 to 0520 and from 1100 to 1110 on **2300**.

Obviously the monitoring process has not produced any power rating data on these regional transmitters. Gleaning scraps of information rarely produces a complete picture. A tentative logging of this one was made during January at 1526.

The Home Service 1, with exactly the same schedule as above, is also radiated from the remainder of the North Korean regional stations, these being Chongjin, North Hamgyong Province (Hamgyong Bug Do) on **2696**; Shinuiju, North Pyongyang Province (Pyongyang Bug Do) on **2746**; Pyongsong, South Hamgyong Province (Hamgyong Nam Do) on **2766**; and Hamhung, South Hamgyong Province (Hamgyong Nam Do) on **2776**. Of these, Shinuiju is that most reported by DXers residing nearer to North Korea than we are here in the UK.

KCBS in Pyongyang, the North Korean capital, broadcasts the Home Service 1 continually from 1958 to 1800 with a power of 120kW on or near **2850**, not often being reported in the European SWL press.

KCBS (Korean Central Broadcasting Station, 'Choson Chung-ang Pangsong') is scheduled on the air from 2100 to 1930 which includes the Foreign Service broadcasts in Japanese from 2100 to 2250 and from 0900 to 1455. The power is 120kW, the frequency **3015** and this one is rarely heard here in Europe.

Our subject next month will be Indonesian stations on the low frequency ranges.

AROUND THE DIAL

Switch on, twiddle the receiver controls and get listening for some of the following transmissions – it's DX time!

AFRICA

Cameroon

Garoua on **5010** at 1808, OM with a news bulletin in English. Radio Garoua carries the Home Service in vernaculars and French from 0425 to 0800 (Saturday and Sunday until 0700) and from 1645 to 2315. Relays of the Yaounde newscasts in English are at 0530, 1800 and 2100. The power is 100kW.

Gabon

Africa No.1, Libreville on **15475** at 1955, OM with announcements mostly consisting of promos (promotions) in French amid a programme of French pop music and songs. This 250kW transmitter operates daily from 1700 to 2300 in French for African consumption.

Lesotho

Maseru on **4800** at 1827, OM with an announcement in Sesotho then OMs with tribal chants. LNBS (Lesotho National Broadcasting Service) is on this channel with the Home Service in Sesotho from 0300 through to 2200, this schedule including news bulletins in English at 0430, 0500, 0527, 1130 and at 1600. The power is 100kW. On the Caledon River and a commercial centre with railway linkage to Durban, Maseru is the capital of Lesotho.

Namibia

SWABC (South West Africa Broadcasting Corporation) Windhoek on **3270** at 1940, OM with announcements in a vernacular then YL with songs and a backing of local-style music in a Home Service 1 presentation.

Programmes in this service are in the local vernaculars Herero, Damara and Nama and are on the air from 0400 to 0630 and from 1830 to 2200. The All Night Service, Radio Orion, operates from 2200 to 0400 with announcements in Afrikaans, English and German.

Nigeria

FRCN Kaduna on **4770** at 2234, YL with a talk in English all about the political scene in the UK. I hope it made some sense to the local population – I don't understand it myself at times! The Home Service 2 in local vernaculars and English is on this frequency from 0430 through to 2305 with newscasts in English timed for 1600 to 1700. The power is 50kW. The town of Kaduna in Northern Nigeria is the capital of Kaduna state.

Tunisia

Tunis on **11730** at 1018, YL with a song, pipe music in the local style, YLs trilling then OM with announcements during the Arabic programme for Europe, timed from 0600 to 1755.

CENTRAL AMERICA

Costa Rica

Radio Reloj, Irazu on **4832** at 0603, OM and YL alternate with news items in Spanish, OM with the station identification at 0607. This 3kW transmitter operates a 24 hour schedule.

Honduras

La Voz Evangelica, Tegucigalpa on **4820** at 0422, OM with a religious talk in Spanish, LV Evangelica operates in Spanish (but see below) from 1030 to a closing time varying from 0500 to 0600. There is, however, an English transmission timed from 0300 to 0500 every Monday. The power is 5kW. The city of Tegucigalpa, including the modern Comayagua, its twin city across the River Choluteca, is the capital of the Republic. Located in a Honduran mountain valley, Tegucigalpa was a colonial silver mining centre founded in the late 16th century.

NORTH AMERICA

USA

WYFR Okeechobee, Florida with a relay of the Voice of Free China, Taipei, Taiwan

SHORT WAVE NEWS

on 17845 at 1940, YL and OM with a discussion in Chinese during a programme in that language directed to Europe and timed from 1900 to 2000.

SOUTH AMERICA

Brazil

Radio Difusora Acreana, Rio Branco on 4880 at 0232, OM with the station identification in Portuguese, promos then OM with folk songs and guitar backing. RD Acreana is on the air from 0900 through to 0400 with a power of 5kW.

Radio Relogio Federal, Rio de Janeiro on 4905 at 0235, time signal pips, OM and YL with a discussion in Portuguese. At 5kW, this one operates from 0730 to 0330.

Ecuador

Radio Popular de Cuenca, Cuenca on 4800.6 at 0219, YL with a local pop song, OM with an announcement in Spanish after the station identification. Radio Popular operates from 1000 through to 0530 but sometimes works around the clock. The frequency can vary from the nominal 4800 up to 4802 and the power is 5kW.

Peru

Radio Eco, Iquitos on 5009.8 at 0428, OM with an announcement in Spanish then YL with a folk song, the signals vanishing at 0430 when those from Garoua on 5010 at sign-on wiped out Radio Eco. At 1kW, R Eco is on the air from 0900 to around 0400. The city of Iquitos, founded in 1863, is in North Peru on the Amazon, 2,300 miles up the river. It was an important port during the wild rubber boom of the early 20th century.

PACIFIC

Australia

Melbourne on 7205 at 1857, OM with a talk about kangaroos and the local wildlife in an English transmission to Asia, scheduled from 1430 to 2040.

Melbourne on 17715 at 0340, OM and YL with a discussion about touring Australia then the station identification during the English programme for Asia, from 0100 to 0900.

NEAR AND MIDDLE EAST

Iraq

Baghdad on 15195 at 0358, YL with a song, local-style

music then YL with the station identification at the commencement of an Arabic programme for Europe, scheduled from 0400 to 1000. The glory of Baghdad is reflected in the many tales of *A Thousand and One Nights*.

Kuwait

Radio Kuwait on 15495 at 0407, quotations from the Holy Koran in a programme for Africa, from 0200 to 0430.

Syria

Damascus on 9950 at 0414, stringed instrumental music, single chime time-check at 0415 then YL with the station identification and a news bulletin during an Arabic presentation to Europe scheduled from 0330 to 0900. Damascus, the Arabic 'Esh-Sham' on the Barada River, is the capital of Syria and dates from antiquity. On the road to Damascus, Paul was converted to Christianity.

United Arab Emirates

Dubai on 17890 at 0347, OM and YL with a talk about Bedouin music and songs in an English programme directed to North America from 0330 to 0400.

EUROPE

Austria

Schulungssender des Osterreichischen Bundesheeres, Fleckendorf on 5035 at 1430, military music followed by repeated chimes then carrier off. The schedule of this one is from 0930 to 1430, Monday to Friday inclusive. There are morse code classes timed from 1000 to 1030 and from 1230 to 1300.

Czechoslovakia

Prague on 7345 at 1920, YL with an announcement followed by a programme of classical piano music in the English programme for Africa and Europe, timed from 1900 to 1930.

Prague on 17705 at 1443, YL with a news commentary in the English transmission for Asia, timed from 1430 to 1500.

West Germany

Cologne on 6075 at 0910, OM with a newscast of world events in the German transmission for Europe, scheduled from 0600 to 2355.

Italy

RAI (Radiotelevisione Italiana) Rome on 17780 at 1830, OM with the station identification followed by YL with a newscast of local and world events in the Italian programme directed to Central America from 1830 to 1905.

Luxembourg

Radio - Tele - Luxembourg, Luxembourg on 6090 at 1908, OM with announcements during a programme of USA pop records in the German presentation to Europe, scheduled from 0330 to 2300. There is an English transmission for Europe from this station timed from 2300 to 0200.

UK

Wooferton relay of a VOA (Voice of America) English transmission to Europe on 9760 at 1903, OM with a news bulletin of both world and USA events.

USSR

Moscow with a relay of Kabul, Afghanistan on 9665 at 1907, OM with a newscast in English in a broadcast intended for Europe and scheduled from 1900 to 1930. Also logged in parallel on 11880.

Spain

REE (Radio Exterior España) Madrid on 7450 at 1915, YL with the station identification then into a programme of light music during the Spanish programme for Europe, scheduled from 0930 through to 2130.

Switzerland

SBC (Swiss Broadcasting Corporation) Berne on 6165 at 0851, OM with a talk during the French programme for Europe, timed from 0700 to 1000.

Berne on 9560 at 1002, OM with the world and local news in the English transmission to Australasia, scheduled from 1000 to 1030.

CLANDESTINE

Radio-ye Iran (Radio Iran) on 7075 at 1830, piano music interval signal, OM with the station identification then a mixed choir with a marching song at sign-on. Also logged on 9400 in parallel. The programme language is Farsi (Persian), the transmission is for

Middle Eastern consumption and the schedule is from 1830 to 1925. Operated by the National Resistance Movement of Iran, the policy is of support for the former prime minister, Bakhtiar.

NOW HEAR THESE

Bujumbura on 3300 at 1944, OM with announcements in French then into a programme of local-style rhythmic music rendered on stringed instruments. Radiodiffusion Nationale du Burundi is on this frequency with the Home Service in French, Kirundi and Swahili from 0300 to 0700 (Sunday until 1000) and from 1600 to 2100, the latter schedule including a news bulletin in English at 1700. The power is 25kW and the frequency can vary slightly on occasions. Bujumbura identifies in French as 'La Voix de la Revolution'. The channel is more often than not severely affected by commercial interference, which on this particular occasion was absent. Bujumbura, formerly Usumbura (the name was changed in 1964), is the capital of Burundi and a port on Lake Tanganyika.

Radiodiffusion de la Republique Rwandaise, Kigali on 3330 at 1950, OM with a talk in French. The Home Service in Kinyarwanda, Swahili and French is on this channel from 0300 to 0600 (Sunday until 2100), from 0900 to 1200 (Saturday until 2100) and from 1330 to 2100 with news bulletins in French timed at 0430, 1115, 1600, 1800 and 1930. The power is 5kW and the frequency, like that of Bujumbura, can also be subject to slight variation at times.

NOW LOG THESE

Radio Centinela del Sur, Loja on 4890 at 0325, OM and YL with songs in Spanish, OM with the station identification and announcements at 0330. A previous logging of this one ended abruptly whilst a YL was singing a local ballad. Presumably a transmitter breakdown; most certainly they did not return to the air during the following ten minutes, after which the writer proceeded on a search of the 60 metre band for the signals from other Latin American transmitters.

REW

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■ Sony 6700 receiver, 1.6-30MHz, FM 88-108MHz, MW, SSB, CW. Cost £248, accept £100 or exchange for Trio R600 or Lyetron 12-band receiver. B Collins, 5 Railway View, Macfin, Ballymoney, Co Antrim, N Ireland BT53 6QU

■ Yaesu FRG7 comms receiver, exc condx. No mods. Recently realigned, manual and box included, complete with aerial wire and two radio books, £115 ovno. Tel: Philip, Cheltenham. (0242) 571279

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■ FT221R, muTek, £325. 2m GaAsFET PA, £40. 70cm muTek PA, bipolar, £10. TR8400 70cm 10W mobile, £160. 70cm and 2m two-way splitters, £10 each. Omega complete QRP rig, offers, 4XC250B 2m linear, £120, 1.5kW capable 2m tetrodes, offers, will consider p/er for FT780, IC402, 21el Tonnas etc. WHY? Mike, 46 Hollytree Road, Gateacre, Liverpool L25 5PO. Tel: (051) 428 2448

■ Satellite dish, 2.5m diameter, 4 segment assembly, complete with stand. Hassle from local council necessitates sale, £175. Ian. Tel: Lincoln (0522) 694134

■ Two GEC Worcester 10-channel high band mobile radio telephones type RC620, £40 each or £75 for both or WHY? Tel: King's Lynn (0553) 763428

■ FDK 750XX 2m multimode Tx/Rx, 18 months old, excellent condition. Genuine reason for sale. Original box, manual + circuit diagrams, mobile bracket etc. Now costs £499 new, only £325 ono. G1KRL, not QTHR. No licence, no sale! E Sweetland, 103 Abington Avenue, Northampton, NN1 4PB. Tel: (0604) 37266

■ Reftec 934MHz transceiver (original type), £125. Les Wallen 934MHz collinear aerial, £25. Postage extra. If interested give me a ring. Andrew

Emmerson, Northampton (0604) 844130

■ Free: Some electronic components, hardware and transformers - a bit heavy so please send £2 to cover post/packing. All by post only. Martin, 6 Downland Garden, Epsom KT18 5SJ

AX25 packet radio TNC, £99. FT-708 70cm hand-held, £160. NEC 8023 dot matrix printer, £120. ARRL Handbook 1985, £4. Trevor Tugwell, 6 Kestrel Drive, Mudeford, Christchurch, Dorset BH23 4DE Tel: (0202) 486344, Ext 2223

■ Thandar TF200 freq counter and TP600 pre-scaler, plus case, service manual and x1x10 probe, 600MHz, all new, £150 + p&p. Oscilloscope probe with all adaptors, instructions, on a BNC, still sealed in box, £10. Lots of new Pro software for TRS 80 Model 100 lap computer, cost £30 to £150 each. Sell £10 each + p&p. Hewlett Packard HP22 program calculator + charger etc, £25. UK freq books, never sold in UK shops. Tel: (0473) 85526 any time

■ Heathkit 5MHz oscilloscope, needs attention, £30. Heathkit ac electronics, dc electronics, semiconductor devices, electronic circuits, digital techniques, microprocessors, Heathkit Experimenter, Heathkit Digital Design Experimenter microcomputer, all one complete home study training course. All books in good condition. Sell for £650 or could swap for audio mixers, disco equipment etc. For more information contact James Bonner, Ballyargus, Redcastle, Co Donegal, Ireland. All offers considered

■ Radiobase, for the 48K Sinclair ZX Spectrum, and ZX Spectrum+, is a database which can hold up to 550 radio station records. It is supplied on cassette complete with approximately 250 records on Irish stations (including the pirates), but may be used for any stations. Records are easily updated, amended, deleted, sorted and saved. Searching facilities are by station name (or part of), location (or part of), or by a combination of characters entered by the user. A fast frequency search is also available. Lists of stations may be produced on the screen, or via your printer if your printer software is loaded into the computer and print commands embedded in the program. Full instructions are supplied with the cassette, which is available for £5.50 from Brian Buckley, 'Enfield House', 29 Coalisland Road, Lurgaboy, Dungannon, County Tyrone, Northern Ireland BT71 6LA

WANTED

■ Info on R1155 valve receiver. Also suitable SSB/CW modification circuit. Will refund postage. JH Greenstein, 14 Usishkin St, Jerusalem 92426, Israel

■ Circuits for Selena B210 8-band receiver, Realistic music centre type Clarinet 390A, Audioline car radio cassette - no model number but has five-band graphic equaliser, FM/LW/MW and uses LA4460 and LA4461 IC audio stage. Would also like HY5 preamp or address of stockist. W Wrightham, 95 Kelvin Walk, Sheffield S6 3ES

■ Early portable valve radios. Any pre-war model would be of interest. Working condition immaterial. Also wanted early radio components. Tel: Reading (0734) 883799

■ Trio TS700G, first class order only please. State price wanted. Phone after 6pm ask for Ron Tel: (042 43) 4726

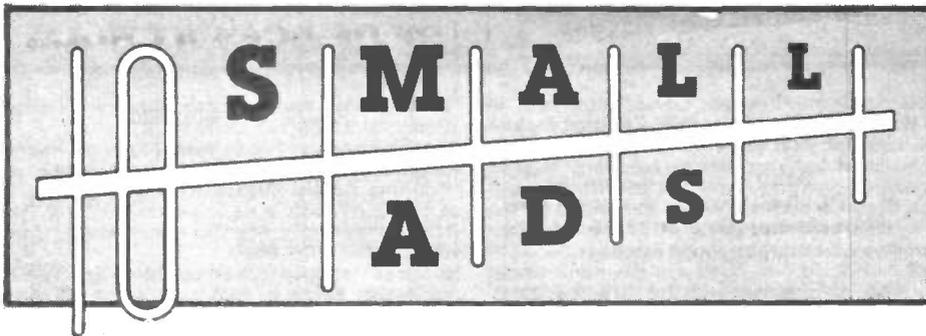
■ Manuals for Hambander 8000, Emerson FU424, Hoover W/M A3006, £8 each. Circuit diagrams £4 each. Frank Mathieson, 4 Vickers St, Motherwell ML1 3RF Lanarkshire, Scotland. Tel: Motherwell 66381

■ Service manuals for Tektronix 7514 scope, 7B50 & 7B51 plug-ins. Buy or copy, all expenses paid also 7A12 or 7A18 plug-in units, any condition. Tel: (069) 172 597

■ Circuit diagram or manual for MCR1 wartime receiver. R Goad G4EFA, Flat 2 Osborne Chambers, 59a Osborne Road, Southsea, Hants PO5 3LS

■ Time base, 15 or 20MHz for Telequipment S43 scope, K type amp plug-in, must be working. Phone after 6pm. Tel: (031) 668 3451

■ Valve receivers: Collins 51J, R338, R390A; BC312, BC342, BC348, B-2, BC779, BRT400; Hamerlund Super Pro, SP400, SP600; Hallicrafters



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Radio & Electronics
The communications and electronics magazine *World*

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TBA120C £1.00	TIP36S 50p	BC613 10p	3C239 10p	AC188K 15p			
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TBA120C £1.00	TIP36V 50p	BC616 10p	3C242 10p	AC188K 15p			
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TBA120C £1.00	TIP37C 50p	BC624 10p	3C250 10p	AC188K 15p			
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TBA120C £1.00	TIP37E 50p	BC626 10p	3C252 10p	AC188K 15p			
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TBA120C £1.00	TIP37K 50p	BC632 10p	3C258 10p	AC188K 15p			
TBA120C £1.00	TIP37L 50p	BC633 10p	3C259 10p	AC188K 15p			
TBA120C £1.00	TIP37M 50p	BC634 10p	3C260 10p	AC188K 15p			
TBA120C £1.00	TIP37N 50p	BC635 10p	3C261 10p	AC188K 15p			
TBA120C £1.00	TIP37O 50p	BC636 10p	3C262 10p	AC188K 15p			
TBA120C £1.00	TIP37P 50p	BC637 10p	3C263 10p	AC188K 15p			
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GAIN:- 2.5 dB
FREQ:- 28-30MHz



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British made using high grade aluminium and a low loss coil complete with small radials this antenna is our most popular amongst the 29MHz fraternity.
POWER:- 1kW
GAIN:- 3.5 dB
FREQ:- 28-30MHz
LENGTH:- 6.6 METRES



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POWER:- 2kW
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LENGTH:- 9.1 METRES



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