

Radio & Electronics

AUSTRALIA
HOLLAND
NEW ZEALAND
NORTH AMERICA \$2.95
D71699

NEW STYLE

For all aspects of practical amateur radio **World**

Simply the Best

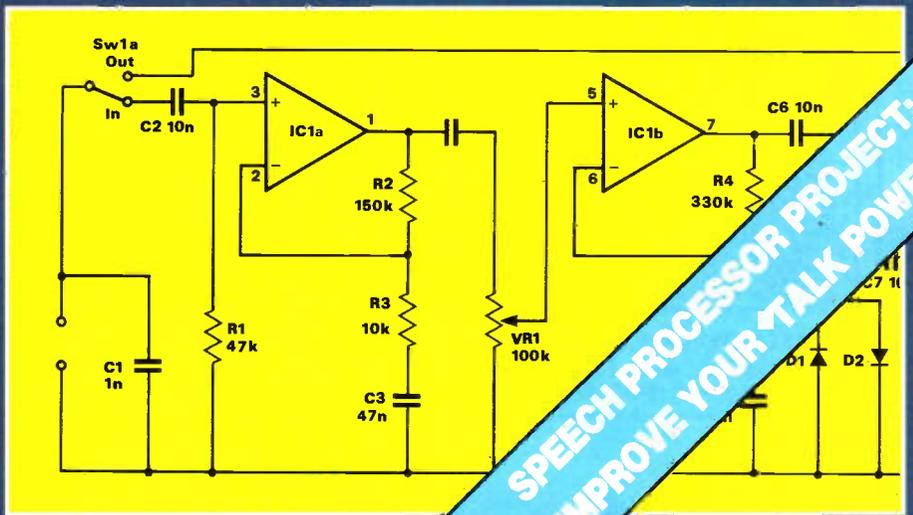
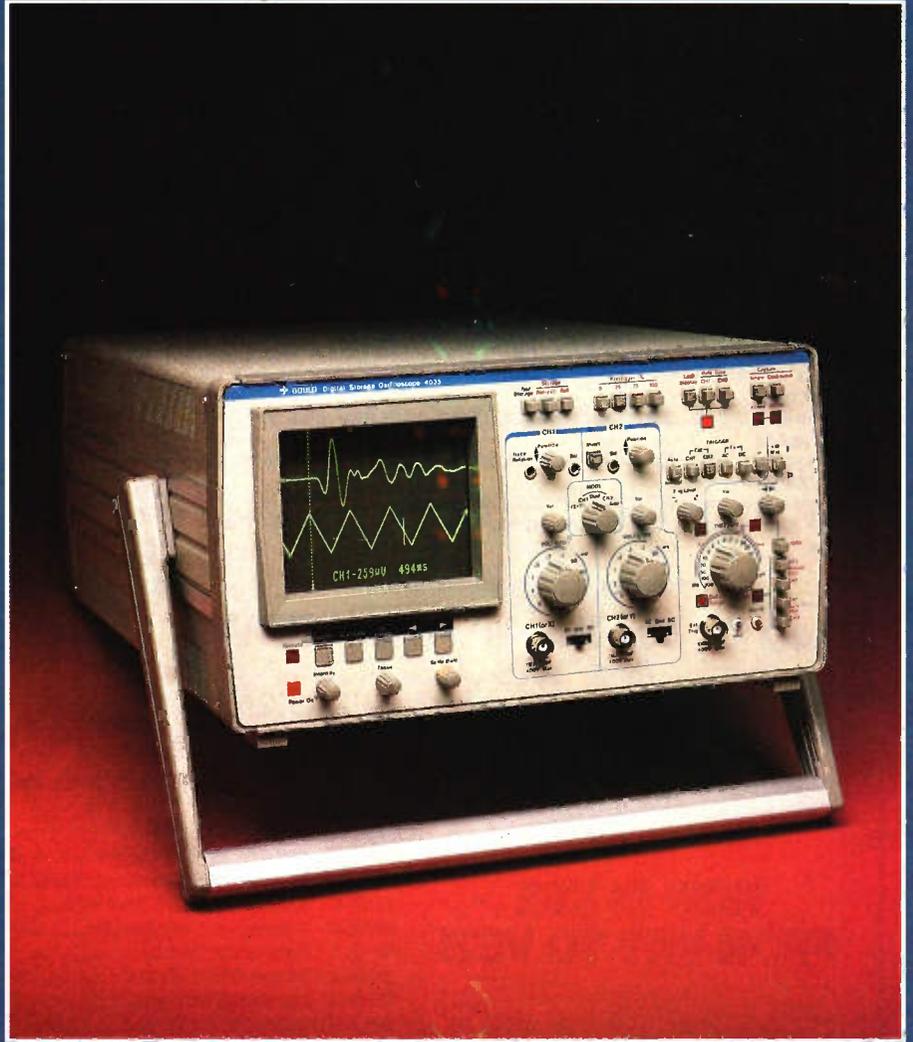
**OSCILLOSCOPES:
GET THE BEST OUT
OF YOUR TEST GEAR**

**MAIDENHEAD:
THREE PROGRAMS FOR
THE NEW LOCATOR**

**DATA FILE:
STARTS A SERIES ON
OPTO-ELECTRONICS**

**AMATEUR TV:
A GUIDE TO
GETTING STARTED**

**UoSAT-2:
DECODING TELEMETRY
ON THE BEEB**



**SPEECH PROCESSOR PROJECT:
IMPROVE YOUR TALK POWER!**

Western

3 Easy Steps ... to get on top (of the pile-up)! ...

Step 1. You'll need a MAST!

SOME STAY UP... SOME FALL DOWN!
SORRY, WE ONLY SUPPLY THE FORMER TYPE!
Since we make TOWERS OVER 300ft tall, all designed by qualified structural engineers to British Standards you can...

BUY WITH CONFIDENCE

We have the engineering calculation to justify our specifications... beware of 'no or half-specs'.

We can offer:-

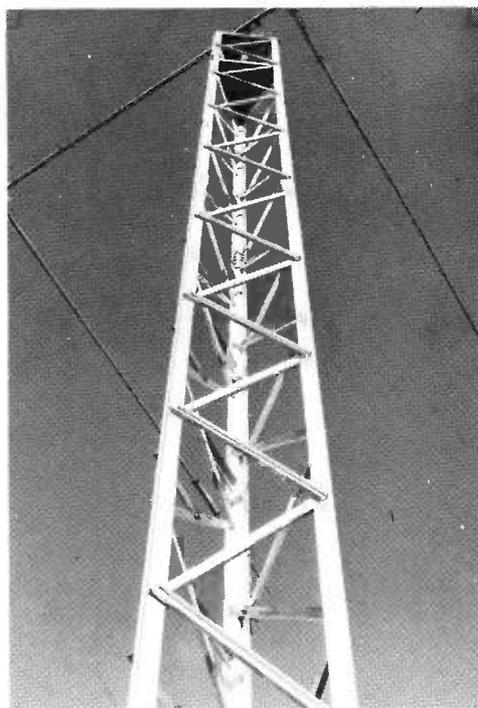
- TELESCOPIC STEEL 'Westower'
- TELESCOPIC STEEL 'Uti-Mast'
- LATTICE ALUMINIUM 'Alu-Mast' (right)

THE UNIQUE ALUMAST

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

- * Made from high strength corrosion resistant alloy using WESTERN'S EXCLUSIVE 'W' section leg extrusions.
- * Easy assembly using stainless steel bolts and "Nyloc" locking nuts for security.
- * Free-standing to 30ft (9.15m) with a typical tri-bander plus VHF/UHF antennas.
- * Heights to 250ft (75m) with appropriate guy configurations (ask us for quotes).
- * Lightweight - only 25lb (11kg) per 10ft (3.05m) section.
- * 30ft (9.15m) mast is delivered in a tube only 10ft 6in (3.2m) long, 6in (0.126m) dia.

FOR FULL SPECS PLEASE SEND S.A.E.



FULL PRICE LIST

375/PSS/3	30ft mast (3 sections).....	£299.00
375/PSS/1	Additional 10ft section.....	£100.05
HB-1	Hinged base unit.....	£52.90
FB-1	Fixed base unit.....	£39.10
RMP-1	Rotor mounting plate.....	£19.55
TP-1	Top plate with sleeve.....	£21.85
GB-1	Guy brackets (set of 3).....	£19.55

Step 2. You'll need an ANTENNA!

for a "MAN-SIZED SIGNAL" you'll need a "MAN-SIZED ANTENNA"
For a "MINI-SIGNAL" try a "Mini-Antenna"

to PENETRATE THE 'DX' we make the "DX-PENETRATOR" series of MAN-SIZED ANTENNAS

PRICES (INC. CARR. AND VAT) ANTENNAS

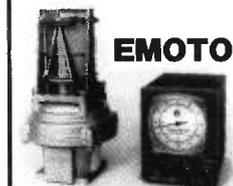
Cat. No.	Price				
WESTERN ANTENNAS (Carriage paid)					
1075 DX-7/2	7MHz, 2 ele. Yagi, Gamma matched, 20' boom..	£294.40	1085 DX-31/32	Conversion Kit.....	£51.75
1076 DX-7/3	7MHz, 2 ele. Yagi, Gamma matched, 40' boom..	£364.55	1086 DX-32/33	Conversion Kit.....	£63.25
1077 DX-51	Rotary dipole for 28, 24, 21, 18 and 14MHz.....	£93.15	1087 DX-33/34	Conversion Kit.....	£80.50
1080 DX-6V	10-80m Multi-band vertical plus 30m.....	£102.35	1089 DX-103	3 element 10m Yagi.....	£90.85
1081 DX-31	Dipole 10/15/20m 2Kw p.e.p.....	£83.95	1090 DX-105	5 element 10m Yagi.....	£113.85
1082 DX-32	2 element 10/15/20m 2Kw p.e.p.....	£128.80	1093 DX-4K	Converts DX-31/2/3/4 to 40m dipole.....	£69.00
1083 DX-33	3 element 10/15/20m 2Kw p.e.p.....	£188.60	1094 DX-27/1	Rotary dipole for 27MHz C.B.....	£13.80
1084 DX-34	4 element 10/15/20m 2Kw p.e.p.....	£264.50	1095 DX-27/3	3 ele. Beam for 27MHz, Gamma matched...	£40.25
			1096 DX-24Q	2 ele. quad 2, 10, 15 & 20m.....	£199.99
			1097 DX-26Q	2 ele. quad 2, 10, 15, 16 & 20m.....	£224.25

**NOW IN USE
FROM VK7 TO VE7!**

Step 3. Turn the ANTENNA! You'll need a ROTATOR

ROTATORS... we only stock the best... buy RELIABILITY... buy EMOTO

... WE ARE THE SOLE U.K. DISTRIBUTORS



EMOTO 105TSX For light HF and large VHF arrays.....	£140.30
EMOTO 105PSX Pre-set controller.....	£49.45
EMOTO 502SAX For heavier HF beams plus VHF/UHF.....	£194.35
EMOTO 1102MXX The really big one for large HF monobanders.....	£270.25
EMOTO 1103MXX As 1102MXX but greater turning power.....	£276.60
EMOTO 1102MSAX Circular dial.....	£379.50
EMOTO 1103SAX Circular dial.....	£385.25
MB300 Rotary bearing.....	£20.70
450 Flexible mount for 103.....	£6.90
451 Flexible mount for 1102/3.....	£13.80

**HF/VHF ROTATOR
only £39.95 Now!
ask for Cat. No. 1145**

Western Electronics (UK) Ltd FAIRFIELD ESTATE, LOUTH, Lincs LN11 0JH
Tel: Louth (0507) 604955. Telex: 56121 WEST G

OPEN HOURS: 09.00-12.00, 13.00-17.00 Mon/Fri, SATURDAYS BY APPOINTMENT
Goods ex-stock supplied by return. Prices ruling are those at date of despatch

Agent
Northern Ireland
Tom Greer G14TGR
Norma Greer G14TBP
Tel: Drumbo (023 126) 645

CONTENTS

Editor

Jim Chalmers

Assistant Editor

Duncan Leslie

Advertisement Manager

Anne Brady

Publisher

Peter Williams

General Manager

Alan Golbourn

Published by

Radio & Electronics World
Magazines

Sovereign House

Brentwood

Essex CM14 4SE

England

Tel: (0277) 219876

ISSN

0262-2572

Printed

In Great Britain

Newstrade sales

Seymour Press Ltd

334 Brixton Road

London SW9 7AG

Tel: 01-733 4444

Subscriptions

Tel: 01-684 3157

Audit Bureau of Circulations

Membership approved pending first audit

© Copyright 1984

Radio & Electronics World Magazines

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.

Cover Photographs

Top - Gould 4035 oscilloscope (courtesy of Gould Design & Test Systems) (p29)

Bottom - Speech processor circuit (p20)

SPECIAL FEATURES

16 Cable TV goes 'On the Air'

Nigel Cawthorne describes the operation of the first of the newly-franchised cable TV companies to begin transmissions.

20 Simple Speech Processor

A P Dean presents a simple device to increase a station's 'talk power'.

22 UoSAT-2 Telemetry on the BBC Micro

Decode the signals from the satellite using this computer program, described by Terry Weatherley.

26 Tatung Einstein Review

This powerful newcomer to the home computer market is reviewed by Simon Karas.

29 Testing! Testing!

Frank Ogden continues his series on test gear with a look at oscilloscopes.

34 ATV - Getting Started

Norrie Macdonald gives an introduction to this exciting branch of amateur radio.

43 Data File

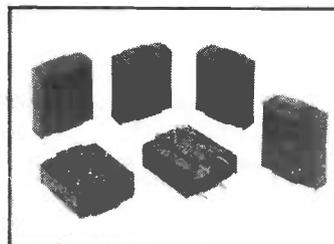
A wide variety of practical LED circuits are covered by Ray Marston, in the first of a series about opto-electronic principles.

56 The Morse Test - A Pragmatic Approach

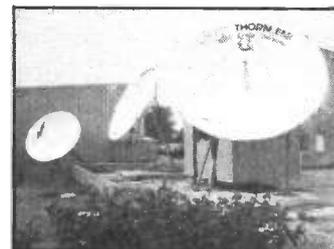
Richard Hunt presents a logical self-study course to help in passing the Morse test.

62 Computing Maidenhead

Brian Kendal and Jeff Howell present three programs relating to the new Universal (Maidenhead) Locator system.



Mains suppression chokes - page 5



Head-end downlink - page 16



Better than the rest? - page 26



Ever thought of ATV? - page 34

REGULARS

4 Product News

13 News Desk

60 Amateur Radio World

65 Corrections and Mods

66 QSO

68 ATV on the Air

71 DX-TV Reception Reports

75 Short Wave News

78 Latest Literature

81 Free Classified Ads

84 Small Ads

READER SERVICES

45 Newsagents Order Form

54 Subscription Order Form

61 Amateurs Handbook Order Form

70 Amateur Radio Subscription Order Form

80 Back Issues Order Form

83 Free Classified Ad Order Form

86 Advertisers Index

86 Advertising Rates and Information

NEXT MONTH

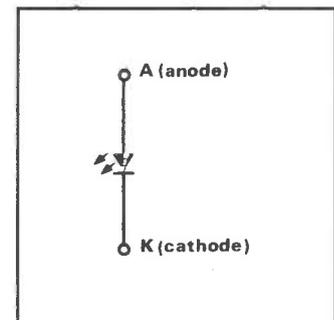
77 What's in store for you

Next issue

Cover date January 1985 on sale Thursday 13 December

Publication date

Second Thursday of the month preceding cover date



Opto-electronics - page 43

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

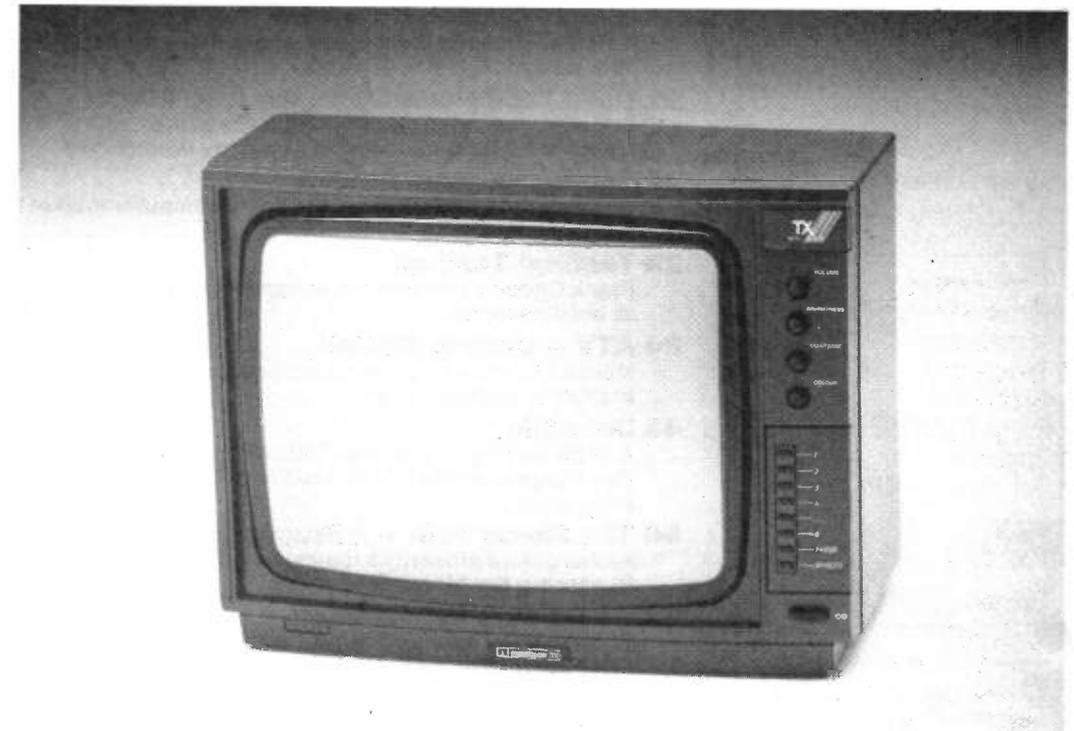
COLOUR MONITOR

Aware of the expanding technological revolution that is affecting many aspects of domestic and business life, Ferguson have introduced a new product to their range derived from recent technological advancements - a 14in Ferguson TX monitor colour television.

Microcomputers are now a familiar part of the everyday scene, and the new addition to the Ferguson range has been designed to offer the home computer user the best possible picture performance via the most direct route from the computer to picture tube.

The new 14in Ferguson TX monitor colour television, MCO1, is designed with separate RGB, composite video and aerial inputs for choice of connection with home computers, video games and video recorders, ensuring the best possible performance of each.

The provision of separate RGB, composite video and aerial sockets also allows the home computer, video recorder or game and television aerial to be connected simultaneously. The Ferguson TX monitor colour television senses the signal selected by the user and switches to it automatically. The sound output signal from the video game or home computer can also be routed through the



14in Ferguson TX monitor colour television for improved quality.

Because there is no one standard connector for all home computers, special leads will be available to connect most popular makes of home computer to the Ferguson TX monitor colour television, and there will also be a range of video leads for use with video recorders in the Ferguson Videostar range.

Based on the very successful TX90 chassis, introduced in 1983, the new Ferguson TX monitor colour television makes an ideal second set for use by all the family. A specially designed Ferguson battery adaptor is available with automatic adjustment for 12 or 24 volt dc operation, giving a typical running time of 8 hours when used with a standard 40A/H battery, making the MCO1 suitable for use anywhere in the home, boat,

caravan or outdoors.

An advisory service to aid dealers and customers with queries on compatibility or upgrading, from one home computer to another, has been established. The Ferguson Advisory Service can be contacted on 01-807 3060.

*Thorn EMI Ferguson Limited,
Cambridge House, Great
Cambridge Road, Enfield,
Middlesex EN1 1UL. Tel: 01-
363 5353.*

TRACKPAPER

Trackpaper has been produced to help with the layout of circuits which are to be built on stripboard. The tracks and holes found on stripboard are reproduced, to the same 0.1 inch matrix, in print on paper sheets.

Component positions can therefore be drawn out on Trackpaper first, and any mistakes in the layout can then be rectified before using the board. By drawing different configurations of the circuit on the paper the most suitable layout can be chosen.

Trackpaper can also be positioned over the strip-

board and the components pushed through the paper onto the board. The components would then be soldered in position and the paper removed.

Trackpaper is available in packs of 20 A5 size for £1.55 plus 20p P&P.

*P & S Supplies, Dept E5, 51
Cambridge Road, Impington,
Cambridge CB4 4NU.*

FILTER CAPACITORS

Oxley Developments has introduced a new range of high voltage tubular chassis mounting lead-through filter

capacitors, the FLTM/C/-series.

Designed to provide effective filtering between 1MHz and 1GHz and presenting a low series impedance to dc and LF currents up to 10A, the new lead-through capacitors are fabricated using Oxley's state-of-the-art Ceramox dielectric.

This material provides high capacitance per unit volume while maintaining full filtering efficiency on lines carrying dc to 400Hz currents, at voltages up to 500V dc or peak ac and at ambient temperatures between -55°C and +85°C. Dielectric withstan-

ding voltage is 1KV dc. Typical insertion losses range from 6dB at 1MHz to 50dB at 1GHz.

All capacitors are supplied with a nut and a 'crinkle washer'; the bodies and nuts are silver-plated brass and the washers are tin plated beryllium copper. Mounting requirements are: chassis thickness (max) 3.1mm, mounting hole diameter 5.1mm. Minimum pitch is 7.05mm (with nut) and 6.5mm (without nut).

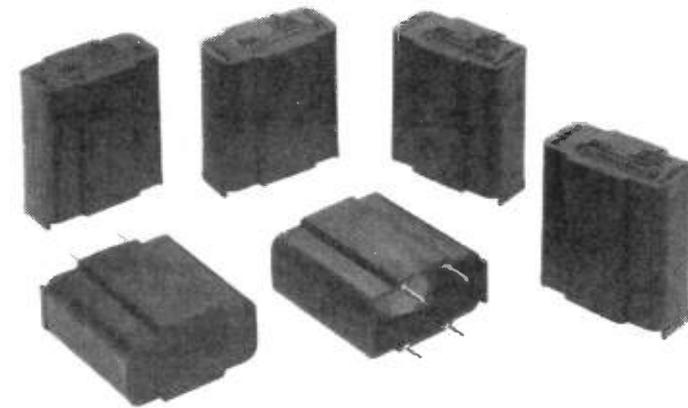
*Oxley Developments Co Ltd,
Priory Park, Ulverston, Cum-
bria LA12 9QG. Tel: (0229)
52621.*

MAINS SUPPRESSION CHOKES

Iskra has introduced a new range of PCB mounted mains interference suppression chokes, the EDT series.

Originally developed for applications in consumer equipment, the new filters are designed to suppress incoming and equipment-generated low frequency and medium frequency conducted RFI. A typical application would be the protection of microprocessing equipment controlling electrical pumps, fans and other units having a potential for producing mains interference.

The choke consists of two inductors symmetrically wound on a common ferrite ring core. Inductance values of each arm of the two windings (which are electrically isolated from one another) range from 12mH to 27mH, but other values can be supplied to special order. Typical resistance values per



winding are: 0.6ohms for the 12mH version increasing to 0.7ohms for the 27mH version. Current rating is 1A at rated voltage of 250V ac, and the filters will withstand 2000V ac 50Hz test voltage (applied between windings). This device can be an efficient custom built transient filter when used in conjunction

with the Iskra KNB series 'X' and 'Y' capacitors.

Overall dimensions are 33.5mm x 36.5mm x 18mm and the housing is made of a self extinguishing plastic material to UL94VO.

Iskra Ltd, Redlands, Coulsdon, Surrey CR3 2HT. Tel: 01-668 7141.

DUAL DIGITAL VOLTMETER

The newest instrument in the CIL Electronics range is the digital voltmeter series DTR1680.

There are basically two types - the dual voltmeter DTR1680 and the single voltmeter DTR1681. In its basic form, the instrument performs as a 4½ digit voltmeter, measuring dc and ac to an accuracy better than 0.01% from 200mV to 1200V.

It is auto-zeroing and auto-ranging and a calibration certificate traceable to NPL standard is provided.

Various programmes are

available for data-logging and operating functions accessible from the front panel. Optional extras include 64K RAM, isolated IEEE and RS232 interfaces.

All the reasonably priced voltmeters on the market use either the single or dual slope technique for their A to D conversion; therefore even though they are sold as 5½ and 6½ digits, the majority cannot achieve more than 0.005% accuracy, which is in fact 4½ digits.

The DTR1680 series has fast 16 bit A to D conversion using excessive approximation

technique which has a non-linearity error of 0.006%.

Since the single or dual slope method is slow, ac measurement in many meters is done by the analogue technique which is inherently inaccurate. The DTR1680 has a microprocessor which is programmed to sample the incoming signal, calculate the RMS value and display it on the front panel.

There are various programmes for different types of calculations, peak value, RMS value, frequency, etc. Many control functions can be executed through a series of programmes with or without the 64K RAM and interface options. An important option available is a 26K floating decimal point BASIC programmable via the RS232 interface, executed from the front panel, transforming the DVM into a computer with readout facilities from the front panel or terminals on the interface ports.

Price of the basic models 1680 and 1681 is £450.00 and £300.00 respectively.

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



PORTA-PATTERN 'BANTAM'

Crow of Reading Limited, international distributor of Porta-Pattern test chart products, has now introduced the compact Bantam four chart system, designed primarily for outside broadcast and field production applications.

It is a robust foldaway all-aluminium package, measuring only 9½in x 11in x ¾in when closed. The outer casing hinges open at a right angle with a test chart mounted on each inside surface.

A double-sided centre leaf carries two further charts, enabling the Bantam to hold the four standard test patterns most needed for daily camera set up.

The system is designed for use on any level surface so that a separate mount is not required, each chart being held in the vertical position as required by an effective latching mechanism.

With the system closed, the charts are fully protected from dust and dirt, and considerable protection is also provided against normal rain or snow. The system can, therefore, be used in rigorous situations where paper or card-mounted charts deteriorate rapidly, yet the cost of the Bantam is relatively low compared with these 'throw away' charts. It thus becomes economically viable to provide high quality charts for individual cameras instead of a single system for an entire studio or outside broadcast unit.

The Bantam's four test patterns are (1) the resolution chart, a standard reference for measuring and evaluating the camera's overall resolution, (2) the linearity chart (525 or 625 line), designed for setting up the geometry of the camera's reproduction, (3) the registration chart, which presents suitable images for adjustment of scan timing in multi-tube colour cameras and (4) the logarithmic grey scale chart, carrying two rows of nine paint chips, which provide discrete reflectances from peak white ranging to TV black.

Crow of Reading Limited, PO Box 36, Reading RG1 2NB. Tel: (0734) 595025.

Cirkit. Making it per

Cirkit's got the kits you need to make your copy loud and clear.

In all there are over 100 kits to choose from. Selected and designed to offer the best possible standards at the best possible price.

Delivery is fast and reliable. We keep in touch with the manufacturers and we know what's going on. So as soon as new products are available, Cirkit has them.

Cirkit means a bigger catalogue. A better company to deal with.

And a wide range of kits and products that's growing all the time.

At Cirkit, we're tuned in to your needs.

Just send for our catalogue or visit one of our three outlets at:

200 North Service Road, Brentwood, Essex. CM14 4SG;
53 Burrfields Road, Portsmouth, Hampshire. PO3 5EB;
Park Lane, Broxbourne, Hertfordshire. EN10 7NQ.

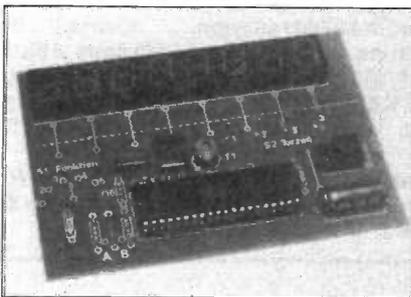
Please add 15% VAT to all advertised prices and 60p post and packing. Minimum order value £5 please. We reserve the right to vary prices in accordance with market fluctuation.

10MHz DFM

ADFM capable of operating at frequencies up to 10MHz. The kit can be configured in six different measurement modes including: frequency, period, elapsed time and unit counter. Applications can be extended using the CIRKIT prescaler and preamp.

SPECIFICATION: Input signal: 2.0V (min) TTL. Frequency range: 0 to 10MHz. Period measurement: 0.5 to 10 secs. Time measurements: up to 10 secs. Output: BCD multiplexed. Display: 8 digit 12mm LED. Supply: 6-9V DC at 100mA(nom).

41-01500 54.10



10MHz DFM

DFM PRE-AMPLIFIER

The rise time of some low frequency signals, even apparent square waves, is often too slow to give a constant readout from a DFM. The use of a pre-amp ensures that these signals are input to the DFM at the correct level and with the correct shape. This simple addition greatly increases the effectiveness of a DFM at low frequencies.

SPECIFICATION: Frequency range: 1Hz-5MHz. Sensitivity: 1Hz-3MHz:20mV, 3MHz-5MHz: 40mV. Max input voltage: 100V (220V instantaneous). Power supply: 5V 8mA. Input signal: Any. Output signal: TTL square wave.

41-01502 5.13

DFM PRESCALER

This prescaler is intended for use with the Cirkit 10MHz DFM, although it is compatible with other frequency counters. The function of the prescaler is to divide the incoming frequency by ten and to shape it into a waveform suitable for the digital input requirements of the DFM. This enables the frequency range of the DFM to be extended up to 50MHz.

SPECIFICATION: Supply voltage: 5V DC. Nominal current: 25mA. Frequency range: 10kHz-50MHz. Input sensitivity: 20mV(typical). Output: 5V TTL level. Dimensions: 80mm x 50mm.

41-01501 8.55

2m POWER AMP

A carefully designed 20W, 144MHz linear power amplifier, to boost the output of hand-held and transportable transceivers such as the TR2400 IC2E, FT208, FT290 etc. With 10dB gain to give a 20W output from a 2W input. Automatic changeover relay - switched from RF sense circuit. High power - output relay, robust construction with die-cast box, plus RX pre-amp.

SPECIFICATION: Bandwidth -3dB: 144-146MHz. Power gain: min 10dB. Output power: 1W input: 10W, 2W input: 20W. Supply voltage: 10-16V. Supply current (at 12V): <3amps-20W output. Input/Output impedance: 50Ω. Size (excluding sockets): 122 x 96 x 44mm. Pre-amp section spec as 2m Pre Amp Kit.

41-01404 32.87

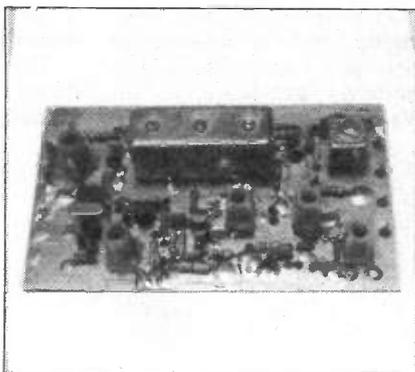
2m CONVERTER

Low noise 2m to 10m converter. This design uses low noise dual gate MOSFETs in the RF and mixer stages which, together with a TOKO pre-aligned helical filter and pre-wound coil, give a high specification and repeatable performance.

A reliable 116MHz overtone oscillator circuit is followed by a double tuned stage which gives a very clean output, this reduces spurious to a minimum. As the circuit is basically linear any mode - AM, FM or SSB - can be converted. The complete circuit is built onto a double-sided PCB.

SPECIFICATION: Noise figure: Less than 2dB. Gain: Min 22dB. 3dB Bandwidth: 144-146MHz. IF Output: 28-30MHz. Input/Output impedance: 50Ω. Supply voltage: 10-16V. Supply current (at 12V): 28mA. Size: 97 x 57 x 22mm.

41-01306 17.35



2m Converter

2m PRE-AMP

Very compact low-noise MOSFET 2m pre-amp. The overall PCB is sufficiently small to be installed inside receivers or transceivers.

SPECIFICATION: Noise figure: Better than 1.5dB. Gain: 18dB Min. Input/Output impedance: 50Ω. Size: 34 x 13 x 10mm.

KIT INCLUDES: Double-sided PCB - All resistors - All capacitors - MOSFET - Coils and cans.

41-01307 3.91

To: Cirkit Holdings PLC, Park Lane, Broxbourne, Hertfordshire. EN10 7NQ.
I enclose 85p. Please send me your latest catalogue and 3 x £1 discount vouchers!
If you have any enquiries please telephone us on Hoddesdon (0992) 444111.

Name

Address

Telephone

Area of Special Interest

R&EW12

Cirkit
Bigger Stock. Better Service.

New Winter
Catalogue
Out Now!

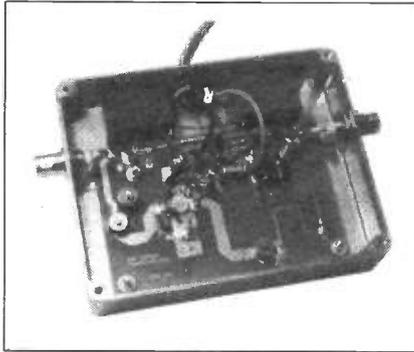
fectly loud and clear

70cm CONVERTER

70cm to 144MHz low profile converter employing high level Schottky diode double balance mixer, pre-aligned helical filter and low noise transistors. The complete design gives a low noise figure and uses pre-aligned filters and pre-wound coils to give repeatable performance with minimum alignment.

SPECIFICATION: Bandwidth: 430-440MHz. RF Gain: 8dB min. Noise figure: <2.5dB. IF output: 144-146MHz. Supply voltage: 10V. Supply current: 30mA. Size: 97 x 57 x 15mm.

41-01405 21.50



70cm 10W Power Amp

70cm 10W POWER AMPLIFIER

The current generation of UHF handheld synthesised transceivers have almost all the facilities found in mobile/base transceivers, the only major limitation being their output power. For handheld operation 1 watt or so is adequate, but for mobile to mobile and for use with higher power repeaters, the addition power provided by the CIRKIT amplifier increases the range considerably. This is especially noticeable, as is to be expected, at the limits of the service area.

The Cirkit 70cm Power Amp will boost the output power of hand held transceivers up to 12W. Automatic relay switching between TX and RX, is provided via the RF sense circuitry. The finished unit is mounted in a tough pre-drilled die-cast box, which provides sufficient heatsinking while providing a rugged low profile housing.

SPECIFICATION: Power gain (2W I/P): 7.2dB. Output power (13.8V) 2W input: 10W(min). Saturated power output: 14W. Supply voltage: 10-16V (13.8V nom). Input/Output impedance: 50R. Bandwidth: 430-440MHz. Supply current: 2 amps at 12W. Dimensions: 119 x 94 x 34mm.

41-01505 33.82

70cm PRE-AMPLIFIER

This high performance pre-amp offers increased receiver sensitivity and a corresponding extension of the useful communication range. The completed unit is sufficiently compact to be built into virtually any existing receiver and does not require the use of any test gear when setting up.

SPECIFICATION: 3dB bandwidth: 425-445MHz. Noise figure <2dB. Gain: 13dB(min). 1dB compression: -3dBm (0.5mW). Saturated output: -2dBm (0.7mW). Supply voltage: 8-12V (12V nom). Input/Output impedance: 50R. Dimensions 50 x 10 x 17mm.

41-01506 4.78

NOW AVAILABLE exclusively from CIRKIT, TAU high quality ATU kits and accessories.

Full HF coverage, tunes from 1.5MHz continuously to 29.350MHz. Based on the renowned SPC transmatch configuration, TAU innovated this composite module design with large air-spaced capacitors rated at 5kV, tested to 7kV. Roller inductor infinitely variable. Solid precision radio engineering. Heavy weight long life construction. Will tune any transmitter/aerial combination to optimum. A lifetime investment and should never need replacing. Power handling capabilities from a few milliwatts to above 3000 watts PEP. Undoubtedly the finest ATU module available today.

STU 5K ATU Kit 41-50500 130.00

CABINET - custom-made for STU 5K ATU 41-50510 62.50

DIGITAL TURNS COUNTER

Multi-turn, vernier scale with digital indication, for use with roller coaster, with or without cabinet. Turns counter 41-50520 27.94

BALUNS

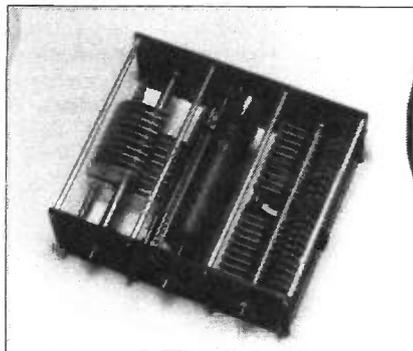
To complete the ATU, we have the following Baluns:

Location	PEP	Ratio	Stock No.	Price
Outdoor	OB141	1kW 4:1	41-50141	27.35
Outdoor	OB111	1kW 1:1	41-50111	27.55
Indoor	IB241	200W 4:1	41-51241	17.25
Indoor	IB141	1kW 4:1	41-51141	22.35

ROLLER COASTER

To complement existing equipment, covers 1-30MHz, 28uH inductance, tapered pitch for 10 and 15 meters.

Roller Coaster 41-50540 46.00

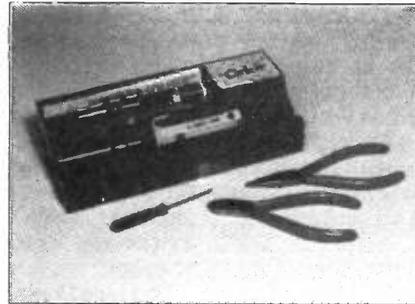


TAU ATU

AKC AERIAL KIT

Unique clip-on spacer system for open wire feeders. Patented design manufactured from an ultra-violet resistant poly-propylene the spacer can be configured to give a 75,300, 400 or 600 ohm system. Kit contains 20 spacers, 1 Tee piece and 2 Ceramic insulators.

AKC Aerial Kit 41-50530 12.70



CIRKIT ELECTRONICS TOOL KIT

Contains: 15W Soldering Iron, 2 spare bits, heat shunt, solder, pliers, cutters, and screwdriver.

41-00007 15.56

Selected Lines

PB2720	80dB Piezo Buzzer	43-27201	0.55
10M15A	10.7MHz Filter	20-10152	2.10
FC177	LCD Freq. Meter	39-17700	20.00
CM161	Min LCD Clock	40-80161	8.25
8 x 0.3"	IC socket	28-00800	0.12
14 x 0.3"	IC socket	28-14000	0.13
16 x 0.3"	IC socket	28-16000	0.13
CX120P	COAX relay (PCB)	46-90120	11.96
CX520D	COAX relay (N type)	46-90520	26.98
CX540D	COAX Relay (BNC)	46-90540	26.98
HC6010	10MΩ DMM	56-06010	33.00
HC7030	0.1% Acc DMM	56-07030	43.00
Meteor	100MHz DFM	56-00100	95.00
Meteor	600MHz DFM	56-00600	121.00
Meteor	1000MHz DFM	56-01000	165.00
CS240	Antex 17W Iron	54-22300	5.20
TCP3	Weller temp cont iron	54-20007	17.63
PU3D	Weller 24V PSU for TCP3	54-20026	30.74

Books

The Radio Amateurs: Q & A Reference Manual	02-02157	5.95
Oscilloscopes: How to use them, how they work	02-21300	4.35
The World's Radio Broadcasting Stations	02-11564	7.00
The ZX Spectrum	02-00100	5.95
Electronics Pocket Book Practical Design	02-21309	7.50
of Digital Circuits	02-11831	10.45
Projects in Amateur Radio	02-21304	3.80
Active Filter Cookbook	02-21168	12.70
Beginners Guide to Amateur Radio	02-11262	4.50
CMOS Cookbook	02-21398	11.85
Design of Active Filters	02-21539	10.15
Design of Op-Amp Circuits	02-21537	9.30
Design of Phase-Locked Loop Circuits	02-21545	9.30
Design of VMOS Circuits	02-21686	10.15
Effectively Using the Oscilloscope	02-21794	9.30
Foundations for Microstrip Circuit Design	02-79447	21.00
Handbook of Electronic Tables Formulas	02-21532	11.00
TTL Cookbook	02-10358	11.00
TV Antennas and Signal Distribution Systems	02-21584	10.15

PRODUCT NEWS

'DOCTOR DX'

With this module plugged into the rear of a Commodore 64, an amateur radio transceiver appears on your TV screen in colour graphics. Touch the function keys and the tuning scale moves up and down. Touch other function keys and the transceiver switches bands.

Listen to the loudspeaker, and you will hear stations sending Morse as you tune across them - complete with background noise. You are in the middle of a CQ worldwide DX contest, with stations working each other, calling CQ etc. If you enter your latitude and longitude and time of day at the beginning, you will find that the countries you hear are appropriate to the propagation from your location at a sunspot maximum.

All 304 DXCC countries are represented, with a density weighted according to the amateur radio population of each country.

Plug a Morse key into 'Doctor DX' and you can call each station. If your operating is good it will call you back with a full contest exchange and your score is kept on the screen. At the top of each

PLL VIDEO AMPLIFIER

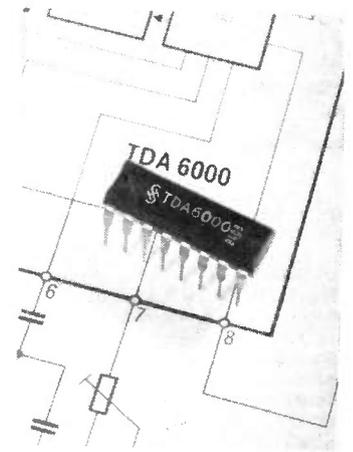
The eyes and ears of television viewers are becoming more and more discerning. In order to prevent mutual interference between picture and sound signals, Siemens has equipped the new TDA6000 video amplifier for the IF stages in TV sets with 'genuine FPLL (frequency-phase-locked loop) synchronous demodulation'.

This ensures, no matter how demanding the test card (even with the most intricate patterns), a weighted inter-carrier signal to noise ratio of 50dB. Even with superimposed text, there is no longer any 'crackle' from the speaker.

The new IF module takes its place alongside seven other amplifiers, designed with a standard board layout to facilitate chassis production on a modular basis. In addition

to the TDA2440 (PNP tuner) and the TDA2441 (NPN tuner), there are the TDA2450 (for multi-standard TV sets with positive or negative modulation), the TDA 5400/5410 (PNP/NPN tuner with switchable phase), the TDA5430 with separate feed voltage (30V) for the AFC section, and the TDA5510 with DIN-standard VCR interface and internal VCR switching.

The TDA6000's values represent, for the first time ever, 'hi-fi' equivalent standards for picture and sound (1° differential phase, 1% differential gain - typical values for a dc tuning range of 1MHz and 150% AM-modulation). Thanks to the linear design which all these amplifiers have in common, it is possible to incorporate SAW filters with a sound porch of only -10dB (as opposed to -26dB previously). These mod-



ules contribute significantly to the improvement and reliability of picture and sound quality.

Siemens Limited, Siemens House, Windmill Road, Sunbury-on-Thames, Middlesex TW16 7HS. Tel: (09327) 85691.

band are slow Morse stations, while at the bottom are faster and more 'expert' stations.

For people who want to learn contest operating skills, or simply improve their Morse without the embarrassment of doing it on the air, 'Doctor DX' is the answer.

Currently attracting rave reviews in the American amateur radio press, 'Doctor DX' is available in the UK at £96.95 inc VAT, plus £1.50 P&P.

ICS Electronics Ltd, PO Box 2, Arundel, West Sussex BN18 0NX. Tel: (024 365) 590.

TAPE HEAD CLEANER

Ensuring peak response and high quality reproduction, Electrolube's Video Tape Head Cleaner is a high quality safety solvent designed for use on all magnetic tape heads.

The cleaner loosens and removes accumulated deposits of dirt and tape oxide and dries quickly without leaving any residues on the tape.

The solvent is non-flammable, can be used on plastics, rubbers, etc, without fear of damage, and is completely non-conductive.

The video tape head cleaner can be used for tape heads on video, tape, cassette and audio recorders and is ideal for use in the data processing, word processing and computer areas.

The solvent comes in handy 110 gram aerosols and is conveniently applied by spraying directly on to the heads and mechanisms. In addition, the cleaner is ideal for spraying onto cleaning tapes and other tape cleaning devices such as cotton buds or felt and chamois leather sticks.

Electrolube Limited, Blakes Road, Wargrave, Berkshire RG10 8AW. Tel: (073 522) 3014.

MIRACLE MODEM

The Modem WS2000, manufactured by Miracle Technology (UK) Ltd, has now received BABT approval for use with both standard telephones and selected PABX systems.

BABT (British Approvals Board for Telecommunications) approval means that it can now be used with telecommunications systems run by British Telecom, to gain instant access to the world of information technology.

Incorporating the capability of both CCITT and BELL Standards (where regulations allow) the WS2000 can link virtually any computer or data terminal with any other, anywhere in the world, for high speed transfer of data. This modem can run 75, 300, 600 and 1200 baud.

Full two-way telex facilities are now available to the WS2000 user at a fraction of the cost of setting up a conventional telex system.

Prestel & Micronet, Telecom Gold and a host of private bulletin boards worldwide are instantly accessible with the WS2000, plus high speed user-user and terminal-mainframe links.

Among expansion accessories available are autodial and autoanswer and an add-on chip set which allows full computer/software control of the modem. Intelligent control interfacing, battery power, acoustic coupling and

TTL RS232 interfacing can also be added, subject to BABT regulations.

The Modem WS2000 is available from computer dealers throughout England and in many other countries, or direct from the manufacturer, and costs just £150.

For further information, contact Miracle Technology (UK) Ltd, 10-12 St Peter's Street, Ipswich IP1 1XB. Tel: (0473) 50304/5.



EPROM PROGRAMMER

An extremely powerful and versatile intelligent EPROM programmer has been launched by Devon-based electronic equipment manufacturers GP Industrial Electronics.

Called the XP640, the unit has been designed to provide advanced programming and editing facilities for all EPROMs and EEPROMs in common use, but without the addition of personality cards or modules which are so often required with other programmers currently on the market.

The XP640 boasts a host of facilities. Its multi-page video output and 16 character display enables editing and programming data to be presented as comprehensive visual displays. Memory is a massive 64K x 8 RAM, and both 8 and 16 bit programming can be accommodated. The RS232C interface supports 16 formats with transmission rates up to 19.2K baud.

The XP640 incorporates all fast programming algorithms, to ensure the highest possible programming speeds, and a code lock key, which locks the machine out of edit mode to prevent inadvertent or unauthorised use.

Amongst other facilities, the comprehensive RAM editor features; ASCII display,



page select, define/shift/copy/fill block, split, shuffle, insert, delete, search and replace.

The XP640's remote control feature allows full operation of the unit by remote.

The price of the XP640 is £795.

GP Industrial Electronics, Unit E, Huxley Close, Newnham Industrial Estate, Plymouth. Tel: (0752) 342961.

LIGHTWEIGHT dc FAN

The 814 is a 24 volt dc equipment fan from Papst that measures only 62mm square and weighs less than 3 ounces – so light that it can be mounted directly onto a printed circuit board.

The 814 will operate from a supply voltage varying from 16 to 30 volts dc and produces 40m³/h airflow at the nominal operating voltage of 24 volts, at which voltage the power consumption is 3 watts.

This high performance per unit size is possible due to refinements in the design of the new seven blade impeller, and to significant new concepts in venturi design.

The 814 operates at 5300rpm and the rugged, high quality ball bearing system ensures an anticipated life in excess of 25,000 hours at the maximum operating temperature of 65°C.

Whilst ideal for hot spot cooling, this new fan is also suited for applications in modern microcomputer systems, small amplifiers and portable electronic equipment – in fact wherever effective cooling is required and available space is at a premium.

Papst Motors Limited, East Portway, Andover, Hampshire SP10 3RT. Tel: (0264) 53655.

CRYSTAL TIME BASE

A new kit, for a 50Hz crystal timebase manufactured by Velleman, is now available from Electronic and Computer Workshop Ltd.

This high accuracy unit will produce a constant amplitude of output irrespective of supply voltages over the range 7 to 20V. It is a useful extension to the micro-processor timer (also available as a kit, this is a versatile timer that can control up to 20 functions), or for use with other time controlled devices requiring a high accuracy 50Hz synchronising signal.

With a CMOS circuit, specifications include a 5mA supply current and a crystal frequency of 3.2768MHz.

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

DELTA ONE TRANSCEIVER

Amongst the new Nevada 934 Professional Series of 934MHz Personal Radio (CB) equipment now being introduced is the Delta One transceiver, a unit produced in collaboration with Cybernet, a Japanese company well-established as a manufacturer of high-quality equipment.

Sleek, robust, and above all reliable, the transceiver

incorporates scan and memory facilities, high SWR protection, and has a socket for a large extension S-meter.

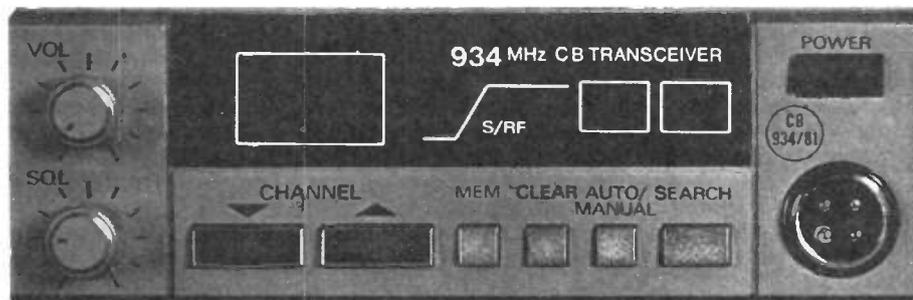
Made to the high quality necessary for good results at this frequency, the Delta One is supplemented by a full range of equipment made to similar standards.

Various antennae are available, including a high-gain 12 element loop yagi for base use. Other accessories

include a mast-head pre-amp with a very low noise figure, and an SWR/power meter.

With the introduction of Nevada's Professional Series, the users of this band, mainly serious enthusiasts and businessmen, can now obtain good quality equipment at an affordable price.

Telecomms, 189 London Road, North End, Portsmouth PO2 9AE. Tel: (0705) 662145.



PRODUCT NEWS

THINKJET PERSONAL PRINTER

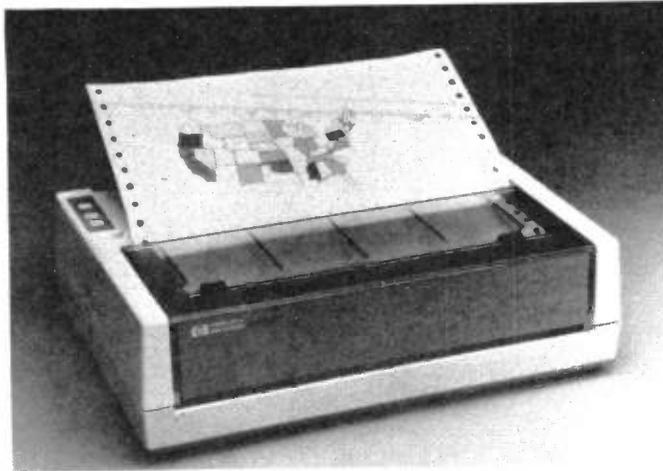
Rapid Recall have received their first delivery of the new and widely publicised Hewlett-Packard ThinkJet printer.

The very quiet printer employs new technology to out-perform all other dot matrix printers in the same price range.

The ThinkJet prints at 150 characters per second using an 11 x 12 character cell to achieve excellent resolution. It is compatible with the raster scan graphics output generated by HP personal computers, and prints graphics at 192 dots per inch.

Both friction and pin feed paper handling is included as standard, allowing either fan-fold or cut sheet paper to be used.

The user replaceable print head incorporates an ink



reservoir and a chip with 12 resistor controlled nozzles which control the ink spray. After about 500 pages of printing – that's about a million characters – the print head is discarded and a new

one snapped into place.

There are four character styles that can be selected from the host computer: compressed, normal, bold and expanded, which provide 142, 80, 71 and 40 characters per

line respectively.

The ThinkJet is very small, measuring only 29.2 x 20.6 x 8.9cm (about the size of an A4 sheet of paper), and has a noise output of only 50dB (A).

The version that Rapid Recall currently have in stock has an HP-IB interface, which is suitable for use with Hewlett-Packard computers or with instrumentation and control systems employing the IEE 488 bus.

Versions with other interfaces will be available in the near future – the HP-IL model is expected by November 1984, with the Centronics model following closely. The serial RS232C model will be in stock by early 1984.

Rapid Recall Limited, Rapid House, Denmark Street, High Wycombe, Bucks HP11 2ER. Tel: (0494) 26271.

CONTROL SWITCHES

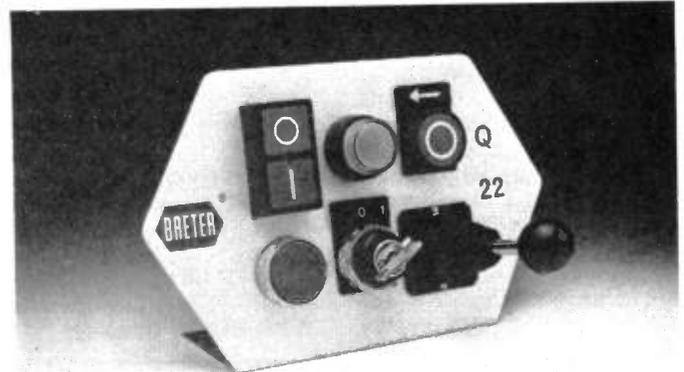
A new range of control switches is available from Quiller Components Ltd.

The switches, featuring pushbuttons, keys and selectors, joysticks and emergency stop operators are manufactured by Breter of Italy and finished in thermoplastic material to complement the range of metal switches already available. The thermoplastic element combines low cost with high quality to produce excellent thermal and dielectric properties.

Use of snap-on contact blocks ensures that any circuit arrangement is possible. Contacts are rated at 10A 250V ac and feature high conductivity silver alloy contacts, providing excellent resistance to wear and welding.

Available with 22mm diameters, the control switches are manufactured in compliance with the relevant IEC, CEE, BSI and VDE standards.

Quiller Components Ltd, 85 Stanley Road, Bournemouth BH1 4SD. Tel: (0202) 303424.



SINGLE CHIP MODEM

New from AMI is a single chip 300 baud full-duplex FSK (frequency shift keying) modem.

Compatible with the Bell 103/113, AMI's S3530 is a new CMOS device which functions either as a full-duplex FSK or, by reversing the polarity on one input pin, as a CCITT V.21 modem circuit for international applications.

Unique to the modem is an on-chip RS232C control interface, which eliminates the need for the extensive discrete circuitry commonly required to implement the modem handshaking function. This feature results in a compact, inexpensive stand alone modem.

An automatic-abort func-

tion prevents the S3530 from tying up a system should there be difficulty in establishing a data link. If no carrier is detected after the device has been put into an answer or originate mode, it aborts the call and disconnects the telephone line. Other features include transmit and receive filtering, and an automatic answer/originate mode selection.

The S3530 modem has been designed for stand alone applications, as well as for integration into terminals and computers. It requires an external 3.58MHz crystal, giving a 4.8KHz output for UART (universal asynchronous receiver-transmitter) interface applications. Requiring only a +5 volt supply and

dissipating only 110mW the S3530 is especially suited to portable / battery-powered systems.

AMI Microsystems Ltd, Princes House, Princes Street, Swindon, Wiltshire SN1 2HU. Tel: (0793) 37852.

MODEM 84

The Modem 84 from Watford Electronics is a full duplex direct connect system (ie is not acoustically coupled via a handset) which offers a cheap way of connecting up with Prestel, Micronet etc, and is fully BT approved.

As well as receiving and transmitting data at 1200 and 75 baud respectively, the Modem 84 can also send at

1200 baud in half-duplex mode.

Also available is advanced software on ROM to control the Modem, which offers a high specification at an impressive price.

The system is easily installed by plugging in the ROM and connecting the lead from the Modem to the computer's RS423 port.

The Modem 84 and software ROM, plus comprehensive manuals, are available for £82.00 plus £2.50 carriage. The software alone is available for £20.00, and the Modem without software for £62.00 plus £2.50 carriage.

Watford Electronics, 33/35 Cardiff Road, Watford, Herts WD1 8ED. Tel: (0923) 40588.

PORTABLE IRON

Greenwood Electronics recently launched a revolutionary new butane powered portable soldering iron, the Oryx Portasol, at Internepcon.

Little bigger than a felt tip pen, the Portasol works on entirely different principles from conventional gas-powered irons. There is no flame during operation, the chemical energy of the butane gas being converted directly to heat by means of a patented catalytic converter in the solder tip. Conversion rate is adjustable to provide control over tip temperature and, at its maximum setting, the iron delivers power equivalent to a 60 watt electric soldering iron, the tip temperature being adjustable between 250 and 450°C.

The Oryx Portasol iron will run for up to 60 minutes on its internal gas supply, and refuelling is identical to filling a gas cigarette lighter.

The same principles that make gas cigarette lighters safe are applied to the Portasol.

The Oryx Portasol can be carried in the pocket. It is supplied with a protective cap and is immediately ready for use, the cap including an igniter to start the catalytic conversion.

The introduction of this compact new iron brings a new dimension to soldering. Equally invaluable to the engineer, the wireman, the repairer and the hobbyist, the Portasol offers the advantage of eliminating all risk of electrical damage to sensitive components. Its dimensions are 175mm long by 19mm in diameter.

Replacement tips – which include the converter – are readily available.

Greenwood Electronics, Portman Road, Reading, Berks RG3 1NE. Tel: (0734) 595844.

dc/dc CONVERTER

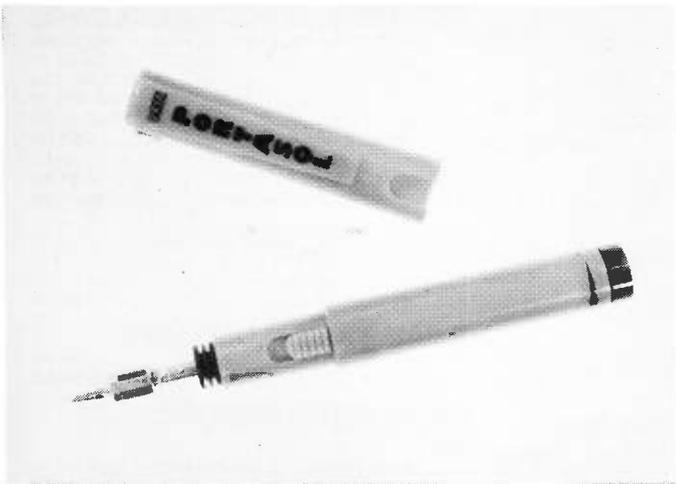
A 12 volt to 24 volt dc to dc power converter has been introduced by Philips Test and Measuring for use with many of its popular compact portable oscilloscopes.

The PM8905 converter enables the PM3212, PM3215 and PM3217 25MHz and 50MHz series, the PM3254 75MHz field-service models, the PM3267 100MHz low cost/high performance scope

and the PM3305 35MHz glitch-capturing digital storage oscilloscope, to be powered from standard 12 volt car batteries.

The 12 volt dc input of the converter is fully insulated from the output and protected against short-circuits, overload or incorrect polarity of the input voltage. The converter unit, which weighs only about half a kilogram, can be attached to the oscilloscope or used separately. It meets all the standard environmental tests applied to Philips' instruments.

Pye Unicam Ltd, York Street, Cambridge CB1 2PX. Tel: (0223) 358866.



COMPUTER CARE KIT

Memorex (UK) Ltd, one of the world's leading suppliers of IBM compatible equipment, have launched a new range of computer care products.

Developed specifically for the home computer enthusiast and the semi-professional user by Memorex's Media Retail Division, the Computer Care Kit will be available from major retailers and independent stores.

The comprehensive range of products consists of: VDU and TV screen cleaning kit, comprising twenty foil sealed

sachets of cleaning tissues and two anti-static cloths, priced at £4.95; case and keyboard cleaning kit, also priced at £4.95, comprising aerosol spray foam, cleaning cloth and cotton buds; disc drive and head cleaning kit with ten disposable head cleaners and aerosol spray cleaner for wet and dry action, costing £9.95; and a storage case for 5¼in floppy discs, costing £2.25.

Memorex (UK) Ltd, 96-104 Church Street, Staines, Middlesex TW18 4XU. Tel: (0784) 51488.

VIDEO PRINTER

A new video printer recently announced by Nuclear Enterprises enables a high resolution paper record to be produced of virtually any image projected on a raster-scanned video display.

The printer – designated TP95 – can be used to supplement the computer printer in those applications where graphic information from the display needs to be recorded on paper.

The standard print area is 171 x 228mm and resolution is selectable up to six dots per millimetre, giving remarkable picture quality.

The TP95 is virtually silent, requires no warming up and uses thermal paper which is very easily loaded into the high precision feed mechanism.

Only a single coaxial connection is required when using composite video signals, but separate video signals may also be used if necessary.

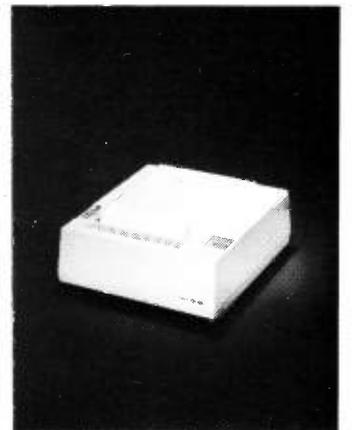
The picture position and intensity may be adjusted by the user to his own requirements and a self-test function may be selected which prints a standard test pattern.

Additional monitoring ensures that an alarm sounds in the event of malfunction or mis-operation.

The TP95 is self contained and is 400mm wide, 168mm high and 426mm deep. It operates from a standard 220/240V 50Hz mains supply and consumes 250W maximum.

Nuclear Enterprises is part of the Measurement Division of Thorn EMI Electronics.

Nuclear Enterprises Limited, Bath Road, Beenham, Reading, Berkshire RG7 5PR. Tel: (0734) 712121.



REGULATORS

LM317T Plastic T0220 variable	£1.00
LM317 Metal	£2.20
7812 Metal 12v 1A	£1.00
7805/12/15/24 plastic	50p
7905/12/15/24 plastic	50p
CA3085 T099 Variable regulator	£1.00
LM723 14 dil	50p

EPROMS/MEMORIES

27128-300nS	£18.00
2764 INTEL/FUJITSU 300ns £6.50 250nS	£7.00
2716, 2708, 1702 EX EQUIPMENT £2	10/£17.00
2732A-3 NEW £3.50 EX EQPT	£2.50
2114 EX EQPT 80p 4116 EX EQPT	70p
4164-150nS £4 MC6810P	£1.00

POWER TRANSISTORS

TIP141, 142, 147 £1ea TIP112, 125, 42B	2/£1.00
TIP35B £1.30 TIP35C	£1.50
SE9302 100V 10A DARL SIM TIP121	2/£1.00
2N3055 Motorola	50p 5/£2.00
2N3055 Ex eqpt tested	4/£1.00
Plastic 3055 or 2955 equip. 50p	100/£30.00
2N5302 NPN 30A 60V SIM 2N3771	80p
2N3773 NPN 25A 160V	£1.80 10/£16

DISPLAYS

Futaba 4 digit clock fluorescent display	
FLT-02-8 also 5-LT 16	£1.50
Futaba 8 digit calculator fluorescent display 9CT-01-3L	£1.50
LCD Clock display 0.7" digits	£3.00
Large Clock display 1" digits	£3.00
7 seg 0.3" display comm cathode	2/£1

MISCELLANEOUS

1.25" Panel fuseholders	5/£1.00
STAINLESS STEEL HINGES 14.5" BY 1" OPEN	
£1.00 each	10/£7.00

QUARTZ HALOGEN LAMPS

A1/216 24v 150w	£2.25
H1 12v 55w (car spot)	£1.25

WOUND POT CORES

with adjuster unused	
RM7 LA4245	3/£1.00
RM8 LA4344	2/£1.00
MAINS TRANSIENT SUPPRESSORS 245V	3/£1.00
TOK KEY SWITCH 2 POLE 3 KEYS	
ideal for car/home alarms £3 £100+	£2.00
12v 1.2w small wire ended lamps	
fit AUDI/VW TR7 VOLVO SAAB	10/£1.00
14v 0.75w MES lamps	8/£1.00
Heat shrink sleeving pack	£1.00
PTFE sleeving pack asstd colours	£1.00
250 mixed res diodes, zeners	£1.00
Mixed electrolytic caps	100/£2.00
ITT CASS RECORD/PLAY AMP+cct	£2.00
Stereo cassette deck	£5.00
Stereo cass R/P head	£2.50
Mono head £1 Erase head	50p
Thermal cut-out 50°C, 77°C or 85°C	70p
Thermal fuse 121°C 240v 15A	5/£1.00
Vero pins fit 0.1" Vero	200/£1.00
Double sided PCB pins	200/£1.00
TO220 Micas + bushes 10/50p	100/£2.00
TO3 Micas + bushes	10/50p
RELAYS 240v AC coil PCB mounting	
2 pole changeover £1 3pole c/o	£1.00
Varley 24v dc 4p c/o relay	80p
Fig 8 mains cassette leads	3/£1.00
KYNAR wire wrapping wire 2oz reel	£1.00
PTFE min screened cable	10m/£1.00
TOKIN MAINS RFI FILTER 250v 15A	£3.00
TDK MAINS RFI FILTER 115v 15A	£1.00
IEC CHASSIS PLUG/RFI FILTER 10A	£3.50
Epoxy potting compound 50g	£2.00
Mercury tilt switch small	£1.00
Min rotary sw 4p c/o 1/8" shaft	2/£1.00
Thorn 9000 TV audio o/p stage	2/£1.00
10m7 CERAMIC FILTER. 50p	100/£20.00
6m CERAMIC FILTER	50p 100/£25

240v AC FAN 4.6" SQUARE NEW	£5.50 (£1)
240/115v AC FAN 4.6" SQ NEW	£7.00 (£1)
12v DC Brushless fan reversible	
2.5" sq 2" deep QUIET	£9.00
KLIPPON terminal block EKS 12/4	
12way 20A term block	3/£1.00

BELLING-LEE 12way block L1469	4/£1.00
POTENTIOMETERS short spindle	
2k5 10k 2m5 Lin	5/£1.00
500k 1in 500k lag long spindle	4/£1.00
40KHZ ULTRASONIC TRANSDUCERS	
EX-EQPT NO DATA	PAIR £1.00
STICK-ON CABINET FEET	20/£1.00
TO3 TRANSISTOR COVERS	10/£1.00
TRANSISTOR MOUNTING PADS TO5/TO18	£3/1K
DIL REED RELAY 2 POLE N/O CONTACTS	£1.00

RECTIFIERS

120v 35A stud	50p
12FR400 12A 400v small stud	4/£1.50
BY127 1200V 1.2A	10/£1.00
BY254 800v 3A	8/£1.00
BY255 1300v 3A	6/£1.00
1A 800v bridge rectifier	4/£1.00
6A 100v bridge	50p
10A 600v bridge	£1.50
15A 100v bridge	£1.50
25A 200v bridge	£2 ea. 10/£18.00
25A 400v bridge £2.50	10/£22.00

SCRs

MCR72-6 400v £1 BTX95 800V 15A	£1.50
BTX95 800v 15A	£1.50
35A 800v stud	£2.00
70A 500v large stud	£3.00
MCR106 equiv 4A 400v 40p ea	100/£20.00
2N5061 800mA 60V TO92	4/£1.00
TICV106D .8A 400v TO92 3/£1	100/£15.00
MEU21 Prog unijunction	3/£1.00

TRIACS

TXAL225 8A 400v 10mA gate	diacs 25p
TXAL228 8A 400v isol tab	2/£1 100/£35
25A 400v ex eqpt tested	£1.50

CONNECTORS (EX EQPT price per pair)

'D' 9 way £1; 15 way £1.25; 25 way £2.00 37 way £2; 50 way £3.50; covers 50p ea	
NEW 25 way PCB SKT	£1.00
D9 PCB PLUG 90 deg	£1.50
0.1" double sided edge connector 32 way	
ideal ZX81/SPECTRUM	£1.50
0.1" d/sided pcb plug 24+25 way	£1.50
2 pole sub min connectors ideal radio	
control RS 466/472/488/343	5 pairs/£2.00

IDC CONNECTORS

25 WAY 'D' PLUG/SKT 37 'D' PLUG	ea £2.00
20 WAY SOCKET (BBC USER PORT)	£1.00
26 WAY SOCKET (BBC PRINTER)	£1.50
34 WAY SOCKET (BBC DISC DRIVE)	£2.00
40 WAY SOCKET	£2.00

IDC CARD EDGE CONNECTORS D/S EX-EQPT

34 WAY (FITS DISC DRIVE PCB)	£3.00
40 WAY (FITS CENTRONICS 739 PCB)	£3.00
50 WAY	£3.50

WIRE WOUND RESISTORS

W21 or sim 2.5W 10 OF ONE VALUE FOR	£1.00
1R0 2R0 2R7 3R9 5R0 10R 12R 15R 18R 20R 27R 33R	
36R 47R 120R 180R 200R 330R 390R 470R 560R 680R	
820R 910R 1K 1K15 1K2 1K3 1K5 1K8 2K4 2K7 3K3 10K	
W22 or sim 6 watt 7 OF ONE VALUE for	£1.00
R22 1R5 9R1 10R 12R 20R 33R 51R 56R 62R 120R 180	
270R 390R 560R 620R 1K 1K2 2K2 3K3 3K9 10K	

W23 or sim 9 watt 6 OF ONE VALUE for	£1
--------------------------------------	----

1R0 3R0 6R8 56R 62R 100R 220R 270R 390R 680R 1K	
1K8 10K	

W24/ sim 12 watt 4 OF ONE VALUE for	£1.00
R50 2R0 10R 18R 47R 68R 75R 82R 150R 180R 200R	
270R 400R 620R 820R 1K	

PHOTO DEVICES

Slotted opto-switch OPCOA OPB815	£1.30
2N5777	50p 100/£26.00
TIL81 TO18 Photo transistor	£1.00
TIL38 Infra red LED	2/50p
OPI2252 Opto isolator	£2.00
Photo diode	50p 6/£2.00
MEL12 (Photo darlington base o/c)	50p
RPY58A LDR 50p ORP12 LDR	85p
LEDs RED 3mm or 5mm	12/£1 100/£6.00
GREEN or YELLOW 3 or 5mm 10/£1	100/£6.50
FLASHING RED 5mm	50p. 100/£30.00

DIODES

1N4148	100/£1.50
1S3740 Germanium	100/£2.00
1N4004 or SD4 1A 300v	100/£3.00
1N5401 3A 100V	10/£1.00
BA157 1A 400V Fast recovery	100/£2.50
BA159 1A 1000V Fast recovery	100/£3.50

MULTI TURN PRESETS

10R 20R 100R 200R 500R	40p
2K 5K 22K 50K 100K 200K	

IC SOCKETS

8 pin 12/£1; 14 pin 10/£1; 18/20 pin 7/£1; 100/£12;	
1k/£80; 22/28 pin 25p; 24 pin 25p 100/£20 1k/£100; 40	
pin 30p; 16 pin 12/£1 100/£6	

TRIMMER CAPACITORS small

GREY 1.5-6.4pF GREEN 2-22pF	5 for 80p
GREY larger type 2-25pF	5 for 80p

SOLID STATE RELAYS NEW 10A 250v AC

zero voltage switching	
control voltage 8-28V DC	£2.50
VARIAC 0 to 130v 6A new uncased	£6.00

POLYESTER/POLYCARB CAPS

10n/15n/22n/33/47n/68n 10mm rad	100/£3.00
100N 250V radial 10mm	100/£3 1000/£25.00
1u 250V C280	5/£1 100/£10
1u5 P/carb 15mm rad	100/£5 (£1)
2u2 160v rad 22mm	100/£10 (£1.50)
470n 250v AC X rated rad	4/£1.00
33n 250v AC X rated rad 15mm	10/£1
10n 250v AC X rated rad 10mm	10/£1.00
100n 600V SPRAGUE axial 10/£1	100/£6.00

BEAD THERMISTORS

GLASS BEAD NTC Res @ 20°C	80p
250R 1K2 50K 220K 1M4	
R53 THERMISTOR	£2.00

BEAD TANTALUM CAPS

47u 3V 68u 6V 12/£1	100/£6
2u2 20V 8/£1	100/£8.00

SMALL AXIAL CERAMIC CAPS 50V

15p 18p 22p 27p 33p 47p 68p 82p 470p in 10n(25V)	
	100/£3.00

MONOLITHIC CERAMIC CAPS

100N 50v 100/£5 10N 50V	100/£3.00
470N 50V 100/£7 1uF 50V	100/£8.00

STEPPER MOTOR 4 PHASE 2 9v WINDINGS

£3.50	10/£35.00
-------	-----------

KEYTRONICS

332 LEY STREET, ILFORD, ESSEX

Shop open Mon-Sat 10am-2pm

TELEPHONE: 01-553 1863

MIN ORDER £2.50 OFFICIAL ORDERS WELCOME
UNIVERSITIES COLLEGES SCHOOLS GOVT DEPARTMENTS
P&P AS SHOWN IN BRACKETS (HEAVY ITEMS)
50p OTHERWISE (LIGHT ITEMS)

ADD 15% VAT TO TOTAL

ELECTRONIC COMPONENTS BOUGHT FOR CASH



NEWS DESK

Innovation development

A call for closer collaboration between manufacturing industry and academic sources of innovation, with the aim of reversing Britain's declining share of worldwide investment in high-technology research and development and to stem the flood of British inventions to competitive countries, was made this week by Stanley Grinstead, Chairman of Grand Metropolitan PLC.

Announcing his company's plans to build a £1 million Innovation Development Centre on the Surrey Research Park, Guildford, Mr Grinstead said that while British inventions still proliferated, too many were being forced overseas through lack of funding by UK industries, or failed because the inventor was unable or unwilling to concentrate on the commercial development of his idea.

As one example of the extent of other industrialised nations' exploitation of British ideas, Mr Grinstead quoted a recent report published by the Japanese government which claims that of all the postwar sources of industrial growth in Japan, 52 per cent are British, 22 per cent American and only 6 per cent have originated in Japan itself.

Grand Metropolitan believe that their Innovation Development Centre, which will be ready for occupancy by March 1985, will be the first of its kind in the UK and will fill a very clear gap in the needs of British innovation development.

'Our primary objective is to help inventions from British universities, research institutes and other sources of original thinking, to become marketable products which will form the basis of new British industries in the field of high technology', says Mr Grinstead. 'What we are looking for are new ideas or major modifications of existing systems or processes which can not only be practically developed in the Innovation



Development Centre, but which also have, as an end product, something which is sufficiently commercially viable to form the basis of a successful new company'.

Home computer growth

The phenomenal growth in the personal computer market since 1980 is expected to stabilise in the next five years, according to a new *Market Assessment Product Group Report*, the first full market study carried out. Sales levels for home computers are forecast to rise to a peak of 1.9 million units this year, but are likely to fall off to 1.2m by 1988. This, however, is not seen as an indication of the demise of the home computer, merely of the market becoming mature.

'In the longer run', the report states, 'it is conceivable that home computers will become major items of household equipment. An expansion of computer use beyond games to include domestic management is quite feasible. As a home work station, with a link to the place of employment, computers in the home have a strong future. This will expand and change the potential market considerably towards the end of the forecast period.'

The rapidly growing market for home computers has attracted a host of entrants and brands. At present there are around 38 brands of computers on the market, many of which are relatively small and lack the public awareness of established names.

How long they will survive is a matter of debate, but a reduction in the number of models available seems inevitable: 'The major established brands should escape virtually unscathed, but smaller ones look vulnerable, particularly if MSX quickly gains popularity.'

Sinclair remains undisputed market leader with 43 per cent market share, followed by Commodore (22 per cent) and Acorn (and BBC) (10 per cent).

Market Assessment Product Group Report No 35, Personal Computers includes a market overview and sub-market reports on home computer peripherals, home computer software and personal home computers, and is available from *Market Assessment Publications, 2 Duncan Terrace, London N1 8BZ. Tel: 01 278 9058.*

Graphics and CAD systems

A new British company, Data-Graphic Ltd, has been set up to design, manufacture and market a complete range of advanced computer products for the rapidly growing graphics and CAD markets.

With its Headquarters in Cwmbran, Wales, the new company has been formed by Gerry Tuffs, former Chief Executive of computer terminal manufacturer Data Type, who has wide experience in the computer and CAD systems marketplace.

Data-Graphic have recently launched two new products into the UK market - PCB Draughtsman II, a low cost colour CAD system for PC

board designers developed jointly with a US corporation, and a graphics subsystem, which enables an IBM PC to be transformed into a powerful CAD workstation for less than £6,000.

Gerry Tuffs, who becomes Chairman and Chief Executive of Data-Graphic, comments, 'In our first year we plan to establish Data-Graphic as a leading computer graphics and CAD systems supplier... as part of our development program we plan to move rapidly towards UK sub-assembly with local component sourcing.'

'It is our intention to build up our product line quickly in the CAD/graphics area, and we have established an R&D development team in Cwmbran to work on both hardware and software.'

Funding for the company, which has a £100,000 issued share capital, has come entirely from the company's management team.

London Teleport

The London Teleport, British Telecom International's satellite earth station in the Docklands, was officially opened on 9 October by two of Britain's astronauts, Mr Christopher Holmes and Lt Col Richard Farrimond.

The Teleport, the world's first international earth station to be installed in a city, currently transmits six television channels to cable TV networks around the UK and Europe.

The programmes are beamed to satellites in geostationary orbit some 22,300 miles above the equator, and received back by cable networks in the UK and around Europe a quarter of a second later.

As well as offering considerable potential for the development of further cable TV distribution, the Teleport will also be able to provide specialised communication services for London's business community, including video-conferencing and the new digital communications facilities.

Mobile satellite terminal

News events in remote places that previously could not be covered by existing television reporting systems, can now be captured with a new kind of electronic news gathering (ENG) unit developed by GEC McMichael Limited of Stoke Poges.

Named satellite news gathering (SNG), the equipment is a compact, transportable satellite terminal made small enough to be flown in a light private aircraft such as a Lear jet, or on scheduled air services.

The SNG terminal can be taken to any location accessible to this kind of air transport and set up and operated by a crew of two. Designed for robustness and reliability in operation, it comprises just two packages: an elliptical dish antenna and an electronics unit linked to it by cables.

Neither of these units, when packed in a flight box, is more than 1 metre high. The



whole terminal is powered by a 12 volt battery, or local mains if available.

Essentially the SNG terminal is a transmit-only uplink to communications satellites that work at 14 to 14.5GHz. From the satellites, the news pictures and sound are received at any broadcasting network centre on a larger fixed antenna.

However, although the SNG terminal is basically a transmit-only system, it does include a receiving facility for narrow-band audio signals. This enables production or engineering spoken instructions to be sent from the broadcaster's studio centre via the satellite to the SNG operating and reporting team.

This mast, from which radio broadcasts are beamed to all four islands in the group, is badly corroded, as are the radiating wires, insulators and even the location bolts themselves. The concrete counterbalance weights also need to be replaced.

An Incomtel engineer—with a foreman painter who will supervise locally recruited labour throughout—will fly to the islands as soon as confirmation that the vital spares, sent ahead by boat, have arrived.

Inspec at Electronica '84

Inspec is exhibiting its full range of information products and services at Electronica '84 in Munich from 13-17 November.

Visitors to the Inspec stand will be offered free online searches of the Inspec database, which currently contains in excess of 2.2 million records drawn from the world's leading technical publications.

Those unfamiliar with online searching will see how easy it is to find relevant information within minutes on all aspects of electronics, communications, computing, control engineering, information technology and physics.

Inspec is the Information Division of the Institution of Electrical Engineers, and provides information via a range of services to industrial, government, business and academic organisations throughout the world.

Basicode translator

Kuma Computers has developed the Basicode translator for MSX microcomputers in advance of the two new Radio Chip Shop series on Radios 1 and 4, to be presented by David Freeman and Barry Norman.

Now, all users who purchase one of the MSX micros currently appearing in the shops will be able to take advantage of the free software offered by the BBC for downloading every week.

'MSX is the first time we have been able to offer the Basicode facility for hardware in advance of it appearing in the shops', said Trevor Taylor, producer of the Chip Shop series.

Communication operators

The City and Guilds of London Institute has introduced a new scheme for Communication Operators. The syllabus, assessment and certificate have been introduced to satisfy a need for formal qualifications for the many thousands of people employed as operators in telecommunications both in the United Kingdom and overseas.

The qualification enables operators to prove their competence to a current or prospective employer, but will be equally attractive to experienced operators and to people who wish to enter employment in this field, particularly young people.

The scheme is in two parts, and certificates are awarded to successful candidates at each level. Normally a candidate should qualify at Part I before progressing to Part II.

Several components are available at each part, comprising academic studies, operating procedures, and operating skills (communication keyboard and/or Morse code transmission and reception). The assessment con-

sists of written tests and practical assessment.

The scheme permits candidates to qualify in additional, optional subjects to strengthen their qualification.

A number of colleges and other recognised training establishments are considering organising courses for assessment in 1985/6. Examinations may be held at any time.

Dolby digital sound

The Australian Broadcasting Corporation's TV and radio services via the AUSSAT satellite will use the new Dolby digital sound system, along with Plessey Scientific Atlanta's B-MAC (Multiplexed Analogue Component) transmission for the picture. The decision was announced on 13 September by the Australian Minister for Communications. It sets a standard for the future satellite transmissions in the country.

Australia is the first country to announce a firm decision in favour of the system. Practically all major American companies involved in satel-

lite broadcasting are also reported to be seriously interested and announcements of firm decisions are expected soon.

Various European Broadcasters, including the BBC and the IBA, are testing the Dolby digital system for its potential application in conventional terrestrial services.

Dolby Laboratories claim low cost, good quality sound even under bad reception conditions, as well as low and flexible bit-rates, as the main advantages of its system over conventional digital PCM systems.

Grand Camores radio

A major maintenance service contract has been awarded to Incomtel through its German-based associate by the Islands of Grand Camores, 400 miles off the coast of Mozambique.

Under this contract—placed by Gesellschaft fuer Technische Zusammenarbeit (GTZ) and funded by German aid—Incomtel will refurbish the 90 metre high radiator mast sited at Moroni, the capital of Grand Camores.

ATTENTION 10 METRE OPERATORS!

especially for the 10 Metre users who have converted CB rigs

The AKD 10 Metre Linear Amplifier

- ★ 25 Watts FM out for 4 Watts in
- ★ 50 Watts PEP on SSB
- ★ About 10 Watts out for ½ Watt in (13.8V)
- ★ Automatic RF sensing
- ★ Fully protected output
- ★ Relay switching employed
- ★ Requires nominal 12 volts @ 5 amps (15 volts maximum)
- ★ In-line fused
- ★ 2 year guarantee (including output device)
- ★ British made



£25.50
Incl VAT, p&p

10 Metre RF Switched, In-Line Pre-Amp.

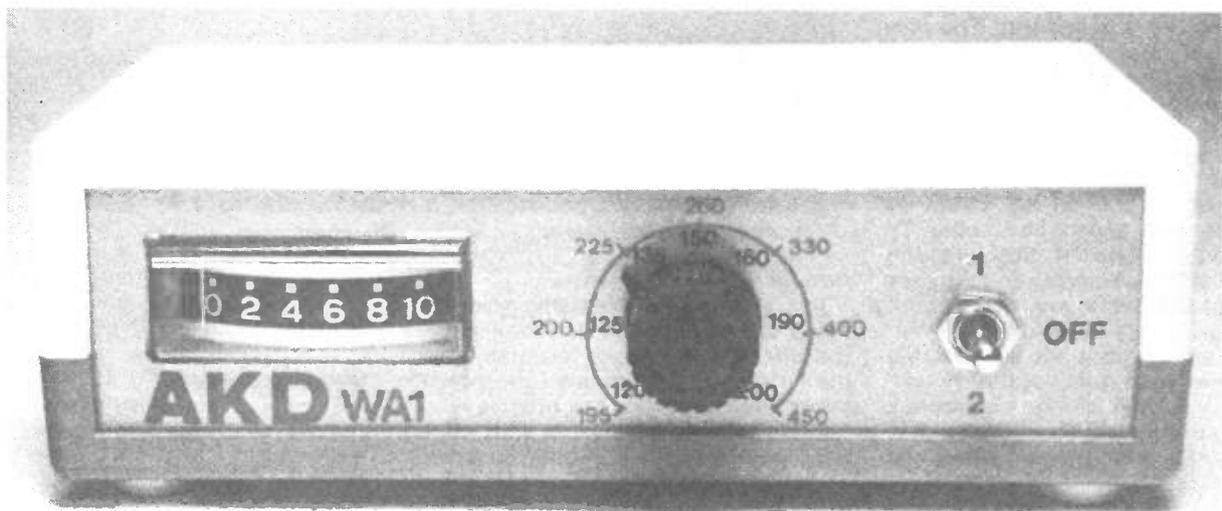
- ★ 3SK45 Dual Gate Fet, 15 dB gain
- ★ Fail safe, will handle 10 watts through power
- ★ 2 year guarantee



£14.50
Incl VAT, p&p

★★★★★

Also available, the AKD range of RF INTERFERENCE FILTERS – high performance, sleek appearance.
Used by British Telecom, Granada, ITT, Thorn-EMI and other prominent companies.



A WAVEMETER FOR VHF/UHF
The AKD WA1 Absorption Wave-meter covers 120-450 MHz in two ranges. It is extremely sensitive and comes complete with a small aerial. It requires a PP3 battery.
£24.95 inclusive of postage & VAT

Proprietor: J W Armstrong

Direct from the Manufacturer — or from your local Amateur Radio dealer.
Trade enquiries welcome

*** AKD * ARMSTRONG KIRKWOOD DEVELOPMENTS**
10 Willow Green, Grahame Park Estate, Hendon, London NW9 5GP

Tel:01-205 4704

CABLE TV

GOES

'ON THE AIR'

NIGEL CAWTHORNE G3TXF

Swindon Cable is the first of the eleven newly franchised cable companies to come on the air with multi-channel TV programmes. 'Transmissions' started in mid-September to a number of newly wired houses in Swindon.

The main difference between the new cable TV franchises and the older wired TV distribution networks is that the new franchises will be able to transmit through their cables a large number of programmes which originate from outside the immediate area, including satellite channels. Old wired TV systems were only allowed to retransmit the local BBC and IBA programmes.

As the percentage of the UK population covered by direct UHF transmissions has increased to over 99%, the need for the old-style wired TV distribution has become less and less. The new cable TV franchise services represent the start of a new era in TV broadcasting and home entertainment in the UK.

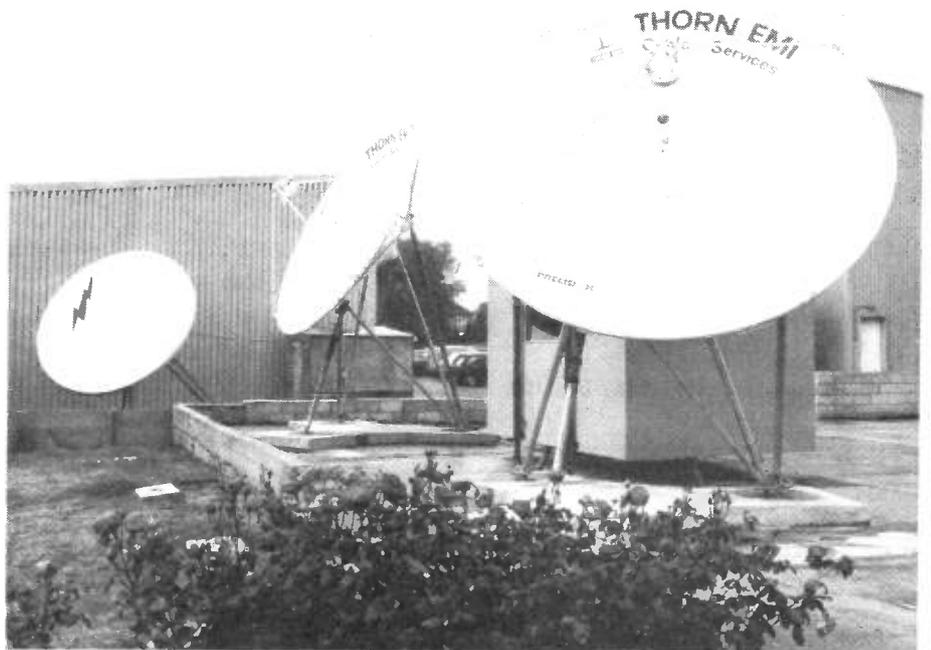
Bringing cable into the home

A coaxial cable has to be connected to the subscriber's house in order to receive the new broadband cable TV services. Installation of the Swindon system started this summer and they are hoping that the cable will 'pass' about 5,000 houses before the end of the year. The cable has to 'pass', or be available underground just outside the house, before a subscriber can be connected. The final connection from the underground coaxial cable running along just a few inches under the pavement is made only after the TV viewer has decided to become a 'subscriber' to the cable system.

Cable TV - how it works

The main difference between normal 'off-air' TV broadcast reception and the cable TV systems is that the cable viewer can receive many more programme channels than he would normally have access to directly 'off-air'. This includes the new satellite programmes.

To receive satellite programmes, the cable company sets up its own satellite receiving station (TVRO: Television Receive Only) and then feeds the programmes to the subscribing viewers



The satellite TV transmissions on ECS and Intelsat are received at this earth station. Downlink frequencies are around 11GHz

through their cable network.

The licences that are being granted to cable operators insist that they include the BBC and IBA's main programmes in their programme selection. The cable TV subscriber therefore can receive all his normal TV programmes as well as the additional satellite and other channels. The cable operators will also be able to offer BBC and IBA programmes from different regions. These programmes might normally not be receivable by the viewer directly, but the cable company, because it can take advantage of a well sited receiving station, can feed these programmes to their subscribers.

Six 'normal' channels

Swindon Cable, for example, are providing their viewers with programmes from three IBA regions: HTV, Central and TVS. These are in addition to the normal BBC1, BBC2 and Channel 4 programmes. These 'normal' channels account for only six of the thirteen channels being offered. The other seven

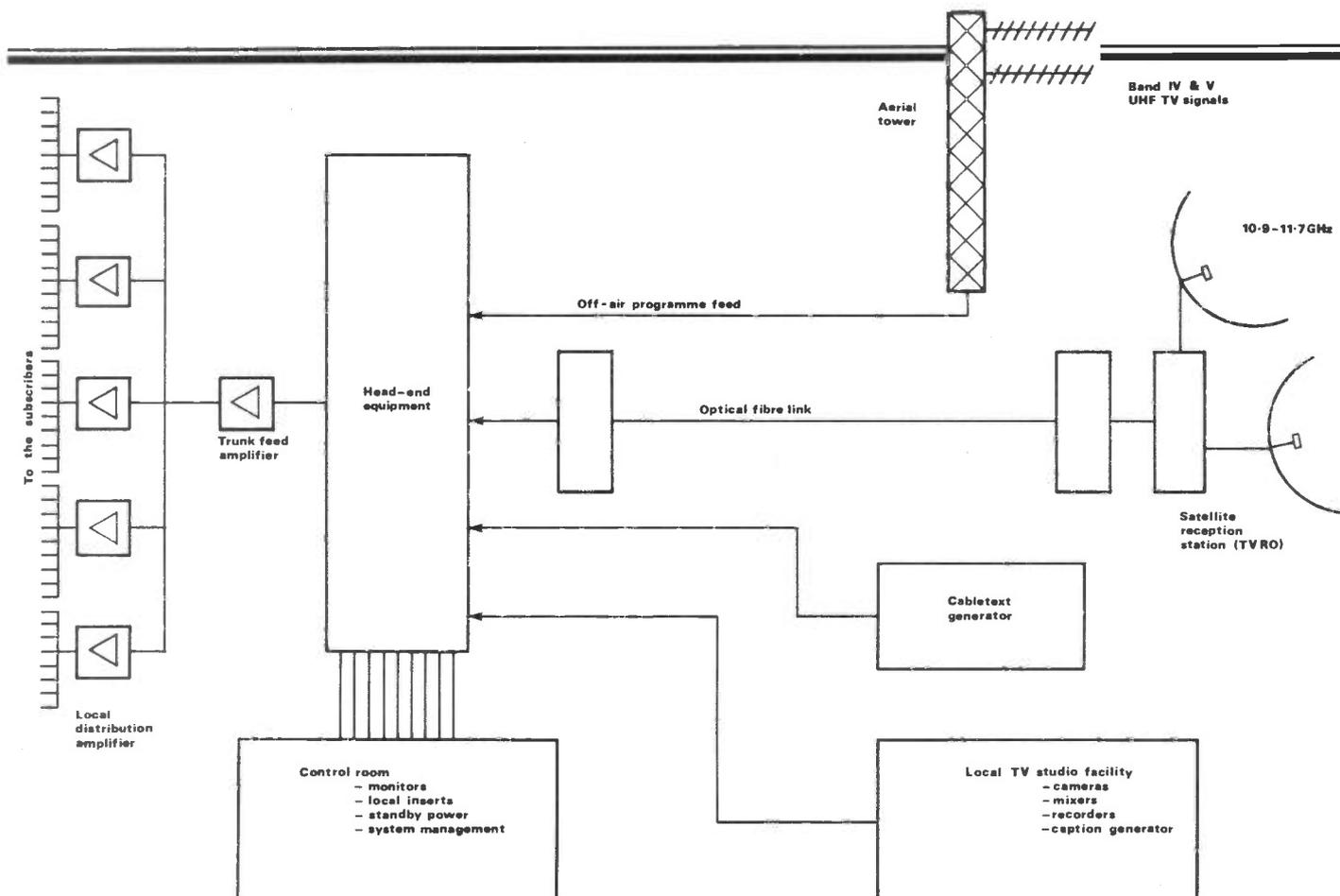
channels are a mixture of satellite channels, locally generated programmes and a 'cabletext' service.

Satellite signals

Signals transmitted from the programme satellites are received at an earth-station site 1.7 miles from the Swindon Cable headquarters. The satellite signals are demodulated down to 'base-band' video at the satellite receiving site. The video programmes are then fed to the headquarters building through fibre optic cables.

Reception of the satellite programmes is in the 10.9-11.7GHz cable TV distribution band. DBS or Direct Broadcast Satellite TV signals will be broadcast in the neighbouring frequency band of 11.7-12.5GHz. The satellite signals are not scrambled at present, and there is currently heated discussion within the industry concerning the encryption of satellite TV transmissions.

Cable TV has created a whole new vocabulary of jargon. 'Head-end' is one



A cable system

of these words. It simply means the point to which all the signals are brought before being sent down the cable to the subscribers.

Inputs to the head-end include the signals from the satellite channels, which arrive at the head-end from the TVRO site through fibre optic cables, and the standard UHF TV programmes, which are received off-air at the HQ building through an array of high-gain TV antennae mounted on a 65ft tower.

Other inputs to the head-end equipment include the cabletext data. This is transmitted in a similar way to Teletext. Subscribers having Teletext receivers will be able to 'page' the information. Those not having teletext receivers will get a scrolled synopsis of the 200 page databank. The Cabletext service includes pages of local information such as job vacancies, weather reports and

travel information.

In order to keep the information supplied on the Cabletext network as accurate as possible, some of the major information suppliers, such as British Rail, will have data input facilities within their own offices in order to speed-up the inputting of data. The Cabletext viewer will know that his train is late just as soon as BR does!

As well as the off-air channels, both from terrestrial TV and satellite, the cable companies will also be providing some of their own local programme material.

Local programmes

Housed within the headquarters building of Swindon Cable there will also be two studios (one of 1200sq ft and one of 450sq ft) which will include colour TV cameras, mixers, recorders and other

studio equipment necessary for small scale local news programmes as well as the production of local commercials.

Local programming will include a TV magazine programme as well as the occasional documentary and coverage of local special events such as general and local elections. It is the local TV element of the cable services that is one of their main selling points.

Control room

Swindon Cable's control room situated next to the head-end equipment monitors all the incoming signals as they are transmitted on to the subscribers. An impressive bank of over 30 TV monitor screens has been built. The scheme will eventually be expanded up to 32 channels as other satellite programmes become available.

Since the control room is the heart of the system, some stand-by power facilities have been included. Should a power failure occur at the headquarters building, the station expects that it can be back on the air within thirty seconds.

This facility obviously is only really necessary where any power cut is localised. If the area of the power cut included the cable TV subscribers as well, then having standby power at the control room would not serve any purpose anyway, since the viewers would be in darkness too!

Downlink frequencies for the satellite TV programmes that are currently available to cable TV operators

Programme	Satellite	Frequency/GHz
TEN	Intelsat V at 27.5° West	11.175
Screen Sport	Intelsat V at 27.5° West	11.135
Premiere	Intelsat V at 27.5° West	11.015
TV5, France	ECS - F1 at 13° East	11.492
SKY, UK	ECS - F1 at 13° East	11.650
Music Box	ECS - F1 at 13° East	11.674

CABLE TV

Eleven cable TV franchise operations have been authorised so far, and Swindon Cable, with the close backing of Thorn-EMI, has been the first of these to get on the air. Other areas are still planning operations. Apart from installing the head-end equipment, the most important part of the installation is getting the cable into the ground to bring the signals to the subscribers.

In order to be able to receive cable TV, a cable has to be brought right into the subscriber's house. The cable network starts at the head-end and runs out to the area to be served. The first areas to be wired are in the Freshbrook, Toothill and Westlea areas of Swindon.

The cable laying process involves digging a small trench along the pavement into which is put a number of 3in diameter plastic tubes. The coaxial cables are then pulled through the plastic tubes and connected up to the distribution amplifiers.

Bundles

The cables are pulled through in bundles of seven, wrapped together. The thickness of the cable that is brought into the subscriber's house is very similar to normal low-loss TV down-lead. The coax used for the customer feed in Swindon is the solid dielectric type, which is resistant to problems of moisture ingress.

A network of amplifiers and selectable attenuators is used to ensure that the correct level of signal is brought to each subscriber's house. A main trunk feed running from the headquarters building is used to supply signals to a number of

The first eleven interim cable TV franchise holders

Aberdeen
Belfast
Coventry
Croydon
Ealing
Glasgow (North)

Guildford
Liverpool (South)
Swindon
Westminster
Windsor

local amplifiers. These amplifiers are housed in small green coloured metal boxes (kiosks) on the sides of pavements. One kiosk can feed up to 100 houses.

Hard sell

Cable TV companies have to sell their product to would-be subscribers. The cable TV subscription charge depends on the number of programmes being provided, and there is a connection charge as well as the monthly subscription. The monthly subscription for the full service is £15 (this includes the Premiere film channel – which is one of the satellite channels).

Once the TV viewer has decided to become a subscriber, the cable is brought into his house from the pavement outside. When laying the cable, the cable company brings a 'cable end' under the pavement outside every house in the area being wired. It is only when the TV viewer becomes a subscriber that the cable end is brought into the house. This is one of the reasons why installing a cable TV system is such a major investment for the cable company.

At the time it is installing the cable underground, the cable company does not know for certain how many subscribers it will eventually have. Nevertheless the company needs to provide a cable-end in front of every house in the area, just in case the occupants do decide to become subscribers. It is argued that it is cheaper to bring a cable end to the outside of every house in the area, whether it will be used or not, than to run a cable individually under the pavement every time that a new subscriber is signed up.

The cable 'switch'

Swindon Cable are deliberately doing their cable installation in two phases. The first phase will be using classical cable TV techniques whereby the switching of the required programme takes place within the subscriber's home, for which there will be a small control box on top of the existing TV set.

However, in the second phase a new microprocessor controlled cable switch will be installed away from the subscriber's home. This switch, which is currently being designed and tested by Thorn-EMI, will be able to handle up to 100 homes. The subscriber will have a small microprocessor controlled programme selection unit within his home. Commands sent from here will travel back to the switch unit which will be housed in the pavement-side kiosks.

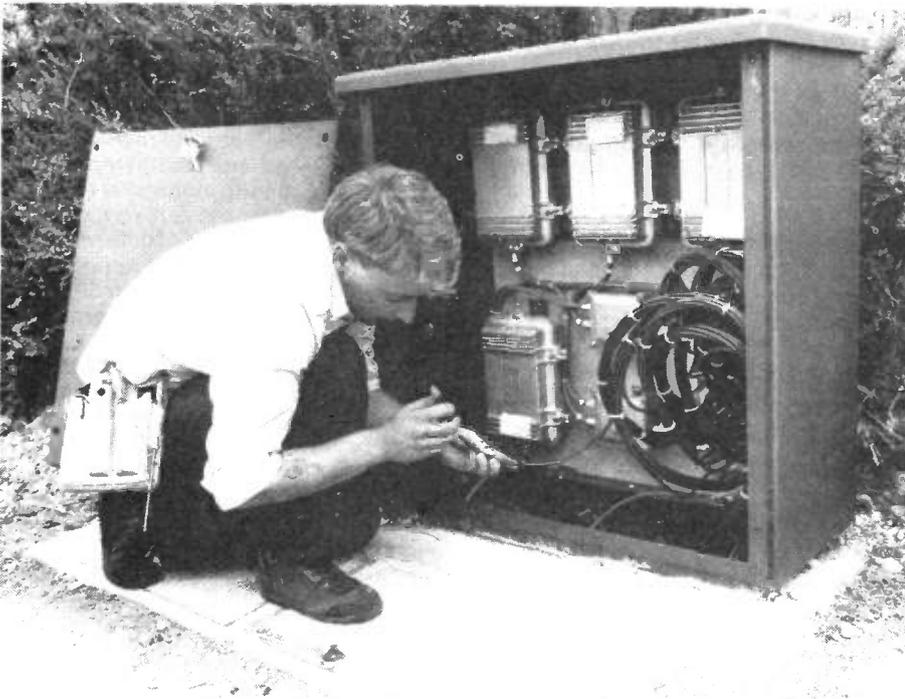
The eventual introduction of the new switches will also mean that the system will become 'interactive'; the viewer will then be able to communicate directly back to the control room and beyond from his armchair. It is this two-way flow of information that represents one of the most exciting opportunities being created by the new cable TV systems.

Interactive services

It is in the area of the possible interactive services that the new cable TV systems will eventually develop into much more than a multi-channelled version of the classical 'goggle box'! Viewers, through the interactive system, will be able to communicate with local companies and business services.

Swindon Cable is in negotiating with banking organisations so that a home-banking service can be provided for their subscribers, and shopping through the TV will be a reality in the not-too-distant

A pavement housing (kiosk) for distribution amplifiers. The cable switches will also be housed in this type of cabinet





Swindon Cable control room

past all these houses is in the order of £15 million. In addition to the cable installation work, Swindon Cable will also be spending £250,000 on their new studio facilities.

Cable TV has arrived

The first eleven cable TV franchises which will be operating under licences granted by the Home Office are listed in the table, and many more are expected to apply for permission to operate new cable TV networks. Some existing cable networks will be up-graded to provide the new services.

The government has set up a new body called The Cable Authority, which will be setting standards and overseeing the activities of the private cable TV companies in a manner similar to the IBA and the independent television companies.

If a cable TV company is about to operate in your area you can soon expect to be seeing small teams of workmen digging up pavements and laying plastic pipes, followed some days later by other teams of workmen with drums of coaxial cable that they are pulling through the plastic underground ducting. If this is happening near you, then you know that cable TV is coming, for better or for worse!

future. The key piece of engineering equipment for these interactive services is the cable switch and central computer. Only when these are installed will the subscribers be able to 'talk back'. Swindon Cable expect to be installing the switches during the course of 1985.

Low market penetration would mean lots of loose unused cable ends! Estimates vary as to how many houses in a

given area will be willing to pay the extra for having cable TV brought into their house.

Many of the current estimates do not greatly exceed 50%, which would mean that up to half of the cable-ends laid will never be connected to anything!

The franchise that Swindon Cable has covers 53,000 homes. The total investment required in order to bring a cable

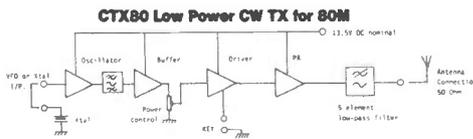
C M HOWES COMMUNICATIONS

EASY TO BUILD KITS BY MAIL ORDER

139 Highview
Vigo, Meopham
Kent DA13 0UT
England
Fairseat (0732) 823129

Enjoy the fun and satisfaction of "home-brew" equipment with one of our kits. All HOWES Kits come complete with a good quality fibre-glass printed circuit board that is drilled and tinned. The part locations are screen printed on the board for easy assembly. All board mounted components are supplied, as are full clear instructions. Our kits are designed so that even a novice constructor will meet with success. Choose a worthwhile winter project from our expanding range:-

NEW



The HOWES CTX80 is a simple, easy to build low power transmitter for the 80 Meter amateur band. The CTX80 is crystal controlled, but has provision for connection of an external VFO. One crystal is included in the kit. The CTX80 kit contains all you need to get on 80M CW— apart from an antenna, Morse key and receiver, how about using it with our DcRx 80M Direct Conversion Receiver?

Brief Details

- ★ Fully adjustable output power up to about 5W RF output.
- ★ 5 element LC lowpass output filter.
- ★ Key click suppression built in.
- ★ Crystal supplied with kit.
- ★ Provision for 3 crystals on the PCB
- ★ Provision for external VFO
- ★ Provision for adding AM modulator
- ★ 4 transistors
- ★ Only one coil to align
- ★ Nominal 13.5V DC operation
- ★ PCB size: 5 by 2 inches (128 by 51mm)

CTX 80 KR £12.95. Not yet available in assembled form.

DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVER.

The DcRx is our very popular single band receiver. Hundreds of these kits have been sold to both beginners and experienced amateurs. Use it with our CTX80 transmitter to make a simple low power station that is fun to use for holidays and portable use as well as for the QRP home station. Three versions of this receiver are available, one covers the 20 or 30M band, one covers 80M, and a new version covers 160M (Top Band). The kit includes ready-wound coils and is intended to be suitable for the first time builder. If you do ever have a problem with the kit, we have a fixed price repair and calibration service. The DcRx will drive a loudspeaker or headphones, and operates from a 12V battery or power supply. A case and two tuning capacitors are the only major parts to add to finish your receiver. We have suitable capacitors at £1.50 each while stocks last (These are not suitable for the 160M version which requires larger value items).

DcRx KR £14.80 Assembled PCB module £19.90. PLEASE STATE WHICH BAND YOU REQUIRE

The HOWES CM2 is an easy to build, versatile, microphone unit. The kit builds into a high quality desk microphone or small mobile microphone unit for "hands free" operation in the car. The kit contains an electret condenser microphone capsule capable of very good audio quality, and an easily assembled preamp unit that incorporates a Plessey "VOGAD" chip for automatic control of modulation levels. You can speak loudly or softly, close to, or further away from the mic and full modulation level is automatically maintained.

The CM2 has an on-board voltage regulator, so that the unit can work from 8 to 14V DC. There is a miniature relay incorporated in the design for transmit/receive switching of the associated transceiver, yet the total current consumed by the unit is only about 30mA from a 9V battery. The quality of the audio produced by the HOWES CM2 has been favourably compared over the air with some of the most expensive mics on the market. It is ideal for both FM and SSB, CB and Amateur use. A bass roll-off option is included that helps keep down low frequency bumps, thumps and car noise when used under mobile conditions. You could easily build this unit into a small case for dash or sun-visor mounting in the car, with a remote transmit switch mounted on the gear stick. The facility for remote transmit/receive switching is built into the CM2.

Like our very popular AP3 speech processor, with which the CM2 shares some common circuitry, there is no need for a separate on/off switch. The unit only draws current when in the transmit mode, so ensuring good battery life. The circuit board is fairly small to enable it to be built into a compact case, but we have been careful in our design to ensure that it is not at all fiddly to build as a result.

This kit is suitable for the novice constructor, no test equipment is required and there is only one easy adjustment to make to set the output level to suit your radio. In terms of performance and audio quality, the HOWES CM2 Communications microphone kit must offer some of the best value on the market. We anticipate a big demand for this kit and have priced it accordingly. There must be a place for a "hands free" quality microphone in your shack or car.

CM2 KR £10.25. Assembled PCB module + Mic capsule £13.75.

XM1 mk2 Our super crystal calibrator with EIGHT output marker intervals. Built in voltage regulator, and ident facility. Very handy around the shack, as well as keeping you "legal"!

XM1 mk2 KR £16.80. Assembled PCB module £21.30.
AP3 AUTOMATIC SPEECH PROCESSOR. This item is very well known on the air, over 1000 units sold, as described by G4KQH in the September 83 issue of "Ham Radio Today". Add some extra "punch" to your signal and "get out" that bit better. AP3 KR £15.90. Assembled PCB module £21.40.

ST2 CW SIDE-TONE or PRACTICE OSCILLATOR. The ST2 provides a nice sounding note for monitoring your sending or Morse practice. Approx 1W output at 800Hz into an 8 Ohm load. 12V operation. Direct connection to your key, or the ST2 will work by RF sensing on rigs of as little as 1/2W on the HF bands. A volume control is included with the kit. KR £7.30. Assembled PCB module £10.80.

If you would like more information on any kit, simply drop us a line, enclosing an SAE. We have an information sheet on each product.

73 from Dave G4KQH, Technical Manager.

SPEECH PROCESSOR

IMPROVE YOUR TALK POWER

WITH THIS SIMPLE PROJECT

AP DEAN

A speech processor is probably the most useful accessory for the amateur transmitting station. It improves the station's 'talk power', allowing greater distances to be covered with the same transmitter output.

The circuit described below performs very well considering its simplicity, and can be built for around £3 (excluding case).

Principle of operation

Consider the speech waveform in *Figure 1a*. If this signal is fed to a correctly adjusted transmitter the largest peaks of the signal will give 100% modulation, and so the transmitter is only fully modulated for a very small period, which does not make full use of the transmitter's power.

In *Figure 1b* the speech waveform has been amplified and the peaks clipped, resulting in a waveform which is more constant in amplitude.

This allows more of the signal to fully modulate the transmitter, giving a higher average modulation level and thus increasing the effectiveness of the transmitter.

Obviously the process of clipping produces harmonics, which if not adequately filtered would greatly increase

the transmitter's bandwidth and cause 'splatter'.

Circuit description

The circuit diagram of the processor is shown in *Figure 2*. The microphone signal is amplified by IC1a and IC1b. D1 and D2 clip off any part of the signal which is greater than 700mV. The gain of the amplifier and hence the degree of clipping is set by RV1. The clipped waveform is filtered by IC1c, which is a standard low-pass filter of slope 12dB/octave and frequency 3KHz, and attenuated back to microphone level by R11/R12.

Capacitors C2-C6 provide a high-pass characteristic to the amplifier, attenuating signals below 300Hz to prevent breath effects, etc, from reaching the transmitter.

The circuit is powered by two PP3 batteries; however, if a single supply is preferred it should be quite simple to modify the circuit without affecting the performance.

Construction

None of the component values are critical, and IC1 may be almost any quad op-amp: suggested types are TL074, TL084, LM348 and LM349.

All components except SW1 and RV1 can be mounted on Veroboard, and the board should be mounted in a metal box to screen the circuit from both 50Hz pick-up and RF.

IC1a and IC1b have a maximum overall gain of approximately 500, therefore reasonable care should be taken with layout to avoid instability.

The pin connections for the microphone and transmitter have not been shown, since this obviously depends on the actual microphone used. It is important, however, to link through all other pins on the plug/socket to ensure that the push-to-talk still operates.

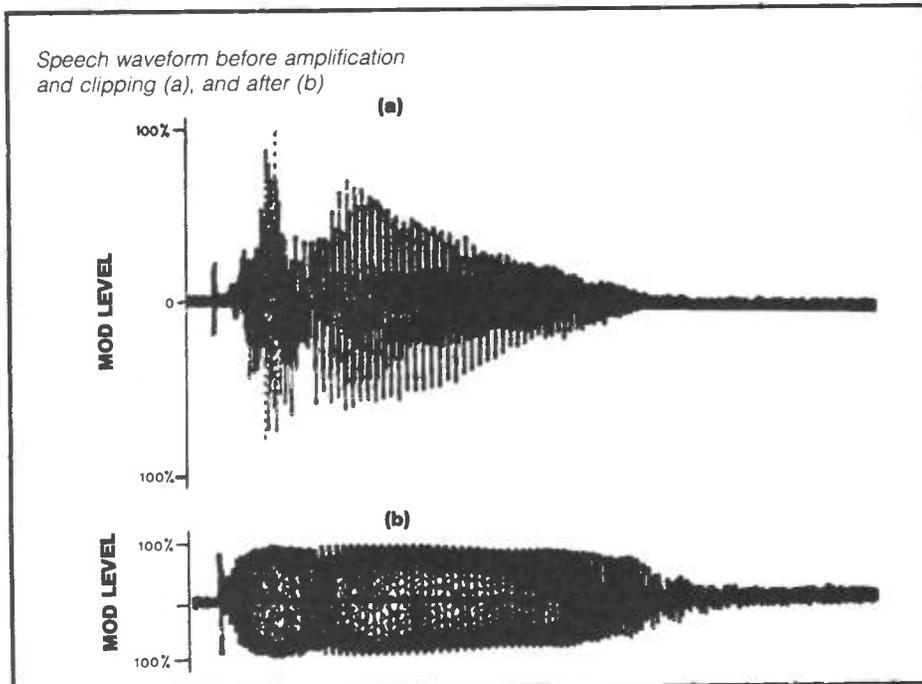
Operation

The speech processor should be connected between the microphone and transmitter, and RV1 adjusted for the required clipping level.

The setting is best found by trial and error whilst in contact with a distant station (the processor should not be needed for working local stations!).

The output level of the processor may require adjustment to suit the microphone's sensitivity, and this can be done by changing the value of R11.

Note: since the power dissipated in the PA stage of an SSB transmitter is dependent on the average modulation level, it is advisable to check whether the transmitter can cope with the increased modulation level achieved by using the processor (most commercial sets should handle this easily).



Components list

Resistors

R1, 9, 10	47K
R2	150K
R3, 5	10K
R4	330K
R6	68K
R7	1M
R8	15K
R11	56K
R12	560R

Capacitors

C1, 8, 9	1nF
C2, 4, 6, 7	10nF
C3, 5	47nF
C10	470pF
C11, 12, 13	100nF

Semiconductors

IC1	LM348 or similar
D1, 2	1N4148 or similar

Switch

SW1	4-pole c/o toggle
-----	-------------------

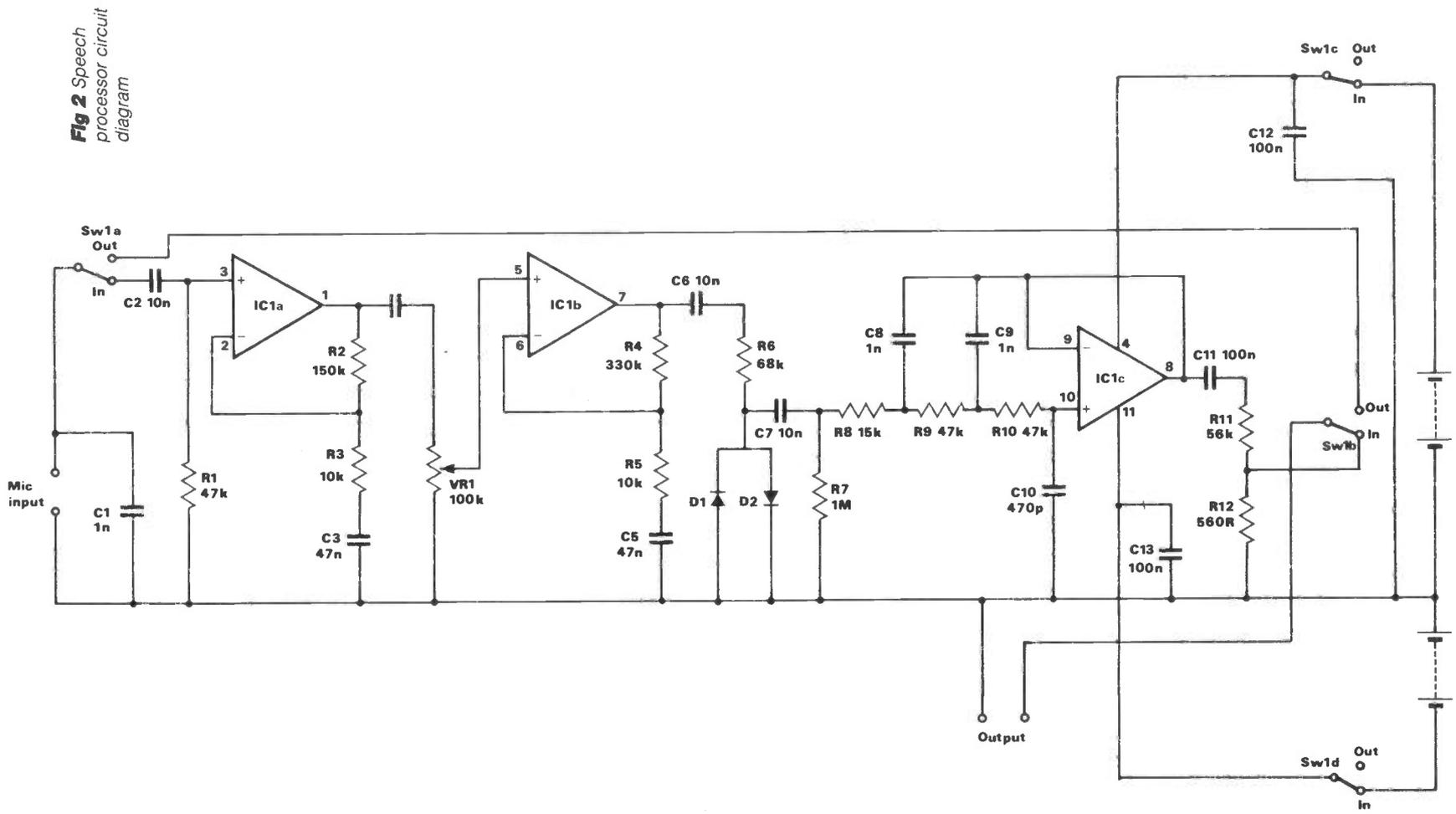


Fig 2 Speech processor circuit diagram

UoSAT-2

TELEMETRY ON THE BBC MICRO

TERRY WEATHERLEY G3WDT

UoSAT-2 was launched together with LANDSAT-5 on 1st March 1984. Following a perfect launch, the spacecraft shut down its telemetry beacon after three orbits, leaving the ground command station with a problem.

After some ten weeks of silence the command station managed to reactivate the beacon, and at present this can be heard strongly in the UK on 145.825MHz during the morning and evening passes. Similar in design to UoSAT-1, the

spacecraft was built and interfaced to the launch vehicle by a team of engineers at the University of Surrey in five months: no mean achievement.

Communication with the ground is achieved through the two beacon signals transmitted on 145.825 or 435.025MHz. The FM signals are designed to be received on simple FM equipment, and feedback from stations receiving UoSAT-1 led the team to increase the deviation of the signal to make it less

susceptible to ground generated noise.

To the ear the 1200 baud telemetry sounds the same as that from UoSAT-1, but there is one important difference. The tones used to represent the '0's and '1's are interchanged. It is this interchange which makes possible the decoding of the signals by a BBC computer without the need of an interface. The telemetry signal sounds like a computer program, so it ought to be possible to input it to the computer via the cassette input. Unfortunately things are never as simple as that.

The BBC computer expects programs in 'block' format to be coming in through the cassette port, not telemetry, and if it does not find the required checksum it generates an error. Furthermore, the data coming in through the port is not displayed on the screen.

Complex

The Advanced User Guide explains the complex way in which the cassette is read, and also explains that the ULA chip needs the data to be at 300 baud for it to work; thus the 6850 must convert the 300 baud clock into a 1200 baud clock. This can be achieved by software division of bits in the 6850 control register.

At about this time the BBC began to broadcast software in 'Basicode'; in this format data was read in from the cassette port as if it were coming from the keyboard. This was achieved using a software program supplied on cassette.

Here, then, was something to experiment with. The UoSAT-2 signals could be recorded and then played back through the cassette port.

This method certainly worked, *but*, and it is a big but, if any ASCII character was interpreted as a control code this code was executed by the computer. This led to unpredictable mode and colour changes and sometimes complete breakdown.

A partial cure was achieved by trapping the control codes and replacing them with a dummy character, but the real breakthrough came when Trevor Stockhill (G4GPQ), first through *Oscar News* and later in a University of Surrey newsletter, provided BBC users with a suitable program. This produced excellent results, and is listed.

Record

It is best to record the UoSAT-2 data and then to replay it through the computer, since this avoids the problem of the computer putting noise onto the signal. It also enables the data to be outputted to a printer with more success, since the printer is usually slower than the 1200 baud signal.

The first indication that the telemetry is being decoded is the appearance on the screen of the satellite identifier:

UoSAT-2 8405174112923

followed by a block of data (left).

UoSAT - telemetry decoded on the BBC

```
!UOSAT-2      0004260232630
001045014173022110340BF040004050005060006070007080008090009
10514111346112000313066214234015351316181F17586D186690195973
20380921186C22659AR3000124001725000726100527669C28498F295385
3!522631040632285E33591D34000735277436337237452738504A395249
40774041122442642643067644168F45000146000247513448530A495008
5063885!099452683A!3310454666755000056000357521458516F59517F
608368615BD4621F0A633240644402651D0F66C00C67000168000E69000F
!UOSAT-2      0004260232634
00108901415102211003409E040004050005060006070007080008090009
10514111346112000313066214234015351316181F17585E18669 15973
20369E21189322659A23000124001725000726100527668D284952295385
30522631040632285E33596A34000735278B36338D37452738504A395249
40774041122442642643067644168F45000146000247513448530A495008
5064075!099452684D53286A5467005500056000357521458516F59517F
608368615BD4621F0A633240644402651D0!C00C67000168000E69000F
!UOSAT-2      0004260232639
001111014140022101034106040004050005060006070007080008090009
10514111346112000313066214237315351316181F17585E186690195962
20358C21188222659A230001240017250007261005276672284925295381
30522631040632285E33585B34000735278B36338D37452738504A395249
40774041!224$264264$07644!68F$%001460802$7513448130A49508
5064255!09942!85C53308D54667150005400357521458516F59517F
608368615BD*621F0A63324064440261D0F66C00C67000168000E9000F
!UD!AT2      0004260232644
0011440141260220990341174004050005060008700007080008!90009
10=Y411!0vfs7! !27!Kw!J!wE!x6690195962
2034722118'D22659A230001240017250007"61002'666328489F29585
305226310462286D33586B3400075278B36338DE7Z!"7854%35249
4077*041122442638B4332644168F41000146000247513448530A495008
%0642!1103652685C5339F54799%00056003575214%16F59517F
6083686!5BD4621F8263324064440265!D0F66C00!700018000E6900F
!UOSAT-2      00042&023"649
0011880!410402209903$1240400040100050600060"007080008090009
10514111346112000313067314217115348B1617981758E186690195962
20336421189322659A2300012400172500072610052766502848621538
30522631040632286D3E586B3400735278B36!37452738504A395249
40774041122442638B43320644168F45000146000247513448530A495008
50644351104152!85C533140%467005500005600035752145816F59517F
683B615!D4621F82633240644402651D0F66!00C67000168000E69"00F
!UOSAT-2      0004260232654
```

```

>L.
 5 REM UOSAT-2 ON THE BEEB
 6 REM T.STOCKHILL G4GPQ-AMSAT-UK
10 MODE3
20 ON ERROR GOTO 340
30 DIM CODE%100
40 FOR PASS%=0 TO 2 STEP 2
50 P%=CODE%
60 [OPT PASS%
70 .start JSR &FFE0
80 BCC chaok
90 CMP #&1B
100 BEQ error
110 JMP start
120 .chaok AND #&7F
130 CMP #&0D
140 BEQ print
150 CMP #&0A
160 BEQ exit
170 CMP #&1F
180 BPL print
190 LDA #&7C
200 .print JSR &FFE3
210 .exit JMP start
220 .error LDA #&7E
230 JMP &FFF4
240 ]
250 NEXT PASS%
260 ★FX205,64
270 ★FX7,3
280 ★FX156,3,252
290 ★FX156,2,252
300 ★MOTOR1
310 ★FX2,1
320 ★FX156,1,252
330 CALL start
340 ★FX2,0
350 ★MOTOR0
360 ★FX156,2,252
370 ★FX205,0

```

★ = asterisk

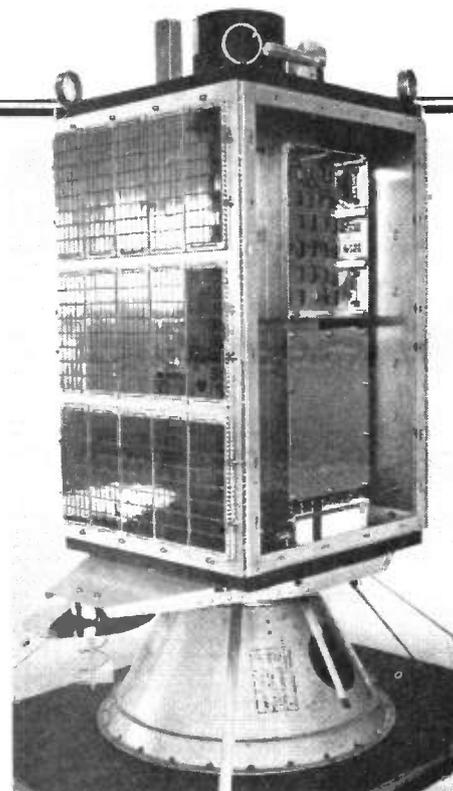
The series of figures following 'UoSAT-2' is the date/time in the format YYMMDDWHHMMSS where the W is the day number. The example above decodes as 11hrs 29mins 23secs on Wednesday 17th May 1984. At the time of writing the clock is not correct.

The data block consists of a channel number, value and check digit. Channels 1 to 59 can be identified and decoded using the information in the table overleaf. Channels 60-67 give the status

points when further decoded.

The check digit is a useful addition since it can give some indication as to whether the channel has been received correctly. The 'book' says it can be used by "exclusive-or'ing the binary (0-15) value of all six characters in each channel (2 identifiers, 3 data and 1 checksum). A non-zero result indicates that the channel has been corrupted in transmission."

The digits are of course in HEX.



Harold Meerza came up with a rule of thumb method to use the checksum. Take the first 5 characters and list the binary equivalents; eg for channel 61 the figures are 615BC. List them as binary numbers:

```

6=0110
1=0001
5=0101
B=1011
C=1100

```

Next sum each column *but do not carry*; eg 0+1+1+0=0. The total for the example is 0101.

Convert back to HEX. This equals 5. If the check digit is 5 then the copy could be error free.

To convert channels 60-67 to status points write down the three characters giving the value of each channel in succession:

```

60800, 615BC5, 62800, etc.
8005BC800 etc.

```

Change to binary as before:
1000000000001011011100...

These then are the status points as given overleaf. The first '1' shows that the 145MHz beacon is on, for example.

Thus UoSAT-2, together with the BBC computer, opens up the exciting world of spacecraft telemetry to all.

References

The Advanced User Guide, Bray, Dickens & Holmes.
Oscar News, AMSAT-UK.
University of Surrey Newsletter

AMSAT-UK is a voluntary organisation for all interested in satellites. Further details can be obtained by sending an SAE to AMSAT-UK, 94 Herongate Road, Wanstead Park, London E12.

UoSAT-2 TELEMETRY

UoSAT-2 Telemetry Calibration Equations

Chan no.	Name	Equation	Chan no.	Name	Equation
00	Solar array current -Y	$I=1.9(516-N)$ mA	31	-10V line current	$I=0.48N$ mA
01	Nav mag X axis	$H=(0.1485N-68)$ uT	32	PCH voltage -10V	$V=0.036N$ V
02	Nav mag Z axis	$H=(0.1523N-69.3)$ uT	33	1002 comp curr (+10V)	$I=0.21N$ mA
03	Nav mag Y axis	$H=(0.1507N-69)$ uT	34	Digitalizer current (+5V)	$I=0.13N$ mA (N<500)
04	Sun sensor no. 1		35	145MHz beacon power O/P	$P=(2.5N - 275)$ mW (N>200)
05	Sun sensor no. 2		36	145MHz beacon current	$I=0.22N$ mA
06	Sun sensor no. 3		37	145MHz beacon temp	$T=(480-N)/5$ C
07	Sun sensor no. 4		38	Command decoder temp (+Y)	$T=(480-N)/5$ C
08	Sun sensor no. 5		39	Telemetry temp (+X)	$T=(480-N)/5$ C
09	Sun sensor no. 6		40	Solar array voltage (+30V)	$V=(0.1N-51.6)$ V
10	Solar array current +Y	$I=1.9(516-N)$ mA	41	+5V line current	$I=0.97N$ mA
11	Nav mag (Wing) temp	$T=(330-N)/3.45$ C	42	PCH voltage +5V	$V=0.0084N$ V
12	Horizon sensor		43	DSR current (+5V)	$I=0.21N$ mA (n<500)
13	Spare (tbd)		44	Command RX current	$I=0.44N$ mA
14	DCE RAMUNIT current	$I=(N-70.4)/6.7$ mA	45	435MHz beacon power O/P	$P=(2.5N-200)$ mW N>175
15	DCE CPU current	$I=(N-187.1)/2.0$ mA	46	435MHz beacon current	$I=0.44N$ mA
16	DCE GMEM current	$I=(N-121.3)/2.1$ mA	47	435MHz beacon temp	$T=(480-N)/5$ C
17	Facet temp +X	$T=(480-N)/5$ C	48	P/W temp (-X)	$T=(480-N)/5$ C
18	Facet temp +Y	$T=(480-N)/5$ C	49	BCR temp (-Y)	$T=(480-N)/5$ C
19	Facet temp +Z	$T=(480-N)/5$ C	50	Battery charge/dischg curr	$I=8.8(N-513)$ mA
20	Solar array current -X	$I=1.9(516-N)$ mA	51	+14V line current	$I=5N$ mA
21	+10V line current	$I=0.97N$ mA	52	Battery voltage (+14V)	$V=0.021N$ V
22	PCH voltage +10V	$V=0.015N$ V	53	Battery cell volts (MUX)	See below
23	P/W logic current (+5V)	$I=0.14$ (N<500)	54	Telemetry current (+10V)	$I=0.20N$ mA
24	P/W Geiger current (+14V)	$I=0.21N$ mA	55	2.4GHz beacon power O/P	$P=((N+50)**2)/480$ mW
25	P/W Elec sp.curr (+10V)	$I=0.096N$ mA	56	2.4GHz beacon current	$I=0.45N$ mA
26	P/W Elec sp.curr (-10V)	$I=0.093$ mA	57	Battery temp	$T=(480-N)/5$ C
27	Facet temp -X	$T=(480-N)/5$ C	58	2.4GHz beacon temp	$T=(480-N)/5$ C
28	Facet temp -Y	$T=(480-N)/5$ C	59	CCD imager temp	$T=(480-N)/5$ C
29	Facet temp -Z	$T=(480-N)/5$ C	60-67	Status points 1-96	
30	Solar array current +X	$I=1.9(516-N)$ mA			

Multiplexed Battery Scheme (channel 53)

Six consecutive TLM frames will carry the total volts, the following ten frames will be individual cells, starting with cell no. 10. Each cell has its own equation. The calibrations will be supplied later.

UoSAT-2 Status Points

Telemetry Frame No.	No.	Item	State	Telemetry Frame No.	No.	Item	State
60 (MSB)	1	145 MHz General Beacon power	Off/On	64 (MSB)	49	Engineering data	Bit 1
60	2	435 MHz Engineering Beacon power	Off/On	64	50	Engineering data	Bit 2
60	3	2401 MHz Engineering Beacon power	Off/On	64	51	Engineering data	Bit 3
60	4	Telemetry channel mode select	Run/Dwell	64	52	Engineering data	Bit 4
60	5	Telemetry channel dwell address load	Off/On	64	53	Engineering data	Bit 5
60	6	Telemetry channel dwell address source	Gnd/Computer	64	54	Command Watchdog	Disable/Enable
60	7	Primary Spacecraft Computer power	Off/On	64	55	Command Watchdog reset	0/1
60	8	Primary Spacecraft Computer error count	Bit 1	64	56	145 MHz beacon data select	A
60	9	Primary Spacecraft Computer error count	Bit 2	64	57	145 MHz beacon data select	B
60	10	Primary Spacecraft Computer bootstrap	PRON/UART	64	58	145 MHz beacon data select	C
60	11	Primary Spacecraft Computer error count	Bit 3	64	59	145 MHz beacon data select	D
60 (LSB)	12	Primary Spacecraft Computer bootstrap	A/B	64 (LSB)	60	145 MHz beacon data select	E
61 (MSB)	13	Gravity gradient boom deployment pyros	Safe/Arm	65 (MSB)	61	145 MHz beacon data select	F
61	14	Gravity gradient boom deployment pyros	Hold/Fire	65	62	145 MHz beacon data rate	A
61	15	Gravity gradient boom deployment	Safe/Arm	65	63	145 MHz beacon data rate	B
61	16	Gravity gradient boom deployment	Hold/Deploy	65	64	435 MHz beacon data rate	A
61	17	Gravity gradient boom deployment	Extend/Retract	65	65	435 MHz beacon data rate	B
61	18	Attitude Control Magnetorquers	Safe/Arm	65	66	435 MHz beacon data rate	C
61	19	Attitude Control Magnetorquer -X	On/Off	65	67	Particle / Wavecounter control	Count/Reset
61	20	Attitude Control Magnetorquer -Y	On/Off	65	68	Beacon lockout latch	Enable/Disable
61	21	Attitude Control Magnetorquer -Z	On/Off	65	69	Engineering data	Bit 6
61	22	Attitude Control Magnetorquer	Reverse/Forward	65	70	Engineering data	Bit 7
61	23	435 MHz PSK mode	NRZ1/NRZIC	65	71	Engineering data	Bit 8
61 (LSB)	24	2401 MHz PSK mode	NRZ1/NRZIC	65 (LSB)	72	Engineering data	Bit 9
62 (MSB)	25	Attitude Control Magnetorquers	High/Low power	66 (MSB)	73	P/W channel plate control	Bit 0
62	26	Digitalizer expt. power	Off/On	66	74	P/W channel plate control	Bit 1
62	27	CCD Camera expt. power	Off/On	66	75	P/W channel plate control	Bit 2
62	28	CCD Camera expt. integration period	Bit 0	66	76	Space Dust (MSB)	
62	29	CCD Camera expt. integration period	Bit 1	66	77	Space Dust	
62	30	CCD Camera expt. video amp gain	Bit 0	66	78	Space Dust	
62	31	CCD Camera expt. video amp gain	Bit 1	66	79	Space Dust	
62	32	DSR power	Off/On	66	80	Space Dust	
62	33	DSR mode	Read/Write	66	81	Space Dust	
62	34	DSR mode	Run/Reset	66	82	Space Dust	
62	35	Radiation Detectors Geiger-A EHT power	Off/On	66	83	Space Dust (LSB)	
62 (LSB)	36	Radiation Detectors Geiger-B EHT power	Off/On	66 (LSB)	84	DSR write cycle complete	
63 (MSB)	37	Radiation Detectors Geiger-C EHT power	Off/On	67 (MSB)	85	1002 CMD output	
63	38	Electron Spectrometer sensor EHT power	Off/On	67	86	1002 Telemetry port (MSB)	
63	39	DCE expt. power	Off/On	67	87	1002 Telemetry port	
63	40	DCE expt.	Reset/Run	67	88	1002 Telemetry port	
63	41	DCE expt. PROM select	A/B	67	89	1002 Telemetry port	
63	42	DCE expt. CPU clock rate select	0.9/1.8 MHz	67	90	1002 Telemetry port	
63	43	Navigation Magnetometer power	Off/On	67	91	1002 Telemetry port	
63	44	Space Dust experiment power	Off/On	67	92	1002 Telemetry port	
63	45	Status calibrate		67	93	1002 Telemetry port	
63	46	BCR status	0/1	67	94	1002 Telemetry port	
63	47	435 MHz beacon modulation select	AFSK/PSK	67	95	1002 Telemetry port	
63 (LSB)	48	2401 MHz beacon modulation select	AFSK/PSK	67 (LSB)	96	1002 Telemetry port (LSB)	

The 'engineering data' bits contain the internal status of certain modules and are unlikely to be of general interest.

GAREX THE SCANNER SPECIALISTS WITH 4 GREAT PRODUCTS

J.I.L.SX-200-N - THE SUPERIOR SCANNER

- ★ The choice of the professionals
 - ★ AM + FM all bands
 - ★ Wide coverage: 26-88, 108-180, 380-514MHz
 - ★ 16 memories ★ Positive action keyboard
 - ★ Proven reliability ★ 12v DC & 230v AC
 - ★ **S-meter & 96-108MHz converter available**
- £299**

REVCO RS-2000-E - THE VERSATILE SCANNER

- ★ 70 memories ★ AM + FM all bands
 - ★ Covers: 60-180, 380-520MHz
 - ★ Search & store of active channels
 - ★ All the usual search & scan functions
 - ★ 12v DC & 230v AC operation
 - ★ Counts activity of selected channel
- £259**

REVCO RS-160 - FM POCKET SCANNER

- ★ Incredible 160 memories (4 banks of 40)
 - ★ Positive action keyboard
 - ★ Covers 26-32, 68-88, 138-176, 380-512MHz
 - ★ Scans, searches & stores active frequencies
 - ★ With nicads, charger & flexiwhip aerial
- £249**

J.I.L. SX-400 - PROFESSIONAL SCANNER

- ★ Covers 26-520MHz (no gaps)
 - ★ AM + FM (manual, automatic or programmable)
 - ★ Computer interfacing for limitless memory, remote control & data logging
 - ★ I.F. output terminals (10.7MHz & 455KHz)
 - ★ Switchable channel spacing & I.F. bandwidths
 - ★ Specifications set by the professionals
- £598**

Regulated mains adaptor for SX-400..... **£29.50**

★ REVCON ★

A superb quality 16 element, all British made VHF/UHF broadband fixed station aerial from Revco. Ideally suited to all scanners and other VHF/UHF Receivers
Covers 50-500MHz PRICE £27.45 inc

ASK FOR OUR LIST OF SECONDHAND SCANNER BARGAINS

★ SPECIAL OFFER ★

"CENTURY 21D" Communications Receiver. 0.5 to 30MHz. CW, USB, LSB, AM & FM. Digital readout, Provisions for an external speaker and headphones. An excellent performer for only..... **£199**

CRYSTALS FOR NR-56, SR-9, SR-11, TM-56B. We have a range of 2m & VHF Marine band crystals for these receivers at **£3.00** each (+ 20p post per order). Please phone to check stock.

RESISTOR KITS a top selling line for many years. E12 series, 5% carbon film, 10Ω to 1m, 61 values, general purpose rating 1/4W or 1/2W (state which).

Starter pack 5 each value (305 pieces)..... **£3.10**

Standard pack 10 each value (610 pieces)..... **£5.55**

Mixed pack, 5 each 1/4W + 1/2W (610 pieces)..... **£5.55**

Giant pack, 25 each value (1525 pieces)..... **£13.60**

DC/DC TRANSISTORISED INVERTERS 12V input, 400V 200mA rectified and smoothed output..... **£9.50**

This unit is a chassis section cut from used R/T equipment, tidied, fully wired & tested. Free-standing but no luxuries like cabinet. 24v version - same price. SAE for details.

SPECIAL OFFER discontinued line 12 or 24v to 380v inverter. **£5**

SPARE PARTS FOR PYE RADIOTELEPHONES WESTMINSTER & PF70 SERIES also Cambridge, Vanguard etc, SAE list

GAREX FM DETECTOR and squelch conversion for Pye R/T equipment Ready Assembled, full instructions. Tailor-made, easy-fit design, replaces existing squelch board, with minimum of modifications. For AM Cambridge **£6.30**; for Vanguard AM25B (Valve RX) **£6.10**; for Transistor Vanguard AM25T **£6.95**

MAIN DISTRIBUTOR OF REVCO PRODUCTS

PRICES INCLUDE UK P&P and 15% VAT

GAREX ELECTRONICS

7 NORVIC ROAD, MARSWORTH, TRING, HERTS, HP23 4LS

Phone 0296 668684. Callers by appointment only

Goods normally dispatched by return

NEW THIS MONTH

PCB MOUNTING NI-CADS

Much sought after 4.8V 150mA batts with PCB mntg tags on 25mm pitch. Batt size 25 x 16e. Ideal for paralleling. 99p ea; 10 + 85p; 25 + 70p; 100 + 60p

FIBRE OPTICS

Scoop purchase of single and twin cable. For use with visible light or infra-red. Core 1mm dia, overall 2.25mm dia. Single 50p/m; 20m coil £6.30. Twin 90p/m; 20m coil £11.00

MINIATURE RELAYS

PCB mounting, DPCO size 20x15x15mm. Available in 3, 9 or 12V. £1 each.

1W AMPLIFIER

2914 Audio amp panel 95x65mm with TBA820 chip. Gives 1W output with 9V supply. Switch and vol control. Just connect batt and speaker. Full details supplied. Only £1.50 10 for £12; 25 for £25; 100 for £75.

2915 Stereo version of above 115x65mm featuring 2 x TBA820M and dual vol control. £3.50 10 for £30; 25 for £65; 100 £200

AM TUNER PANEL

2916 For use with mono amp above. Neat panel 60x45mm. Only £1.50; 10 for £12.00.

NI-CAD CHARGER SCOOP!

Ever-Ready model CH4, this charger will take up to 4 AA, c or D cells plus 2 PP3 if required. Smart two tone grey case 212x97x60mm. Only £7.95.

1984/5 CATALOGUE

84 page A4 size - Bigger Brighter, Better - more components than ever before! With each copy there's discount vouchers, Bargain List, Wholesale Discount List, Bulk Buyers List, Order Form and Reply Paid Envelope.

All for just **£1.00!**

Winter Supplement due out November - Send large SAE for your free copy.

GREENWELD

- The Pack People!

More packs - more in them - more value! All our packs contain brand new marked full spec components at a fraction of the normal price and offer constructors the widest range of parts at the lowest cost! How do we do it? By buying manufacturers end-of-run and surplus components. Because we purchase from many sources, we have an extremely wide range of top quality parts - too costly to sort hence the packs described below. Our larger packs are ideal for schools, groups or clubs.

NEW PACKS:

K524 OPTO PACK - a variety of single point and seven segment LEDs (incl dual types) of various colours and sizes, opto isolators, numericators, multi digit gas discharge displays, photo transistors infra red emitters and receivers. 25 assorted **£3.95** 100 **£14.95** 250 **£35**

K525 PRESET PACK - Big, Big variety of types and sizes - submin, min and std, MP, slider, multiturn and cermet are all included. Wide range of values from 20R to 5M. 100 assorted **£6.75** 250 **£12.95** 1000 **£49**.

K526 HEATSINK PACK - Lots of different sizes and shapes of heatsink for most diode and transistor case styles. A pack of 25 assorted including several large finned types - total weight over 1kg **£5.50** 100 **£19.50**.

K527 HARDWARE PACK - This has a large variety of pk and self taper screws from 2 x 1/2" up to 8 x 1/4" also washers, some BA, metric and Whit screws plus other miscellaneous brackets, captive nuts and bits and pieces. 1kg (up to 1000 pieces) **£4** 3kg **£9** 10kg **£25**

K528 ELECTROLYTIC PACK - All ready cropped for PCB mounting this pack offers excellent value for money. Good range of values and voltages from 0.47µF to 1000µF. 6v to 100v 100 **£3.95** 250 **£8.95** 1000 **£32**.

K531 PRECISION RESISTOR PACK - High quality, close tolerance R's with an extremely varied selection of values mostly 1/4 and 1/2w tolerances from 0.1% to 2% - ideal for meters, test gear etc. 250 **£3** 1000 **£10**

K532 RELAYS - wide selection of styles voltages and contacts 4V - 240V, AC/DC, SP to 4PCO 20 for **£6** 100 **£25**

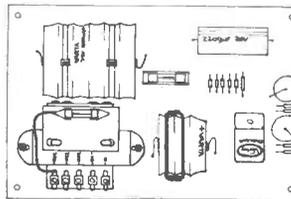
TORUS'

Computer-controlled Rob built around the gearbox described below. Complete kit of parts inc PCB, program listings for BBC (other micros soon). £44.85 20W ribbon cable (min 3m recommended - 5m better) £1.30/m SAE for illustrated leaflet.



MOTORISED GEARBOX

These units are as used in a computerised tank, and offer the experimenter in robotics the opportunity to buy the electro-mechanical parts required in building remote controlled vehicles. The unit has 2 x 3V motors, linked by a magnetic clutch, thus enabling turning of the vehicle, and a gearbox contained within the black ABS housing, reducing the final drive speed to approx 50rpm. Data is supplied with the unit showing various options on driving the motors etc. **£5.95**. Suitable wheels also available. 79mm Dia plastic with blue tyre, drilled to push-fit on spindle. 2 for **£1.30** (limited qty). 3in dia aluminium disc 3mm thick, drilled to push-fit on spindle 2 for **60p**.



NI-CAD CHARGER PANEL

177 x 114mm PCB with one massive Varta Deac 57 x 50mm 0 rated 7.2V 1000mAh and another smaller Deac 32 x 35mm 0 rated 3.6V 600mA. The price of these Ni-cad stacks new is over £20. Also on the panel is a mains input charger transformer with two separate secondaries wired via bridge rectifiers, smoothing capacitors and a relay to the output tags. The panel weighs 1kgm. All this for just **£6.00**

A recently purchased parcel of components contained some PCB's for radios/tape players. Five types are available.

Z908 Panel 147 x 38mm with 2 x TDA 1004 6W audio amp IC's not soldered in! so they can easily be removed. Also 1000/16, 1000/10 x 2, 470/16 elacs, ceramic discs, R's also choke. (All easily removed) Stereo Amp? Only **£3.00** (IC's cost £4 ea)

Z909 Another board which escaped the clutches of the flow solder machine - 103 x 39mm, this is an RF panel with a TDA1200 FM/IF chip & uPC1176C noise canceller + R's & C's inc tants. Chips cost around £8 together. Price for panel **£2.50**

Z910 139 x 39mm, this panel has soldered in components - TCA4500A and TBA651R, AM radio with IF amp. Probably complete RF section of radio as IF's and trimmers are on board. + R's C's etc **£2.50**

Z911 L shaped board 125 x 35mm, looks like RF section of radio - BF194-5 etc + trimmers & IF's, but tuner is absent. **£1.00**

Z912 Same as Z909, only components have been soldered. **£2.50**

Z913 Another L shaped panel 135 x 40mm with non-soldered components including: BC549C x 2, BC208 x 3, BF241 x 2, BF194, coils, trimmers, R's C's etc. **£1.00**

VEROBOARD & RIBBON CABLE

Discontinued lines, some at less than 1/2 price!! eg Dipboard 158 x 165mm **£3.50**; 26W Grey ribbon **£4/3m**; Red wirewrap wire 24AWG **£2.50/100m**. Full details on List 18

GREENWELD

Min Access order value £5 No min CWO value. Official orders from schools etc. welcome - min invoice charge £10.

Our shop has enormous stocks of components and is open from 9-5.30 Mon-Sat. Come and see us!!

443K Millbrook Road
Southampton SO1 0HX

Tel: (0703) 772501/783740

All prices include VAT; just add 60p P&P

THE TATUNG EINSTEIN MICROCOMPUTER

A review by Simon Karas



The Tatung Einstein with monitor (above) and 3in compact disc drive

Tatung has entered the competitive field of microcomputers with its own British designed Einstein as a rival to the BBC Micro and the new Sinclair QL, both of which are also aimed at the home, educational and small business user.

The Einstein's main processor is a Z80 (8-bit) with a clock speed of 4MHz. It has 80K RAM: 16K is used for the display leaving 64K for the user.

Its graphics resolution is 256x192 pixels and it has 16 colours (transparent, black, dark green, medium green, light green, dark blue, cyan, dark red, medium red, light red, dark yellow, light yellow, magenta, grey, and white); it has a greater variety of shades than the BBC Micro which also has 16 colours, but this is gained at the expense of a facility for flashing colours. The text display has 32 or 40 columns and 24 rows with the same 16 colours.

Keyboard

The keyboard is a full QWERTY type with 48 alphanumerical graphics keys, 8 programmable function keys and 11 'control' keys. The repeat delay and repeat speed are programmable, and there are 160 pre-defined symbols – saving time when programming graphics.

The computer comes with a 3in

compact floppy disc drive built in. Each disc can store 500K of data (250K on each side) and is housed in a rigid plastic case with shuttered access aperture.

Second disc

A second disc drive can be fitted into the computer as well as external twin drives, giving a total disc space of 2M bytes, and the disc operating system (DOS) is CP/M compatible (the operating system used by the majority of microcomputers).

Although the 3in discs are not as popular as the 3½ and 5¼in ones, Tatung dealers will be stocking them and Tatung have been in touch with many software houses to ensure that their new computer will not suffer from a lack of programs.

The BASIC (Xtal) is loaded from disc. It has many useful features. For instance, programs can be merged, or a few lines of a program can be relocated, both of which are useful facilities when writing long programs. Drawing and filling in shapes is made easy by the incorporation of special graphics commands: POLY allows a polygon to be drawn in one command; ELLIPSE allows circles and ellipses to be drawn in one command; and FILL allows any enclosed area to be shaded in a chosen colour.

It has all the features of BBC BASIC, except PROCedures: it is surprising that this has not been added to the Einstein's BASIC since PROCedures are a beginning to structured programming and an introduction to other languages – it is this that has endeared the BBC Micro to schools. This means that the Einstein is not a computer that one would buy primarily for educational use, although it will prove little handicap for those intending to rely mainly upon commercial software for business or other specialist use.

Easy to handle

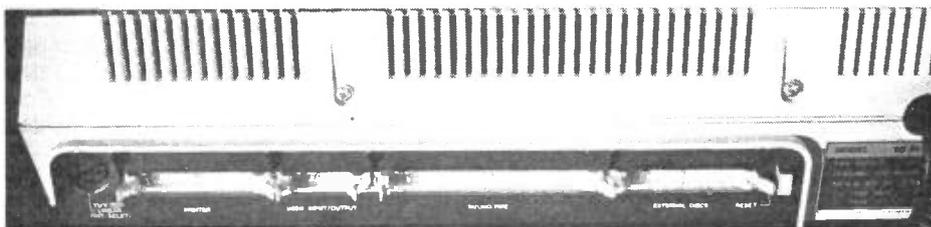
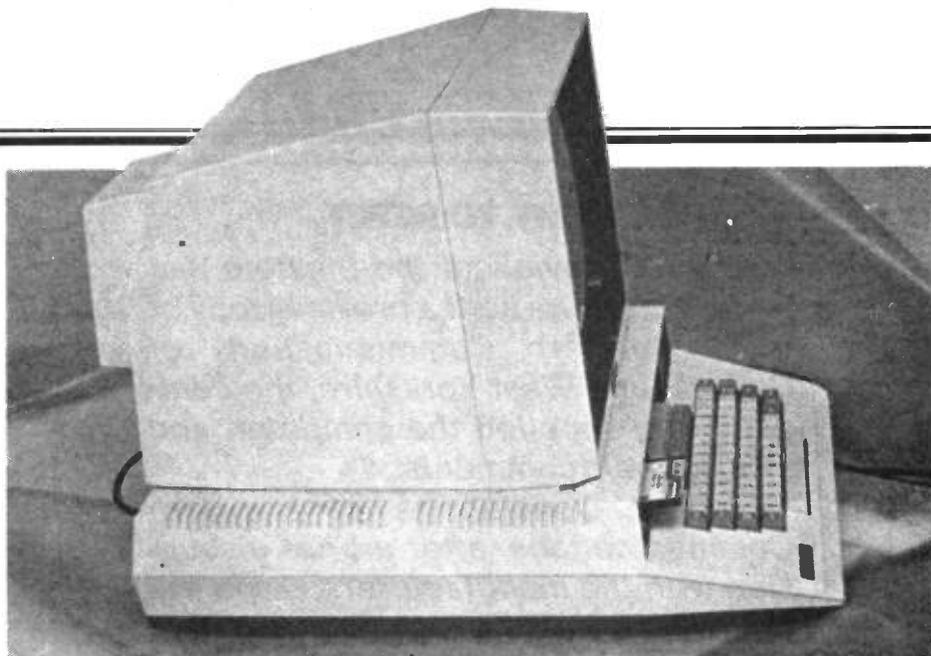
Despite these drawbacks for the programmer, the Einstein's graphics are easy to handle with its 160 predefined symbols.

One of the computer's best features is that there are 32 sprites which are handled from within BASIC: this enables BASIC programmers to write their programs with faster graphics. Sprites can also be enlarged without redefining any shapes. The main drawback of the graphics is that the resolution is not very high – inferior to many of its competitors.

The sound generator uses envelopes through three music channels and one noise channel: it is therefore very versatile, although it takes quite some practice before one can produce the required sound every time. There is also provision for a speech synthesis chip. The sound is emitted through a 3½ inch by 2¼ inch, 250mW internal loudspeaker.

The editing of programs is a bit tricky; the computer has two cursor keys and two shift keys, when it would perhaps be more convenient if it had four separate cursor keys. It would also be helpful if it duplicated at the bottom of the screen what is being edited in the text above.

This computer is not likely to become dated very quickly, because it allows for expansion. As well as the normal UHF TV



signal and RGB monitor signal it has a YUV signal, which is said to allow for greater colour saturation control.

The Einstein will connect directly to most types of printers (but check that the one you buy is not an exception!). As I mentioned before, two external disc drives (either 3 inch, 3½ inch or 5¼ inch) can be added and it can communicate with other computers via the built in RS232C interface.

There are two joystick ports which can also be used for 'robot arms', etc (although Tatung do not as yet produce such unusual accessories). There is also a device called the Tatung 'pipe' which will connect devices (eg a second processor) straight to the main processor.

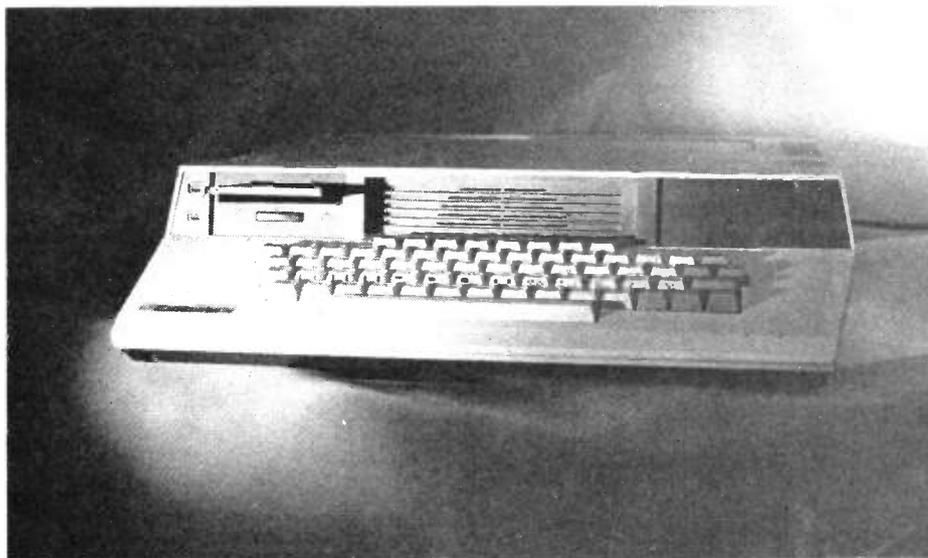
Although the Einstein has very good facilities for such external expansion, internally it is inferior to my own computer (a BBC): there simply doesn't seem to be the space for as many additional EPROMs. Nevertheless it is easier to add new languages because its languages are disc-based.

The Einstein comes equipped with three instruction booklets: a BASIC reference manual describing all BASIC commands; a DOS/MOS introduction manual which explains the commands for the use of discs and the machine code commands; and an introduction explaining how to set up the hardware, as well as teaching the fundamentals of BASIC programming.

All the booklets are clearly written – although the section on machine code seems to assume too much for it to encourage beginners, and does not go into enough depth for those with some experience.

The Einstein, then, perhaps doesn't have the edge over some of its competitors as a programmer's machine (it lacks an assembler as well as PROCedures in BASIC), but may prove more than adequate for those relying on software: this is no bad thing in itself, but the software – because it is disc based – will be quite pricey (£12.65 upwards, with language discs such as PASCAL costing £46).

The computer itself will set you back £499, which seems good value considering the size of its memory; and Tatung tell us that they are soon releasing some software for radio amateurs which we expect to be reviewing in coming months.



RIGHT TO REPLY

After the review of the Einstein had been written we sent a preview copy of it to Northern Communications of Claremount, West Yorkshire, the company who supplied the computer, and invited their comments.

Richard Constantine of Northern Communications, after a brief discussion with the manufacturers, made the following points:

I was disappointed that you didn't refer to the price (£499 including VAT). When compared with the BBC Model B, with interfaces and disc drives to give a comparable performance to the basic Einstein, this computer seems very good value indeed, especially when you consider its superb finish and presentation.

Colour graphics

The remarks concerning colours were possibly a little ambiguous; the BBC does not have a true sixteen colours, but eight plus eight flashing.

The graphics are of a high quality (it is not strictly true that the resolution is not very high in comparison to the competition – the majority of computers have 256x192 pixels resolution).

Given the CP/M compatibility, there is a wealth of professional disc-based software readily available for this machine, and blank 3 inch discs are stocked by W H Smiths!

The Einstein is the only machine, as far as I know, to have a fully screened and earthed power supply to reduce RFI, and the number of I/O ports on the machine means good potential for expansion.

The comments below come from the factory.

As from this month (October) Digital Research's 'Dr Logo' procedures program will be supplied with the machine as standard, and BBC BASIC (Z80) is now available on disc.

Speech can be catered for via the 'pipe' port.

Editing

The reviewer seems to prefer the line editor of the BBC to the full screen editing facility of the Einstein, which in commercial use is generally recognised as being superior to line editing. However, Xtal BASIC does also have a line editor (it is obvious that the reviewer is a BBC addict).

As far as space for additional chips is concerned, a machine such as the BBC needs extra ROM space because of the limitations inherent in having a resident language – a 'clean' machine avoids the necessity.

The comment about the Einstein being inferior internally might indicate to some readers that the general construction is poor, and I'm certain this was not the intended conclusion (since it isn't!).

Richard says the Einstein already runs with the FT980 and FT757GX, but in addition there are plans for a standard interface for most common rigs. A package of amateur radio software is not very far away, and this combined with the very user-friendly nature of the unit and the advantages of the disc format (not to mention the care taken to avoid RFI) should, he believes, make this a very good machine for radio amateurs.

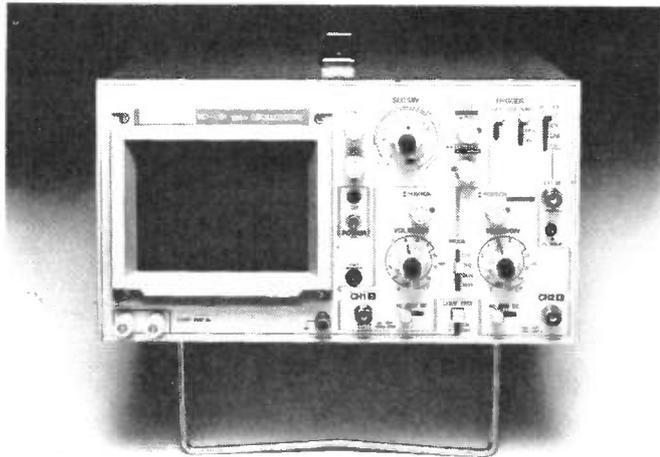
Software Prices (a selection of those available)

CIS Cobol w/Forms 2 and Animator (L)	£375.00
Database (B/H)	£19.95
Easidata (B/H)	£29.95
Einstein Simplex (B)	£150.00
Forth (L)	£46.00
Home Budget (H)	£19.95
Invoicing (B)	£29.95
Mini-Calc (B/H)	£19.95
Music Composer (H)	£14.95
Pascal (L)	£46.00
WDPro (B/H)	£57.50
Zen Assembler Editor (U)	£29.95

Key: L=language U=utility
B=business H=home



TESTING! TESTING!



Get the most out of your test gear with a little help from...

Frank Ogden G4JST

This month – oscilloscopes

A signal displayed graphically on the screen of an oscilloscope would appear to give all the information about that signal at a glance.

The height of the waveform gives the amplitude; the length of the waveform along the horizontal axis gives a direct readout of the duration; and with a bit of practice, the harmonic content of a signal can be guessed by the shape of the waveform. In all a most useful instrument, but one which requires extreme caution in interpreting the results.

Like most other pieces of test gear the scope produces a result which should be treated in context. This includes the limitations of the instrument itself, and the upset caused to the circuit under inspection brought about by the capacitive and resistive loading of the scope input.

As with other areas of electronics the problems are minimal (although not entirely absent) in the audio range and become progressively more interesting as the frequency under inspection increases into the megahertz range. But first, the limitations of a scope.

Slew rate and frequency response

These two things are related but are not the same.

Frequency response is straightforward. An oscilloscope may show a relatively level frequency response to 15MHz and be quoted in the specification as operating from 'dc to 15MHz'. This may hold true for signals up to, say, 1.5cm peak to peak deflection at 15MHz.

If the Y gain is stepped up in an attempt to increase trace size, the height of the waveform may no longer tally with the increase in amplification, ie it will be rather smaller than it should be. This is due to slew rate limiting.

At 15MHz, the capacitance of the scope deflection circuits may be such that available output current from the deflection transistors (or valves) is inadequate

to charge the tube Y plate capacitance to a high enough voltage.

The implications of this should be fairly obvious: oscilloscopes tend to be very inaccurate in the voltage measurement of ac signals near to the upper frequency limit of the instrument. The capacitive loading of the external circuit under inspection may tend to 'round off' waveforms with fast rise-times.

Slew rate limiting on the internal instrument circuitry has roughly the same effect.

Care should also be exercised when prodding around tuned circuits. The detuning effect of the scope input capacitance will show a gross under-reading when connected, for instance, to the primary of an IF transformer. The scope (and most other test gear for that matter) should always be connected to a low impedance circuit node wherever possible.

The divide-by-ten probe

The importance of test gear affecting

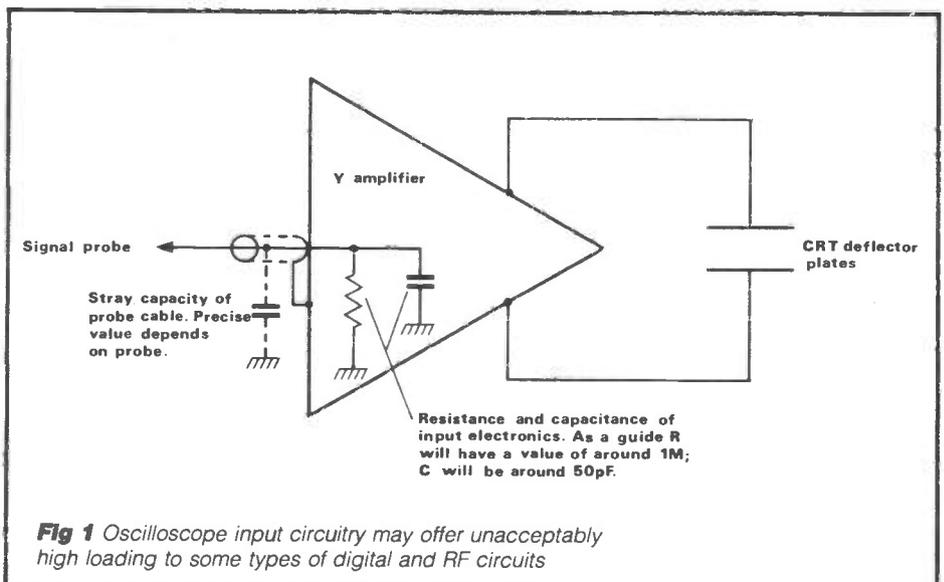
the operation of circuitry under test cannot be over-emphasised. The interference can be substantially reduced – but not completely eliminated – by the use of an attenuator probe. *Figure 1* shows the equivalent input circuit.

Loading

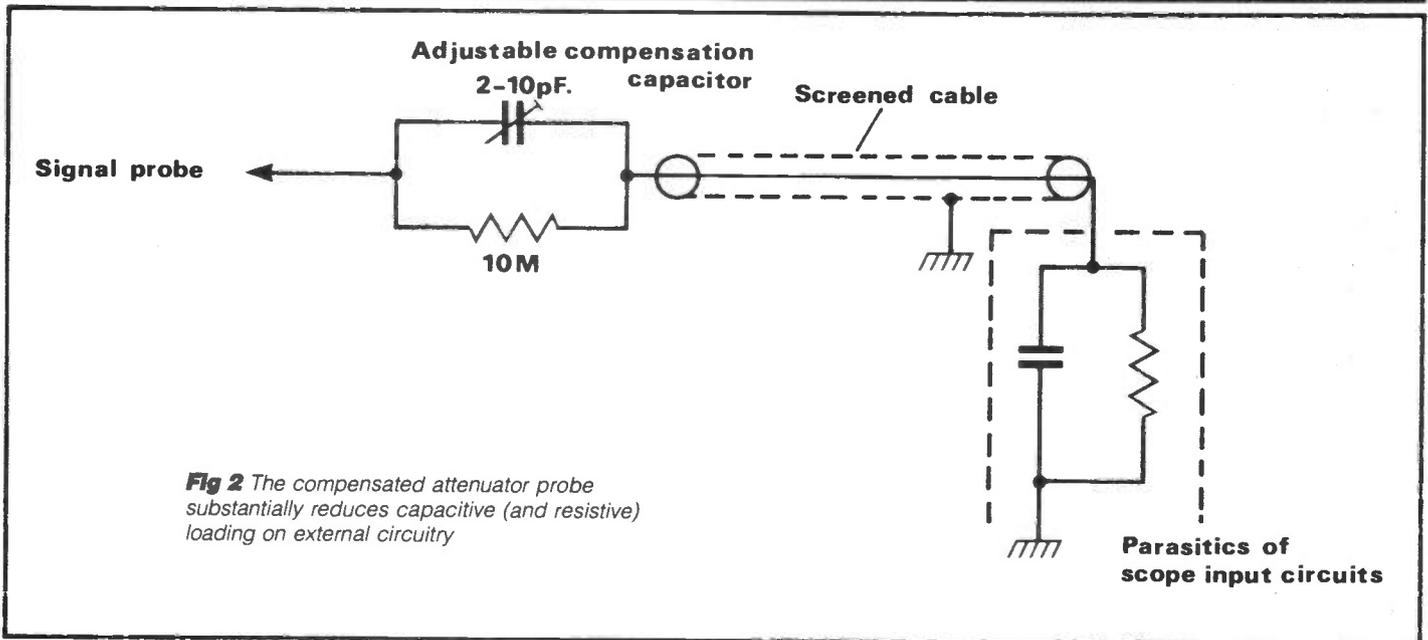
For equipment of fairly recent manufacture, the loading will be in the region of 50pF in parallel with a resistance of 1M. The cable connecting probe to scope input will have a capacitance of 50pF or thereabouts. The attenuator probe contains both a resistive and capacitive divider.

Although it cuts the signal reaching the scope by a factor of ten, it also reduces the capacitive loading by the same degree. Since most scopes have plenty of Y sensitivity for the majority of purposes, the reduction in deflection sensitivity may be a welcome trade-off for reduced circuit loading.

Figure 2 shows the circuit of a typical attenuator scope probe. The principal



TESTING! TESTING!



feature is a small series trimmer capacitor, which is adjusted so that the ratio of the resistive part of the attenuator is matched exactly by the capacitive part. The capacitive part comprises the value of the trimmer in comparison to that of the combined probe cable plus scope input capacitance.

The scope probe trimmer capacitor is adjusted by applying a low frequency square wave with fast rise and fall times and looking at the observed result.

If the trimmer provides too much capacitance, then the waveform will show excessive overshoot. If too little, then the square wave will develop 'shoulders'. Figure 3 gives the sort of diagrams over a range of trimmer adjustment.

Triggering

To be useful, a scope timebase has got to lock in time with the repetitive event to be observed.

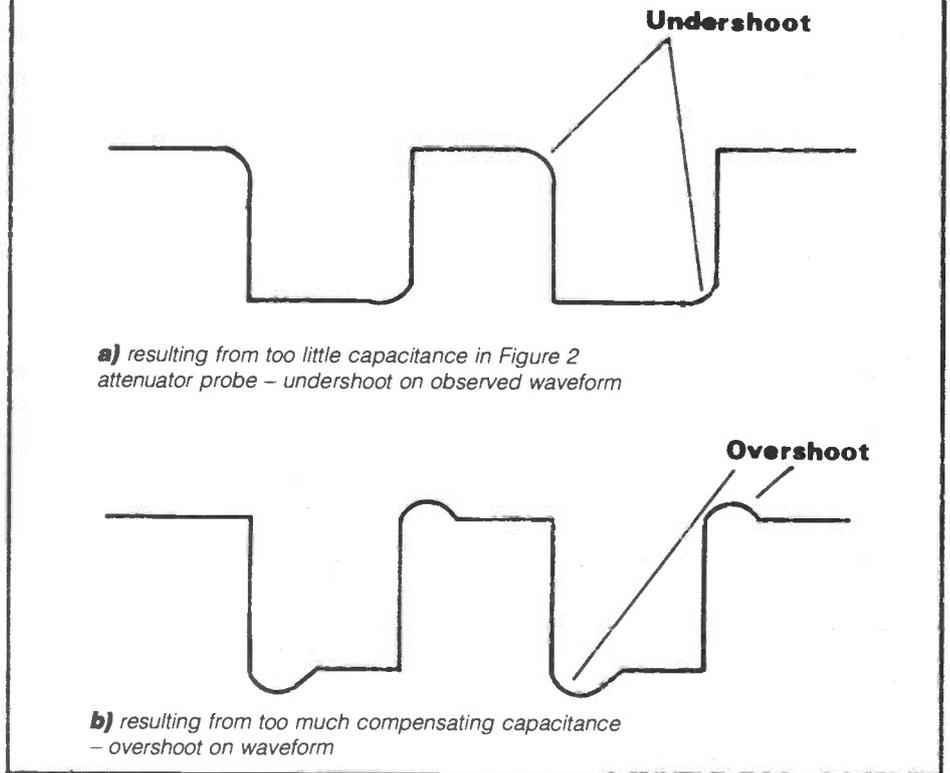
There are certain kinds of instruments – storage scopes, one shot photographic scopes – which can freeze a single event in time. Since these are beyond my pocket and, I imagine, that of most of the people reading this, I won't discuss them further.

There are some sort of repetitive events that do not show up on a conventional oscilloscope even though they may be critically important to the function (or malfunction) of a circuit.

Most of these can be characterised as short duration pulses, for instance glitches in a digital system, which occur regularly but are too narrow in width to be observed.

Suppose a $1\mu\text{s}$ pulse occurs regularly every 1mS . Even the cheapest 3MHz instrument should be able to resolve a signal of this type but it generally doesn't. It probably triggers the time-

Fig 3 Distortions of ideal squarewave:



base – usually the only way that you know that such a pulse is present – but you can't see anything no matter how high the brilliance control is turned up. The reason is, of course, that the pulse gets lost at the start of the trace, removed by the same part of the oscilloscope internals which suppress trace flyback.

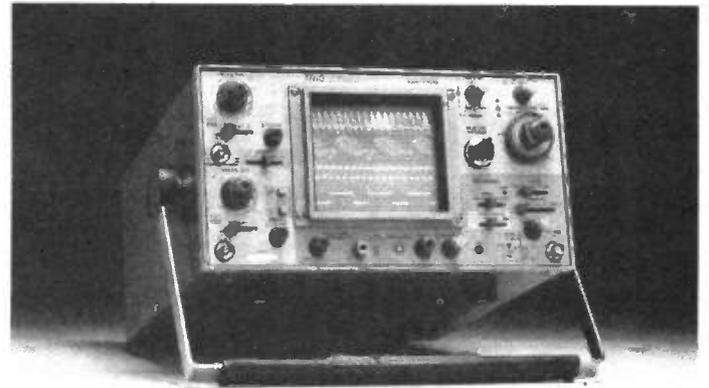
Slow timebase

Where a slow timebase speed is selected so that several pulses should be displayed, the results may be equally

disappointing, because the actual width of the pulse on the screen may only occupy $1/2000$ th of the total trace length. A microscopic dot of light above the trace baseline may just be visible, though.

It is occasionally possible to make out the shape of a fast pulse by unlocking the timebase when turned to its fastest speed.

In the free running state the pulse may be dimly visible running along the bright baseline trace.



Commercially available oscilloscopes; the MJ Instruments 102 and the Trio-Kenwood CS 1100 (photos courtesy of MJ Instruments and House of Instruments Ltd)

Chasing parasitics

Looking for parasitics in low frequency equipment, audio power amplifiers for instance, can also have pitfalls for the oscilloscope.

MosFETs and modern bipolar output transistors will effectively amplify to several tens of MHz. These parasitics may be so high in frequency that they don't show directly on the scope trace. You need to look for what they leave behind – usually some sort of kink or discontinuity in an otherwise smooth waveform.

It is unusual, but not impossible, for low frequency circuits to oscillate continuously at some HF or VHF mode. Far more usual is for the circuit to oscillate over just a small part of the input signal cycle. This makes itself known on the scope tracer in a manner typically shown in Figure 4.

A carefully calibrated instrument – most scopes incorporate screwdriver accessible front panel controls for this purpose – offers most of the facilities of an accurate ac millivoltmeter and can be used in much the same way; ac current may also be measured by using a temporary low value resistor as a series shunt in the circuit under inspection. Selection of the resistor is dictated by normal Ohm's Law (eg 0.1ohms and input signal to the scope of around 280mV peak to peak with a measurement current of 1A RMS). Figure 5 offers a typical example of current measurement.

The last example is a fairly straightforward measurement technique providing that the measurement frequency isn't too high.

Difficulty

Switch mode power supplies often present more difficulty because the current transients are extremely fast, and any stray inductance introduced by the measurement process will lead to wild inaccuracies and a possible upset to the operation of the circuit.

Bear this in mind when poking around the power supply stages of large screen colour TVs. Always put the test shunt

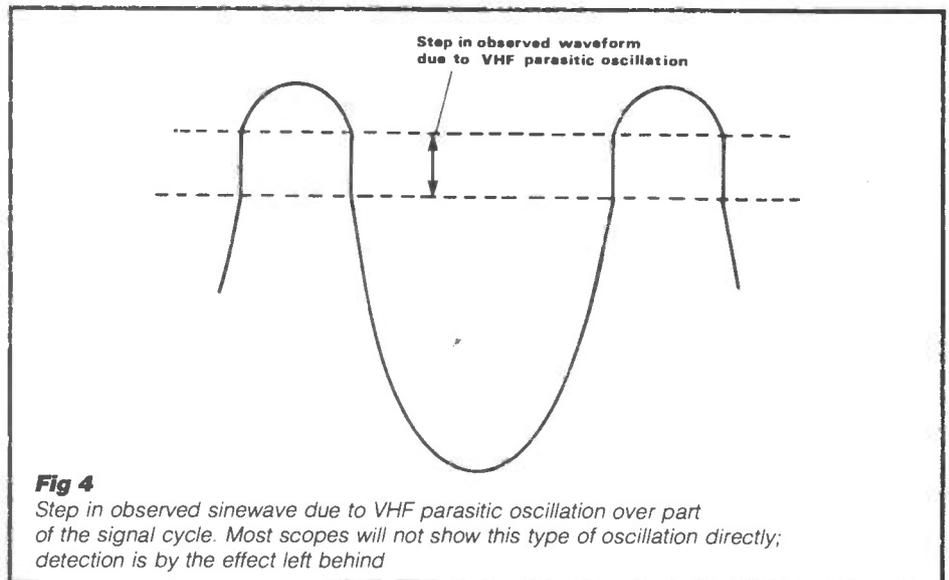


Fig 4

Step in observed sinewave due to VHF parasitic oscillation over part of the signal cycle. Most scopes will not show this type of oscillation directly; detection is by the effect left behind

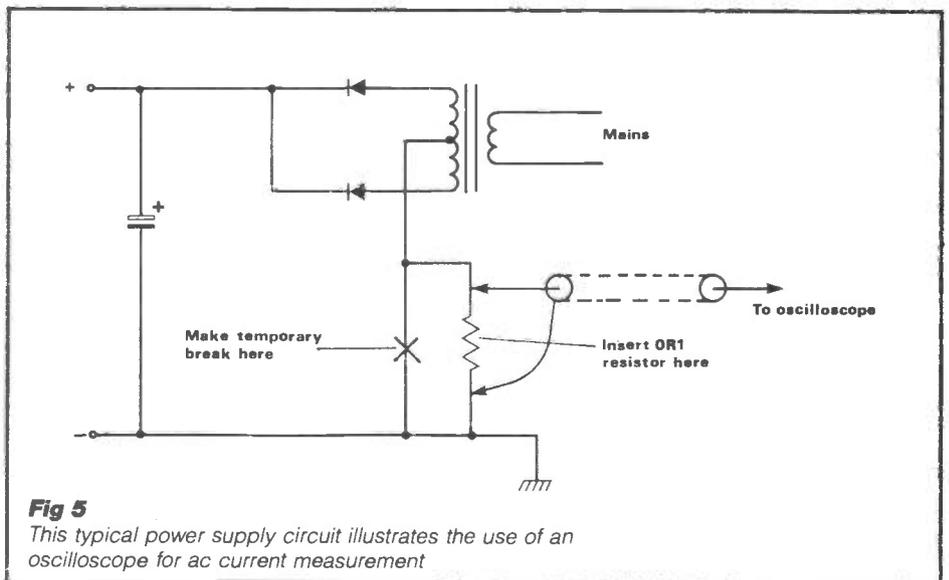


Fig 5

This typical power supply circuit illustrates the use of an oscilloscope for ac current measurement

resistor – it must be carbon, never wirewound – as close as possible to the circuit inspection point. Preferably it should be temporarily soldered directly into the circuit.

There are many other situations where

a scope may be used as an adjunct to other test gear, particularly signal generators. The next part of this series deals with signal generators together with some of the more unusual applications for them.

FARNELL
STANDARD
KENWOOD
JAYBEAM
TONNA
ICOM
TRIO
ICOM
YAESU
REVCO
BICG
PLESSY
TELECOM
BRITISH
MOTOROLA
COLLINS
SONY

HITACHI
GEC
PYE
ITT
BELCOM
SUN
WELZ
PHILIPS
MARGONI
EDDYSTONE
FDK

R WITHERS COMMUNICATIONS



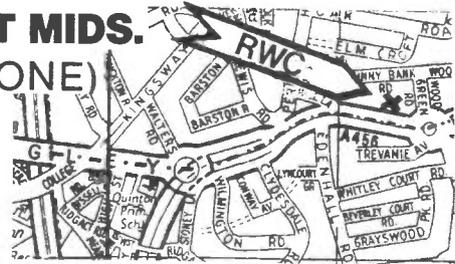
584 HAGLEY ROAD WEST, OLDBURY, WARLEY
B68 0BS (QUINTON, BIRMINGHAM) WEST MIDS.
Tel: 021-421 8201/2 (24 HR ANSWERPHONE)



RWC SPECIAL OFFER



PLEASE ASK ABOUT THE RWC CREDITCARD
AVAILABLE NOW VIA LOMBARD TRICITY



R.W.C.'S BARGAIN WINDOWS – ONCE ONLY OFFERS

<p>YAESU FT290R FREE *HB9CV £279 * VARTA NI-CADS * CHARGER * LISTEN ON INPUT WHILE STOCKS LAST</p>	<p>BLAZETONE 2Mtrs 15W TWO ONLY DEM</p>	<p>STANDARD VHF FM PMR BATTERY OR 12V. 4-CH 140-172MHZ</p>	<p>YAESU FT708R FREE * HB9CV *NI-CADS *CASE *CHARGER *POST PACK £199 10 ONLY</p>		
<p>25w 10 MTR LINEAR RELAY SWITCHED 5w DRIVE £16.50 3 ONLY INC P&P</p>	<p>10 MTR MOD KIT FOR DNT 40FM AND LCL2740 INC 2x-TALS RWC 1x-TALFILTER BEST 2 CAPACITORS SELLER £12.95</p>	<p>R.W.C. SPECIAL LAST TEN AT AM+ FM THIS PRICE *70 MEMORIES *AC-DC SUPPLY *AUTO SEARCH *LOCK PRIORITY £299</p>	<p>DNT10M. MOBILE FIVE ONLY *6W. *40CM *INC BRAC- KET £47.50</p> <p>RWC 10M DNT BASE 10 ONLY *240v *TILT BRACKET *1 YEAR WARRANTY £57.50 POST FREE</p>		
<p>CENTURY 21D INC FREE G5 RV MULTIBAND ANT *500Kc's — 30 MHZ *BARLOW WADLEY LOOP *LED DISPLAY *HEADPHONE JACK £198 * POST FREE AM+ SS3</p>	<p>THREE ONLY YAESU FTV107 HF 2 MTR TRANSV INC 2MTE MODULE 70CMS OPTION LAST THREE £159</p>	<p>YAESU FTV 707 HF 2 MTR TRANSV. FITTED 2 MTR BOARD 50MHZ OPTION TWO ONLY £159</p>	<p>YAESU FT790R MULTIMODE 70CMS SAVE OVER £50 ONLY £279 *FREE NI-CADS *FREE CHARGER *FREE HB9CV *FREE LISTEN INPUT MOD</p>		
<p>FARNELL 10 AMP OK ON 2MTU PSU REGULATED AND FULLY PROTECTED SWITCH LIST £185 MODE LAST FEW £39.50</p>	<p>AJH LINEAR KIT 30W ON 2MTRS EASY TO BUILD INC FULL INST. VALUE AT £29 POST FREE CASE +H/SINK £50 EXTRA</p>	<p>TURN THAT BEAM KOEPEK ROTATORS 50KG LOAD- ING FULL 1 YEAR WARRANTY ACCURATE TO 1° £37</p>	<p>TOYO 3.5 — 148MKZ SWR + POWER MTR MADE IN JAPAN 1KW HF RATING FREE PATCH LEAD P&P FREE £29</p>	<p>POWER MODULES FOR FDK YAESU ICOM TRIO ETC. EG 25W 2 MTR WRITE FOR FULL LIST £35</p>	<p>POWERHOUSE PSU 13.8V 5/7AMP DC SUPPLY FULL PROTECTION BRITISH MAKE £9.95 INC P&P</p>
<p>SUN TRIPLE 5/8 BASE ANTENNA 144-148MHZ 7.2DB1 QUALITY CONSTRUCTION LOW USWR SAVE ££s £29.95</p>	<p>HOXIN DC GROUND 1/2 WAVE MOBILE ANT INC PL259 +CO-AX £9.50 TO CLEAR</p>	<p>POLICE BAND 1/4 WAVE FINE ON 2MTR LAST FEW INC BANTEK BASE SILLY PRICE £4.50</p>	<p>SUN HIGH QUALITY GUTTER MOUNT KITS INC 4UCO-AX AND PL 259 ANODISED BLACK FINISH ONLY £9.95</p>	<p>STOP PRESS LOW PASS TVI FIL- TER BY TELCO LIST £39.95 12 ONLY £12.50 MADE IN USA</p>	<p>G5RV HF MULTI-BAND DIPOLE ANTENNA FULL WAVE £14.95 1/2 WAVE £12.95 POST & PACKIG FREE!</p>
<p>TRAVELLING JIM 2M + 70- C- MS INC LEAD 2M £7.95 + PL259 70CM £6.95</p>	<p>R.W.C. BARGAIN PACK BNC KIT SILVER + NICKEL PLATED FOR ALL FOR ALL ELBOWS WORTH £104 PLUGS ETC ONLY £6.99</p>	<p>USA MADE PUSH ON PL259 LAST 30 TO CLEAR FOR UR67 UR43 99p FOR THREE!</p>	<p>SILVER PLATED 'N' TYPE 2KW CO-AX SWITCH LESS THAN 1DL 4 ONLY LOSS £13.50 TWO WAY</p>	<p>HF AERIAL TRAPS W3DZZ TYPE HIGH QUALITY 71MHZ £8.95 PAIR POST FREE</p>	<p>CCTV LENS 39MM JAP 'C' TYPE FIXING TOKINA QUALITY WERE £30 FEW ONLY £7.50</p>
<p>FT102 AM FILTERS XF 455 CN BY YAESU ALSO A FEW CW FILTERS £19.50</p>	<p>RF TRANSISTORS OVER 20,000W IN STOCK FOR ALL FOR ALL HF/VHF/UHF RADIOS EG. 2SC2290RSC1947 £7.50 (MRF404) £22</p>	<p>VERY HEAVY CHROME PLATE MORSE KEY BLOCK SUIT HK705 ETC. WITH FREE 1/4" JACK + LEAD £6.95</p>	<p>MINI HEADPHONES 3.5MM + 1/4" JACKS MONO STEREO SUPER QUALITY LIGHTWEIGHT DESIGN £3.95 INC P&P</p>	<p>KENWOOD TRIO NOISE CANCELLING DYNAMIC MIKE SUPER QUALITY £12.50 LAST FIVE</p>	<p>HEAVY DUTY MAGNETIC MOUNT 50239 MOUNT 3MTASCO-FX PL259 SPECIAL PRICE £8.95</p>

All offers subject to availability on a first come first served basis. Prices subject to change without change all correct at time of going to press, E&OE. Terms No COD. Barclaycard and Access accepted. Post free over £50 under £50 add £2 post and handling, unless stated.



G4KZH (Ray)

"A HAPPY CHRISTMAS TO ALL OUR CUSTOMERS FROM ME AND ALL AT R.W.C." (G6VKN, G6VXN, G8DOG, G6KZH, G1KZH)

NEW YEAR SPECIAL

Have your transceiver 'M.O.T.' tested on the spot* with a Comprehensive Test Report for only **£12.50** inc. FM Dev. TX Power Out Frequency, RX Sensitivity, 12db Sinad etc. Full written report inc simple adjustments carried F-O-C!

* Phone first for appointment.

Real After Sales Service.



Over £20,000 worth of test equipment in stock. Our service back-up is second to none.

DON'T MISS THESE CHRISTMAS GIVEAWAYS

**FOR THIS MONTH ONLY
YAESU FT 290R**

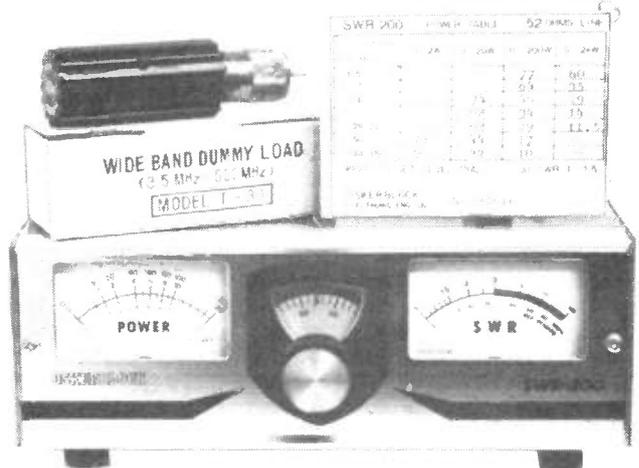
The world's best selling Two Metre Multimode with FREE MMB11 Mobile Bracket worth over £28 for only **£289** And Free Ni-cads

- * 144-146MHz
- * FM-CW-USB-LSB
- * Portable/mobile
- * 10 memories
- * Dual V.F.O.
- * Dual scanner



OSKERBLOCK 200
SWR and Power Meter
with Free 30w Dummy Load

- * 2Kw Power at H.F.
 - * 3.5 - 1.70MHz
 - * Individually calibrated
 - * Dual precision meters
 - * 52 or 75Ω switched
 - * Quality Japanese finish
- ONLY £39.95**



BEAT THIS FOR VALUE

YAESU FT 708R Fantastic 70cms Portable with FREE NC7 Desk Charger worth over £30!



£199

- * 10MHz (430-440MHz)
- * 200MW/1 watt output
- * 10 memories
- * Full scan facility
- * Very rugged design

Ask about the RWC Credit Card



ATV

... GETTING STARTED

BY NORRIE McDONALD GM4BVU

Regular readers of this magazine will be familiar with Andy Emmerson's column *ATV on the Air*, but may see it as too specialised a branch of amateur radio to do more than look at the pictures. The amateur television hobby is also well-served by informative and practical articles in the magazine of the *British Amateur Television Club*, called *CQ-TV* and published quarterly for members.

But I realised when planning this article that the wider circulation magazines such as *Radio and Electronics World* reach people who may know little of what ATV is about, and even less about where to find out! My intention therefore is not to write the definitive answer to the principles and techniques of amateur television, but rather to pull together information from a variety of sources and provide in one place advice on how the beginner can receive amateur pictures on 70 centimetres.

I chose 70cms because most activity is on this band both in the UK and on the continent, and although commercial gear is now coming on the market for 24cms, 'the ATV band of the future', Andy G8PTH has covered this well in his series in *Amateur Radio* from February to June of this year.

ATV in general

First a few words about ATV generally. In *Electronic Technology* magazine Ray Pressnell G6KMC described amateur television as 'the practice of transmitting and receiving television signals on certain amateur frequencies specified by the Home Office... ATV considerably pre-dates professional broadcast television, but for many years after its inception it was confined to closed-circuit systems. Broadcast ATV became a reality when the GPO granted special licences to television amateurs in 1950'.

A special TV transmitting licence is no longer necessary: however, a normal amateur radio Class A or Class B Licence is required. Full details are available through the *Radio Society of Great Britain*. Provided a normal domestic receiving licence is held, there is no reason why any interested person should not at least attempt to receive ATV signals.

BATC

British Amateur Television Club members divide broadly into those who are licenced to transmit and receive TV on the amateur radio bands, and those whose interests lie in the technicalities of producing video equipment and programme material. Of course many are interested in a lot of different aspects, SSTV (slow-scan TV) being another facet of the hobby.

The radio frequency enthusiasts transmit pictures from their homes, from portable locations, and via repeaters, and use the medium to communicate visually with other like-minded amateurs and maybe to enter TV contests. In this group are to be found those who receive only and those who enjoy receiving long distance broadcast television stations either direct or via the growing number of relay satellites.

Video enthusiasts often construct their own studio equipment or use ex-commercial equipment for special effects, computer graphics, video recording and editing, animation and so on.

Why ATV?

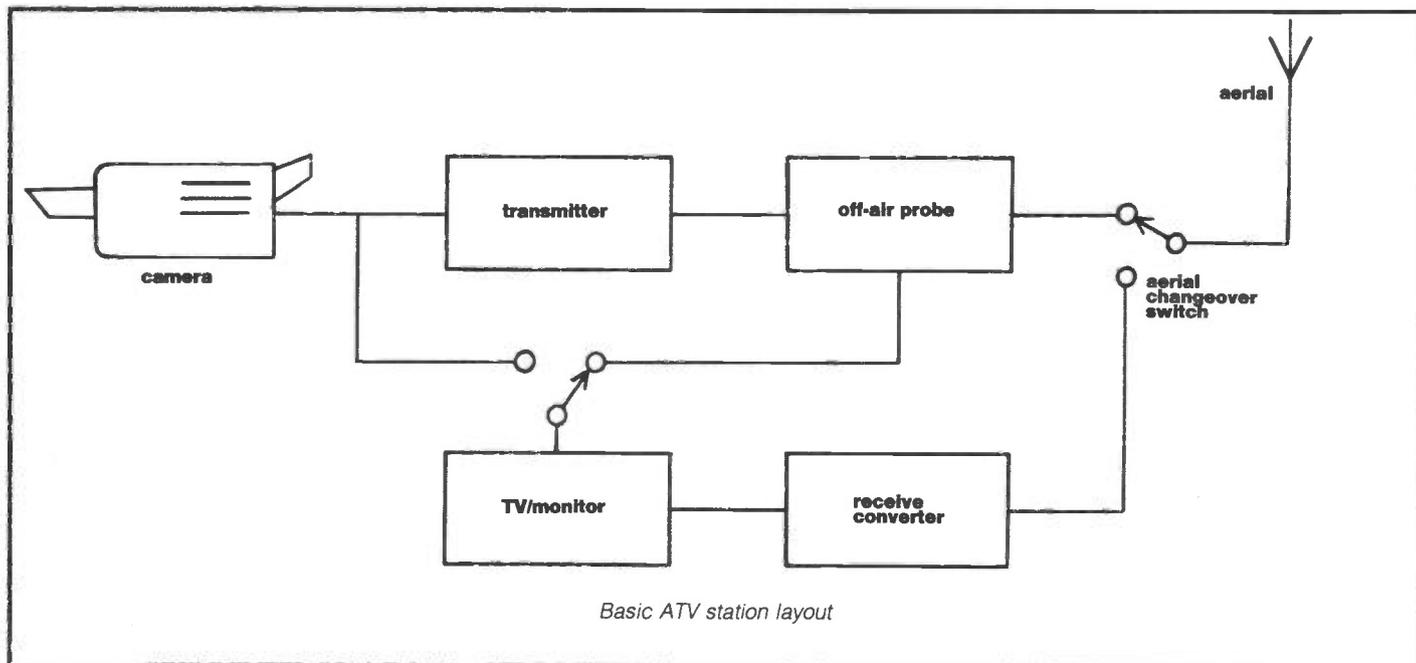
But *why* I hear you say..! I have been fascinated by TV since a boy at school, possibly because the visual image conveys so much that is interesting, and I still believe I can recreate the excitement that John Logie Baird felt so many years ago when a shaky image struggles out of the 'noise'.

A few weeks ago, during lift conditions, I received pictures from OZ1BCK in Copenhagen, and GM4UBJ (Bill, Motherwell) and myself spent several hours trying to establish contact. Now TV contacts over that distance take unusual lift conditions on the band, but George (GM3RVK, in Kennoway) regularly exchanges noisy pix with me during contests over an 80km path, and we always get a kick out of it when we make it. It's just good fun, and as demanding or as simple as you care to make it.

So receiving amateur video can mean noisy DX (long distance) or excellent quality colour from stations within, say, a 25 mile radius. Pictures are usually 'live' video from a camera, or frequently now computer-generated captions and animations. And yes, this *can* be expensive to start with... but you do not need this gear just to receive.

High frequencies

Television is characterised by the need to handle very high frequencies throughout the system from the camera to the receiver, and this includes the aerial system. The TV system used in the



UK is known as System 1, and the bandwidth required for a single channel is 8MHz. The 2 metre band is totally unsuitable for TV, being only 2MHz wide, and the 70cm band can only support a single channel by the use of nearly the whole band. Higher carrier frequencies are much easier to modulate, and of course there is also room for more channels.

But let us stick with 70cms, where the situation is not as bleak as it seems due to the energy distribution of a TV signal within the band. In practice, due to directional high gain aerials and relatively low power, ATV and other users co-exist happily on the band with little interference.

An elaborate set-up for a special event



Station requirements

An amateur TV station need only be as complex as the individual desires. Many stations employ no more equipment than a camera, a transmitter and a receiver as shown in the block diagram. This basic system is adequate for normal communication and is easy to set up, use and maintain.

The single major item which will help you receive good pictures over substantial distances is undoubtedly the aerial, and of course this serves equally well later for transmission.

Aerials for amateur television are similar to normal amateur radio aerials, except that two important factors, gain and bandwidth, are more critical for ATV

applications. For anything other than local operation an aerial gain of 10dB should be considered as an absolute minimum. At distances of 10 to 15 miles you will get at best 50 to 100 microvolts from the received ATV signal. But you need 1 to 3 millivolts to get commercial quality! So what can you do?

Transmitting television requires the maximum possible effective radiated power across the whole 70cm band to prevent loss of colour sub-carrier or lost DX at the top of the band, and of course this applies equally to receive. Typically, the higher the gain, the narrower the beamwidth, and this can lead to lost signals because of directivity! Height is also a factor, and should be optimised to clear local obstructions while minimising losses due to long feeders. 50 feet is probably the maximum height before masthead preamplifiers are needed to avoid attenuation in the feeder cable.

Antenna types

In practice, three types of receiving antenna are in common use in this country. The first is the Jaybeam eight-over-eight slot fed Yagi, which has a forward gain of around 12dB, adequate bandwidth for TV work, and a horizontal beamwidth of 45° which means it is not too critical on alignment. It is small and light, making it easy to handle and erect.

The second is the 18-element Parabeam, which has high forward gain (15dB) with a 28° beamwidth and again adequate bandwidth for colour. And you *should* aim for colour; it's almost as easy now for stations to transmit colour as black & white, so you may as well plan to display it!

The final class of Jaybeam aerial is the popular 'X' element type known as the

ATV—GETTING STARTED

'Multibeam'. The 15.7dB gain and 26° beamwidth of the 48-element version (at 1.83 metres long) makes it the ideal compromise aerial for most stations and must surely be 'old faithful' for ATV.

The four metre long MBM88 gives 18.5dB/19°, which is super for DX, but makes it very easy to miss signals through incorrect beam alignment.

These aerials, available for many years and very reliable, have been joined by a 28-element version. Perhaps the best solution for a really high gain installation without the problems inherent in the physical size of the 88-element beam, is to use combinations of two or four aerials stacked and bayed, either all 28-element or 48-element, with appropriate phasing harness. Gain over a single antenna is increased by +3dB for two, and +6dB for four antennae.

Some TVers have claimed that Multi-beam performance deteriorates in wet weather due to water shorting out elements at the high impedance insulator points. Can't say I've noticed!

Tonna

An alternative is the excellent Tonna range of 70cm aerials, but here I will mention only the Type 20422 21-element 'ATV Special', cut for 438MHz. This improves performance at the common ATV frequencies from 435.5MHz and 436MHz upwards to the colour sub-carrier frequency, 4.433MHz above the main carrier. At 18dB/24° it is first class, and its long length of 4.6 metres is offset by very light weight of 2.6kg.

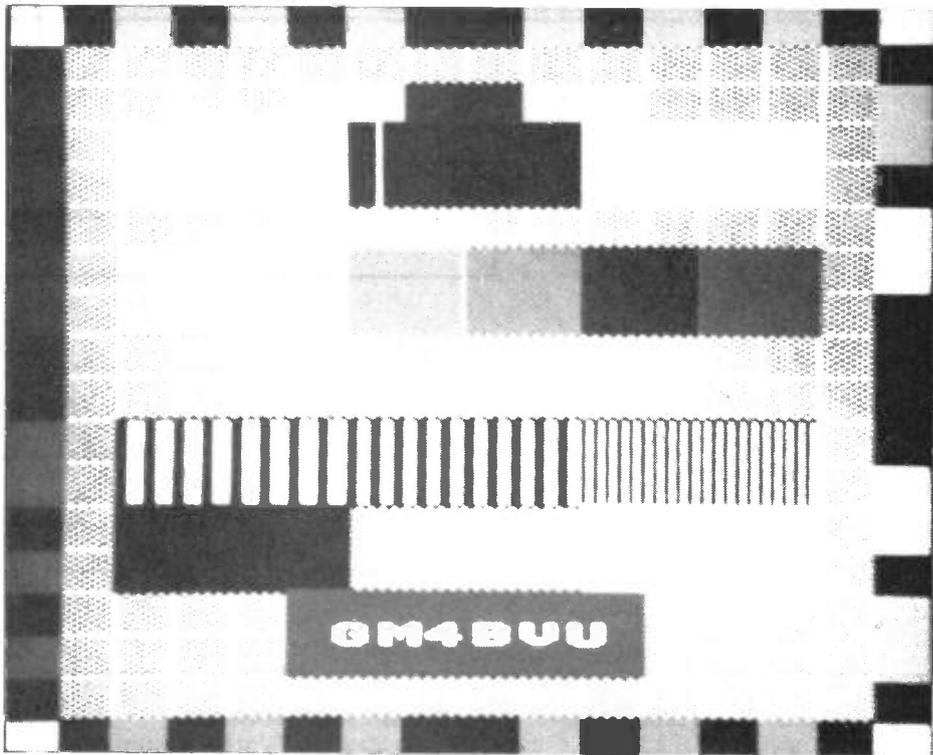
Stacking frames and power splitters are also provided for 2 or 4-way combinations. Incidentally, horizontal polarisation is standard throughout Europe for ATV signals.

Let me conclude with a final word on aerials for those handy with a saw. If you prefer the DIY approach, a 10-element 10dB gain log-periodic aerial can be made following the method of Lewis Elmer (G8EUP) described in *CQ-TV* No 112. The raw material is uncoated welding rod!

Don't skimp!

Assuming a good aerial is installed, *do not* be tempted to use 50ohm 'bargain-basement' cable. The feeder must be at least Uniradio UR67 which is 'relatively lossy but affordable' to quote *CQ-TV* No 123, and preferably Andrews Helix which is very costly and needs special expensive coaxial connectors. A relative newcomer is Popes Super Low Loss H100 cable from W H Westlake, which falls in between these two extremes and is excellent value.

Avoid sharp bends and do not strain or apply pressure to any part of the cable run. Finally, ensure all connections to aerial plugs and sockets are made according to the book, scrupulously clean and adequately protected against



The author's callsign incorporated into a test card

moisture. It gets very wet, so do not take even the slightest chance!

My favoured technique is to completely cover baluns and other connectors with self-amalgamating tape (from Randam Electronics or Radiospares), and then again with Denzo tape, a real gungey mess which retains its sticky form and repels all water. A joint re-opened after years under that lot will still shine like new.

Oh, a word about connectors... steer clear of the PL259, SO239 type UHF connectors, they are not really good enough for the tiny TV signals. Use only commercial 'N' type plugs and sockets, and standardise on 50 or 75ohm versions to match the aerial and TV receiver, as they are *not* interchangeable. In the shack for very small runs, eg linking a pre-amp to the tuner, BNC connectors and thinner cable may be employed, but the well-known 'Belling Lee' as used on broadcast television sets is *out* for ATV completely, except perhaps for low-cost video and pulse circuits, but not RF!

Now that we have a signal into the shack, how do we detect it?

Receivers

In recent years the most common ATV receiver has been a standard black and white 625-line TV with an external tuner modified for 70cms. This is commonly the Mullard ELC1043 or ELC1043/5, readily available from advertisers in *Television* magazine and elsewhere.

The tuners have reasonable sensitivity, but may not tune low enough to cover the amateur frequencies. The 1981 BATC

ATV Handbook contains details of the very simple modification needed. Another BATC publication, *TV for Amateurs*, shows how to use the U321 tuner for 70cm TV coverage. Back issues of *CQ-TV* are peppered with ideas and mods for the home-brewer, and the usual safety precautions must be taken if the TV chassis is live.

Optimum

For the beginner, and even the experienced TVer, I feel the optimum method nowadays must surely be to insert an 'up-converter' between the aerial feeder and the RF input to a standard portable TV, preferably a colour one.

By tuning the TV to around channel 35 or 36, amateur signals are resolved with some major advantages over the ELC1043 approach. Firstly no internal changes at all are needed to the telly, so it can be your domestic set, but the real benefit is that these converters usually provide additional gain from ultra-low-noise RF amplifier stages before the mixer, and with a good noise figure can make all the difference for DX. Spurious responses are reduced by a built-in high-Q filter.

For around £30 and the cost of a 12 volt power supply, you can make yourself really unpopular by commandeering the domestic telly and that's you in business! The choice is between completed units housed in durable die-cast boxes with BNC sockets fitted, and either kit-form or assembled PCBs for which you only need to provide the box.

The complete ready-to-run types are the Microwave Modules MMC435/600, or Fortop TVC435/40, both having around 25dB typical gain. Overall noise figure is better than 1.9dB for the MMC435/600 and 2.5dB for the Fortop unit. The MM converter is fully reviewed in *CQ-TV* No 113 and was found to be 'an excellent unit for its intended purpose'.

Converter

The Wood and Douglas TVUP2 converter is available at £22.80 for the kit, or £27.50 as an assembled board. Its advantage (apart from being slightly cheaper) is that it is crystal-controlled to give more stable operation 'over the extreme conditions that it could meet from a windswept hilltop to a hothouse shack' as it says in their catalogue. It also features a -60dB de-sensing input for local monitoring when you aspire to transmission. This reduces the front-end sensitivity, the normal gain being 30dB from its two RF stages. Altogether a neat unit, although I regret to say I have not yet tried it. Several local GM stations use this circuit and claim it is first rate.

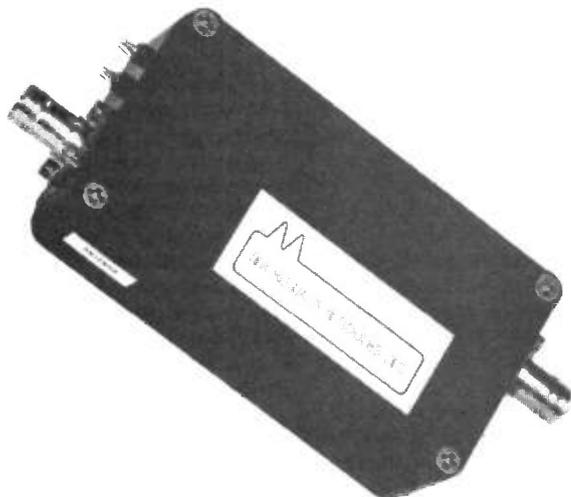
I use the MMC435/600 and it receives its signal via switching diodes inside the matching MTV435 transmitter, with the output normally going to the tuner of my Hitachi VT6500 portable video machine, where I tune the signal for display on a JVC VM14PSN monitor. During contests I feed the converter output straight into a Grundig b/w portable which is better for resolving the weaker signals.

So you 'pays your money and takes your choice' . . . I really feel the easy way to get on ATV is to use the converter approach.

Home-brew

If you have a monitor (that is a TV set which has no tuner and IF strip, and which accepts a straight composite video input), then you could consider building an ATV receiver as described in *BATC Handbook* No 1 page 21.

A Microwave Modules TV up-converter



The author's TV transmitter and receive converter

This receiver is interesting as it uses a surface acoustic wave filter (SAW) for its selectivity, and from a constructor's point of view is a significant advance on the multitude of tuned circuits previously required. The PCB is available (very cheap!) via BATC. So in this case your up-converter feeds a tuner, or the tuner is a modified ELC1043 type, the IF signal passing to the IF selectivity, amplification, demodulation, AGC and AFC circuits to produce a standard 1 volt peak-to-peak video signal.

In passing, let me mention that TV monitors are frequently available at rallies, but are often ex-educational TV units and tend to be bulky. If you want to make a colour monitor, why not convert a Ferguson 14in Movie Star portable as described on page 25 of *CQ-TV* No 119. This set uses the well-proven TX9

chassis, and again a PCB is available through club-sales to take the work out of the project. Take particular note of the need to fit a small mains isolating transformer, essential for safety!

Pre-amps

Earlier I mentioned pre-amps, and there is nothing that will help pull a signal out of the noise better than a pre-amp with a good noise figure. The range available is too great to detail here, but reference to the Wood & Douglas catalogue or Piper Communication's range of German SSB Electronics products will surely find something to suit your budget! muTek Limited also market a range of excellent circuits.

While a pre-amp in the shack is useful, a mast-head pre-amp, especially a 'state-of-the-art' GaAsFET or MosFET, will work wonders, for it will help overcome losses and noise generated in the downlead by boosting the signal by typically 16/17dB with a very low noise figure of 0.9 to 2dB.

Caution

But a word of caution! These pre-amps are very sensitive to RF, even very low dollops of RF like 50mW! So if you plan to move onto transmission, make sure you employ the appropriate control circuit for dc powering your pre-amp. The pre-amp *must* be de-activated and the antenna switching relayed over to transmit before the transmitter is powered up. Otherwise the super-sensitive FET will join mine in that great silicon gulch in the sky! Yes, I managed it twice before it was realised that many rigs (apparently including my Trio TS780) go to transmit as they are powered up. This produces a

ATV – GETTING STARTED

large enough pulse of RF to destroy a pre-amp! So apply power (dc) to your pre-amp very carefully.

Again beware of aerial systems using coaxial isolating or change-over switches, as some of these will give inadequate isolation with RF leakage enough to destroy the pre-amp device! But do not be discouraged, just observe the supplier's precautions and you too can 'pull-in' the DX.

For the home-brewer, G8ADE described a DIY Tx/Rx timing system in CQ-TV No 125 on pages 37 and 38.

Signal reports

For the licensed amateur, you will find that signal reports are very welcome to the stations whose pictures you receive, and ATV talk-back is centred around two main frequencies; 144.750MHz (mainly FM) and 144.170MHz (SSB). These are 'calling' frequencies, so check around them for ATVers and move off them once contact is established.

The standard method of reporting is based on a scale P0 to P5, similar to the RST system for conventional radio (see table).

A printed Reporting Chart to help you assess signal quality is published by BATC for 12p plus 20p p&p.

Anyone interested in amateur television is advised to join the *British Amateur Television Club*. The club issues the quarterly magazine referred to throughout this article, *CQ-TV*. This is virtually the only regular source of practical information on TV equipment and techniques available to amateurs in the UK. The club has its own library and sales department and can often supply hard-to-get items at reasonable cost, as well as a range of informative handbooks on both fast and slow-scan television.

Finally, I must thank the BATC for permission to quote liberally from *CQ-TV*, and wish you every success should you decide to try this exciting branch of the amateur radio hobby.

Useful addresses for the ATVer

British Amateur Television Club, Membership Secretary: D Lawton, G8ANO, 'Grenehurst', Pinewood Road, High Wycombe, Bucks HP12 4DD.

Printed Circuit Boards: Peter Delaney, G8KZG, 6 East View Close, Wargrave, Berks RG10 8BJ.

Publications: Ian Pawson, G81QU, 14 Lilac Avenue, Leicester LE5 1FN.

Radio Society of Great Britain (for general information on licensing), Alma House, Cranborne Road, Potters Bar, Herts EN6 3JW.

Fortop Limited, 9 Ryebrook Grove, Chell, Stoke-on-Trent, Staffordshire (70 and

THE BRITISH AMATEUR TELEVISION CLUB AMATEUR TELEVISION REPORTING CHART



5 EXCELLENT
No noise visible



4 GOOD
Slight noise visible



3 FAIRLY GOOD
Noticeable Noise



2 PASSABLE
High noise level



1 LIMITED USE
Objectionable noise



0 NOT USABLE
Picture lost in noise

Reproduced courtesy of BATC, G6NOX/T and G6KKD/T

Signal reporting scale

P0	... Not usable	Picture lost in noise
P1	... Limited use	Objectionable noise
P2	... Passable	High noise level
P3	... Fairly good	Noticeable noise
P4	... Good	Slight noise visible
P5	... Excellent	No noise visible (closed-circuit quality)

24cm transmitters and receivers, FM-TV gear, linear amplifiers).

Wood and Douglas, Unit 13, Young's Industrial Estate, Aldermaston, Reading RG7 4PQ (70cm TV Tx – kit or ready-built, 70 and 1.3GHz converters, 1.3GHz FM-TV gear, video generators).

Piper Communications, 4 Severn Road, Chilton, Didcot, Oxon OX11 OPW (everything to do with VHF, UHF and microwaves).

Microwave Modules Ltd, Brookfield Drive, Aintree, Liverpool L9 7AN (70cm transmitter and upconverter, filters and high power linears for many forms of ATV).

Randam Electronics, 12 Conduit Road, Abingdon, Oxon OX14 1DB (70 and 24cm aerials and masts).

Solent Scientific, Allan Latham G8CMQ, 75 Chalk Hill, Southampton (24cm FM-TV products).

★ ★ NI-CAD BARGAINS ★ ★

Re-chargeable Nickel-cadmium batteries in stock. Re-chargeable but very little use in condition. DEAC 1000DK Button Stacks 6 cells - 7.2V. Size 2 1/4 x 2 1/2". Capacity 1AH. £4 inc. VAT (p&p 25p). DEAC 600DKZ Button stacks 3 cells - 3.6V. Size 1 1/4 x 1 1/4". diam. Capacity 0.6AH. £1.50 inc. (p&p 20p). Also available - PCB's from which these batteries have been removed containing Transformer, Diode rectifiers, smoothing capacitors, DPDT Relay, fuses etc. easily adapted to charge either of the above stacks. ONLY £1.50 each inc. VAT (p&p 75p).

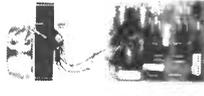


★ ★ STEPPER MOTORS ★ ★

Brand new stock of 'ASTROSYN' Type 20PM-A055 stepper motors. 28V DC. 24 steps per rev. 15 oz-in torque @ 100PPS. Body length 2 1/2", diameter 2", shaft 1/4" diam x 4 1/4" spirally threaded. Weight 16oz. Price each £11.50 (p&p 50p). Connections supplied. INC. VAT

★ ★ STEPPER MOTORS ★ ★

In stock - used, but excellent condition, 4-phase steppers. 50 steps/rev motor with (removable) gearbox giving a 300:1 reduction. 6V DC operated. Complete with a driver board requiring just a single 6V rail and pulse input. Motor measures 1" x 2" diameter, gearbox 3" x 2 1/2" output shaft 3/16". Sold complete with connections, CCT diagram of motor, CCT details of half-stepping etc. All for just 28 inc. VAT (p&p 50p).



OPTICAL ISOLATORS

SPERRY UNIVAC M4000 opto-isolator units providing 2KV of insulation between Modems and Terminals. 25 way 'O' connectors (RS232C Interface) in and out. Measures 9x5x7". Complete with handbook. £18.50 inc vat & pp

BECKMAN TURNS COUNTER DIALS

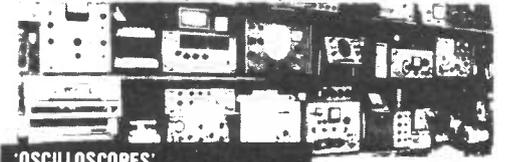
Miniature type (22mm diam). Counting up to 15 turn "Helipot". Brand new with mounting instructions. Only £2.50 each. INC VAT & pp.

TELEVISION SERVICE KIT

We have managed to obtain a stock of Labgear T.V. Service equipment affording vast savings on new. All items are sold in full working condition and guaranteed. LABGEAR COLOURMATCH CM6004PG. UHF TV Pattern generators. Grey scale, variable level cross hatch & dot patterns £35. inc. LABGEAR COLOURMATCH CM6010RG Gated Rainbow colour pattern generators. Cross-Hatch/dot & gated rainbow (RGB) colour bar patterns. £65 inc. UNADHD E0684 PAL Colour-bar & pattern gen. £275 - KORTING 82512 PAL/NTSC Colour & pattern gen. £275 - Mail Order customers please add £2.50 postage ea. item

RALFE ELECTRONICS

10 CHAPEL STREET, LONDON, NW1 TEL: 01-723 8753



'OSCILLOSCOPES'

HEWLETT-PACKARD 141A Storage Oscilloscope
HEWLETT-PACKARD 1707A dual trace 75MHz £750
TEKTRONIX 454A dual trace 150MHz sweep delay £950
TEKTRONIX 453 dual trace 50 MHz sweep delay £600
TELEQUIPMENT S61 - see display below
TELEQUIPMENT D67 dual trace 25MHz sweep delay £350
TELEQUIPMENT D75 dual trace 50 MHz sweep delay £450
TELEQUIPMENT D63 c/w dual-trace & differential units £375

All these units are sold in full operational condition and calibrated to spec. All prices are subject to additional VAT & carriage (Securicor) - £10

TEST EQUIPMENT

Sony/TEKTRONIX 335 SCOPE 5 list price
REGUVOLT 2KVA CVT's Sine wave 230V, AC £100.
MARCONI TF868 LCR Bridge
MARCONI TF2604 Electronic Multi-Meter
MARCONI TF893A Audio Power Meters £85.
MARCONI TF2502 RF Power Meters. DC. 1GHz. 10w fsd £350.
MARCONI TF2701 In-Situ Universal Component Bridge £250.
ROHDE & SCHWARZ 'SDR' AM Signal Generator 0.3-1GHz
TEKTRONIX 2901 Time-mark Generator
ROHDE & SCHWARZ Resonance Frequency Meter 470MHz-2.5GHz
BRUEL & KJAER Polyscop 5WOB II
AIRMEC Display Oscilloscope 279. 4 trace. 14x10" CRT £195.
RIKADENKI 3-channel Chart Recorder, Model B 341.



TELEQUIPMENT S61 SCOPES

A bulk purchase of these quality oscilloscopes enables us to offer them for sale for just £100 +vat. Specification as follows:
Bandwidth DC 5MHz Sensitivity 5mV/div Sweep speeds from 500ms/div to 1us. 8 x 10cm CRT. External X & Z mod inputs £115 inc vat & inc handbook Zorex (Carriage £10)



POWER CUTS ???

We all hope not, but be prepared in case. We have a stock of Transistors. Fluorescent light inverters for emergency use. These are top quality units in polyprop translucent cases with black base. 12V Battery input 8W tube (supplied) output. Circuitry has solid state charge over to charge Ni-cad cells when mains supply is on (batts not supplied). Size 12x4x5". Buy now before its too late! £22 ea inc VAT & P&P. Also available 12VDC-Mains 50Hz inverters from 100W

SWEEPERS

TELECOM 2003 System 800-1500MHz £325
TELECOM SM2200 with 500-900MHz plug-in £175
KNIGHT KG-687 3-220MHz £150

FILE MANAGER SYSTEM MODEL

4081 Option 31 (Third disc drive)
4081 Graphic System compatible.
GMS (SEE 488-1979) compatible.

PLEASE NOTE. All the pre-owned equipment shown has been carefully tested in our workshop and reconditioned where necessary. It is sold in first-class operational condition and most items carry a three months' guarantee. For our mail order customers we have a money-back scheme. Repairs and servicing to all equipment at very reasonable rates. PLEASE ADD 15% VAT TO ALL PRICES. EQUIPMENT WANTED. PLEASE WRITE OR PHONE

★ COMPUTER PERIPHERALS ★

1.6MB 8" FLOPPY DISC DRIVES - New Stock

After our recent sell-out of the DRE7100 FDDs, we are pleased to offer another bargain package as follows: BRAND NEW American 'MFE Corp' model M-700 DOUBLE-SIDED 8" Disc Drives. Massive storage capability up to 1.6MBytes. Full IBM compatibility. External power requirements are ±5V at 1.2A and +24V at 1.1A. Full spares/back-up available U.K. (Eicomatic's). Current list is over £315.

NOW LOWEST PRICE EVER £160 - INCLUDING MANUAL INC CARRIAGE & INC VAT

8" SHUGART type SA800

Floppy disk drives. We are pleased to say that we have these in stock now after our sellout a few months ago. Used but excellent condition single-sided drives to 800KB. Few only at the same price £90 inc VAT & carriage & Zerox of user handbook. Also to those too late for our last stock of 19MByte Winchester's - we now have some coming in ca. £125, please call.

SWITCHING POWER SUPPLIES

The following DC power supplies are available now from stock in limited quantities. All fully tested and guaranteed.

5V @ 10 Amps	£18	12V16A(110V.In)	£20
5V @ 20 Amps	£20	5V @ 40 Amps	£30
5V @ 60 Amps	£40	19V @ 30 Amps	£40
-15V, -12V & -5V @ 11A, 4A and 40A	£50		

ALL PRICES NOW INCLUDE VAT CARRIAGE & C2 EACH.

CENTRIFUGAL BLOWERS

'TORIN' Type U62B1 230V Cap/Start (supplied). Very powerful (200W, 3000rpm) centrifugal fans for large rack cooling or enclosure extraction applications. Overall dimensions 20x12 cms, outlet 6x4 cms. BRAND NEW Surplus stock £15 each inc. VAT, pp £1.50. ALSO SEE LEFT HAND COLUMN

ROTRON INSTRUMENT COOLING FANS

Supplied in fully tested excellent condition, as follows:
• 115V. 4 1/2 x 4 1/2 x 1 1/2" £5. 230V same size
• £5.50. 115V 3 x 3 x 1 1/2" £4. 230V 3" size, brand new £6. Also small quantity 115V 4 1/2" size, brand new £6. Postage each + 50p please. www10

SECURITY

Assemble and install your own system and save pounds

SECURITY

A COMPLETE SECURITY SYSTEM FOR ONLY £39.95 + V.A.T.

contains Control Unit Enclosure & mechanical fixings Key Switch & 2 keys LED's 5 1/2" Horn Speaker 4 high quality surface mounting Magnetic Switches CA 1250 HW 1250 KS 3901 LED 1 HS 588 MS 1025

With only a few hours of your time it is possible to assemble and install an effective security system to protect your family and property, at the amazingly low cost of £39.95 + V.A.T. No compromises have been made and no corners have been cut. The outstanding value results from volume production and direct supply. Assembly is straight forward with the detailed instructions provided. When installed you can enjoy the peace of mind that results from a secure home. Should you wish to increase the level of security, the system may be extended at any time with additional magnetic switches, pressure pads or ultrasonic sensors. Don't wait until it's too late - order today. Order code CS 1370

EXTENDED SYSTEM CS 1480 Price £62.50 + V.A.T. This system contains, in addition to the CS 1370, an ultrasonic detector type US 5063 + its enclosure, an additional horn speaker and a further 2 magnetic switches. This system represents outstanding value for money for the high level of security provided. Order Code CS 1480

SELF-CONTAINED ULTRASONIC ALARM UNIT CK 5063 only £37.00 + V.A.T.

Requires no installation. Easily assembled using our professionally built and tested modules
• Adjustable range up to 25 ft
• Built-in entrance and exit delay
• Built-in timed alarm
• Key operated switch - Off, Test and Operate
• Provision for an extension speaker
• Fully self-contained
• Uses US 5063, PSL 1865 Key Switch 3901, 3" Speaker 3515

Now you can assemble a really effective intruder alarm at this low price using tried and tested Riscomp modules. Supplied with full instructions, the unit contains everything necessary to provide an effective warning system for your house or flat. With a built-in LED indicator and test position the unit is easily set-up requiring no installation. It may simply be placed on a cupboard or desk. Movement within its range will then cause the built-in siren to produce a penetrating 90db of sound or even 110db with an additional speaker. All parts included and supplied with full instructions for ease of assembly. Size 200 x 180 x 70mm. Order as CK 5063

ALARM CONTROL UNIT CA 1250

Price £19.95 + V.A.T.

The heart of any alarm system is the control unit. The CA 1250 offers every possible feature that is likely to be required when constructing a system, whether a highly sophisticated installation or simply controlling a single magnetic switch on the front door.
• Built-in electronic siren drives 2 loud speakers
• Provides exit and entrance delays together with fixed alarm time
• Battery back-up with trickle charge facility
• Operates with magnetic switches, pressure pads, ultrasonic or IR units
• Anti-tamper and panic facility
• Stabilised output voltage
• 2 operating modes full alarm/tamper and panic facility
• Screw connections for ease of installation
• Separate relay contacts for external loads
• Test loop facility

HARDWARE KIT HW 1250

only £9.50 + V.A.T.

This attractive case is designed to house the control unit CA 1250, together with the appropriate LED indicators and key switch. Supplied with the necessary mounting pillars and punched front panel, the unit is given a professional appearance by an adhesive silk screened label. Size 200 by 180 by 70mm. Please allow 7 days for delivery.

Add 15% VAT to all prices
Add 70p post and packing to all orders
Line disconnection
Shop hours 9.00 to 5.30 p.m.
Closed Wednesday
Saturday 9.00 to 1.00 p.m.
S&E with all enquiries
Order by telephone or post
using your credit card

SIREN & POWER SUPPLY MODULE PSL 1865

only £9.95 + V.A.T.

A complete siren and power supply module which is capable of providing sound levels of 110db at 2 metres when used with a horn speaker. In addition the unit provides a stabilised 12V output up to 100mA. A switching relay is also included so that the unit may be used in conjunction with the US 5063 to form a complete alarm.

POWER SUPPLY & RELAY UNIT PS 4012

Price £4.95 + V.A.T. Provides stabilised 12V output at 85mA and contains a relay with 3 amp contacts. The unit is designed to operate with up to 2 ultrasonic units or 1 infra-red unit IR 1470.

SIREN MODULE SL 157

Price £2.95 + V.A.T. Produces a loud penetrating sliding tone which, when coupled to a suitable horn speaker, produces SPL's of 110db at 2 metres. Operating from 9-15V.

5 1/2" HORN SPEAKER HS 588

Price £4.95 + V.A.T. This weather-proof horn speaker provides extremely high sound pressure levels (110db at 2 metres) when used with the CA 1250 PSL 1865 or SL 157.

3-POS. KEY SWITCH 3901

Price £1.43 + V.A.T. Single pole, 3 key-switch intended for use with the CA 1250.

MAGNETIC SWITCH MS 1025

Price £1.17 + V.A.T. Surface mounting superior quality.

US 4012 ULTRASONIC MODULE

Price £10.95 + V.A.T. Basic low cost ultrasonic detector suitable for wide range of movement detection applications, featuring 2 LED indicators and having adjustable range 5-25 ft.

DIGITAL ULTRASONIC DETECTOR US 5063

only £13.95 + V.A.T.

• 3 levels of discrimination against false alarms
• Crystal control for greater stability
• Adjustable range up to 25ft
• Built-in delays
• 12V operation

This advanced module uses digital signal processing to provide the highest level of sensitivity whilst discriminating against potential false alarm conditions.

ULTRASONIC MODULE ENCLOSURE

only £2.95 + V.A.T. Suitable metal enclosure for housing an individual ultrasonic module type US 5063 or US 4012. Supplied with the necessary mounting pillars and screws etc. For US 5063 order: SC 5063. For US 4012 order: SC 4012.

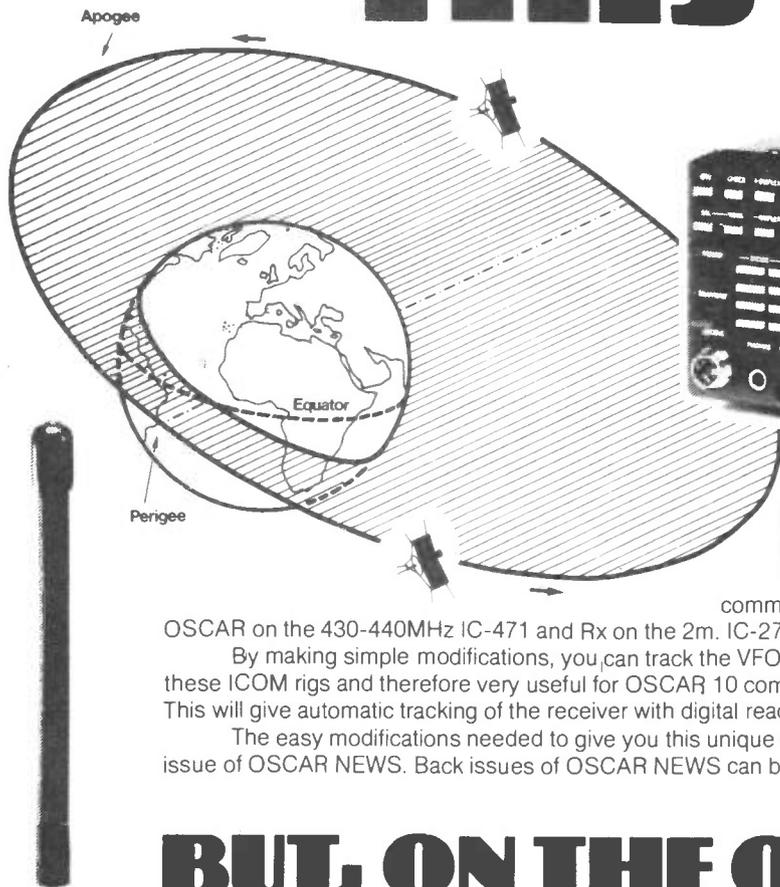
INFRA-RED SYSTEM IR 1470

only £25.61 + V.A.T.

Consisting of separate transmitter and receiver both of which are housed in attractive moulded cases, the system provides an invisible modulated beam over distances of up to 50ft. Intended for use in security systems, but also ideal for photographic and measurement applications. Size 80 by 50 by 35mm.

RISCOMP LIMITED
Dept RE12
21 Duke Street,
Princes Risborough,
Bucks. HP17 0AT.
Princes Risborough (084 44) 6326

ICOM IS OUT OF THIS WORLD.



IC-271 & 471

ICOM can introduce you to a whole new world via the world communications satellite OSCAR. Did you know that you can Tx to

OSCAR on the 430-440MHz IC-471 and Rx on the 2m. IC-271.

By making simple modifications, you can track the VFO's of the Rx and Tx either normally or reverse. This is unique to these ICOM rigs and therefore very useful for OSCAR 10 communications. Digital A.F.C. can also be provided for UOSAT etc. This will give automatic tracking of the receiver with digital readout of the doppler shift.

The easy modifications needed to give you this unique communications opportunity are published in the December '84 issue of OSCAR NEWS. Back issues of OSCAR NEWS can be obtained from AMSAT (UK), LONDON, E12 5EQ.

BUT, ON THE OTHER HAND...

IC-02E IC-04E, (70cm).

The new direct entry microprocessor controlled IC-02E is a 2 meter handheld jam packed with excellent features.

Some of these features include: scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are of course included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority.

The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. New HS-10 Headset, with earphone and boom microphone, which operates with either of the following: - HS 10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS 10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay. The IC-02E continues to be available.



Thanet ICOM Thanet ICOM

SAMSONS

(ELECTRONICS) LTD
9-10 Chapel Street, Marylebone
London NW1 5DN
21-23 Bell Street, London, NW1
01-262 5125 & 01-723 7851



We are stockists of the complete range of 'DOUGLAS' transformers.
Please ring or send S.A.E for details.

AVOMETERS
We have in stock a limited quantity of excellent quality AVOs.
AVO B £89.95 inc VAT. AVO 7 £37.50 inc VAT.
AVO MINOR £20 inc VAT. Callers only, or ring for special delivery.

METERES
Special offer! 250V and 500V meters at give-away prices. Buy now while stocks last. £38 + VAT. Callers only or ring for special delivery.

DIGITAL CLOCK MOVEMENTS
A well made clock 'movement' fitted with timer mechanism and neon illumination. Size approx 110mmx50mmx50mm a.c. operation. A Snip at £3.95 inc VAT & Carriage

SWITCH MODE POWER SUPPLIES
By Gould Advance
5V 40 amp £35, 5V 20 amp £25, 10.5V 20 amp £30. inc VAT and carriage

HIGH GRADE LT TRANSFORMERS
ALL PRIMARIES 240V
OPEN FRAME TOP PANEL CONNECTIONS
No 1 tapped 21-256-7-9-9-10-11-12-13-14-15V 8A £10. No 2 12V 8A £7.50. No 3 tapped 13-12-10-8V 8/2A £9. No 4 Sec 6.3V 2A, 6.3V 2A and 32-0-32V 280 m/A £4.75. No 5 Sec 3V 1.5A, 15V 1/2A, 9V 50 mA £3.95. No 6 Sec 14V 2A £3.95. No 7 Sec 27.5-0-27.5V 1.2A and 7-0-7V 750 mA £3.50. All prices include postage and VAT.

PARMEKO LT TRANSFORMERS
Open frame type top panel connections, prices include postage and VAT. No 1 12-18-32V 2A (DC rating) and 12-18-32V 1/2A (DC) £9. No 2 12-18-32V 1A (DC) and 12-18-32V 1/4A (DC) £8. No 3 12-18-32V 1/2A (DC) and 12-18-32V 1/4A (DC) £8. No 4 12-18-32V 1/4A (DC) and 12-18-32V 50 mA (DC) £2.50. No 5 32V 100 mA (DC) and 32V 25 mA DC £2.50.

HEAVY DUTY AMPLIFIER TRANSFORMERS
MADE BY FAMOUS MAKERS
These superbly constructed transformers have an output of 40V-0V-40V at a massive 2000 watts conservatively rated.
SPECIAL OFFER Price £40 inc VAT Ring For Carriage

GARDNER'S 'C' CORE TRANSFORMERS
PRI-10V, 0V, 200V, 220V, 240V, (screen)
Main outputs separate windings 29V and 3V tapped at 1V will give 26V, 28V, 29V, 30V, 33V at 16amps. Size 150x133x170
Price £18.00 inc VAT & Carriage

SPECIAL OFFER, CLAUDE LYONS VOLTAGE STABILISER
Input 210-270V a.c. Output 240V a.c. ± 5%!!! Rated at 2.9kVA. Ideal for stabilising computer supplies
£195 inc VAT. Carriage £12
Hurry - only a few left

GOULD ADVANCE P.S.U.s.
13.8V 30amp d.c. supplies. Great for linear!!!
ONLY £65 inc VAT. Carriage £3. Limited offer

6000w CONSTANT VOLTAGE TRANSFORMER BY REGAVOLT
This high grade piece of equipment has inputs of either 220 or 240V a.c. - 20% + 12%. Output 220 or 240V + - 1%. Please note this C.V.T. has isolated Secondaries
Size 17.5"x11.5"x25" Weight 3cwt
Price £550 inc VAT. Ring for carriage details
Note: this transformer is ideal for computer P.S.U.s

E.H.T. DC SUPPLY
Mounted on P.C.B with fuseholder and mains input block. Output 5KV at 20mA.
Our Price £5.50 inc VAT & Carriage

E.H.T. TRANSFORMERS
High-grade E.H.T. Trianny. PRI 240V, 380V, 500V, 600V, 700V, 800V, 1000V, 18 M/A. Probably used for boiler ignition but with 101 other uses!!!
£5 inc carr & VAT

PARMEKO OV TRANSFORMERS
PRI 6000 or 8000V or CT Sec 3.75 or 15Ω Ser/Par for EL84x2 12.5W £4.50. PRI 500V for EL84 3W Sec £3.75 or 15Ω Ser/Par £2.50. PRI 30-45-60-90 to 1 also 90TΩ for push/pull Sec 3.75Ω £2. All prices include postage and VAT

AC WKG CAPACITORS
MFD AC WKG Price MFD AC WKG Price
0.25 1500V £1.50 5 350V £1.75
0.75 440V £1.00 5 440V £2.00
1 400V £1.50 4 600V £2.00
25 350V £1.50 6 300V £2.00
27 700V £1.75 8 250V £1.50
All prices include postage and VAT

ELECTROLYTIC CAPACITORS
22,000 63V DC wkg. 33,000 40V DC wkg. 3,000 50V DC wkg. 20,000 45V DC wkg. 6,500 50V DC wkg. All £4 each inc VAT and carr.

PARMEKO HT CHOKES
10H 250 m/a £5.95 20H 75m/a £3.50
5H 250m/a £5.50 10H 75m/a £2.90
5H 180m/a £4.75 7.5H 60m/a £2.50
2.5H 500m/a £5.95 15H 120m/a £3.95
2.5H 250m/a £5.50 50H 10m/a £2.50
20H 120m/a £4.75 25H 60m/a £2.75
All prices include postage and VAT

HEAVY-DUTY LT. CHOKES
C core type 10 m/h 25 amps £10 carr
£3, VAT £15

SPECIAL OFFER HIGH-GRADE ISOLATION TRANSFORMERS
Open frame terminal block connections
£29.50, carr £4, VAT £5.02. Pri 240V, Sec 240V, 250 watts, open frame type tag connections. £19, P&P £2, VAT £1.50. Pri 100-110-200-210-220-230-240-250V - Sec 220-230-240V 600W, can be used in reversed open frame type terminal block connections, £15, carr £2.80, VAT £2.67.

PARMEKO NEON TRANSFORMERS
PRI tapped 200-220-240-250V. Size 7000V 55 M/A. Totally enclosed in wall mounting steel case. Size 9 1/2 x 8 1/2 x 4 1/2 in.
£17.50 inc VAT and carriage
PRI tapped 200-220-230-240-250V. Size 5000V 20 M/A. Totally enclosed in wall mounting steel case. Size 7x6x5 in.
£12.50 inc VAT and carriage

COMPUTER GRADE LT TRANSFORMERS BY FAMOUS MAKERS
ALL PRIMARIES 220-240V
Prices include Postage and VAT

No 1 Sec 43V 3A £5.95. No 2 Sec 40V 3A £5.95. No 3 Sec 65V 1A and 18-24V 1/2A £5.95. No 4 Sec 25V 2A £4.50. No 5 Sec 24V 2A £4.50. No 6 Sec 27.5-0-27.5V and 7-0-7V 0.75A £5.25. No 7 Sec 13-0-13A and 12V 1A £ . . . No 8 Sec 60V 1/2A £4.95. No 9 Sec 40V 1/2A £4.50. No 10 Sec 10-7-0-7-10V 1/2A and 29-21-0-21-29V 370 m/a c core £4.25. No 11 Sec 55V 1/2A £3.75. No 12 Sec 24V 3A and 110V 1/2A £7.95. No 13 Sec 28V 1/2A and 24V 1/2A £5.50. No 14 Sec 36V 1/2A £3.50. No 15 Sec 20V 2A £3.75. No 16 Sec 12-25V 2A £3.75. No 17 Sec 24-0-24V 1A and 6.3V 1A £4.95. No 18 Sec 24V 4A £5.50. No 19 Sec 12-15-20-24-30V £4.75. No 20 Sec 4.5V 5A twice £4.50.

PARMEKO HT TRANSFORMERS
ALL PRIMARIES 220-240V
POTTED TYPES
No 1 Sec 500-0-500V 120 m/a 6.3V 5A 6.3V 3A 5V 3A £8.50. inc postage and VAT.
No 2 Sec 300-0-300V 60 m/a 6.3V 2A CT 6.3V 1A £5.50 inc postage and VAT. No 3 400-0-400V 180 m/a £6.50 inc postage and VAT. No 4 Sec 400-0-400V 150 m/a and 150-0-150V 250 m/a inc postage and VAT. No 5 Sec 350-325-0-325-350V 120 m/a £6.50 inc postage and VAT. Gresham PRI 220-240V, Sec 250V 80 m/a 6.3V 4.5A 15V 1.2A £5.95 inc postage and VAT. PRI 230-250V, Sec tapped 190-210V 24 m/a 6V 1A £3.95 inc postage and VAT. PRI 220-240V Sec 300V 20 m/a 30V 100 m/a 6.3V 5A half shrouded, sub chassis mounting £6.50 inc postage and VAT. PRI 220-240V Sec 370-390-410V 6 m/a £2.75 inc postage and VAT

G.P.O. TOOLBOXES
Once again we have some more of these extremely useful boxes. Size 7 x 7 x 9" with carrying strap and handle. Also detachable hinged lid.
A Real Bargain at £5.00 inc VAT & Carriage

BLACK & WHITE 12" MONITORS
On the chassis with no case. Will give 80 column 120 line. Special price to clear
£15.00 inc VAT. Carriage £3.00

MEMORIX V.D.U.s 1377
We do not as yet have full information on these very attractive units which features a 12" monitor mounted in an adjustable cradle, and a full Alpha Numeric Keyboard. But response to them has been such that we feel you should be told about them. Comes with diagrams for monitor offered to you at £85.00 inc VAT. Carriage £17.00. Ring for details.

NEW TRANSFORMER BARGAINS
By famous makers
No 1 Pri 115-230V Sec 21V 3A + 40V 300 M/A. £5.25
No 2 Pri 220-240V Sec 17.5V 1A 3 times £5.75
No 3 Pri 220-240V Sec 29-28-27-0-27-28-29V 0.3A £4.00
No 4 Pri 220-240V Sec 6.3V 5ACT 6.3V 2ACT £5.00
No 5 Pri 220-240V Sec 40V 3A £6.25
All prices inc VAT and carriage

15AMP ISOLATION TRANSFORMERS BY FAMOUS MAKERS
These high grade transformers are as new and were manufactured for a top UK electronics company to extremely high standards. Each transformer has a large range of tappings for adjusting inputs and outputs.
Size approx 220mm x 280mm x 320mm Weight approx 37kgs. Our price £95 inc VAT
Ring for Carriage Details

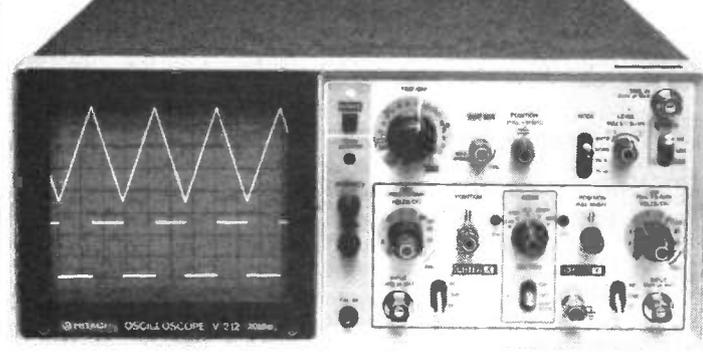
CONSTANT VOLTAGE TRANSFORMERS
Gould Advance
Typ 240V output ± 1%
150W £18.00 carr £2.95
250W £39.50 carr £3.75
500W £85.00 carr £7.50
3000W £295.00 carr £20.00
All prices inc VAT

PAPER BLOCK CAPACITORS
8 MFD 250V WKG DC £3.50
10 MFD 350V WKG DC £15.00
8 MFD 400V WKG DC £2.50
4 MFD 1000V WKG DC £2.00
1 MFD 1000V WKG DC £1.25
All prices inc VAT and carriage

FANS
MUFFIN 4 1/2" 110V £4.00
WOODS 6" and 8" 240V £5.50
Tangential Blowers 240V approx 3" x 15" vent. Very powerful. £11
All prices inc VAT and carriage

AUTO SHUTDOWN TRANSFORMERS FOR AMERICAN EQUIPMENT
240/110 Volts. 80-2250 watts. Regular stock line. Types 80-1500 watts are fully shrouded. Fitted with American two or three pin socket outlets and 3 core 240V mains lead. Types 1750 and 2250 watts are steel cased with two American socket outlets. Neon indicator, three core mains lead and carrying handle. Send SAE for price list and further details. American sockets, plugs, adaptors also available.

Hitachi Oscilloscopes the highest quality from £299 the most competitive prices + VAT



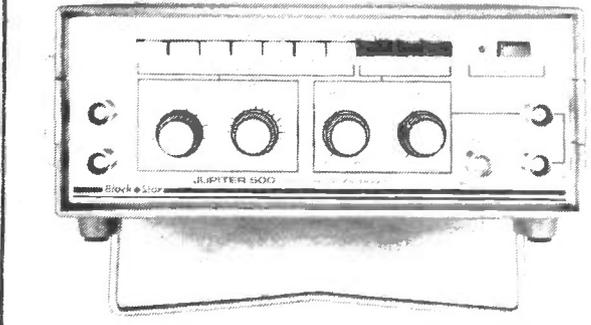
Hitachi Oscilloscopes provide the quality and performance that you'd expect from such a famous name, with a newly-extended range that represents the best value for money available anywhere.

- V-212 20MHz Dual Trace (illustrated)
- V-209 20MHz Mini-Portable
- V-222 20MHz Dual Trace
- V-509 50MHz Mini-Portable
- V-203F 20MHz Sweep Delay
- V-1050F 100MHz Quad Trace
- V-353F 35MHz Sweep Delay
- V-1100 100MHz DMM/counter
- V-422 40MHz Dual Trace
- V-134 10MHz Tube Storage
- V-650F 60MHz Dual Timebase
- VC-6015 10MHz Digital Storage
- VC-6041 40MHz Digital Storage

Prices start at £299 plus vat (model illustrated) including a 2 year warranty. We hold the complete range in stock for immediate delivery.

For colour brochure giving specifications and prices ring (0480) 63570
Thuriby-Reltech, 46 High Street, Solihull, W. Midlands, B91 3TB

FUNCTION GENERATOR 0.1Hz - 500kHz



Designed and manufactured in Britain

Black Star

- * Sine, Square, Triangle, TTL output
- * Accuracy typically 1% of range
- * Typically 0.02Hz - 700kHz
- * Variable DC offset
- * 7 switched ranges with coarse and fine frequency controls
- * External A.M. facility
- * ± 30V output capability
- * External sweep facility
- * Short circuit protection all outputs

JUPITER 500 (inc. P & P and VAT) £128.80

Colour leaflet with specifications and prices available from:

BLACK STAR LTD, (Dept REW) 9A Crown Street, St. Ives, Huntingdon, Cambs. PE17 4EB, England. Tel: (0480) 62440 Telex: 32339

DATA FILE . . .

Ray Marston looks at a wide variety of practical LED circuits in this first part of an in-depth survey of opto-electronic principles and systems.

Opto-electronics can be regarded as the study of any devices that produce an electrically-induced optical (visible or invisible light) output, or an optically-induced electrical output, and of the electronic techniques and circuitry used for controlling such devices. Opto-electronics is obviously a fairly large subject, and we will be taking an in-depth look at it in this and the next few editions of 'The File'.

Amongst the best known 'light-producing' opto-electric devices are LEDs (light-emitting diodes) and LED arrays, which produce a genuine 'light' output, and LCD (liquid-crystal display) devices, which do not actually generate light, but which produce variations in a device's ability to reflect existing ambient light. Light-sensitive devices include photo-diodes, photo-transistors and LDRs (light-dependent resistors).

Some devices, such as opto-isolators and opto-reflectors, combine both light-producing and light-sensitive units in a single package. We will look at all of these devices over the next few months. Let's start off by looking at some basic LED principles and circuits.

LED basics

An LED is a device which emits a fairly narrow bandwidth of visible or invisible (infra-red) light when the diode junction is stimulated by a forward current. They have typical energy conversion efficiencies some ten to fifty times better than a simple tungsten lamp, and have very fast response times (typically $0.1\mu\text{s}$, compared with tens or hundreds of mS for a tungsten lamp), and are thus widely used as 'visual' indicators. Such LEDs are presently widely available in red, orange, yellow and green colours.

Figure 1 shows the standard LED symbol. The device is a genuine diode, and a significant voltage (roughly 2 volts) is developed across it when it is passing a forward current. Figure 2 shows the typical forward voltages of different coloured standard LEDs at forward currents of 20mA. If an LED is reverse-biased it will avalanche or 'zener' at a fairly low voltage value, as shown in Figure 3. Most LEDs have maximum reverse voltage ratings in the range 3 to 5 volts.

To use an LED, a suitable current-limiting device (such as a resistor) must be wired in series with the LED. Figure 4 shows how to work out the 'R' value needed to give a particular current from a particular supply voltage. In practice, R can be connected to either the anode or the cathode of the LED. The LED

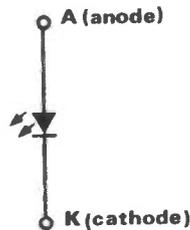


Fig 1 LED symbol

Colour	Red	Orange	Yellow	Green
V_f (typical)	1V8	2V0	2V1	2V2

Fig 2 Typical forward voltages of standard LEDs at $I_f=20\text{mA}$

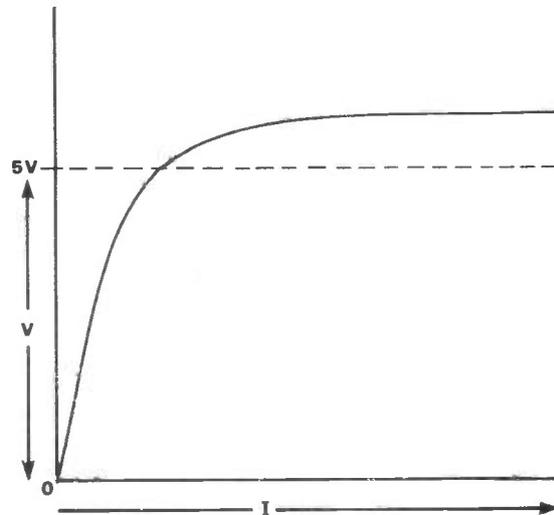


Fig 3 A reverse-biased LED acts like a zener diode

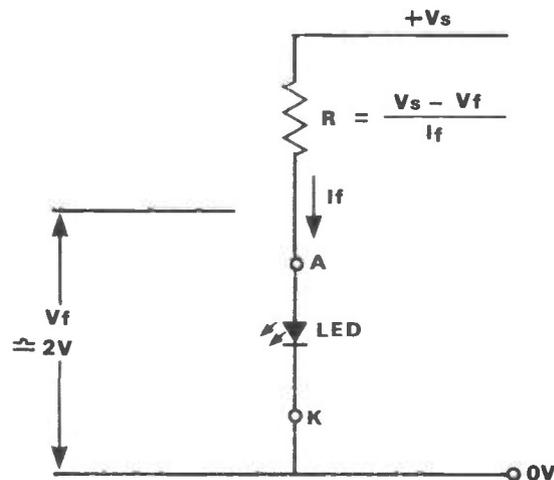


Fig 4 Method of finding the 'R' value for a given V_s and I_f

All diodes at 10p or less in this list 20 of one type	£1.00
OA 47	5p
OA 90	5p
IN 60	5p
IN 541	5p
IN 914	5p
IN 2069a	10p
IN 2070	10p
IN 4001	3p
IN 4002	3p
IN 4003	3p
IN 4004	4p
IN 4005	4p
IN 4006	4p
IN 4007	4p
IN 4148 x 40	£1
IN 4448 x 40	£1
IN 4742	10p
IN 4722	10p
IN 4751	10p
IN 5235	10p
IN 5254	10p
IN 5349	10p
IN 5392	10p
IN 5393	10p
IN 5928B	10p
1A V 30	10p
IM 72Z55	10p
IR 105a	20p
IR 3051	10p
IS 164	10p
IS 921	10p
IS 3011a	10p
IS 3072a	10p
IS 5024a	50p
IS 5030	50p
ITT 210	10p
ITT 921	10p
ITT 923	10p
ITT 1075	10p
ITT 2001	10p
ITT 2002	10p
ITT 4150	10p
ZE 15	10p
ZF 3	10p
ZF 3.3	10p
ZF 4.3	10p
ZF 10	10p
ZF 11	10p
ZF 12	10p
ZF 15	10p
ZF 33	10p
ZF 43	10p
ZF 47	10p
ZF 82	10p
ZPD 3.9	10p
ZPD 4.7	10p
ZPD 5.6	10p
ZPD 10	10p
ZPD 47	10p
ZPY 8v2	10p
ZPY 12	10p
ZPY 16	10p
ZPY 24	10p
ZPY 43	10p
ZPY 47	10p
ZPY 56	10p
ZTE 2	10p
ZTK 22	10p
ZTK 33	10p
ZTK 33a	10p
ZW 13	12p
ZW 27	10p
ZW 4.3	10p
ZW 310	10p
ZX 68	30p
ZY 47	10p
ZY 72	10p
AA 113	10p
AA 119	8p
AA 144	10p
BA 102c	10p
BA 157	8p
BA 159	8p
BA 173	8p
BA 182	8p
BA 201	8p
BA 202	8p
BA 243	8p
BA 248	8p
BA 316	8p
BA 318	8p
BAV 10	10p
BAV 21	10p
BAW 21	10p
BB 103	10p
BB 105A x 12	£1
BB 105B x 12	£1
BB 105G x 12	£1
BB 121a	10p
BRC 83c13	10p
BZX 46c22	15p
BZX 619 1	5p
BZX 61c110	5p
BZX 61c20	10p
BZX 61c30	10p
BZX 61c220	10p
BZX 70c6v2	8p
BZX 70c12	20p
BZX 70c33	8p
BZX 79c3v9, 4v7, 5v1, 5v6, 6v2, 6v8, 7v5, 11, 12, 30, 47	10p each
BZX 83c4v3, 5v6, 6v2, 12, 13, 24, 27, 33	10p each
BZX 84c6v8 x 10	30p each
BZX 85c6v2	10p
BZX 86c0v7, 3v9, 4v3, 6v2, 8v2, 12	10p each
1A/1600V	10p
CV 8617	10p

Min 12 volt Relays	75p
Y 716	10p
Y 729	30p
Y 730	10p
Y 827: 6A/1KV	20p
Y 860	30p
Y 933	50p
Y 969	50p
Y 997	30p
R 1038	40p
R 1039	40p
R 2009	50p
R 2010b	£1
R 2029	50p
R 2210	50p
R 2257	50p
R 2265	50p
R 2305	50p
R 2306	50p
R 2322/2323	pair 80p
R 2323	15p
R 2396	50p
R 2461	50p
R 2030	50p
R 2443=BD124	40p
R 2737	40p
R 2738=TIP41	30p
R 2775=TIP41c	40p
R 3129=TIP47	40p
S 2008b	80p

BU 105/04	80p
BU 108	£1
BU 124	50p
BU 126	80p
BU 180a	65p
BU 204	70p
BU 205	£1
BU 206	£1
BU 207	£1
BU 208 on heat sink	70p
BU 208A	£1.10
BU 208D	90p
BU 222	£1
BU 326	£1
BU 407	60p
BU 426V	60p
BU 500	£1.10
BU 508A	£2
BU 526	75p
BU 807	£1
BUX 84	50p
BUW 84	30p
BUY 71	£1

TIC 106a	30p
TIC 116m	40p
TIC 116n/Y 1003	35p
TIC 126N	40p
TIC 206m	30p
TIC 225S	40p
TIC 226E	40p
TIC 226m	30p
TIC 236m	30p
TICV 106D	10p
(T092 case 2A/400V)	10p
TIP 29	20p
TIP 30	35p
TIP 30A	35p
TIP 30B	40p
TIP 30C	45p
TIP 31	30p
TIP 31A/RCA 16334	35p
TIP 32	30p
TIP 33B	50p
TIP 34A	70p
TIP 34B	80p
TIP 34C	70p
TIP 35B	50p
TIP 35C	70p
TIP 35D	80p
TIP 36	50p
TIP 36C	70p
TIP 41B	40p
TIP 41D	70p
TIP 42/BRC 6109	30p
TIP 49	40p
TIP 57	30p
TIP 100	30p
TIP 102	30p
TIP 112	30p
TIP 115	50p
TIP 117	50p
TIP 120	35p
TIP 125	35p
TIP 130	30p
TIP 131	25p
TIP 136	30p
TIP 140	50p
TIP 147	50p
TIP 640	50p
TIP 2955	35p
T 6032	30p
T 6036	40p
T 6040	40p
T 6047	40p
T 6049	40p
T 6051	40p
T 6052	40p
T 9005	40p
ZTX 102c	10p
ZTX 108c	10p
ZTX 109k	5p
ZTX 213	10p
ZTX 341	10p
ZTX 342	10p

SPECIAL OFFER CVC 21	£35
Chassis complete	£35
Computer Transformer	20v/2.25A, 20v/1.5A, 17.5A, 19.5A, 26/05A
	£3

ZTX 384	10p
ZTX 451	10p
ZTX 550	10p
MJ 2253	80p
MJE 3040	80p
MJE 2209	10p
SP 8385	80p

Voltage Regulators	
+5V/LM78P05SC	30p
-5V/LM79M05CP	25p
-8V/78M08c	30p
+5V/78M06c	30p
+10V/78LA10	20p
LM 337	30p
LM 342/18	30p
LM 340T 5.0	50p
-12V/MC 7912	20p
+12V/LM 340T12	50p
+15V/78M15	15p
+18V/MC78M18	20p
+24V/78M24	30p
MC 7724cp	40p
MC 7824	40p
TIS 90	10p
TIS 91	20p
TIS 92	20p
TIS 93	20p

CB Radio transistor
16119 2A/40v.50Meg
5 for £1.

U 19885	40p
U 3832	15p
U 3845	15p
MR 508	10p
MR 501	10p
MR 502	10p
BCW 71R	30p
BYF 1202	10p
BYF 1204	10p
BYF 3126	40p
BYF 3214	40p
BYX 10	5p
BYX 36/600	35p
BYX 36/300	25p
BYX 55/350	10p
BYX 55/600 (Bead)	10p
BYX 71/350	20p
BYX 71/600	80p
BYX 72/300	20p
BYV 95B	10p
BYV 95C	12p
BYV 96D	10p
BPW 41	15p
BYW 56 2A/1000v G11	5p
BZV 93c75	50p
BZV 15/18	30p
BZV 15/30	30p
BZV 70c6v2	10p
BZX 79 3v	10p
Bush thyristor RCA 76122	£1
ITT computer bookset 2020	£2

G8 20 turn 100K pot.	35p
Transformer 240v/20v-	
500MA	75p
Viewdata torroids	£5
CVC 20 tube base	£2
Mitsumi tape motor	75p
Sankyo tape motor	75p
TIP 31	30p
TIP 31A/RCA 16334	35p
TIP 32	30p
TIP 33B	50p
TIP 34A	70p
TIP 34B	80p
TIP 34C	70p
TIP 35B	50p
TIP 35C	70p
TIP 35D	80p
TIP 36	50p
TIP 36C	70p
TIP 41B	40p
TIP 41D	70p
TIP 42/BRC 6109	30p
TIP 49	40p
TIP 57	30p
TIP 100	30p
TIP 102	30p
TIP 112	30p
TIP 115	50p
TIP 117	50p
TIP 120	35p
TIP 125	35p
TIP 130	30p
TIP 131	25p
TIP 136	30p
TIP 140	50p
TIP 147	50p
TIP 640	50p
TIP 2955	35p
T 6032	30p
T 6036	40p
T 6040	40p
T 6047	40p
T 6049	40p
T 6051	40p
T 6052	40p
T 9005	40p
ZTX 102c	10p
ZTX 108c	10p
ZTX 109k	5p
ZTX 213	10p
ZTX 341	10p
ZTX 342	10p

Stereo GEC amp 20 watt + pre-amp with 4 pots + mains power unit with circuit

SPECIAL OFFER
Decca-TTT etc.
FEO4/250AC/4
Mains filters
(grey type) x 4
£1

SKB 2/08 L5A	30p
KBL 005	30p
KBL 02	30p
KBP 04	30p
W02	15p
W04	15p
W05	20p
GEC remote panel. Main transformer 31c SAA 1025/SN 74147/BA 231	£8
AT 2076/55 GEC split diode transformer	£10
AT 2048/11 LOPTI	£2.50
Mullard	£2.50

PHILIPS DIY HOME SECURITY ALARMS KITS

Send for details. Prices £54 to £112

10 Mixed TV & radio speakers £5 + £2 post	Philips GP422.4CH (£40 cost) £6	Mullard Broadband RF power modules BLW 60C £6.00 12.5 V 175 MC-S 45w VHF.BGY33 £15 UHF.BGY22E £5 PT4236C £5 PT9783 £5 PT8706C
80 4in speakers 4700/10v x 10 58/16 x 10 150/16 x 10 47/25 x 10	Stereo Dynamic Cartridge	
220/25 x 10 1/250 x 10 8000/30v 470/40v x 10 22/100v x 10 100/350v 400/350v 47/500v 1/600v 022/1kv	12 Volt Aerial Changer over Relays..... £1	
	GEC Hlnachi V/Cap tuner, after 1979 Series..... £13	
	6 Push Button Unit for GEC 2100 Series Replacement for Touch Button Unit..... £12	

Philips	£1.00
Freeze	£1.00
Foam Cleaner	£1.00
Contact Cleaner	£1.00
G11 Neon Switch	£1.00
GPO 5 way plug	25p
12v screwdriver tester with lead + croclip	25p
Mains timer, 13 amp - up to 2 hours: easy to use, plugs into socket	£3.00
Sellotape PVC Electric Insulation 25mm x 20M	50p
50mm x 20M 70p	
Telescopic aerials (radio)	£1.00
UHF Radio Aerial	50p
Xcelite pliers	£3.50
Xcelite snips	£5.00
Xcelite cutters	£3.50
GKN Supascrew kits	£2.50
VU meter	45p
Pull up large aerial	75p
'V' TV aerial	£1.00
Soldering iron 6v/23w	£2.50
Weller solder iron 15 watt/25 watt	£5.00
Portable TV aerial	75p
Phillips snips	£2
2 way baby alarm/intercom with long leads	£5
Philips universal battery tester/charger, fuse/bulb tester	To Clear £4
Vol/ohm test meters 1000 ohm/volt	£5
Eisenmann NICAD CHARGER 5.5V/150 ma	£7
12V Nicad pack 'AA'	£2.50
Hitachi TP 007 Battery pack 7.2v/1.6A	£2.50
Hitachi Silver Oxide Battery G13 UCC357 IEC SR44 1.5V	80p
'AA' 1.25V Nicad	£1
'C' Nicad	£2
'D' Nicad	£3
Duracell PP3	60p
Duracell 'C'	50p
70ML Silicone Sealer (clear)	£1
3/4in x 1/2in microphone/speaker	80p
Continental 2 pin plug with 5/2ft mains lead (black &	

MJI 102 — A NEW NUMBER IN BRITISH 'SCOPES ...



Simple Operation — Fully Automatic Trigger —
Single Beam — 100mV to 50V/Div. — Sensitivity —
10mS to 1 μ S/Div. — Sweep — X - Y Facility —
Lightweight and Compact

and at a very lightweight price
SEND FOR DETAILS NOW!

£129⁹⁵

MJ Instruments

HILLTOP HOUSE, THINGOE HILL,
BURY St. EDMUNDS, SUFFOLK, IP32 6BE. Tel: (0284) 67104

CENTRE ELECTRONICS

345 STOCKFIELD RD, YARDLEY
Birmingham (Telephone 0676 32560)
(Shop open Thurs-Fri-Sat)

OFFER FOR SALE A few only ex demonstration and exhibition examples of the Eddystone Model 1590 communications receiver. This up to date HF/MF general purpose receiver covers the frequency bands 150KHz to 350KHz and 580KHz to 30MHz with reception facilities for CW and AM signals and also has provisions for USB and LSB of A3A A3H and A3J transmissions operation is from standard AC mains (100-120V and 200-250V) or 12V DC negative earth.

FEATURES include digital readout display, S meter FET and MOSFET front end stages, 10 crystal positions for high stability working. Ex Works price new is £950 plus VAT.

OUR PRICE £620 each including packaging and delivery anywhere UK and 1 YEAR MANUFACTURERS GUARANTEE Further details on request

SPECIAL ANNOUNCEMENT
BREAKING FOR SPARE PARTS
RACAL RADIO RECEIVER TYPES RH17, RH17/L, RA117. ALL PARTS ARE AVAILABLE. PLEASE TELEPHONE OR WRITE FOR PARTS AND PRICE LISTS

Radio & Electronics World —

For all aspects of practical amateur radio

Don't take a chance on being able to get your copy

AVOID DISAPPOINTMENT
Place a regular order with your newsagent

Should you have any difficulties obtaining a copy, phone (0277) 219876 or write to Circulation Department, **Radio & Electronics World**, Sovereign House, Brentwood, Essex CM14 4SE



NEWSAGENT ORDER FORM

Radio & Electronics World
For all aspects of practical amateur radio

To (name of newsagent)

Please order a copy of **Radio & Electronics World** for me every month

NAME

ADDRESS

Newtrade distributors: Seymour, 334 Brixton Road, London SW9 7AG. Tel: 01-733 4444

TAU

Designed and manufactured in Gt. Britain

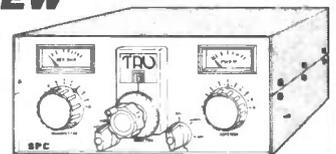
TAU SYSTEMS LTD
51 GREENHEY PLACE
EAST GILBERRANDS
SKELMERSDALE WNS 9SA
ENGLAND
Phone: 0695 24682

INTRODUCING the REAL ATU

FULL COVERAGE, TUNES 1.5 CONTINUOUS TO 29.350 Mcs

Special Features **NEW** model SPC 3000

- 1 Renowned "SPC" transmatch circuit
- 2 TAU innovative composite design*
- 3 Large spaced Capacitors rated 5kV, tested to 7kV
- 4 Roller Coaster inductor infinitely variable
- 5 Balun built in, 1Kw, 4 to 1 impedance ratio
- 6 Transmitter switch, thro ATU or direct to antenna
- 7 Five position antenna switch to 5 input/outputs
- 8 Twin Meter automatic readout of SWR & Power
- 9 unsurpassable transmission strength and clarity
- 10 Solid, traditional precision radio engineering
- 11 Heavyweight, long-life construction
- 12 Superb ultra-compact cabinet design with tilt feet
- 13 Superlative finish and looks — compatible with all rigs
- 14 Will tune any Transmitter/Aerial combination to optimum
- 15 Lifetime Investment — will never need replacing



cabinet dimensions, wide 313mm, high 147mm, deep 380mm
unpacked weight 9.7 kilos of solid quality engineering

£349.⁹⁵ including UK VAT
ex works, carriage extra

UNDOUBTELY THE FINEST ATU AVAILABLE — NOBODY MATCHES UPTO US! TAU SYSTEMS LTD

RTTY and CW TRANSCEIVE with NO TERMINAL UNIT

This fantastic program interfaces direct with your rig, slashing the cost of previous systems. Split screen, type ahead, all the usual features and more. Tape and kit for the very simple interface for only £17.50. Connectors and ready-made interfaces available. For CBM64 and VIC20 (+ at least 8k). BBC-B coming soon. CW-only version for SPECTRUM £10.

And four superb programs for CBM64, VIC20, BBC-B, SPECTRUM

LOCATOR QTH or Maidenhead locator or lat/long. Distances, headings contest points, converts between locator and lat/long. Tape £6.

LOGBOOK Date, band, mode, call and remarks. Superfast callsign search. Easy, fast updating of files. Screen/printer output. Tape £6.

MORSE TUTOR Britain's best. Learn fast in easy stages from absolute beginner to over 40 wpm. Join the hundreds who have succeeded with this program. Tape and full learning guide £6. For ZX81-16k also.

RAE MATHS All the practice and testing you need. Tape and comprehensive reference sheet detailing all you need to know £8. VIC20 needs expansion (any). For ZX81-16k also. Dont let maths make you fail, PASS with this program.

All programs are very easy to use and come with full instructions.

Prices include p&p 1st Class by return. Add £1 per tape if outside UK or Ireland.

technical software (REW)

Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF Tel. 0286 881886

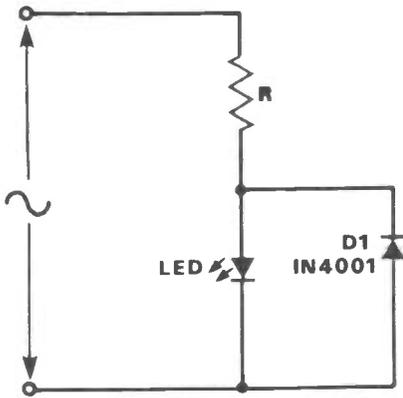


Fig 5 Using an LED as an indicator in an ac circuit

brightness is proportional to the LED current; most LEDs will operate safely up to absolute maximum currents of 30 to 40mA. An LED can be used as an indicator in an ac circuit by wiring a diode in inverse parallel with it, as shown in *Figure 5*, to prevent the LED being reverse biased. For a given brightness, the 'R' value should be halved relative to that of the dc circuit.

Practical usage

The first practical problem that you'll encounter when using an LED is that of identifying its polarity. Most LEDs have their cathodes identified by a notch or flat on the package, or by a short lead, as indicated in the 'outline' diagram (*Figure 6*). This practice is not universal, however, so the only sure way to identify an LED is to test it in the basic circuit of *Figure 4*: try the LED both ways round; when it glows, the cathode is the most negative of the two terminals. Note that it is always good practice to test an LED before soldering it into a circuit.

Special mounting kits, comprising a

plastic clip and ring, are available for fixing LEDs into PC boards and front panels, etc. *Figure 7* illustrates the functioning of such a kit.

Most LEDs come in the form of a 'single LED' package of the type shown in *Figure 6*. Multi-LED packages are also available, however. The best known of these are the 7-segment displays, comprising seven (or eight) LEDs packaged in a form suitable for displaying alpha-numeric characters. So-called ' bargraph' displays, comprising 10 to 30 linearly-mounted LEDs in a single package, are also available.

Most LEDs provide only a single output colour. A few specialist devices do however provide 'multi-colour' outputs. These are actually two-LED devices, and *Figure 8* shows one such device which comprises a pair of LEDs connected in inverse parallel, so that the colour green is emitted when the device is biased in one direction, and red (or yellow) is emitted when it is biased in the reverse direction. This device is useful for giving polarity indication and null detection.

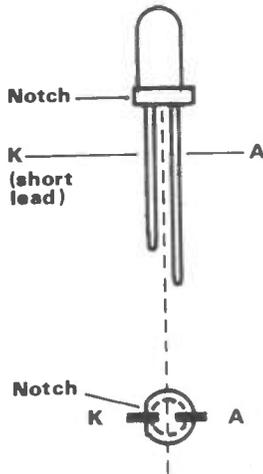


Fig 6 Typical outline and method of recognising the polarity of an LED

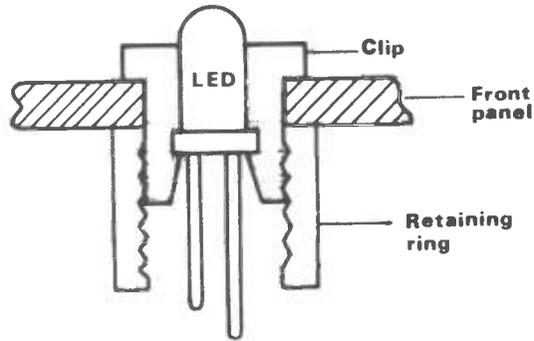


Fig 7 Clip and ring kit used to secure an LED to a front panel

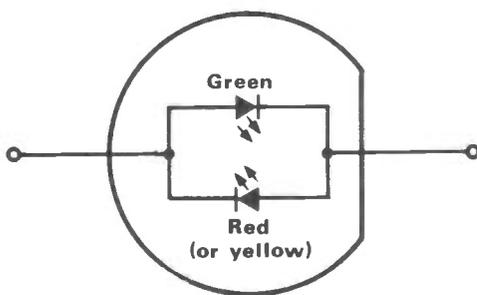


Fig 8 'Bi-colour' LED actually houses two LEDs connected in inverse parallel

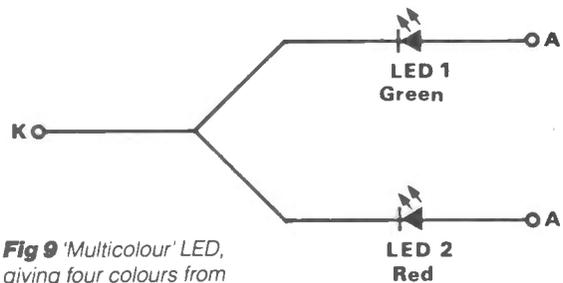


Fig 9 'Multicolour' LED, giving four colours from two junctions

Output colour	Red	Orange	Yellow	Green
LED 1 current	0	5 mA	10 mA	15 mA
LED 2 current	5 mA	3 mA	2 mA	0

Another type of 'multi-colour' LED is shown in *Figure 9*. This comprises one green and one red LED mounted in a 3-pin common-cathode package. This device can generate green or red colours by turning on only one LED at a time, or can generate orange and yellow ones by turning on the two LEDs in the ratios shown in the table.

A very important practical point concerns the use of 'second grade' or 'out-of-spec' devices advertised as 'Bargain Packs'. These devices often have forward voltage drops in the range 3 to 10 volts, and may consequently be quite useless in many practical applications. *Always test these devices before use.*

Multi-LED circuits

If you ever need to drive a number of LEDs from a single source, this can be done by wiring all LEDs in series as shown in *Figure 10*.

Note that the supply voltage used here must be significantly greater than the sum of the individual LED forward voltages. This circuit thus draws minimal

total current, but is limited in the number of LEDs that it can drive.

A number of these circuits can, however, be wired in parallel, so that almost any number of LEDs can be driven from a single source, as shown in the 6-LED circuit of *Figure 11*.

An alternative way of driving a number of LEDs is to simply wire a number of the *Figure 4* circuits in parallel, as shown in *Figure 12*. Note, however, that this circuit is very wasteful of current (which is equal to the sum of the individual LED currents).

Figure 13 shows a 'what not to do' circuit. This circuit will not work correctly, because inevitable differences in the forward voltage characteristics of the LEDs will usually cause one LED to 'hog' most of the available current, leaving little or none for the remaining LEDs.

LED-control circuits

The three most widely used types of visible-output LED-control circuits are (ignoring those used for alpha-numeric

LED control): those used for LED 'flashing', for LED 'sequencing', and for LED 'dot' or 'bar' analogue-value indication.

LED 'flasher' circuits are designed to turn an LED alternately on and off, to give an eye-catching display action. These circuits may control a single LED, or may be designed to control two LEDs in such a way that one turns on as the other turns off, and vice versa. A special LED-flasher IC is available (the LM3909), which can be used to flash an LED from a very low voltage (1V5) battery supply, and to do so at a very low mean current level. A dozen practical LED-flasher circuits are shown later in this article.

LED 'sequencer' circuits are designed to drive a chain of LEDs in such a way that each LED in the chain is switched on and off in a time-controlled sequence, so that a ripple of light seems to run along the chain.

LED analogue-value indicator circuits are designed to drive a chain of linearly-spaced LEDs in such a way that the length of chain that is illuminated is

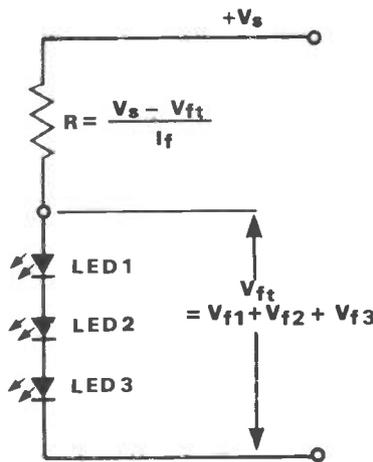


Fig 10 LEDs wired in series and driven via a single current-limiting resistor

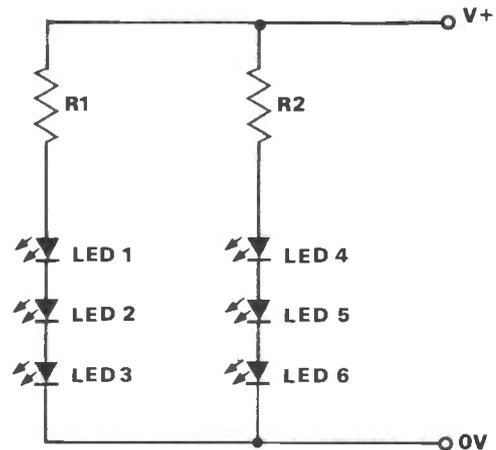


Fig 11 Any number of *Figure 10* circuits can be wired in parallel, to drive any number of LEDs

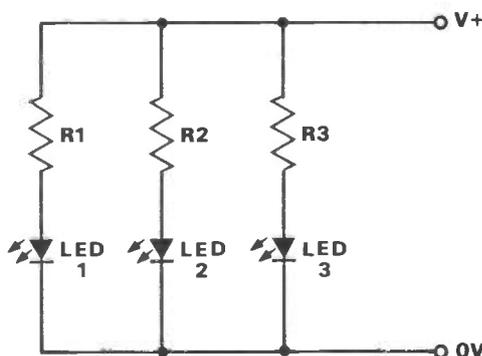


Fig 12 This circuit can drive a large number of LEDs, but at the expense of high current

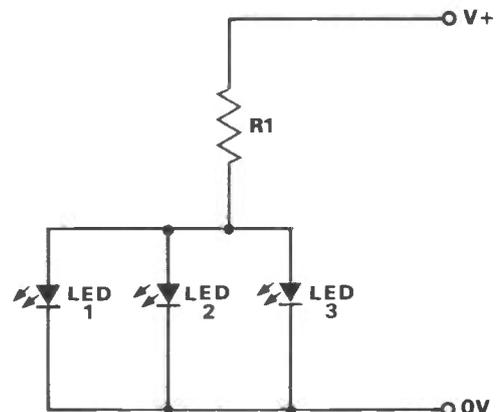


Fig 13 This LED-driving circuit will not work. One LED will hog all of the current

HART

LINSLEY HOOD 300 SERIES AMPLIFIER KITS

Ultra high quality. Mosfet output, Hi-Fi amplifier kits by this famous designer. Two models of identical appearance are available, one giving 35 watts per channel output, the other 45. Careful design has made these amplifiers capable of superb sound quality. The delicacy and transparency of the tone quality enables them to outperform, on a side by side comparison, the majority of commercial amplifiers. Building is very easy as almost all components are fitted on easily removed printed circuit boards. Subsequent setting up needs only a simple multimeter to obtain the full specified performance. Both kits come with very comprehensive building instructions.

35 Watt Complete Kit — **£79.50** 45 Watt Complete Kit — **£83.50** Reprints of Original Articles from 'Hi-Fi' News **£1 no Vat.**

LINSLEY-HOOD CASSETTE RECORDER CIRCUITS

Complete record and replay circuits for very high quality low noise stereo cassette recorder. Circuits are optimised for our HS16 Super Quality Sendust Alloy Head. Switches bias and equalisation to cater for chrome and ferric tapes. Very easy to assemble on plug-in PCBs. Complete with full instructions.

Complete Stereo Record/Play Kit — **£25.26**
VU Meters to suit — **£2.30 each**
Reprints of original Articles. **75p no Vat.**

LINSLEY-HOOD 100 WATT POWER AMPLIFIER

Our complete kit for this brilliant new design is the same size as our Linsley-Hood Cassette Recorder 2. Kit includes all parts for two power amplifiers with large heatsink area, huge power supply and speaker protection circuit. Total cost of all parts is **£114.46** but our special introductory prices for all parts bought together is only **£105.50**.

Please Note: New Phone Number: **(0691) 652894**
Personal callers are always very welcome but please note that we are closed all day Saturday.

ALPS FF317U FM FRONT END

Beautiful, precision make High Quality variable capacitor tuned FM Front End with Dual-gate MosFet. 2-AM Gangs and 3:1 reduction gear.
FM range 87 to 109MHz 12v 30mA Max. AGC and AFC. OUR PRICE ONLY **£3.99** INCLUDING VAT AND POSTAGE (Circuit if required 35p).

MULLARD UHF TV FRONT ENDS

Compact Varicap tuned modules. U322 is used in 'ELEKTOR' teletext decoder. U321 **£9.24** inc vat U322 **£9.76** inc vat.

COMPLETE STEREO TUNER MODULE

Three band LW/MW/FM Stereo Tuner fully assembled on PCB 165 x 85mm. Supplied with Ferrite rod aerial and band switch fully wired. Facility provided to drive tuning meter and stereo LED. Only needs 12v DC supply. FM sensitivity. 2.5uV. **Price only £7.99 inc. VAT and post.**

STEREO CASSETTE DECK

Following the runaway sellout of our last cassette deck we have now obtained a small quantity of an even nicer one. Min features are full auto-stop. Chrome/Ferric Switch, Manual record level control (invaluable for computer use), twin VU meters and 3-digit counter. Complete with all record and replay circuitry, control keys and cassette carrier/door. Very good quality and only **£21.80** inc Vat and Post. Circuit diagram and notes **35p**. SET OF 5 SUB-MINIATURE IF TRANSFORMERS for high quality AM tuner. THE SET ONLY **38p!** Application circuit required **10p** Suitable ferrite rod antenna **85p**

AM VARICAP DIODE BARGAIN Due to a fantastic bulk purchase we are now able to offer the super SMV2012 varicap diodes at unbelievable prices. These are a wide range diode for use in AM tuner applications. They are also supplied in matched sets to eliminate tracking errors!
Matched pair only 25p. Matched 4 only 60p.

AM TUNER COIL SET Set of 4 coils for long medium and short wave AM tuner. Coils are LW Osc, MW Osc, SW Osc and SW Aerial. Normally 30p each. OUR PRICE FOR THE SET ONLY **55p**

Application circuit using coils and matched pair of SMV2012 varicaps. 35p 168A E162 455KHz IF Transformer **30p** Suitable PC Board **£1.50** PC Mounting Wavechange Switch **£1.60**

HIGH QUALITY REPLACEMENT CASSETTE HEADS



Do your tapes lack treble? A worn head could be the problem. Fitting one of our replacement heads could restore performance to better than new! Standard mountings make fitting easy and our TC1 Test Cassette helps you set the azimuth spot-on. We are the actual importers which means you get the benefit of lower prices for prime parts. Compare us with other suppliers and see! The following is a list of our most popular heads, all are suitable for use on Dolby machines and are ex-stock.

HC20 Permalloy Stereo Head. This is the standard head fitted as original equipment on most decks **£5.11**
HM90 High Beta Permalloy Head. A hard-wearing, higher performance head with metal capability **£8.06**
HS16 Sendust Alloy Super Head. The best head we can find. Longer life than Permalloy, higher output than Ferrite, fantastic frequency response **£9.91**
HQ551 4-Track Head for auto-reverse or quadrophonic use. Full specification record and playback head **£9.73**
MA481 Latest version Double Mono (2/2) record/Play head. Replaces R484 **£8.90**
SM166 Standard Mounting 2/2 Erase head. Compatible with above or HQ551 4 Track head **£5.90**
HS24 Standard Erase Head. Semi double gap, high efficiency **£1.50**
HS61 Metal Tape Erase Head. Full double gap **£4.90**
Please consult our list for technical data on these and other Special Purpose Heads.

HART TRIPLE-PURPOSE TEST CASSETTE TC1

One inexpensive test cassette enables you to set up VU level, head azimuth and tape speed. Invaluable when fitting new heads Only **£4.66** plus VAT and 50p postage.

Tape Head De-magnetiser. Handy size mains operated unit prevents build up of residual head magnetisation causing noise on playback **£4.94**

Full details of the entire range of HART products is contained in our illustrated lists. Ask for your FREE copy NOW.

Enquires for lists are also welcome from overseas but please let us have three IRCs to cover the cost of surface post or 5 IRCs for airmail.

Please add part cost of post, packing and insurance as follows

INLAND **OVERSEAS**

Orders up to £10-50p Postage at cost plus £2

Orders £10 to £49-£1 documentation and handling

Orders over £50-£1.50

All prices exclude VAT unless stated.

HART
HART ELECTRONIC KITS LTD
PENYLAN MILL
OSWESTRY, SHROPSHIRE
SY10 9AF

Send for my CATALOGUE ONLY 75p (plus 25p post/packing)

My all-inclusive prices quoted in the catalogue are the lowest. All below Normal trade price — some at only one tenth of manufacturers quantity trade.

Millions of components. thousands of different lines

Rechargeable Nickel cadmium batteries Ex-unused Equipment
AA (HP7) 1.25V 500 MA Set of 4 **£2.00**
Clear LED illuminates red, green or yellow depending upon polarity/current, oblong 5 x 2 1/2mm face **25p** or 100 for **£23** or 1000 for **£200.00**
5mm Red Flashing LED **25p** or 10 for **£2.25**
Watch/Calculator/Lighter etc. Mercury batteries
RW52 (PX 675) RW54 made by Ray-O-Vac
RW56 (DH 323, WH8) **31p** Each or 10 for **£2.60**, 100 for **£21.00**
RW57, RW58
IN 4004 or IN 4006 Diodes 300 for **£6.48**
TO5 or TO18 Heatsinks **7 1/2p** 100 for **£6.50**, 1000 for **£55.00**
Clipover Heatsink for I/C or TO202 Device 21 x 18mm — **18p**, 02 100 for **£16.50** or 1000 for **£155.00**
Heatsink for TO3 or plastic power **19p** 100/**£17.50** 1000/**£165.00**
KB50005/01/02 3 amp 50v/100v/200v Bridge Rectifiers **35p/36p/40p** 10 off **£3.20/£3.40/£3.70** 100 off **£30/£31/£34**
Plessey SL403. 3wt amp. From bankrupt source hence sold as untested, at 4 for 60p; 10 for **£1.20**
ITT mercury wetted relay, 20-60V DC coil, SPCO 2A **79p**, 10 for **£7.00**

SEND PAYMENT PLUS 16p SAE OR LABEL

Prices you would not believe before inflation!

BRIAN J REED

TRADE COMPONENTS
ESTABLISHED 27 YEARS

161 St Johns Hill, Clapham Junction, London SW11 1TQ

Open 11am till 6.30pm Tues to Sat. Telephone: 01-223 5016

Radio & Electronics World

PCB's

May '84	Signal Generator.....	£1.90
	Frequency meter.....	£4.30
	S meter display.....	£0.99
	S meter control.....	£1.99
July '84	VLF converter.....	£1.60
	Teleprinter Interface.....	£1.45
Sept '84	5ch Scanner main.....	£3.92
	5ch Scanner display.....	£1.40
Nov '84	Base mic.....	£1.50

Prices include VAT & P&P

KITS and other PCB's also available SAE for full list.

Edwardschild Ltd. (0277) 216433  
28 Shenfield Cres, Shenfield, Essex CM15 8BN

ELECTRONICS C•A•D "ANALYSER"

PERFORMANCE ANALYSIS OF LINEAR CIRCUITS using the BBC MODEL B AND SPECTRUM 48K micros.

Simulates Resistors, Capacitors, Inductors, Transformers, Bipolar and Field effect Transistors, and Operational Amplifiers in any circuit configuration.

Performs FREQUENCY RESPONSE ANALYSIS on Circuits with up to 16 Nodes and 60 Components, for Phase and Gain Loss. Input Impedance and Output Impedance

Ideal for the analysis of ACTIVE and PASSIVE FILTERS, AUDIO, WIDEBAND and RF AMPLIFIERS, LINEAR INTEGRATED CIRCUITS etc. etc.

"ANALYSER" can greatly reduce or even eliminate the need to breadboard new designs.

USED BY INDUSTRIAL AND UNIVERSITY R & D DEPARTMENTS WORLD WIDE.

LOW COST...VERY EASY TO USE

For further details write or phone **NUMBER ONE SYSTEMS**

Department REW, 9A Crown Street, St Ives
Huntingdon, Cambs UK, PE17 4EB

Tel: 0480 61778 Telex: 32339

proportional to the analogue value of a voltage applied to the input of the driver circuit, ie so that the circuit acts like an analogue voltmeter. We'll look at a range of practical 'sequencer' and analogue-value indicator circuits in next month's edition of *Data File*.

Simple LED-flasher circuits

One of the simplest types of LED display circuit is the LED flasher, in which a single LED repeatedly switches alternately on and off, usually at a rate of one or two flashes per second. A two-LED flasher is a simple modification of this circuit, but is arranged so that one LED switches on when the other switches off, or vice versa.

Figure 14 shows the practical circuit of a transistor two-LED flasher, which can be converted to single-LED operation by simply replacing the unwanted LED with a short circuit. In this circuit, Tr1 and Tr2 are wired as an astable multivibrator, with its switching speeds determined by the R3-C1 and R4-C2 time constants. With the values shown, the circuit operates at about 1 flash per second.

Figure 15 shows an IC version of the two-LED flasher. This design is based on the faithful old 555 timer chip or its more modern CMOS counterpart, the 7555. The IC is wired in the astable mode, with its time constant determined by R4 and C1. The action here is such that output pin 3 of the IC alternately switches between the ground and the positive supply voltage levels, alternately shorting out and disabling one or other of the two LEDs. The circuit can be converted to single-LED operation by omitting the unwanted LED and its associated current-limiting resistor.

Figure 16 shows a useful modification of the above circuit, in which the flashing rate is made variable via RV1, and two pairs of series-connected LEDs are connected in the form of a cross so that the visual display alternately switches between a horizontal bar (LEDs 1 and 2 on) and a vertical bar (LEDs 3 and 4 on), thus forming a visually interesting display. The flash rate is variable between 15 and 2000 per second.

The LM3909 'flasher' IC

A seemingly trivial task that sometimes faces the design engineer is that of providing an illuminated (glowing or flashing) indication of the 'on' state of a piece of electronic equipment, or the location of a passive device (fire extinguisher, torch, emergency switch, etc) in a darkened room.

These tasks are obviously easily solved if mains power is available, but can present serious problems when battery powered equipment is concerned. LED indicators typically draw about 12mA when illuminated and can thus place a fairly heavy strain on small supply batteries. LEDs, in any case, drop two or

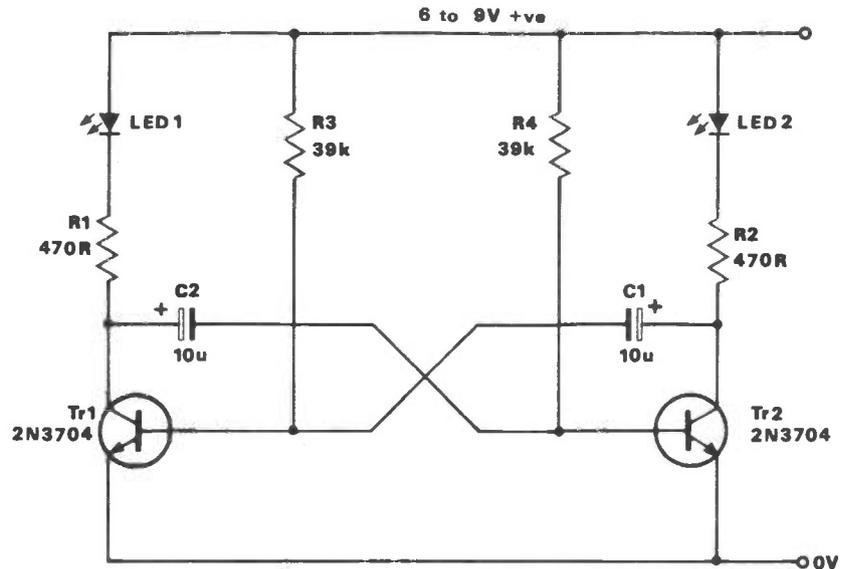


Fig 14 Transistor 2-LED flasher circuit operates at about 1 flash per second

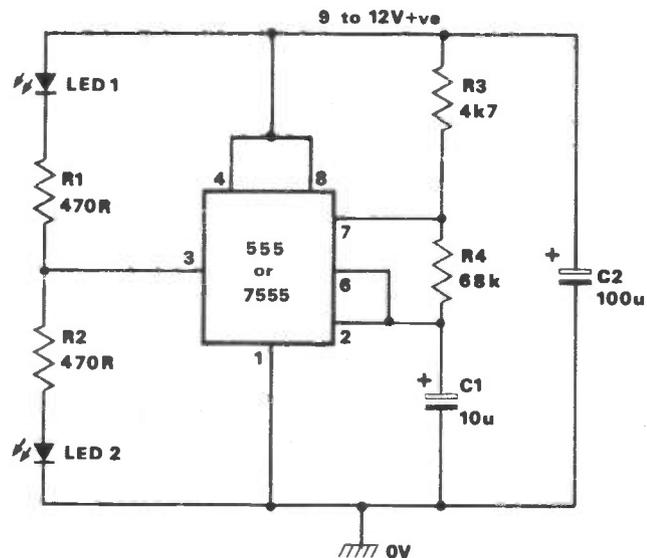


Fig 15 IC 2-LED flasher circuit operates at about 1 flash per second

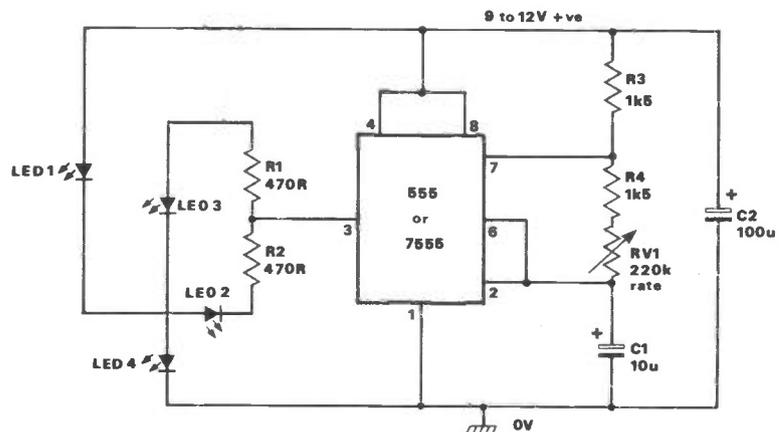


Fig 16 4-LED 'Double-Bar' flasher. Rate is variable from 15 to 2000 flashes per minute

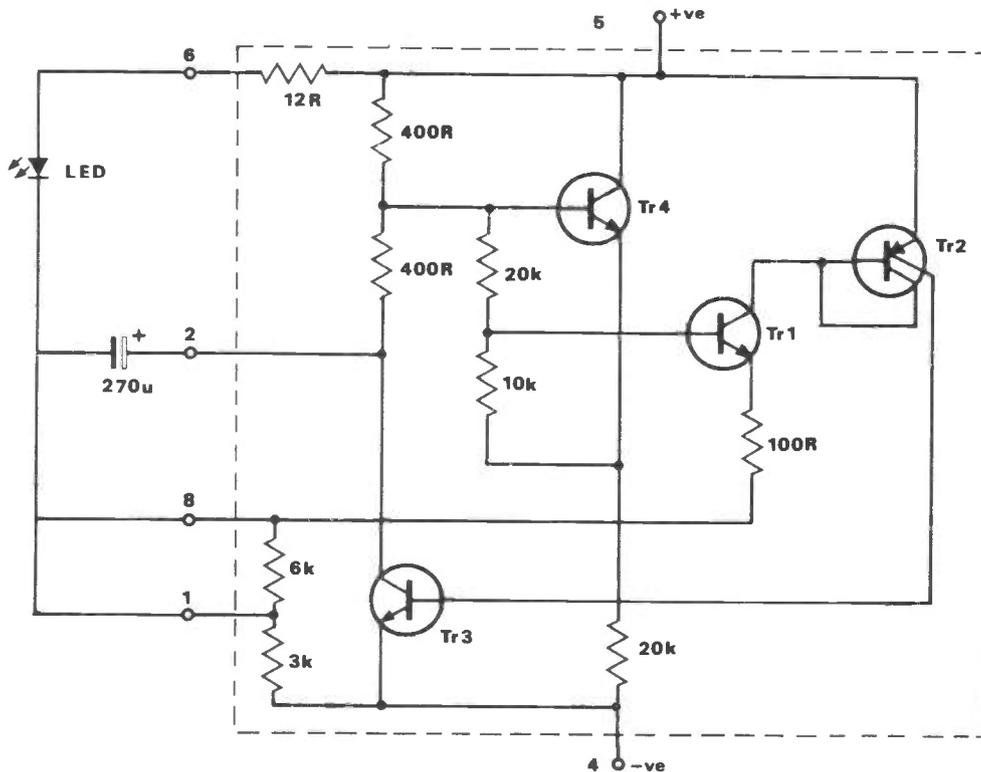
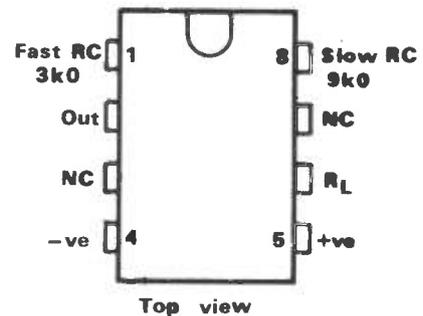


Fig 17 Internal circuit and practical connections of the LM3909 low-voltage LED flasher IC. The IC outline is also shown



more volts under the 'on' condition and can thus not readily be powered from battery voltages below 3 volts or so.

National Semiconductors provided an ingenious solution to this problem some years ago when they introduced the 8-pin LM3909 LED flasher/oscillator IC. This device acts basically as a low duty cycle (brief 'on' period, long 'off' period) oscillator that provides a voltage-doubled high-current pulse to an external LED. Because of the voltage-doubling facility, the IC can flash an LED even when powered from cell voltages down to 1.1 volts.

Because of the low duty cycle facility, the device can provide high pulse currents (up to 100mA) while still drawing very low *mean* currents (typically 0.3 to 1.5mA) and can thus provide months, or even years, of continuous flasher operation from a single 1.5 volt cell.

The internal circuit of the LM3909, together with typical external connections for 1.5 volt flasher operation, is shown in *Figure 17*.

In this particular application, the LED receives current (via the 270µF capacitor and the internal 12R resistor and Tr3) for only about 1% of the time. For the remaining part of each operating cycle all transistors except Tr4 are off. The internal 20K resistor (from Tr4 emitter to supply common) draws only 50µA or so. The 270µF capacitor is charged through the two 400R resistors and (in this particular application) through the 3K0 resistor, connected between pins 1 and 4 of the circuit.

Transistors Tr1 through Tr3 remain off until the 270µF capacitor becomes charged to about 1 volt. This voltage is determined by the junction drop of Tr4, its base-emitter voltage divider, and the junction drop of Tr1. When the voltage at pin 1 becomes a volt more negative than that at pin 5 (the supply positive pin), Tr1 begins to conduct and then turns Tr2 and Tr3 on. The IC then supplies a pulse of high current to the LED.

The current amplification of Tr2-Tr3 is roughly 500; Tr3 can handle over 100mA of collector current, and rapidly pulls pin 2 close to supply common (pin 4). Since the 270µF capacitor is charged at this time, it forces the pin 1 terminal *below* the supply common value; consequently, the volt drop across the LED is greater than the supply voltage value;

the internal 12R resistor (between pins 5 and 6) limits the LED current to a safe value.

Thus, the 270µF capacitor alternately charges via the 3K0 timing resistor and discharges via the LED and the internal 12R resistor in this particular application. In some other applications the short between pins 1 and 8 can be removed, enabling the capacitor to charge through a total of 9K0, with a consequent increase in the duty cycle and reduction in mean current consumption.

If voltage boosting is not needed (with or without current limit), loads can be wired directly between pins 2 and 6 or pins 2 and 5 of the IC. The IC is thus a fairly versatile device. A variety of practical applications are shown in the remaining part of this month's article.

NEW from

Peerless

This exciting new range of designs covers all domestic HiFi applications. There are 20, 30 and 40 litre designs using the famous Peerless Polypropylene bass units (newly released to the DIY market), a 7 litre mini speaker and two designs specifically intended for use with digital systems. The



Wilmslow Audio Total kits include all cabinet components, accurately machined from MDF board, drive units, crossover kits, wadding, grille fabric, terminals, nuts, bolts, etc. Full details are in the Peerless Manual for Loudspeaker Constructors which is available F.O.C. (send 12" x 9" SAE)

Total kit Prices per pair inc. VAT

Design 50/2R (7 litre, reflex)	£32.50 plus carr./ins	£6.00
Design 65/2R (20 litre, reflex, Polyr.)	£111.00 plus carr./ins	£6.50
Design 825/2R (30 litre, reflex, Polyr.)	£115.00 plus carr./ins	£10.00
Design 100/3 (40 litre, 1B, Polyr.)	£172.00 plus carr./ins	£10.00
Design CD825/2R (25 litre, reflex) for digital	£128.50 plus carr./ins	£10.00
Design CD825/3R (30 litre, reflex) for digital	£185.00 plus carr./ins	£10.00

Basic kits (drive units and crossovers only) per pair

Design 50/2R	£67.50 plus carr./ins	£4.50
Design 65/2R	£77.00 plus carr./ins	£4.50
Design 825/2R	£77.00 plus carr./ins	£4.50
Design 100/3	£128.50 plus carr./ins	£5.50
Design CD825/2R	£88.95 plus carr./ins	£5.00
Design CD825/3R	£144.00 plus carr./ins	£5.50

Active versions of the three 825 designs are available

VERY COMPETITIVE PRICES

on speaker drive units:
**AUDAX • CELESTION
 DECCA • ELAC • FANE
 GAUSS • GOODMAN'S
 KEF • MCKENZIE
 PEERLESS • SCANSPEAK
 SEAS • TANNOY • VOLT
 WHARFEDALE etc.**
**COMPREHENSIVE
 CATALOGUE!**
**Pages & pages of drive
 units, kits, crossovers,
 cabinet components,
 designs for PA cabinets
 crossover calculations etc.**

£1.50 Post Free (Export £3.50 or \$6!)

**Visit our new
 HI-FI STUDIO**

for a great deal on
**Ariston, A&R, B&W, Dual, Kef,
 M-Short, Mission, Monitor,
 Nad, Rotel, Trio, Walker etc.**

Constructor Series Speakers



IT'S SO EASY

Have fun, save money, building a Kef design with a Wilmslow Audio CS Total kit.

No electronic or woodwork knowledge necessary and the end result is a proven top-quality design that you'll be proud of.

Each kit contains all cabinet components, accurately machined for easy assembly, speaker drive units, crossovers, wadding, grille fabric, terminals, nuts, bolts, etc. The cabinets can be painted or stained or finished with iron-on veneer or self adhesive woodgrain vinyl. Easy foolproof assembly instructions supplied. Set of constructor leaflets sent free on receipt of large S.A.E.

CS1 (As 101)	£111 pr. inc. VAT, plus carr./ins	£6.00
CS1A (simplified LS3/5A)	£108 pr. inc. VAT, plus carr./ins	£6.00
CS3 (as 103.2)	£131 pr. inc. VAT, plus carr./ins	£10.00
CS5 (as Carlton II)	£195 pr. inc. VAT, plus carr./ins	£15.00
CS7 (as Cantata)	£263 pr. inc. VAT, plus carr./ins	£18.00

Kef Constructor Series basic kits (drive units and crossovers only)

CS1	£88.50 carr./ins	£5.00
CS1A	£84.00 carr./ins	£5.00
CS3	£100.50 carr./ins	£5.00
CS5	£139.95 carr./ins	£5.50
CS7	£193.05 carr./ins	£5.50



Dept REW
35-39 Church St. Wilmslow, Cheshire SK9 1AS
Tel: 0625 529599

Wilmslow Audio Catalogue post free £1.50
 Celestion Cabinet Handbook post free £1.00
 Fane loudspeaker enclosure Design post free £2.95
 Peerless Manual FOC
 Loudspeaker Constructors FOC
ALL the above £5 post free



(Visa Access, American Express)



CRIMSON ELECTRIK amplifier kits, modules, active crossovers. YAMAHA Professional and Producer series products. 3rd Generation mixers, amplifiers. McGregor PA amplifiers, combos etc.

All at very competitive prices!

Lightning service on telephoned credit card orders
EFFICIENT EXPORT SERVICE

TRANSISTORS

BC107/8/9	- 12p	BC184L	- 10p	BFY50,51,52	- 20p
BC147/8/9	- 10p	BC212,212L	- 10p	BFX88	- 15p
BC157/8/9	- 10p	BC327,337,337L	- 12p	BSX19	- 12p
BC547/8/9	- 8p	BD135,136	- 25p	BSX20	- 15p
BC557/8/9	- 8p	BD137,138,139	- 25p	2N2926	- 7p
BC182L	- 10p	BF195,7	- 12p	2N3055	- 50p
BC183	- 10p	BCY70	- 15p	TIP31A,32A	- 25p

SUBMINIATURE TANTALUM ELECTROLYTICS. (MFDS/VOLTS)

0.1/35, 0.22/35, 0.47/35, 1.0/35, 3.3/16, 4.7/16	14p
2.2/35, 4.7/25, 10/6 - 15P, 4.7/35, 6.8/16	16p
10/16, 10/25, 22/6 - 20P, 15/25, 22/16, 33/10	30p

ELECTROLYTIC CAPACITORS. (Mfds/Volts)

1/25, 1/50, 2.2/25, 2.2/50, 4.7/25, 4.7/50, 10/16, 10/25, 10/50	5p
22/16, 22/25, 22/50, 47/16, 47/25, 47/50, 33/10 - 6p, 100/16, 100/25	7p
100/50 - 12p, 100/100 - 14p, 220/16 - 8p, 220/25, 220/50	10p
470/16, 470/25 - 11p, 470/35 - 12p, 470/40 - 15p, 1000/16	15p
1000/35 - 22p, 1000/40 - 35p, 2200/10 - 8p, 2200/25	35p
Carbon Film resistors 1/4W 5% E24 series 0.51R to 10M	1p
100 off per value - 75p, even hundreds per value totalling 1000	£7.00
Metal Film resistors 1/4W 10R to 1M 5% E12 series - 2p, 1% E24 series	3p
Mixed metal/carbon film resistors 25W E12 series 1R0 to 10M	1 1/2p

Miniature polyester capacitors 250V working for vertical mounting

0.1, 0.15, 0.22, 0.33, 0.47, 0.68 4p. 0.1 5p. 0.15, 0.22 6p. 0.33 & 0.47

Mylar (polyester) capacitors 100V working E12 series vertical mounting

1000p to 8200p - 3p. 0.1 to 0.68 mfd - 4p. 0.1 5p. 0.12 & 0.15

Subminiature ceramic plate capacitors 100V wkg vertical mounting. E12 series

2% 1.8 pf to 47 pf - 3p. 2% 56 pf to 330 pf - 4p. 10% 390p - 4700p

Polystyrene capacitors 63V working E12 series long axial wires

10 pf to 820 pf - 3p. 1000 pf to 10,000 pf - 4p. 12,000 pf

DIODES (p.i.v./amps)

75/25mA 1N4148 2p. 800/1A 1N4006 6p. 400/3A 1N5404 14p. 115/15mA OA91	6p
100/1A 1N4002 4p. 1000/1A 1N4007 7p. 60/1.5A S1M1 5p. 100/1A bridge	25p
400/1A 1N4004 5p. 1250/1A BY127 10p. 30/45mA OA90 6p. 30/15A OA47	8p
Zener diodes E24 series 3V3 to 33V 400 mW - 8p. 1 watt	12p
L.E.D.'s 3 & 5mm Red 10p. Green, Yellow 14p. Grommets 3mm - 2p, 5mm	2p
20mm fuses 100mA to 5A Q/blow 5p. A/surge 8p. Holders p.c. or chassis	5p
High speed p.c. drills 0.8, 1.0, 1.3, 1.5, 2.0mm - 22p. Machines 12V d.c.	£6.00
HELPING HANDS 6 ball joints and 2 croc clips to hold awkward jobs	£4.50
AA/HP7 Nicad rechargeable cells £1.50 pair. Universal charger unit	£6.00
Glass reed switches with single pole make contacts - 8p. Magnets	12p

All prices are inclusive of VAT. Postage 20p (free over £5). Lists Free.

THE C. R. SUPPLY CO

127 Chesterfield Rd, Sheffield S8 0RN

Return posting

WOOD & DOUGLAS

* NEW CATALOGUE * NEW PRODUCTS * NEW TELEPHONE NUMBER * NEW PRICES *
 OUR FULL current product range is listed below but keep in touch at rallies and exhibitions throughout the Summer for our latest developments for you the active amateur.

Package Prices	Kit	Package Prices	Kit
1. 500mW TV T/mitt (70FM05T4 + TVM1 + BP4F33)	35.00	8. 2M Linear/Pre-amp 25W (144PA4/S + 144LIN25B)	42.00
2. 500mW TV T/ceive (As 1 + TVUP2 + PSI 433)	60.00	9. 70cms Synth 10W T/ceive (R5 - SY + AX + MOD - SSR + 70FM10)	150.00
3. 10W TV T/mitt (As 1 + 70FM10 + BDX35)	65.00	10. 2M Synth 10W T/ceive (R5 + SY - SY2T - SSR + 144FM10A)	120.00
4. 10W TV T/ceive (As 2 + 70FM10 + BDX35)	90.00	11. 2M Crystal Cont'd 10W T/ceiver (R5 + T3 - BPF + 144FM10 + SSR)	85.00
5. 70cms 500mW FM T/ceive (70T4 + 70R5 + SSR1 + SPF)	105.00	12. 70cms Linear/Pre-amp (70LIN10 + 70PA2/S)	45.00
6. 70cms 10W FM T/ceive (As 5 + 70FM10)	105.00		
7. 2M Linear/Pre-amp 10W (144PA4/S + 144LIN10B)	40.00		

70cms EQUIPMENT	CODE	ASSEMBLED	KIT	2M EQUIPMENT	CODE	ASSEMBLED	KIT
Transceiver Kits and Accessories				Transceiver Kits + Accessories			
FM T/mitt (0.5W)	70FM05T4	48.00	28.75	FM Transmitter (1.5W)	144FM2T3	39.35	26.30
FM Receiver (with PIN RF c/o)	70FM05R5	65.40	45.80	FM Receiver (with PIN RF c/o)	144FM2R5	65.50	47.20
T/mitt 6 Channel	70MC06T	21.30	14.25	Synthesiser (2 PCB's)	144SY25B	78.75	60.05
Receiver 6 Channel	70MC06R	25.20	17.90	-ditto- Multi/Amp (1.5W O/P)	SY2T	27.80	20.65
Adaptor	70MC06A	88.00	62.25	Bandpass Filter	BPF 144	6.50	3.30
Synthesiser (2 PCB's)	70SY25B	34.15	22.10	PIN RF Switch	PSI 144	7.55	5.35
-ditto- Transmit Amp	A-X3U-06F	8.95	5.50	Power Amplifiers (FM/CW Use)			
-ditto- Modulator	MOD 1	6.50	3.30	1.5W to 10W (No c/o)	144FM10A	24.15	18.50
Bandpass Filter	BPF 433	7.55	5.35	1.5W to 10W (Auto-c/o)	144FM10B	36.11	26.25
PIN RF Switch	PSI 433	7.55	5.35	Linears			
Converter (2M or 10M I.F.)	70RX2/2	27.10	20.10	1.5W to 10W (SSB/FM) (Auto c/o)	144LIN10B	38.40	28.50
TV Products				2.5W to 25W (SSB/FM) (Auto c/o)	144LIN25B	40.25	29.95
Receiver Converter (Ch 36 Output)	TVUP2	27.50	22.80	1.0W to 25W (SSB/FM) (Auto c/o)	144LIN25C	44.25	32.95
Pattern Generator (Mains PSU)	TVPG1	42.25	36.50	Pre-Amplifiers			
TV Modulator (For Transmission) Ch 36 Modulator (For TV Injection)	TVM1	9.85	5.75	Low Noise, Miniature	144PA3	8.60	7.40
Power Amplifiers (FM/CW Use)	TVMOD1	9.80	5.50	Low Noise, Improved Performance	144PA4	12.86	8.40
50mW to 500mW	70FM1	18.45	12.80	Low Noise, RF Switched, Full c/o	144PA4/S	24.30	15.30
500mW to 3W	70FM3	23.45	17.80	GENERAL ACCESSORIES			
500mW to 10W	70FM10	41.45	33.45	Toneburst	TB2	6.70	4.25
3W to 10W	70FM3/10	23.95	18.30	Piptone	PT3	7.50	4.45
10W to 40W	70FM40	65.10	52.35	Kaytone	PTK3	8.75	6.05
Combined Power Amp/Pre-Amp (Auto c/o)	70PA/FM10	56.60	40.15	Relayed Kaytone Regulator (12V low differential)	PTK4R	12.70	8.20
Linears				Solid State Supply	REG1	6.95	4.40
500mW to 3W (Straight amp, no c/o)	70LIN3/LT	27.90	19.90	Switch	SSR1	5.85	3.70
3W to 10W (Auto c/o)	70LIN3/10E	41.05	30.15	Microphone	MPA2	6.10	3.50
10W to 7W (Auto c/o)	70LIN10	44.25	32.50	Pre-Amplifier	SWR1	6.35	5.35
Pre-Amplifiers				CW Filter	CFW1	8.55	5.80
Bipolar Miniature (13dB)	70PA2	8.10	6.50	TVI Filter (Boxed)	HPF1	5.95	—
MOSFET Miniature (14dB)	70PA3	9.65	7.50	FM TV MODULES			
RF Switched (30W)	70PA2/S	24.25	15.25	50mW 420MHz Source (Video Input)	UFM01	26.95	19.80
GaAs FET (16dB)	0PA5	20.10	12.80	50MHz i.f. Processor	VIDIF	54.25	38.95
6M EQUIPMENT				Varactor Multiplier (Boxed)	WDV400/120	63.95	—
Converter (2M i.f.)	6RX2	28.40	20.80				

Further details on our product range will gladly be forwarded on receipt of an A5 size SAE. Technical help is available by phone (NEW NUMBER) during normal office hours. Kits are usually available by return of post but please allow 28 days for unforced delays. Please add 75p to your total order for postage and handling. Credit card orders are gladly accepted, please give us a call.

ANYONE CAN SEE A KIT... REPUTATION SELLS OURS

Unit 13, Youngs Industrial Estate Aldermaston, Reading RG7 4PQ Tel: 07356 71444; Tx: 848702



Practical LM3909 circuits

Figure 18 shows the Figure 17 1.5 volt flasher circuit redrawn in a practical configuration. The circuit gives a brief flash once every second or so, and typically draws an average current of only 0.63mA. As shown in the table, this circuit will give some 3 months to 30 months of continuous operation from a battery, depending on the size and type of cell that is used.

An even longer life can be obtained from the 'minimum power' flasher circuit of Figure 19. This circuit is similar to the one described above, except that the short is removed from between pins 1 and 8, causing the capacitor to charge via 9K0 of internal IC resistance and so operate with an increased duty cycle and reduced mean current consumption; the circuit has a typical current drain of 0.32mA.

The Figure 18 and 19 circuits are of particular value as 'indicator' or 'locator' beacons for use on fire extinguishers, emergency lanterns, torches, emergency switches, etc. The operating frequencies of these circuits are fairly heavily dependent on supply voltage, as is implied by the circuit of Figure 20. This circuit is similar to that of Figure 19, except that it is designed for 3 volt operation, in which case the timing capacitor value has to be increased by a factor of 2.7 for approximately the same flash rate.

Figure 21 shows another variation of the 1.5 volt flasher circuit. In this case the internal timing resistors are shunted by an external 1K0 resistor, thereby reducing the charge time constant of the circuit and causing the flash rate to increase (to 2.6Hz) and the duty cycle to decrease, with the mean current consumption rising. The circuit gives a far more noticeable flasher indication than the three previous circuits, but at the expense of 1.2mA of current drain.

Experimenting

If you enjoy experimenting with circuits, you can build the variable-rate flasher of Figure 22: the rate is variable from zero to 20Hz via the 2K7 pot. The two external 68R resistors are used to stabilise the duty cycle of the circuit and maintain a fairly steady apparent brilliance level as the rate is varied.

The Figure 23 circuit is designed to give apparently continuous illumination of the LED when powered from a 1.5 volt cell. The circuit in fact acts as a 2KHz square wave generator, the two external 68R resistors being used to approximately equalise the 'on' and 'off' times of the generator. The circuit gives a fairly dim LED illumination and has a battery drain of about 4mA. LED brilliance can be increased by using the alternative connections of Figure 24, but at the expense of 12mA of battery drain.

All of the LED flasher circuits that we

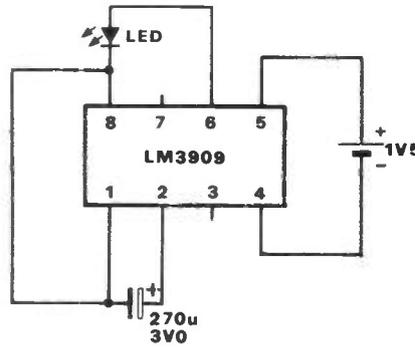


Fig 18 Practical 1V5 LED flasher, with details of estimated battery life

Cell size	Estimated battery life under continuous operation	
	Standard cell	Alkaline cell
AA	3 months	6 months
C	7 months	15 months
D	15 months	30 months

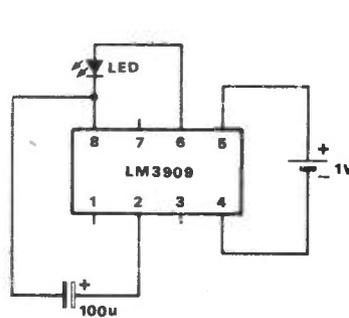


Fig 19 Minimum power 1V5, 1.1Hz LED flasher. Mean drain current is 0.32mA

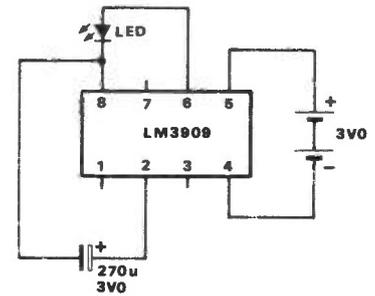


Fig 20 1Hz flasher consumes an average of 0.77mA from a 3 volt battery

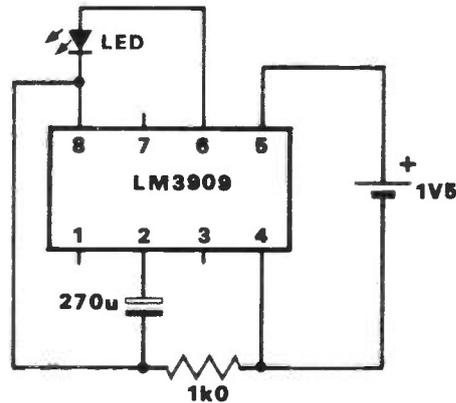


Fig 21 Fast 1V5 blinker. Flash rate is 2.6Hz and drain current is 1.2mA

have looked at in Figures 18 to 24 are intended for operation from 1.5 or 3 volt supplies. Most of these designs can in fact be used, in slightly modified form, at voltages up to 6 volts, as shown in the circuit of Figure 25. Note in this case that a 68R resistor is wired in series with the LED, to limit its drive current to a safe

value.

The LM3909 IC has a 6.5 volt zener built in between pins 2 and 4 (not shown in Figure 17). This fact can be put to practical use in the flasher circuit of Figure 26, which can be powered from any dc supply in the 85 to 200 volt range: the 100µF timing capacitor is connected

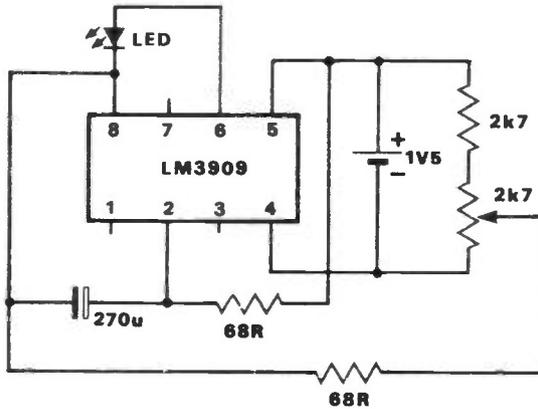


Fig 22 Variable rate flasher

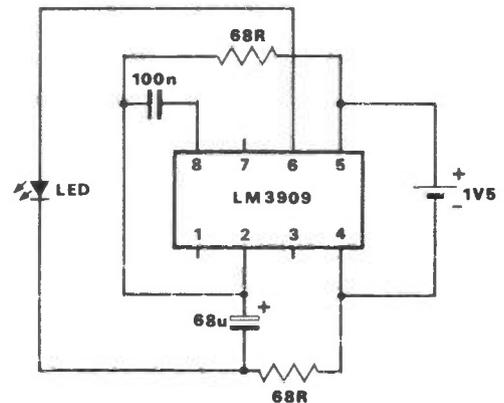


Fig 23 High efficiency 'continuous' LED indicator operating from 1.5V

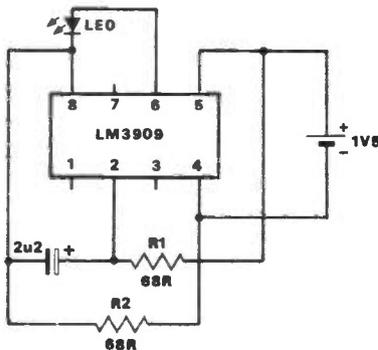


Fig 24 This 1.5V circuit gives an apparently continuous LED indication. Battery drain is 12mA

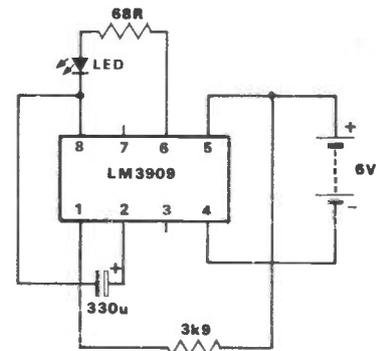


Fig 25 This 6 volt flasher operates at about 1Hz

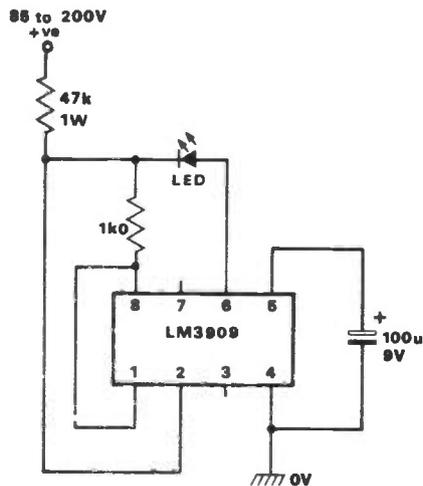


Fig 26 This LED flasher circuit can operate from any supply in the 85 to 200 volt range

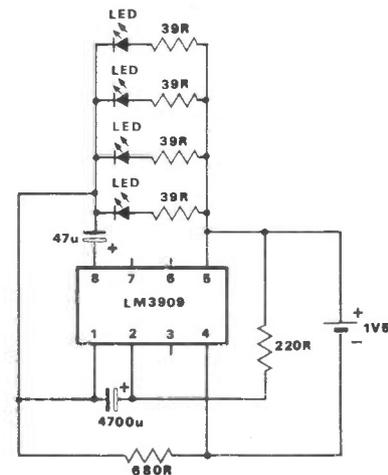


Fig 27 This 4-LED flasher operates at 1.5Hz and drains 1.5mA from its 1.5 volt battery

directly between pins 4 and 5 in this application.

In some flasher applications it is useful to have a number of LEDs flashing on and off simultaneously. Four LEDs can, for example, be used to mark the outline of an emergency switch or a first-aid cabinet (often, in emergency situations,

mains power services are cut).

To conclude this month's edition of *Data File*, Figure 27 shows the practical circuit of such a 4-LED flasher. Note that a 39Ω resistor is wired in series with each LED, with one end connected directly to pin 5 of the IC (the supply positive pin). The circuit operates at a flash rate of

about 1.5Hz, and draws a mean current of about 1.5mA from a 1.5 volt battery.

In next month's edition of *Data File* we will continue the opto-electronics theme by looking at a wide range of practical LED-sequencer and analogue-value indicator circuits. 

A GREAT MAGAZINE FOR ALL ASPECTS OF PRACTICAL AMATEUR RADIO

Packed with more editorial features than any other magazine plus more pages of readers small ads

ALSO . . .

- . . . Product reviews . . .
- Communications & electronics news . . .
- Reception reports — shortwave, DX-TV, ATV . . .
- Construction projects — what to build for your rig, your computer & your enjoyment . . .
- New technology . . .
- Educational articles . . .
- Coming events . . .
- Readers letters . . .
- Technical & practical questions answered . . .
- Latest equipment reviews . . .
- and all the latest news in the Amateur Radio World . . .
- Keep in touch with up to date developments - TAKE **R&EW** every month and stay informed.

SUBSCRIBER BENEFITS

Take out a **POST FREE (UK) Sub while offer lasts**

- Delivery to your door by publication date each month
- Inflation proof — price guaranteed for 12 months

On sale **NOW** at your newsagent and at equipment dealers

RADIO & ELECTRONICS WORLD SUBSCRIPTION ORDER FORM

To: Subscription Department • Radio & Electronics World • 513 London Road • Thornton Heath • Surrey • CR4 6AR. Tel: 01-684 3157

PLEASE SUPPLY: (tick box) for 12 issues, all rates include P & P
 Inland £11.80 World-Surface £13.10 Europe-Air £19.20 World-Air £25.90

NAME
 ADDRESS

 Postcode.....

PAYMENT ENCLOSED: £ Cheques should be made payable to Radio & Electronics World. Overseas payment by International Money Order, or credit card.

CREDIT CARD PAYMENT

Signature..... RE1284



AA117	9p	BC328	8p	BFX85	20p	TIP112	54p	2N3773	100p	BYX70/500	31p	DY802	45p	4042	58p	7482	70p	74LS367	52p	HA-1368	190p	TBA990	80p
AA118	9p	BC357	8p	BFX87	15p	TIP115	45p	2N3819	29p	BYX70/800	39p	ECC82	40p	4043	57p	7485	45p	74LS399	85p	LA-1201	120p	TC270	80p
AA119	9p	BC357	8p	BFX88	15p	TIP117	58p	2N3866	85p	BYX71/600	80p	ECC83	40p	4044	56p	7486	25p	74LS670	130p	LA-1365	370p	TC280	80p
AC107	27p	BCY33	150p	BFY50	14p	TIP120	43p	2N4031	25p	OA47	40p	ECC84	40p	4047	65p	7489	100p	LA-3301	180p	LA-3301	180p	TC290	85p
AC126	15p	BCY34	150p	BFY51	14p	TIP121	43p	2N4036	25p	OA90	40p	ECC85	40p	4048	49p	7490	35p	LA-3350	150p	LA-4031	140p	TD1170	90p
AC127	15p	BCY35	150p	BFY52	14p	TIP122	47p	2N4037	25p	OA91	40p	ECH81	40p	4049	40p	7492	45p	LA-4032	150p	LA-4032	150p	TD1412	90p
AC128	15p	BCY56	18p	BFY56	25p	TIP125	47p	2N4443	75p	OA200	7p	ECH84	32p	4050	40p	7493	45p	LA-4051	250p	LA-4051	250p	TD2003	150p
AC128K	23p	BCY70	18p	BFY57	25p	TIP126	56p	2N4444	78p	OA202	7p	ECL80	57p	4051	62p	7495	45p	LA-4101	140p	LA-4101	140p	TD2003	150p
AC141K	23p	BCY71	18p	BFY64	25p	TIP127	100p	2N5061	20p	IN914	2p	ECL82	59p	4052	61p	7497	80p	LA-4102SK	140p	LA-4102SK	140p	TD2020	140p
AC142K	23p	BCY72	18p	BFY65	25p	TIP147	100p	2N5294	30p	IN4001	2p	ECL84	57p	4053	61p	74107	80p	LA-4220	150p	LA-4220	150p	TD2030	140p
AC153K	23p	BD115	20p	BU100	84p	TIP2955	34p	2N5296	30p	IN4002	4p	ECL85	57p	4054	61p	74111	80p	LA-4420	150p	LA-4420	150p	TD2322	90p
AC176	18p	BD124P	50p	BSX20	15p	TIP3054	38p	2N6106	40p	IN4003	4p	ECL86	57p	4055	61p	74116	85p	LA-4430	150p	LA-4430	150p	TD2530	90p
AC176K	20p	BD124	110p	BT106	90p	TIP3055	38p	2N6107	40p	IN4004	4p	ECL86	57p	4056	61p	74119	85p	LA-4440	150p	LA-4440	150p	TD2532	90p
AC187	15p	BD128	35p	BT116	90p	TIS43	45p	2N6109	40p	IN4005	4p	EF80	31p	4060	72p	74122	40p	LA-4520	150p	LA-4520	150p	TD2540	75p
AC187K	20p	BD131	20p	BT157	75p	TIS44	40p	3N128	35p	IN4006	4p	EF85	34p	4065	72p	74123	40p	LA-4530	150p	LA-4530	150p	TD2550	75p
AC188	17p	BD132	25p	BT119	100p	TIS61	15p	3N143	65p	IN4007	5p	EF89	43p	4066	25p	74125	40p	LA-4540	150p	LA-4540	150p	TD2552	100p
AC188K	23p	BD135	20p	BT120	100p	TIS88A	45p			IN4148	2p	EF183	45p	4069	27p	74126	45p	LA-4550	150p	LA-4550	150p	TD2690	80p
ACV18	45p	BD136	20p	BU104	100p	TIS90	18p			IN5400	10p	EF184	53p	4070	27p	74132	42p	LA-4560	150p	LA-4560	150p	UPC-555H	80p
AD117	45p	BD137	20p	BU105	100p	TIS91	18p			IN5401	10p	EF184	53p	4071	27p	74133	42p	LA-4570	150p	LA-4570	150p	UPC-555H	80p
AD142	45p	BDY92	100p	BU108	100p	TIS93	20p			IN5402	10p	EY86	31p	4072	27p	74145	45p	LA-4580	150p	LA-4580	150p	UPC-555H	80p
AD149	45p			BU110	100p					IN5403	11p	EY87	31p	4073	27p	74153	45p	LA-4590	150p	LA-4590	150p	UPC-555H	80p
AD161	22p	BD138	20p	BU111	140p					IN5404	12p	PC97	100p	4075	27p	74155	45p	LA-4600	150p	LA-4600	150p	UPC-555H	80p
AD192	22p	BD139	20p	BU126	70p	VN10KM	90p	2SA203	30p	IN5405	12p	PC98	100p	4076	27p	74157	45p	LA-4610	150p	LA-4610	150p	UPC-555H	80p
AF124	25p	BD140	20p	BU204	75p	VN46AF	88p	2SB4	25p	IN5406	13p	PCF80	58p	4077	27p	74160	50p	LA-4620	150p	LA-4620	150p	UPC-555H	80p
AF125	25p	BD144	90p	BU205	75p	VN66AF	100p	2SB7	25p	IN5407	13p	PCF200	135p	4078	27p	74164	50p	LA-4630	150p	LA-4630	150p	UPC-555H	80p
AF127	25p	BD150	30p	BU208	75p	VN88AF	115p	2SB337	120p	IN5408	13p	PCF801	110p	4081	27p	74167	50p	LA-4640	150p	LA-4640	150p	UPC-555H	80p
AF139	25p	BD157	30p	BU209	75p	VN89AF	110p	2SB406	120p	IN5409	13p	PCF802	110p	4082	27p	74173	50p	LA-4650	150p	LA-4650	150p	UPC-555H	80p
AF239	22p	BD158	38p	BU208D	120p			2SC400	21p	IN5410	13p	PCF806	115p	4093	45p	74174	75p	LA-4660	150p	LA-4660	150p	UPC-555H	80p
AL112	70p	BD166	30p	BU326	85p	ZTX107	11p	2SC495	60p	8pin	8p	PCF200	100p	4094	45p	74175	65p	LA-4670	150p	LA-4670	150p	UPC-555H	80p
AL113	80p	BD175	30p	BU406	85p	ZTX108	11p	2SC733	40p	14pin	12p	PCL81	54p	4098	45p	74176	65p	LA-4680	150p	LA-4680	150p	UPC-555H	80p
AS215	100p	BD177	30p	BU408	85p	ZTX109	11p	2SC1172	150p	18pin	12p	PCL82	54p	4099	45p	74177	65p	LA-4690	150p	LA-4690	150p	UPC-555H	80p
AS217	100p	BD179	32p	BU408	85p	ZTX122	21p	2SC1279	24p	20pin	14p	PCL84	50p	4501	45p	74182	65p	LA-4700	150p	LA-4700	150p	UPC-555H	80p
AU110	110p	BD181	45p	BU500	110p	ZTX300	13p	2SC1306	20p	22pin	16p	PCL85	55p	4502	55p	74192	40p	LA-4710	150p	LA-4710	150p	UPC-555H	80p
AY102	180p	BD182	60p	BU526	80p	ZTX301	16p	2SC1307	20p	24pin	18p	PCL86	55p	4503	55p	74196	40p	LA-4720	150p	LA-4720	150p	UPC-555H	80p
AY106	180p	BD183	60p	BU526	80p	ZTX302	16p	2SC1307	20p	24pin	18p	PCL86	55p	4503	55p	74196	40p	LA-4730	150p	LA-4730	150p	UPC-555H	80p
		BD201	33p	MJ2500	100p	ZTX303	17p	2SC1520	25p	26pin	20p	PLF200	85p	4506	110p	74393	70p	LA-4740	150p	LA-4740	150p	UPC-555H	80p
		BD202	38p	MJ2501	100p	ZTX304	17p	2SC1969	130p	40pin	25p	PLF200	85p	4506	110p	74393	70p	LA-4750	150p	LA-4750	150p	UPC-555H	80p
		BD203	42p	MJ2555	85p	ZTX320	29p	2SC2029	120p			PL504	95p	4508	128p	74LS00	60p	LA-4760	150p	LA-4760	150p	UPC-555H	80p
		BD204	42p	MJ3000	115p	ZTX326	29p	2SC2078	120p			PL508	190p	4510	57p	74LS04	45p	LA-4770	150p	LA-4770	150p	UPC-555H	80p
		BD222	31p	MJ3001	115p	ZTX500	130p	2SC2122A	200p			PL519	450p	4511	57p	74LS08	20p	LA-4780	150p	LA-4780	150p	UPC-555H	80p
		BD225	31p	MJE29A	30p	ZTX501	130p	2SC2352	27p	BY28 Range		PY81	70p	4512	57p	74LS09	15p	LA-4790	150p	LA-4790	150p	UPC-555H	80p
		BD232	31p	MJE30A	30p	ZTX502	18p	2SD234	37p	2V7 to 39V	8p	PY88	48p	4513	120p	74S10	15p	LA-4800	150p	LA-4800	150p	UPC-555H	80p
		BD234	32p	MJE340	25p	ZTX503	18p	2SK135	400p	BZK6 Range		PY88	48p	4514	110p	74S11	15p	LA-4810	150p	LA-4810	150p	UPC-555H	80p
		BD237	21p	MJE350	80p	ZTX504	25p	TA7202	150p	2V7 to 39V	12p	PY88	48p	4515	110p	74S14	15p	LA-4820	150p	LA-4820	150p	UPC-555H	80p
		BD238	24p	MJE520	30p	ZTX550	24p	UPC575	100p			PM500A	160p	4516	65p	74S14	15p	LA-4830	150p	LA-4830	150p	UPC-555H	80p
		BD433	28p	MJE295K	90p									4518	65p	74LS20	25p	LA-4840	150p	LA-4840	150p	UPC-555H	80p
		BD437	28p											4520	65p	74LS30	35p	LA-4850	150p	LA-4850	150p	UPC-555H	80p
		BD535	28p											4522	65p	74LS32	35p	LA-4860	150p	LA-4860	150p	UPC-555H	80p
		BD536	38p											4526	60p	74LS38	40p	LA-4870	150p	LA-4870	150p	UPC-555H	80p
		BD537	40p											4527	60p	74LS73	25p	LA-4880	150p	LA-4880	150p	UPC-555H	80p
		BD538	40p											4528	65p	74LS74	35p	LA-4890	150p	LA-4890	150p	UPC-555H	80p
		BDX32	100p											4529	65p	74LS75	35p	LA-4900	150p	LA-4900	150p	UPC-555H	80p
		BDX65	80p											4530	50p	74LS76	30p	LA-4910	150p	LA-4910	150p	UPC-555H	80p
		BF180	18p											4531	50p	74LS77	30p	LA-4920	150p	LA-4920	150p	UPC-555H	80p
		BF181	18p											4532	50p	74LS78	30p	LA-4930	150p	LA-4930	150p	UPC-555H	80p
		BF183	20p											4533	50p	74LS79	30p	LA-4940	150p	LA-4940	150p	UPC-555H	80p
		BF184	20p											4534	50p	74LS80	30p	LA-4950	150p	LA-4950	150p	UPC-555H	80p
		BF185	20p											4535	50p	74LS81	30p	LA-4960	150p	LA-4960	150p	UPC-555H	80p
		BF194	20p											4536	50p	74LS82	30p	LA-4970	150p	LA-4970	150p	UPC-555H	80p
		BF195	20p											4537	50p	74LS83	30p	LA-4980	150p	LA-4980	150p	UP	

THE MORSE TEST

A PRAGMATIC APPROACH

by Richard S Hunt G4YBF

What is it that puts people off learning Morse code operation? Perhaps there are too many legends around to suggest that Morse operators are not quite of the mortal world, that they are doing something that requires mystical or superhuman gifts.

People that can send Morse tend to reinforce these notions, the old hands especially – they delight in stories of split-brained freaks who can send Morse simultaneously in two languages while transcribing Morse at 60wpm into perfect copperplate, writing with their feet probably.

Hence it seems quite proper that we should have to break our backs to try and acquire this learning, and many operators don't bother to try. This is a great pity. How needless it is that so many technically well qualified operators disqualify themselves from using the HF bands, just for the want of a little bit of extra effort.

The object

This article sets out a course of self study addressed specifically to the demands of the Department of Trade & Industry Morse test for radio amateurs. It is based on my own multifarious experiences of learning the Morse code, on many conversations with Morse operators, and on a jaded familiarity with the various methods that exist for teaching the subject.

The haphazard way I initially went about the task left me with some firm ideas about how I should have done it from the beginning, because once the problems had been correctly identified it proved fairly easy to master the requirements of the test.

Let's get the problem clearly in view. The test requires you to send and receive Morse figures and letters (no other symbols) at 12wpm. This requires some effort to learn, but it does not demand above average ability.

Think of it another way, what you have to do is learn to instantly transcribe 36 different sounds as they occur, without thinking about it; you also need to be able to generate these sounds as required.

You have to learn a language, and the brain is well used to tackling the kind of processing job outlined above. Once reception has been learned, then learning to send the code is second nature; a degree of neuro-muscular coordination has to be developed, that's all.

Learning Morse is not as hard as it may seem, provided you go about it efficiently: by not wasting your time going to evening classes; by not using slow Morse transmissions (which never seem to be in the right place on the wavebands at the right time anyway); by not arranging cooperative learning schemes with friends (invariably fruitless); and by not using over-complicated and gimmicky Morse tuition computer programmes that introduce unnecessary difficulties to the task of learning (and mainly function as design exercises for the programmer anyway).

Some of these activities may interest and amuse, but at the early stages of learning they introduce distractions and time wasting that could put you for ever off the problem in hand, passing that darn test.

You need to spend about half an hour a day learning, at first. You will also need access to a sound generating home

computer, a tape recorder, a Morse key and bleeper, and a test date three months ahead.

The Morse program that comes with this article is for the Sinclair Spectrum and is the one that I used myself. As an example of elegant programming it would not win many prizes, but it demonstrates the basic needs: it generates random figures and letters at pre-set speeds with random gaps of at least seven dot units.

You need to modify line 30 to make it generate the particular letters or figures you require. The programmed speed is approximate and depends on what figures or letters are being sent out. Check the speed yourself if you need to.

It makes sense to record the computer generated Morse onto tape. That way you will be able to go through your lessons without having to drag the computer out every time.

The Morse key you use should be a simple type of reasonable quality. Government surplus types, with the comfortable rounded knob, are ideal.

The bleeper circuit shown uses the ubiquitous 555 timer IC. It is based on the standard astable circuit shown on the Radio Spares data sheet, and it works well. Vary R2 to alter the pitch.

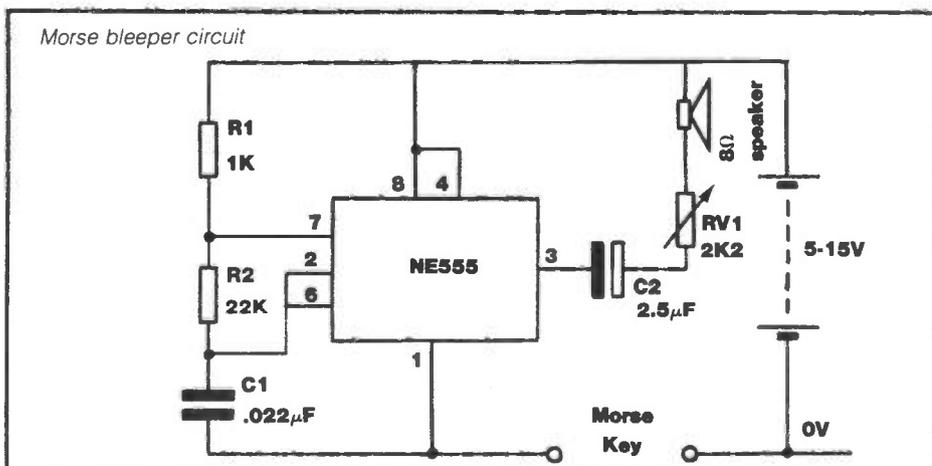
The test costs fifteen pounds. Although a date can normally be arranged at a few weeks notice, I advise you to get a date three months ahead, before you begin to learn. It's a bit of positive thinking which might pay.

Are you sitting comfortably?

Adjust the program to generate the letters A to F at 5wpm or any other speed you feel happy with, sit down with a pad of paper, and jot down the letters, noting any gaps that may occur. (The Morse code consists of dots, dashes and spaces. The detection of gaps will become important once you begin to receive Morse over the air, although it is not vital for passing the test, so ignore this aspect if you want).

Once you can easily transcribe the first group of letters, speed up the sending rate in stages until you can read at 8wpm. As you learn the characters, think of them as sounds, riffs, or little tunes, rather than as a sequence of dots and dashes. Remember that you do have to think. The learning is almost entirely in the head, and demands full concentration and respect from the student.

Go through the above process with the



next half dozen letters of the alphabet. Then re-learn all the 12 letters at 8wpm.

You will find that you have not really properly learnt the first group of characters: when you thought you were learning the Morse letters you were actually distinguishing the difference between the sounds of the letters more than you were detecting the separate sounds themselves.

This is why every time you learn another group of letters you will have a bit of trouble with those you thought you had learnt.

Continue the learning process until you can jot down any letter or figure as you hear it, at 8wpm.

Now run the program in its complete form, increasing its speed to keep ahead of your ability to transcribe the characters.

At the six week mark you should be able to read Morse at 12wpm, and by now you may have been tuning around the HF bands seeking to use your new language skill. By all means do so, if you enjoy it, but remember that this will not directly help you pass the test, and so from that point of view is a bit of a waste of time. How much time have you got to waste?

Continue increasing your speed until you can receive solid at 15wpm. The test, at 12wpm, will be easier.

Sending Morse

While you are in the final stages of increasing your receiving speed get a Morse key and a bleeper. It will be best if you can use your non-writing hand when you use the key; that way your hands get a rest during a contact.

I suggest you place the key about a foot in from the table edge. Hold the key in a similar way to the way you would hold a pen. Operate with the hand and wrist always relaxed.

You will probably have special trouble with sending certain letters. Any dot that comes after two or more dashes can be difficult to generate fluently, and '5's and 'h's are often difficult at first.

Because of your experience of receiving perfect Morse you will know pretty well whether you are sending good Morse or not, which is the point of not sending Morse until you are used to hearing it properly sent.

As you improve you may find a temptation to increase your sending speed: resist it, but concentrate on sending perfect letters at a relaxed speed. How easily you learn to send good Morse and how much practice you need will vary, but after a couple of weeks of daily practice for perhaps half an hour a day you should be pretty good at it.

Don't forget that the test officially does not permit any uncorrected errors. If the test date is now a month away then give yourself a break from regular practice, do enough to keep your hand in, and begin to prepare for the test.

Having listened to perfect Morse it will be hard to send bad Morse. To find out how good the Morse you are sending is, it will be interesting and useful to record some of it onto tape. Indeed, when you get to that stage you can stop using the computer generated Morse for practice.

When you play the tape you will be able to spot any sending problem you may have, and you will get your first chance to receive actual words.

Reading words instead of random characters may confuse you a bit at first, because you may find yourself trying to read the message or anticipating what word comes next, or generally thinking about things other than transcribing the Morse.

The test

As the test date draws nearer do as much practice as you think you need to. One of the good things about the test is that it is objective, and so you have a clear idea about how prepared you are for it.

Concentrate on your weaknesses. If you have not reached the test standard then put in more practice. Eventually you will probably be looking to improve your fluency.

Progress is sometimes not so dramatic during these latter stages, but if you have been practising regularly you should not

be panicking for results at this juncture.

It need hardly be said: get to the test centre in good time, make sure you are not tired or hungry, try to be as relaxed as possible. Also, don't forget to bring your Morse key with you.

Make it clear to the examiner that if you make a sending mistake, you will correct the whole word from which the erroneous letter came. Otherwise you may find yourself in the awkward position of not being able to correct a mistake because it happened more than one letter prior to your noticing it.

I have yet to hear of an examiner with an ungenerous attitude to the radio amateur test. The adage is that if the examiners are testing professional operators they try to fail them, but if they are testing amateurs they try to pass them. So enjoy it, you're paying the fifteen pounds.

After the test

The ability to pass the test will not enable anybody to competently operate CW on the amateur bands. But once you have a class A licence you will probably want to make that little bit of extra effort to learn other Morse characters, procedure signals, the Q code, standard abbreviations, etc. And, make no mistake, Morse is still a useful language, the best for DX.

MORSE TEST PROGRAM

```
5 PRINT "How many words per minute?"
10 INPUT I
15 PRINT I
20 LET n=1/I
30 BEEP n*2, 69: GO SUB 50+INT (RND*30)
40 GO TO 30
50 GO SUB 210: GO SUB 220: RETURN
51 GO SUB 220: GO SUB 210: GO SUB 210: GO SUB 210: RETURN
52 GO SUB 220: GO SUB 210: GO SUB 220: GO SUB 210: RETURN
53 GO SUB 220: GO SUB 210: GO SUB 210: RETURN
54 GO SUB 210: RETURN
55 GO SUB 210: GO SUB 210: GO SUB 220: GO SUB 210: RETURN
56 GO SUB 220: GO SUB 220: GO SUB 210: RETURN
57 GO SUB 210: GO SUB 210: GO SUB 210: GO SUB 210: RETURN
58 GO SUB 210: GO SUB 210: RETURN
59 GO SUB 210: GO SUB 220: GO SUB 220: GO SUB 220: RETURN
60 GO SUB 220: GO SUB 210: GO SUB 220: RETURN
61 GO SUB 210: GO SUB 220: GO SUB 210: GO SUB 210: RETURN
62 GO SUB 220: GO SUB 220: RETURN
63 GO SUB 220: GO SUB 210: RETURN
64 GO SUB 220: GO SUB 220: GO SUB 220: RETURN
65 GO SUB 210: GO SUB 220: GO SUB 220: GO SUB 210: RETURN
66 GO SUB 220: GO SUB 220: GO SUB 210: GO SUB 220: RETURN
67 GO SUB 210: GO SUB 220: GO SUB 220: GO SUB 210: RETURN
68 GO SUB 210: GO SUB 210: GO SUB 210: RETURN
69 GO SUB 220: RETURN
70 GO SUB 210: GO SUB 210: GO SUB 210: GO SUB 220: RETURN
71 GO SUB 210: GO SUB 210: GO SUB 210: GO SUB 220: RETURN
72 GO SUB 210: GO SUB 220: GO SUB 220: RETURN
73 GO SUB 220: GO SUB 210: GO SUB 210: GO SUB 220: RETURN
74 GO SUB 220: GO SUB 210: GO SUB 220: GO SUB 220: RETURN
75 GO SUB 220: GO SUB 220: GO SUB 210: GO SUB 210: RETURN
76 BEEP n*4, 69: RETURN
77 BEEP n*4, 69: RETURN
78 BEEP n*4, 69: RETURN
79 BEEP n*4, 69: RETURN
210 BEEP n, 69: BEEP n, 36: RETURN
220 BEEP n, 69: BEEP n*3, 36: RETURN
```

PHONE
0474 813225
3 LINES



P.M. COMPONENTS LTD
DEPT REW SELECTRON HOUSE, WROTHAM ROAD
MIDDEHAM GREEN, MEOPHAM, KENT DA13 0QY

TELEX
966371
PM COMP

INTEGRATED CIRCUITS

AN124	2.50	MC1349P	1.20	STK439	7.95
AN214Q	2.50	MC1350P	0.95	STK461	11.50
AN239	2.50	MC1351P	1.50	TA7061AP	1.50
AN240P	2.80	MC1357	2.35	TA7108P	1.50
AN264	2.50	MC1358	1.58	TA7120P	1.65
AN612	2.15	MC1495	3.00	TA7129P	2.50
AN362L	2.50	MC1496	1.25	TA7130P	1.50
AN7140	3.50	MC145106P		TA7137P	1.00
AN7145	3.50			TA7146	3.95
AN7145M	3.95	MC1723	7.95	TA7178AP	2.95
AN7150	2.95	MC3357	2.75	TA7193P	3.95
BA521	3.35	MC3401L	2.50	TA7203	2.95
CA1352E	1.75	ML231B	1.75	TA7204P	2.15
CA3085	0.48	ML232B	2.50	TA7205AP	1.15
CA3215E	1.85	ML2350	0.75	TA7222AP	1.80
CA3140T	1.15	PLL20A	5.75	TA7310P	4.25
ETT6016	2.50	SAA500A	3.50	TA7310P	1.80
HA1339A	2.95	SAA1025	7.25	TA7313AP	2.95
HA1366V	2.75	SAA5010	6.35	TA7314P	2.95
HA1377	3.60	SA5560S	1.75	TA7317P	1.00
HA1156V	1.50	SA5560S	1.75	TA7317P	1.00
HA11551	2.95	SA5580	2.85	TA7321P	2.25
LA1230	1.15	SA/SB/T/U		TA7609P	3.15
LA4102	2.95			TA7811AP	2.95
LA4140	2.95	SL901B	4.85	TAA550	0.25
LA4031P	1.95	SL1310	6.65	TAA575	1.35
LA4140	2.95	SL1310	7.95	TAA661B	1.20
LA4461	3.95	SL1327	1.10	TAA700	1.70
LA4250	2.95	SL1327Q	1.10	TAA120AS/B/C	1.00
LA4420	1.95	SN76003N	1.95	TBA231	1.25
LA4430	2.60	SN76031N	1.95	TBA235	1.50
LA4400	4.15	SN76033N	1.95	TBA236	1.70
LA4220	2.50	SN76110N	0.89	TBA440N	2.55
LC7210	3.60	SN76115N	1.25	TBA480Q	1.25
LC7300	3.60	SN76131N	1.30	TBA510	2.50
LC7137	5.50	SN76262N		TBA510Q	2.50
LM1011	3.15			TBA520Q	1.10
LM1324N	8.50	SN76272N	2.05	TBA530Q	1.10
LM3037	1.50	SN76533N	1.65	TBA540	1.25
LM3803	2.95	SN76544A	1.95	TBA540Q	1.35
M51513L	2.30	SN76570N	1.00	TBA550Q	1.95
M5155L	2.95	SN76600N	1.15	TBA560C	1.45
M51521L	1.80	STK1014	7.95	TBA560Q	1.45
MB3712	2.00	STK015	5.95	TBA570	1.00
MB3756	2.50	STK043	9.50	TBA641A12	
MC1307P	1.00	STK1045	7.95	TBA651R	2.50
MC1310P	1.95	STK433	5.95	TBA720A	2.45
MC1327	0.95	STK433	5.95		
MC1327Q	0.95				
MC1330P	1.10				

TBA750Q 2.65

TBA800	0.69	TDA2571	2.95
TBA810AS	1.65	TDA2581	2.25
TBA810P	1.65	TDA2582	2.95
TBA820M	0.75	TDA2593	2.95
TBA820Q	1.45	TDA2600	2.50
TBA920	1.65	TDA2610	2.50
TBA950/2X		TDA2620	2.50
		TDA2680A	2.75
		TDA2690	2.45
		TDA3310	2.95
		TDA4600	2.50
		TDA4900	2.95
		TDA9903	3.15
		TDA1441	1.15
		TEA1009	3.35
		UPC566A	2.95
		UPC575C2	
		TCA270S	
		TCA270S	
		TCA280	2.95
		TCA800	2.95
		TCA830S	1.95
		TCA900	2.95
		TCA940	1.85
		TDA440	2.20
		TDA1001	1.95
		TDA1002A	2.95
		TDA1003A	3.95
		TDA1004A	3.25
		TDA1006A	2.95
		TDA1010	2.15
		TDA1035	2.95
		TDA1037	1.95
		TDA1044	1.15
		TDA1170	1.95
		TDA1190	2.15
		TDA1270Q	3.95
		TDA1327	1.70
		TDA2002	1.95
		TDA2003	2.95
		TDA2010	1.95
		TDA2020	2.95
		TDA2030	2.80
		TDA2140	3.95
		TDA2151	1.95
		TDA2160	2.50
		TDA2190	2.95
		TDA2521	3.25
		TDA2522	1.95
		TDA2523	2.95
		TDA2524	1.95
		TDA2530	1.95
		TDA2532	1.95
		TDA2540	1.95
		TDA2541	2.15
		TDA2560	2.15

TDA2571 2.95

TDA2581	2.25	TDA2582	2.95
TDA2593	2.95	TDA2600	2.50
TDA2610	2.50	TDA2620	2.50
TDA2680A	2.75	TDA2690	2.45
TDA3310	2.95	TDA4600	2.50
TDA4900	2.95	TDA9903	3.15
TDA1441	1.15	TCA270	2.10
TEA1009	3.35	UPC566A	2.95
UPC575C2		TCA270S	
TCA280	2.95	TCA800	2.95
TCA830S	1.95	TCA900	2.95
TCA940	1.85	TDA440	2.20
TDA1001	1.95	TDA1002A	2.95
TDA1003A	3.95	TDA1004A	3.25
TDA1006A	2.95	TDA1010	2.15
TDA1035	2.95	TDA1037	1.95
TDA1044	1.15	TDA1170	1.95
TDA1190	2.15	TDA1270Q	3.95
TDA1327	1.70	TDA2002	1.95
TDA2003	2.95	TDA2010	1.95
TDA2020	2.95	TDA2030	2.80
TDA2140	3.95	TDA2151	1.95
TDA2160	2.50	TDA2190	2.95
TDA2521	3.25	TDA2522	1.95
TDA2523	2.95	TDA2524	1.95
TDA2530	1.95	TDA2532	1.95
TDA2540	1.95	TDA2541	2.15
TDA2560	2.15	TDA2560	2.15

NEW BRANDED CATHODE RAY TUBES

A1865/20	65.00	D14-200GM	75.00	M28-11LA	49.00	SE42BP31AL	55.00
AW36 11	25.00	D14-210GH	75.00	M28-12GH	55.00	SE42BP31L	55.00
CME822W	19.00	D14-270GH/50	78.00	M28-12CL	55.00	SE5FP31	55.00
CME822GH	25.00	D14-310W	110.00	M28-13GL	49.00	T837	65.00
CME1428GH	45.00	D14-320GH/82	85.00	M28-13GL	49.00	T948N	65.00
CME1428W	39.00	D14-340GH/K	85.00	M28-13WA	49.00	T948H	65.00
CME1523W	39.00	D14-340GH/M	85.00	M28-131GR	55.00	V3191	59.00
CME1431GH	39.00	D14-340GH	85.00	M28-132GM	55.00	V4150LC	55.00
CME202GH	45.00	D16-100GH/65	69.00	M28-133GH	55.00	V4254B	65.00
CME202GH	45.00	D16-100GH/67	69.00	M31-100GH	55.00	V4274GH	65.00
CME2325W	45.00	D16-100GH/79	69.00	M31-101GH	55.00	V4283W	65.00
CME3126GH	45.00	D16-100GH/79A	75.00	M31-182GR	55.00	V5002LD	65.00
CME3128GH	45.00	D16-100GH/97	69.00	M31-182GV	55.00	V5004GR	59.00
CME3128GH	45.00	D18-150GH/70	69.00	M31-183W	55.00	V5004LD	65.00
CME3155W	45.00	D21-10GH	69.00	M31-184GH	55.00	V6001GH	59.00
CRE1400	25.00	D21-10GH	69.00	M31-184P31	55.00	V6002GH	59.00
CV429	89.00	D21-10LD	69.00	M31-185GH/VR	69.00	V6007DP31	59.00
CV1450	35.00	DB7-36	35.00	M31-186W	69.00	V6007GW	59.00
CV1526	45.00	DG7-36	45.00	M31-190GH	69.00	V6008GH	59.00
CV2185	15.00	DG7-32	15.00	M31-190GR	69.00	V6008H	59.00
CV2191	19.00	DH7-11	19.00	M31-190W	69.00	V6034WA	59.00
CV2193	15.00	DH7-91	15.00	M31-191GH	69.00	V6048F	49.00
CV2928	65.00	DP7-5	35.00	M31-191GR	69.00	V6048H	49.00
CV5709	85.00	DP7-6	35.00	M31-191GV	69.00	V6052GH	49.00
CV5320	85.00	DP7-11	35.00	M31-191W	69.00	V6052GR	49.00
CVX389	85.00	DN13-78	35.00	M31-191W	69.00	V6054BLA	65.00
D9-110GH	39.50	F15-101LC	49.00	M31-191W	69.00	V6054BLA	65.00
D9-120	39.50	F16-101LC	49.00	M31-191W	69.00	V6054BLA	65.00
D10-210GH	45.00	F21-130GR	55.00	M31-220W	59.00	V6064BLA	55.00
D10-210GH/68B	45.00	F21-130GR	55.00	M31-270G31	65.00	V6064BLA	55.00
D10-410GH/72	45.00	F31-120GH	79.00	M31-271GW	65.00	V6064BLA	55.00
D10-230GH	35.00	F31-131GR	65.00	M31-271W	65.00	V6064BLA	55.00
D10-230GH	35.00	F31-131GR	65.00	M31-271W	65.00	V6064BLA	55.00
D10-290GH	55.00	F31-10GR	65.00	M36-12W	75.00	V6064BLA	55.00
D10/293GV/90	49.50	F31-10GR	65.00	M36-141LA	75.00	V6064BLA	55.00
D13-27GH	49.50	F31-10LD	65.00	M36-141W	75.00	V6064BLA	55.00
D13-33GH	49.50	F31-10LD	65.00	M36-141W	75.00	V6064BLA	55.00
D13-33GH	49.50	F31-10LD	65.00	M36-141W	75.00	V6064BLA	55.00
D13-47GH/26	55.00	F31-12LD	65.00	M36-141W	75.00	V6064BLA	55.00
D13-47GH/34	55.00	F31-13GR	65.00	M36-141W	75.00	V6064BLA	55.00
D13-47GH	55.00	F31-13LD	65.00	M36-141W	75.00	V6064BLA	55.00
D13-51GL/26	85.00	F31-13LD	65.00	M36-141W	75.00	V6064BLA	55.00
D13-51GM/26	85.00	F41-123LC	160.00	M36-120WA	65.00	V6064BLA	55.00
D13-450GH/01	55.00	F41-123LC	160.00	M36-120WA	65.00	V6064BLA	55.00
D13-471GH/26	55.00	F41-142LC	185.00	M36-120WA	65.00	V6064BLA	55.00
D13-550GH	55.00	M7-120W	19.00	M36-121GR	65.00	V6064BLA	55.00
D13-600GM	59.00	M14-100GM	45.00	M36-121GR	65.00	V6064BLA	55.00
D13-610GH	59.00	M14-100LC	45.00	M36-122GH	65.00	V6064BLA	55.00
D13-610GH	59.00	M17-151GV	175.00	M36-122GH	65.00	V6064BLA	55.00
D13-611GM	59.00	M17-151GV	175.00	M36-122GH	65.00	V6064BLA	55.00
D13-630GH	59.00	M19-100GY	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-120GH/08	65.00	M19-101GR	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-150GH	75.00	M19-103W	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-150GH	75.00	M23-110GH	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-172GH/84	59.00	M23-111GH	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-172GR	55.00	M23-111GH	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-172GV	55.00	M23-111GH	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-173GH	55.00	M23-112GM	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-173GM	55.00	M23-112GM	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-173GR	55.00	M23-112KA	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-181GH/62	55.00	M23-112W	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-181GH/68	55.00	M23-112W	55.00	M36-122GH	65.00	V6064BLA	55.00
D14-181GJ	55.						

PHONE 0474 813225 DEPT REW SELECTRON HOUSE, WROTHAM ROAD MEOPHAM GREEN, MEOPHAM, KENT DA13 0QY



TELEX 966371 PM COMP

A SELECTION FROM OUR STOCK OF BRANDED VALVES

A1714 18.50	E41 3.95	EL153 12.15	M8099 5.00	QOV03-20A 18.50	U41 6.95	2C21 1.00	6AG5 1.50	6F33 17.00	12CA5 1.95	6064 2.95
A1998 11.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV03-20B 32.00	U50 2.00	2C39A 23.50	6AG7 1.95	6FG5 1.95	12CX6 1.20	6064 3.20
A2087 11.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV06-40A 23.95	U82 3.00	2C39B 20.50	6AH6 1.50	6FH8 12.50	12DC06E 3.80	6205 6.95
A2134 14.95	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U91 0.70	2C40 37.00	6AJ4 2.00	6GG6 0.80	12DW4A 3.80	6688 6.80
A2293 6.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AJ7 2.00	6GH8A 0.80	12DW4 2.50	6688 11.50
A2426 29.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AK6 2.00	6GK6 1.95	12E14 28.00	6688 9.50
A2599 17.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AL5 0.80	6GS7 2.15	12GN7 4.50	6973 4.90
A2792 17.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM4 3.25	6GV7 2.50	12HG7A 4.50	6973 4.90
A2900 11.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM5 6.00	6GW6 2.50	12J7GT 3.50	6973 4.90
A3042 24.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM6 6.00	6H1 0.50	12K7GT 1.00	6973 4.90
A3283 24.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM7 6.00	6H2 0.50	12K7GT 1.00	6973 4.90
AC77H 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM8 6.00	6H3 0.50	12K7GT 1.00	6973 4.90
AC77J 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM9 6.00	6H4 0.50	12K7GT 1.00	6973 4.90
AC77K 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM10 6.00	6H5 0.50	12K7GT 1.00	6973 4.90
AC77L 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM11 6.00	6H6 0.50	12K7GT 1.00	6973 4.90
AC77M 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM12 6.00	6H7 0.50	12K7GT 1.00	6973 4.90
AC77N 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM13 6.00	6H8 0.50	12K7GT 1.00	6973 4.90
AC77O 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM14 6.00	6H9 0.50	12K7GT 1.00	6973 4.90
AC77P 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM15 6.00	6H10 0.50	12K7GT 1.00	6973 4.90
AC77Q 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM16 6.00	6H11 0.50	12K7GT 1.00	6973 4.90
AC77R 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM17 6.00	6H12 0.50	12K7GT 1.00	6973 4.90
AC77S 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM18 6.00	6H13 0.50	12K7GT 1.00	6973 4.90
AC77T 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM19 6.00	6H14 0.50	12K7GT 1.00	6973 4.90
AC77U 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM20 6.00	6H15 0.50	12K7GT 1.00	6973 4.90
AC77V 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM21 6.00	6H16 0.50	12K7GT 1.00	6973 4.90
AC77W 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM22 6.00	6H17 0.50	12K7GT 1.00	6973 4.90
AC77X 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM23 6.00	6H18 0.50	12K7GT 1.00	6973 4.90
AC77Y 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM24 6.00	6H19 0.50	12K7GT 1.00	6973 4.90
AC77Z 4.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM25 6.00	6H20 0.50	12K7GT 1.00	6973 4.90
AH221 39.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM26 6.00	6H21 0.50	12K7GT 1.00	6973 4.90
AH238 39.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM27 6.00	6H22 0.50	12K7GT 1.00	6973 4.90
AL90 8.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM28 6.00	6H23 0.50	12K7GT 1.00	6973 4.90
AN1 14.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM29 6.00	6H24 0.50	12K7GT 1.00	6973 4.90
ARP12 0.70	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM30 6.00	6H25 0.50	12K7GT 1.00	6973 4.90
ARP34 1.25	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM31 6.00	6H26 0.50	12K7GT 1.00	6973 4.90
ARP54 2.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM32 6.00	6H27 0.50	12K7GT 1.00	6973 4.90
ATP4 1.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM33 6.00	6H28 0.50	12K7GT 1.00	6973 4.90
AX50 4.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM34 6.00	6H29 0.50	12K7GT 1.00	6973 4.90
AZ11 4.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM35 6.00	6H30 0.50	12K7GT 1.00	6973 4.90
AZ31 2.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM36 6.00	6H31 0.50	12K7GT 1.00	6973 4.90
BL63 2.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM37 6.00	6H32 0.50	12K7GT 1.00	6973 4.90
BS450 67.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM38 6.00	6H33 0.50	12K7GT 1.00	6973 4.90
BS810 66.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM39 6.00	6H34 0.50	12K7GT 1.00	6973 4.90
BS814 53.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM40 6.00	6H35 0.50	12K7GT 1.00	6973 4.90
CIK 19.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM41 6.00	6H36 0.50	12K7GT 1.00	6973 4.90
C3JA 21.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM42 6.00	6H37 0.50	12K7GT 1.00	6973 4.90
C6A 9.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM43 6.00	6H38 0.50	12K7GT 1.00	6973 4.90
C1112G 70.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM44 6.00	6H39 0.50	12K7GT 1.00	6973 4.90
C1108 84.98	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM45 6.00	6H40 0.50	12K7GT 1.00	6973 4.90
C1134 32.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM46 6.00	6H41 0.50	12K7GT 1.00	6973 4.90
C1148A 115.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM47 6.00	6H42 0.50	12K7GT 1.00	6973 4.90
C1149/1 130.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM48 6.00	6H43 0.50	12K7GT 1.00	6973 4.90
C150/1 135.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM49 6.00	6H44 0.50	12K7GT 1.00	6973 4.90
C154 32.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM50 6.00	6H45 0.50	12K7GT 1.00	6973 4.90
CCA 2.60	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM51 6.00	6H46 0.50	12K7GT 1.00	6973 4.90
CC3L 0.90	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM52 6.00	6H47 0.50	12K7GT 1.00	6973 4.90
CL33 2.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM53 6.00	6H48 0.50	12K7GT 1.00	6973 4.90
CV Nos Prices on request	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM54 6.00	6H49 0.50	12K7GT 1.00	6973 4.90
DA1 22.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM55 6.00	6H50 0.50	12K7GT 1.00	6973 4.90
DA2 17.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM56 6.00	6H51 0.50	12K7GT 1.00	6973 4.90
DA90 4.50	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM57 6.00	6H52 0.50	12K7GT 1.00	6973 4.90
DA100 125.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM58 6.00	6H53 0.50	12K7GT 1.00	6973 4.90
DAF81 0.48	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM59 6.00	6H54 0.50	12K7GT 1.00	6973 4.90
DAF91 0.70	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM60 6.00	6H55 0.50	12K7GT 1.00	6973 4.90
DAF96 1.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM61 6.00	6H56 0.50	12K7GT 1.00	6973 4.90
DC70 1.75	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM62 6.00	6H57 0.50	12K7GT 1.00	6973 4.90
DC90 1.20	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM63 6.00	6H58 0.50	12K7GT 1.00	6973 4.90
DCX4-1000 12.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70	2C40 37.00	6AM64 6.00	6H59 0.50	12K7GT 1.00	6973 4.90
DCX4-5000 28.00	EB91 0.52	EL183E 3.50	M8100 5.00	QOV07-50 63.50	U92 0.70					

AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

A meeting of those who have been intimately involved in the construction of some of the satellites now familiar to radio amateurs was held recently in Cheltenham. Amongst those attending were such well-known personalities as Ian Ashley ZL1AOX, Dick Daniels W4PUJ, Robin Gape G8DQX, Bandi Gschwindt HA5WH, Werner Haas DJ5KQ, Gordon Hardman KE3D, Phil Karn KA9Q, Jan King W3GEY, Hans Peter Kahlan DK1YQ, Karl Meinzer DJ4ZC, Harold Price NK6K, Randy Smith VE1SAT/VE6, Martin Sweeting G3YJO and Dave Woodhall ZS6BNT.

Co-ordination

The meeting proposed the formation of an International Amateur Satellite Service Co-ordination Committee. This must be the third time an effort has been made to bring together those involved in the international amateur satellite field, so that resources can be pooled and plans co-ordinated.

AMSAT-UK tried to do so several years ago, but failed due to lack of interest from the radio societies of the countries involved. Region 1, IARU, tried with the formation of the Satellite Co-ordinating Group at its Brighton Conference in 1981, but again failed through lack of activity.

So we hope this new effort will be successful, which it may well be this time as it is composed of those who are actually engaged in the planning, building and running of amateur satellites. Anyway, we wish them a successful and fruitful future.

Amongst other matters discussed were changes to the schedule for the Oscar-10 satellite necessary to cope with sun angle constraints and upcoming eclipse periods.

The schedule selected is responsive to the reduced power per orbit and the requirement to off-point the satellite from its optimum attitude in order to minimise thermal and power effects caused by poor sun angles. A modified general beacon schedule was also adopted in order to share the time more equally between CW, 50 baud RTTY and 400bps telemetry, and reduces the time between successive transmissions of each type.

Three possible missions for the future were discussed. These included an asteroid encounter probe, an advanced Phase-4 satellite system concept, and a modified Phase-3 satellite.

It is proposed that this will be launched on Ariane-4 and will contain much of the same hardware as Oscar-10, but with

developments such as a plasma propulsion kick motor, an improved Mode-L transponder, an S-band beacon experiment, and a packet radio and beacon unit.

At the conclusion of the meeting most of the participants felt it had been a worthwhile exercise and had accomplished its intended objectives, again demonstrating the value of international co-operation and participation as the Amateur Satellite Service matures.

Italian transponder experiments

Every year about August time, there is a weather phenomenon above the Mediterranean which appears with sufficient regularity to attract the attention of scientists in the area. Investigations into it are conducted by means of high altitude balloons.

Recently this facility was made available to Italian radio amateurs to fly beacons and transponders for experimental purposes.

The latest such activity was conducted in August with an Oscar-10 type Mode-B transponder, and a very successful flight took place. The balloon, 100ft high and 75ft in diameter, rose to a height of 38Km and flew at 110Km per hour in a westerly direction to the south of Spain, where its load of scientific equipment, which weighed nearly a ton, was parachuted down to earth by radio controlled release from the balloon.

A number of good SSB QSOs were made during the flight through the transponder, which was returned safely to earth with the rest of the parachuted scientific equipment.

50MHz beacon at RSGB HQ

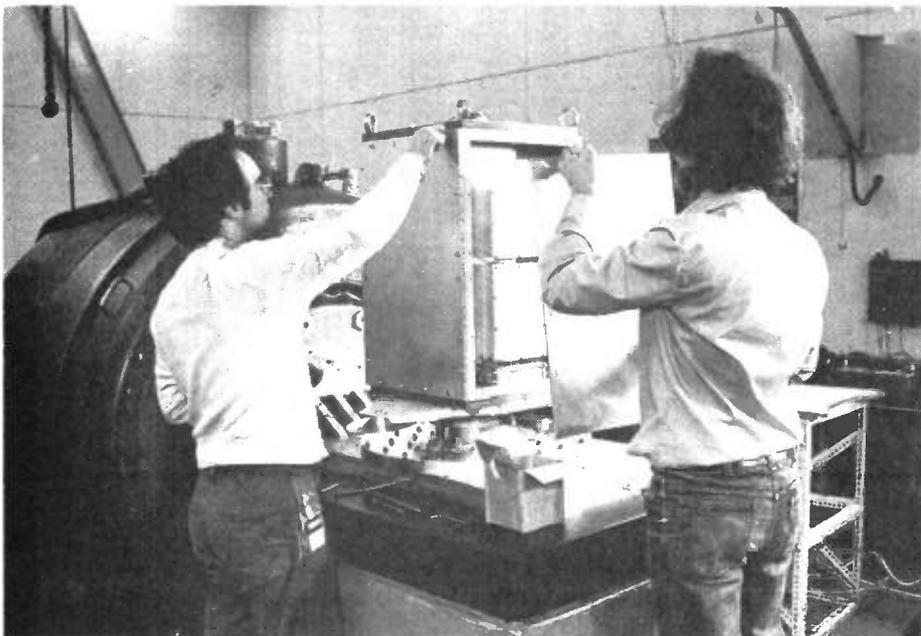
The 50MHz beacon recently installed at RSGB HQ, Potters Bar, is now functioning well. It is on 50.05MHz and has a 15 watt output into a crossed dipole antenna. The callsign is GB3NHQ (New Headquarters).

It functions 24 hours a day and has already been heard as far away as Inverness in Scotland. Reports on it would be much appreciated and should be sent to *The General Secretary, RSGB Headquarters, Alma House, Cranborne Road, Potters Bar, Hertfordshire.*

Young radio amateurs

It is good to see the very young coming

UoSAT-2



into amateur radio, and it is even more satisfying to learn that they very often come in via CB radio.

In the writer's area recently, Jeremy Warren of East Harling became the youngest ever radio amateur to pass his Class B licence examination at West Suffolk College. He became interested in radio transmission when his next door neighbour introduced him to CB radio. Jeremy soon realised that amateur radio was a far more satisfying interest than CB radio and was, in fact, a natural progression from it.

Jeremy's next step is to learn the Morse code and get his Class A licence so that he can 'talk to the world!'

Also in East Anglia, Andrew Buffham of Gorefield had to wait until his 14th birthday before he could use his amateur radio equipment. It was a double celebration in the Buffham household, as Andrew's father took the radio amateurs examination at the same time and he passed too. They applied for consecutive callsigns which they both received on the same day!

Andrew and his father started a course for the amateur radio examination about a year ago, and sat the examination last May. Andrew said his interest began with CB radio, which he enjoyed, but because

of problems created by some of the other users of CB at that time his interest in it soon faded.

Through the influence of some friends who were radio amateurs, he realised amateur radio was a much more fulfilling project, and his interest in it soon developed to the stage where he felt it was definitely worthwhile making the effort to get through the technical and Morse code exams.

Satellite for Class B licensees

It is often said that Class B licensees can use satellites for two way communication, since their RF output to the satellite is on 2 metres which Class B licensees are authorised to use. Some new licensees have been told they cannot use satellites, but this seems to be incorrect.

This matter did, in fact, come up much earlier in the satellite scene - in the days of Oscar-6 and 7 - when the decision that they could use satellites was made. However, the new schedule to the amateur licence which came into force on 10 September last specifically states that Class B licensees may not use the type of transmission known as 'Morse'. So it seems Class B licensees can use the satellites if they use SSB.

The solar cycle

We are just about half way through the present solar cycle. The recent burst of solar activity has now died down and some of the lowest activity since 1979 has been experienced lately. At the time of writing, the lowest solar flux of this cycle has been predicted.

A report has recently been produced comparing the present sunspot cycle with the previous one, from which the conclusion is drawn that the present cycle - Cycle 21 - is running true to form and should give the next maximum around 1987/88. However, some other solar activity predictors do not take this view but think the next maximum may be delayed until 1990.

Degree in satellite engineering

A Masters Degree in satellite communication engineering has been instituted at the University of Surrey, which began last October. This course will draw considerably on the experience derived from the design, building, programming, launching and control of UoSATs I and II.

Next Radio Amateur Exams

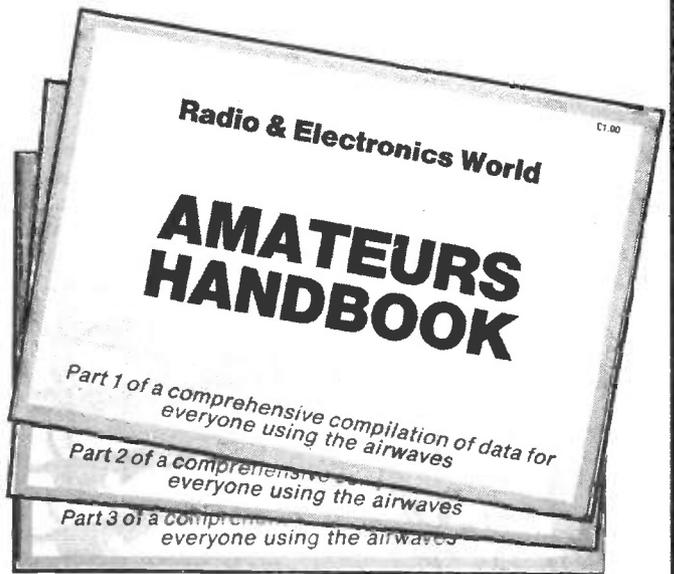
The next Radio Amateurs Examinations will be held on 3 December 1984, 18 March 1985 and 13 May 1985.

THE THREE PART

AMATEURS HANDBOOK

is now available as a complete set for only £2.50 (including post and packing).

First published in *Radio & Electronics World*, the Handbook is an informative guide to the world of the amateur radio enthusiast. It contains a multitude of useful facts and figures designed to benefit both the novice and the licensed amateur.



To: Radio & Electronics World · Sovereign House · Brentwood · Essex · CM14 4SE

NAME.....

ADDRESS.....

..... Postcode.....

PLEASE SUPPLY:

1 set of R&EW AMATEURS HANDBOOK

PAYMENT ENCLOSSED: £2 — 50

Cheques should be made payable to Radio & Electronics World. Overseas payment by International Money Order, or credit card.

CREDIT CARD PAYMENT

Signature.....

COMPUTING

MAIDENHEAD

A recent short paragraph in *Radio Communication* briefly reported that the International Radio Union (IARU) has agreed that, as from 1 January 1985, a new locator system will replace the present 'QTH Locator' and will be known as 'Universal Locator'.

The new system was originally devised by John Morris G4ANB for a meeting of IARU VHF managers at Maidenhead in Berkshire, and was selected from a number of other proposals.

This system met the criteria of worldwide application, simplicity combined with reasonable accuracy, and partial compatibility with the system at present in use.

Despite the adoption of the name Universal Locator, in general parlance it is known as 'Maidenhead' and we shall be using this terminology throughout this article.

Why locators?

There is nothing new about locator systems; the oldest currently in use is familiar to everyone - latitude and longitude. Everyone who has used an Ordnance Survey map will also be familiar with the United Kingdom National Grid Reference (NGR) system, so why must we be burdened with yet another?

In essence, the answer is convenience of use. The latitude and longitude system is ideal for use by the professional navigator, for it is extremely accurate and relatively convenient to use.

However, further criteria arise for the communicator, for not only must the system be positionally accurate, the

Jeff Howell G4BXZ and Brian Kendal G3GDU with three short programs for the new Locator System

results must also be capable of being passed accurately over a radio circuit with low probability of error - even in conditions of low signal strength and/or severe interference.

Long experience has shown that, in such circumstances, long strings of figures are particularly prone to error. As a position quoted in latitude and longitude may contain up to thirteen figures and two letters, an alternative solution was sought.

QTH Locator

In about 1970, the QTH (then known as QRA) Locator was introduced into Europe. This was based on 'squares' covering two degrees in longitude and one degree in latitude, these being identified by two letters, the first letter indicating the longitude and the second the latitude.

These were divided into eighty smaller squares in eight rows (N to S) of ten (E to W) and numbered 01 to 80. In turn, each of these was divided into nine subsquares

of 2 degrees 30 minutes in latitude and four degrees of longitude which were lettered 'a' to 'h' and 'j' in a cyclic pattern.

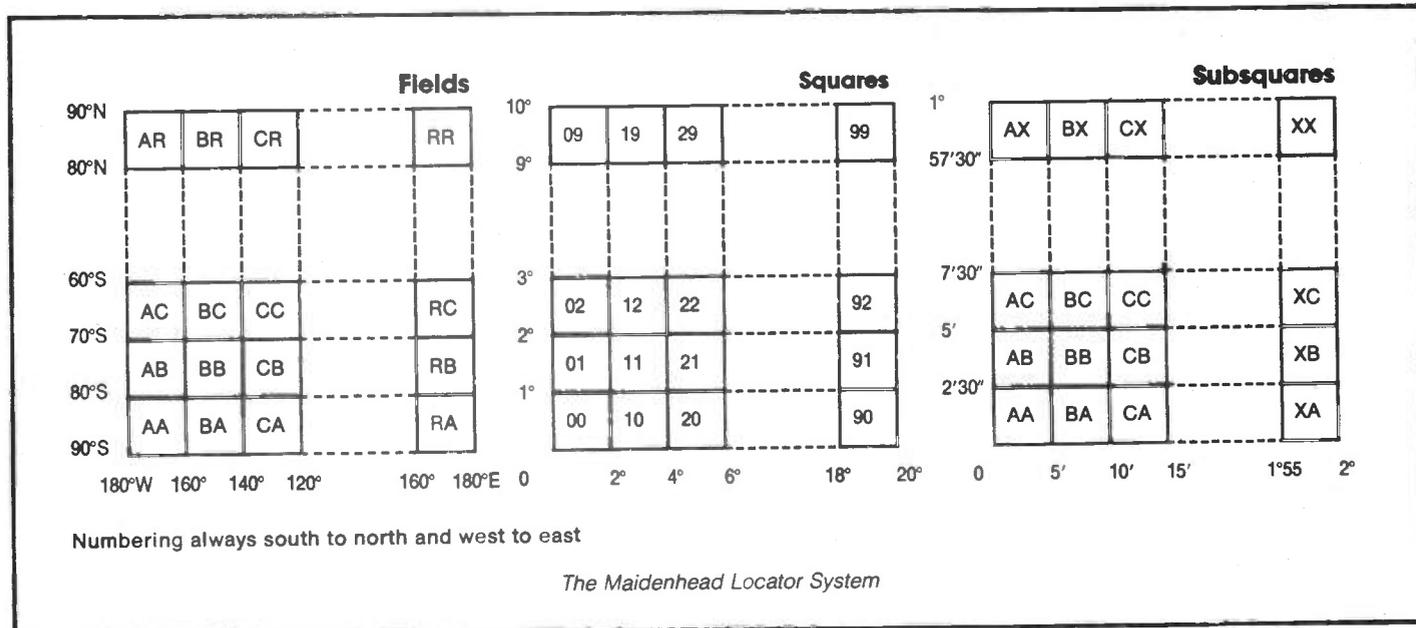
The disadvantages of this system were several but did not cause serious inconvenience for a few years.

The first letter of the QTH Locator indicated longitude, A being immediately east of the Greenwich meridian. The same letter would therefore be repeated every 52 degrees eastwards. The same would apply to the second letter in a north/south direction.

In the early days this did not matter very much, for the distances worked on VHF (and the system was only used on VHF) were not very great and any ambiguities could be resolved by knowing the other operator's national prefix.

Dramatic increase

More recently, however, particularly with the development of meteor scatter and satellite working, distances have increased dramatically. Considering the fact that the QTH Locator system could



repeat itself many times within a country the size of the USA or USSR, the implications are obvious.

Looking further into the QTH Locator system, the method of numbering the smaller squares and the cyclic system of determining the last letter added complexity to the programming of small computers, which by the late 1970s and early 1980s had become almost universal for computing distance worked, contest scores, etc.

Faced with these disadvantages the IARU sought an alternative locator system, and after examining quite a number adopted that proposed by John Morris, G4ANB.

The Universal (Maidenhead) Locator

The Maidenhead system will define any position in the world by means of two letters followed by two figures then a further two letters.

The first two letters define the 'field'. The world is divided into 324 fields, each 20 degrees in longitude by 10 degrees in latitude. Starting at the South Pole facing the International Date Line and moving in a clockwise (ie easterly) direction, the first letter indicates longitude and the second latitude.

Each field is then divided into 100 smaller squares, covering two degrees of longitude by one degree of latitude, these corresponding exactly to the QTH locator squares used at present.

These are numbered 00 to 99, starting in the south-west corner and counting northwards and eastwards. Thus the square in the south-east corner is 90 and that in the north-east corner is 99.

To further define position, each of these squares is divided into 576 subsquares formed into a 24 by 24 grid. Each of these is therefore 5 minutes E-W and 2.5 minutes N-S, which is very slightly larger than the present subsquares which measure 4 minutes E-W by 2.5 minutes N-S. Lettering follows the system of the fields, commencing with AA in the south-west corner and XA in the south-east corner, with XX in the north-east.

The Universal (Maidenhead) Locator system is thus capable of defining a geographical location with an accuracy only slightly less than the present system, but with the overwhelming advantage of worldwide application without ambiguity.

Using the programs

This month we are offering three short programs concerned with the Maidenhead Locator system.

The first of these will give the Maidenhead locator position for a geographical point defined by latitude and longitude, the second will derive the latitude and longitude for a point defined by a Maidenhead locator, whilst the third will calculate the distance in kilometres,

the relative bearing and the RSGB contest score between two Maidenhead locators.

User friendly

Each program is 'user friendly' and quite simple to operate.

In the first program, on keying the RUN instruction, the user is invited to enter the latitude and longitude in degrees, minutes and seconds, N/S or E/W, and immediately the locator will be displayed.

The second program operates in a reverse fashion with the locator being entered and the latitude and longitude of the centre of the subsquare being displayed.

On running the third program, the heading 'Maidenhead Locator' is printed and beneath this 'HOME STATION'. On entering the home station locator, the screen clears and 'DISTANT STATION' is printed. Enter the locator of the distant station and the screen will clear and then print the range, bearing and contest score.

Program descriptions

1. Latitude and longitude to Maidenhead Locator.

This program operates in three sections in which lines 50-100 handle latitude, lines 110-160 handle longitude, and lines 170-190 construct the locator.

The first and second sections operate similarly, so a description of the operation of lines 50-100 will suffice for both.

The latitude is entered in the form of three numbers and a letter, the letter determining whether the position is north or south of the equator. If north the figures are used as given, but if south, they are converted to an equivalent negative latitude, this being performed by the subroutine at line 250.

This subroutine is a simple computation, but the result is checked (at lines 280 and 310) to ensure that the minutes and seconds values lie within the range 0 to 59.

The processing is completed at lines 80-100 where the latitude coordinate is converted to 'fields', 'squares' and 'subsquares' of the locator, these variables being named I, J and K.

Line 190 converts these to character form, combines with the longitude coordinates, and prints the result.

The opportunity to perform further calculations is offered at lines 200-240.

2. Maidenhead to latitude and longitude.

This program commences with the definition of two functions, FNA(I) and FNB(J), the first of which converts the characters in the text string (called M\$) into their numerical position in the alphabet, where A=0 and Z=25. The second (at line 40) converts a fraction of a minute into a number of seconds.

Program to calculate Universal Locator position from the latitude and longitude of a point

```

10 REM - LAT/LONG TO MAIDENHEAD CONVERSION
20 REM - J.M.HOWELL JULY 1984
30 CLS
40 PRINT
50 PRINT "ENTER LATITUDE (D,M,S,N/S)"
60 INPUT D,M,S,A$
70 IF A$="S" THEN GOSUB 250
80 I=INT(D/10)
90 J=INT(D-I*10)
100 K=INT((M+S/60)*2/5)
110 PRINT "ENTER LONGITUDE (D,M,S,E/W)"
120 INPUT D,M,S,A$
130 IF A$="W" THEN GOSUB 250
140 F=INT(D/20)
150 G=INT((D-F*20)/2)
160 H=INT((ABS(D*60-INT(D/2)*120)+M+S/60)/5)
170 PRINT
180 PRINT "MAIDENHEAD LOCATOR- ";
190 PRINT CHR$(F+74)+CHR$(I+74)+CHR$(G+48)+CHR$(J+48)+CHR$(H+65)+CHR$(K+65)
200 PRINT
210 PRINT "RUN AGAIN (Y/N)"
220 INPUT A$
230 IF A$="Y" THEN GOTO 40
240 STOP
250 D=-1-D
260 M=59-M
270 S=60-S
280 IF S<60 THEN 310
290 S=0
300 M=M+1
310 IF M<60 THEN 340
320 M=M-60
330 D=D+1
340 RETURN

```

COMPUTING MAIDENHEAD

Lines 50 to 80 invite the user to enter the locator which is to be converted to latitude and longitude (M\$). This complete, lines 90-140 derive the latitude and 150-190 the longitude.

The operation of each of these sections of the program is similar, with the appropriate characters being converted to degrees and minutes. The number of degrees is then tested to determine whether the location is north or south of the equator or east or west of the Greenwich meridian. If south or west, further conversion is necessary.

3. Bearing, distance and contest score (50Km ring system).

This starts by defining constants, arrays and functions which will be used later in the program. Among these, FNA has exactly the same purpose as FNA in the Maidenhead to lat/long program. The subroutine at line 470, which is called at line 60 and elsewhere in the program, merely prints 'Maidenhead Locator' and is included to minimise typing.

The home station locator is loaded at lines 70-90 and the distant locator at 100-130, the index J determining which section of the arrays P and M\$ are used in receiving the data. The subroutine at lines 350-460 fetches the locator and performs comprehensive validity checks. In these a FOR-NEXT loop at 390-450 is used to process firstly the longitude and secondly the latitude parts of the locator, and at 440 the latitude and longitude representation is saved in array P.

The calculation of bearing and distance is achieved at lines 140-220 using a formula which has been specially derived to give high accuracy at short ranges, in view of the limitations of present day home microcomputers.

The bearing to the nearest degree is printed at line 270 and the range to the nearest 1/100th of a kilometre at line 290. Line 320 prints the contest score on the 50Km range ring system, taking into account that 'on the ring' scores low.

For further calculations the program returns to line 100, thus obviating re-entry of the home locator.

No STOP statement has been written into any of these programs; consequently, in order to terminate any of them, it will be necessary to use one of the BREAK facilities on the computer.

Tested

All three programs have been tested and run as presented on a Sanyo microcomputer, but when using a BBC machine it was found necessary to improve the presentation by changing the semicolons to commas in the print statements on lines 120-140 and 170-190 of the Maidenhead to lat/long program. Similar minor amendments to compensate for 'dialects' may be necessary for use with other makes of computers.

Program to calculate latitude and longitude from locator position

```

10 REM - MAIDENHEAD TO LAT/LONG CONVERSION
20 REM - J.M.HOWELL JULY 1984
30 DEF FNA(I)=ASC(MID$(M$,I,1))-65
40 DEF FNB(J)=(J-INT(J))*60
50 CLS
60 PRINT
70 PRINT "ENTER MAIDENHEAD LOCATOR"
80 INPUT M$
90 D=FNA(2)*10+FNA(4)-73
100 M=FNA(6)*2.5+1.25
110 PRINT
120 PRINT "LATITUDE- ";
130 IF D>=0 THEN PRINT D;INT(M);FNB(M);"N"
140 IF D<0 THEN PRINT -1-D;INT(60-M);60-FNB(M);"S"
150 D=FNA(1)*20+FNA(3)*2+INT(FNA(5)/12) -146
160 M=INT(FNB(FNA(5)/12)*2+5.01)/2
170 PRINT "LONGITUDE- ";
180 IF D>=0 THEN PRINT D;INT(M);FNB(M);"E"
190 IF D<0 THEN PRINT -1-D;INT(60-M);60-FNB(M);"W"
200 PRINT
210 PRINT "RUN AGAIN (Y/N)"
220 INPUT M$
230 IF M$="Y" THEN GOTO 60
240 STOP

```

Program to calculate distance in kilometres, relative bearing, and RSGB contest score between two Maidenhead locators

```

10 REM - MAIDENHEAD BEARING DISTANCE AND SCORE
20 REM - J.M.HOWELL JULY 1984
30 DIM P(2,2),M$(2)
40 M=57.2958
50 DEF FNA(I)=ASC(MID$(M$(J),I,1))-65
60 GOSUB 470
70 PRINT "HOME STATION"
80 J=1
90 GOSUB 350
100 PRINT
110 PRINT "DISTANT STATION"
120 J=2
130 GOSUB 350
140 A=P(2,1)/M
150 B=P(2,2)/M
160 L=(P(1,2)-P(1,1))*2/M
170 E=SIN(A)*SIN(B)+COS(A)*COS(B)*COS(L)
180 D=ATN(SQR(1-E*E)/E)
190 IF D<0 THEN D=180/M+D
200 IF A<B THEN F=90*(1+ABS(A-B))/(A-B)
210 IF L<0 THEN F=90+M*ATN((SIN(A)*E-SIN(B))/(SIN(L)*COS(A)^2))
220 IF SIN(L)<0 THEN F=F+180
230 GOSUB 470
240 PRINT
250 PRINT "FROM ";M$(1);" TO ";M$(2)
260 PRINT
270 PRINT "BEARING =",INT(F)
280 PRINT
290 R=6365.11*D
300 PRINT "RANGE =",INT(R*100)/100;" KMS"
310 PRINT
320 PRINT "SCORE =",799-2*INT((20000-R)/50)
330 GOTO 100
340 PRINT "ERROR - TRY AGAIN"
350 INPUT M$(J)
360 CLS
370 PRINT
380 IF LEN(M$(J))<>6 THEN 340
390 FOR I=1 TO 2
400 A=FNA(I)
410 B=FNA(I+2)+17
420 C=FNA(I+4)+.5
430 IF A<0 OR A>18 OR B<0 OR B>9 OR C<0 OR C>24 THEN 340
440 P(I,J)=A*10+B+C/24-90
450 NEXT I
460 RETURN
470 CLS
480 PRINT
490 PRINT TAB(5);"MAIDENHEAD LOCATOR"
500 PRINT
510 RETURN

```

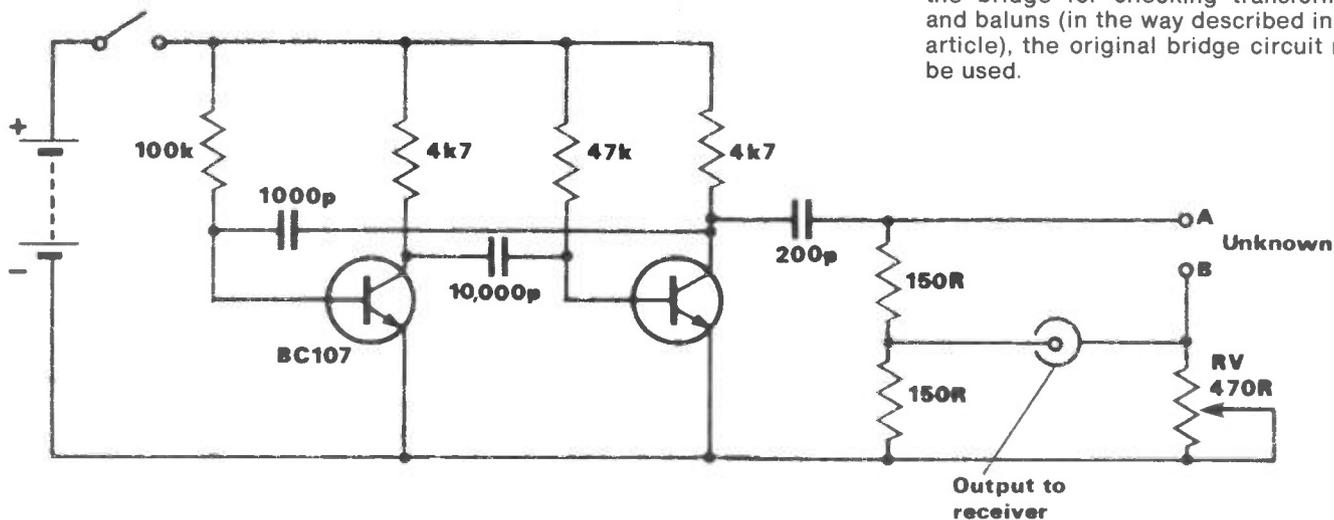
CORRECTIONS AND MODS

Whilst every effort is made to ensure that there are no mistakes with our diagrams, the occasional error does occur. We appreciate our readers' co-operation in notifying them to us.

RF Bridge (June '84)

Unfortunately a number of drafting errors occurred in the drawing of the multivibrator part of the circuit (Figure 3). A corrected circuit diagram is shown here.

To obtain a linear scale when measuring inductance and capacitance, the bridge circuit should be redrawn as shown: this requires an additional 150 ohm resistor. Calibration of the scale follows the procedure described in the article. If the constructor is only using the bridge for checking transformers and baluns (in the way described in the article), the original bridge circuit may be used.



The correct circuit diagram

HAVE YOU THOUGHT OF BECOMING AN AUTHOR?

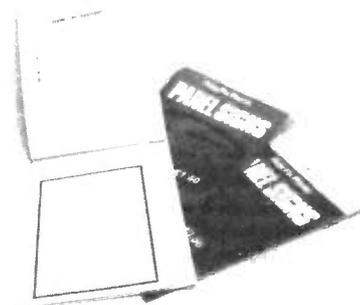
We are always interested in receiving articles to be considered for publication and are particularly keen to hear from anyone who has something to say related to the amateur radio field. As mentioned before, projects for fellow readers to build are most welcome.

You don't need to be an expert writer. If you can get your ideas down on paper, preferably typed, with drawings that we can follow and photographs where relevant, we will sort out the style, grammar, spelling etc.

If you have an idea for an article, or have designed and built a project that you think others would be interested in, but still have doubts about becoming an author, why not write (giving brief details and your *telephone number*) or telephone the editorial dept.. and of course you will be paid for your effort.

FOR A PROFESSIONAL FINISH

Use Strip-fix Plastic PANEL SIGNS



Set 3 — White wording **Set 4 — Black wording**
Over 1,000 words and symbols, covering more than 300 terms, in each set of 6 sheets.

Set 5 — Dials
6 sheets containing one large and two medium scales, large horizontal tuning scale, frequencies, 12 control panels.

Easy to fix. Stapled in booklet form to hang above workbench
Only **£1.50** per set, all 3 sets for only **£3.00** inc VAT & postage

Available only from:
DATA PUBLICATIONS
45 Yeading Avenue, Rayners Lane, Harrow, Middx HA2 9RL

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

Australian anniversary

A special commemorative call sign, VI3WI, will be on the DX bands until at least 30 April, 1985.

The call sign is part of the 150th anniversary celebration of European settlement in Victoria, Australia.

VI3WI will be activated on a roster basis by selected members of the Wireless Institute of Australia and its affiliated clubs.

All DX bands and all modes will be used, and a commemorative QSL is available, either direct or via the VK3 QSL Bureau.

A special award certificate is also available for radio contact with Victoria between November 1984 and 30 April, 1985.

Contact (SWLs log) one station in VK3 during the award period to qualify.

A QSL card for the qualifying contact, endorsed with a congratulatory message on Victoria's 150th anniversary, plus \$2 or equivalent, should be sent to:-

Victoria 150 Award, Wireless Institute of Australia, 412 Brunswick Street, Fitzroy 3065, Victoria, Australia.

In addition, the Wireless Institute of Australia is running an International RTTY art competition as part of its 75th anniversary celebrations.

Entries must not contain more than three overlinings, and must be submitted with a hard copy printout and baudot tape.

Categories are:

(a) Best hand generated original submitted by its author outside VK.

(b) Best hand generated original submitted by its author who is a VK.

(c) Best non-original hand generated or computer generated RTTY picture.

Entries close 31 August

1985, and must be sent to *WIA 75 RTTY Art Competition, Wireless Institute of Australia, 412 Brunswick Street, Fitzroy 3065, Victoria, Aus.*

The Mayflower event

For the fourth year, a hands-across-the-sea commemorative station, call sign WA1NPO, will be on the air on America's Thanksgiving Day, Thursday 22 November.

The station will be located in Plimoth Plantation, near Plymouth, Massachusetts, within the precincts of a living-history museum which vividly depicts life in Plimoth Colony, the first permanent English settlement to be established in the New World. The museum's exhibits include a reproduction of a complete Pilgrim village as it existed in 1627, and a full-size replica of the Mayflower.

On the UK side, a complementary station, call sign GB2UST, will be operated by Sidmouth (Devon) Amateur Radio Society from the astronomical observatory 200ft above the town, which is set in the heart of the Sir Walter Raleigh country.

Both stations will be operating from 1300GMT to 2000GMT on frequencies 14180, 14255 and 14345KHz SSB on 20 metres, and 21260 and 21385KHz SSB on 15 metres. WA1NPO will be looking for calls from any UK station, and an attractive certificate featuring the Mayflower will be available for confirmed contacts.

Further details are available from Peter Jackson, G3ADV, 32 Brown Avenue, Parkfield, Nantwich, Cheshire CW5 7DH. Tel: (0270) 627149.

Used test equipment

Following its recent move to larger and more convenient premises, Carston Electronics Ltd is seeking to

purchase high quality used test equipment, instrumentation and computer equipment. Those wishing to dispose of surplus equipment, especially those current and recent model units from major international instrument and computer manufacturers, should contact Carston, where they can quickly turn them into liquid funds.

Carston's move and its subsequent requirement for more stock is in response to the increasingly important market in top-quality used equipment and instruments. Many companies, large and small, are purchasing their equipment from a wider range of sources than in the affluent past. Secondhand is no longer a dirty word, and when these units are refurbished to manufacturer's original specifications and fully guaranteed, performance is equal to buying new, with reliability often of a higher standard.

For further information contact: Mr Ed Cooper, Managing Director, Carston Electronics Ltd, 99 Waldegrave Road, Teddington, Middlesex TW11 8LL. Tel: (01) 943 4477.

SSTV

Although many G stations are active on SSTV on 14230 KHz there appears to be very little local activity on the LF bands.

For some months now GD4 HOX, EI6EU and EI3CZ have been very active on 80 metres and would welcome others joining them.

They can be found on 3730KHz most Saturdays at 2.30pm and Sundays at 10.15am, and frequently during the week at 1.15pm.

The WAB winter award 1984/85

The Worked All Britain award is available to any station who, during the period from 1 December 1984 to 28 February 1985 inclusive, works a station in a minimum of 100 WAB areas in the counties of North, South, and West Yorkshire. A minimum of WAB areas must be worked in each county.

To work an area a station must exchange RS(T) reports and obtain the WAB area. QSL cards are not required.

Stations activating a WAB area in the above counties as a mobile or portable station may count it as an area worked. An area worked or activated may only count once.

To obtain the certificate please forward completed claim sheet together with a cheque or postal order for £2 made payable to 'The WAB Awards Account', with a first class stamp for postage, to the WAB Awards Manager, G3UQT. Claim forms are available from G4KSQ on receipt of an SAE.

SWL stations should log 100 stations heard from the above areas with a minimum of five in each county.

The award is available to any station whether a member of WAB or not. It is endorsable for any band or bands and for any mode.

The WAB VHF winter award

This award is intended for stations operating or listening on bands above 28MHz. To qualify a station must obtain 100 points and work at least one station in five different counties. One point is awarded for each different WAB area worked or heard. A station activating a WAB area as a mobile or portable station may also claim one point but any area may count only once. Only contacts made between 1 December 1984 to 28 February 1985 inclusive to count.

To work an area a station must exchange reports, RS(T), with a station in a WAB area and obtain details of that area. No QSL cards are required.

To obtain the certificate please forward completed claim sheet together with a cheque or postal order for £2 made payable to 'The WAB Awards Account' to the WAB Awards Manager, G3UQT, with a first class stamp for postage.

Claim forms are available from G4KSQ on receipt of a stamped addressed envelope. The certificate is available to stations whether a member of WAB or not.

Listening stations should log stations heard transmitting from 100 different WAB areas and from five different counties.

UoSAT answerphone

The UoSAT Spacecraft Control Centre now has an operational second telephone line and two answering machines. The original number (0483-61202) will carry UO-11 bulletins and data, while the new number (0483-61707) will carry information on UO-9. Each bulletin will announce which spacecraft it is covering and give the number for the alternative line.

MARCE

The Marshall Amateur Radio Club Experiment (MARCE) was one of the packages aboard the recent 41G Space Shuttle mission. The builder of MARCE, W4QAU, is eager for news; has anyone heard the 435.033 downlink?

Reports can be sent via the UoSAT team at the University of Surrey, or given on the AO-10 net (149.957 downlink) anytime between 00:00 and 01:00UT.

Repeaters

There seems to be appreciable interest in microwave operation in the Cambridge area.

The Cambridgeshire Repeater Group are currently working towards a 10GHz input facility on GB3PY, and the editor of the group's newsletter (Chris Lorek G4HCL) would welcome ideas and support.

In the latest newsletter there is a call for more thoughtful and responsible operating practice, since modern rigs are capable of pushing out rather more power than was the norm a few years ago;

'It is the height of the ridiculous to drive to the top of, say, Dunstable Downs, with 25 watts into a $\frac{7}{8}$ wave 2m antenna, and then ask on R6 "Can anyone tell me what repeater this is?", because there is a high chance that you are getting into all of them, right up to central Scotland ...

So this is a plea for sensible operating. When using high gain VHF/UHF antennae, do not go driving around on the high power setting when it is clear that the low power setting will do ...'

Anyone interested in the Cambridgeshire Repeater Group can find members in the Green Dragon Pub, Water Lane, Cambridge every Friday lunchtime. If you need talk-in, just call on GB3PI.

New clubroom

The Horndean and District Amateur Radio Club now has a larger meeting room, and the limit that previously had to be placed on membership has been lifted.

There is an active constructors' club, aimed at those who know little about radio techniques or have doubted their ability ever to construct a piece of useful equipment.

The club meets on the first Monday of each month at Merchistoun Hall, on the A27 near the Schooner Inn.

Northern radio

G6HBF, who edits *Feedback*, the journal of Bury Radio Society, is attempting to put together an article on the 'Northern early days of Amateur Radio' and is trying to track down a copy of *World at their Fingertips* by John Clarricoats.

He also wonders if anyone can recall pre-war and early post-war radio in the Manchester area, or remembers the BRS meetings held at Spring Mill, Tottington, or has any early photos etc.

Bury Radio Society meets each Tuesday evening in the clubroom at the Mosses Youth and Community Centre, Cecil St, Bury.

SLARS

Information has reached us concerning the Sierra Leone Amateur Radio Society. This society has been given honorary membership by Cheshunt and District Amateur Radio Club, who give them a great deal of help and encouragement (apparently equipment, books and spares are not available locally).

At present, Cheshunt and District AR Club are looking into alternative power sources for the Sierra Leone Beacon, since there are problems with the local mains supply. The requirement is for 2 amps plus to charge a 12 volt car battery, and solar cells and wind generators are under consideration. If any-

one has relevant knowledge or information, the Honorable Secretary, Roger G4OAA, is the man to contact.

Roger points out that a great deal can be gained by all concerned from twinning with a third world amateur radio society, and hopes that more British clubs will do this.

Cheshunt and District Amateur Radio Club meet

every Wednesday in the Church Room, Church Lane, Wormley, near Cheshunt, Herts. Club call signs are G4ECT and G6CRC.

Change of venue

As of the first Wednesday of December, the North Devon Radio Club will meet at Micro Chips, Castle Street, Barnstaple.

DATES FOR YOUR DIARY

21 Nov Junk Sale - Braintree and District Amateur Radio Club, St Peter's Church Hall. Further information from G6OIX, QThr.

21 Nov Recce and Image Processing - Hastings Electronics and Radio Club; meetings on Wednesdays at West Hill Community Centre, Hastings. Information from Dave Shirley G4NVQ, club secretary.

21 Nov Hints and Tips on Home Construction - Three Counties Amateur Radio Club; meetings on Wednesdays at the Railway Hotel, Liphook, Hampshire. Enquiries to R S Hodgson G3TBT, QThr.

21 Nov Open Night - Glenrothes & District Amateur Radio Club. Raffle, trade stands, talk and slide show by VP8 AQA at the Crown Hotel, Thornton, 7.30pm.

30 Nov-2 Dec 'Your Computer' Christmas Fair - Olympia 2, London.

1 Dec Special Event Station GB2KCF - Bristol Amateur Radio Club on the occasion of the YMCA Christmas Fayre. The club meets every Tuesday at the YMCA, Park Road, Kingswood. Information from T Rowe G8NNU.

2 Dec Flea Market - Coulsdon Club, St Swithuns Church Hall, Grovelands Road, Purley. Information from G4BOX, QThr.

2 Jan Discussion - What's Legal? - South Bristol Amateur Radio Club. Meetings every Wednesday at the Whitchurch Folk House. Information from Len Baker G4RZY, c/o 62 Court Farm Road, Whitchurch, Bristol.

4 Jan Junk Sale - Dunstable Downs Radio Club. For details contact Phill Morris G6EES on Dunstable 607623.

4 Jan Used Equipment Extravaganza - Radio Society of Harrow. Meetings every Friday at The Harrow Arts Centre. Details from Dave Atkins G8XBZ.

ATV ON THE AIR

Presented by
Andy Emmerson G8PTH

Here we are again, with another international contest behind us. I hope it went well for you if you entered. Despite the mediocre weather there was cheerful activity to be heard – and seen, of course.

Dateline: 25th August 1984. Location: the little village of Ratby in Leicestershire. It was mid-afternoon and I was at the shack/workshop of Chris Smith G8LMW (possibly more familiar to you rally-goers as LMW Electronics – the people with the transverters and other microwavey bits and pieces). I was drooling over his completely home-made ring-of-six amplifier for 23cm (350 watts output!) and listening to the 23cm beacons.

'Flat, isn't it?' said Chris. 'We haven't had a decent lift this year'.

'About time we did, too', I agreed. And with that I gathered up my bits and pieces and prepared to set off home.

Seventy centimetres

Well, it was quite an opening, sufficient to affect broadcast TV reception on Band IV. Cyril (Silverstone Electronics) Hayward G4AHH rang up to say he had worked some interesting DX and was thinking of getting back on ATV.

That was my prompt to get into the shack, and some stations were indeed heard on the calling channel working TV. Operation was quite orderly too, partly because a lot of people did not seem to have realised there was a lift on. (Sore point with some – the decent thing is to ring your mates, and I didn't!).

The activity soon picked up and seemed to favour the east-west direction, with little heard north and south. Plenty of PA0 contacts were made, notably with PE1DWA (Hans in Zoetermeer), and PE1DWQ (Frits at Hommerts).

Grant Dixon G8CGK (Peterstow, Herefordshire) is probably best known as an SSTVer, but he has recently put together a fast-scan station as well. Using a few watts from a QQV03-20A transmitter he put out a good signal which reached G8GOQ/P out on the Mendip Hills, 40 miles away.

Grant is also constructing for 24cm FM. In his letter he mentions two other active stations in his neck of the woods who swap pictures on 70cm. These are Ray G6TSL in Ross-on-Wye and Peter G8WGD in Staunton. Soon to join them are John G1DIV (Cinderford), Mike GW1EDP (Monmouth) and Mervyn, who is an 'eyewig' at Upton Bishop and is studying for the RAE as a retirement

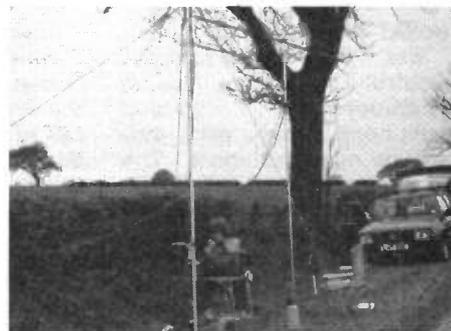
project. Great – and good luck!

Someone else who went out portable recently was Andy Goy G4HJD from Hull, the place with the independent phone system.

With Nick G8PSE he took a station equipped for 2m, 70cm and 24cm to Caistor, 16km west of Grimsby. Sitting on a grass verge in the middle of nowhere they seemed to attract a lot of rain, but despite this all the equipment seemed to work well. G3VZV has swiped the list of stations they worked, so I can't go into this, but they seem to have had a good time despite the rain.

With three ATV stations active in Hull they are looking for more contacts and are also building some BATC construction projects for 24cm FM. They travelled down to Leicester twice to work the repeater there but with no success (I believe it is broken, lads), and will try the Dunstable one next. That's dedication!

Mike Cox G8HUA writes from his new QTH at Scholes, Cleckheaton, in West Yorkshire to say that he is on the air again. All equipment is homebrew, starting with the CQ-TV122 exciter into a two-stage G4DYP linear, but using BLX67 and BLX68 to get about 5 watts PEP. A 2C39 linear is coming along.



Nick G8PSE who went portable with G4HJD near Caistor

For receive Mike has a MM upconverter and a JVC CX-610 (these handy receiver/monitors do in fact tune 70cm – there is a preset pot for the varactor tuner inside, but then the tuning calibration is wrong). Antenna is a 21 element Tonna.

Twenty four centimetres

Returning to the start of this piece, the reason I was at Chris's place was to have my 1296TT10 optimised at the bottom end of the band.

The 1296TT10 is a solid-state 10 watt PA which Chris makes. Taking an input of 1 or 2 watts it produces 9 or 10, which means it is a very useful device for increasing the output from a Microwave Modules transverter or, say, one of the old Fortop TV transmitters. In my case, I use it to drive an EME twin-tube PA, which needs a fair bit of drive.

As supplied the 1296TT10 is set up for 1296MHz and has virtually no gain at 1250.

GM4GM/P, the Clyde Valley DX group who chose a site 2000 feet ASL



However, Chris did the trick with his magic twiddling sticks, and I have no hesitation in recommending this device now.

Note that LMW Electronics also carry a comprehensive range of transistors, microwave trimmers, chip capacitors etc. If you are into this kind of construction you really ought to send off for his price list. The address is 102 Stamford Street, Ratby, Leics LE6 0JU.

It was, of course, a bit of luck that I had my 24cm gear back in time for the lift – it enabled me to make what I offer as the first TV QSO on 24cm between England and the Netherlands.

The station concerned was PE1DWQ, Frits, while PE1HZR and PE1DWA were also on the band, though not seen here.

There was a fair amount of fading and also diversity reception; PE1DWA was inaudible on two metres here, yet perfectly readable five miles away at G8UGU.

All these Dutchmen were on Ancient Modulation, which meant I got out my trusty TVC1260/40 converter. Frits had to slope detect my signals.

I have been passed an interesting letter from Jan-Martin LA8AK. Apparently 70cm TV is not possible in Norway but 24cm is being examined. One amateur, LA4WN, is active on 24, and LA6LCA may be on the air later. They have already tried 3cm. Sound subcarrier was 7.5MHz, but they are changing to 5.5MHz. How long will it take for us to follow suit, I wonder?

Allan G8CMQ rang up from his Solent QTH to pass on some activity news from his part of the world. There is now 24cm activity all the way along the coast from Bournemouth to Brighton. Slight lifts – better on 24cm than on two metres – occurred on 16th and 19th August. On the Thursday John G6MPE (Brighton) got pictures to G4JQU in Southampton and G6XGH in Titchfield, using just 10 watts to a tripler.

Apparently John can work Chichester and Havant all the time. F1EDM (still temporarily receive-only) and F3LP were also worked. Three days later Allan managed to get a signal from Martin G8KOE. Newish stations on 24 include G5NBX and G6CSX (Chichester) and G6RSV (Havant). There was also a 24cm TV walkabout demo at the Flight Refuelling Hamfest.

Activity in the Midlands is on the increase. There is a cluster of stations in the Greater Birmingham area, notably G3DFL, G5KS and G8MTF. George G4EUF at Markfield is getting his station together and G8BWC in Nottingham is receiving signals.

A last word from Mike Cox G8HUA, who got a mention in the 70cm section. He says he has a Sandpiper 20 turn helix and is building the FM IF strip from CQ-TV122 ('good issue that one'). Anyone else on 24 FM, he asks. Well?



Making Scotch VHS cassettes, showing the fresh tape just after it has been split. Bet he drinks Carling Black Label!

Slow-scan TV

I start the slow-scan section with an apology, to Richard G3WW. I accused SSTVers of having gone off the air for the last three months. Richard did indeed send in a report, and I am afraid this got lost in the PTH filing system (a pile of books and papers on the staircase waiting to go upstairs).

Nonetheless, that was the only report received, and apart from some more notes from Richard I have received no other slow-scan info at all. (Having said that I have received by today's post lots of info from John GM6KJD in Aberdeen; these will appear next month.)

The 7th May was a red letter day for G3WW as he reached what is undoubtedly a world record – 2000 different two-way SSTV QSOs. Congratulations Richard, this is no mean achievement, and I have not heard any challengers yet!

Richard has been at it since November 1972, and no doubt has added to this score in the meantime. The 2000th contact was to a new country, Iceland; Luftur TF3LJ was the lucky lad who was making his first two-way on SSTV. Richard has now worked 112 countries, all but 4 confirmed with QSL cards from the distant station. (I wish my contacts were as conscientious!)

Equipment in use at G3WW is a Wraase SC-1 SSTV/FAX converter with KB442 keyboard, a Seikosha GP-250X dot matrix printer, a Sony 10in b/w monitor and a Taxan 12in colour monitor; also a Robot 400 (with several mods including 24 second frame) plus two W9NTP memories for RGB colour.

On the RF side, equipment includes an Icom 740, Heath SB220 linear, HyGain 205BA, Mosley 3 element Elan beam and 40/80m lazy H at 56ft. For 2m he has an FT-221R with muTek front end and Dressler masthead preamp, and also a NAG 144XL linear and two 16 element Tonnas at 70 ft.

Richard was prevented from visiting

the BATC summer convention because of a meeting with Gerald ZS6BTD and Jeremy G3NOX to discuss the SSTV forum at this year's Dayton Hamvention. The different standards used for SSTV b/w and colour transmissions were considered later when Mel W6VLH and XYL visited Richard, who won Mel over to 32 seconds b/w (I'm confused! When is someone going to explain all these competing standards and how you equip for them? What ever happened to good old 5FP7 tubes?!?).

Richard's recent two-way 2m activity includes G3CCH, G4DYB, G4NJ1, G4IHZ, G14LKA, G8ASI, G3NOX and G3CDK. On and around 14230 GM4TXX, I2CEL, I3XQW, I6GKI, I0UVF, EA3BTG, EA3JY, EA8EV, EA8RP, F2RR, DL2GB.

Other news

Some enlightened suppliers are providing me with samples of their new offerings to review. Thanks – let's have more!

From Malcolm Taylor G4YMT (8 Four Stones Grove, Edgbaston, Birmingham B5 7LW), comes a new testcard program for the 48K Sinclair Spectrum computer. Costing just £2.49 inclusive, it provides you with a colourful test pattern with bars, circle and digital clock. Flashing text is an option and call sign and talkback frequency are in clear letters. At this price you can't really go wrong (unless you are a programming genius, in which case you can probably do better yourself).

I have also received a 24cm converter from Solent Scientific and a tunable 24cm converter by Wood & Douglas to match their VIDIF strip. Both are recommended and will be reviewed fully in these pages soon. Also coming up will be more operating news from Scotland: I've had so much this time I must hold some over. Please keep your letters coming, care of the editor, and I'll see you again next month.

Amateur RADIO

For all two-way radio enthusiasts

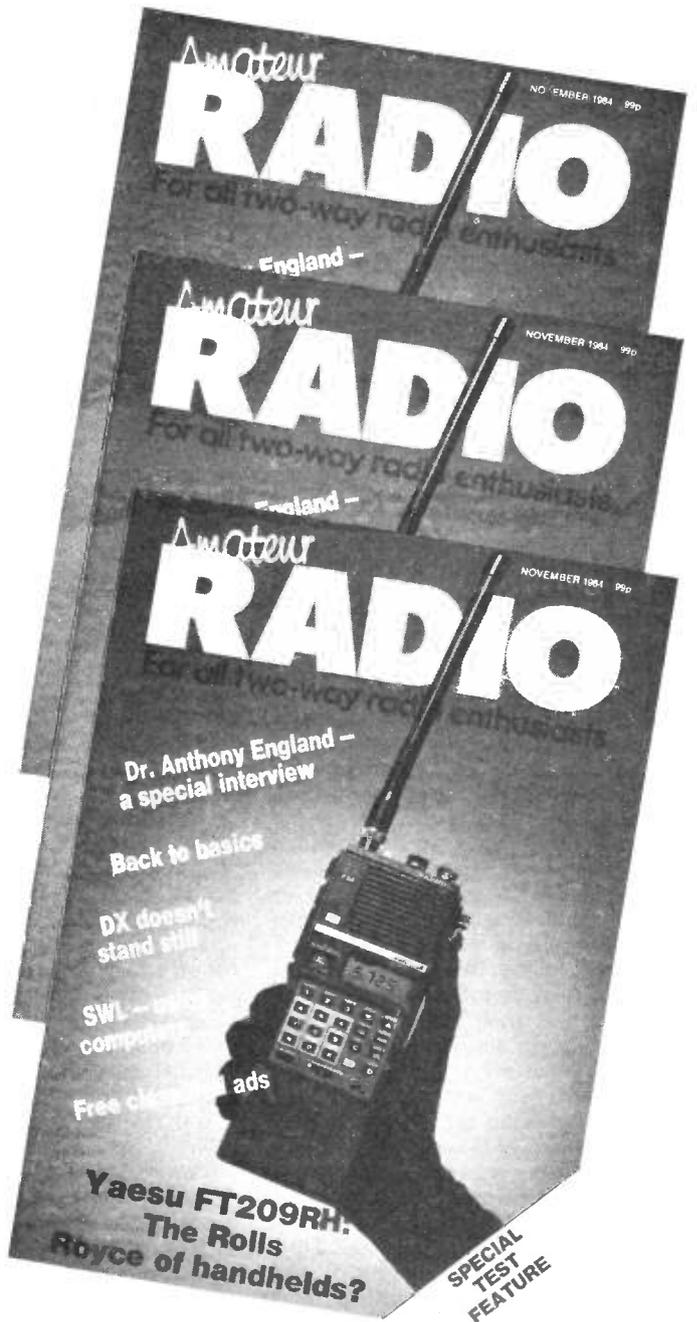
THE PERFECT COMPLEMENT TO
RADIO & ELECTRONICS WORLD

DON'T MISS YOUR COPY

With regular features like Current Comment, DX Diary, Straight and Level, Angus McKenzie's equipment review, SWL, Rally Calendar and Free Classified Ads, and a host of special features in each issue, make sure you place a regular order for **Amateur Radio** with your newsagent or take out a post free subscription now, while the offer lasts

SUBSCRIPTION BENEFITS

... delivery to your door by publication date each month
... inflation proof – price guaranteed for 12 months



On sale NOW at your newsagent

AMATEUR RADIO SUBSCRIPTION ORDER FORM

To: Subscription Department • Amateur Radio •
513 London Road • Thornton Heath •
Surrey • CR4 6AR. Tel: 01-684 3157

NAME

ADDRESS

.....

..... Postcode.....

PLEASE SUPPLY: (tick box) for 12 issues, all rates include P & P

Inland World-Surface Europe-Air World-Air
£11.80..... £12.95..... £17.75..... £25.70.....

PAYMENT ENCLOSED: £

Cheques should be made payable to Amateur Radio. Overseas payment by International Money Order, or credit card.

CREDIT CARD PAYMENT  

Signature RE1284

DX-TV

RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

At the end of August, and with Autumn approaching, most DX-TV enthusiasts suddenly realise that the luxury of Sporadic-E reception experienced during the summer is over for another year. Those exotics that were contemplated, but which never actually materialised, will have to wait until another time.

The 1984 season was particularly memorable on two counts. The season was noticeably short, which no doubt disillusioned the beginners and dabblers. To compensate, however, there was a glut of exotics. These originated mainly from the Middle East, although Canadian system 'M' signals manifested themselves on channels A2, A3 and A4 on at least one occasion.

Outstanding 'firsts'

Several firsts occurred during the season, such as the classic Iranian channel E2 reception noted in East Anglia on May 24th, and also the channel E3 Aramco-TV (Dhahran) signals on the same day. The recently commissioned E3 transmitter at Akarnaika in Greece meant a new country for most of us. Despite the outlet having an ERP of only 1.58KW, it has been received far and wide at high signal levels.

Arabic signals on E2 and E4 have puzzled a few lucky enthusiasts during openings to the south-east, but as yet no positive identification has been possible. One likely candidate is Egypt, as this country operates in Band I on these channels via two 900 watt transmitters at Dumyat.

During the Sporadic-E season we've had reports of a couple of firsts in Band III and at UHF via tropospheric propaga-

tion. From our Dutch correspondent, Gösta van der Linden, comes the news that a fellow DXer (Rijn Muntjewerff) noted a PM5534 test card from the north with identification which confirmed reception of the new television service in the Faeroe Islands (see *Service information*).

This was during the morning of June 8th and emanated from the channel E6 outlet at Tórshavn. The signal was very strong, which gives us every hope of reception in the UK during the coming months.

Further up the scale, well into the UHF spectrum, a Leeds DXer has noted the American Forces Network (AFN-tv) service from the Dutch base at Soesterberg on system 'M', channel 80. This corresponds to our channel 71! Congratulations to all those concerned and hopefully the rest of us will get a look in soon.

Viewing during August

Excellent Sporadic-E (SpE) conditions occurred during the first half of the month. On the 4th, Band I became jammed solid with signals for the entire day. Fortunately this was a Saturday, so most enthusiasts received something of interest.

The band was open during the 5th too, with signals appearing from as early as 0600BST until well into the evening. From the 11th onwards, anticyclonic conditions produced enhanced tropospheric activity in Band III and throughout the whole of UHF. Most of the signals were of West German or Scandinavian origin and lasted until the 28th. Sporadic-E activity by this stage had almost completely

disappeared, and even during the first few days of September activity was practically zero.

Iceland has been somewhat of a rarity this season. In fact it didn't make an appearance here in Derby until August 5th. Signals from RUV arrived on channel E4 from the Stykkisholmur outlet situated in the north-west of the country. The opening was already in progress upon switching on at 1250, when the PM5544 test card was resolved by a number of DX-TV enthusiasts.

On the 7th at 0750 a very weak PM5544 was noted on E3 with the aerials facing the south-east during an opening to Italy. Incidentally, RAI were radiating a blank raster on channel IA at the time. Unfortunately the mystery PM5544 test card eventually faded before being positively identified, but Greece or Jordan is suspected.

Flashing caption

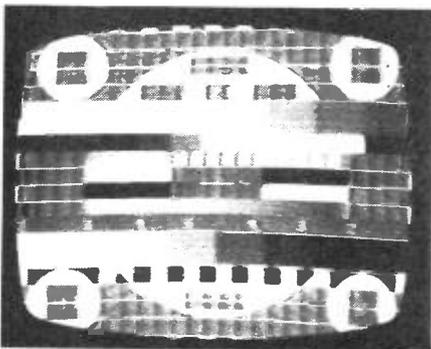
Interesting observations occurred on the 9th, when the Russian current affairs programme 'Hoboctn' finished at 0801 on channel R1, followed by a female announcer. The closedown clock was displayed, preceded by a flashing caption (in Russian, of course) warning viewers to switch off their sets. Test transmissions then appeared consisting of the monochrome 'letterbox' test pattern (see last month's *R&EW*). This ultimately switched to the electronic test card known as the 'Leningrad' pattern.

An unusual feature of this test card was its identification towards the top. The number '28' appeared in lieu of the more usual 'UT 0167'.

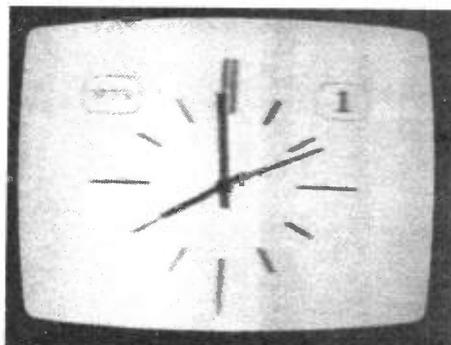
Reception reports

The Icelandic reception of August 5th on channel E4 was noted by Chris Howles of Lichfield, despite the local BBC1 Sutton Coldfield transmitter on B4 which is practically on his doorstep.

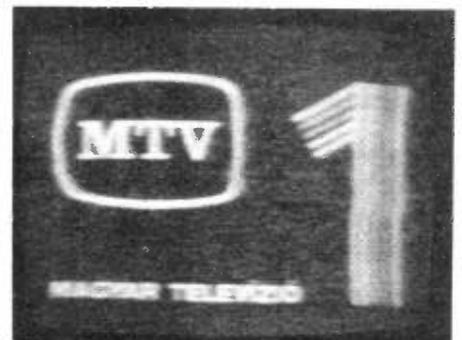
Simon Hamer (Powys, Wales) also saw Iceland, but a few days later on the 9th at 1940. He had to position his dipole vertically to receive this! The 5th was extremely active, and he succeeded in receiving the Italian RAI-1 transmitter at Torino on channel IC.



The 'Leningrad' electronic test card from TSS in Russia. Note the identification at the top



Clock caption used by Magyar Televízió in Hungary. A 'negative' version is also transmitted



Identification caption broadcast by by MTV-1 (Hungary) and received via Sporadic-E

Rumania on R3 was seen for the first time by Simon on the 6th, and a little closer to home the Austrian E4 outlet at Patscherkofel was noted – another first for Simon.

A possible exotic appeared at 2020BST in the form of a coloured female announcer on channel E3. Unfortunately the signal was short-lived, but at 2105 on E4 a news programme was noted which ended with a globe complete with lines of latitude and longitude.

Signals from Central and Eastern Europe continued well into the evening on the 11th, and of particular interest was the closedown of Soviet TV at 2255 following the news. Czechoslovakian TV closed shortly after 2300, showing the flag during the national anthem. The closedown sequence was followed by the 'RS-KH' electronic test card.

During the tropics at the end of the month Simon monitored the FM radio band, and was rewarded on the 26th with Dutch programmes from NOS-1 on 87.70, 87.85 and 88.0MHz, NOS-3 from Lopik on 96.80MHz, and a Dutch pirate station on 102.1MHz. The Flemish and French speaking services from Belgium were heard on 102.8MHz and 102.4MHz respectively.

French signals

Tony Harris (Fareham, Hampshire) has sent further details about his DX-TV installation which allows 'entertainment quality' pictures from France on a daily basis. His receiver is a multi-standard Luxor SX9 series (see last month's **R&EW** for full details). Tony's experience in receiving the scrambled transmissions of 'Canal Plus' indicates that the vision or sound can be resolved, but not both.

He was hoping to improve Band III reception by changing his Antiference MH308 Band I/III system to a Triax 13-element Band III only array, but any improvement is negligible. A photo of the French test card is shown below.

For recording French programmes Tony has located a source of multi-band PAL/SECAM video recorders. He's recently purchased a Blaupunkt VHS machine for £299.95 from a discount retailer called *A1 Hampshire Video, Stubbington Green, Fareham, Hampshire*.

Sporadic-E

Graham Angel of Sheffield had a field-day on the 4th during an all-day SpE opening. Two interesting signals, both on test card, came to light.

The first was the Rumanian FuBK test pattern on channel R2, with 'TVR BUCURESTI' displayed across the central band. The second was a mystery identification on an FuBK pattern at 1130 BST on channel E3. The inscription was 'RTS', and since much of the activity involved south-eastern Europe everything points to Yugoslavia.

We aren't aware of such an identification, but several other enthusiasts noted a rare Yugoslavian low-power relay (Pisvir E3 with 25W ERP) displaying the identification 'JRT SA1'. This originated from the studios of Radiotelevizija Sarajevo. We can only assume that Graham saw a different test card prior to the start of programmes.

Clive Athowe (Blofield, Norfolk) has recently returned from the darkest jungles of Africa where television is unknown – well, almost!

He's been on holiday to Tanzania and he was hoping to take a few snaps of the local TV, but unfortunately Mr Baird's invention hasn't caught on in that part of the world just yet. However, there is a TV service on the nearby island of Zanzibar where there is a UHF network.

August was a particularly good month for tropospheric DX in Band III and UHF for Clive. Vertically polarised transmissions from the British Forces Broadcasting Service (BFBS) in West Germany were logged on the 21st and 22nd on

channels 40 and 49.

Meanwhile, on the 21st, 25th and 27th, the AFRTS network from the American base at SHAPE in Belgium was seen on channel 34. The signal on the 21st consisted of colour bars on the 525-line/60Hz system 'M' standard. Programmes were seen on the 25th and 27th.

There were tropics in Band I too. On August 27th the Norwegian PM5534 test card appeared on E2 with the transmitter location 'GULEN' in the lower black rectangle. On E4 the PM5534 pattern was present from Bremanger. Norwegian test cards occupied every Band III channel during the same period; both the Bergen and Lyngdal PM5534 patterns were noted on E9.

Clive mentioned that Ray Davies on the Norfolk coast received a Norwegian relay at UHF on channel E35 with the identification 'NORGE BJERKREIM'. This shows what can be achieved at UHF with extremely low-power outlets, since all Norway's UHF transmitters have only a few watts ERP.

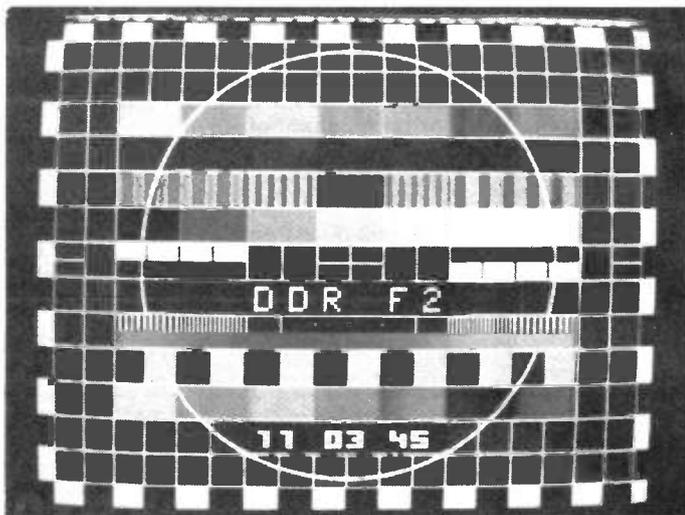
Mystery

We end our East Anglian report this month with a mystery. Clive and Ray noted the Belgian PM5544 on the 27th with 'BRT TV1' identification on channel E39. However, there aren't any BRT outlets listed on this channel!

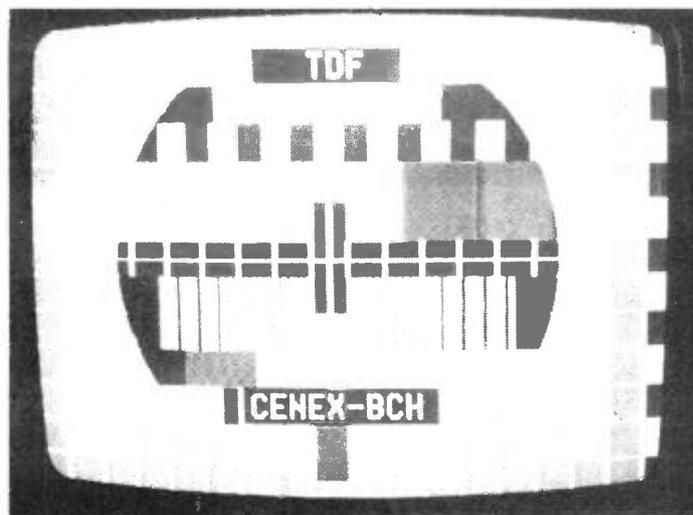
A long and extremely interesting account of the month has arrived from Kevin Jackson of Leeds.

He's received Greece at long last on their news programme, which featured local items. This occurred during the hectic opening of the 4th.

Prior to this he saw the low-power E3 relay at Pisvir (Yugoslavia) radiating the FuBK test card with 'JRT SA1' identification, together with a floater, the more commonly received 'JRT BGRD 1' PM5534. The 10KW JRT transmitter on E4 at Pelister (situated close to the Greek and Albanian borders) accompanied the



The colour electronic test card radiated by DDR: F2 in East Germany (courtesy of Alessandro Münger)



The French PM5544 test card with unusual identification (courtesy of Tony Harris)

latter, displaying the 'JRT SKOPJE' PM5544.

The tropes of the 25th were so intense that Kevin's local transmitter at Emley Moor was virtually wiped out by Anglia TV from Sudbury. Not bad considering his domestic aerial is in line-of-site with Emley Moor. On the 26th he even managed to watch Dutch TV without an aerial connected!

DX log for August

We are featuring part of two logs this month; firstly the reception noted here in Derby:

1/8/84: TVE (Spain) E3 with Olympic coverage; CST (Czechoslovakia) R2 with the 'CST 01' FuBK test card; TVP (Poland) R2 on dark PM5544 test card; DDR: F1 (East Germany) E4 from Cottbus radiating the electronic test card; RAI (Italy) IA on programmes; CST R2 with the 'SR1 TV BRATISLAVA' PM5544.

2/8/84: RAI IA on programmes.

4/8/84: Band I jammed with signals throughout the day from most of Europe - see various reports for highlights.

5/8/84: TSS (Russia) R1 and R2 at 0600BST on progs; Switzerland E2 with '+PTT SRG1' FuBK at 0850; RAI IA and IB with religious service during the morning; TVE1 (Spain) E2 and E4; TVE2 E2 with the GTE colour test card at 0956; RUV (Iceland) E4 on PM5544, very strong at times; unidentified news or current affairs programme with 'AHET' caption on R2 - suspect Hungary or Czechoslovakia; ARD (West Germany) E2 on progs; JRT (Yugoslavia) E3 with a subtitled film at 1958.

6/8/84: TSS R1 and R2 with progs at 0610; NRK (Norway) E2 on 'NORGE STEIGEN' PM5534; JRT E3 with commercials at 1900; ORF (Austria) E2a with Olympic highlights at 1945; RAI IA on programmes from 2000 onwards.

7/8/84: RAI IA with a blank raster followed by the PM5544 at 0800; unidentified E3 PM5544 - suspect Jordan or Greece; TVE1 E2, E3 and E4 with various test patterns including the GTE test card, blank raster and colour bars within the space of 30 minutes; DDR:F1 E4 on test card; CST R1 and R2 with the 'RS-KH' pattern and 'CST 01' FuBK prior to the

station opening sequence.

8/8/84: RAI IA with programmes.

9/8/84: TSS R1 and R2 with progs followed by closedown and test transmissions shortly after 0800; RAI IA on PM5544 at 0830.

10/8/84: RAI IA on PM5544 from 0800 onwards.

11/8/84: Sporadic-E reception from Eastern Europe on R1 and R2. Tropes noted from the Netherlands on E4 (Lopik) and E5 (Smilde); tropes from West Germany in Band III from Westdeutscher Rundfunk (WDR) on E9 (Langenberg) and E11 (Teutoburger Wald).

The log for the second half of the month comes from Clive Athowe near Norwich:

12/8/84: SR-1 (Sweden) E3 on progs; TVE1 E3 on GTE test card.

14/8/84: TVE1 E2 on colour test card.

15/8/84: TSS R1 and R2 with 'HOBCTN' current affairs programme.

16/8/84: West German tropes; DDR: F1 E5 (Inselberg) with programmes.

18/8/84: West German tropospherics.

20/8/84: TSS R1 and R2 on programmes via SpE; TVE1 E3 on GTE test card; JRT E3 with a subtitled programme; excellent reception from West Germany via enhanced tropospherics.

21/8/84: Highlights of West German trop reception include BFBS on E40 and E49 showing the PM5544 (both transmissions vertically polarised); AFRTS E34 (from SHAPE in Belgium) on colour bars - very strong signals; DDR:F2 on E34 from Brocken.

22/8/84: DR (Denmark) E7 and E10 with programmes via tropes; DDR: F2 E29 (from Schwerin) on test card; DDR: F1 E11 on programmes, also DDR: F2 on E34; West German tropes including Norddeutscher Rundfunk (NDR-1) on E56 (transmitter unlisted).

24/8/84: TVE1 on channels E2, E3 and E4 with the GTE test card via Sporadic-E.

25/8/84: Tropes from West Germany on UHF; DDR: F2 E29 and E34 with the test card; DDR: F1 E11 and E37 with 'Kinderfernsehen' (children's programmes); DR E5, E7 and E10 radiating the 'DR DANMARK' PM5544; NRK (Norway) E9 with 'LYNGDAL' PM5534; AFRTS E34 (SHAPE).

27/8/84: AFRTS E34 with programmes; many West German signals via tropes; NRK on E2 from Gulen, E4 (Bremanger), E5 (Stord), E6 (Bjerkreim), E7 (Hovdefjell), E8 (Bokn), E9 (Bergen), E9 (Lyngdal), E10 (Skien) and E11 (Lønahorgi); DR E5, E7 and E10 on programmes; BRT (Belgium) on 'BRT TV1' PM5544 on channel E39! SR-2 (Sweden) E23 and E26 plus SR-1 on E33 - all on programmes.

28/8/84: DDR: F1 E5 on progs; SR-2 E24 with 'TV2 SVERIGE' PM5534; SR-1 E33 on 'TV1 SVERIGE' PM5534 test card.

30/8/84: CST R1 and R2 with the 'RS-KH' EZO-type test card via Sporadic-E; TSS R1 and R2 (two stations on channel R1)

with 'HOBCTN'; SR-1 E2 with programmes.

Beginner's DX guide re-launched

In the October '84 issue of *R & EW* we mentioned Simon Hamer's pamphlet called 'TV DX For Beginners'. It was originally published by North England Radio Club International, but this DX group recently disbanded and copies soon became unobtainable.

Fortunately, Simon's original text (together with a new selection of photographs) has been re-published in booklet form. The 8-page guide should prove to be very useful to all newcomers to DX-TV and is available from: *HS Publications, 17 Collingham Gardens, Derby DE3 4FS*. The price is £1.65, which includes postage and packing worldwide via surface mail.

Service Information

Faeroe Islands: The new TV service has been received by a DX-TV enthusiast in the Netherlands. The PM5544 electronic test card was seen with a digital clock and the identification 'SJONVARP FØROYA'. Full details about the transmitters were given in the October issue of *R & EW*.

Mali: In West Africa the Mali TV service has opened its colour service. Technical assistance was given by Libya and there are currently two hours per week of colour TV using the SECAM system.

Romania: There is a new channel R6 transmitter in service at Bucegi. The TVR outlet has an ERP of 150KW. According to the EBU in Belgium, TVR have taken out of service over 260 VHF transmitters at one fell swoop. However, it is thought by many DXers to be an erroneous listing.

Netherlands: There are plans to start a third NOS-TV network as soon as possible. All Dutch transmitters will be adapted for stereo sound between 1985 and 1987. The system currently used by ZDF in West Germany will be employed.

West Germany: The Norddeutscher Rundfunk (NDR-1) outlet at Mölln on channel E53 has an ERP of 20KW and not 20 watts as reported earlier.

Spain: There are two new UHF transmitters in service for the Madrid area on channels E49 and E55, both with 117KW ERP. Some enthusiasts are beginning to wonder if this means the demise of the RTVE channels E2 and E4 in Band I which serve the same area. At least the RTVE-2 channel E2 outlet at Santiago seems safe, for the time being!

Sweden: Three SR-1 transmitters formerly operating in Band I have moved to UHF. Östmark, Svinesund and Hunnebostrand now radiate on channels E38, E28 and E59 respectively.

This month's service information was kindly supplied by Gösta van der Linden (Netherlands), Alexander Wiese (West Germany) and the European Broadcasting Union (Belgium).



A news programme caption in cyrillic characters from Yugoslavia (via SpE)

COMPUTER WAREHOUSE

1000's OF BARGAINS FOR CALLERS

THE 'ALADDIN'S' CAVE OF COMPUTER AND ELECTRONIC EQUIPMENT

HARD DISK DRIVES

Fully refurbished DIABLO/DRE series 30 2.5 Mb disk drives.
DEC RK05, NOVA, TEXAS compatible.
 Front load. Free stand or rack mount £350.00
 Exchangeable type (via lid removal) £295.00
 me3025 PSU unit for 2 drives £125.00
DIABLO/DRE 44-4000A/B 5+5 ex stock from £995.00
 1000's of spares for 330, 4000, 3200, HAWK ex stock
 Plus in house repair, refurbishing service.
 Call for details or quotation.

EX STOCK INTEGRATED CIRCUITS

OVER 100,000 ITEMS INCLUDING:
 Intel D8085AH-2 £25.00 D8271 £65.00
 D8202 D8257-5 8255 D3002
2732 EPROM SPECIAL fully guaranteed
 450ns £3.75, 350ns £4.00, 300ns £4.50

HOT LINE DATA BASE

DISTEL ©

THE ORIGINAL FREE OF CHARGE dial up data base
 1000's of stock items and one off bargains.
ON LINE NOW - 300 baud, full duplex CCITT tones, 8 bit
 word, no parity
01-679 1888

COMPUTER 'GAB'

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 Ali 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. Dim. 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 & insurance £9.50.**

STILL IN STOCK

FP1500 Heavy Duty 25 cps daisy wheel
 RS232 interface, bi directional printers,
 Brand New at £499.00
CALL FOR MORE DETAILS

COOLING FANS

Keep your hot parts COOL and RELIABLE with our range of BRAND NEW professional cooling fans.
ETRI 90XUOI Dim. 92 x 92 x 25 mm. Miniature 240 v equipment fan complete with finger guard. £9.95.
GOULD JB-3AR Dim. 3" x 3" x 2.5" compact very quiet running 240 v operation. NEW £6.95.
BUHLER 69.11.22. 8-16 v DC micro miniature reversible fan. Uses a brushless servo motor for extremely high air flow, almost silent running and guaranteed 10,000 hr life. Measures only 62 x 62 x 22 mm. Current cost £32.00. **OUR PRICE ONLY £12.95 complete with data.**
MUFFIN-CENTAUR standard 4" x 4" x 1.25" fan supplied tested EX EQUIPMENT 240 v at £6.25 or 110 v at £4.95 or BRAND NEW 240 v at £10.50. 1000's of other fans Ex Stock.
 Call for Details. Post & Packing on all fans £1.60

SAVE £250

SUPER PRINTER SCOOP

BRAND NEW CENTRONICS 739-2



The "Do Everything Printer" at a price that will NEVER be repeated. Standard CENTRONICS parallel interface for direct connection to BBC, ORIC, DRAGON etc. Superb print quality with full pin addressable graphics and 4 type fonts plus HIGH DEFINITION internal PROPORTIONAL SPACED MODE for WORD PROCESSOR applications. 80-132 columns, single sheet, sprocket or roll paper handling plus much more. Available ONLY from DISPLAY ELECTRONICS at the ridiculous price of **ONLY £199.00 + VAT** Complete with full manual etc. Limited quantity - Hurry while stocks last.
 Options. Interface cable (specify) for BBC, ORIC, DRAGON or CENTRONICS 36 way plug £12.50. Spare ribbon £3.50 each BBC graphics screen dump utility program £8.60. Carriage and Ins. £10.00 + VAT

ONLY £199

BUDGET RANGE VIDEO MONITORS

At a price YOU can afford, our range of EX EQUIPMENT video monitors defy competition! All are for 240v working with standard composite video input. Units are pre tested and set for up to 80 col use on BBC micro. Even where MINOR screen burns MAY exist - normal data displays are unaffected.

1000's SOLD TO DATE
 9" HITACHI very compact fully cased. dim. 21cm H x 21cm W x 22cm D. Black and white screen **£44.95**
 12" KGM 320-321, high bandwidth input, will display up to 132 columns x 25 lines. Housed in attractive fully enclosed brushed alloy case. B/W only **£32.95** GREEN screen **£39.95**
 24" KGM large screen black & white monitor fully enclosed in light alloy case. Ideal schools, shops, clubs etc. **ONLY £55.00**
 14" BRAND NEW Novex COLOUR type NC1414-CL. Many exciting features such as RGB TTL and composite video input, GREEN TEXT key, internal speaker and audio amp. Even finished in BBC micro matching colours. Fully guaranteed. **ONLY £199.00**
 Carriage and ins on ALL videos £10.00

DUAL 8" DISK DRIVES

Current, quality, professional product of a major computer company, comprising 2 x 40 track MPI or Shugart FULLY BBC COMPATIBLE single sided drives in a compact, attractively styled, grey ABS structured case with internal switched mode PSU. The PSU was intended to drive both drives and an intelligent 280 controller with over 70 i/c's. The controller has been removed leaving ample space and current on the +, -5, +12 and -12 supply for all your future expansion requirements. Supplied tested with 90 day guarantee in BRAND NEW condition with cable for BBC micro. Ex Stock at only **£259.00** + £10.00 carr. Limited Quantity Only

SPECIAL 300 BAUD MODEM OFFER

Another GIGANTIC purchase of these EX BRITISH TELECOM, BRAND NEW or little used 2B data modems allows US to make the FINAL REDUCTION, and for YOU to join the exciting world of data communications at an UNHEARD OF PRICE OF ONLY £29.95. Made to the highest POST OFFICE APPROVED spec at a cost of hundreds of pounds each, the 2B has all the standard requirements for data base, business or hobby communications. All this and more!!

- 300 baud full duplex
- Full remote control
- CCITT tone standards
- Supplied with full data
- Modular construction
- Direct isolated connection
- CALL ANSWER and AUTO modes
- Standard RS232 serial interface
- Built in test switching
- 240v Mains operation
- 1 year full guarantee
- Just 2 wires to comms. line

NOW ONLY £29.95

Order now - while stocks last. Carriage and Ins. £10.00

8" 19MB WINCHESTER DISK DRIVE

Made in the UK by a subsidiary of the World's largest disk drive manufacturer. This BRAND NEW "end of line" unit offers an outstanding opportunity to add a MASSIVE 19 mb of storage to your computer system. Superbly constructed on a heavy die cast chassis the DRE 3100 utilises 3 x 8" platters in a dust free cavity. All drive functions are controlled by microprocessor electronics using an INTEL 8035 cpu and TTL support logic. Data to the outside world is via two comprehensive 8 bit TTL level bi directional data busses with full status reporting for ease of interfacing. Many features such as Av. seek time 35 ms, 512 bytes per sector, +24, -24 and +5 v DC supply, plug in card system, and compact size of approx. 19cm H x 21cm W and 42cm D etc, make this item a real snip.

Units are BRAND NEW and BOXED and sold at a FRACTION of original cost - hence unguaranteed. Complete with 150 page manual, circuits and applications guide.

ONLY £225.00 Carriage £10.00

Suitable power supply unit - sold ONLY with drive £39.95.

PROFESSIONAL KEYBOARD OFFER

An advantageous purchase of brand new surplus allows a great QWERTY, full travel, chassis keyboard offer at fractions of their original costs.
ALPHAMERIC 7204/60 full ASCII 60 key, upper, lower + control key, parallel TTL output plus strobe. Dim 12" x 6" x 5" +5 & -12 DC. **£39.90**
DEC LA34 Uncoded keyboard with 67 quality, GOLD, normally open switches on standard X, Y matrix. Complete with 3 LED indicators & i/o cable - ideal micro conversions etc. pcb DIM 15" x 4.5" **£24.95** Carriage on keyboards £3.00

66% DISCOUNT

Due to our massive bulk purchasing programme which enables us to bring you the best possible bargains, we have thousands of I.C.'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 PARCEL OF A LIFETIME. Thousands of components at giveaway prices! Guaranteed to be worth at least 3 times what you pay. Unbeatable value!! Sold by weight.
 2.5kls **£4.25** + pp **£1.25** 5kls **£5.90** + **£1.80**
 10kls **£10.25** + pp **£2.25** 20 kls **£17.50** + **£4.75**

ELECTRONIC COMPONENTS EQUIPMENT

GE TERMIPRINTER

A massive purchase of these desk top printer-terminals enables us to offer you these quality 30 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 corresponding 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 **£130.00** or untested **£85.00**, optional floor stand **£12.50** Carr & Ins **£10.00**.

DATA MODEMS

Join the communications revolution with our range of EX TELECOM data modems. Made to most stringent spec and designed to operate for 24 hrs per day. Units are made to the CCITT tone spec. With RS232 i/o levels via a 25 way 'D' skt. Units are sold in a tested and working condition with data. Permission may be required for connection to PO lines.
MODEM 20-1 Compact unit for use with MICROMET, PRESTEL or TELECOM GGLD etc. 2 wire direct connect 75 baud transmit 1200 baud receive Data i/o via RS232 'D' socket. Guaranteed working with data **£69.95**
MODEM 20-2 same as 20-1 but 75 baud receive 1200 baud transmit **£130.00**
TRANSDATA 307A 300 baud acoustic coupler RS232 i/o **£95.00** brand new **£44.50**
NEW D5L2123 Multi Standard modem selectable V21 300-300 bps, V23 75-1200, V23 1200-75 full duplex. Or 1200-1200 half duplex modes. Full auto answer via modem or CPU. LED status indicators. CALL or ANS modes Switchable CCITT or BELL 103 & 202. Housed in A.C. case size only 2.5" x 8.5" x 9". **£286.00** + VAT.
 For further data or details on other EX STOCK modems contact sales office.
 Carriage on all modems £10.00 + VAT.

SEMICONDUCTOR 'GRAB BAGS'

Mixed Semis amazing value contents include transistors, digital, linear, I.C.'s, triacs, diodes, bridge recs, etc. All devices guaranteed brand new full spec with manufacturer's markings, fully guaranteed, 50+ **£2.95** 100+ **£3.15**.
TTL 74 Series A gigantic purchase of an "across the board" range of 74 TTL series I.C.'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 I.C.'s full spec 100+ **£6.90** 200+ **£12.30** 300+ **£19.30**

EX STOCK DEC CORNER

BA11-MB 3.5" Box, PSU, LTC £385.00
DH11-AD 16 x RS232 DMA interface £2100.00
DLV11-J 4 x EIA interface £310.00
DUP11 Sych. Serial data i/o £650.00
DZ11-B 8 line RS232 mux board £650.00
LA36 Decwriter EIA or 20 ma loop **£270.00**
LAXX-NW LA180 RS232 serial interface and buffer option £130.00
LAX34-AL LA34 tractor feed £85.00
MS11-JP Unibus 32 kb Ram £80.00
MS11-LB Unibus 128 kb Ram £450.00
MS11-LD Unibus 256 kb Ram £850.00
MSC4804 Qbus (Equiv MSV11-L) 256 kb £499.00
PDP11/05 Cpu, Ram, i/o, etc. £450.00
PDP11/40 Cpu, 124k MMU £1850.00
RT11 ver. 3B documentation kit £70.00
RK05-J 2.5 Mb disk drives £650.00
KL8JA PDP 8 async i/o £175.00
M18E PDP 8 Bootstrap option £75.00
VT50 VDU and Keyboard - current loop £175.00

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.

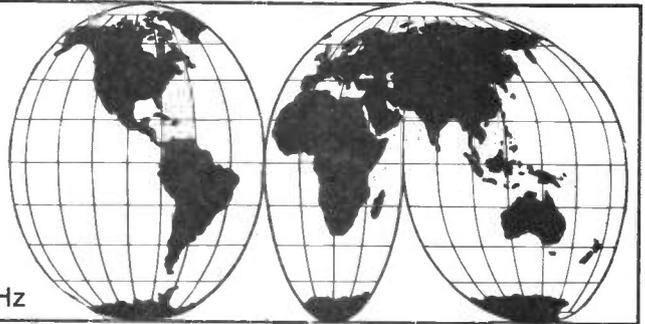
DISPLAY ELECTRONICS

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. 10.15 - 5.30. We reserve the right to change prices and specifications without notice. Trade, Bulk and Export enquiries welcome.
32 Biggin Way, Upper Norwood, London SE19 3XF
 Telephone 01-679 4414 Telex 27924

SHORT WAVE NEWS FOR DX LISTENERS

By Frank A Baldwin

All times in GMT, **bold** figures indicate the frequency in KHz



In this opening section I would like to bring to the attention of my readers one of the two inland countries on the South American continent, Bolivia.

Now Bolivia, for the comparatively inexperienced listener, is not all that easy to log. This is partly because most of the transmitters are low powered, ranging from 1 to 5KW, and partly because many are co-channel with other Latin American stations.

Additionally one must be something of an insomniac if any success is to be achieved, the early hours of the morning being the best time to log Bolivians – and I mean early hours, from 0001 onwards.

The Republic of Bolivia is sited in western South America, the official capital being Sucre but La Paz being the political and commercial centre of the country.

The eastern part of Bolivia is tropical, the northern part is set in rain forests drained by rivers of the Amazon basin, the south merges into the Chaco and the west is Andean. In the south-west is a large salt plain, while in the north-west is the basin of Lake Titicaca.

The main centres of population, industry and communication facilities lie on the high, wind-swept plateau (Altiplano) and between mountain ranges and in the valleys. Their time is minus 4 hours GMT.

So much for the background; now on with some of the Bolivian stations on the 60 metre band.

The stations listed here are those retrieved from the computer memory bank, and are believed by the writer to be currently operating and capable of being logged here in the UK, with some persistence and not a little luck.

Radio Emisoras Bolivia

At the LF end of the band we commence with Radio Emi-

soras Bolivia in Oruro, on **4755** where it operates from 0900 (Sunday from 1000) to 1600 and from 2300 (variable) to 0300 (variable to as late as 0430). Sunday from 1000 to sign-off continuous, and all with a power of 5KW. This one is fairly regularly reported in the SWL press, although I must confess that it has not been entered into my logbook as yet. However, there is a snag when searching for signals from this station – the frequency can vary from **4753** up to **4756**, so listen for the station identification before making that logbook entry.

Radio Nueva America

On **4797** there is a Bolivian I listen to regularly, this being Radio Nueva America located in La Paz and mentioned in these columns from time to time. The schedule is from 1000 to 0400 (Sunday from 1100 to 2300) with a power of 1KW. The snag? Yes, once again the frequency is variable, the nominal being **4795**.

Radio Santa Ana

A few KHz up the band and listed on **4805**, but actually measured by the writer on **4803.6** on two recent occasions, is Radio Santa Ana in Yacuma. R Santa Ana is on the air from 1100 to 1800 and from 2115 to 0100 but the closing time is variable to as late as 0400. This one has been logged twice recently just after midnight, with a reasonably good signal for the 1KW transmitter used and also, of course, because on the channel shown it is in the clear – and that makes a change!

Radio Grigota

Somewhere between the limits **4832-4836** you may be able to locate Radio Grigota, Santa Cruz, currently reported to be operating on the first mentioned channel. It is listed as being on the air from 1000 (Sunday from 1100) to 0300 with a power of 5KW, but you will have great dif-

ficulty separating this one from the co-channel Emisora Radio Reloj in San Jose, Costa Rica, which operates from 1100 to 0800 and often around-the-clock.

Radio Fides

On **4845** there is Radio Fides, La Paz, with a 5KW transmitter operating from 0900 (variable) to 1730 and from 2230 to 0300, the snag here being co-channel R Bucaramanga, Colombia, with a 10KW signal and a 24-hour schedule.

Radio Norte

If you tune to **4925** at the right time and with Lady Luck smiling upon you, there will be some sounds from Radio

Norte, Montero, with its 1.5KW transmitter operating from 2200 to 0230 (Sunday 1200 to 2000); but the channel is a crowded one, there being two Brazilians and a Colombian on a frequency dominated by the Brazilians.

In the next issue I will be dealing with some more Bolivians on the 60m band and also some even more difficult ones on the 90m band, but meanwhile don't forget to listen for those signals now arriving here from the Far East and South East Asia around the 1530 to 1630GMT mark.

The other land-locked country on the South American continent? Oh yes – it is Paraguay.

AROUND THE DIAL

AFRICA

Egypt

Cairo on **9850** at 1415, OM with the station identification, OM and YL with some announcements then music in the local style, all in the Domestic Service which is entirely in Arabic on this channel from 1400 to 2245.

Gabon

NHK (Nippon Hoso Kyokai) Tokyo relay on **21695** at 1509, OM with a newscast then station identification and a programme all in English and directed to the Americas, Europe, and the Far and Middle East from 1500 to 1600.

Kenya

Nairobi on **4885** at 1833, OM with a talk in a local vernacular. This is the North Eastern and Coastal Service which operates from 0250 to 0630 and from 1330 to 2020 with a power of 5KW, featuring a newscast in Swahili on each hour with programmes in Somali and vernaculars at other times. This channel replaces that of **4934** in order to avoid interference from the Nigerian Educational Service, Lagos, on **4932**.

Nigeria

Lagos on **4990** at 0557, OM with a pep talk in English about cleaning up the countryside and good citizenship, the interval signal (talking drum and other drums), time pips then OM with the station identification and the local news in English. This is Channel 1 which operates in both English and vernaculars and is on the air from 0400 to 1000 and from 1700 to 2310 with a power of 20KW.

South Africa

Johannesburg on **4835** at 0410, OM with a talk in English all about his apparently well-stocked crocodile farm! This station operates entirely in English and is scheduled on the air from 0348 (Saturday from 0430, Sunday from 0500) to 0700 and from 1520 to 2220 with a power of 100KW.

THE AMERICAS

Brazil

Radio Difusora do Maranhao, Sao Luis on **4755** at 0100, OM with the station identification in Portuguese, promos, a jingle and then some local pops on records. This one is on a 24-hour

SHORT WAVE NEWS

schedule and has a power of 2KW.

Radio Jornal do Brasil, Rio de Janeiro on **4875** at 0245, OM station identification, frequencies, announcements all in Portuguese then into a sports commentary. RJ do Brasil on this channel is listed on the air from 0900 to 0500 with a power of 10KW.

Radio Marajoara, Belem on **4955** at 0224, OM with a sports commentary in Portuguese. The schedule is from 0830 to 0300 and the power is 10KW.

Colombia

Ondas del Meta, Villavicencio on **4885** at 0553, YL with a local pop song, pop music, OM with announcements and station identification at 0600.

Ondas del Meta has a power of 5KW and operates from 1000 (variable from 0900) to 0500 (variable from 0330) but sometimes around-the-clock - just to confuse us all presumably!

Ecuador

Radio Popular, Cuenca on **4800** at 0430, OM station identification, YL with a song in Spanish. Cuenca is on the air from 1000 through to 0700 but on occasions works a 24-hour stint - all part of the fun when logging LA stations. The power is 5KW.

HCBJ Quito on **15250** at 0100, OM with the station identification in English in an announced continuous English programme on this channel, no target area stated and not in parallel on **15155**.

Guatemala

Radio Tezulutlan, Coban on **4835** at 0150, YL with the Rosary in Spanish. The schedule of this Guatemalan is from 1100 to 1600 and from 2100 to 0230 with a power of 3KW.

Netherlands Antilles

Bonaire on **17605** at 2101, OM with a pop song during an English programme intended for Central and West Africa and recently timed from 2030 to 2120.

Bonaire on **21685** at 1930, YL with the station identification and a newscast in the Dutch programme directed to Europe and North West Africa from 1930 to 2025.

Venezuela

Radio Mundial, Ciudad Bolivar on **4770** at 0102, OM with a folk song in Spanish complete with local style orchestral backing. The schedule is from 0900 to 0400 and the power is 1KW.

Radio Tachira, San Cristobal on **4830** at 0325, OM with promos, YL with a jingle then some typical local style music. This one operates from 0900 (variable to 1000) to 0400 with a power of 10KW.

ASIA

China

Xinjiang PBS, Urumqi on **5060** at 0050, YL with announcements in Mongolian, guitar-type instrumental music, YL with songs. This is the Home Service which also relays Radio Beijing programmes in Mongolian, scheduled from 0000 to 0515 and from 1130 to 1650 with a power of 50KW.

Radio Beijing on **10260** at 1520, European classical music in the Domestic 2nd Programme which is on this frequency from 0700 to 1558.

Radio Beijing on **11600** at 1417, OM with a talk about ship building technology in China during an English transmission for South Asia and timed on this channel from 1400 to 1500.

India

AIR (All India Radio) Hyderabad on **4800** at 0054, music in the local style in a programme of the South Regional Service which is on this channel from 0025 to 0215 and from 1200 (March to April from 1130) to 1740. Listen for the newscast in English at 0032, 1530 and at 1730. The power is 10KW.

AIR Delhi on **9950** at 1403, YL with a newscast in Nepalese then station identification and OM with a newscast in Bengali (1405 to 1415), all in the Domestic Service.

Israel

Jerusalem on **15585** at 1911, OM with a talk about local politics in an English presentation to Africa, Europe and North America, scheduled from 1900 to 1930.

Jerusalem on **17685** at 1010, OM with a newscast in the English programme for Australasia, East Asia, the Middle East, Europe and

North America and timed from 1000 to 1030, this being a relay of the Domestic Service Network 'A'.

Kuwait

Radio Kuwait on **21675** at 1249, Arabic songs and music in an Arabic programme for Europe, North Africa and North America, timed from 0815 to 1300.

Pakistan

PBC Rawalpindi on **5010** at 0047, OM with quotations from the Holy Quran. This is the Home Service which is on the air from 0045 (December to March from 0130) to 0430 and from 1500 to 1800 with a power of 10KW. The frequency at times can vary down to **5005**.

PBC Islamabad on **21800** at 1022, YL with the Urdu programme for the UK, scheduled from 0715 to 1100. This one is usually on **21802**.

Turkey

Ankara on **15220** at 2057, YL with songs then OMs with a discussion during the Turkish transmission intended for Turks abroad in Western Europe, the Middle East and North Africa, scheduled on this frequency from 0400 to 2200.

EUROPE

Finland

Helsinki on **6120** at 0828, OM with a talk in Finnish in a relay of the Domestic Service to Europe, scheduled from 0700 to 0955.

West Germany

Cologne on **6075** at 0950, OM with a sports commentary in the German programme for Australasia and Europe.

Netherlands

Hilversum on **6045** at 0956, OM with a talk about gas and other energy costs, all in an English transmission for Europe and scheduled from 0930 to 1020.

Hilversum on **15560** at 2030, YL with the station identification, OM with news comment in a programme for Central and West Africa.

SOUTH EAST ASIA

Australia

Melbourne on **6035** at 1920, OMs with a discussion about Australian taxes and bank

facilities during an English programme for Africa which may be heard on this channel from 1800 to 2200.

Melbourne on **15165** at 0112, OM with announcements in English then YL with a ballad in an English programme on this frequency from 0100 to 0930.

CLANDESTINE

Voice of the Libyan People on **15040** at 1858, OM with a talk in Arabic, OM station identification at 1900 then some Arabic type music, all with an overlay of a jammer sounding something like an American police car siren. The schedule is from 1755 to 0330 and has also been logged in parallel on **11685**.

NOW LOG THIS

Radio Cuarto Centenario, Tupiza, Bolivia on **5030** at 0025, YL with a ballad, some typical Bolivian music then OM with announcements and identification in Spanish at 0030. The power is 1KW and the schedule is from 2130 to 0100 evening slot (Saturday until 0300) but be careful - Radio Los Andes in Huamachoco, Peru also operates on this channel at 5KW but tends to come through somewhat later here in Europe.

Radio Difusora San Martin, Tarapoto, Peru on a measured **4810.5** at 0347, OM with a song in Spanish, local style music then OM with announcements including Peruvian place-names. The schedule is from 0930 to 0500 (Sunday until 0300) but - here we go again - sometimes on a 24-hour schedule. The power is 1KW.

NOW HEAR THESE

Radio Nueva America, La Paz, Bolivia on a measured **4797** at 0340, local orchestra with folk music, YLs songs in Spanish. The schedule is from 1000 (Sunday from 1100) to 0400 (Sunday until 2300). The power is 1KW.

Radio Madre de Dios, Puerto Maldonado, Peru on **4950** at 0111, OM with a long political harangue in Spanish. This Peruvian is on the air from 1100 (variable to 1030) to 0200 (variable to 0230) and the power is 5KW. The frequency can also vary to **4951**. 

NEXT ISSUE

Radio & Electronics ***For all aspects of practical amateur radio*** **World**

CANAL PLUS

Nigel Cawthorne G3TXF describes Europe's first VHF/UHF pay-TV service

RUSSIAN SATELLITE SIGNAL RECEPTION

Receiving and processing equipment used to decode VHF signals from the USSR's navigation satellites

A NIGHT IN THE CELLS

A few suggestions to help keep your batteries healthy

PRINCIPLES OF Z80 MORSE DECODING

Dr M A Kiam-Laine tackles the problems of decoding Morse signals using a computer

DATA FILE

Ray Marston continues with the opto-electronics theme and looks at LED sequencer and analogue-value indicator circuits

PHASED VERTICAL ARRAYS

A computer program for the design and modelling of phased vertical antenna systems

PLUS all the usual features!

New products ● News ● Reception reports ...

DON'T MISS the January issue – on sale **13th December**

To be sure of your copy of *Radio & Electronics World*, complete the newsagents order form in this issue or take out a subscription

LATEST LITERATURE

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

PRACTICAL ELECTRONICS

By Barry Woollard

This is the second, expanded edition of an introduction to electronics, which was originally developed as a training course 'Electronics for Electricians'.

It was written to give an outline of the components used in industrial electronics, with a view to aiding electricians with little or no knowledge of modern electronics in learning about recognition, ratings, associated circuitry and typical applications. It subsequently proved useful to a rather wider range of people and was therefore expanded to include a more useful range of components, techniques and exercises.

An essentially practical rather than theoretical book, this volume is very easy to follow (the author's view is that to gain a 'working knowledge' of electronics, 'practical experience is essential'). There are many clear diagrams, and numerous exercises and examples.

Although written primarily for professionals this book should be immensely useful to a great many people with a less 'formal' interest in practical electronics. Some readers will not be able to work through all the exercises, lacking the prerequisite equipment (a dual-trace oscilloscope, for example), but nevertheless there is a great deal to be learned from this text.

McGraw-Hill Book Company (UK) Ltd, £6.95.

COMPUTER TERMINOLOGY EXPLAINED

By I D Pool

The last few years have seen some remarkable advances in computer technology. What was once an expensive tool for scientists and large organisations can now

be seen, albeit in slightly smaller form, in countless ordinary households throughout the country.

However, along with the increasing accessibility of microcomputers a whole new language has been built up which can be immensely confusing to those unfamiliar with computers.

This book has been written with the aim of providing a useful explanation of many terms associated with home computers. Also included are some of the terms used in connection with mini and mainframe computers.

The book is certainly not comprehensive, nor does it claim to be (there are, by a very rough estimation, just

over four hundred entries in the alphabetical glossary), but the book is clearly written and informative.

There is a tendency, common amongst authors in specialist fields, to assume too great a knowledge on the part of the reader. However, in this book the tendency is only slight; certainly any absolute beginner should first read a good explanatory textbook, after which this volume will prove a most useful aid.

This is not to say that more experienced users cannot benefit from this publication, but inevitably the more advanced the computer user the less he can gain from a list as limited as this.



There is a useful BASIC reference guide after the alphabetical section, outlining most of the common BASIC commands, and then two appendices listing ASCII codes and control codes.

Bernard Babani (Publishing) Ltd, £1.95.

AN INTRODUCTION TO PROGRAMMING THE AMSTRAD CPC464

By R A & J W Penfold

The recently introduced Amstrad CPC464 uses a variation of BASIC called Locomotive BASIC.

This has a large range of useful commands available to support the good graphics and sound of this machine, and although a BASIC variant of this complexity can be a little intimidating to the beginner, the authors claim that mastery of the various instructions and functions need not be too difficult, given the proper approach as demonstrated by this book.

Given the apparently excellent value represented by the Amstrad machine there will be many purchasers of this computer amongst home micro users, and no doubt a reasonable number will be first-time buyers. Consequently a good guide to programming will be of great benefit.

The authors have tried, as far as possible, to complement the information supplied by the manufacturer rather than just duplicate it.

As usual with these authors the text is clearly arranged and easy to follow, but with this publisher the reproduction of the listings often leaves a little to be desired in terms of attractive presentation although they are easily readable, and of course informative.

Bernard Babani (Publishing) Ltd, £2.25.

INTRODUCING PASCAL

By Boris Allan

Pascal has become a relatively popular computer language for microcomputers. It was originally developed to promote a simple, logical approach to programming.

This book is intended to give the reader who knows nothing of Pascal a 'map of the territory', as well as giving a deeper understanding to the experienced reader, an understanding sometimes not gained from traditional teaching techniques.

After an outline of Pascal's origins, the author describes the language with clarity, taking the view that despite its structure Pascal programmes are as easy to write badly as with any other language.

The variants emphasised are Standard and UCSD Pascal, and the appendices include a brief outline of Modular M-2, a descendant of Pascal.

The treatment of FILES and PACKED data structures is brief, due to their dependence on the particular computer used, and VARIANT data records are ignored as the author feels they have little practical application.

An interesting point is the author's instructions in the preface to read the book from beginning to end, without skipping sections. If this advice was always given and followed, a great many mistakes could probably be avoided.

Granada Publishing, £6.95

MSX - AN INTRODUCTION

By Jonathan Pearce & Graham Bland

With the introduction of the MSX standard this autumn there will inevitably be a corresponding wealth of literature on programming the new machines, of which *MSX - an introduction* is the first to reach us.

This book begins with an introduction to computers in general, which is written with the assumption that the reader is entirely ignorant of computer hardware, and gives a clear outline of the terminology.

Following this introduction



the MSX - BASIC commands are described one by one, in order to give the reader a knowledge of their functions before actually starting to programme. The programming techniques are then covered; their treatment is both understandable and logical.

There are chapters later in the book devoted to the graphics and music capability of MSX - BASIC, claimed to be its most powerful features. The scope of the book does not include machine code programming, which thus avoids the possibility of confusing the absolute beginner (MSX machines, incidentally, use the Z80A micro-processor).

The book is available in two forms. It can be purchased on its own, or as part of a software pack with a cassette of MSX - BASIC programmes.

Century Communications, £7.95 (book only) or £12.95 (book and cassette).

PRACTICAL ROBOTICS AND INTERFACING FOR THE SPECTRUM

By A A Berk

In this book Dr Berk aims to give an introduction to robotics and interfacing using the Spectrum computer.

After defining for the reader what 'robotics' actually means (and dispell-

ing all sci-fi B-movie misconceptions!), he builds on the Spectrum user's knowledge of the machine to outline the simple electronic techniques which can be used to construct computer peripherals at low cost.

There are practical examples included (which do not tie up the Spectrum full-time - the machine is still available for its ordinary uses), and in the programming BASIC is used throughout.

The book is well-written and understandable, and for the many readers who are primarily computer enthusiasts rather than electronic home-constructors one of the appendices is a relatively long introduction to electronics, components, and soldering.

It is a very interesting book; considering the number of Spectrum owners about maybe we'll soon be tripping over a multitude of home-constructed robots!

Granada Publishing, £5.95.

CATALOGUES

Electrovalue

The latest catalogue from Electrovalue is now available. This catalogue is published three times a year and issued free on request. The latest edition is the largest yet in terms of items stocked, and is available by writing or

telephoning the company. *Electrovalue Ltd, St Jude's Road, Englefield Green, Egham, Surrey TW20 0HB. Tel: (0784) 33603*

Cirkit

The first Cirkit catalogue has now been published, and replaces that previously published under the name of Ambit. It features a range of kits and components expanded over the previous Ambit range, and contains three discount vouchers for orders in excess of £15. It costs 85p and is available from newsagents or direct from the company.

Cirkit Holdings PLC, Park Lane, Broxbourne, Herts EN10 7NQ. Tel: (0992) 444111

Ross Electronics

The 1985 products catalogue from Ross Electronics has been enlarged to include a greatly increased range of home computer accessories, including floppy disc head cleaners, interface adapters, cables and connectors. The 60 page, full colour publication also features microphones, intercoms, headphones, test equipment etc.

The Ross headphones range, plus various microphones, is also featured in a separate 12 page brochure. Both publications are available free of charge.

Ross Electronics, 49/53 Pancras Road, London NW1 2QB. Tel: 01 278 6371

Mitel

With the recent opening of the thick film hybrid manufacturing facility at Caldicot, Gwent, Mitel Semiconductor has produced an 8-page, full colour brochure describing the capability of the new plant.

Producing a comprehensive range of analogue and digital hybrids for telecom applications, Mitel Semiconductor also provides a custom design service for outside customers, and has the manufacturing capacity to produce over 3 million hybrid devices per year.

Copies of the brochure may be obtained from:

Mitel Semiconductor, Severnbridge Estate, Portskewett, Newport, Gwent NP6 4YR. Tel: (0291) 423355

Radio & Electronics World

For all aspects of practical amateur radio

BACK ISSUE SERVICE

All issues from October 1981 onwards are still available, with the exceptions of January 1982 and February 1982. All orders must be pre-paid, the cost of each issue being £1.00 inclusive of postage and packing. A contents index spanning the issues from October 1981 to September 1983 is available on receipt of a stamped addressed envelope. To ensure that you don't miss any future issues, we suggest that you place a regular order with your newsagent or complete the subscription order form found in this issue.



APRIL 1984
Designs - One Night's Work (IF Oscillator); HF Linear Amplifier, The Piano Keyer - only £5 for Perfect Morse, Peak-Reading LED RF Wattmeter; Speech and the Computer - Make the Beeb Micro Talk!; 2 Metre Tiger Antenna.
Features - Hall Effect Devices - Exploiting Magnetism's Effect on Conductors; Data File - CMOS Bilateral Switches and Multiplexer/Demultiplexer ICs; Data Brief-TD 2002A Linear IC



MAY 1984
Projects - One Week's Work (VHF/UHF Frequency Meter); Spectrum Analyser Update; Assembling a Logic Probe Signal Generator; 2 Metre J-Stick Aerial; SX-200 Relative S-Meter.
Features - Data File - 4046B Phase-Locked Loop CMOS IC; Hamley HM203-4 Oscilloscope review; A Beginners Guide to Meteor Scatter Propagation; High & Low Measurements - A Guide to Measuring Outside the Conventional Ranges



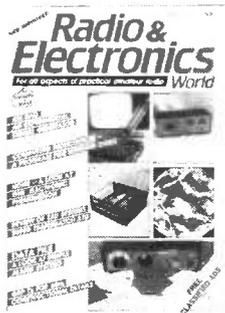
JUNE 1984
Projects - Microprocessor Controlled Dot Matrix Printer; One Night's Work - Replacement Plug-in Module for 2532 EPROM; A low-cost Frequency Standard; Radio Frequency Bridge; Modifying the RGB Interface for the Ferguson TX90.
Features - High Speed Data Transmission; Trio-Kenwood TS-430S Transceiver; ZX Spectrum Data Transmission Program; Data File - National Semiconductors LM Range of Dual Audio-Preamplifier ICs; Data Brief - MC 1648 (SL 1648) Voltage Controlled Oscillator; HP41CX Calculator Review



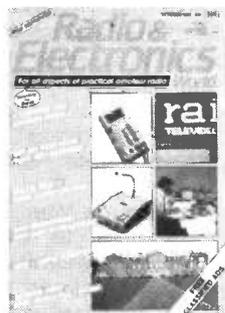
JULY 1984
Projects - VLF converter, a unit for the very low frequency; Teleprinter Terminal Interface; Multifunction Test Instrument, a versatile piece of test equipment; Building the Fortop TVT-437; Improving Indoor Aerials, getting better reception without an aerial amplifier; Logic Probe for CMOS and TTL's.
Features: Amplicon Digital Panel Printer; Oscar 10; Yaesu FC102 Review; Data File - audio power amplifiers; Images of the World, a new publication review.



AUGUST 1984
Projects - High Quality Directional Coupler, a coupler for frequencies above 432 MHz; QOV06-40A Linear amplifier, a 100 watt valve linear amplifier; 40ft Tilt-over and extending mast, a home construction project; One night's work, adapting a portable typewriter; BBC Micro volume control; TV and Video interface.
Features - Twenty Questions; Sporadic-E propagation; Data File - Audio amplifiers; BBC Micro Morse tutor; Improving Resistors; Data Communication; Computing Transmission Lines



SEPTEMBER 1984
Projects - Low Power Transmitter, an 80m CW design; AM RAD, an experimental signal generator; Spectrum Analyser, further update on this project; Five Station Scanner, an add on unit for the 720 channel airband receiver.
Features - Computing Inductances, a program for winding coils; Data File, a look at alarm systems; Satellite Update, more information about weather satellites; Noise, a look at this electronic phenomenon; Distance and Bearing Program, an aid for station location; Super-Transmatch, a review of Tau Systems ATU kit.



OCTOBER 1984
Projects - Base Mic, construct this processor controlled accessory; One night's work, build an indoor UHF TV aerial.
Features - Modems, the link between computers and radio; Non-linear elements, a look at multipliers; Data File, continuing the look at alarm systems; SSTV for the BBC Micro, getting started in this mode; Testing! Testing! how to use your test gear: multimeters.



NOVEMBER 1984
Features - cellular mobile radio; computing attenuators for calculating resistance values; small aerials, coping with problems of space; 27-29MHz conversions; Data File, concluding the series on security systems; FETs - a beginner's guide; Non-linear elements, log and anti-log; QSO, interesting contacts from clubs and individuals; ATV on the air, with a look at a range of aerials for the average pocket.

RADIO & ELECTRONICS WORLD

TO: Back Issues Department • Radio & Electronics World • Sovereign House • Brentwood • Essex • CM14 4SE

NAME:

ADDRESS:

.....

.....

POST CODE:

BACK ISSUE ORDER FORM

PLEASE SUPPLY: (state month and year of issue/s required) [NOTE: January & February 1982 issues not available]

.....

..... at £1.00 each

PAYMENT ENCLOSED: £

Cheques should be made payable to **Radio & Electronics World**. Overseas payment by International Money Order or credit card

CREDIT CARD PAYMENT:

SIGNATURE

C P I

FREE CLASSIFIED ADS

FREE CLASSIFIED ADS CAN WORK FOR YOU

We are pleased to be able to offer readers the opportunity to sell your unwanted equipment or advertise your 'wants'.

Simply complete the order form at the end of these ads, feel free to use an extra sheet of paper if there is not enough space on the order form. We will accept ads not on our order form.

Send to: **Radio & Electronics World**, Sovereign House, Brentwood, Essex CM14 4SE.

DEADLINE AND CONDITIONS

Advertisements will be inserted in the first available issue on a first come first served basis. We reserve the right to edit and exclude any ad. Trade advertisements are not accepted.

FOR SALE

■ New unwanted components for sale, mostly electrolytic capacitors plus some resistors and transistors, 100+ items. £2.50. Also plans for small radio transmitter. £1. Guitar phaser by Watford Electronics in unpainted strong metal case with control intensity and on/off foot switch. £15 + £1.50 P&P. Fuzz box £9. 14 pin IC sockets, 5 for 60p, 8 pin 50p, 741 ICs 5 for 80p, NE555 5 for 90p, some new radio valves still boxed. Send SAE. D Martin, 29 St John's Close, Leatherhead, Surrey.

■ Xtal calibrator LF, 5 valves, mains operated, 10in x 7in x 6in, audio output, frequency and input coax sockets, HC6U and B7G Xtal holders £9. RAF Xtal monitor, 6 internal, 1 external 10X holders, requires batteries or PSU £5. Various 10X, HC6U, B7G Xtals, for both units, available at extra cost 2m $\frac{1}{2}$ wave ring plane mobile antenna, plus boss, 1ft coax, and PL259 plug. £12. 2m 5-element yagi. £5. Ancient Cossor valve operated double beam oscilloscope, tatty but working. Heavy, so must collect, £6. Osker block miniature SWR meter, £4. Eagle footswitch plus cable, £2. Xtal mike with 1m cable and standard jack plug, silver matt. £4. Various valves, Xtals, meters, coils and variable capacitors. State wants, buyers collect, or add P&P. Contact: A W McNeill, 40 Turnpike Road, Newbury, Berks RG13 3AS. Tel: Newbury 40750.

■ Eddystone 830/9 receiver with synthesiser inputs, first class set, 300KHz to 30.5MHz. £130 ono. Eddystone 930/X receivers; one 80MHz to 117MHz, other 117MHz to 172MHz, AM/FM, self-contained mains PSU and speaker, small size. £25 each or £45 pair. (All plus carriage if required). Also CDU150 oscilloscope; 30MHz dual-beam. £125 ono. Prefer buyer collect. Drybrough, G8HEV, Mounts Lane, Newnham, Daventry, Northants NN11 6ES. Tel: (0327) 703964

■ KW2000A complete mic LFP spare PA valves. £150. Buyer collects or pays carriage. Tel: R Duesbury, (0783) 284050.

■ Print your own QSLs with a Gestetner Duplicator 360, good working order, clean condition. £50 ono. Car head rests. £5. Singer electric typewriter with RTTY punch tape. £5 (needs attention). Garden gate waney panelled, 4ft high 3ft wide. £15 ono. Tel: Tamworth 51591.

■ Automatic telephone recorder unit which when used with a standard cassette player, will automatically stop/start cassette and record two-way conversation. £25. Tel: Worcester (0905) 840995.

■ Ten digit, desk top calculator with a concealed micro transmitter. Transmitter is operated by touch switch on rear of case. Will transmit room conversation to a VHF receiver up to 300 yards away. A real James Bond play toy. £85. Tel: (0905) 840995.

■ Powerful, rechargeable hand lamp with a 1,000ft beam, ideal for power cuts etc. Complete with mains charger and internal 6V 8amp hour sealed rechargeable battery. £40. Torch will pay for itself many times over when compared to a dry battery one, 16 hours use on one charge. Tel: (0905) 840995.

■ Cordless, rechargeable, hand-held soldering iron with charger. As new £25. Tel: (0905) 840995.

■ Drake TR7A with P57 power supply, latest model, boxed. £850. Drake MN7 ATU £125. Drake SP75 speech processor £50. Trio TR9000 2 metre multimode with PSU control unit and speaker. £250. Dressler D200S 1KW 2 metre linear with GaAsFET preamp and interface. £600. Various Drake accessories inc mobile mounts etc. Rotator beams etc. Bryan, 410 Manchester Road, Sheffield. Tel: (0742) 666169 (evenings).

■ Oscilloscope tube for Tequipment D83. Good working order. £150 ono, postage and packing paid by seller. Tel: (050 16) 231 (Scotland).

■ Shure 444D microphone, excellent condition dual impedance 50K or 500K auto vox lockdown extending neck etc. Cost £50 sell for £30 ono or swap for small two metre receiver FM or anything interesting, ie ATV receive converter etc. Tel: Pete 01-789 1913.

■ Buzzers on small PCB 3in x 1 $\frac{1}{4}$ in with 4 resistors, 3 diodes, 2 capacitors, 1 transistor with 4 screw terminals one common, one soft, one med, one loud, tones new. £2 each. Crocodile clips 1 $\frac{1}{2}$ in long, 10 for £2. D Martin, 29 St John's Close, Leatherhead, Surrey.

■ Instrument wire 7/36 1.2mm O/D, over twelve different colours. Sample willingly sent. Over 25,000 yards. £250. J A Sanders, Mullions, South Street, Walton, Somerset. Tel: (0458) 43056.

■ Marconi 600ohm variable attenuator. Cossor 4in CRTs 89 series, suitable 1035, 1049 etc. General radio VHF oscillator 65-500MHz. Flight Four transistor radio, includes air band. Offers on all above. Cooper, 11 Radical Ride, Wokingham, Berks RG11 4UH. Tel: (0734) 734312.

■ FT101Z transceiver, fitted FM, 9-band model. Complete with fan, desk mike, spare (new) valves, immaculate condition. £390 plus carriage or buyer collects. N M Lister, G4LVP. Tel: Hitchin (0462) 58728 (after 6.30pm or weekends).

■ AVO signal generator CT378A, 2-250MHz, almost new condition. £55. Tektronix 545A dual trace oscilloscope delay sweep, superb condition. £125. Texas silent 700 printer. £35. Calne Electronics pulse generator 1Hz-10MHz. £15. Advance J1A audio oscillator. £25. Tektronix 536 X-Y 10MHz oscilloscope. £120. Philips power supply 35 volts 2 amps (twice). £25. HP DVM £20. Tektronix 575 curve tracer for transistors. £120. Several manuals for Tektronix 500 series. Tel: 01-868 4221

■ Motorola CD100 9 ch UHF mobile with cradle, fitted preamp tone-burst SU8 RB13 R14 manuals. £130 or WHY. R B Lever, 4 Hambleton View, Wigginton, York YO3 8PN. Tel: (0904) 768545.

■ Ham International JUMBO II, mint condition, 26.965-28.305 plus legal FM band, EPROM coder fitted, easily modified for full 10m, AM/FM USB/LSB, 20W PEP base station. £150 ono. Will deliver within 50 miles of Ayrshire or buyer collects. Tel: (0294) 75050 (after 6.30pm) leaving your telephone number.

■ 3 valve radios, 2 working, wooden cabinets, Goldring deck, Garrard deck. Mr T W Baggot, The Flat, Oddington House, Moreton-in-Marsh, Glos GL56 0UP. Tel: (0451) 31722

■ Bargain Toshiba RPF11L portable receiver, FM, MW, LW, and 8 short wave bands, signal strength meter, ideal for DX enthusiast, overall performance very good, mint condition, in original packing, earphone and carrying case. £50 ono. To include postage/carriage. John Lightfoot, 32 Woolley Drive, Bradford-on-Avon, Wiltshire BA15 1AU. Tel: (022 16) 3654.

■ Grundig Satellit 3400, 21 tuning ranges, LED frequency counter, SSB, FM with 6 pre-selector keys, battery/mains. £190. Tel: Wem (0939) 32714.

■ Yaesu FR50B amateur band receiver Q multiplier fitted, good order. £70. G4ORS. Tel: Rushden 314250. (Northants).

■ 10FM mobile system, modified DNT M40FM, with crystal filter, 100KHz shift, 3SK88 front end, 50 watt amp, base loaded antenna, connecting leads and manual etc. £65. Chris G4UKF. Tel: (0935) 823475 (mornings or weekends).

■ Ferguson TX90 37140 RGB monitor conversion, as per R&EW Jan 1984, PCB only £5 or complete kit of parts £25. Cheques: A S Warne, 113 Queens Road, Vicars Cross, Chester, Cheshire.

■ PU adaptor for Rogers Cadet amplifier MkIII, blue, 47Kohms, 10mV RIAA. Ferrograph 632 stereo 2 track, 2 channel, Papst drive motor fitted, re-

valved, plus 5 reels of Maxell UDXLI tape, superb sound, mechanics bargain. £120. Mr J Townsend, 89 High Street, Barry, South Wales CF6 8DY.

■ ETI 5600 stereo synthesiser, digital keyboard, 5 oscillators, 900 socket patch panel, 5 mixers, joystick, echo/reverb, may be micro controlled, complete with foot pedal, foot switch, chrome stand, teak cabinet, headphones. Very good condition, hardly used, with instruction and construction manuals. £380. Tel: Paul (0458) 42022 or call 32 Brookleigh Road, Street, Somerset. (Evenings).

■ Creed 75RP teleprinter, good condition. £30. Tel: (0202) 708065 (Poole).

■ Teletype ASR33 type by Westrex with tape reader, punch, paper feed and pedestal. £40. Pulse generator Ericsson PRF 10Hz-100KHz, 4 - 500 μ S width, mV steps to 50V, either polarity. £40. Tel: Slough 45939.

■ New semiconductors in packs comprising 25 BC550, 75 IN4148, 25 12 Zeners, 19 IN4002 for £3 per pack or two packs for £5. New $\frac{1}{4}$ W resistors in packs of 210 made up equally from 30 values for £1 or two packs for £1.60. Iambic keyer with paddle. £10. Infra-red/Ultra violet lamp as new. £15. G Martorano. Tel: (0664) 500228.

■ Data logger Solartron contains DVM 20mV to 1KV and display, digital clock, channel scanner, punch drive, all as separate sub-chassis with own power supplies. £45. Tel: Slough 45939.

■ Trio TW4000A dual FM bander, absolutely mint and complete. £440. Also Yaesu FT207R with slow nicad car charger, speaker/mic YM-24A mint and complete. £150. Jaybeam D5/2m. £25 buyer collects. Tel: Colin Mitchell. Stafford 661771 (evenings).

■ Teleprinter. Built-in paper tape, Friden Flex-owriter model 1F, working, includes spare parts, needs 110V ac. Buyer inspects and collects or arranges carriage. First reasonable offer secures. Godfrey, G4GLM, 63 The Drive, Edgware, Middlesex HA8 8PS. Tel: 01-958 5113 (evenings or weekends).

■ Trio TR-2300 2m synthesised portable FM 1W transceiver. 80 channels, repeater shift, tone burst. All furnished accessories plus nicads, service manual, packing box. Little used. £95. Wood and Douglas 144FM10B 1.5W to 10W 2m (auto c/o) power amp kit, (unbuilt). £15. Texas TI 99/4A computer, joysticks, solid state software - Munch Man, Household Budget Management. £45. Will split. Chris. Tel: Bourne End 26177 (near Maidenhead).

■ Relays 50V ac 3-way £1. Geared 50V ac motors £2. Foot switch £2. Electronic counter £2. Micro-switches, single or mounted £1 each. Crystal 492.59KHz £2. 240V in 24V out 12amp transformer £10. 240V in, 110V out 10amp £10. Various projector lamps. 9.5mm Patheson with films, excellent £60. RCA 16mm mag/opt £150. 16mm cartoons, offers. Cosmica C mount F1.4 25mm £30. 16mm silent projector/camera £40. 10 100V transformers £15. 16mm rewind £10. Pair telephones £8. Grundig stereo chassis £5. Various transformers, transistors, diodes, capacitors, resistors, valves, all kinds. 2 Pairs stereo earphones. Calculator £5. Viewmaster viewer 10 3-reel packets £7. Interested in exchange. Contact: J H Williams, 5 Fern Road, St Leonards, East Sussex.

■ 2 PYE vanguards, as new, High band 1 Eddystone 770R 19 to 165MHz VHF receiver working. Offers for above. Will deliver locally. M Nimmo, 58 Manor Place, Edinburgh EH3 7EH. Tel 031 226 2807 Evenings.

■ Creed 15B teleprinter (Current Model) complete with PSU and tape punch and reader, vgc. Only 400 hours running time. Offers, or Exchange for general coverage receiver or scanner. Tel 0475

FREE CLASSIFIED AD

FOR SALE

38998 After 6pm

■ Westrex teletype and punch and reader-240V works well £30. Avo valve tester type 160, good cond £30. Sony ICF7600D multiband Rx, as new £149. All items inc p&p replies by mail only please. N Beresford, 16 Crown Road, Marlpit Hill, Edenbridge, Kent, TN8 6AW

■ CV1596 double beam tube 4" new surplus perfect £10 inc postage. Teleton 20 + 20 stereo amp new condition £203 £25 inc postage surplus to requirement. Write Mr G Cox T Hollingcross Lane Glossop Derby SK138JQ

■ Two Eddystone S880 receivers 500KHz to 30.5MHz in 30 bands, £175 each, £300 the two. J Cooper Church-Field Road, Outwell Wisbech Cambs PE148RL. Tel 0945 773558

■ Complete PCB kit from artwork to assembled board using photo positive technics. Full instructions included plus developer, Etchant, drill, UV exposure unit (self contained), PCB holder for drilling and assembly and more only £90.00. One only everything brand new, ring for details: Chelmsford 262807 evenings

■ FT 290R muTek front end auto T/BRST nicads speaker Mic £220, FT790R Auto tone burst nicads £220, pair for £425. Exidy Sorcerer 48K computer plus green screen monitor. Half new price for a super machine £420. Kermod, 56 Brantwood Road Bradford 9. Tel 0274 497438

■ Sony ICF7600D portable FM/LW/MW/SW, PLL synthesizing receiver, direct, scan, or preset tuning. Mains/battery. Worldwide coverage. Includes transformer, Nicads, manual, still boxed as brand new. Comet price £170 accept first £145. Tel: Sheffield (0246) 410545

■ Digital multimeter, Altai KD55C, with case, mint condition and little used, £26. 500V Evershed Vignoles Megger, excellent condition, with heavy leather case, £35, Mennell, 2 Sutcliffe Close, London NW11 6NT. Tel: 01 455 2666

■ Yamaha PS55 Portatone keyboard cost over £500 will exchange for HF transceiver FT101ZD or similar R19, must have digital freq readout. Keyboard in mint condition only few months old. Tel: 0203 393010 after six pm.

■ Yaesu FC902 ATU and MD1B8 top of the Yaesu range desk scan microphone. £100 cash for both in excellent condition or straight swap for Datong FL3 audio filter, contact 0269 844061 anytime.

■ Tektronix scope. Type 454 60MHz bandwidth. Two channel. Dual timebase. Solid state. Recently serviced. Condition almost as new. Selling with two full probe kits and manual and circuit diagrams. Good tube. Very good value for £300 Tel: 0555 840409

■ CRT DG7 132 - boxed and unused £25 plus postage. Mr W Mawson, 8 Elsdon Drive, Forest Hall, Newcastle Upon Tyne NE12 9RH. Tel: 0632 662082

■ FT290 two years old. Little use with Nicads charger, Slim-Jim and 10M of RG8 cable. £220 on Tel: Watford (0923) 27047

■ Dish aerial on stand 6ft diam excellent condition £100. Low loss coax cable RG213/U 12ft long £10. Tel: Bassingham 231 evenings.

■ FLDX500 80-10m transistor must sell going QRT good cond. FRDX500 80-10m receiver FM fitted, buyer collects or carriage at cost. Glasgow area £275 for both. Will split if necessary also Tandy TRS80 16K £80 only bought May 1984. GM4ELV QTHr

■ Trio R1000 full SW coverage 0-30 excellent condition, £200. No offers, this is a bargain. Eddystone 870A valve SW Rx mainly b/cast use offers around £50. Mr A Roxbee, 25 Toms Croft, Turners Hill, Hemel Hempstead, Herts HP2 4LL. Tel: 0442 66968

■ Yaesu FT290R, boxed, plus Nicads, mobile mount, flexible aerial, £180. Tel: 01 994 8361

■ TR10 TS-510 SSB transceiver 3.5-29.7MHz, PS-510 ac power supply, remote VFO 5-D, desk microphone Shure model 444 and others. Not used for 4 years, perfect working order offers invited, Tel: 0703 767346, 7 Bassett Cres, West Bassett, Southampton SO1

■ Icom R70 receiver £330, Heathkit 4 amp 13.8 volt

PSU £20, Emoto 103 SAX rotator light HF large VHF £45, Wood and Douglas 2 metre synthesiser 2 assembled PCB with thumb wheels £30, Wood and Douglas 2 metre FM receiver £50, Tel: Williams 0376 23604

■ Spectrum Maplin keyboard £17, ZX81 anti-wobble connector for RAM pack £6, quantity of Spectrum software all originals Jet Set Willy £3, Hunter Killer £3, 3-D Golf £2, Horace and the Spiders £1.70, Penetrator £2, 3-D Tank £2, and others Tel: Robert, 01 907 2253

■ Barlow XCR30 £40. Leader LSG17 £40. Fidelity CB2000 with speaker and SWR £35, Plusstron TVR5D £65. Teleg D52 £25, Mr Hill, Midhurst 3632 after 7pm.

■ Trio R2000 receiver mint condition, super radio with many facilities, must go to make way for HF-TX set up. £325 ovno Tel: Stan on (0602) 875413 after 6pm

■ Sagant EL40X compressed 80/40M trap dipole, 80ft long, with balun and carry bag. Ideal /P, adjustable without cutting, £19. Azimuth dual LCD, clock, 12 and 24 hour displays, extra large digits, extruded all case £16. G3ZPF QTHr

■ AOR 2001 Rx scanner 25% 550MHz no gaps. AM WFM NFM. 12V mains complete with power supply. Boxed brand new £295. G4WVJ Dave Tel: 051 678 5346

■ If you require service information for any electronic equipment then I may be able to help. Over ten years I have accumulated a considerable private library covering all manner of equipment from vintage wireless to video recorders. From trannies to tellies, in fact practically anything electronic of any make and age. I am willing to get copies done for anyone who wants them. Please write stating what your equipment is and I will see if I can help. Please include SAE with your enquiry Mr M Small, 8 Cherry Tree Road, Chinnor, Oxfordshire OX9 4QY

■ Have DX-TV Antiference MH473 aerial for VHF bands 1 and 3 in box. Also 160ft RU8 low-loss cable. plus Realistic Pro-47 scanner 10 ham 10 maritime fitted crystals. Would sell or exchange for any scanner covers airbands 108 to 138 would prefer SX200N, John Freely, 71 Harris Drive, Orrell, Bootle, Liverpool L20 L26LF Tel: 051 922 9632 anytime

■ Oscilloscope for sale. Telequipment D67A 25MHz dual trace with two time bases giving delayed, intensified or mixed sweep. Two vertical amplifiers with FET inputs. Little used. Less than half price at £350. Tel: 0525 221 187

■ Yaesu FRG7700 mem with FRT7700 ATU FRA 7700 active ant and FRV7700 140-170MHz converter very nice unit in immaculate condition bargain £425 ono WHY. Tel: 07048 77322

■ 150W high pressure Xenon arc lamp with housing and power supply £150; or as part of complete spectrofluorimeter containing stepper motor-driven excitation and emission grating monochromators, photomultiplier, analogue display and control unit, recorder output, CCT diagram £450; or exchange for HF station or WHY. Tel: 01 593 3617 evenings

■ TDK T1200 handheld 143-149MHz complete with Nicads charger and case ¼ watts output £100 or would exchange for 2 metre mobile rig cash adjustment if required Tel: Harlow (0279) 26647

■ Tandy Model 100 portable computer, video monitor, Trio R2000 general coverage receiver, range of items of modern UK military manpacks, linear amplifiers, ATUs, and accessories by Racal and Redifon, all in excellent condition. Approx 100 other smaller items SAE for full list, please see also my 'Wanted' ad in this issue. R.J. Sayers, G81YK, 40 Royal Oak Drive, Leegomery, Telford, Shropshire, TF14SS.

■ CR tube (3in) with mu-metal screen, base mount and viewing hood £3. Woden UM1 modulation transformer with details of connections £2. RSGB VHF-UHF manual (1969) £1. Surplus radio equipment conversion manual (BC and SCR series 1948) £1. Crystals: 100, 7206, 7070, 7074, 1891, 7050, 1600KHz. £5. Buyer collects or postage extra. Tel: 01-452-7618.

■ Icom IC215 portable 2m t'ceiver. 15 channels (all crystals incl), Nicads, ¼ wave helical, carrying

strap. 3½ or ½ watt O/P, user handbook included. In good condition. £85 ono. Tel: 061 865 9233. Vik G6TEV QTHr.

■ Cobra 148 GTL DX £100. Tel: 01-651 6876 Bromley Kent.

■ TS510 with PS510 trio SSB/CW pair. Sell or exchange for MM4001 KB. G4YUG QTHr. Tel: (0473) 830147.

■ Astatic D104 crystal microphone with UB8 stand as new £40. Servomex voltage stabilizer AC7 mk2 195-260V ac at 32amps 140lbs, hence buyer collects £60. Ten-Tec Argonaut 509, 80 to 10 transceiver, as new £240. TS900 transceiver with PSU and speaker £650. Martin Wills G3ZZS, 21 Woodford Road, Glenholt, Plymouth PL6 7HX. Tel: Plymouth 707550.

■ KW 2000B Tx/Rx with matching PSU and manual £150. K Parker G3PKR, 21 Lundy Drive, Hayes, Middx.

■ FWO vintage Eddystone 840 HF/MF comms Rx covering MW/SW broadcast bands thru' ham (1.8 to 28KHz) and CB (27KHz) AM ANL/BFO for SSB. An efficient and handsome gen cov Rx, £85. DNT 40 channel FM CB rig boxed as new (RRP CB mag £100) £35. 3 function SWR/PWR/FS meter (CB) boxed as new £7.50 or swap/Px all or any item for WHY: Also have VW Beetle car value c.£400 swap/Px for 1.8-28KHz T/cvr. H Walton, 0602 (Nottingham) 606644 day or 268880 ev/wkd.

■ Realistic DX-302 receiver 10KHz - 30MHz digital readout. AM. SSB, CW. Mains or battery operated. Global AT1000 ATU, both boxed and in excellent condition with instructions. Prefer buyer collects. £140. Tel: Oxford (0865) 66075.

■ Fairmate hand held VHF scanner covers 136 - 162MHz. 20 channel memory. Includes Nicads and charger. £55 ono. Tel: 01 444 8872.

■ Latest pair of brand new handheld fully synthesised memory scan transceivers. The Icom ICOM2E's are equipped with charger, spare battery pack, speaker mic, carrying case and most other accessories. Over £680 of equip all in original packing. £520 or nearest offer. Please phone David anytime or leave message at 01-458 9723 London. ■ Moonraker four element beam 10m. £65 ono. Mr D Dewar, 311 Gangstead Lane, Hull HU11 4BT. Tel: 811477.

■ CBM 64 plus C2N cassette vgc 8 months old £175 or swap ham gear. PET computer 2001 series 32K vgc £130 or swap ham gear WHY. Bob, Canvey Island 697906.

■ Yaesu FT101ZD FM fitted and 902 ATU complete in lockable wooden cabinet, spare PA bottles and AM board. Sell for £500 or exchange for a mobile FT707, FP707 PSU, FC700 ATU or equivalent. Tel: 021 745 3429.

■ Yaesu FRT7700 SWL ATU for FRG7700 Rx nice condition £28. Trio HS4 8Ω headphones original packing £6. Three KT66 valves new no boxes £4 each or £10 the three. Postage extra all items. Mr N Richardson, 2 Edna Road, Ringlestone, Maidstone, Kent ME14 2QJ.

■ Two PYE Motafones £40, one Jaybeam wide-band PMR antenna £40, one FDK hand scanner 140-180MHz £80, one PYE balun with case and mic £30, one Stornafone 500 3ch with battery £10, two PYE Rx homebases, one PYE Tx, the three £60, GLPMR mobile mount 12ch, one Tx crystal, one Rx crystal VHF high band £120 or swap for two PYE PF70s complete. Alistair Graham, 16 Fordell Leader Road, Dalketh, Scotland.

■ 24GHz directional coupler and detector (with crystal) £28, rotary attenuator £35, SWR meter (£700 new) £190, also bends, twists, couplers etc. 1000-2000MHz wavemeter £18. Mains synchronous motors, various speeds, £1 each. Push buttons, reed contacts, 10 for £8. Mann, Tel: Cambridge (0223) 860150.

■ Drake TR7A with PS7 power supply latest model. Boxed £850, Drake MN7 ATU £125. Drake SP75 speech processor £50. Various drake accessories inc mobile mounts baluns etc. Trio TR9000 2 metre multimode with PSU control unit and matching speaker £250. Dressler D200S 1KW 2metre linear £600 with GaAsfet pre-amp and interface. Bryan, 410 Manchester Road, Sheffield. Tel: (0742) 666169 evenings.

Radio & Electronics
For all aspects of practical amateur radio **World**

SMALL ADS

COMPUTER CONTROL HARDWARE

Relay units for connection to USER ports.
Single Relay board. Rated 1A @ up to 24V DC
Fully buffered Only 4 x 4 cm.....£2.75 (Kit)
£3.50 (Built)
Eight Channel relay board. Latched inputs
May be built up in stages Rated 1A at 24V DC
Basic board inc 2 relays.....£10.75 (Kit)
£13.75 (Built)
Assembled board with all 8 relays.....£32.00
High power relay output unit
Rated up to 5A at 240V A.C.from £14.75 (Kit)
For full details send 2 x 16p stamps
Visa accepted

Please add VAT at the current rate to all prices.
PNP COMMUNICATIONS (REW)
62 Lawes Avenue, Newhaven,
East Sussex BN9 9SB Tel: (0273) 514465

HAMPSHIRE

FARNBOROUGH COMMUNICATIONS

97 Osborne Rd, North Comp, Farnborough. Tel
0252 518009
Open: 6 days 10-6
Yaesu, Icom, FDKs, Mosley aerials,
Jaybeams, G Whips

NOTTS

R.A.S.(NOTTINGHAM)

P Owen G8UUS
3 FARNDON GREEN; WOLLATON PARK
NOTTINGHAM: TEL: 0602 280267
Open: Tues-Fri 10-5.30, Sat 9-5
YAESU: FDK: ICOM: TONNA
HALBAR: WELZ: ANTENNAS & OWN GW5 H.F

RADIO & RTTY BOOKS

RTTY TODAY beginners guide to RTTY decoding on home computers and other equipment £6.20 + 60p p&p.

WORLD PRESS SERVICES FREQUENCIES NEWS AGENCIES

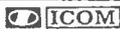
RTTY services listings worldwide £6.20 + 60p p&p
2 or more books p&p free

INTERPRODUCT LIMITED

Dept RE, Stanley, Perth PH1 4QQ. Tel: 073882-575

KENT

Thanet Electronics



95 Mortimer St, Herne Bay
Tel: 02273-69464

Open: Mon, Tues, Wed 9-5
Thurs 9-1, Fri, Sat 9-5.30

All mail order & service enquiries to head office, 143 Reculver Rd, Tel: 02273-63859

COUNTY GUIDES

FROM ONLY £13.16 PER MONTH

Take advantage of this simple, economical and rewarding method of advertising by filling in the form below.

MORSE TUTOR

£4.00 on cassette. £8.50 on microdrive for Sinclair Spectrum. 4 to 19 words per minute, variable spacing, variable groups of random letters, numbers or mixed; Random sentences, own message, single characters and variable pitch. Feedback on screen, printer, or speech (Currah Microspeech 48K only) and repeat facility, 16K and 48K versions on one cassette 48K only on microdrive.

WD SOFTWARE

Hilltop, St. Mary, Jersey, C.Islands
Telephone (0534) 81392

LIVERPOOL

PROGRESSIVE RADIO ELECTRONICS SPECIALISTS

47 Whitechapel Liverpool 051 236 5489
89 Dale St Liverpool 051 236 0154
93 Dale St Liverpool 051 236 0982
Open Tues-Sat 9.30-5.30

FOR ALL YOUR ELECTRONIC NEEDS.

LONDON

BONEX LTD

RF component specialists Toko coil & Inductors

102 Churchfield Road
London W3 6DH
Tel: 01 992 7748

NORFOLK

Eastern Communications

31 Cattle Market Street

NORWICH

(0603) 667189

MAIL ORDER

ACCESS/BARCLAYCARD

MON-FRI 9.00-6.00
SAT 9.30-5.00



Radio & Electronics World

COUNTY GUIDE

Ensure that radio & electronics enthusiasts in your area know where to find you

Ad sizes

20mm x 59mm = single County Guide
40mm x 59mm = double County Guide

Total prepayment rates	Ad space	3 issues	6 issues	12 issues
single	£47.00	£88.00	£158.00	
double	£94.00	£176.00	£316.00	

RADIO & ELECTRONICS WORLD COUNTY GUIDE ORDER FORM

TO: Radio & Electronics World · Sovereign House · Brentwood · Essex · CM14 4SE · England · (0277) 219876

print your copy here

NUMBER OF INSERTIONS REQUIRED

Single County Guide 3 £47.00 6 £88.00 12 £158.00
Double County Guide 3 £94.00 6 £176.00 12 £316.00

PAYMENT ENCLOSED

£ —

Cheques should be made payable to Radio & Electronics World. Overseas payments by International Money Order

Conditions — Payment must be sent with order form. No copy changes allowed. Ads accepted subject to our standard conditions, available on request.

Registered No 2307662 (England)

C P I

ALPHA KEYS

Precision engineered keys for the connoisseur. Twin or single paddle keys individually made to be one of the smoothest and lightest movements ever. For the fast operator.

CAVITY WAVEMETER

One wavemeter to cover 144MHz to over 2500MHz. Can measure RF as low as 50 Milliwatts with suitable meter. Also now short version to cover 430MHz to over 2500MHz.

10GHZ WAVEMETER KIT

A pre machined cavity to make a 10GHZ wavemeter using your micrometer. Can be fixed direct to your wave guide.

COAXIAL RELAY KITS

The cavity block is pre machined to take your BNC or N type sockets.

Send large SAE for full information to:

**PAUL SERGENT G4ONF
6 GURNEY CLOSE
COSTESSEY
NORWICH NR5 CHB
Tel: (0603) 747782**

MORSE READER PROGRAMME for Spectrum, Dragon, CBM, G4, Any Vic 20, BBC B. Self tracks approximately 8/30 WPM Spectrum needs no interface, others use simple 1 transistor interface. Circuit and full instructions with cassette £6.00. **J E Price, 4 Houseman Walk, Kidderminster, Worcs.**

4 PLASTIC BOXES £2

1. Thick black, four screw top, size 90mm by 70mm deep 26mm.
2. Thick black four screw top, size 150mm by 84mm, deep 43mm.
3. Thin white flick on top, size 81mm by 64mm, deep 26mm.
4. Thin semi-clear white top, size 81mm by 64mm, deep 64mm.

ONE OF EACH TYPE (sample) £2.00 plus P&P 30p.

ELECTRONIC MAIL ORDER

**62 Bridge Street, Ramsbottom, Lancs. BLO 9AG.
Tel: (070 682) 3036. - ACCESS/VISA**

Solatron CT 438 Dual Beam Oscilloscope plus spare £65. **Marconi TF1064** VHF Signal Generator £40. **TF2604** Electronic Voltmeter £30. **TF1066B** FM Signal Generator £50. **TF1041** Vacuum Tube Voltmeter £20. **Transformer 1K-O-1K** £5, **AV08** £40. **GEC KT88** £5 each. **DC current calibrator** £50. **Sinclair DM235** DVM £35. **Sinclair PFM 200** Frequency Meter £20. Dartford 72913

EUROLEC VIDEO SERVICES

Tel: 01669 2611 Telex: 893819 Eurlec

Address for correspondence only:

35 Sandy Lane South, Wallington, Surrey SM6 0PF

N1700 Library Cassettes Sony 2860 suite..... £3,000
New unused, some opened and Sony 2860 suite..... £1,950
erased with library labels removed (plus VAT)
LVC120E10, LVC30 £7.50, LVC60 £5 Studio colour cameras - please
enquire
Now and boxed LVC Cassettes JVC UHF umatic tuners, new
LVC90 £8.50, LVC60 £6.50 £75.00
1800 Format Cassettes Used/ Tested ZEIMART 3 port telecine unit with
electronic dichroic filter unit
£500.00
VC45E5 VC45E5
VC30E4 VC15E2.50

Second used NTSC - PAL Transfers, phone for
Edit equipment currently available: VAT Reg. No. 335 709645
JCV heavy duty edit suite..... £3,500

Sixty years practise has perfected the fully guaranteed **G3SRK MORSE KEY** £10.00 incl VAT and pp. Why pay more? Also Morse 60 min cassettes, beginner and advanced £3.50 each

**J Sykes, 7 Top o' the Hill
Slaithwaite, Huddersfield HD7 5UA**

XXX ADULT VIDEO CLUB

For the genuine adult films. Available only from ourselves. Ring

0924-471811 (24hrs)

For the intimate details or write **ADULT VIDEO CLUB**
P.O. Box 12, Batley, W. Yorks.

Complete full-size sets, any published service sheets £2.50 + large SAE - except CTV's/Music Centres from £3.50 + large SAE. Manuals from 1930 to latest. Quotations, free 50p magazine, price lists, unique technical publications, for large SAE. Comprehensive TV or Radio courses now only £9.50 each

TISREW

**76 Church Street, Larkhall, Lanarkshire ML9 1HE
Phone: 0698 883334**

VINTAGE RADIOS repaired - restored. Over 200 Radios stocked. 1922-1960. **RADIO VINTAGE**, 250 Seabrook Road, Seabrook, Hythe, Kent CT21 5RQ. Phone anytime (0303) 30693.

SAVE THIS CHRISTMAS ON YOUR COMPUTER

Acorn Electron Computer under £189.95, **Save** £10. Spectrum 48K £120, **Save** £9.95. All hardware and software for Commodore 64, Vic 20, Dragon, BBC etc. Send SAE for list.

**Mr J Seaward, 7 St Olaf's Road,
Stratton, Nr Bude, Cornwall.**

G W MORSE KEYS 4 Owen Close, Rhyl, Clwyd Wales LL18 2LQ

THE GW MORSE KEY
A joy to use and to look at, this key is made from solid brass polished and mounted on a slate base, here in GW land (not JA) Mounting the key on slate stops all movement of the key when in use. £34.50 pp £2.00 ea.

24 HR LCD CLOCK
Clear 1/2" high led readout repeat alarm clock, battery powered (2 AA pencils). No R/F problems known. Complete with batteries £9.50 pp £0.50 ea.

GWHP PRODUCTS
The full range of Gwhips always in stock for quick and prompt delivery or collection.

NEW NEW BASE STATION ANTENNA FROM NEW
NEW GWHP PRODUCTS NEW
NEW AVAILABLE SOON NEW

For full information and price list please send SAE
BRASS CALL PLATE

Your call sign engraved on a brass plate for fixing to the GW morse key or any of your radio equipment £1.00 only.
NO POST & PACKING CHARGE FOR ORDERS OVER £50.00

Radio & Electronics World

For all aspects of practical amateur radio

This method of advertising is available in multiples of a single column centimetres - (minimum 2cms). Copy can be changed every month.

RATES

per single column centimetre:
1 insertion £9.65, 3 - £9.15, 6 - £8.65, 12 - £7.75.

RADIO & ELECTRONICS WORLD SMALL AD ORDER FORM

**TO: Radio & Electronics World · Sovereign House
Brentwood · Essex CM14 4SE · England · (0277) 219876**

PLEASE RESERVE.....centimetres by.....columns

FOR A PERIOD OF 1 issue..... 3 issues..... 6 issues..... 12 issues.....

COPY enclosed..... to follow.....

PAYMENT ENCLOSED:..... £

Cheques should be made payable to Radio & Electronics World. Overseas payments by International Money Order

CHARGE TO MY ACCOUNT.....

COMPANY

ADDRESS

SIGNATURE **TELEPHONE**.....

C P I

SOLENT ELECTRONICS (LEE) LTD

**ELMORE ROAD, LEE on the SOLENT, HAMPSHIRE
TEL: 0705 580696**

Sub-contract-PCB Assembly-Looms Test - Pack + Design to Manufacture Products inc. Test Equipment - Power Supplies - Fire + Security Emergency Lighting - Multi Meters.

MORSE TRANSLATOR by G4MGD. For BBC B micro. Decoder/Encoder: 6-22wpm. Full receive/transmit. Variable speed/volume. Self test facility. Red keys programmable for own call sign/standard phrases etc. Requires either CW interface designed specifically for this program by G3LIV or RTTY or audio amp information on which is in program. Inclusive price £8.50.
MORSE INSTRUCTOR by G4MGD. BBC B. Full morse tutor. Inclusive price £5.95.



PAEAN SYSTEMS

**Quebec Marketing AM, Lt Bealings
Woodbridge, Suffolk IP13 6LT
☎ (0473) 623757 ☎**

Learn to make your own Printed Circuit Boards

EXPERIMENTER'S PRINTED CIRCUIT KIT
Laminate Boards, Chemicals, Instruction Book, also, Plans & Circuits for 50 Interesting Projects you can build with own parts and transistors £2.50 p&p 50p.

Protect your premises with an efficient **BURGULAR ALARM, PHOTOELECTRIC KIT** £5.50 p&p 50p. **INVISIBLE BEAM OPTICAL KIT** £4.50 p&p 50p. Send SAE for details of all Kits & Circuits and **FREE** 5 transistors & 5 diodes.
**EXPERIMENTAL ELECTRONICS 335, Battersea Pk Rd
London SW11. Tel: 01 720 2683**

Buying or selling? Contact the Used Equipment Centre for the best deal. 25 years of amateur radio experience, friendly advice, full no quibble guarantee on all equipment. Heard about our exchange plan, buy & try? Why not contact me David Cole G3RCQ Hornchurch 55733, evenings/weekends or send SAE for full details & current list of equipment. G3RCQ 65, Cecil Avenue, Hornchurch, Essex. Urgent daytime enquiries 01-594-3495.

FREE Trade Guides of Middle East, USA Indonesia, Japan, Europe. POB 503, Singapore 9144.

ADVERTISERS INDEX

Armstrong Kirkwood Douglas.....	15	Microwave Modules	Outside Back Cover
Blackstar.....	42	Number One Systems	48
Brian J Reed.....	48		
Centre Electronics.....	45	P M Components.....	58, 59
Cirkit.....	4, 5		
Commutech (Devon) Ltd.....	55	Ralfe Electronics.....	39
Data Publication	65	Reltech Instruments.....	42
Display Electronics	74	Riscomp Ltd	39
Edwardschild	48	Samson Electronics.....	42
		Sendz Components	44
Garax Electronics.....	25	C R Supply Co	51
Grandata.....	55		
Greenweld Electronics	25	Tay Systems.....	45
		Technical Software.....	45
Hart Electronics.....	48	Thanet Electronics	40, 41
Hightech Antennas	Inside Back Cover		
C M Howes	19	Weirmead.....	55
		Western Electronics.....	Inside Front Cover
M J Instruments	45	R Withers.....	32, 33
		Wilmslow Audio	51
Keytronics.....	12	Wood & Douglas	51

Radio & Electronics World

For all aspects of practical amateur radio

ADVERTISING RATES & INFORMATION

ABC membership approved pending first audit Jan-Dec 1984

DISPLAY AD RATES		series rates for consecutive insertions			
depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
61 x 90	1/8 page	£91.00	£86.00	£82.00	£73.00
128 x 90 or 61 x 186	1/4 page	£160.00	£150.00	£145.00	£125.00
128 x 186 or 263 x 90	1/2 page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£560.00	£530.00	£475.00
263 x 394	double page	£1140.00	£1070.00	£1020.00	£910.00

COLOUR AD RATES		colour rates exclude cost of separations	series rates for consecutive insertions		
depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
128 x 186 or 263 x 90	1/2 page	£420.00	£395.00	£375.00	£335.00
297 x 210	1 page	£810.00	£760.00	£730.00	£650.00

SPECIAL POSITIONS	Covers: Bleed: Facing Matter:	Outside back cover 20% extra, inside covers 10% extra 10% extra [Bleed area = 307 x 220] 15% extra
-------------------	-------------------------------------	----------------------------------------------------------------------------------------------------------

DEADLINES		*Dates affected by public holidays			
issue	colour & mono proof ad	mono no proof and small ad	mono artwork	on sale thurs	
Jan 85	8 Nov 84*	14 Nov 84*	16 Nov 84*	13 Dec 84	
Feb 85	6 Dec 84*	12 Dec 84*	14 Dec 84*	10 Jan 85	
Mar 85	17 Jan 85	23 Jan 85	25 Jan 85	14 Feb 85	
Apr 85	14 Feb 85	20 Feb 85	22 Feb 85	11 Mar 85	

CONDITIONS & INFORMATION		Printed — web-offset.	Overseas payments by International Money Order. Commission to approved advertising agencies is 10%.
<p>SERIES RATES Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copy will automatically be repeated if no further copy is received. A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received. Display Ad and Small Ad series rate contracts are not interchangeable.</p>	<p>If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.</p> <p>COPY Except for County Guides copy may be changed monthly. No additional charges for typesetting or illustrations (except for colour separations). For illustrations just send photograph or artwork. Colour Ad rates do not include the cost of separations.</p>	<p>PAYMENT All single insertion ads are accepted on a pre-payment basis only, unless an account is held. Accounts will be opened for series rate advertisers subject to satisfactory credit references. Accounts are strictly net and must be settled by publication date.</p> <p>FOR FURTHER INFORMATION CONTACT Radio & Electronics World, Sovereign House, Brentwood, Essex CM14 4SE. (0277) 219876</p>	<p>CONDITIONS 10% discount if advertising in both Radio & Electronics World and Amateur Radio. A voucher copy will be sent to Display and Colour advertisers only. Ads accepted subject to our standard conditions, available on request.</p>

A New Approach to HF Antennae Design

Compare these performance figures of Hightech Antennae's **MBFr80** with the best 3 element antennae available today.

	Typical Spec. for 3 element Tri Band Beam	Hightech Antennae's Spec for MBFr80
	No. of Elements — 3	2 Parasitic + 1 Absorber Element
Front to Back Ratio	25dBd	43dBd
Forward gain	6dBd min.	Better than 4.5dBd
VSWR at Resonance	1.5 : 1	1.1 : 1
Max. Power Input	1kW (100% duty cycle)	2kW (100% duty cycle) 5kW peak
Input Impedance	50 ohm	50 ohm
Boom Length	4.2m	4m
Max. Element Length	8.2m	4.6m
Max. Wind Survival	75mph	100mph
Net Weight	16.3kg	8kg
Wind Load	80mph = 47kg	100mph = 23kg

The front to back ratio advantage from Hightech Antennae's **MBFr80** is 18dBd better than other antennae available today. Remember this is a 3 S-unit noise reduction in unwanted directions over and above other antennae.

6dBd = 1 S-unit

Massive front to back ratio. This is more important than forward gain on today's crowded amateur bands.

Flat VSWR across all HF bands.

No need for the purchase of ATU's for those with solid state PA's.

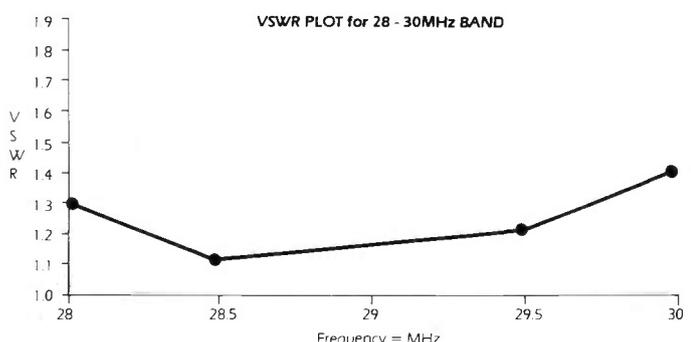
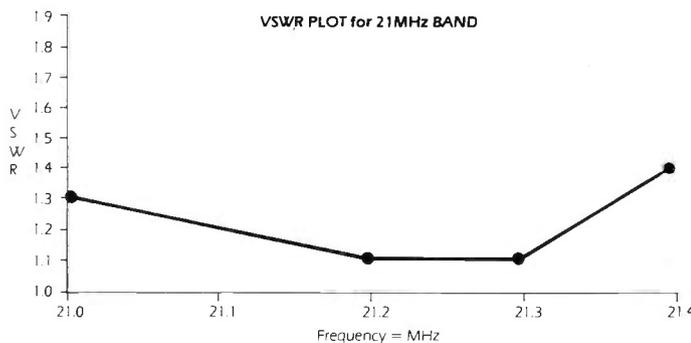
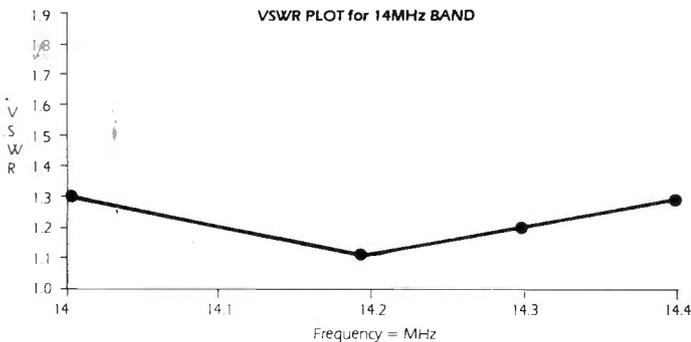
No need for the purchase of baluns.

A complete break with the coil and capacitor trap arrangement with, of course, its associated losses, restricted bandwidth etc.

Expandability: Extra parasitic element (director)

Extra absorber element for even greater front to back ratio.

With the conversion kits available, a 3 element, 3 band beam with an enormous front to back ratio will become the standard for others to follow.



H I G H T E C H

Antennae (Scotland) Ltd

To: HTA (Scotland) Ltd., 24 Gremista Ind. Est., Lerwick, Shetland Is. ZE2 0PX

Please Supply **MBFr80** Antenna(e)

@ £189.95 incl. VAT & P & P

Name (please print)

Address (please print)

Postcode

I enclose a cheque/PO payable to HTA (Scotland) Ltd value £

or debit my Access Card No.

Cardholder Signature

Credit Card Hotline 0595 - 5949

Please allow 28 days for delivery Offer valid UK only



MICROWAVE MODULES LTD

SOMETHING FOR EVERYONE

MMS1

THE MORSE TALKER



This unique product is a self contained speaking morse tutor and, as well as a random morse generator, the MMS 1 incorporates a microprocessor speech synthesis system which provides talk back of the random morse. This product is a truly cost effective means of obtaining a full class 'A' amateur licence, without having to rely on a third party for instruction.

FEATURES—

- ★ Wide speed range: 2-20 wpm.
- ★ Segmented alphabet choice for novices.
- ★ Variable group length - 1, 5, 50 characters. Truly random and accurate.
- ★ Internal loudspeaker. 12v DC operation. Available from stock.

£115 inc VAT (p&p £3)

MMC 144/28 HP

144 MHz HIGH PERFORMANCE RECEIVE CONVERTER



Input frequency range :144-146 MHz
Output frequency range :28-30 MHz
Typical gain :20 dB minimum
Noise figure :2 dB
3rd order intercept point :+19 dBm (output)

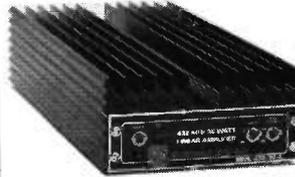
FEATURES

- ★ Excellent strong signal handling characteristics
- ★ Gasfet RF amplifier
- ★ High level double-balanced mixer
- ★ Harmonic-free, regulated oscillator

£42.90 inc VAT (p&p £1.25)

MML 432/30-L

70CM 30 WATT LINEAR AMP WITH RECEIVE PREAMPLIFIER



FEATURES—

- ★ RF Vox
- ★ 1 or 3 watts input (switchable)
- ★ Suitable for SSB & FM
- ★ 30 watts output
- ★ Suitable for use with rigs such as - FT790R, FT708R, IC4E, C78, TR3500 etc.
- ★ Available from stock.

£139.95 inc VAT (p&p £3.50)

MML 144/30-LS

2M 30 WATT LINEAR AMP WITH RECEIVE PREAMPLIFIER



FEATURES—

- ★ RF Vox
- ★ 1 or 3 watts input (switchable)
- ★ Suitable for SSB & FM
- ★ 30 watts output
- ★ Suitable for use with rigs such as - FT290R, FT208R, IC2E, C58, TR2500 etc.
- ★ Available from stock.

£75 inc VAT (p&p £3)

MML 144/200-S

144 MHz 200 WATT LINEAR AMPLIFIER



FEATURES

- ★ 200 watts Output Power
- ★ Linear All Mode Operation
- ★ Suitable for 3, 10 & 25 watt Transceivers
- ★ Ultra Low-Noise Receive Preamp - Front Panel Selectable
- ★ Relative Output LED Bar Display
- ★ Equipped with RFVox & Manual Override
- ★ LED Status Lights for Power, Transmit, Preamp on and input level

£245 inc VAT (p&p £4.50)

MTV 435

435MHz 20 WATT ATV TRANSMITTER



This high performance ATV transmitter consists of a dual channel exciter, video modulator and a two stage 20 watt linear amplifier. It is suitable for stage 20 watt linear amplifier. It is suitable for monochrome and colour transmissions, has two switch selectable video inputs, and includes a test wave form generator. Full transmit/receive switching is incorporated and aerial changeover is achieved by a PIN diode switch, which allows connection of the 435MHz aerial to a suitable receive converter, such as the MMC435/600 which is available at £29.90 inc VAT, p&p £1.25. Available from stock.

£159.95 inc VAT (p&p £3)

MMA 144V

2M RF SWITCHED PREAMPLIFIER

This RF switched low-noise receive pre-amplifier utilises the proven 3SK 88 MOSFET in a noise matched design. Providing a power gain of 15dB and having a noise figure of 1.3dB, this unit will accept a through power of 100 watts. Available from stock.

£34.90 inc VAT (p&p £1.25)

MMC 144/28

2M CONVERTER



This low noise converter when used in conjunction with a 28-30MHz receiver will provide reception of the 2 metre amateur band. All that is required is a 12 volt supply and a suitable antenna. Available from stock.

£29.90 inc VAT (p&p £1.25)

MM2001

RTTY TO TV CONVERTER



This converter contains a terminal unit and a microprocessor controlled TV interface and requires only an audio input from a receiver to enable a live display of 'off-air' RTTY and ASCII on a domestic UHF TV set, or video monitor.

- ★ RTTY 45.5, 50, 75, 100 baud
- ★ ASCII 100, 300, 600, 1200 baud
- ★ Switchable input filter
- ★ Parallel printer output
- ★ UHF and Video outputs
- ★ 16 line, 64 character display
- ★ 12v DC operation

£189 inc VAT (p&p £3)

MM4001 KB

RTTY TRANSCIVER

This package, when connected to a transceiver and a domestic UHF TV set provides a data communication capability at a cost of half of any similar system, for both RTTY and ASCII.

FEATURES—

- ★ RTTY - 45.5, 50, 75, 100 baud
- ★ ASCII - 110, 300, 600, 1200 baud
- ★ Four message stores
- ★ Stored test functions (RY, QBF, etc)
- ★ Auto CQ call
- ★ Full size Qwerty keyboard
- ★ Parallel printer output
- ★ UHF and Video outputs
- ★ 16 line, 64 character display
- ★ 12v DC operation

£299 inc VAT (p&p £4.50)

"A copy of our catalogue is available by sending a large SAE (25p), or 40p in stamps"

ALL MICROWAVE MODULES PRODUCTS ARE FULLY GUARANTEED FOR 12 MONTHS INCLUDING PA TRANSISTORS



WELCOME

MICROWAVE MODULES
BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN, ENGLAND
Telephone: 051-523 4011. Telex: 628608 MICRO G
CALLERS ARE WELCOME PLEASE TELEPHONE FIRST

HOURS:
MONDAY TO FRIDAY
9-12.30, 1-5.00