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For all aspects of practical amateur radio

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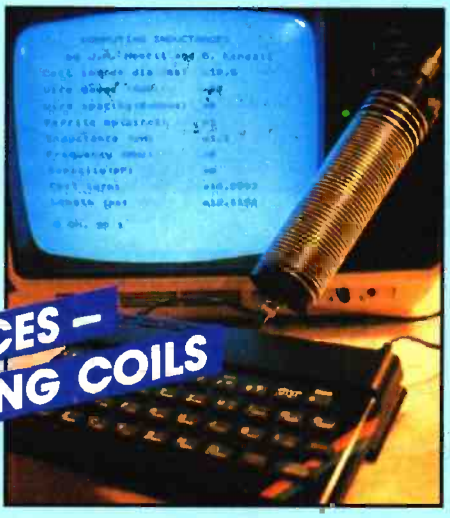
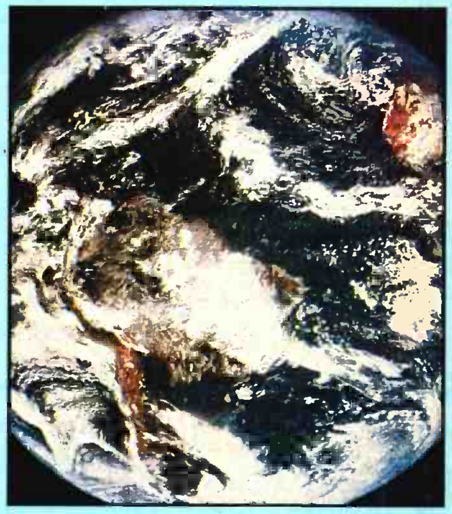


AM RAD
AN EXPERIMENTAL SIGNAL GENERATOR

COMPUTING INDUCTANCES – A PROGRAM FOR WINDING COILS



NOISE – A LOOK AT THIS ELECTRONIC PHENOMENON

REVIEW OF TAU SYSTEMS SUPER TRANSMATCH ATU

DATA FILE
A LOOK AT SIMPLE ALARM SYSTEMS

QRP Tx FOR 80m
CONSTRUCTIONAL DETAILS

FREE CLASSIFIED ADS

AMTRONICS (TONBRIDGE) G4 SYZ
THE AMATEUR RADIO SPECIALISTS IN KENT

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Access

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Convertor	£26.95
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70cm TX/RX	£169.00
24cm TX	£199.00
TX Kit	£33.60

B.N.O.S.	
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3-100 Linear	£172.50
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Safety Mic	£28.95
503 Mic	£47.50
303 Mic	£36.50
F53 C/W Speaker	£52.00

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30FT LATTICE TOWER. Made by professionals for Amateurs. This is the latest product in our ever increasing range. Towers and mountings in stock (cash-n-carry) or delivered. Call in at the shop to inspect this quality tower or send SAE for full details.

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70cm 5 Element 9.5 db gain 0.7m long. Go anywhere antenna. Fantastic performance. End mounting, horizontal or vertical. Will fit in suitcase.

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FULL RANGE IN STOCK

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New-2 metre Preamps. Also inline 10 metre Preamps, ie 29MHz FM

Full range Jaybeam Antennas.
Large stocks of pole, clamps, including the new 1 Eli.
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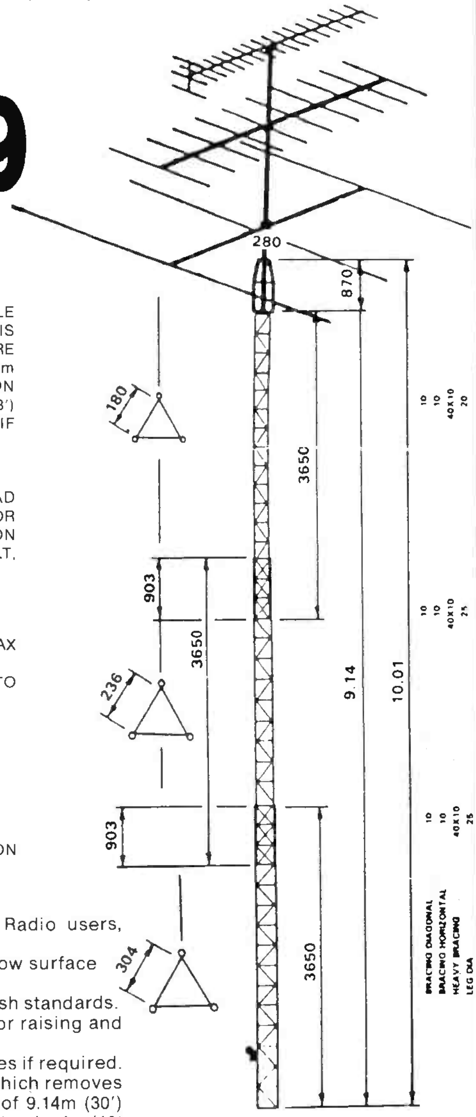
Access, Visa, Postal Order, Cheque

GENERAL SPECIFICATIONS
WINCH (800lb)
ROPES 5mm LOWER 4.5mm TOP
540 Kg (1200lb) S.W.L.
A STANDARD HEAD UNIT IS AVAILABLE ALTHOUGH ONLY REQUIRED IF ROTATOR IS BASE MOUNTED AS ALL 10m (30′) TOWERS ARE FITTED WITH MOUNTING FACILITIES FOR 51mm (2″ Dia) STUB MAST AND DEPENDING UPON AERIAL CONFIGURATION CAN BE UP TO 4m (13′) ALSO ALL HEAD UNITS WILL TAKE A BEARING IF REQUIRED.
FINISH MANUFACTURED TO B.S.I. STANDARDS HOT DIP GALVANISED
FIXINGS FOR ANY ALTERNATIVE HEAD ATTACHMENTS eg CCTV CAMERA MOUNT OR LIGHTING PAD SIMPLY SLOT INTO TOP SECTION OF TOWER AND IS LOCKED WITH SINGLE BOLT, AS IS SAME WITH HEAD UNIT.

LOADINGS
BASE ON C.P.3. CHP V. PART 2
AT WINDSPEEDS OF 160Km/h (100 m.p.h.) MAX WEIGHT OF HEADLOAD 125 Kgs (275lb)
THIS LOADING WOULD BE EQUIVALENT TO WINDSPEED SURFACE AREA OF: .84M (9.0 F^2)

UNIVERSAL MOUNTINGS
(a) WALL
(b) FIXED POST
(c) TILT POST
(d) FIXED BASE
(e) HINGED BASE
VARIATIONS CAN BE MADE TO CLIENTS ON REQUIREMENTS



THE 30′ (10m) TOWER RANGE
The 30′ Tower is the result of a detailed design programme to study the needs of today's Radio users, particularly in an urban environment.
Our Towers are of the conventional triangular lattice construction which provides a low weight, low surface area but high strength combination.
For durability the complete tower, brackets and bell housing are hot dip galvanised to current British standards.
All Towers come complete with suitable winch cables, pulleys, bolts and accessories necessary for raising and lowering as standard. A safety latch is provided to lock the tower in its raised position.
The relatively low closed height of the towers make it practical and acceptable for planning purposes if required. Also the majority of owners find they are able to work on their aerial systems at this closed height which removes the necessity to purchase costly tilt over versions. The extended head height before head unit of 9.14m (30′) provides a good operating platform at a most economic price. Bearing in mind depending on head load a 4m (13′ stub mast can be fitted giving up to 13.7m (45′).
The concept of our range is to provide the user with a basic tower unit and to allow him to choose from a selection of universal accessories to suit the precise needs of individual mounting requirements. If none of the standard items are suitable specific mounts may be manufactured to order.

WE ALSO SELL:
Jaybeam, Bnos, Drae, Fortop (ATV), Azden, Adonis, Met, Datong, Uniden Amateur, FDK, Yaesu, Oscar, Diamond, Sagant, Spectrum Software, RSGB Books and Maps. Also large selection of polls clamps, masts, cable-connectors, lashings etc.

8 TOLLGATE BUILDINGS, HADLOW RD, TONBRIDGE. TEL: (0732) 361850

Radio & Electronics World

For all aspects of practical amateur radio

CONTENTS

SAFETY IN THE SHACK

Some of the constructional projects described in ***R&EW*** refer to additions or modifications to equipment. Any alteration or addition to the circuit may invalidate the guarantee.

We prefer that each constructional project contains its own power supply or battery. A constructional project will occasionally describe how the power supplies of any equipment may be used to supply the circuit of that project. Ensure that the power unit in the equipment is adequate to provide the additional load current. In all cases, check that the equipment mains fuse is correctly rated.

Safety in the shack, please at all times.

See page 62

Dock Strike and Paper Supplies
Paper supplies have been disrupted as a result of the recent dock strike, which has caused different paper to be used in this issue

COVER PHOTOGRAPH CAPTIONS
Top left – Computing inductances
Top right – Am Rad
Centre left – TAU Systems' Super-Transmatch ATU
Centre right – Earth from 22,300 miles in space, taken by ATS-III
Bottom – QRP transmitter for 80m

Editor .... **DENNIS PADFIELD G1AJQ**

Advertisement Manager .... **NICOLA DYER**
Advertisement Executive .... **ANNE BRADY**

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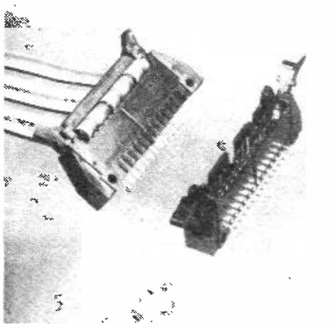
PRODUCT NEWS

Featured on these pages are details of the latest products in communications, electronics and computers. Manufacturers, distributors and dealers are invited to supply information on new products for inclusion in Product News
Readers, don't forget to mention ***Radio & Electronics World*** when making enquiries

IDC RIBBON CONNECTORS



An inexpensive range of IDC ribbon cable connectors to MIL-C-83503 and a suitable top quality 1.27mm pitch ribbon cable are announced by Semiconductor Supplies International.

Female units incorporate strain relief and polarising bumps. Clamp/ejector PCB mounting headers are available, in both straight and right-angle mounting versions.

IDC connectors have beryllium copper contacts in the female connectors and selectively gold-plated contacts in the male headers.

Both connectors and ribbon cable are available in 20, 26, 34 and 40 way versions. Cable is to UL2651 and sold in 35 metre reels, grey only with one polarising band.

Semiconductor Supplies, Sutton, Surrey, Tel: 01-643 1126.

PUSHBUTTON SWITCH RANGE

Cosmos 8000, a new series of high quality pushbutton switches from SECME, is announced by Felco Electronics, the sole UK agent.

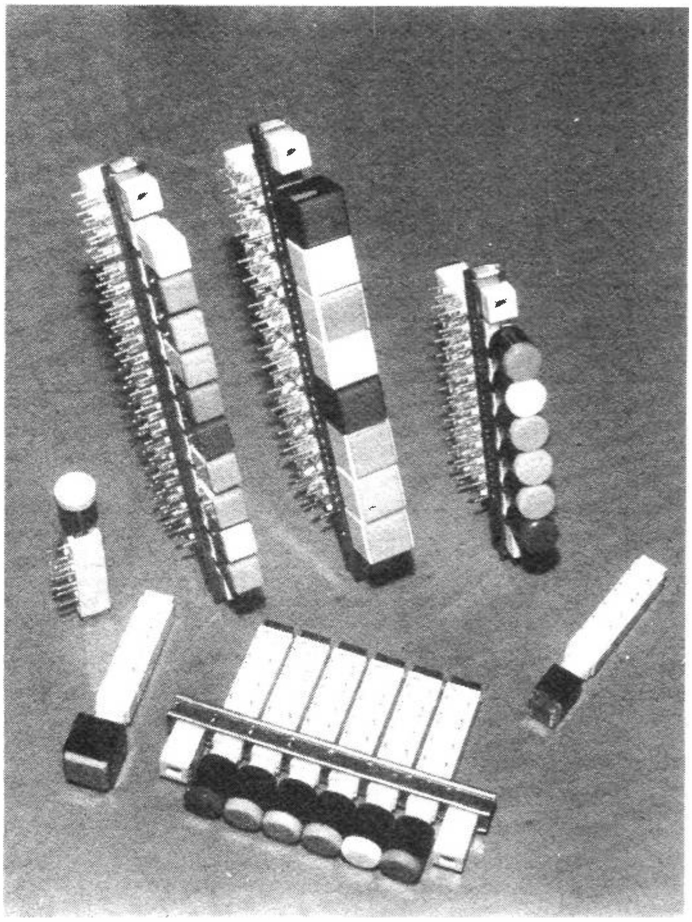
The switches are available singly or grouped in up to 16 ways. Operation of single switches can be specified as either momentary or maintained. Mounted stacked, any combination of momentary and maintained operation is available with or without an additional mutual release facility. With operations specified up to one million, a long in-use life is indicated.

Pushbuttons, in grey or black, with lens covers in a range of nine standard colours, can be supplied in a variety of shapes and sizes: round (10mm diameter); rectangular (8.7 x 8mm) and square (10.16 x 10.16mm and 12.5 x 12.5mm).

A choice of illuminated or non-illuminated is also possible, with illumination by LEDs (red, green or yellow) or incandescent lamps for permanent or switched illumination. LEDs and lamps can be replaced without disturbing the switch assembly.

Individual switches may be mounted directly on to a PCB, or by clip-on panel support accessory. Stacked versions offer a fixing rail mounted along the top surface of the switch modules.

Cosmos 8000 offers innumerable combinations for application in instrumentation, telecoms, modems, test equipment and the professional hi-fi markets. A shortform catalogue with full details on the range is available on request from Felco or its distributors – Souriau (UK), Fleetworld, Steatite and Britec.



Felco Electronics Ltd, 38 London Road, Newbury, Berkshire RG13 1JX. Tel: 0635 48282.

SELECTIVE CALL DECODER

IQD has introduced a new selective calling decoder unit for use in mobile vehicles.

The new unit is extremely easy to install in mobiles and operates from a negative earth supply in the voltage range 7-20volts, consuming a few milliamps on standby. Electrical connectors are very simple, no connection to the transceiver being necessary other than to the earth side of the loudspeaker.

Programming of the new unit is achieved by a 4-digit hexadecimal switch; using numerals alone, 9999 unique substation identification codes can be programmed; inclusion of 'hash' gives expansion by a further 999 stations.

The system is designed so that individual, group and all-station calls can be made. When addressed by an all-station call, the transceiver loudspeaker is simply opened and stays open until muted by the mobile operator.

An LED indicates that the loudspeaker has been opened; this would not otherwise be apparent to an operator returning to a squelched receiver. A bleep of dual-tone frequency is heard upon receipt of an individual call and this serves to distinguish it from an all-station call.

With an individual call the loudspeaker is opened automatically and can be cancelled manually by momentarily earthing the press-to-talk connection, or by replacing the microphone on its hang-up.

The sensitivity of the new units has been designed for use in vehicular environments. Logic functions are built in so that the unit will reset itself four seconds after detecting initial digits; this protects it from being jammed permanently into a waiting condition.

Detection of less than four digits may occur when the unit is operating at extreme range or in difficult terrain; the correct digits must therefore be transmitted within four seconds of each other in order to open the loudspeaker of the called mobile.

A side benefit of this system is that if the base operator feeds in an incorrect digit, he merely waits for four seconds before starting again.

IQD Limited, North Street, Crewkerne, Somerset TA18 7AR. Tel: (0460) 74433.

THIRD HAND

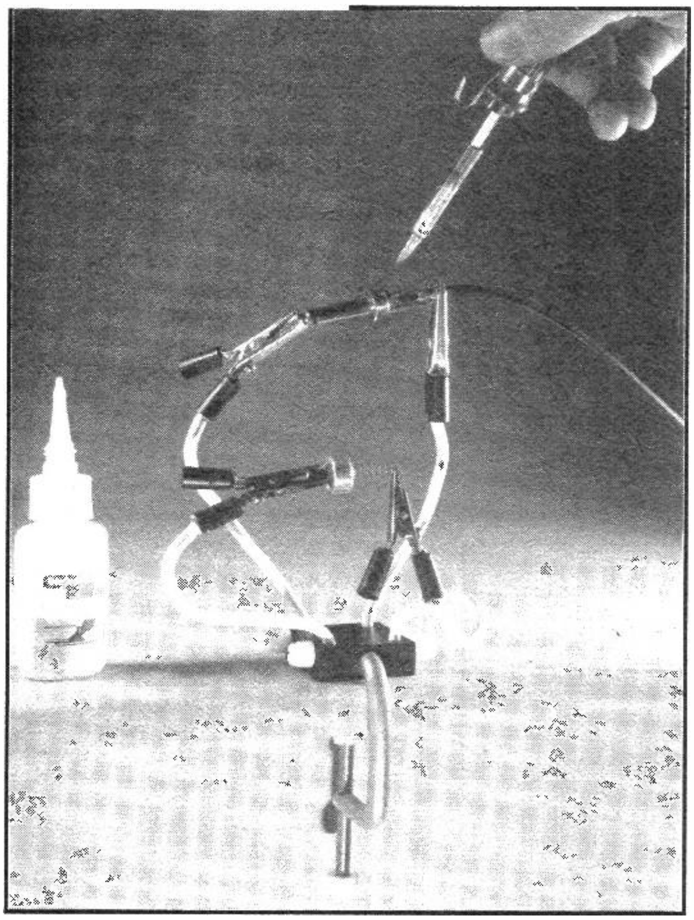
Few DIY jobs are more frustrating than the one that needs 'three hands' – two to hold the work and a third to apply solder or adhesive. The smaller the component, the more difficult it usually proves to position it accurately and firmly.

Gripmate, produced by an innovative Sussex company, is a tiny clamp that provides not just one extra 'hand', but four, able to grip small electronic components and similar items in an infinite number of positions.

A base-block clamped to any bench or table top carries four semi-rigid wires, each fitted with a crocodile clip to hold the work. Alternatively, any of the wires can be replaced with one holding either a magnifying glass for close-up work, or a magnet where this is more appropriate than the clip.

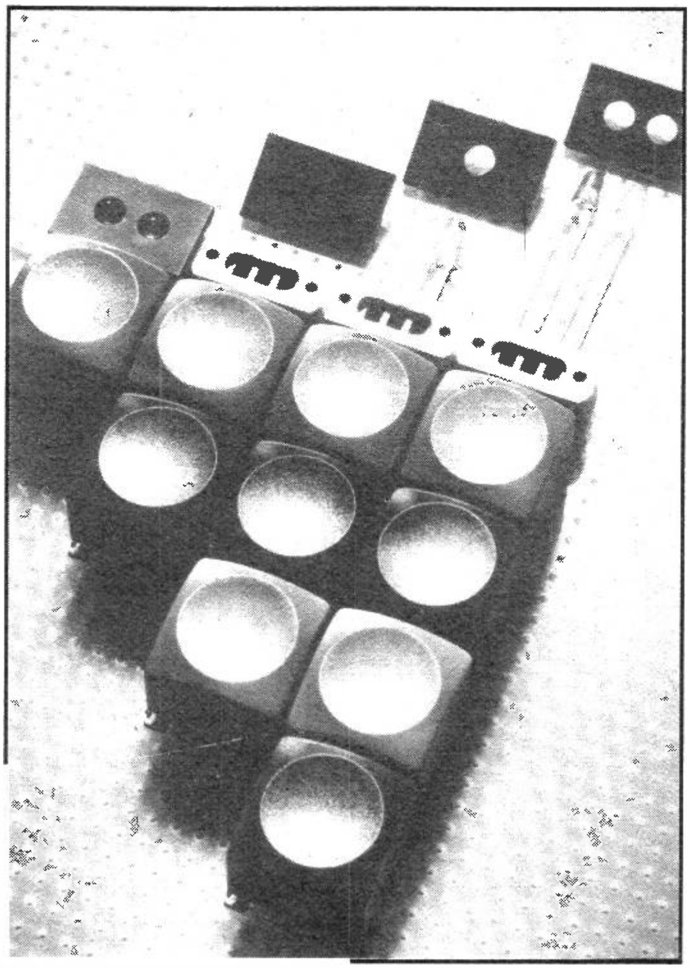
Gripmate is not only clever but inexpensive. The four-handed model costs £4.85 (a basic type with two arms sells for £1.00 less), and the magnifier and magnet come for £2.50 and £1.50 respectively – all inclusive of VAT and postage.

Kemplant Ltd, Durfold Wood, Plaistow, Billingshurst, W Sussex RH14 0PN.



ALBIS KEY ASSEMBLY 82

Designed by Siemens for use in the micro-electronics sector, the versatile 'Albis' Key Assembly 82 permits compact keypads of any required size to be made up with or without light-emitting diodes.



It has a normally-open contact and is intended for PCB mounting: the dimensions are based on the 1/10in (2.54mm) grid system.

The contact system comprises a moving contact member made of conductive elastic material and a stationary contact which is gold-plated in the dust and splash-proof contact area. This contact system makes the key assembly ideal for performing switching functions in electronic circuits.

The operating condition can be signalled by means of light-emitting diodes (LEDs). The LEDs are simply inserted into a mounting strip which accepts 3mm diameter LEDs, and can be directly attached to the key assembly. One or two LEDs can be fitted to a key assembly.

Sensitive electronic circuits can be protected against electro-static damage by placing a conductive strip over the diode mounting strip to dissipate charges caused by contact with the diode case. The rugged and cost-effective 'Albis' Key Assembly 82 has a service life far exceeding 10^6 operations.

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

WIRE STRIPPERS

A pair of adjustable wire strippers have been added to the Knipex range by Draper Tools Ltd.

Both are manufactured from special tool steel with smoothly ground and polished heads incorporating accurate 'V' cutting grooves and knurled rings to lock the screw adjusters in position.

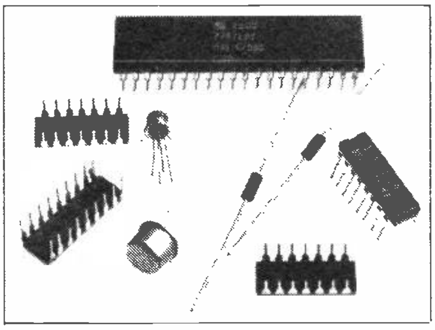
Handles are spring-loaded for effortless operation and the insulation from wires up to 5mm diameter can be stripped. One model has soft PVC coated handles and the other features heavy duty insulated PVC coating.

Also available in the Knipex range is a model made to conform to West German VDE safety standards, with super heavy duty insulated handles and chrome plated head.

Draper Tools Ltd, Hursley

for a better service.

NE556N	Dual version of the 555	61-05560	0.50
uA741CN	DIL low cost op amp	61-07411	0.22
uA747CN	Dual 741 op amp	61-07470	0.70
uA748CN	741 with external frequency comp	61-04780	0.40
HA1388	18W PA from 14V	61-01388	2.75
TDA2002	8W into 2 ohms power amp	61-02002	1.25
ULN2283	1W max. 3-12V power amp	61-02283	1.00
MC3357	Low power NBFM IF system and detector	61-03357	2.85
ULN3859	Low current dual conversion NBFM IF and detector	61-03859	2.95
LM3900	Quad norton amp	61-39000	0.60
LM3909N	8-pin DIL LED flasher	61-39090	0.68
KB4445	Radio control 4 channel encoder and RF	61-04445	1.29
KB4446	Radio control 4 channel receiver and decoder	61-04446	2.75
ICM7555	Low power CMOS version of timer	61-75550	0.98
ICL8038CC	Versatile AF signal generator with sine/square/triangle OPs	61-08038	9.50
TK10170	5 channel version of KB4445	61-10170	1.87
HA12002	Protection monitor system for amps, PSUx, TXs etc	61-12002	1.22
HA12017	83dB S/N phono preamp 0.001% THD	61-12017	0.80
MC14412	300 baud MODEM controller (Eduro/US specs)	61-14412	6.85



Microprocessor & Memories

Z80A	Popular and powerful 8-bit CPU	26-18400	3.40
Z80AP10	2 port parallel input/output	26-18420	2.95
Z80A CTC	4 channel counter/timer	26-18430	2.90
Z8671	Z8 Micro comp. and Basic	26-08671	17.50
6116-3	16K (2kx8) CMOS RAM 200nS	26-36116	6.68
Z6132-6	32K (4kx8) quasi RAM 350nS	26-06132	15.00
4116-2	16K (16kx1) 150nS	26-24116	1.59
2764	64K (8kx8) 450nS	26-02764	9.50
2732	32K (4kx8) 450nS	26-02732	5.70

Voltage Regulators

7805	5V 1A positive	27-78052	0.40
7812	12V 1A positive	27-78122	0.40
7815	15V 1A positive	27-78152	0.40
7905	5V 1A negative	27-79052	0.49
7912	12V 1A negative	27-79122	0.49
7915	15V 1A negative	27-79152	0.49

Transitors

BC182	General purpose	58-00182	0.10
BC212	General purpose	58-00212	0.10
BC237	Plastic BC107	58-00237	0.08
BC238	Plastic BC108	58-00238	0.08
BC239	Plastic BC109	58-00239	0.08
BC307	Complement to BC237	58-00307	0.08
BC308	Complement to BC238	58-00308	0.08
BC309	Complement to BC239	58-00309	0.08
BC327	Driver/power stage	58-00327	0.13
BC337	Driver/power stage	58-00337	0.13
MPSA13	NPN Darlington	58-04013	0.30
MPSA63	PNP Complement to MPSA13	58-04063	0.30
J310	JFET for HF-VHF	59-02310	0.69
J176	JFET analogue switch	59-02176	0.65
3SK51	Dual gate MOSFET-VHF amp	60-04051	0.60
3SK88	Dual gate MOSFET-Ultra lo noise	60-04088	0.99
TIP31A	Output stage	58-15031	0.35
TIP32A	Complement to TIP31A	58-15032	0.35
VN66AF	VMOS Power FET	60-02066	0.95
IN4001	Rectifier diode	12-40016	0.06
IN4002	Rectifier diode	12-40026	0.07
IN4148	General purpose silicon	12-41486	0.05

Silicon Controlled Rectifiers

BRY55-100	100V .8A	52-55100	0.50
C106DI	400V 4.0A	52-00106	0.70
C122DI	400V 8.0A	52-00122	1.45

3mm Diameter LEDs

V178P	Red	15-01780	0.15
V179P	Green	15-01790	0.16
V180P	Yellow	15-01800	0.18

5mm Diameter LEDs

CQY40L	Red	15-10400	0.12
CQY72L	Green	15-10720	0.15
CQY74L	Yellow	15-10740	0.15

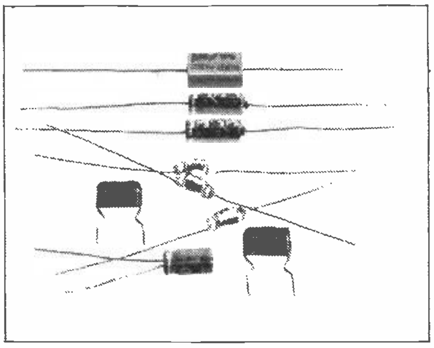
Infra-Red LEDs

CQY99	Emitter	15-10990	0.56
BPW41	Detector	15-30410	1.51

Tri Colour LED

V518	Orange-Green-Yellow	15-05180	0.60

Capacitors



Aluminium Electrolytics Radial PCB Mounting

			Pack of 4
10u	16V	05-10606	0.24
47u	16V	05-47606	0.28
47u	25V	05-47607	0.28
470u	6.3V	05-47705	0.36
470u	16V	05-47706	0.48

Tantalum Beads

			Each
1uf	35V	05-10501	0.18
10uf	16V	05-10601	0.28
47uf	6.3V	05-47601	0.45
47uf	16V	05-47602	0.92

Monolithic Capacitors

		Pack of 3
1n	04-10204	0.39
10n	04-10304	0.42
100n	04-10404	0.45

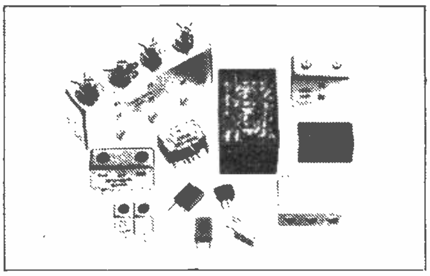
Low Voltage Disc Cermaic

		Pack of 5
1n	04-10203	0.20
10n	04-10303	0.20

Polyester (C280)

		Pack of 3
10n	04-10305	0.18
47n	04-47305	0.24
100n	04-10405	0.24
470n	04-47405	0.51
1uF	04-10505	0.66

R F Components



Filters

CFU/LFB CFW/LFH SERIES

Miniature 455kHz filters. I/P and O/P impedance 2K.

	-6dBW	-40dBW		
LFB6/CFU455H	6kHz	18kHz	16-45512	1.95
LFB12/CFU455F	12kHz	26kHz	16-45515	1.95
LFH6S/ CFW455HT	6kHz	14kHz	16-45525	2.45
LFG12S/ CFW455FT	12kHz	22kHz	16-45528	2.45
CFM2455A Mechanical IF Filters for 455kHz			19-45530	0.77

Crystal Filters 2 Pole Types

10M15A	10.7 Centre Freq.	20-10152	2.10
10MO8AA	10.695 Centre Freq.	20-11152	3.49

Inductors

We offer the complete Toko range of fixed and variable inductors. Over 500 coils from audio to V.H.F. See catalogue for details.

Soldering Irons (Antex)

CS240	Iron 240VAC 17 Watts	54-22300	5.20
XS-240	Iron 25W 240V High heat capacity.	54-22500	5.40
SK6	Presentation pack of one XS-240 with ST4 stand	54-22510	7.20
MLXS	Handy 12V 15W soldering iron complete with crocodile clips and solder	54-20004	5.60

Please add 15% VAT to all advertised prices and 60p post and packing. Minimum order value £2 please. We reserve the right to vary prices in accordance with market fluctuation.

Road, Chandlers Ford, Eastleigh, Hampshire SO5 5YF. Tel: 04215 66355.

THERMA 2 DIGITAL THERMOMETER

The Therma 2 features a new principle whereby the probe is a permanent part of the measurement system, thus ensuring continuous repeatability of readings, and security against probe loss.

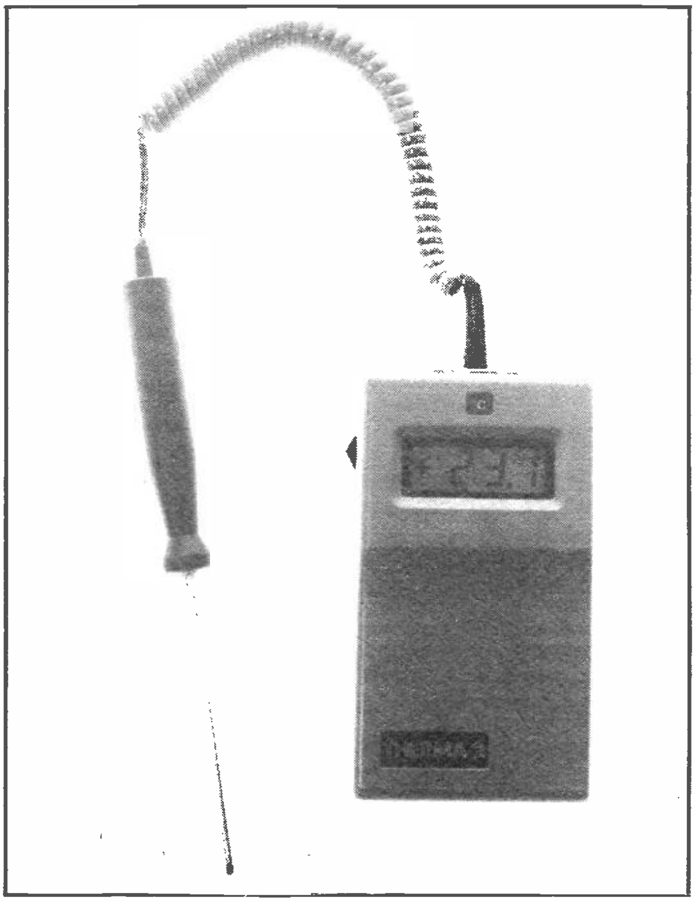
The thermometer is supplied complete with any one of the three probes, surface, needle or air, each one designed to give versatility and precise accuracy.

The Therma 2 electronic thermometer is designed as a rugged, easy to use low cost unit for the measurements of air, liquids, surfaces and semi-solid material.

Power is supplied by a 9 volt battery, which gives the instrument a bright, easy to read liquid crystal display with a resolution of 0.1°C, measuring temperatures between -50°C and 150°C.

Lightness and ease of operation make these ideal units for engineers and technicians alike. Housed in rugged, but attractive, custom moulded cases they can withstand harsh outdoor conditions without looking out of place in the office or laboratory.

High technology electronics and probes for a variety of applications make the Therma 2 an instrument able to fulfil expectations. It is priced at £45.00 each complete. *Electronic Temperature Instruments, Highdown Works, Highdown Avenue, Worthing, West Sussex, BN13 1PU. Tel: Worthing (0903) 690750.*

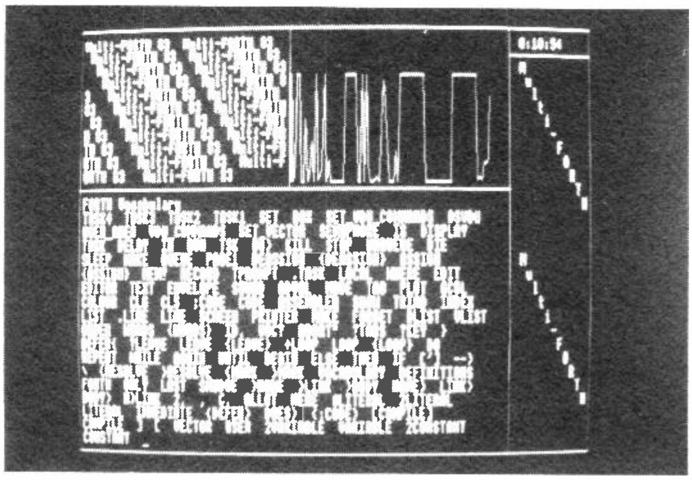


MULTI-FORTH 83

After the success of their ZX81-FORTH ROM, giving an operating system and language which can multi-task (more than ten tasks simultaneously), Skywave Software have moved to larger premises and now produce Multi-FORTH 83 for the BBC Micro.

This version has been specially written for the BBC (and is not rehashed FORTH-79 Code), and is claimed to be the most sophisticated software at present on the market for this computer.

Unique in that it Multi-tasks, it permits the execution of a number of FORTH programs simultaneously and transparently of each other.



Each task is placed in a queue, and the maximum number of tasks in the queue is twenty-eight.

The number of tasks that the system can run is limited purely by memory requirements, and the system as supplied is set up with four pages (1K) available for tasks. This can be expanded as required.

Also available is a Multi-FORTH 83 De-Luxe System, a disc used alongside the EPROM of the standard system, but containing many more source-code definitions and enhancements.

The De-Luxe System is supplied with an Advanced User Manual, which goes into much greater detail than the EPROM's manual, including the generation of user windows (see accompanying photo). The screen shows five tasks running at once, each with its own 'window'. The largest of these contains the main system task, on which the machine can be used normally from the keyboard. The other windows contain four background programs running independently of the main task.

The Multi-FORTH 83 costs £45 + p&p + VAT with the De-Luxe System available on 40 or 80 track disc for £40 + p&p + VAT. *Skywave Software, 73 Curzon Road, Boscombe, Bournemouth, BH1 4PW. Tel: (0202) 302385.*

PLUG-IN TIME DELAY RELAY

A new Magnecraft plug-in time delay relay announced by Diamond H, provides independent controls for setting the timing of repeating cycle on and off operations.

Introduced as the class 222 time delay relay, this new and compact device carries UL recognition, and features a DPDT contact rating of 10A. Two timing controls are located on the relay housing and these may be manually set by the user. They provide for independent ON and OFF timing ranges from 0.1sec to 30min. The timing circuits are solid state, and thus offer excellent repeatability of 0.1%.

Other salient features of the class 222 time delay relay include operating voltages from 12 to 240V ac or 12 to 120V dc. The relay incorporates an octal plug base, the connections to which are annotated on the relay's casing. *Diamond H Controls Ltd, Vulcan Road North, Norwich, NR6 6AH. Tel: Norwich (0603) 45291/9.*

LINEAR POWER SUPPLIES WIN BT APPROVAL

The Coutant GPE range of linear power supplies have been approved by BT for 'user connected' equipment and conform to the Post Office Technical Guide 26. In addition, the GPE range conforms to British Standard 3861 (IEC 380) for electrical safety of office machines and, therefore, meets the requirements of the Health and Safety at Work Act.

The GPE series includes single and twin output units covering the range of one to fifteen amps at 5, 12, 15, 24, 28 and 48 volts. They have a universal input stage covering standard mains supplies from 110 to 240V at 48 to 65 Hz. Auto reset overload protection is standard and over-voltage protection is fitted to all 5V outputs. Over-voltage protection can be supplied as

an option for the other outputs.

Regulator performance is excellent, the output voltage changes less than 0.01% +mV for a 10% mains change and less than 0.03% from zero to maximum output.

Coutant Electronics Limited, Kingsley Avenue, Ilfracombe, Devon. Tel: (0271) 63781.

REPLACEMENT FOR THE NEON SCREWDRIVER

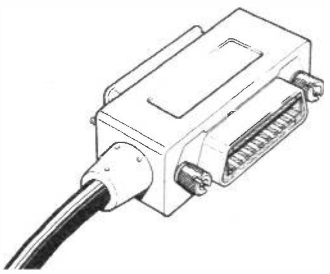
An electronic single-pole voltage tester, designed as an effective replacement for conventional neon voltage testers, is announced by Steinel (UK) Ltd. The Steinel Mono Check will give a bright, easily visible indication in virtually any circumstances, when voltage is detected. A special electronic sensing circuit overcomes the problems of neon types which can often be very difficult to see when the user presents a very high insulation to earth.

DIY enthusiasts will appreciate the tough, high quality construction of the Mono Check and the safety aspects of the design. The instrument retains the useful screwdriver blade design of conventional phase testers, which means that it is a welcome addition to any handyman's toolbox; particularly those who carry out maintenance on their household ring mains.

Voltage testing range is from 80 to 240V ac and there is a very generous overvoltage range of six times normal maximum (1500V). The Mono Check can be used in all situations in temperatures from -20 to +80 degrees C and in humidities up to 95%. The internal battery lasts for 3000 operations or up to one year's normal use.

Steinel UK Ltd, 17 Reddicap Trading Estate, Sutton Coldfield, West Midlands B75 7BU. Tel: 021-378 2820.

MOULDED CABLE ASSEMBLIES



Reliance Cords and Cables now offer, from stock, 100% tested moulded cable assemblies which enable interconnection of up to 15 programmable instruments in daisy chain or star configurations controlled by the IEEE 488 protocol.

The assemblies comply with the IEEE 488 specification and consist of a 23 core screened cable terminated at each end with moulded-on dual male/female connectors equipped with locking screws for rapid and secure connections.

They are available in standard lengths of 1, 2 and 4 metres from stock, as are small quantities of unterminated cable. Non-standard assembly lengths and bulk quantities of cable are available to order.

Reliance Cords & Cables Limited, Staffa Road, Leyton, London. Tel: 01-539 3620

LINE VOLTAGE CONDITIONER

Power International's line voltage conditioner is the ideal way to ensure stable, transient-free power from fluctuating and noisy supplies. Especially designed to protect all types of large sensitive equipment, the line voltage conditioner is ideally suited to prevent power problems such as wild fluctuations in input voltage, oscillatory transients caused by switching, voltage spikes, over and under voltage, common mode noise, transverse mode noise and RF interference.

Three models of the line conditioner are available, the LVC 20, LVC30 and the LVC 60 with maximum current capabilities of 0.83A, 1.46A and 2.50A respectively at 240V. The units all have a response time of 20ms and an output voltage regulation of ±0.5%. Capable of accepting an input voltage range of -25% to +15% at 240V, the conditioners have a flying lead input connection and a 13A socket output connection. Fuses protect the units against overload.

The line voltage conditioners come in attractively styled cases which are designed to blend in with existing office equipment and operate at an audible noise level of not more than 50dB.

Power International Ltd, 2A Isambard Brunel Road, Portsmouth, Hants PO1 2DU

INSPECTION ENDOSCOPE

A new concept in inspection endoscope has been translated into practical terms by FORT Ltd, the international fibre optic company with factories in UK, France and the USA.

They have introduced a 3.5mm endoscope that combines the flexibility of a fibre optic image guide with the protective quality of a stainless steel sheath. The result is a tough instrument which will not break or crease if used within its minimum bend radius of 700mm.

Known as the RA35 kit, the instrument includes a direct view endoscope with integral light guide of 2.4m length, and a flexible 360° rotator tube. This combination gives 90° (lateral) viewing, with complete 360° capability.

The instrument has many applications and can be used in any situation where tight radius bends are not encountered, but where resistance to harsh environmental conditions is necessary. The very small diameter also enables it to be used in a wide range of small bore environments, including the inspection of rifle barrels.

The endoscope is 800mm long but can be supplied in other lengths to special order. Variable focus is standard, as on all FORT instruments.

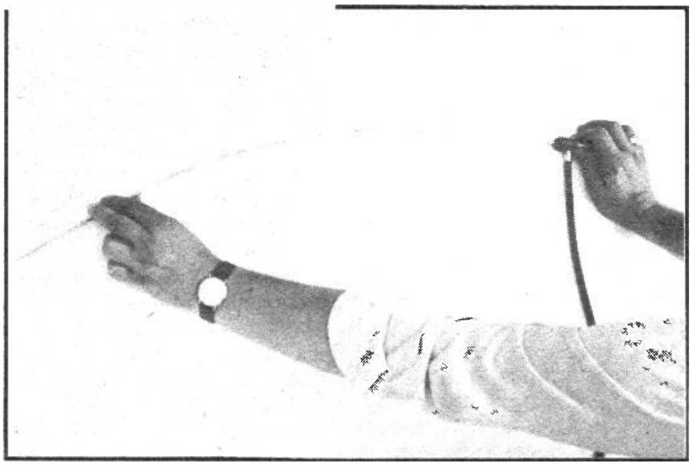
The RA35 kit is contained in a smart, sturdy wooden case and the outfit is available ex-stock at £1,821.

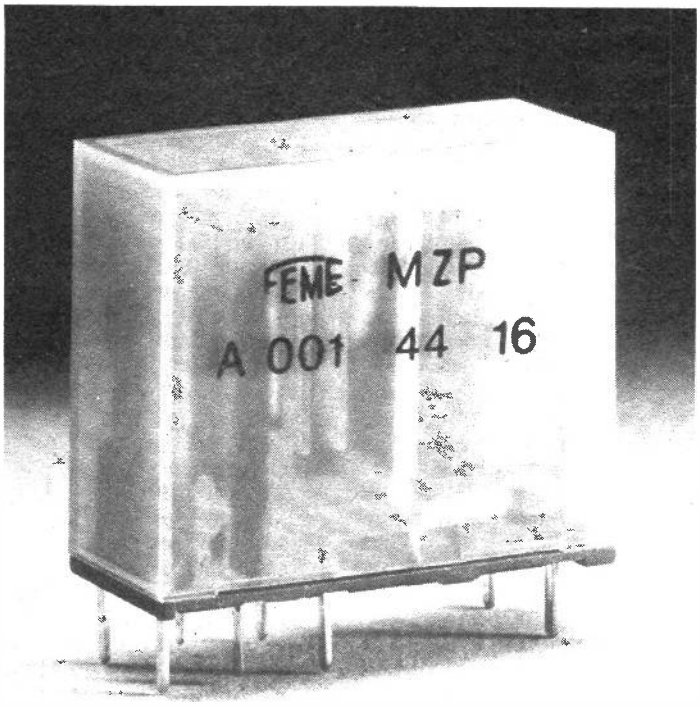
FORT Limited, Riverdale Estate, Vale Road, Tonbridge, Kent TN9 1SS. Tel: (0732) 366266.

16 AMP MINIATURE RELAY

Quiller Components Ltd is pleased to announce that its range of FEME MZPA/16 amp relays has obtained UL approval.

The relays are available with coil voltages ranging from 1.95 to 160V dc, and output contacts are rated at 16 amp/220V ac in single pole





normally open or single pole changeover versions.

FEME MZP relays are suitable for PCB mounting and offer 4KV-8mm insulation as standard with good sensitivity and high switching capability.

Sealed versions are available for use in flow soldering production facilities.

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

NEW FREQUENCY COUNTERS

Levell Electronics have introduced the METEOR range of frequency counters. There are 3 basic versions, MET100, MET600 and MET1000 for measurement of frequencies up to 100MHz, 600MHz and 1GHz. 'X' versions are also available fitted with temperature compensated crystal oscillators for improved accuracy.

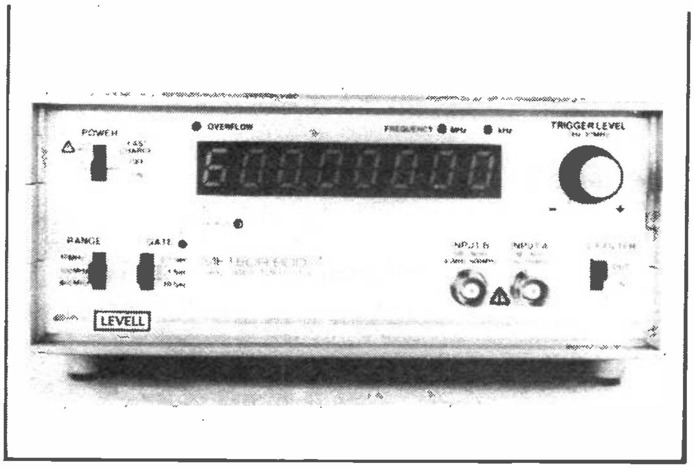
These counters have an 8 digit 0.5in LED display with automatic decimal point and overflow warning. Sensitivity is 5mV up to 1MHz and 50mV at 1GHz with resolution down to 0.1Hz. Mains input protection and a switched low pass filter are included.

A 10MHz crystal oscillator is used giving setability of <± 0.5ppm, temperature stability of <± 2.5ppm 10°C to 40°C and aging of <± 5ppm/year. The 'X' versions give improved setability of <± 0.2ppm, temperature stability of <± 0.5ppm 0°C to 40°C and ageing of <± 1ppm/year.

Power is supplied by rechargeable batteries or ac mains supply via a mains adaptor/charger unit.

A telescopic aerial is available to enable this portable instrument to be used for transmitter frequency measurement in the field.

Levell Electronics Ltd, Moxon Street, Barnet, Herts EN5 5SD. Tel: 01-449 5028, 01-440 8686.



PORTABLE CCTV

A portable CCTV surveillance kit 'Viguard' designed for temporary security, is now available from Pilkington Security Equipment.

The kit is quickly deployed and consists of a video camera, 7in screen monitor, interfaces and a power supply, all contained in 2 lightweight unobtrusive suitcases. A separate fibre-optic cable reel provides up to 1 km video transmission range.

Viguard is powered from a domestic 240V ac mains, or in remote areas can be powered from a car 12V dc supply, via the cigarette lighter socket.

The fibre-optic cabling gives clear transmission with good signal quality, it cannot be bridged, tapped or cut without detection and its freedom from EMI allows Viguard to be used in an electronically noisy environment.

Applications include surveillance of car parks, vehicle storage pounds, building sites, road works, retail locations and many other situations where a temporary link would be desirable from a cost, safety, security or control aspect.

Pilkington Security Equipment, Colomendy Industrial Estate, Rhyl Road, Denbigh, Clwyd, LL16 5TA.

'NAVY-SPECIAL' MOBILE ANTENNA!

Glenstar Electric Motors Ltd (part of the Psimat Group of Companies) based in Henley-on-Thames, have produced a range of compact and efficient HF mobile whip antennas for the amateur market, for 10m, 15m, 20m and 40m.

Development has taken place over the past 3 years and during all stages of this process tests have been carried out by radio amateurs, the results of which were most satisfactory. The small size of the resonator and whip (about 1.4m) gives a discreet looking antenna. With the Navy Special's low cost and the compactness of modern mobile HF rigs, more amateurs will surely be tempted into the fascinating world of mobile HF operation.

Glenstar Electrical Distributors Ltd, Newtown Road, Henley-on-Thames, Oxon RG9 1HQ.

HAND-HELD DIGITAL MULTIMETER

A new hand-held digital multimeter from Iskra, the Digimer 30, has a 3½-digit liquid crystal display and measures voltage, current and resistance values over 28 ranges. Its low power requirement stems from its CMOS circuitry and is provided by an inexpensive 9V battery. Automatic polarity, overranging, decimal point and battery state indication are features of this latest 'Digimer' model.

Other features include electronic overload (voltage and current) protection, shockproof construction, safe plastic casing, easy servicing (single printed circuit), and specially protected test leads. In addition, the reliability of this instrument is claimed to be outstanding.

Measurement ranges are as follows: Vdc: 200mV to 1000V; Vac: 200mV, 2V, 20V, 200V and 650V; current: 200μA, 2mA, 20mA, 200mA, 2A and 10A; resistance: 200Ω to 2000KΩ, and 20 MΩ.

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

LOW VOLTAGE SOLDERING IRONS

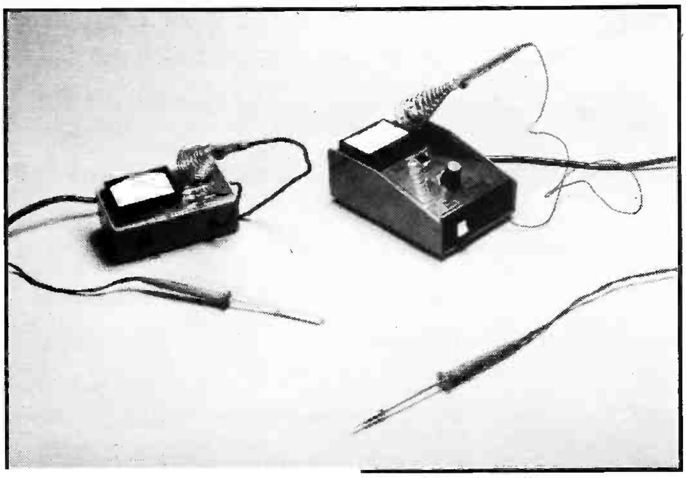
A series of miniature low voltage soldering irons, the Oryx Micro Series, has been introduced by Greenwood Electronics, the Reading-based electronics productions equipment specialists.

These professional irons, the smallest in the Greenwood 'Oryx' range, have been designed for intricate circuit work.

They provide maximum heat in a concentrated area and offer typical tip temperatures of around 320°C. Typical unit weight is only 4 grams.

The Oryx Micro soldering iron range includes 5, 6, 9, 11, 12, 18, and 25 watt models and operating voltages include 6, 12, 24 and 50 volts.

A power supply, station stand and cleaning facility, the Micro P6.6; offers 115/240 Vac mains operation and



delivers a safety isolated output for the 6V, 6W Micro iron.

A more elaborate version, the Micro PT6.6 variable temperature unit, is also available. With this unit the tip temperature of the iron can be controlled between 120°C and 400°C via a control knob on the base stand.

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

MULTIPLE TAG INSULATORS

A range of high quality multiple tag insulator assemblies, the 6X series, which can accommodate up to six banks of insulator tags in each assembly is available from Oxley.

High dispersion grade PTFE is used as the insulation medium and each bank can be supplied with the insulator in a different colour. Standard insulator colours are black, brown, red, orange, yellow, green, blue, violet, pink, grey and white. Each bank includes a special internal eyelet that inhibits rotation of the complete assembly.

Maximum current per terminal is 5A and working voltage is 3KV dc. Maximum capacitance to chassis or between banks is 2pF.

Terminations are silver-plated brass; the mounting screws are nickel-plated brass.

The 6X series meet the 56 day damp heat climatic category of IEC68 (IEC68: 55/200/56). Operating temperature range is -55°C to +200°C.

Oxley Developments Co Ltd, Priory Park, Ulverston, Cumbria LA12 9OG. Tel: 0229 52621.

NEWS DESK

Factfinder – a new information service

The business world is becoming more aware that efficient and speedy access to information of all kinds is a necessity in today's economic climate. The costs of setting up and maintaining a library or information unit can be prohibitive for many companies even though there is an obvious need.

In order to help them overcome this problem the Technical Information Service of GEC's Engineering Research Centre at Whetstone, Leicester is offering its wide experience in the information field to outside companies and individuals in the form of 'FACTFINDER'.

Factfinder comprises a number of information packages, the most comprehensive of which is the full subscription service. This keeps the subscriber up-to-date in selected fields of technology by way of a weekly information bulletin, a quick reference enquiry facility and access to the world's literature by an up-to-date computer link. Other packages on offer include newscuttings, supplied on a daily or weekly basis, information searching and retrieval on any subject and consultancy on all aspects of library and information work.

The Technical Information Service has been supporting a range of companies on the Whetstone site for 25 years and its professionally qualified staff have wide experience in all forms of information handling and retrieval. Comprehensive reference guides and special collections of books and journals on energy technology, engineering and computing are available, but enquiries can be undertaken on any subject.

For further information: *Factfinder, Technical Information Service, GEC Engineering Research Centre, Whetstone, Leicester, LE8 3LH, or telephone 0533 863434 ext 4672.*

British Amateur Television Club news

Congratulations are due to the Bristol TV Group G8GLQ/P for their win over G8DIR and G4CRJ in the British Amateur Television Club's Summerfun contest. Despite fairly awful radio and weather conditions everyone who took part had fun.

ATV operators should note the main contest of the year, the International ATV Contest, will be from 18.00GMT on Saturday 8th September to 12.00GMT on Sunday 9th September.

Amateurs who can receive ATV transmissions even on the domestic telly will find their reports very welcome!

Full details from *G Shirville, G3VZV, 18 Church End, Milton Bryan, Milton Keynes, Bucks, MK17 9HR.*

Ford engineers meet by satellite

Every working day, Ford engineers and executives in Germany and England 'meet' for face-to-face talks without ever leaving their own plants.

They are able to see and talk with colleagues, discuss pictures and graphics, and evaluate vehicle components in detail, by using Europe's first commercial application of international videoconferencing provided by British Telecom International's (BTI) Business Communications Service.

The system links, by satellite, two fully-equipped studios at Dunton in Essex and Cologne, West Germany.

The service is one of the first videoconferencing uses of transmission capacity on the European Communications Satellite (ECS1) and is installed on a trial basis until December this year.

Full audio and videoconferencing is available for one hour in the morning and one in the afternoon, five days a week.

Engineers and executives in the two countries can discuss and examine vehicle drawings, graphics, prototype parts and jointly review all forms of illustrative material, components or cars.

An immediate result of the new videoconferencing link has been the reduction in travel between the two Ford sites. Faster decision-taking and the ability to hold more such productive meetings has impressed Ford executives.

The two identical studios are equipped for seven people. Up to three people in each studio can appear 'on screen' at any one time.

In addition to facsimile and data links, each studio has an 'electronic chalkboard' and an array of cameras, one of which runs on a track, enabling the transmission of three-dimensional views of vehicle materials.

In addition to these two hours each day of videoconferencing, the studios can be used for six hours of audioconferencing.

BTI's Business Communications Service – established to design, install and support complex international communications on a total system basis – was retained by Ford of Great Britain to devise the entire package in the UK and Germany, including liaison with the German telecom authority.

The Business Communications Service mastered the link between the two locations, along with providing the codecs (coders/decoders) which convert signals into digital form and compress them into a fraction of the capacity normally needed for video transmission.

These codecs were developed at British Telecom's laboratories at Martlesham, Suffolk, in collaboration with six other European telecom administrations.

They are manufactured in the UK, under licence, by GEC Video Systems.

From Dunton, the signals are sent over a British Telecom MegaStream digital link to an international 'gateway' exchange, then to BTI's SatStream small-dish terminal near the South Bank, London, up to the ECS1 satellite. A similar small-dish in Cologne relays the signal to the Ford plant.

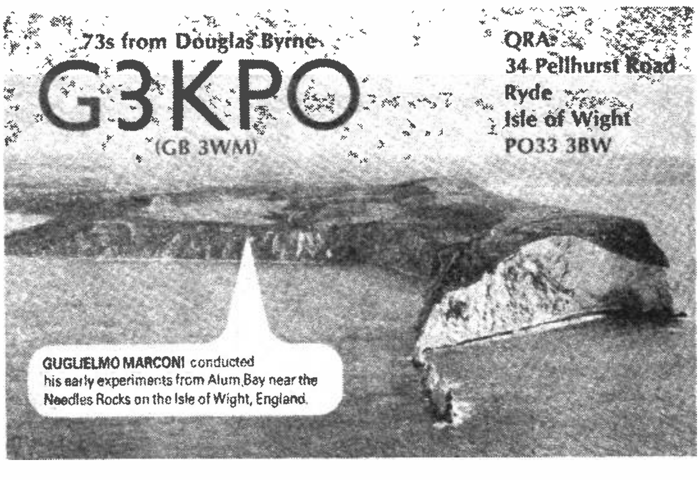
The Business Communications Service was established in 1983 to undertake the full responsibility of running and maintaining international telecommunications systems for major business houses using British Telecom International's knowledge of telecom practice in overseas countries, and is supported, on a contract basis, by PA Computers and Telecommunications (PACTEL).

National Wireless Museum

The wireless museum which is at present housed at Arreton Manor on the Isle of Wight will in future be known as the National Wireless and Communications Museum, thus considerably broadening its horizons.

This was decided at a meeting in Portsmouth, when it was also agreed to seek charitable status for the Museum.

Trustees appointed were Dr G Winbolt, Mr B Jenkins (Managing Director, Radio Victory), Mr T Howarth (Director of Portsmouth City



GUGLIELMO MARCONI conducted his early experiments from Alum Bay near the Needles Rocks on the Isle of Wight, England.

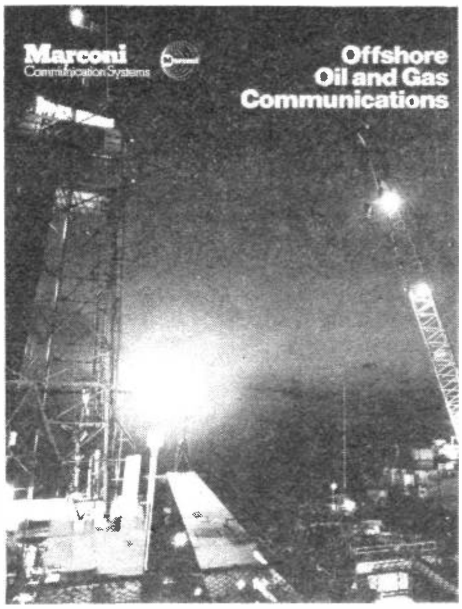
Museum), and Mr D Byrne (Curator).

A new organising committee was elected to replace the original one of the Wireless Preservation Society.

Arreton Manor is near Newport, IoW, and is open to the public from 10am to 6pm on week-days, and from 2pm to 6pm on Sundays.

Oil rig communication terminal

British Telecom International has placed an order, worth around £¼million, with Marconi Communications Systems Ltd, of Chelmsford, for tropospheric scatter communication equipment to be used at the Row Brow shore station near Scarborough for radio communication with the Esmond platform in the North Sea.



British Telecom International will handle the civil engineering work, provide some of its own equipment and be responsible for integrating the system into the national network.

Marconi will provide two high power amplifiers (HPA) with drives, and quadruple diversity receivers, to give an FM/FDM system with a 72 channel capacity.

Tropospheric scatter, or transhorizon radio communications, depend upon high power microwave radio signals beamed into the troposphere to become scattered by atmospheric turbulence so that a small but still usable signal reaches the receiving antenna.

Additionally, the company will supply supervisory units plus the personnel to install and handle the commissioning of the shore to platform link. Although not responsible for the total system, Marconi will guarantee the communication link performance.

Schedules

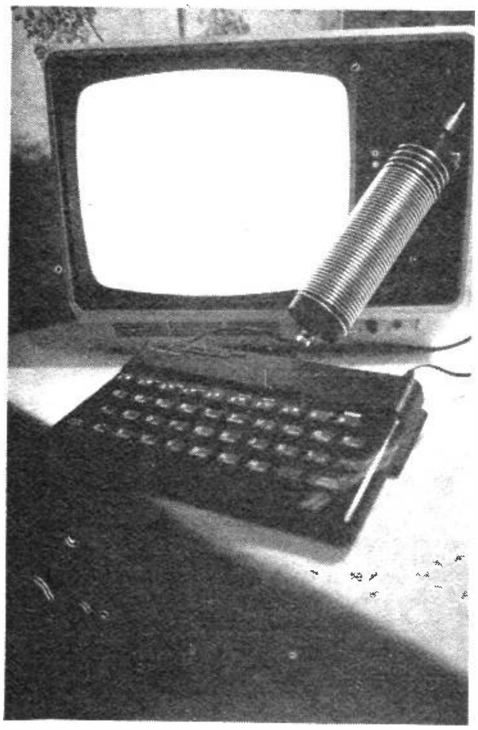
The German Shortwave Press Service ('Kurzwellen-Pressedienst') which was formed in 1981 publishes a new weekly bulletin called 'Schedules'. The bulletin with an average of six pages contains the latest frequency and programme schedules of all radio and TV stations in the world (each Wednesday).

The subscription rates are: world-wide via surface post 58 IRC pa, world-wide via air mail 78 IRC pa or the equivalent in any currency; German Post Office Account: Postgirokonto D-3000 Hannover, Code No: 250 100 30, (Giro Account No: 942 01-306).

A sample copy is available for 2 International Reply Coupons from Shortwave Press Service, *Rainer Pinkau, Weender St 30, D-3400 Goettingen 1, West Germany, Tel: FRG 0551/551 21.*

COMPUTING INDUCTANCES

by Jeff Howell G4BXZ and Brian Kendal G3GDU



To the average amateur, the winding of coils for home-built equipment is really a bit of a hit-or-miss affair. Many old timers, however, seem to have the ability to look at a coil, sniff twice in the air and say: 'I reckon that will just about tune eighty' – and be right.

This, though, is a result of many years constructional experience and even then, if presented with a coil of unusual diameter or wound with a much thicker or thinner gauge wire than usual, the OT will quite likely be hopelessly wrong.

As a consequence, over the years many constructors have preferred to purchase ready wound coils – from the Eddystone and Wearite ranges available just after the war and the Denco and Electroniques coils of the fifties to the Toko range today.

Commercially wound coils, however, can be expensive and if the equipment is being constructed 'from the junkbox', may add considerably to the final cost. What alternative options are therefore available?

The first possibility is that the equipment under construction is being made to a published design, in which case the coil data should be supplied. But what if the prescribed diameter coil formers or the correct gauge wire is not available?

The second possibility is to search through old magazines or handbooks and use the coils described for a broadly similar circuit. For this, however, a large and comprehensive library is necessary to ensure even a moderate chance of success.

The third method is to delve into the text books and calculate the values required. This again gives the choice of three options: pencil and paper, a nomogram or a suitable computer program.

A standard formula for the number of turns necessary for a coil of given inductance is:

$$N = \frac{\sqrt{\dfrac{L\,(457.2d + 1016l)}{MU}}}{d}$$

where: N is the number of turns; L is the inductance required; MU is the permeability of the core; d is the internal diameter; l is the length in mm.

On inspection of this formula, a mathematical difficulty is immediately apparent. To calculate the number of turns, the length of the coil must be known, but how can this be known before the number of turns has been calculated?

The usual subterfuge is to make an intelligent guess for a value of length, and then do the calculation. The number of turns calculated, a suitable wire gauge and turns spacing can be selected.

```
10 REM COIL TURNS CALCULATOR
20 REM J.M.HOWELL JUNE 1984
30 DIM X(9)
40 CLS
50 PRINT
60 PRINT TAB(5);"COIL TURNS CALCULATOR"
70 PRINT
80 B$=""
90 RESTORE
100 FOR I=1 TO 4
110 GOSUB 570
120 NEXT I
130 PRINT "INDUCTANCE KNOWN? (Y/N)"
140 INPUT C$
150 IF C$="N" THEN GOTO 180
160 GOSUB 570
170 GOTO 230
180 READ A$,LO,HI
190 FOR I=6 TO 7
200 GOSUB 570
210 NEXT I
220 X(5)=25330/X(6)/X(6)/X(7)
230 T=1.1312^X(2)/11.76
240 IF X(2)>24 THEN T=T*.967^(X(2)-24)
250 S=X(3)+1
260 D=X(1)+1/T
270 N=D*T/S
280 FOR I=1 TO 10
290 N=SQR(X(5)/X(4)*(457.2*D+1016*N*S/T))/D
300 NEXT I
310 X(8)=N
320 X(9)=S*N/T
330 RESTORE
340 CLS
350 FOR I=1 TO 9
360 GOSUB 550
370 NEXT I
380 PRINT
390 IF X(9)>D*4 THEN PRINT "!! TOO LONG !!"
400 IF X(9)*4<D THEN PRINT "!! TOO SHORT !!"
410 PRINT
420 PRINT "STOP NOW? (Y/N)"
430 INPUT A$
440 IF A$<>"Y" THEN GOTO 40
450 STOP
460 DATA "COIL INSIDE DIA. (MM)",1,300
470 DATA "WIRE GAUGE (SWG)",8,42
480 DATA "WIRE SPACING (0=NONE)",0,5
490 DATA "FERRITE MU (AIR=1)",1,100
500 DATA "INDUCTANCE (UH)",0.01,10000
510 DATA "FREQUENCY (MHZ)",0.01,1000
520 DATA "CAPACITY (PF)",0.1,100000
530 DATA "COIL TURNS",0,0
540 DATA "LENGTH (MM)",0,0
550 B$=" = "+STR$(X(I))
560 PRINT
570 READ A$,LO,HI
580 PRINT A$;TAB(22);B$
590 IF B$<>"" THEN RETURN
600 INPUT C$
610 IF LEN(C$)=0 THEN GOTO 630
620 IF C$="0" OR VAL(C$)<>0 THEN X(I)=VAL(C$)
630 IF X(I)<=HI THEN GOTO 680
640 CLS
650 PRINT
660 PRINT "TOO HIGH - LIMIT =",HI
670 GOTO 580
680 IF X(I)>=LO THEN RETURN
690 CLS
700 PRINT
710 PRINT "TOO LOW - LIMIT=",LO
720 GOTO 580
```

COMPUTING INDUCTANCES

If for any reason a 'silly' result is obtained (such as a 1KW tank coil using 42-gauge wire), another calculation using an alternative value for 'I' will have to be made. In all, this method can tend to be both time consuming and laborious.

The second method is to use a nomogram. This can be quite quick and efficient but, like most graphical methods, requires a certain experience to give an accurate result.

The third method in this modern age is to use the digital dexterity of the home microcomputer equipped with a suitable program.

The program

The program described in this article is designed to calculate the number of turns necessary for a coil of given inductance, or if the value of the required inductance is not known, derive this from the resonant frequency required, and the parallel capacity.

The program will calculate to an accuracy of better than 5% within the limits of the formula, and give indication when these limits have been exceeded.

The language used is standard Microsoft Basic and the program has been successfully run on BBC B, Oric and Sanyo computers.

Furthermore, it may be easily modified to 'Sinclair' Basic for Spectrum machines. Doubtless many other machines will be equally suitable.

Finally, being fully aware that the longer the listing the greater the possibility of inadvertent error, two measures have been taken to guard against this. Firstly, the program has been 'pruned' to minimum length, even at the expense of slightly greater complexity and, secondly, a series of test calculations have been devised which will thoroughly check all aspects of the program.

If, after keying in the listing, the test calculations can be successfully performed, it can be confidently assumed that the program is error-free and is ready for use.

Using the program

If, after the program is loaded, the 'RUN' instruction is given, the screen will clear and the user will be asked to input certain parameters of the coil required such as inside diameter, wire gauge, wire spacing and permeability of the core.

This complete, the user is then asked if the required inductance is known. If so, it is entered. If not, the frequency of operation and the parallel capacity are requested.

During this sequence each figure is compared with predetermined limits to ensure that the validity of the formula will not be compromised. Despite this, it is possible for an answer to be derived which is, in itself, beyond the limit of accuracy of the calculation.

In such a case, although the answer will be printed, this will be accompanied by an appropriate warning such as 'TOO LONG' or 'TOO SHORT'.

Program checks calculations

```
Coil inside dia (mm)      = 25
Wire gauge (SWG)          = 34
Wire spacing (0=none)     = 0
Ferrite mu (air=1)        = 5
Inductance (µH)           = 20.6776
Frequency (MHz)           = 3.5
Capacity (pF)             = 100
Coil turns                = 9.51218
Length (mm)               = 2.36637
!!TOO SHORT!!

Coil indide dia (mm)      = 10
Wire gauge (SWG)          = 22
Wire spacing (0=none)     = 0
Ferrite mu (air=1)        = 1
Inductance (µH)           = 1
Frequency (MHz)           = 0
Capacity (pF)             = 0
Coil turns                = 10.765
Length (mm)               = 8.40534

Coil inside dia (mm)      = 12.5
Wire gauge (SWG)          = 25
Wire spacing (0=none)     = 1
Ferrite mu (air=1)        = 1
Inductance (µH)           = 1.1
Frequency (MHz)           = 0
Capacity (pF)             = 0
Coil turns                = 10.8593
Length (mm)               = 12.1152

Coil inside dia (mm)      = 12.5
Wire gauge (SWG)          = 12
Wire spacing (0=none)     = 1
Ferrite mu (air=1)        = 1
Inductance (µH)           = .46
Frequency (MHz)           = 0
Capacity (pF)             = 0
Coil turns                = 12.0153
Length (mm)               = 64.3721
!!TOO LONG!!
```

The operator is then asked whether a further calculation is required. If it is, the program is re-run. In such circumstances certain parameters, such as wire gauge or coil diameter, may remain constant. If, when these are requested, the RETURN key is pressed, the computer will assume the previous value, thus obviating re-entry.

Note: If, after a calculation in which the required inductance has been derived from frequency and capacity, the inductance is specified in the succeeding calculation, the frequency and capacity previously specified will be displayed in the print out. These figures, however, will be meaningless and will in no way affect the accuracy of the computation.

Operation of the program

Although a detailed knowledge of the program is not necessary for its use, a few notes about its operation may be of interest.

The first action of the program is at line 30 where a 'workspace' of 9 variables (X(1) to X(9)) is defined by use of the DIMENSION instruction. Lines 40 to 70 then cause the heading to be printed on the screen.

Line 80 (B$="") is inserted to remove any value for B$ which may be remaining from a previous calculation, but has no effect during the initial input phase of the program.

Lines 100-120 enable the program to request the first four lines of data (lines 460 to 490) by means of the input/output sub-routine, which starts at line 570. This sub-routine also ensures that the figures entered are within predetermined parameters.

The computation mode of the program is defined at lines 130 to 150. This either reads the required inductance directly or calculates it from the resonant frequency and capacity. In the former case, line 160 is merely a continuation of the sequence in lines 100 to 120.

Before the frequency and capacity can be entered (at lines 190 to 210), the program must issue a dummy read instruction (line 180) which makes no use of the information but merely serves to move the internal data pointer forward one line and allows the next input action to use the next two data statements at lines 510 and 520.

With the frequency required and parallel capacity now defined, the necessary inductance is calculated at line 220.

On lines 230 and 240 the wire gauge is converted to 'closewound turns per millimeter' using an empirical formula which is accurate to better than 5%, whilst on line 260 the mean diameter of the coil is determined from the inside diameter and the diameter of the wire.

The calculation of the number of turns of wire necessary to achieve the required inductance is on lines 270 to 300, with the answer being associated with the appropriate data statement at line 310 and the length of the coil calculated at line 320.

Line 330 then sets the internal data pointer back to the top of the data list (ie line 460).

The complete list of data, which has either been provided by the user or calculated within the program, is then printed by the action of lines 340 to 380.

The ratio of length to diameter is next examined in lines 390 and 400 and if the result is outside the limits of accuracy of the formula used in the calculation, an appropriate warning is given.

In conclusion, the user is given the option of a further calculation at lines 420 to 440 and if this is not taken up, the program stops at line 450.

Future programs

This is the second in a series of 'engineering' programs which will appear in ***R&EW*** over the next few months. These will all be written in standard Microsoft Basic so as to be compatible with the majority of home computers.

It is hoped that the use of these programs will considerably simplify the design of home built equipment.

. . . DATA FILE

Statistics show that the average citizen has a one-in-four chance of being burgled, beaten up, or burnt in his own home. These odds, however, can be improved by fitting a well thought out electronic home-security system.

'Home security' is a fairly large subject. To understand it, you need to first know the basic principles of security system installation and of 'crook psychology'.

Basic precautions

The disasters most likely to strike at home are fire, thuggery, and burglary. Most home fires are caused by lighted cigarettes or pieces of smouldering coal/coke/wood falling onto rugs, by over-heated electrical appliances, or by carelessly placed tea cosies or tea towels igniting from the heat of gas pilot jets, etc.

The first line of defence against fire is common sense, and the second a fire alarm system. The latter can be a sophisticated affair, including smoke and gas detectors, or a simple outfit consisting of a number of normally-open thermostats, all mounted at ceiling height and connected in parallel, and arranged so that they complete an alarm circuit if any of them close, as shown in *Figure 1.*

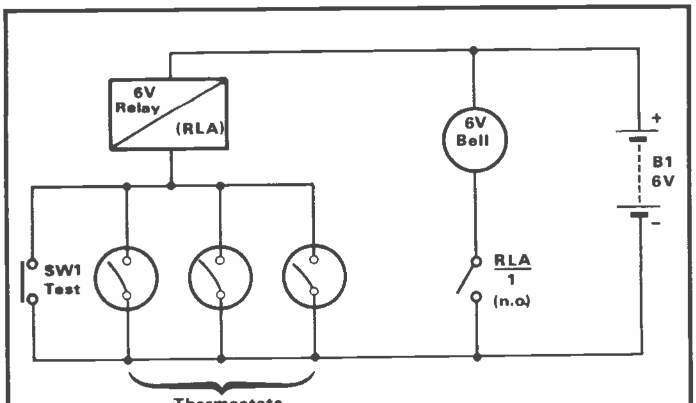


Fig 1 *Relay aided fire alarm using thermostat temperature sensors*

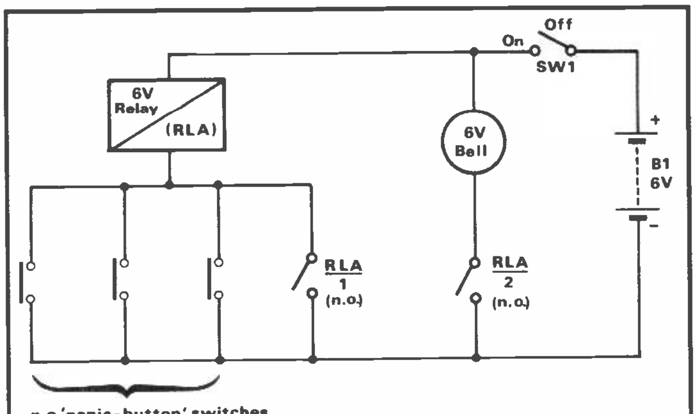


Fig 2 *Simple self-latching 'panic' alarm*

Any fire alarm system is better than none at all, provided that it is reliable, and a simple thermostat type can easily be used in conjunction with most types of burglar alarm system.

Thuggery prevention

Thuggery is a very real menace to the householder. An attack usually occurs when someone in the home opens the front door in response to a call; or it happens shortly afterwards when entry has been gained on the pretext of reading a meter or selling something. Occasionally, the attacks occur late at night following a break-in.

The first line of defence against this threat is common sense and, possibly, a 'spy hole' device and a security chain fitted to the front door.

An excellent second line of defence is a permanently armed system of 'panic' buttons positioned close to likely attack points (front and rear doors, the TV lounge, and the main bedroom) and arranged to operate a self-latching alarm when they are momentarily activated (see *Figure 2).* The 'panic' buttons are ordinary, normally-open, push-button switches. A simple 'panic' system of this kind can easily be used in conjunction with most burglar alarm systems.

Burglary prevention

Any burglar alarm system can be broken down into three basic 'building blocks', as shown in *Figure 3.* The first of these can be regarded as the 'sensor' mechanism, which detects an actual (or 'possible') intrusion at one or more protected points of the house, and sends some kind of signal to the 'control centre' block.

The control centre tests the sensor signals, checks them for validity, and activates the alarm-call generator (an electronic or electro-mechanical siren, etc) when appropriate.

Four basic alarm systems are available,

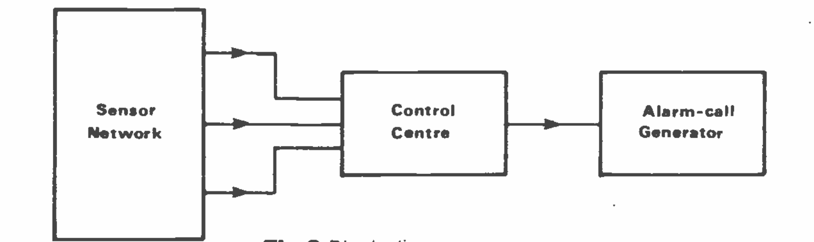


Fig 3 *Block diagram*

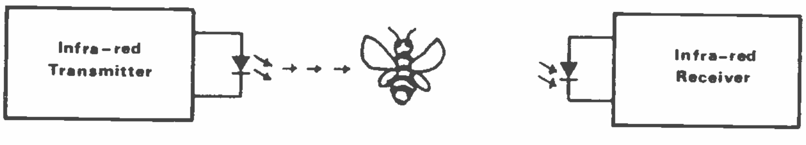


Fig 4 *Single beam infra-red alarm system*

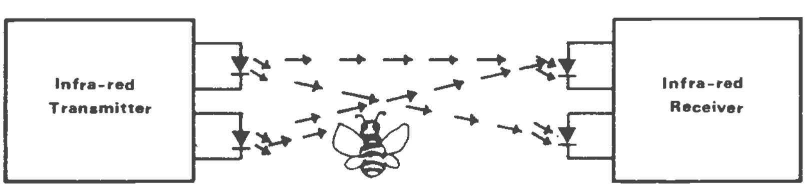


Fig 5 *Dual beam infra-red alarm system*

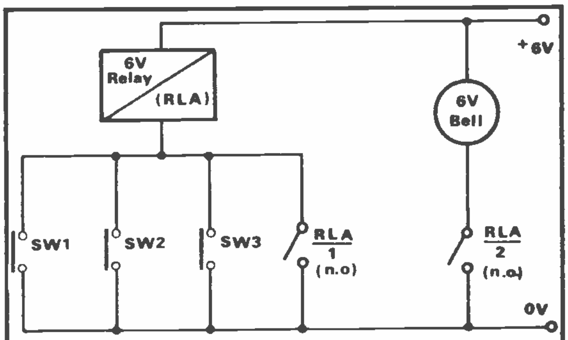


Fig 6 *Simple alarm circuit with n-o switches*

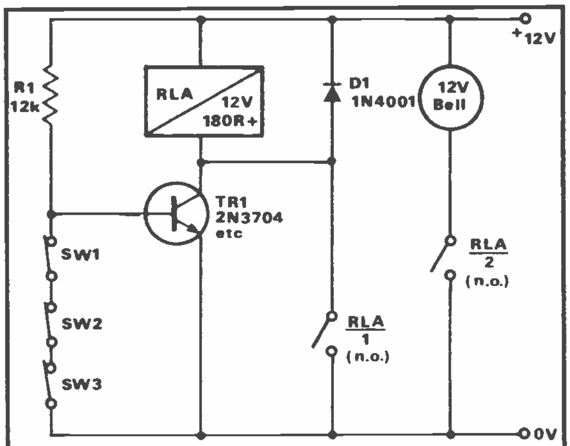


Fig 7 *Simple alarm circuit with n-c switches*

these being the 'radar' type, the ultrasonic type, the infra-red 'light-beam' type, and the 'microswitch' type.

The most important parameter of any system is its reliability or immunity to false alarms, and it is unfortunate that many 'sophisticated' systems have a very poor reliability rating. Any system that gives frequent false alarms (99% of all burglar alarm soundings are false) will be ignored by both the police and its owner, and is thus virtually useless.

Many systems can be false-triggered by electrical interference from lightning or nearby electric motors, etc.

The radar-type generate a microwave field over the whole house, and activate the alarm when that field is disturbed. Unfortunately, these systems can sometimes be false-triggered by large vehicles passing the house, and may thus have a poor reliability rating.

Ultrasonic alarms are usually designed to protect an individual room. They generate an ultrasonic field and sound an alarm if a physical movement within the room causes a significant doppler shift within the field. Some of this type can be false-triggered by draughts, by the fluttering of curtains or drapes, or by the movements of insects close to the ultrasonic sensors, etc.

Infra-red (IR) 'light-beam' types of alarm normally give protection along an invisible 'line-of-sight' beam, and activate the alarm if the beam is broken by a physical object. Most use a single beam, and can easily be false-triggered by insects passing through the beam, as shown in *Figure 4*.

A few IR alarms use a 'dual' beam, as in *Figure 5*, and activate only when both beams are broken simultaneously. These beams are separated by 10 to 25cm, and the alarm can thus not be false-triggered by a small insect breaking one of the beams.

The most popular type of burglar alarm system uses electro-mechanical 'switches' as sensors. These may take the form of microswitches or reed-relays connected to doors and/or opening windows, or pressure-pad switches hidden under carpets.

The sensor switches may all be of the normally-open (n-o) type which close when activated, or of the normally-closed (n-c) type which open when activated, or they can be a mixture of the two.

If normally-open switches are used in all sensor positions, a self-latching burglar alarm can be made by wiring all switches in parallel and connecting them to the alarm bell via a relay, as shown in *Figure 6*.

This type of circuit may use a great deal of sensor-to-alarm wiring, but has the advantage of consuming zero standby current from its supply battery.

If normally-closed switches are used in all sensor positions, a self-latching burglar alarm can be made by wiring all switches in series and connecting them to the alarm bell via a transistor-aided relay, as shown in *Figure 7*. This 'electronic' type of circuit uses a minimum amount of sensor-to-alarm wiring, but has the disadvantage of consuming a quiescent current of 1 mA via R1-Q1 (in practice, this current can be reduced to a negligible value by using a more elegant relay-driving system). Note that the above circuit can easily be modified to also act with normally-open switches, as shown in *Figure 8*.

In a practical contact-operated alarm system, the sensor switches actually connect to the input terminals of a 'control centre', which houses the electronics and the battery, plus a number of switches that enable different parts of the system to be turned on or off, or to be tested.

The centre should ideally be housed in a burglar-proof box and be provided with a key-type on/off switch.

Figure 9 shows a typical control-centre instrument panel, with six control switches. Switch S1 is the main on/off switch, and is of the 'key' type. Push-button switch S2 enables the alarm bell (and thus the battery) to be given a functional check.

The remaining four switches are 'toggle' types, and allow various sensors to be enabled or disabled within the defence system.

Figures 10 and 11 show the connections for turning individual sections of the alarm sensor network on and off. Series-connected normally-closed sensor networks can be enabled or disabled by wiring them in parallel with S1, as shown in *Figure 10*. The sensors are enabled when S1 is open, and are disabled when S1 is closed.

Parallel-connected normally-open sensor networks can be controlled by wiring them in series with S1, as shown in *Figure 11*. The sensors are enabled when S1 is closed, and are disabled when S1 is open.

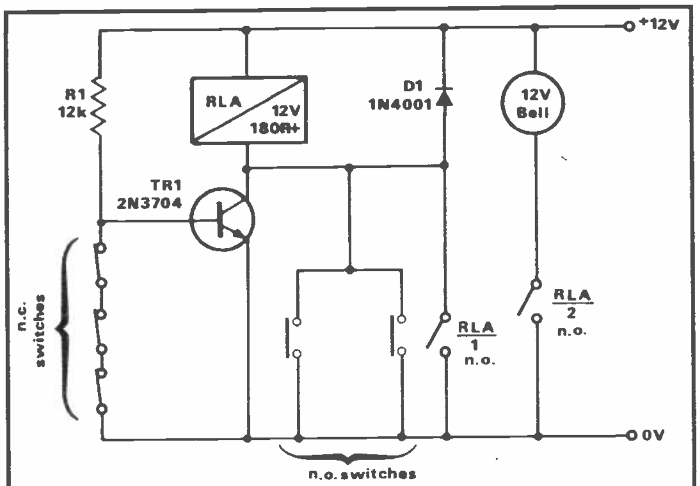
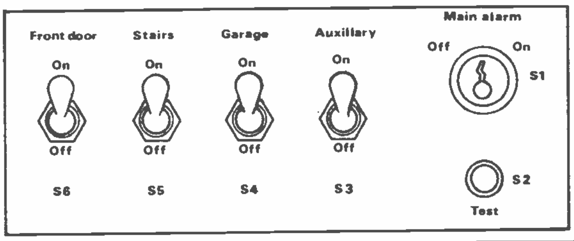


Fig 8 Alarm circuit using n-c and n-o sensor switches

Fig 9 Typical control-centre instrument panel



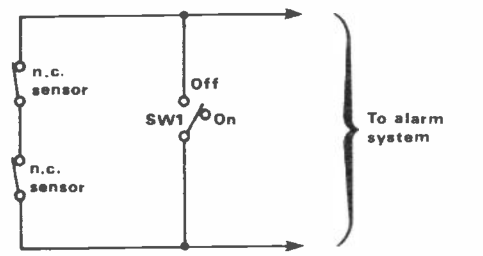


Fig 10 Method of enabling and disabling series-connected n-c sensor switches

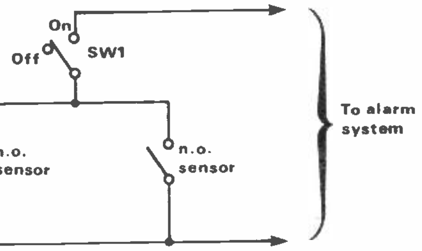
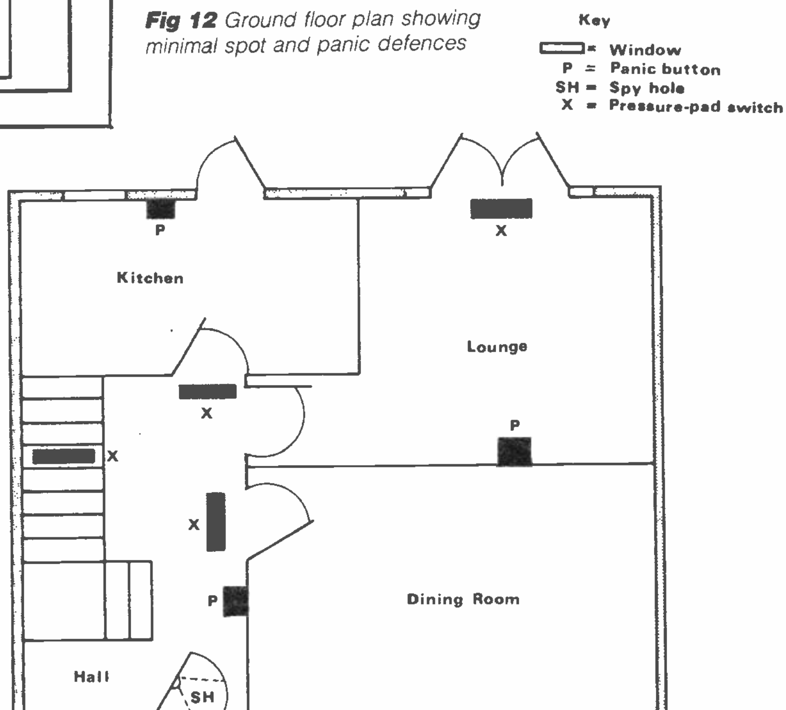


Fig 11 Method of enabling and disabling parallel-connected n-o sensor switches

Fig 12 Ground floor plan showing minimal spot and panic defences



Planning a system

The most popular type of burglar alarm system is that based on the use of switch-type 'contact' sensors. Let's look at the actual techniques of planning the installation of such a system in a house.

Any building can, for our present purposes, be regarded as a box that forms an enclosing perimeter around a number of interconnected compartments. This perimeter 'box' is the shell of the building, and contains walls, floors, ceilings, doors and windows.

To commit any crime within the building the intruder must break through the perimeter, which thus forms the owner's first line of defence.

Once an intruder has entered the building he can move from one room or 'compartment' to the next only along paths that are pre-determined by the layout of internal doors and passages.

In moving from one compartment to the next he must inevitably pass over or through certain 'spots' in the building, as is made clear in *Figure 12*, which shows the ground-floor plan of a medium-sized mid-terrace house. Thus, to move between the kitchen (a likely break-in area) and the lounge he must pass through three 'spots' comprising the kitchen door, adjacent point 'X', and the lounge door. These typical 'spot' points form the owner's second line of defence.

The house owner can thus obtain protection by using full or partial 'perimeter' defence, or by using 'spot' defence, or by using a combination of these two methods.

'Perimeter' defence sensors include microswitches or reed-relay/magnet combinations which can be fitted to external doors and windows, and window foil which can be fitted to the glazing on external doors, windows, and skylights.

'Spot' defence sensors include pressure-pad switches that can be fitted under rugs or carpets, microswitch or reed-relay/magnet door switches, and 'baited traps' comprising an attractive item (such as a clock) placed on top of a concealed microswitch that activates when the item is removed.

When planning the installation, the house owner must try to think like a burglar. Normally, the thief enters a house from an easy access point that is obscured from the view of the neighbours, ie, a back door or window.

Often, he breaks in using tools taken from the owner's shed or garage, so these two places should be included in the owner's defence system.

Invariably, the burglar's first action on entering the property is to secure a rapid escape route, ie, to open the back door. He then starts hunting for stealable goods.

Two examples

Figures 12 and 13 show alternative ways of installing security defence systems in the ground floor of a medium-sized mid-terrace house.

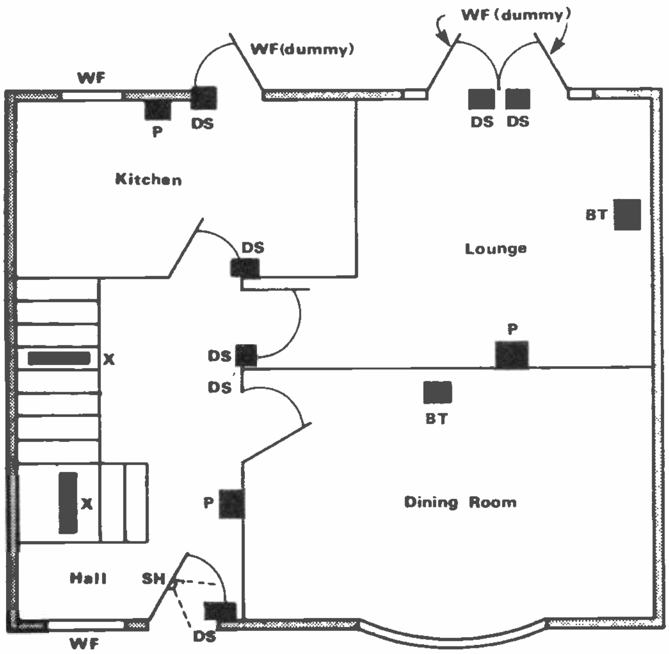


Fig 13
Ground floor plan showing high level perimeter and spot defences

Key
= Window
BT = Baited trap
DS = Door switch
P = Panic button
SH = Spy hole
WF = Window foil
X = Pressure-pad switch

Fig 14 *Reed-relay/magnet combination to form a door activated switch*

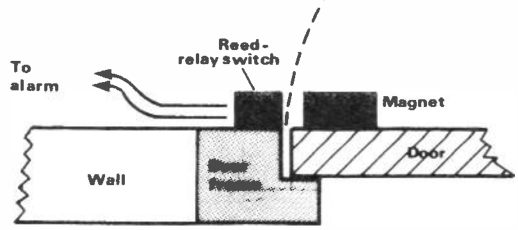


Fig 15 *Simple self-latching alarm*

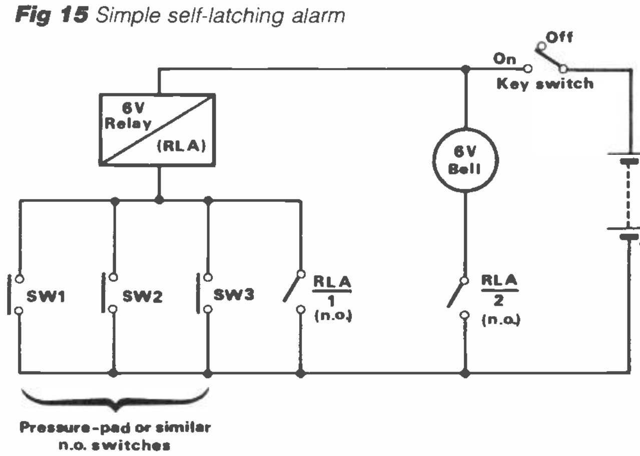
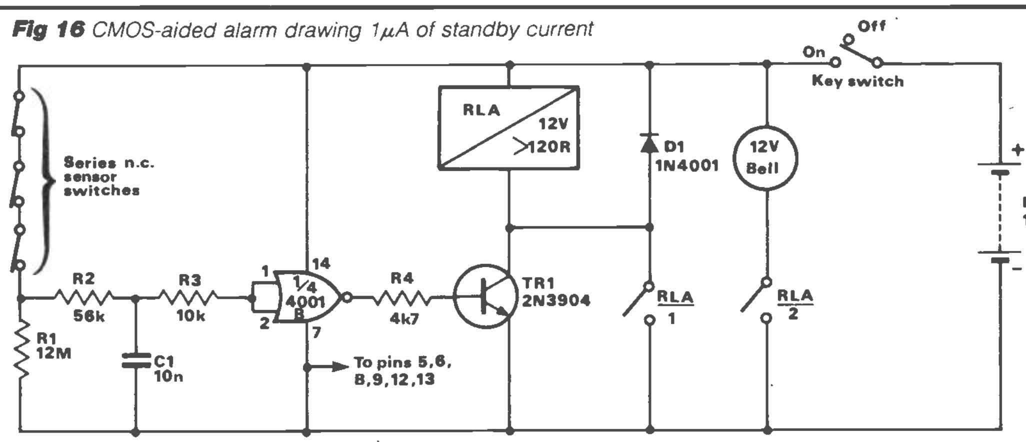


Fig 16 *CMOS-aided alarm drawing 1μA of standby current*



In both cases anti-thuggery protection has been obtained by installing a 'spy hole' device in the front door, and by fixing *'panic'* buttons at three likely attach points. The two houses differ considerably, however, in their methods of burglary protection.

In the case of *Figure 12* the owner has reasoned that a burglar is most likely to enter the house via the French windows of the lounge, or via the kitchen door or window.

If he enters via the French windows he will be detected via a strategically placed pressure pad (hidden under a mat or carpet), but if he enters via the kitchen he will find nothing worth stealing so will open the kitchen door into the hall, where he will subsequently be detected via another hidden pressure pad.

In the unlikely event that the burglar enters the house from the front, he will eventually be detected via a pressure pad located in the hall, adjacent to the dining room door, or via a small pressure pad placed on the stairs.

Note that this house owner has made no attempt to keep the burglar out of the house, but has used 'spot' defences to detect him once he has entered. This simple type of installation is highly cost-effective, and gives a reasonably high degree of protection.

By contrast, the house in *Figure 13* uses an extensive perimeter and spot defence system. Its owner has decided to try to scare off potential burglars by fixing clearly visible window foil to selected areas of glazing at the front and rear of the house. Some of this foil is genuinely connected into the alarm system, and some is 'dummy'.

All external and internal doors are protected by door switches, and two pressure pads are placed on the stairway. Additionally, baited traps are placed in the lounge and dining room. This house has excellent protection.

Installation notes

Pressure pads come in the form of small 'mats;' they are excellent 'spot' defence devices that are easily hidden under rugs. Both standard and stair types are available.

Note, however, that they are fairly sensitive and can easily be set off by large cats and dogs; if you own one of these animals, make sure it is confined to a sensible area when the pressure pad is enabled.

Window foil is an adhesive-backed aluminium strip that bonds to glazing. It couples into the alarm system via special connector blocks. The strip breaks when a window is shattered.

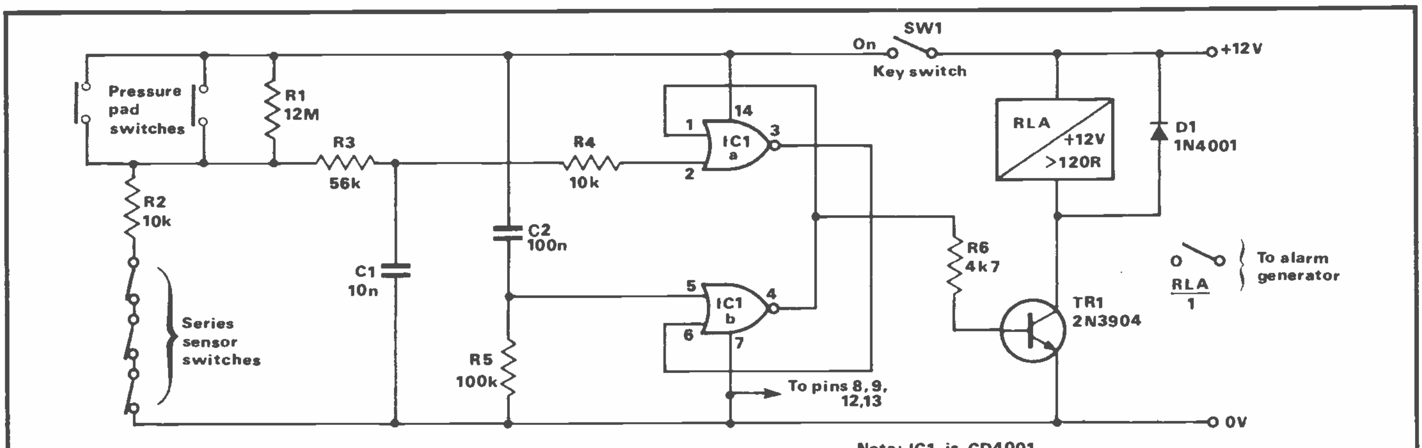
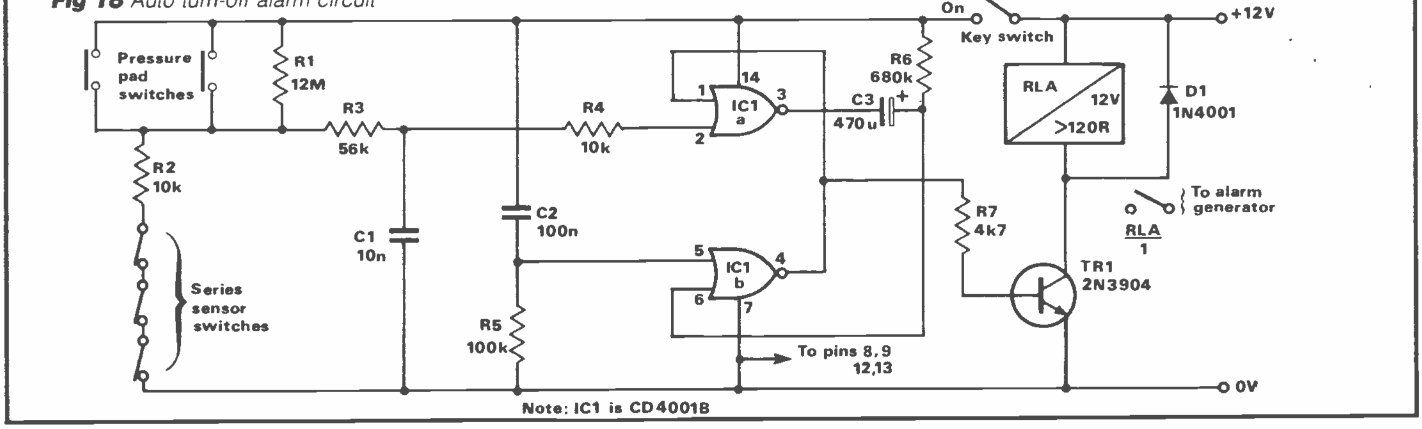


Fig 17 *Simple self-latching alarm circuit*

Fig 18 *Auto turn-off alarm circuit*



Door/window switches usually come in the form of a reed-relay/magnet combination. The magnet is installed in the edge of the door or opening window, opposite the reed-relay that is installed in the frame, as shown in *Figure 14.* When the door/window is closed, the adjacent magnet holds the reed-relay in one switch mode; when the door/window is opened, the magnet moves away from the reed-relay, causing it to switch to the alternative mode.

Most commercial units of this type have two sets of output wires in the reed-relay unit, one set giving normally-open operation and the other giving normally-closed operation.

When you plan your installation, don't forget to make some provision for by-passing the front door protection system, so that you can leave and re-enter the house without sounding the alarm.

Also, remember to protect your shed and/or garage. Keep all wiring neat and concealed, and thoroughly test each section of the wiring as it is installed.

If possible, fit your system with both internal and external alarm bells or sirens. The external unit should be mounted in a prominent position at the front of the house, where it will act as an excellent burglar deterrent: special weatherproof alarm-bell housings are readily available.

Home-security circuits

We have already looked at some very simple burglar alarm circuits in *Figures 6 to 8*. In reality, these circuits need some degree of modification before they can be used as practical burglar alarms. The *Figure 6* circuit, for example, needs to be provided with an on-off key switch, to enable the circuit to be 'unlatched' once it has been activated, as shown in *Figure 15*.

A major defect of the *Figure 7 and 8* circuits is that they each consume a quiescent current of 1mA via the R1-Q1 relay-driving circuitry. This snag can be overcome by increasing the value of R1 to 12M and using a CMOS inverter stage as a buffer between R1 and the input of Q1, as shown in *Figure 16*. This circuit consumes a quiescent current of a mere 1μA.

Note the use of C1 and R2 in this circuit: in practical installations many metres of wire are used to interconnect the series sensor switches and this wire tends to pick up spurious pulses and signals, particularly during thunderstorms. C1-R2 form a simple low-pass filter that helps reject these signals, and thus helps improve the system's immunity to false-triggering.

Note that the *Figure 15 and 16* circuits each use a set of relay contacts (RLA/1) to provide self-latching action. An alternative technique is shown in the circuit of *Figure 17*.

In this case the self-latching action is performed by the IC1a-IC1b bistable circuit. C2 and R5 cause the bistable output to latch low at the moment that key-switch SW1 is first closed.

If any of the sensor switches are subsequently activated they cause a 'high' signal to be fed to pin 2 of the bistable (via the R3-C1 low-pass filter), which then latches into high-output state and turns on Q1 and RLA. Relay contacts RLA/1 are used to activate an external alarm generator.

Note in the *Figure 17* circuit that R2 is wired in series with the series sensor switches, thereby enabling the circuit to be activated by either the series switches or by paralleled pressure-pad switches wired across R1.

This circuit thus makes a very versatile burglar alarm; ideally, the external alarm generator should be powered by its own battery supply.

Figure 18 shows how the above circuit can be modified to give auto-turn-off alarm action, so that the alarm sounds as soon as an intrusion is detected but turns off again automatically after four minutes or so.

This action is obtained via IC1a and IC1b, which are wired together as a monostable or one-shot multivibrator that drives the relay via Q1 and is triggered via the sensor switches.

Note in the *Figure 17 and 18* circuits that Q1 and the relay are permanently connected to the power supply rails, even when SW1 is open and the burglar-detecting sensors are disabled.

This fact makes it easy to add

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BYX 38/300	25p
BYX 55/350	10p
BYX 55/600 (Bead)	10p
BYX 71/350	20p
BYX 71/600	50p
BYX 72/300	20p
BYV 95B	10p
BVY 95C	12p
BYZ 106	10p
BPW 41	15p
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BD132/238	20 for £2
W005 bridge	20 for £2
G11 touch button red	6 for £1
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BY298 3 amp/fast/R	20 for £1.50
BD239	20 for £2.00
MR856	25 for £1.50
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BU205	10 for £8.00
BU105	10 for £6.00
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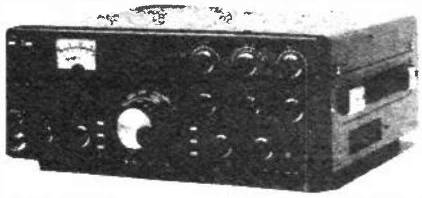
WARD for TRIO



NEW!
TS530SP £669.00

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We also have a considerable range of accessories – Mics, headphones, morse keys, SWR/power meters, filters, wavemeters, mobile and fixed speakers, Ham clocks. Also new AR2001A 25-550 MHz Receiver £345.00

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Commodore 64.... £185.95 1541 Disc Drive.... £210.00
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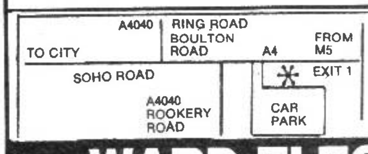


RSGB books, morse keys, practice oscillators

All items subject to availability, prices currently dependent

WARD ELECTRONICS
SOHO HOUSE (FIRST FLOOR), 362-4 SOHO ROAD, HANDSWORTH BIRMINGHAM B21 9QL. Tel: 021-554 0708 (Closed Monday)

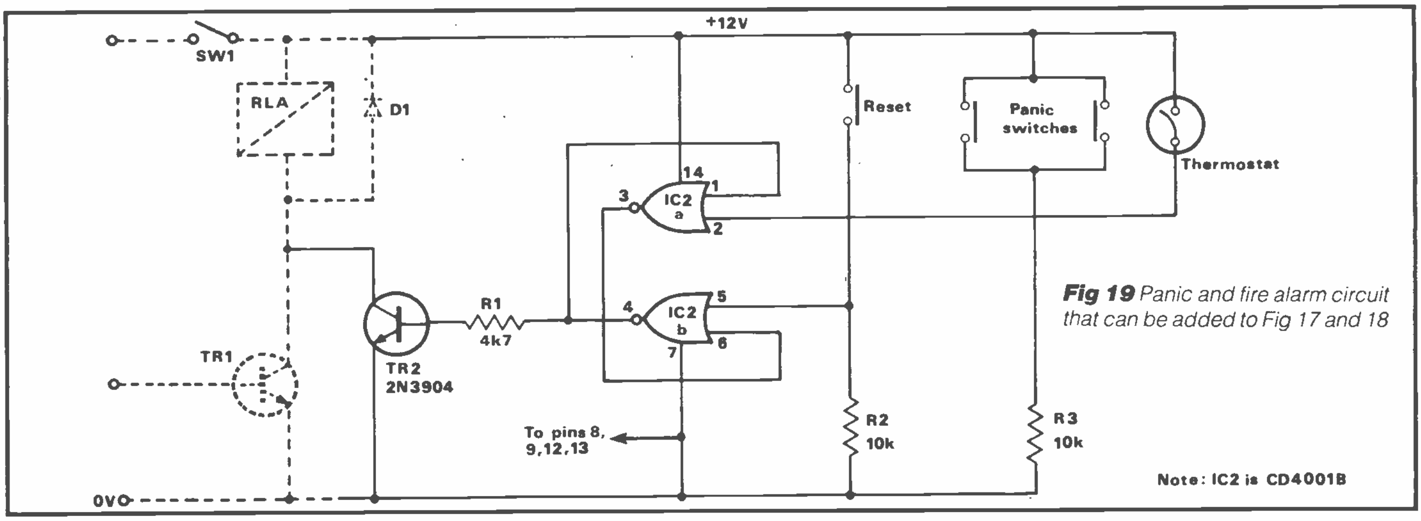


Fig 19 *Panic and fire alarm circuit that can be added to Fig 17 and 18*

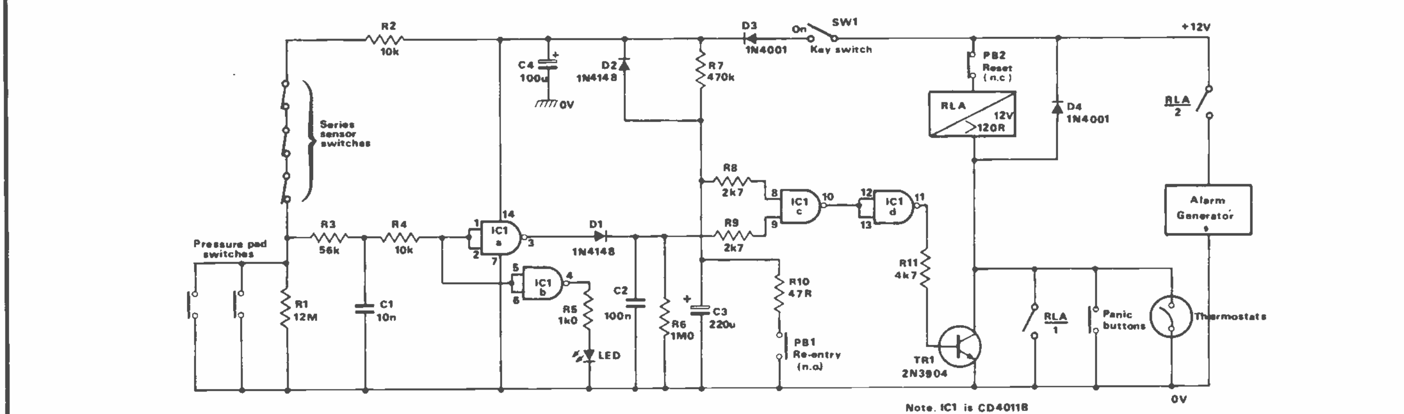


Fig 20 *Comprehensive high-performance home-security system*

accessories such as fire detectors and panic switches, which must be permanently enabled, to the basic circuits.

Figure 19 shows a practical add-on panic and fire alarm circuit that can be used with either of the *Figure 17 or 18* circuits. IC2a and IC2b are wired as a bistable latch that can be used to turn the relay on (via Q2) via any of a number of parallel-connected panic switches or fire-sensing thermostats.

Note that if you decide to combine (say) the *Figure 18 and 19* circuits into a single unit, it is still necessary to use two independent ICs for IC1 and IC2, since these ICs must have isolated supply connections.

Comprehensive system

Most of the burglar alarm circuits that we've looked at so far give useful but fairly limited performances. This month's final circuit, by contrast, gives an outstandingly good performance and incorporates a number of sophisticated features.

The circuit is that of a comprehensive home security system and is shown in *Figure 20*. It is powered from a 12V supply and draws a quiescent current of only a few μA.

The operating theory of the *Figure 20* circuit is moderately complex. The power supply to the CMOS circuitry is smoothed via D3 and C4, ensuring that the circuitry is not adversely influenced by power-supply transients.

This factor enables the alarm system and the alarm generator (a bell or electronic siren, etc) to share the same power supply. Normally, with SW1 closed and all sensor switches inactive, LED1 and the relay and alarm generator are all off. C1-R3 and C2-R6 suppress the effects of any transients or lightning-induced spikes that are on the switch wiring.

If any of the sensor switches activate, the inputs of IC1a and IC1b go high. This action causes LED1 to turn on and (normally) causes the relay to immediately turn on via Q1 and IC1c-IC1d. As the relay turns on, it self-latches via contacts RLA/1 and activates the alarm generator via contacts RLA/2.

Note that the self-latching relay is permanently wired to the supply circuit and can be activated at any time via panic buttons or fire-sensing thermostats, as shown in the diagram.

In the previous paragraph we have described what happens under 'normal' conditions, when SW1 has been closed for more than a couple of minutes. An exception to this occurs when SW1 is first closed, or if PB1 is pressed and then released.

Under either of these conditions the C3-R7-IC1c network disables the Q1 input circuitry for approximately 100 seconds. At the end of this period the circuit returns to normal operation. This facility is of great practical value as follows:

When the system is first turned on via SW1, LED1 should remain off, indicating that all sensors are inactive.

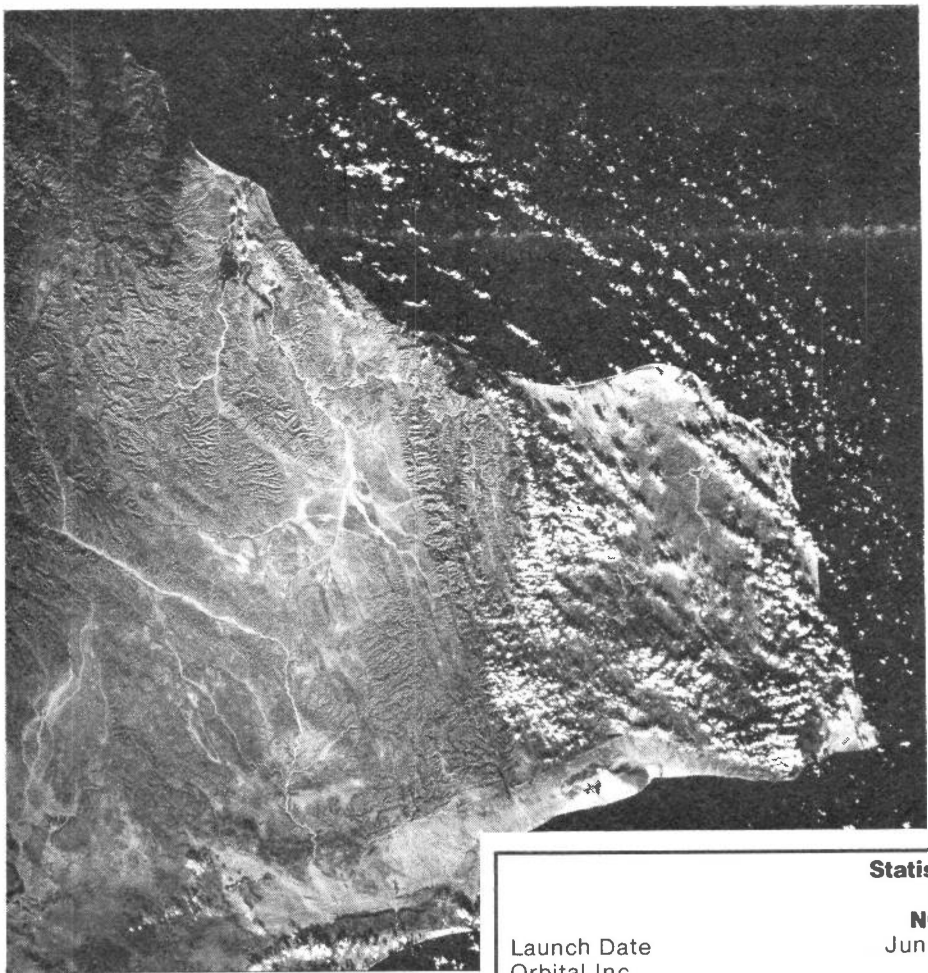
If LED1 does illuminate, a sensor fault is indicated and the owner is thereby warned to locate the fault before the alarm sounds. If the owner wishes, he may leave the premises via a protected door without sounding the alarm during this 100 second 'hold off' period.

At the end of the period the system reverts to normal operation and will activate the alarm generator instantly if an intrusion subsequently occurs.

On his return the owner can re-enter the premises via a protected door without sounding the alarm, by first operating the (concealed) PB1 re-entry switch and thereby initiating a new hold-off period. Note that reset switch PB2 is a normally-closed, push-button type, and enables the alarm to be unlatched once it has been activated.

The *Figure 20* circuit can be used with a wide variety of types of alarm-generator circuit, including bells, sirens, electronic sirens etc.

These alarms can, if required, be designed to give an auto turn-off action.



SATELLITE UPDATE

by Terry Weatherley

Statistical Data	NOAA-7	NOAA-8
Launch Date	June 23rd '81	March 28th '83
Orbital Inc	98.87	98.73
Period	102.0 mins	101.3 mins
Equator X'ing	15.36 local	07.38 local
APT freq	137.62 MHz	137.5 MHz

Keplarian Elements	NOAA-7	NOAA-8
Epoch	84129.50989081	84129.23716454
Inc	99.0459	98.7092
RAAN	100.4732	160.7367
Ecc	0.0012415	0.0017074
Arg	204.9175	165.3873
Mean An	155.1398	194.7797
Mean Mot	14.13031769	14.22406077
Decay	2.54E-06	9.8E-07
Epoch Rev	14825	5779
SMA	7224.336 KM	7192.519 Km
Anom Per	101.908537	101.236913
Apogee	858.862 Km	827.984 Km
Perigee	840.924 Km	803.423 Km

Predict Data
(FOR CALCULATING SATELLITE EQUATOR CROSSING TIMES AND LONGITUDES)

01 JUNE 1984

	NOAA-7	NOAA-8
Orbit #	15158	6118
Date/Time	0026.55z	0018.88z
Long Asc Node	132.08W	70.16W
Nodal Period	101.9787 Min	101.2766 Min
Inc bet Orb	25.49 deg	25.33 deg
Frequency	137.62 MHz	137.50 MHz

Among the measures discussed at the recent European summit held in London this June, was a request by the United States for help with funding for the next American Polar Orbiting Weather Satellite. The contribution made to the Global Weather Watch programme by the Americans is enormous.

For the past twenty years information has been made freely available to all who have asked, be they a national government or an interested amateur. To their credit the other governments have acknowledged this contribution and do not deny that the request is a reasonable one.

NOAA 6

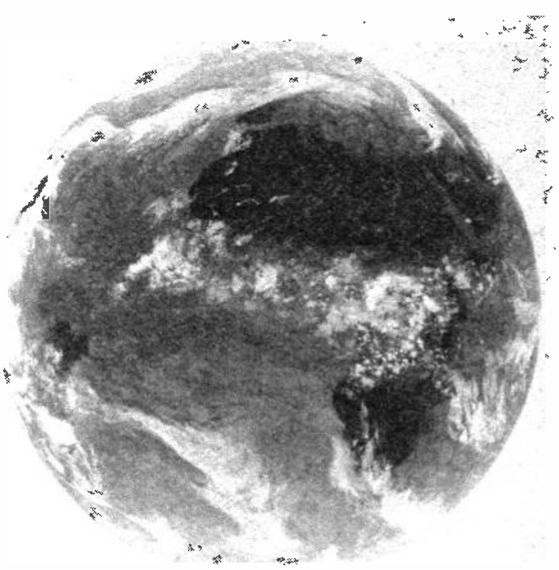
This is the stand-by/back-up satellite at the present time and most systems have been deactivated. The telemetry shows that the power system appears to have experienced a number of failures recently. The spacecraft will be completely deactivated quite soon.

NOAA 7

This is the primary afternoon satellite. NOAA 7 crosses the equator northbound in daylight at about 1536 local time each day. All systems aboard the spacecraft are performing as expected with the exception of the motor. Recent housekeeping telemetry has indicated an unexpectedly high motor current on occasions. Efforts are being made to reduce this by heating the instrument and moving oil to the motor bearing.

METEOSAT

METEOSAT 1981 MONTH 10 DAY 15 TIME 1225 GMT (NORTH) CH. WV
NOMINAL SCAN/RAW DATA SLOT 25 CATALOGUE 1034610119



METEOSAT 1981 MONTH 10 DAY 15 TIME 1225 GMT (NORTH) CH. IR 1
NOMINAL SCAN/RAW DATA SLOT 25 CATALOGUE 1034610120

NOAA 8

NOAA 8 is the primary morning spacecraft crossing the equator southbound in daylight at about 0738 local time each day.

Recently excess noise has been detected on channels 3 and 4. Tests to determine the causes were carried out on May 14, 1984 when channels 3 and 4 were turned off for eleven orbits.

Present theories to account for the excess noise suggest that the cause may be 'microphonic sensitivity' rather than contamination. The tests are to investigate whether any modifications can be performed to eliminate or reduce the noise on this channel on future spacecraft in the series.

NOAA-F

NOAA-F is currently planned to be launched in August 1984 but this could be subject to delay and the launch could be as late as February 1985.

GMS-1 & GMS-2

Japan's second Geostationary Meteorological Satellite GMS-2 was deactivated after nearly two years in space following an apparent malfunction in the electric drive mechanism controlling the scanning mirror. The mirror, which should recycle in 150 seconds, was taking over 3 hours to do so. In early January GMS-1 was moved from its standby position at 160E and is now the primary spacecraft at 145E.

GMS-3 is due for lauch in August 1984 and GMS-5 is planned for 1989.

Meteosat-1 & 2

Meteosats 1 & 2, the European Space Agency's geostationary satellites, continue to be operated simultaneously to provide both image acquisition and dissemenation, and data collection. Both satellites continue to operate on a 24 hours a day schedule at the present time.

ATS

ATS-1. On March 31, 1984 control of ATS-1 was passed to the University of Hawaii. It will be stationed at 165E and will be used as an Educational vehicle for voice communications with islands in the Pacific.

ATS-1 was launched in 1966 and was the first satellite used to test and develop WEFAX communications. Eight pictures were transmitted daily on VHF and received on APT type equipment; in all a historic and remarkable satellite.

ATS-5 is over the Atlantic and will be desynchronized soon.

ATS-3. This satellite is at present working under the control of the University of Miami. Its main use is in the Oceanographic field.

ATS-2 and ATS-4 never achieved geosynchronous orbit and only had a few months of useful life before re-entering the Earth's atmosphere. ATS-6 was desynchronized in 1983. The tables show some recent parameters for some of these satellites.

POINT OF CONTACT

The general interests of some of our readers and of club networks are shown below. If you have similar interests why not establish a contact at the time and on the band indicated.

If you or your club wish to be included in this scheme, would you please complete and return the form below and send to: ***Radio & Electronics World***, Sovereign House, Brentwood, Essex CM14 4SE.

MOST IMPORTANT — include a **telephone number** — if you have a particularly interesting contact so that we can contact you for details for publication.

CLUB ADDRESSES

Abergavenny and Nevill Hall Amateur Radio Club
The club meets on Thursdays at Pen-y-Fal Hospital at 7.30pm. It is also the centre for the RAE which commences on Tuesday September 11th starting at 7.30pm.
For further details contact D F Jones GW3SSY QTHr. Tel: 0873 78674.

Chelmsford Amateur Radio Society
The Chelmsford Society meet, the first Tuesday of each month, at the Marconi College, Arbor Lane, Chelmsford. The September meeting is a 'Junk Sale'.

Glenrothes & District Amateur Radio Club
The Glenrothes and District Club meet at the Clubrooms, Provost Land Centre, Leslie, Fife, on Sunday 16th September 1984 at 7.30pm, for their AGM. It is hoped to bring you further details at a later date.

Bury Radio Society
The meetings are held at the Mosses Community Centre, Cecil Street, Bury, on Tuesday evenings at 8pm. Further details from the Secretary, B Tyldsley G4TBT. Tel: Burnley 24254.

South Bristol Amateur Radio Club
The club meets every Wednesday at the Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol. All enquiries to Len Baker G4RZY. Tel: 0272 834282.

Stowmarket District Amateur Radio Society
The society is now meeting at their new venue, the Maltings Entertainment Complex, which is opposite the railway station. For further information contact G3ZQU on Stowmarket 676288.

Southgate Amateur Radio Club
The club meets at St Thomas' Church Hall, Prince George Avenue, London N14. The club meets monthly with the next meeting on September 13th.

Dunstable Downs Radio Club
The club meets at Chews House, Dunstable Downs alternate Fridays at 8pm. Further information is available from Phil Morris G6EES on Dunstable 607623.

RAE Courses 1984/85

Brooklands Technical College
Chris Roberts G4EVA is the lecturer for the RAE course starting on Sept 19th at The Department of Technology, Brooklands Technical College, Heath Road, Weybridge, Surrey Tel: Weybridge 53300 ext 246. Enrolments are on the 10th, 11th and 12th Sept between 6 and 8pm.

Hendon College of Further Education
Tony Essex G8WCX is the tutor for the RAE course in the Williams Building, Hendon College of Further Education, The Burroughs, London NW4 4BT. The course enrolments are on 12th September from 2 to 8pm.

SPECIAL EVENT STATIONS

GB2MSS
Yeovil Amateur Radio Society will be operating a station at the Mid Somerset Show, Shepton Mallet, Somerset, on 18th August. The station will be operating on 3.5 to 432MHz and further details are available from G3GC. Tel: 0935 75533.

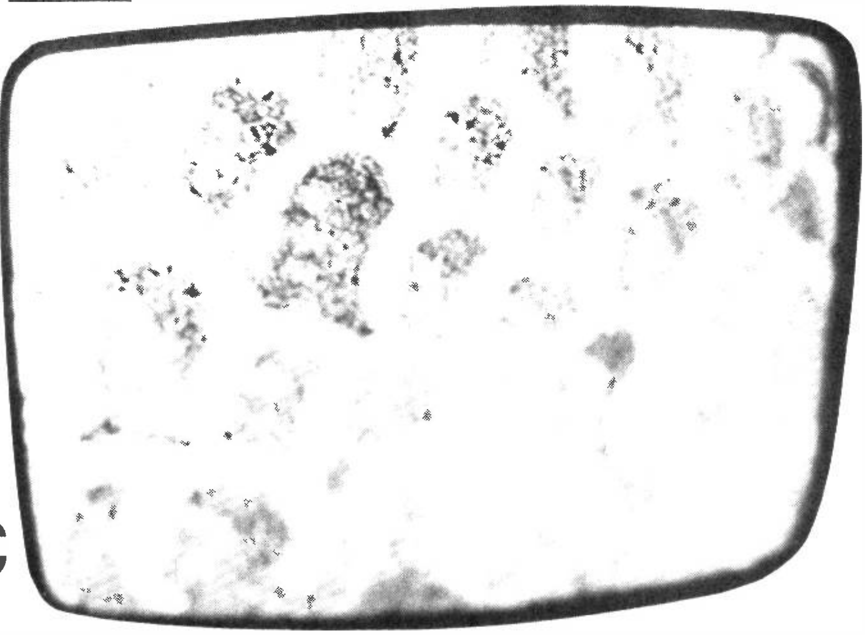
GBYFT
Yeovil Amateur Radio Society are providing a station which will be operating at the Yeovil Festival of Transport, Berwick Park, Yeovil, Somerset, on 11th and 12th August. The station will be operating on 3.5 to 432MHz and further details are available from G3GC. Tel: 0935 75533.

POINT OF CONTACT

Name/Club.. Address ....
.... Postcode..........
Telephone No.................. Call Sign .... Date licenced.......................
Type of licence A..........☐ B..................☐
Bands usually preferred ....
Operating days M T W T F S S Times ....
Equipment ....
Phone/CW..
Special interests eg DX,AMSAT etc...
....
Most interesting contact made to date ....
....RE0984

We are pleased to accept Points of Contact not on our form

NOISE



A LOOK AT THIS ELECTRONIC PHENOMENON

by James Dick

People make a lot of noise about noise. It irritates because it degrades their hi-fi, unilaterally draws boundaries in the experimental sciences, and limits all forms of communication. But exactly what is noise?

Many scientists would agree a connection between noise (in electronics) and weeds (in gardening). This is because the term 'noise' is commonly used to mean any signal in which we are not interested – regardless of whether the 'signal' is the result of a random physical process (true noise?), or merely breakthrough of, for example, an adjacent radio channel (a rose in a herb garden?).

In this article both will be considered, although true noise will receive the most attention – it tends to be more interesting in any case.

Qualitatively, noise needs no introduction. Any radio listener is all too familiar with the off-channel hiss of an FM receiver, or the crackle-hiss-whine of the crowded HF bands.

Visually, the 'snow-like' picture on a television set when the aerial has been disconnected, or the 'grass' on an oscilloscope trace convey representations of noise.

However, familiarity should not breed contempt. Noise is too interesting to dismiss; only by understanding its nature can we optimise the performance of radio receivers, amplifiers, and measuring instruments.

Noise in electronic circuits can come from two types of origin.

It may be caused by physical processes in the circuit itself, or from an origin external to the circuit.

Let us first look at the three main causes of noise within a circuit.

Thermal

Thermal noise – also called Johnson noise – is caused by Brownian motion of the electrons within a conductor. In any material (gas, liquid, solid) which is at a temperature above absolute zero (-273°C), the atoms are continuously vibrating.

The amplitude of vibration is an increasing function of temperature. If a non-insulating material is considered, there will be electrons which are not bound to the material's atoms and these will also be vibrating.

Because the random movement of some of these electrons towards one edge of the material is not always balanced by an equal and opposite movement, a voltage will be momentarily generated between the edges.

In an out-of-circuit resistor, this fluctuating voltage has a mean value of zero, but if the mean-square voltage is determined it is found to be:

$$V^2 = 4k\,TR\,\triangle f$$

where k is Boltzmann's constant, T is the temperature (in Kelvins), R is the resistance and $\triangle$f is the bandwidth used for the measurement.

This mean-square voltage does have an effect, even though its mean is zero. Consider the ac mains: after an integral number of ac cycles, the mean voltage is zero but the power was certainly there because power is proportional to the square of the voltage and hence is always positive.

The bandwidth term which appears is important. Thermal noise is 'white' – that is, it has equal power per Hertz.

So, if we measure the mean-square-voltage in a bandwidth between dc and 20KHz and then between dc and 40KHz, the latter will have double the value of the former.

As an indication of amplitude, a 10KΩ resistor at room-temperature has an rms (root mean square) voltage of around 5μV over the dc to 40KHz range.

Shot

Another source of white noise within a circuit is called 'shot' noise.

The origin of the name reveals the cause: if a cartridge is fired from a shot gun, the amount of lead that hits the target varies

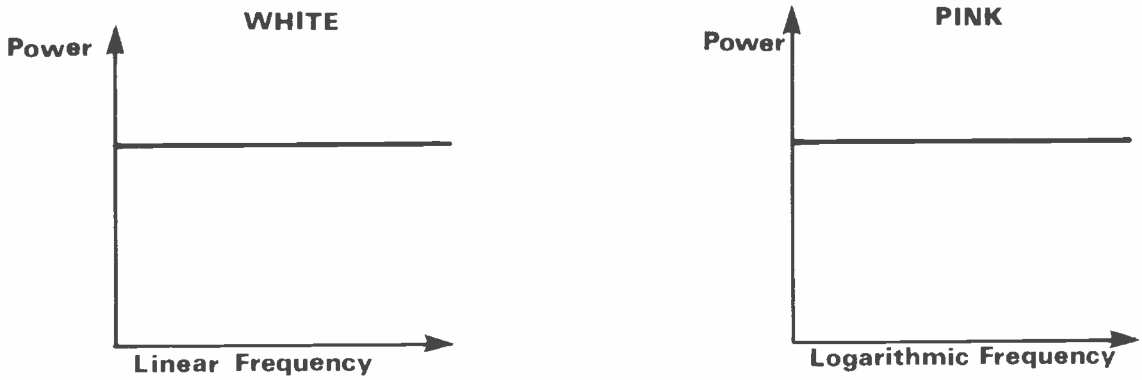


Fig 1 *Noise spectrum*

simply because some of the pellets will arrive before others depending on where they were in the cartridge and their travel-time through the air.

The effect arises because the 'shot' is not one bullet – but is made up of many smaller 'shotlets'.

Now, exactly the same happens when an electric current flows through a circuit element. Although, on average, the same number of electrons move through it in unit time, in reality there are statistical variations. The mean-square current variation is given by:

$$I^2_{MS} = 2e\,I\,\triangle f$$

where e is the electronic charge, I is the 'steady' current, and $\triangle f$ is the bandwidth. Hence, a current of 1 amp varies by about one part in ten million for a dc to 10KHz measurement bandwidth – but a 1 microamp current varies by one part in ten thousand. Whether this is important or not depends on your application.

In valves, shot noise is caused by variations in the number of electrons emitted from the cathode. These variations are statistically described as Poissonian and give rise to a variable current reaching the anode circuitry; this situation is almost directly analogous to the shotgun model above – the electrons take the place of the lead pellets.

Flicker noise

Thermal and shot noise are both well understood in comparison to flicker noise. Indeed, flicker noise has a multitude of possible mechanisms – the major difference is that it is 'pink'.

This term is used when the power (or energy) of the source is proportional to the reciprocal of the measurement frequency.

In more straightforward terms, the energy per octave is constant – so the energy contained in a bandwidth of 1 to 2KHz is the same as that in the 2 to 4KHz band despite the doubling of the bandwidth. With white noise, the energy in the larger bandwidth would have been doubled.

Flicker noise is also 'quality dependent'. In a resistor, the noise components from thermal and shot noise are independent of the resistor type but the flicker noise is not: a wire-wound device can have a flicker noise some ten times lower than a carbon-composite type.

In semiconductor devices, the faults in the crystal lattice and surface defects may cause flicker noise.

The time-variation of valve cathode properties has been suggested as a cause of flicker noise in thermionic devices.

Because of the relatively high power of flicker noise at low frequencies, its reduction is important if a low-frequency response is required from (say) an amplifier.

Noise sources

Externally created noise comes in two forms – interference from other signals and 'genuine' noise. Both are within our definition of noise as 'any unwanted signal'.

Interference may be in the form of cross-talk between adjacent communications channels or multiple allocation of the same channel (your local repeater at the rush-hour?). As such, it is caused by design considerations either at system or section level.

More common is the pickup of emission from electrical pulses. Theoretically, it can be shown by Fourier analysis that a single sharp pulse is composed of broadband energy with a white spectrum. Hence, a single spark will radiate at frequencies from a few to a few million Hertz.

Any receiver with a bandwidth centred on a frequency within this range will receive the pulse. Unfortunately, sources of sharp pulses abound. Electric motors in power tools and heavy industry, arcing at switches, and the continuous 'mush' from commutators are all recognisable to the experienced listener. In many cases the only serious cure is to be sited well away from the sources.

Natural noise comes from two sources – events internal to the atmosphere and those which originate outside the atmosphere. The former is mostly caused by nature's spark: the lightning discharge.

While a local lightning storm creates severe interference (often likened to the crushing of cellophane), a receiver will pick up the impulses from all the storms within its propagation horizon.

Hence, on the HF bands, atmospheric noise may be the integral of sources over many thousands of miles. At very high frequencies, atmospheric effects become more complex. Scattering by water vapour and absorption by gases are both present above 10GHz.

Noise originating outside the atmosphere is called 'cosmic noise'. It is caused by emission from the Sun and planets, sources within our own Galaxy, and other galaxies.

Charged particles, accelerated to relativistic speeds by intense magnetic fields and high-energy events, emit radio radiation over a wide range of frequencies; radio astronomy is commonly undertaken at VHF and UHF.

In summary, manmade and atmospheric noise are the major factors below approximately 15MHz. Both are very variable, but tend to increase at night because of the larger coverage area of the receiver brought on by improved propagation. Above 15MHz, external noise is mostly from cosmic sources and decreases into the UHF range.

Measures of noise

The measurement of noise levels within a system or circuit block is very important. It allows us to determine whether or not a system will be able to perceive a signal, and enables the relative merits of different systems to be established.

The first measure normally encountered is the signal-to-noise ratio. The noise voltage caused by thermal and shot noise is dependent on the bandwidth in which the measurement is made.

The mean-square voltage is linearly dependent on the bandwidth – so the root-mean-square voltage (V_{rms}) is expressed as 'volts per root-Hz' because it is a function of the square-root of the bandwidth. The rms value is used since a value in volts – and not volts-squared – is more convenient and meaningful.

Because the noise – and perhaps the signal – is a function of both bandwidth and the centre frequency of the band, the mean-square voltage from the signal (V_s) and that from the noise (V_n) must be

specified with their frequency characteristics.

The signal-to-noise ratio is then expressed, in decibels, as:

$$SNR = 10 \log_{10} (V_s^2 / V_n^2)$$

The other common noise measure is the 'noise figure'. It is mainly used in amplifier comparisons and varies with the signal-source impedance and frequency.

The noise figure is defined as the noise of the amplifier and source divided by the noise of the amplifier, normally expressed in decibels as:

$$NF = 10 \log_{10} ((4kTR + V_n^2)/4kTR)$$

where 4kTR is the thermal noise in the source and V^2_n is the mean-square voltage which would be obtained if the amplifier had a perfect, noiseless resistor (of value R) at its input.

Although apparently simple, noise figures can be confusing – mainly because they will always have been optimised for a particular configuration and this may differ from manufacturer to manufacturer.

Making noise

Although electronic engineers spend most of their time trying to minimise the effects of noise, occasionally it is necessary to generate noise – usually to a tailored specification.

Simple noise generators may use thermal or shot noise as their source. Zener diodes, operated near their Zener voltage (reverse biased), also produce excellent wideband noise.

Digital techniques have recently taken over many of the random-process generation tasks. The output from a long shift register where the input is fed from either an exclusive or from two of the outputs can produce a pseudo-random sequence nearly 2^n long (n element register).

A 32-element shift register can produce a 200KHz bandwidth noise stream for twenty minutes before repeating itself. While it is possible to build such a generator from its constituents, National Semiconductor have a convenient package which goes by the name of MM5837.

The 8-pin DIL package contains an on-board oscillator and a 17-element shift register with taps, for feedback, at elements 17 and 14. This produces a pseudo-random binary sequence 131071 bits long.

The half-power point of the spectrum has a minimum frequency of 24KHz, so the device is ideal for audio applications in music synthesisers, where the white noise output may be filtered to give a pink spectrum.

Because the sequence repeat time is greater than 1 second, the MM5837 may be regarded as a true noise source for most applications.

The advantage of digitally-produced noise is in its predictability – which sounds ironic for what is meant to be a

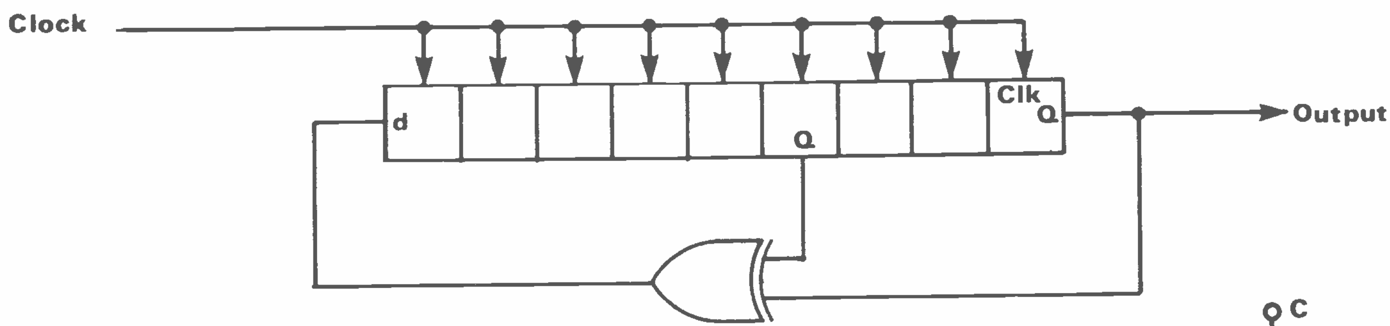


Fig 2 Shift register

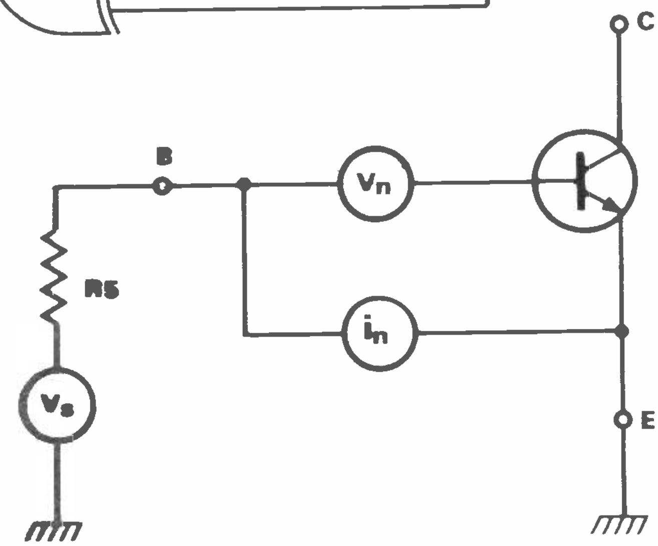


Fig 4 Noise model

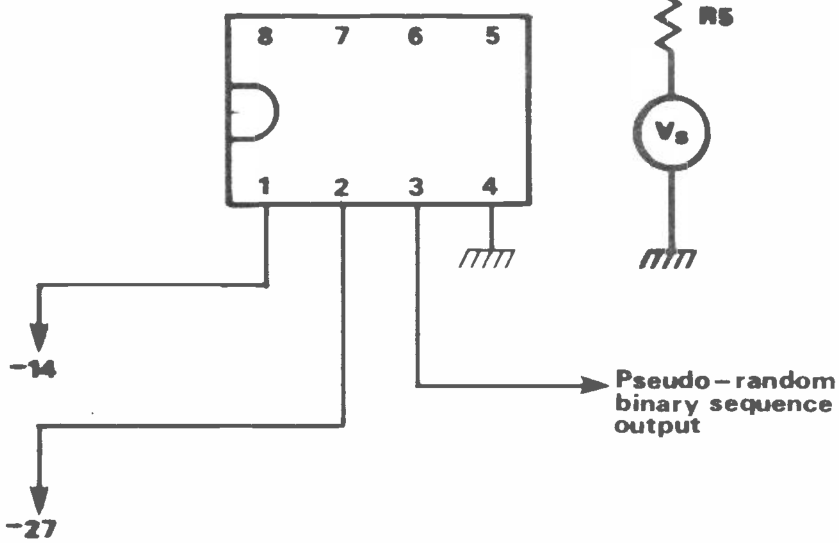


Fig 3 MM 5837 configuration

random process. Analogue techniques suffer from component tolerance problems – while the digital source produces uniform noise characteristics and amplitude.

But why use a noise generator? Because it makes the measurement of amplifier noise figures easy. With the output of the noise source nulled, the amplifier's output voltage is measured with a broadband rms ac voltmeter.

Then the noise source output is gradually increased until the amplifier's output increases by 3dB. The noise figure can then be calculated (in decibels) from:

$$NF = 10 \log_{10} ((V_{ns}^2/4kTR_{ns})+1) - 3$$

where R_{ns} is the output impedance of the noise source (set equal to the amplifier's input impedance) and V_{ns} is the output voltage of the noise source at the 3dB-up level.

Noise in amplifiers

The study of the causes of noise in amplifiers, and noise-elimination, is both complex and extensive – so we are only able to give it an overview here.

The bibliography at the end of the article lists texts that readers might find of interest for further information.

In bipolar transistors, the noise within a device is modelled as coming from a voltage-noise source in the base and a current-noise source across the input. The voltage-noise is caused by thermal noise in the device's intrinsic base resistance, and shot noise is created by the collector current in the intrinsic emitter resistance.

Some flicker noise is also present at high base currents. Hence, the voltage-noise is mainly white and increases at both low and high currents. The increase at low currents is caused by the increase in shot noise in the current-dependent intrinsic emitter resistance.

In most small transistors, the voltage-noise decreases as the collector current rises to around 100 microamps.

The current-noise source is mainly shot noise in the base current and increases with the square-root of the current. Below approximately 100Hz, there is also a contribution from the pink flicker-noise in the intrinsic base resistance. Hence, although the voltage-noise decreases as the collector current increases, the current-noise increases.

If the transistor's operating point is to be optimised for low-noise, the signal source has to be taken into account. This is because the current-noise source in the input of the amplifier creates a noise-voltage when it is placed across the source impedance.

Generally, for low source impedances, the bipolar transistor (type chosen to have a low intrinsic base impedance) biased to a high collector current offers reasonable performance. As the source impedance rises, the collector current has to be lowered. With source impedances above 1MΩ, FET-based amplifiers offer better noise characteristics.

Field effect transistors have a similar model to bipolar transistors. However, now the voltage-noise source is thermal noise in the conduction channel. Since this is inversely proportional to the device's transconductance, high currents offer low noise.

In the audio region, the current-noise is created by shot noise in the gate current and, because the current is only leakage through the gate, the noise created is at least an order of magnitude less than with bipolar devices.

Just as with bipolar devices, the choice of FET and operating point depends on the expected source impedance and individual device characteristics obtainable from the manufacturer's data sheet.

Bibliography

1 *Radio Communication Handbook*, RSGB
2 *Integrated Electronics*, Millman and Halkias
3 *Shift Register Sequences*, Goulomb
4 *Low-noise Electronic Design*, Motchenbacher and Fitchen

NOTES FROM THE PAST

The opening paragraphs of these notes, written more than thirty years ago, reflect the same arguments that we hear today over sport on TV and the number of programme hours. Other comments include a very favourable reaction to the first edition of the RSGB Amateur Radio Call Book, published in 1951

The chief argument put forward by those anxious to ban sound and television broadcasts of sporting events well illustrates how little such people learn from history. The same old argument was proved wrong over a hundred years ago. At the time of the Exhibition of 1851, when photography was still in its infancy, it was solemnly suggested that no photographing of the Exhibition should be allowed. The grounds then put forward were that if people could see pictures of it they would no longer want to see it, and attendances would so decline that a loss would be incurred.

Well, well, well! We all know, today, that the 1851 Exhibition made an enormous profit despite the circulation of photographic reproductions.

In more recent years, the broadcasting of gramophone records was said to threaten a heavy curtailment of sales. Of course, it did nothing of the sort – in fact, it achieved just the opposite. Gramophone companies did bigger business than ever before.

Many sports and entertainments which have struggled for years on enthusiasm alone, and often no promise of future profit, have been so popularised by radio and television that today they have far bigger followings (and profits from gate money) than ever before.

Perhaps I am a purist, but I feel disgusted that these self-styled 'sportsmen' are more interested in making money than the promotion of genuine sport.

I have long advocated less broadcast (and television) hours in order to devote the money saved to provide better programmes. Too much third rate material is used – apparently only to fill in the time in order to make up the scheduled number of hours. Even the programmes arranged for 'popular hours' leave a lot to be desired at times. I sometimes think that listeners have lost their critical faculty, or else they despair of getting the BBC to do anything about it. I am quite sure that a number of our variety artistes would 'get the bird' from a good, old-fashioned music hall audience.

RSGB Call-book

The first edition of the RSGB Amateur Radio Call Book will satisfy a long-felt want, and those concerned are to be congratulated on the speedy production since its compilation was first announced.

That its need was strongly felt in the amateur movement is evidenced by the fact that G-amateur calls are nearly 100% complete, from information supplied by themselves.

It is surprising that such a publication has not been produced before. Several times in post-War years I have urged its need – the last occasion at some length was in our companion journal, the SHORT WAVE NEWS for November, 1949.

If my prompting has had any effect in bringing this most useful handbook to life, may I be permitted to throw in a couple more suggestions.

Firstly, I should like to see a larger type face used in subsequent editions. My eyes are not so keen as they were and, after all, such a book is needed for quick reference.

The second is that through the good offices of the IARU, future editions of National Call Books such as this and those of the REF and VERON etc, might all be of uniform size and style, except perhaps for distinctively coloured covers.

Sheet metal cutting

I returned from holiday just in time to see Inventors' Club in the TV programme of 22nd August, and hope to see the sheet metal saw which was demonstrated in early production.

The idea of using a stiffening metal strip (usually a steel rule) at the back of a normal hack-saw blade, has often been employed by constructors in chassis cutting, and by model engineers. It not only makes cutting quicker and easier but enables one to make a really straight cut. The great virtue of the demonstrated model was its simplicity, and the speed and ease with which even broken hack-saw blades can be used.

Good luck to the designer, and here's one customer for his version as soon as it becomes marketed.

So it has other uses

Wave-change switch contacts have long been a source of receiver noise and crackles, and I guess every reader at some time or the other has advised his listener friends to clean the contacts with carbon tetrachloride. Recently, I gave this advice to a very practical young woman.

'Oh! Carbon tet,' she said, obviously on familiar terms with it, 'I've got some already.'

'Have you?' I asked, rather surprised and wondering vaguely what on earth she could use it for – thinking in terms of beauty preparations etc.

'Yes,' she went on brightly, 'it has roughly the same refractive index as glass, and I use it in photographic enlarging.'

It merely goes to prove you can't be too careful with these modern YLs, and dare not risk putting them off with a 'simple' answer. A few weeks back an attractive, but rather severely dressed young woman, sat beside me on the bus and started to study a complicated-looking circuit. It turned out she was a physiotherapist, and she proceeded to give me a lecture on how it worked. As she explained it in rather the manner I would have expected her to have chosen for an eight-year-old schoolboy, she apparently didn't think I looked over-intelligent. I was glad to escape when we came to my stop.

Finally, a candid letter from T M of Brighton. 'I am not yet 17 and so I have only been a reader for about two years, but I enjoy Radio Miscellany. My cousin says he remembers you from pre-War and, as I saw in a book that the readership of a magazine changes completely during the course of seven years, do you use the same stuff over again?'

Well, well, well! I ask you! No wise-cracks that I don't even wait as long as that, *please.* That certainly seems to put the skids under any ideas I might have had of re-hashing.

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FOR THE DX'er...

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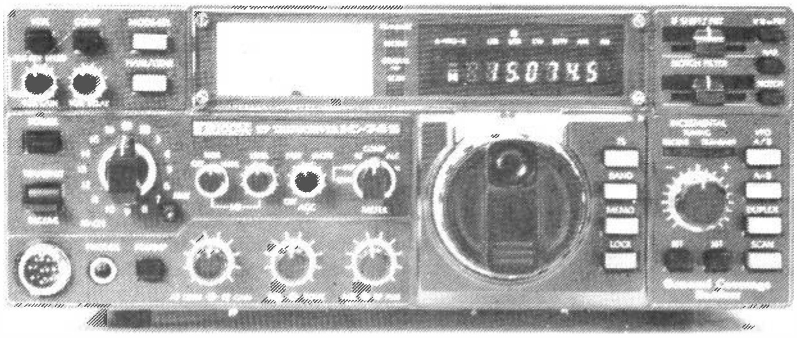

ICOM's IC-745 is the all-in-one transceiver featuring an HF all band SSB, CW, RTTY, AM (receive only) ham transceiver, plus a general coverage receiver. Options for FM transceive and an internal power supply make the IC-745 the complete transceiver in an all-in-one package.

The receiver section features a 100KHz to 30MHz general coverage receiver, this allows access to all HF bands plus all the frequencies in between. The IC-745 has an adjustable AGC circuit and DFM (Direct Feed Mixer) giving a wide dynamic range of 103dB with an intercept point at + 18dBm. Exceptionally clean reception is achieved with a low noise PLL circuit and a 70MHz first IF.

The IC-745's features include IF shift, 16 programmable memories with lithium battery back-up, passband tuning, a noise blanker both wide and narrow, threshold level control, notch filter, receive audio tone control and an all mode squelch. Also available is a front end switchable receiver preamp providing 12dB gain. RIT has a ±1KHz range.

We could go on all day about the 745, get in touch with us and we will send you the full story.

IC-271H, £819.

The IC-271H is the most advanced 2 meter transceiver available today, it covers the spectrum from 144-146 MHz with FM, SSB, or CW using the most advanced 10Hz PLL system. The IC-271H is suitable for simplex, repeater operation, moonbouce or satellite work, and has features found on no other transceiver.

Some standard features include 32 tunable memories, a high visibility fluorescent display, RIT readout, scanning, 12V DC operation with optional AC power supply.

The 271H has a speech synthesizer that announces the displayed frequency, ideal for blind operators, this is an optional extra along with the SM6 desk microphone and 22 channel memory extension with scan facilities.

As you can see from this brief description the IC-271H, (and its 430-440MHz brother the IC-471H) are very versatile sets indeed. More detailed literature can be easily obtained from Thanet Electronics Limited.

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ICOM

ON THE MOVE.

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Brief features:- 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5Khz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer. Just ask for a leaflet and we'll be glad to send you one. Price £319 and £25 for the optional speech synthesizer.

IC-290D, £499.

290D is the state of the art 2 meter mobile, it has 5 memories and VFO's to store your favourite repeaters and a priority channel to check your most important frequency automatically. Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz.

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CROSSWORD

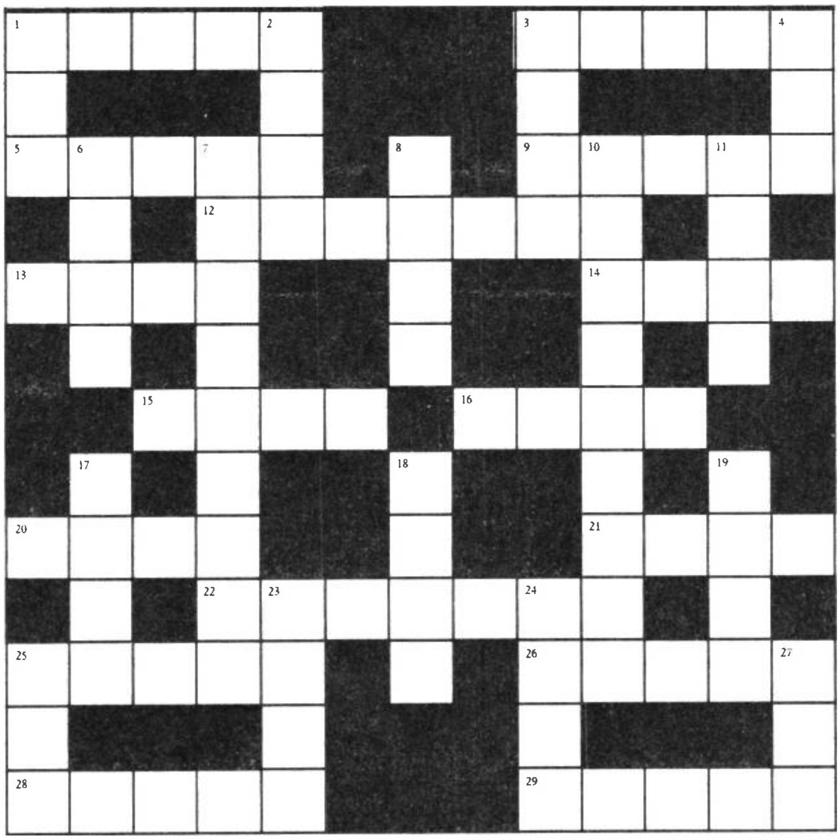
By T R Mowbray G3VUE and D V Pritchard G4GVO

ACROSS

1 In March Okehampton stops the RF (5)
3 Sue's mixed but loud at first for safety devices (5)
5 Artist, little Diana and I, for parts of circle (5)
9 As little Thomas in the middle for the smallest (5)
12 Toe-rags for a place of safe keeping. Like a cell? (7)
13 In India lamps might light it (4)
14 Ohm's Law takes a direction. Upwards? (4)
15 Sonic or elemental (4)
16 Could be twisted by Darlington (4)
20 Visit to barber for calibrated dial? (4)
21 Some dry joints in Middle East may be this (4)
22 By ear or by mouth for VHF DX (7)
25 Is Man isolated for safety reasons? (5)
26 Sardinian and Egyptian stations need direction for emission (5)
28 Wrote for something to put in garden (5)
29 Health centre in Chile for a charge? (5)

DOWN

1 Desirable for mobile operation (3)
2 Time to go back for some output (4)
3 Signal for France, Norway and England (4)
4 In his oscillations a sign of urgency (3)
6 Secondary cell constituent (4)
7 Three legged device at Gate Dip? (4,2,3)
8 Mixed part in two-band antenna (4)
10 Tramlines end at these (9)
11 Mother and saint on which 3 down is hung (4)
17 Royal Engineer inside motoring organisation in that region (4)
18 Has hot tip for the joint (4)
19 In a lie undenied instead (4)
23 Employer rues the day he defined the graphics (4)
24 Objectives Sam and I pointed out (4)
27 Certainly not a static ram (3)



The solution will be printed in the next issue

LOW POWER TRANSMITTER

FOR 80 METRE CW

by DGK GUY G3IBM

This article describes the re-engineering work and construction of a 1950s-style transmitter using 1970s components. It also discusses the design of transmitters in general and shows how a home computer can be used to simplify the design of tuned circuits.

This transmitter consists of a VFO running at half the output frequency feeding a doubler/driver which in turn feeds the PA. *Figure 1* is an overall wiring diagram of the complete transmitter. The power supply is conventional and uses a 12-0-12V transformer and part of a 1A bridge in a full-wave centre-tapped circuit.

A 12V winding feeding a full-wave bridge would also have been suitable. The rectified output is smoothed and fed to a 7812 12V regulator IC.

Switch S3 applies power to the VFO alone to allow the transmitter to be netted to the receiver frequency.

Switch S2 is the send/receive switch. Setting this to SEND applies 12V to the doubler/driver & PA board and to the VFO via the key jack.

12V is also fed to the relay which provides antenna changeover and closes a pair of contacts to mute the receiver during transmit.

There is no front panel PA current meter. A meter was fitted on the original transmitter, but was really only used for initial checking and measurement of power input as I always use an SWR meter and adjust the PA tuning for maximum output.

I therefore decided not to include a meter in this version but, instead, to provide for connecting an external meter for initial setting up.

The VFO unit

Figure 2 is a circuit diagram of the oscillator unit which comprises a series-tuned Clapp oscillator followed by an emitter-follower and amplifier.

The oscillator supply is stabilised at 9V by Zener diode D1. L1 consists of 62 turns of 22 swg enamelled wire wound on a .75

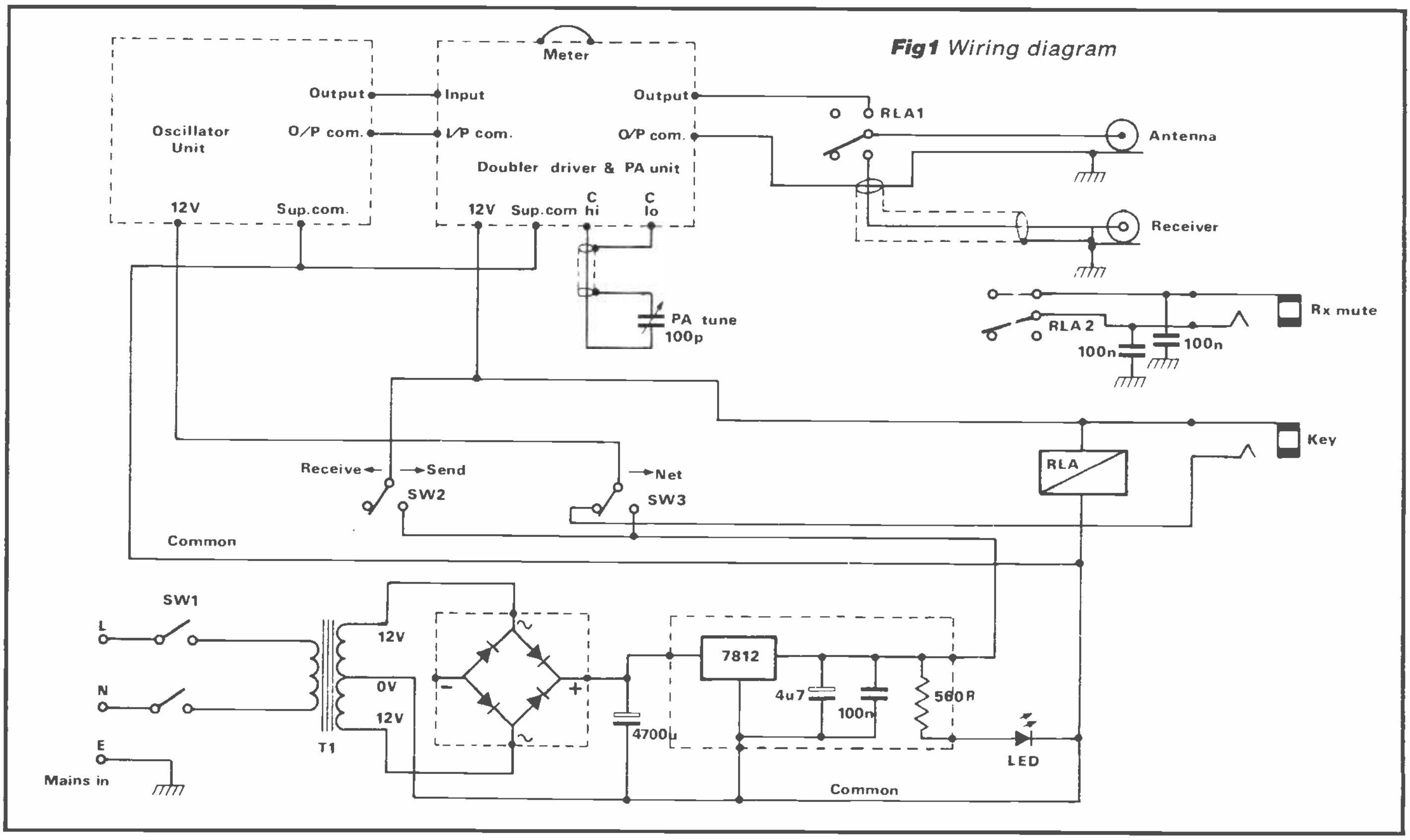


Fig1 Wiring diagram

inch diameter polystyrene former.

The design is fairly conventional, and the only experimental work required was in the values of the trimmer and padder capacitors to provide the required tuning range.

With the values shown, the oscillator tunes from approximately 1.75 to 1.81 MHz (3.5 to 3.62MHz output) which adequately covers the CW part of the 80 metre band.

The power amplifier

Design of the PA is reasonably straightforward and follows the rules for a tapped tank circuit with series matching capacitor *(Radio Communication Handbook: Volume 1 Chapter 6).*

Figure 3 is a simplifed circuit of the PA and, referring to this, the design method is as follows:

1. Decide power output (Wo). I had several BFY50s in the junk box which seemed suitable for the PA. As these will dissipate about 1W continuously with a small push-on heatsink, and assuming 60-70% efficiency, 3W seemed about right for CW (intermittent) operation.

2. Calculate load (Rc) which must be presented to the collector to obtain 3W output. Assuming that Vpk = Vcc, then:

$$R_C = \frac{V_{CC}^2}{2Wo} = \frac{144}{6} = 24\Omega$$

3. Decide loaded dynamic resistance of the parallel tuned circuit (Rd). This should not be too high or tuned circuit efficiency will suffer, nor too low to avoid unwieldy values of C. I chose 2400ohms.

4. Choose loaded Q. Again there is a compromise between high selectivity and good tuned circuit efficiency. I chose a Q of 13.

5. Calculate the value of inductance (L):

$$X_L = \frac{R_D}{Q} = \frac{2400}{13} = 185\Omega$$

$$L = \frac{X_L}{2\pi F} = 8\mu H$$

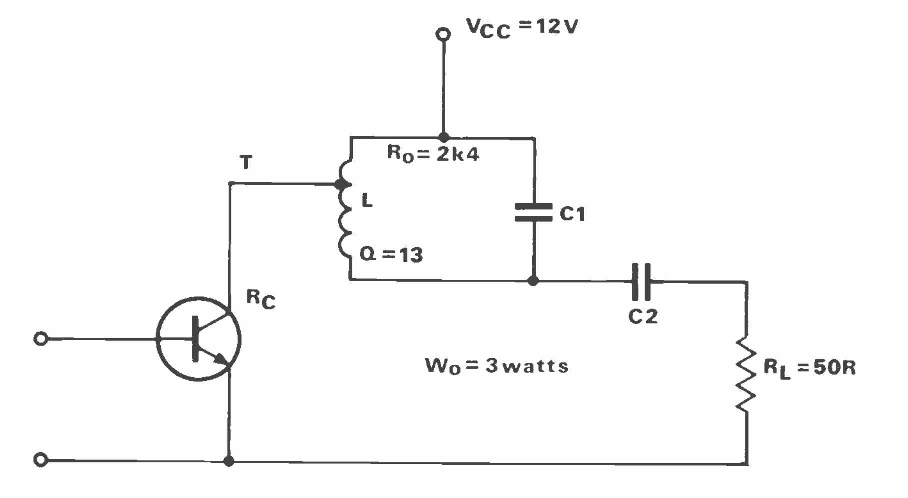


Fig 3 *Simplified PA circuit*

6. Calculate the value of C2:

$$X_{C2} = R_L\sqrt{\frac{R_D}{R_L} - 1} = 50\sqrt{\frac{2400}{50} - 1} = 342\Omega$$

$$C_2 = \frac{1}{2\pi F X_{C2}} = 130pF$$

7. Calculate the value of C1:

$$X_{C1} = \frac{R_D}{Q} \times \left[\frac{1}{\left(1 - \frac{X_{C2}}{QR_C}\right)}\right] = 391\Omega$$

$$C1 = \frac{1}{2\pi F X_{C1}} = 115pF$$

8. Design the coil. The inductance of a single layer coil is given by:

$$L = \frac{r^2\ N^2}{9r + 10L}$$

where: L = inductance (μH), r = radius (ins), N = no. of turns, L = length of coil (ins)

An inductance of 8μH is achieved with a coil of 20 turns of 28swg wire wound on a 0.7 inch diameter former.

To provide a match between Rd (2400ohms) and Rc (24ohms) requires the coil to be tapped to give a turns ratio of:

$$\sqrt{\frac{2400}{24}} = 10 : 1$$

ie 2 turns (from the 12V end).

The above design method is quite straightforward though the maths can be a little tedious. Readers with a home computer can avoid this tedium by using the program listed in *Figure 5.* This requires the user to input Vcc, Wo, Q, Rd, R1 & F.

The program then outputs Rc, L, C1, & C2 and also designs the coil (if required) given the wire gauge and former diameter.

The program was originally written for the BBC Micro but I have made one or two alterations to make it less machine-specific. It should run on most micros but non-Beeb users will need to change the INPUT statement string delimiter from a comma to a semicolon.

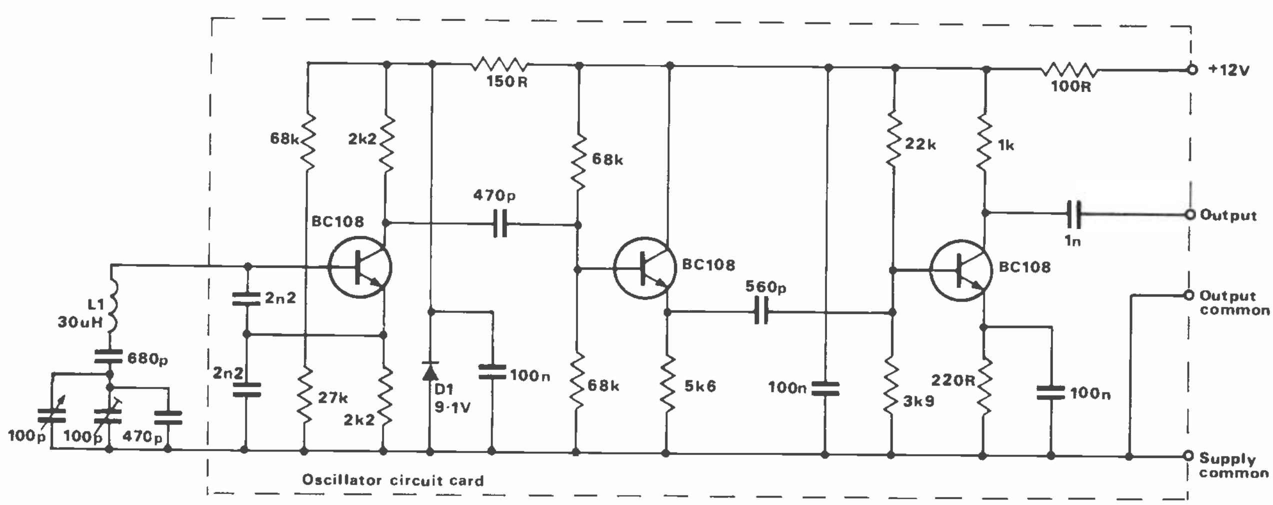


Fig 2 *VFO circuit diagram*

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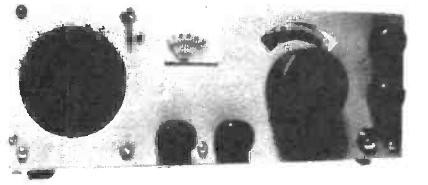

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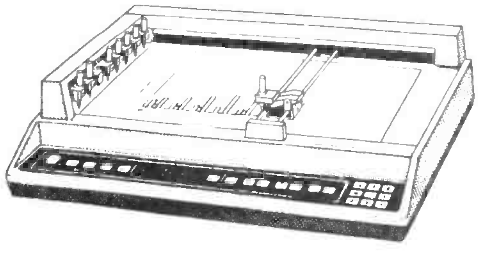

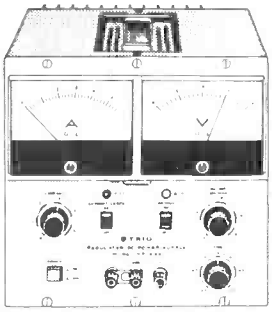

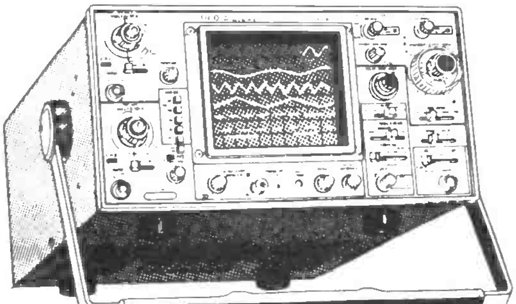

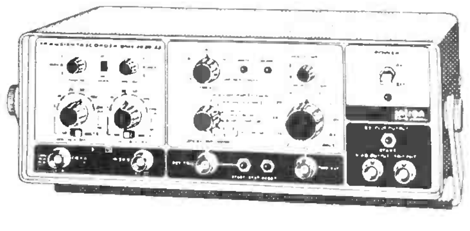

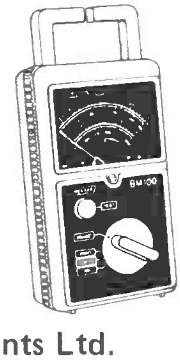

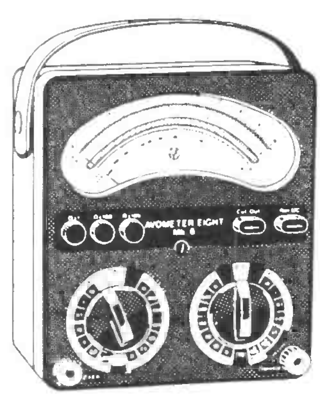

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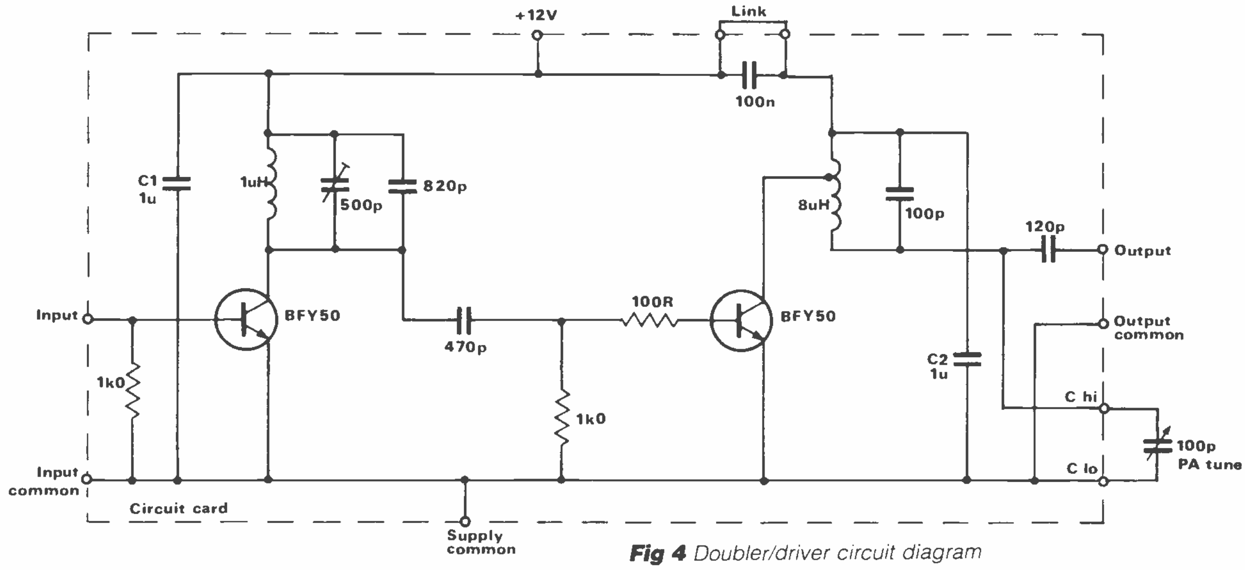

Fig 4 *Doubler/driver circuit diagram*

The doubler/driver stage

Design of the driver is not quite so simple. There are two unknowns which make life difficult.

One is the power needed to drive the PA to the required output: the other is the PA input resistance. My solution was arrived at experimentally – though not without a little science!

I first of all assumed that about 0.3W would need to be produced at the driver collector. This was based on fairly sweeping assumptions of the PA current gain and input resistance.

To produce 0.3W, the driver Rc would need to be:

$$R_C = \frac{V_{CC}^2}{2W} = \frac{144}{0.6} = 240\Omega$$

Further, for a Q of 10, L would need to be about 1μH (see step 5 of PA design procedure). This was my starting point. I wound 6 turns of 28swg wire onto a 0.7 inch diameter former, which should be about 1μH, then adjusted the tuning and coupling capacitors until resonance was achieved and drive was adequate to provide full PA output.

This resulted in the values shown on the circuit *(Figure 4)*. Rc, R1 & Q remain unknown but a computer analysis of the effect of various values of PA input resistance acting through the 470pF coupling capacitor, indicates that driver output is at least 0.3W and that Q lies between 8 and 10. This is quite acceptable and is confirmed by the fact that the circuit works and appears to have adequate selectivity.

```
 10 REM PA output matching Program
 20 REM DGK GUY MAY 1984
 30 DEFFNA(X)=INT(X+.5)
 40 DEFFNB(X)=INT(X*10+.5)/10
 50 DIMA(13)
 60 FORL=1TO13:READA(L):NEXT
 70 REM FILL ARRAY WITH TURNS/INCH DATA FOR 16 TO 28 SWG
 80 DATA14.81,16.95,19.72,23.47,25.97,29.15,33.33,38.91,42
.37,46.51,51.55,56.5,62.5
 90 CLS:REM CLEAR SCREEN
100 INPUT"Enter required Power out (watts) ",WO
110 INPUT"Enter Vcc (volts)                ",V
120 RC=V*V/(2*WO)
130 INPUT"Enter load impedance (ohms)      ",RL
140 INPUT"Enter operating frequency (MHz)  ",F
150 W=2*PI*F
160 INPUT"Enter required circuit Q         ",Q
170 INPUT"Enter tank circuit Rd (ohms)     ",RD
180 XL=RD/Q
190 L=XL/W
200 X2=RL*SQR(RD/RL-1)
210 C2=1E6/(W*X2)
220 X1=RD/Q*(1/(1-X2/(Q*RL)))
230 C1=1E6/(W*X1)
240 PRINT:PRINT"PA load  =  ",FNB(RC);" ohms"
250 PRINT"L          =  ",FNB(L);" uH"
260 PRINT"C1         =  ",FNB(C1);" Pfs"
270 PRINT"C2         =  ",FNB(C2);" Pfs"
280 PRINT
290 INPUT"Do you want to design the coil    ",
300 IFLEFT (A ,1)<>"Y" THENEND
310 PRINT
320 INPUT"Input SWG (in range 16 to 28 SWG) ",S
330 IFS<16ORS>28THEN320
340 INPUT"Input former diameter (ins.)      ",D:R=D/2
350 GOSUB400
360 T=FNB(N/(SQR(RD/RC)))
370 PRINT:PRINT"L = ";FNA(N);" turns, is ";FNB(N/A(S-15));
" ins. long and is"
380 PRINT"tapped at ";T;" turns."
390 END
400 K=10/A(S-15)
410 B=K*L/R^2:C=9*L/R:D=(B^2+4*C)^.5
420 N=(B+D)/2
430 RETURN
```

Fig 5 *Program*

Construction

The oscillator unit is built into a 4.5 x 3.5 x 2.0 inch diecast box for stability. The circuitry is contained on a small piece of 0.1 inch pitch veroboard and is laid out virtually as the circuit is drawn. *Figure 6* is a photograph of the board.

Any sensible layout would do, ensuring that input and output are well removed.

The main tuning components are solidly mounted for frequency stability and wired together with heavy gauge wire. The completed unit is mounted on a platform in order to place the tuning control centrally on the front panel.

A 10:1 slow motion drive is used to improve bandspread, and drives through a flexible coupler to take out any residual misalignment.

The doubler/driver and PA unit is constructed on a 4 x 2 inch piece of 0.1 inch pitch veroboard. *Figure 7* is a photograph of the board. The coils are wound using 28swg enamelled wire on 0.7 inch SRBF formers.

My technique is to drill a 1mm diameter hole where the ends of the coil are to be

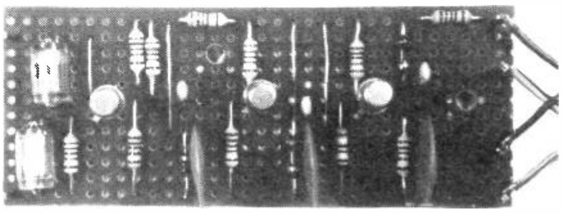

Fig 6

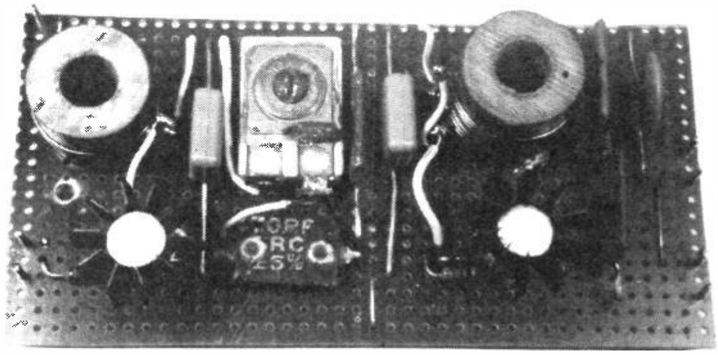

Fig 7

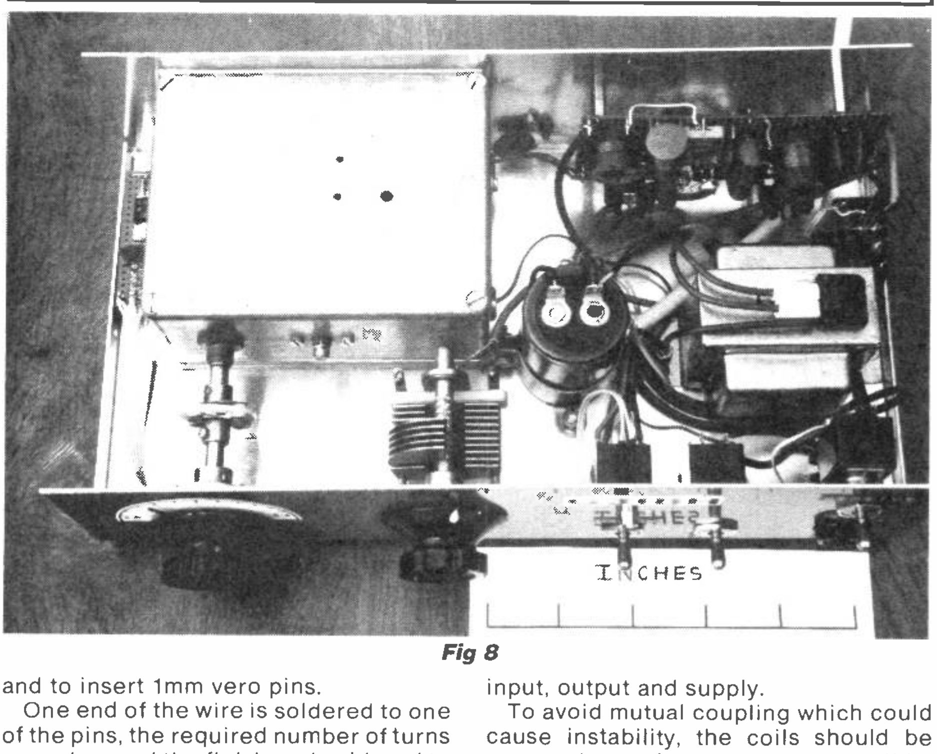

Fig 8

and to insert 1mm vero pins.

One end of the wire is soldered to one of the pins, the required number of turns wound on and the finish end soldered to the second pin.

In the case of the PA coil, 3 vero pins were used – the third to bring out the collector tap. Again the layout of the board is not critical but input and output must be kept apart, and separate common connections should be used for input, output and supply.

To avoid mutual coupling which could cause instability, the coils should be mounted as far apart as possible, preferably with their axes at right angles or at least side-by-side as I have done *(not end-to-end)*.

The driver/PA board is mounted at the back of the box, leaving an area relatively free of RF in which to place the power supply components and relay. *Figure 8* is a photograph of the interior of the finished transmitter.

Sharp-eyed readers will notice that two of the decoupling capacitors on the driver/PA board are different from those appearing in *Figure 7*. During development there was a slight tendency to instability. This was cured by increasing the values of C1 and C2 from 0.1μF to 1.0μF. The circuit diagram *(Figure 4)* shows the correct values.

Overall wiring requires little comment. For low current connections I have used ribbon cable, leaving the separate lines of the ribbon intact where possible as this makes for a tidy layout *(Figure 8)*.

I have used single-point earthing of the supply-commons. That is, I have taken the supply-common connections from the oscillator, driver/PA and the relay back to a single chassis connection which is connected directly to supply negative at the smoothing capacitor.

Not doing this was the cause of instability in the original version.

Co-ax is used between the receiver antenna socket and the relay to reduce RF into the receiver during transmit. Co-ax is also used to connect the PA tuning capacitor to the board.

As a finishing touch, the panel was sprayed grey and the controls labelled using Dymotape. A simple scale is provided for the VFO which was calibrated against the digital display of my R600 receiver.

Setting up and testing

I first of all set up the VFO tuning range. As mentioned earlier, I had already adjusted the fixed circuit components to provide the correct tuning range.

All I did at this stage was to adjust the 100pF trimmer capacitor for a minimum frequency of 3.49MHz so that the required range (3.5 to 3.6MHz) occupied the central, more linear, part of the tuning capacitor range.

The doubler/driver and PA stages were set up using a 12V, 3W bulb connected to the output as a dummy load. This has a resistance (hot) of 48ohms – close enough to 50ohms for practical purposes – and also gives a useful visual indication of power output.

The PA current link was removed and a 0.5A dc meter connected in series. The VFO frequency was set to 3.55MHz and the doubler/driver and PA tuned circuits adjusted for maximum output as indicated by the lamp dummy load.

The PA current was 0.36A giving a dc input power of 4.32W.

The 3W bulb appeared to be fully lit, suggesting 3W output and a PA efficiency of about 69%.

Certainly the original version of this little rig worked extremely well, and the design described here represents a smaller, smarter version which initial 'on-the-air' experience suggests will be just as effective.

I look forward to giving it a lot of use as the shorter days of winter approach and time available for operating increases.

-DISTANCE & BEARING- PROGRAMS FOR THE ZX81, BBC-B and HP41C/CV

By Steven Pocock MA, G4GTU

A recent survey showed that within amateur radio, two home micros dominate the scene, namely the Sinclair ZX81 and the BBC-B. Presented here are three programs for these micros (plus the Hewlett Packard HP41C/CV) to find the exact distance and bearing of any station, anywhere in the world.

The only information required is the latitude & longitude of the distant station which is easily read from any World map found in the majority of amateur 'shacks', and these figures need only be approximate.

In this way, no matter where the station you wish to contact is, you can have your

ZX81 listing:

```
  5 REM "DX"
 15 LET A=51.3
 20 LET B=-0.1
 25 CLS
 30 PRINT "ENTER DX QTH:"
 35 INPUT A$
 40 PRINT
 45 PRINT "LAT ";A$;"?"
 50 INPUT C
 55 PRINT "LONG ";A$;"?"
 60 INPUT D
 65 CLS
 70 PRINT "STANDBY..."
 75 LET M=180/PI
 80 LET X= SIN(A/M)*SIN(C/M)+(COS(A/M)*COS(C/M)*COS((B/M)-(D/M)))
 85 LET K=X
 90 LET X=ACS X*M
 95 LET R= (SIN(C/M)-(SIN(A/M)*K))/(COS(A/M)*SIN(X/M))
100 LET R=INT(ACS R*M)
105 IF D<0 THEN LET R=360-R
110 CLS
115 PRINT AT 5,5;"HOME QTH TO ";A$;":"
120 PRINT AT 10,1;"DIST= ";INT(X*111.12);" KM";"(";INT(X*69.06);" MILES)"
125 PRINT AT 12,1;"BEARING IS ";R;" DEGREES."
130 PRINT AT 20,0;"PRESS ANY KEY TO CONTINUE..."
135 IF INKEY$="" THEN GOTO 135
140 CLS
145 GOTO 15
```

Location	Lat	Long	Distance (miles/Km)	Bearing (deg)
Tokyo	35.40N	139.45E	5960/9591	32
Sydney	33.55S	151.10E	10641/17123	63
Honolulu	21.19N	157.50W	7420/11649	338
Stanley	51.45S	57.56W	7846/12626	214

HP41C/CV listing:

LIST

```
LBL 'DIST
FIX 0
51.3
STO 01
-0.1
STO 02
'LAT N?
PROMPT
STO 03
'LONG E?
PROMPT
STO 04
RCL 02
RCL 04
-
COS
RCL 03
COS
*
RCL 01
COS
*
RCL 01
SIN
RCL 03
SIN
*
+
ACOS
STO 05
69.0468
*
CLA
'tD=
ARCL X
'tMLS
AVIEW
PSE
RCL 01
SIN
RCL 05
COS
*
CHS
ENTER↑
RCL 03
SIN
+
ENTER↑
RCL 01
COS
RCL 05
SIN
*
/
ACOS
STO 06
RCL 04
X<0?
XEQ 'NEG
XEQ 'TRU
LBL 'TRU
CLA
RCL 06
'tBEAM
ARCL X
'tDEG
AVIEW
STOP
LBL 'NEG
360
ENTER↑
RCL 06
-
CLA
'tBEAM
ARCL X
'tDEG
AVIEW
STOP
```

beam pointing accurately at him in seconds.

These programs are a considerable improvement on previous distance/bearing programs and are very accurate, simple to type in, user-friendly, and can be loaded from cassette in about ten seconds. More importantly, they are guaranteed to work! If required, the reader could use such programs as a basis to automatically rotate the beam using a digital to analogue converter.

The amateur simply glances at his map, plugs in the rough coordinates and the micro does the rest!

In use, the only listing changes needed are for your own QTH latitude & longitude; these are:

Lines 15 & 20 for ZX81
Line 20 for the BBC-B
Lines 3 & 5 for the HP41C/CV.

Simply change the values shown (based on London) for your own. No other changes are needed.

When prompted for lat/long of the DX station, values are entered as degrees NORTH and EAST. For example, Tokyo would be entered as 35,140, ie 35N & 140E.

Locations West of Greenwich and South of the Equator are entered as negative values; eg Sydney is entered as -34,152. The -34 indicates 'minus 34 degrees North' ie 34 deg South. Similarly, New York is 42,-74; -74 meaning 'minus 74 degrees East' ie 74 deg West. Accordingly, Port Stanley would be entered as –51.5, -57.6 and so on. Lines could be added to the programs to allow for this, but it adds many unnecessary extra lines and also this format is quite logical and it will rapidly become second nature.

Program Checks

Once you have entered your program it is advisable to test run it with the following data which cover all four 'quadrants' of the globe. If your results agree, or nearly agree to those given, then all is well. If not, then you have made a typing error or errors entering the program. Check especially the lines with trigonometry and brackets as these are the most likely sources of error.

As a final word, these programs are simple but effective, and if you have a printer with 'screen dumping' facilities, then a complete record of headings, (and on the BBC a pictorial representation of beam headings) can be made to your own needs. Good DXing!

BBC-B Listing

```
 10 MODE1
 20 A=51.3 : C=-0.1
 30 PRINT "Enter name of QTH:"
 40 INPUT N$
 50 CLS
 60 PRINT "Input LAT and LONG of ";N$
 70 INPUT B,D
 80 IF B<0 THEN M=-B ELSE M=B
 90 IF B<0 THEN LAT$="S" ELSE LAT$="N"
100 IF D<0 THEN N=-D ELSE N=D
110 IF D<0 THEN LONG$="W" ELSE LONG$="E"
120 PROCDIST
130 PROCBEAR
140 PROCPLOT
150 PRINT TAB(7,30);"Press SPACE BAR to continue..."
160 Z=GET: IF Z=32 THEN RUN ELSE GOTO 160
170 END
180
190 DEF PROCDIST
200 DIST= SIN RADA*SIN RADB + COS RADA*COS RAD B * COS RAD(C-D)
210 DIST=DEG (ACS(DIST))
220 CLS
230 PRINT TAB(8,1);"Distance from home QTH to"
240 PRINT TAB(10,3);N$;" (";M;LAT$;",";N;LONG$;")"
250 PRINT TAB(8,5);"is ";INT(DIST*69.06);" miles (";INT(DIST*111.12);" Km)"
260 ENDPROC
270
280 DEF PROCBEAR
290 BEAR= (SIN RADB- SIN RADA*COS RAD DIST) / (COS RADA*SIN RAD DIST)
300 BEAR=DEG (ACS(BEAR))
310 IF D<0 THEN BEAR=360-BEAR
320 PRINT TAB(2,9);"Beam ";INT(BEAR)
330 PRINT TAB(2,10);"degrees."
340 ENDPROC
350
360 DEF PROCPLOT
370 PRINT TAB(20,9);"N"
380 PRINT TAB(20,28);"S"
390 PRINT TAB(10,18);"W"
400 PRINT TAB(30,18);"E"
410 X=655:Y=437:R=250
420 BEAR=RAD -BEAR+(PI/2)
430 MOVE X-R,Y
440 FOR DX=-R TO R STEP 20
450 DY=SQR(ABS(DX*DX-R*R))
460 DRAW X+DX,Y+DY
470 NEXT DX
480 FOR DX=-R TO R STEP 20
490 DY=SQR(ABS(DX*DX-R*R))
500 DRAW X-DX,Y-DY
510 NEXT DX
520 MOVE 655,437
530 X1=X*COS(BEAR)
540 Y1=X*SIN(BEAR)
550 PLOT1,X1/3,Y1/3
560 ENDPROC
```

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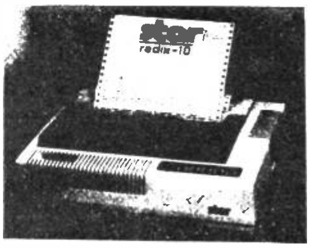

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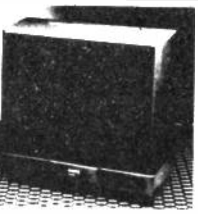

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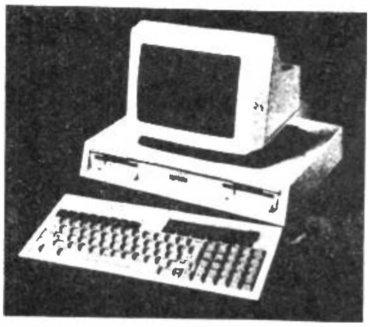

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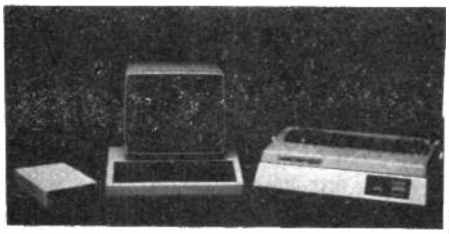

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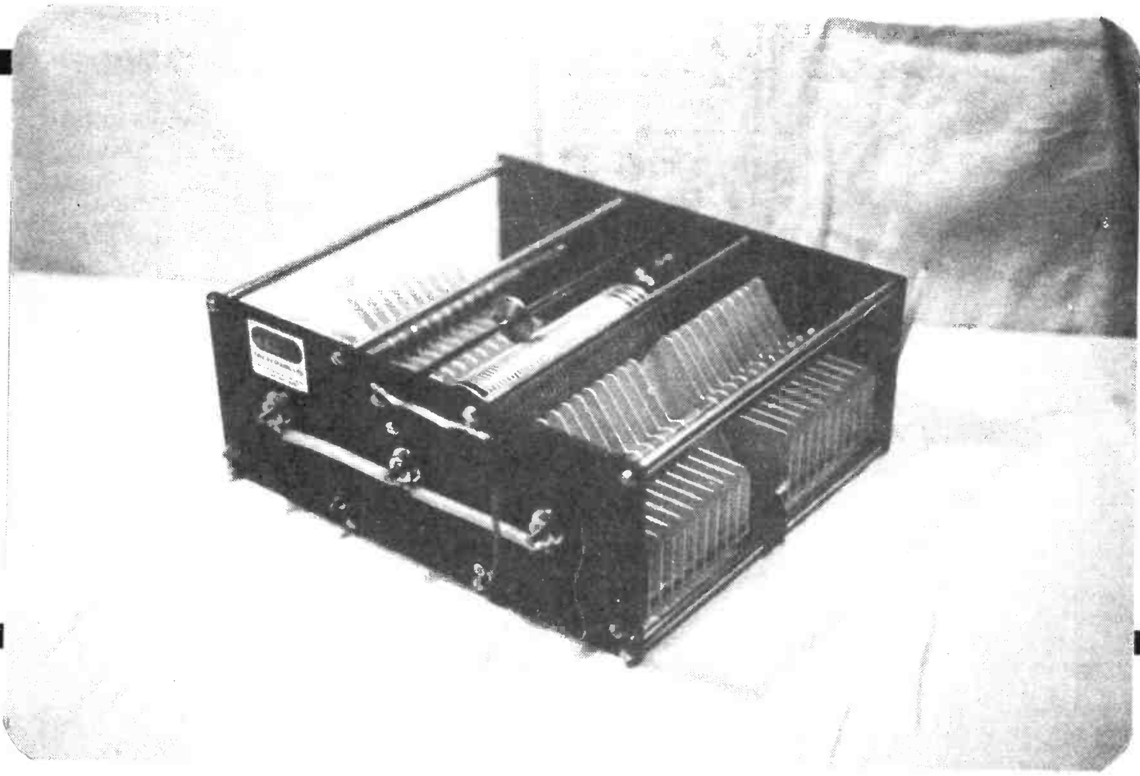


Having just acquired one of these new kits from TAU Systems of Skelmersdale, it was interesting to see how simple it appeared to be to construct, and should be within the capability of any amateur.

The kit is well packaged with all the small parts in labelled bags, and the materials used are of a high quality.

The mainframe end-plates are of phenolic resin bonded laminate sheeting and the tie bars of plated steel, with an internal thread at each end. Solid brass which has been nickel plated is used for the shafts and spacers.

The stator and rotor blades have been stamped out of aluminium sheet and then chemically degreased. The rotor blades have a square hole punched through for positive location onto the shaft. Spacers are provided, machined accurately to length, and a close fit to the shaft. This ensures accurate alignment during construction. The variable inductance coil comes as a pre-formed item, due to the complexity of its design.

Power is supplied through the unit by heavy copper feed wire in a polythene insulator. This is connected to the rotors and the inductor with heavy duty solder tags mounted on the spindle bushes.

The travelling connection of the inductor consists of a specially formed wheel which slides along a plated brass rod; it is kept in contact with the inductor by two small tensioning springs, any unevenness being allowed for by the elongated mounting holes for the shaft in the mainframe plate.

Construction

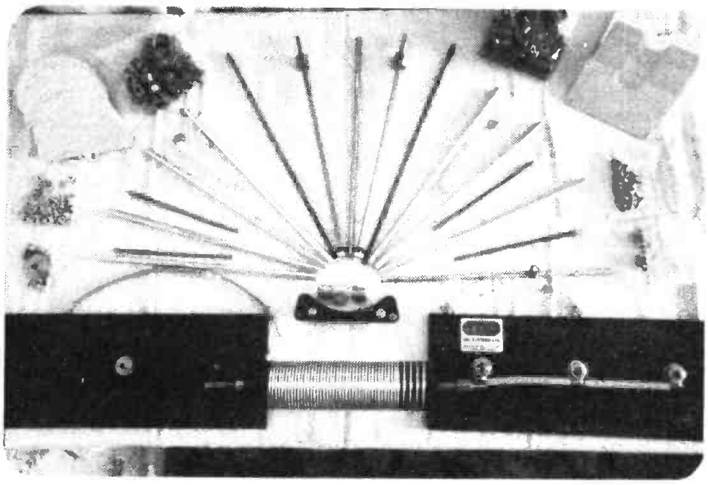
After carefully reading the instruction booklet, construction is very straightforward. All the parts were easily identified from their description in the text.

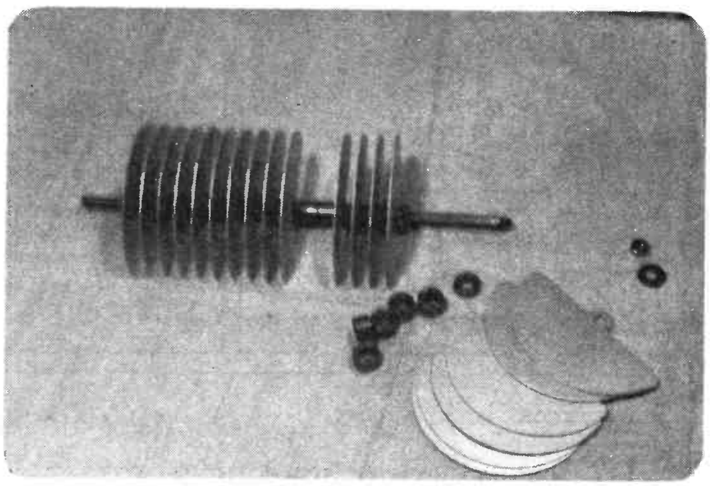
The instructions are explicit, and warnings, advice and other important notes well marked. One minor fault with the instruction booklet is the quality of the pictures; line drawings would probably be clearer.

Tips to assist the constructor are also given where some difficulties may be encountered, an example being the running of a fingernail over the stator and rotor plates, after construction, to obtain a clear ringing sound. This indicates that the plates are correctly tightened.

The tip given about using petroleum jelly, to assist with the location of the pivot point ball-bearing, is useful but it could be rather messy. An alternative I found, is to slide the rotor toward the rear mainframe plate, with the lock nut of the adjuster in position. Then with the unit standing on its front and the bush in place, drop the ball-bearing into place. Now the adjuster can be threaded into the lock nut, trapping the ball-bearing between its location points. The final adjustment is now made.

Adjustment of the stators is best done when all other construction is complete. This is easily achieved as the whole stator unit, being built on threaded rods,





BUILDING THE TAU SYSTEMS SUPER-TRANSMATCH ATU

A look at the construction of this all-British aerial tuning unit kit

by Peter J Kitwood

is easily movable by a very accurate amount.

The method I found best was to tighten the rods and have them under a small amount of tension. Then, by loosening the stator clamp nuts on the side that needs to be moved and gently tightening the opposite side, the stator plates can be moved along the rod.

When the correct spacing has been achieved, the assembly can be finally tightened up. All that is now left is to mount the unit in a case and make the input and output connections.

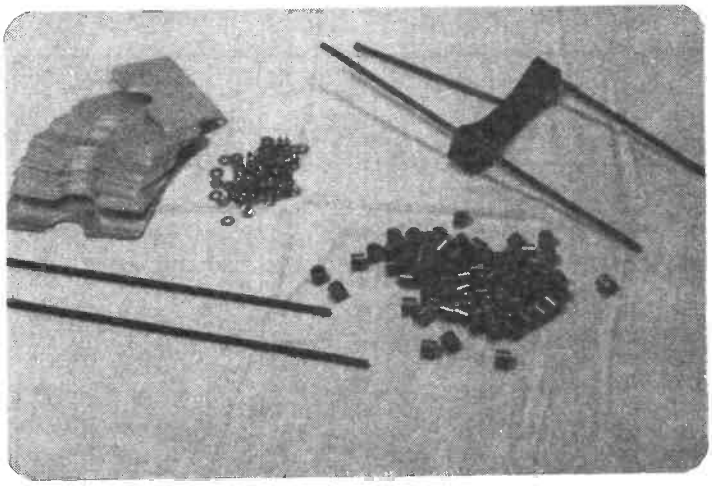
Cases

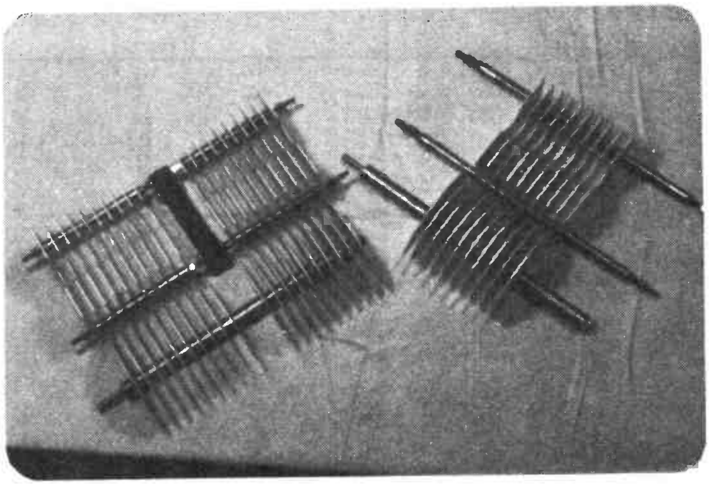
The unit does need to be fitted in a case as there is a possibility of high voltages in the system. The case could either be home-made or obtained from the range that can be supplied by TAU Systems.

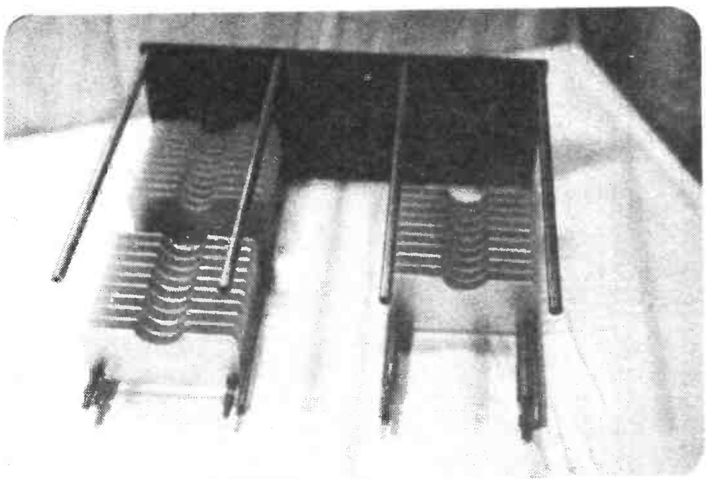
A wide selection of cases and accessories are available to complete the project.

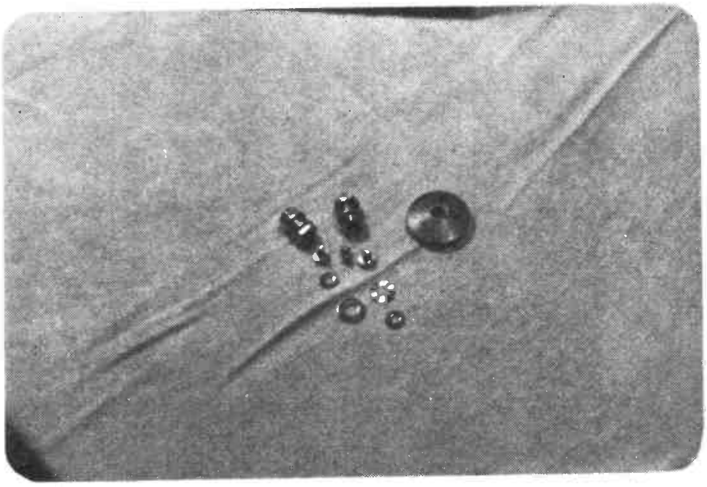
I found the kit a pleasure to construct with no major difficulties, and would recommend anyone looking for an ATU to consider purchase.

It is available as a ready-made unit but with the ease of construction, I would say that the kit is certainly the better buy.









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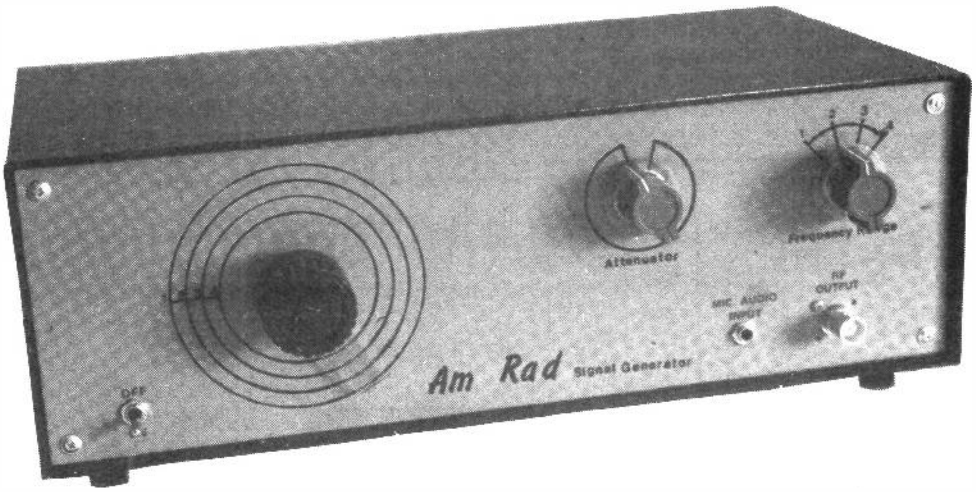


A WIDE RANGE TRANSISTORISED SIGNAL GENERATOR

by PAUL W. WARREN

It must be emphasised to the reader at the start that the following circuit is experimental in nature, and in no way represents state of the art. It does, however, with practice, provide a cheap source of accurate RF energy for the repair or alignment of other radio apparata.

This is one of those simple circuits that is easily made, works well, and has a wide variety of uses, in aligning or repairing faulty domestic receivers, testing dynamic range, or setting up aerial systems.

You can use it in its basic form, or expand it by adding an audio oscillator to its input and a switched step attenuator at its output, and adding RF meters, etc, at will or when your budget allows.

No originality is claimed for the circuit, being a well established type of Hartley oscillator.

In fact, this article is more of an exercise to show novice and blackbox operators what can be achieved with simple home construction, and to stimulate those who, like myself, have more than a passing interest in the engineering aspects of amateur electronics.

Circuit considerations

Actually, the idea for this project came from examining the circuit of an old war surplus BC-221 heterodyne frequency meter described as 'a dual range variable frequency oscillator with a crystal controlled oscillator operating at 1MHz.'

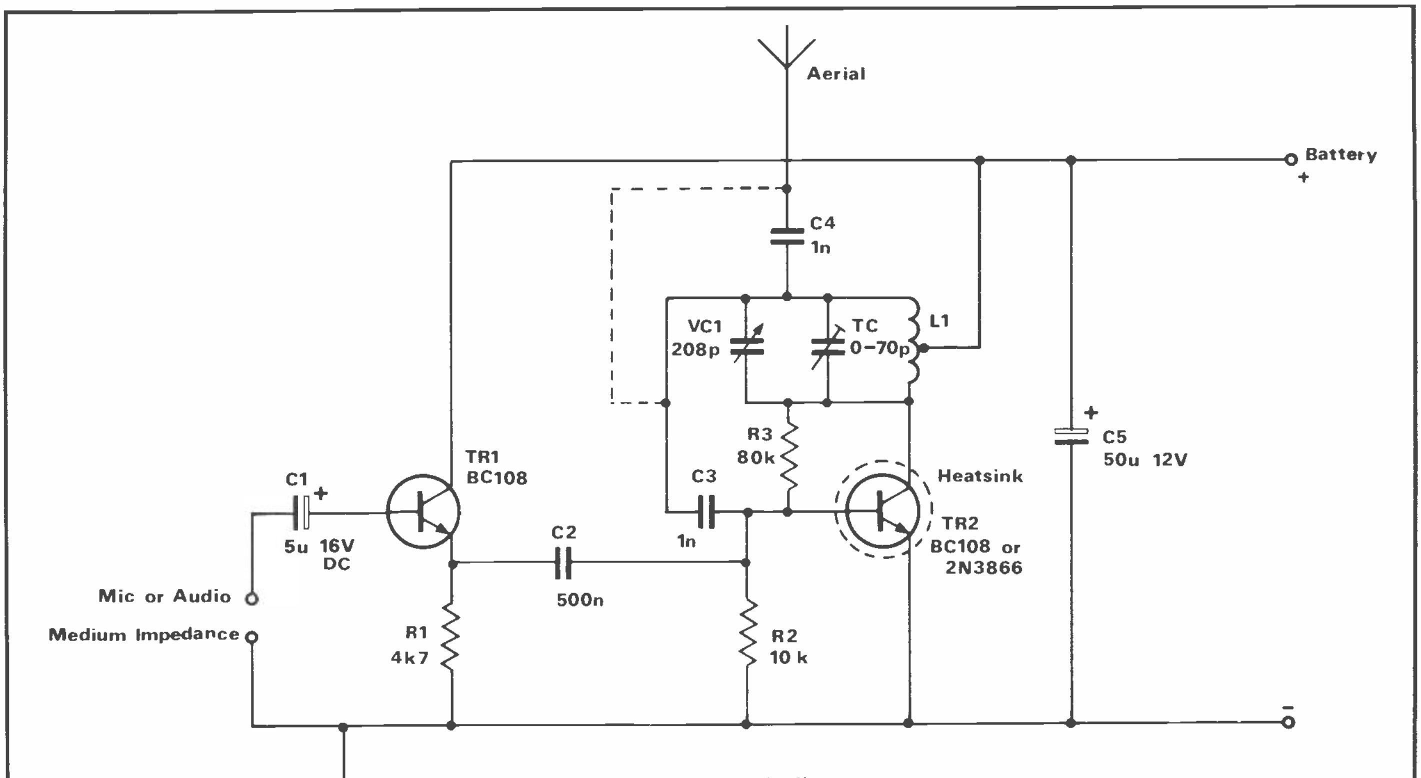


Fig 1a Circuit diagram

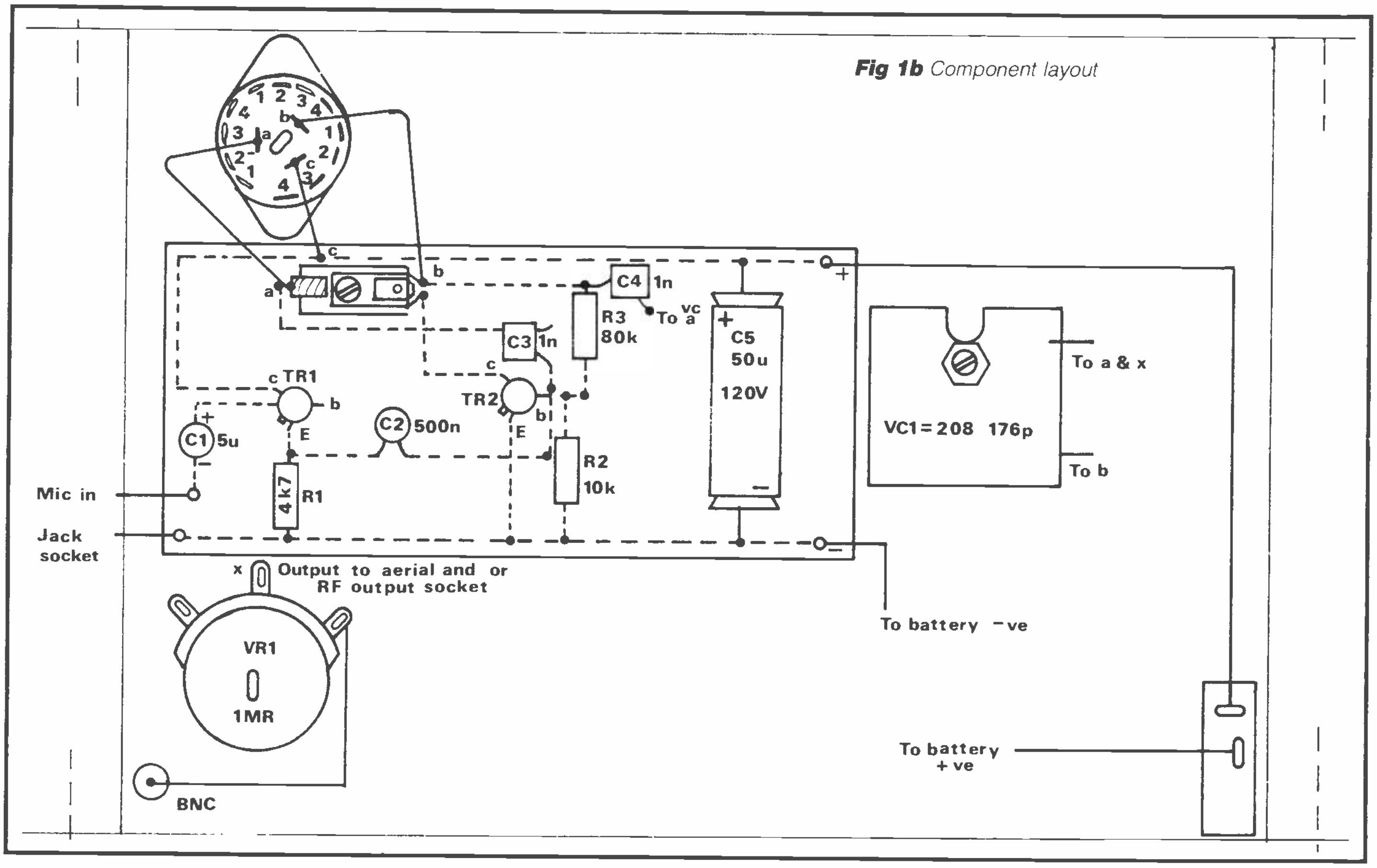


Fig 1b Component layout

The variable frequency oscillator operates in the ranges of 125 to 250KHz and 2 to 4MHz on fundamentals.

The outputs of both oscillators are rich in harmonics, so that the instrument can be used well into the VHF range.

It is calibrated on harmonics to 20MHz and each instrument has to be individually calibrated. They can be housed in either wooden or metal cases.

While I could have copied the circuit direct using FETs, the RF output wasn't strong enough for the dynamic tests I wished to make. Also I did not include the 1MHz crystal oscillator, because the value and added complication to the operations involved are as questionable today as when the BC-221 was more widely used.

There still remain many similarities in use, including the fact that the circuit is prone to strong hum when operated off a mains power supply; this is not necessarily a fault and mains modulation can be as useful as a separate audio oscillator, which is why I haven't included one on the circuit described.

The circuit layout is quite simple and is shown in *Figure 1a* with the component layout shown in *Figure 1b*. You can use just about anything for a circuit board; I use sheets of scrap formica and drill out the holes myself, but you can buy perfboard, or veroboard with copper tracks. It is simply a matter of choice.

Even the component values are not especially critical, and a couple of ohms, pFs, or μFs either way, shouldn't matter. The choice of transistor at Q2 could affect the frequency coverage, in that a

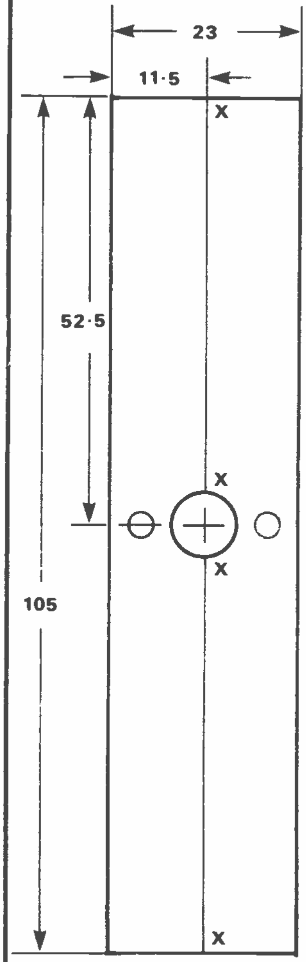


Fig 4 Dial pointer

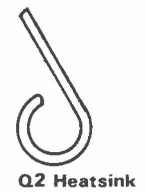


Fig 2 Heatsink

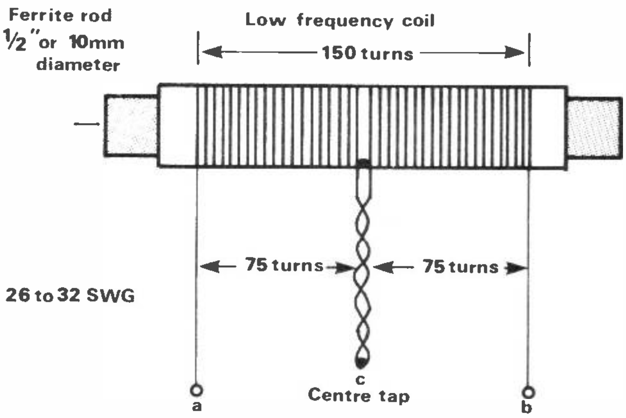
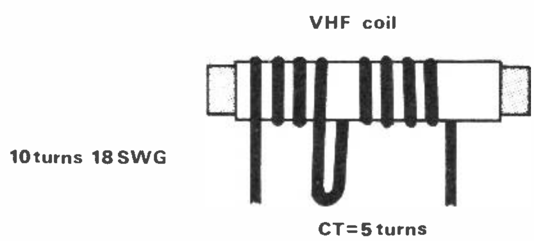


Fig 3 Coil construction



BFY51 used in the first circuit, limited the harmonic output to just about 14MHz; this, too, may be an advantage in some applications.

Conversely, a UHF surplus 2N3866, because it is a one watt transistor, may generate less heat and at the same time allow a more powerful output of harmonics in the UHF region. A *heatsink* shown in *Figure 2* is mandatory on Q2, regardless of the transistor used, otherwise it may suffer burnout.

Metal shielding is mandatory to restrict interference to neighbouring receivers.

This can be accomplished either by using a ready made metal case or lining the case described with kitchen foil and glue.

The value and type of variable capacitor for VC1 is also arbitrary. The prices of these are ever increasing like everything else and price and availability may dictate the final choice more than anything else.

You may choose direct drive, a slow motion drive unit, or the VC may have slow motion drive built in. All these variables influence the type of mounting installation. Anyway, the value may be anything from 60pF to 1000pF (a two ganged 500pF hooked up in parallel). C4 is an aerial capacitor and can be anything from 60pF to 1000pF.

The dotted line shown in the circuit is a setup I use to limit the effects of hand capacitance at higher frequency ranges. If a larger (deeper) case is built, a plastic extension rod used to drive the VC should practically eliminate any hand capacitance effects altogether.

The coils are all experimental. For greater stability the ARRL recommend 'that no metal cores should be used in the oscillator tank coils.'

This, however, reduces the strength of the output signal from the generator. Because of this contradiction, a 3 pole-4 way switch is included, so that different and final coil setups can be switched in and out at will.

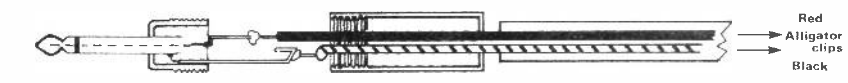


Fig 5: *Test lead connections*

But if the low frequency coil shown in *Figure 3* is found adequate by itself for your intended purpose, then there is no reason why this or other coils cannot be soldered in directly, eliminating the expense of a switch.

The simple attenuator, VR1, while not essential to operation, is recommended to reduce output and not overload receiver circuits, an effect which can obliterate any accuracy of the signal generator.

The case as shown in the title photograph is self-explanatory. The scale pointer shown in *Figure 4* is cut from the clear plastic cover of an audio cassette case.

The hole is melted in with the soldering iron and reamed out to the desired size with a pen knife. Attempts to drill the hole will snag and crack the plastic. Slots are sliced at the points marked 'x'. A red thread is pulled snug in these slots and secured with Bostik or super glue.

For the front panel scale a small protractor is used to good effect and the degrees of 0 to 180 are marked off against frequencies in a note pad.

Unless you have another signal generator, frequency counter or receiver with one, then the signal generator must be calibrated on long, medium, and shortwave against stations of a known specific frequency on your receiver, such as the BBC Local, Radio 1, 2, 3, Independent stations; on shortwave against WWV transmissions on 5, 10 and 15 MHz, BBC World Service and/or other known frequencies you may have marked out on an all-wave shortwave set.

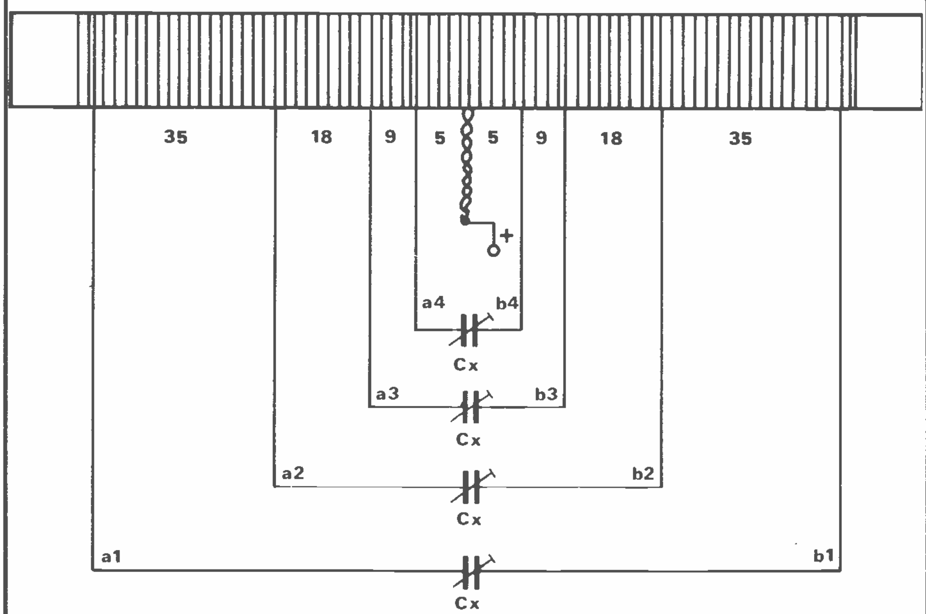


Fig 6: *Coil connections*

The attenuator must be set so as not to overload receiver circuits either on the fundamental circuit frequency or on the myriad of harmonics. Of all the harmonics, the fundamental will be the strongest. Long, Medium and Shortwave (1.8MHz to 6MHz) are less trouble to mark off than the higher frequencies, which will require more time and patience of the experimentor.

To trace a faulty transistor in a domestic or other receiver, one may either start from the RF Amplifier, and work towards the detector, or from the detector backwards. When working with faulty RF circuits, the former method should be preferred.

The aerial lead of the generator is placed, via an isolating capacitor, to the base and collector (the gate and drain in the case of FETs) until the faulty transistor is found.

If the audio stages are suspect, then a diode probe is affixed to the generator's output lead. The diode probe consists of a stiff piece of copper wire soldered to a diode and a connecting lead, all of which is stuffed inside an empty ballpoint pen casing, or else a separate audio oscillator is used. Experimentation with the unit, is I think, all part of the fun of discovery and also useful.

As noted previously, no audio oscillator circuit was included and the coils were strictly experimental and served my own purpose. However, for those who may wish a more permanent set-up, the following notes, drawings and suggestions may be of interest.

Applying an earphone out on a portable radio across the negative rail and C1, only produced distorted sound and unreliable oscillations. Bypassing Q1 eventually altogether, it was found that putting the audio signal across the negative and positive rail at C5 produced a fairly clear modulated RF signal in the test receiver on medium wave, shortwave and FM broadcast. It could be that the Q1 part of the circuit could be eliminated, but it is probably better kept, and with appropriate matching capacitors at C1, used for test distortion from various types of microphones, and other similar inputs.

For the test lead from the broadcast receivers earphone socket, a simple

Parts List

Resistors

R1	4K7
R2	10K
R3	80K
VR1	1M

Capacitors

C1	5μF 16V
C2	500nF
C3,4	1nF
C5	50μF 16V
VC1	208pF mounted on front panel
VC2	0-70pF trimmer

Semiconductors

TR1	BC108
TR2	BC108 or 2N3866
L1	see text
SW1	SPST
SW2	3P4W

(mounted on front panel)

Sockets, plugs and knobs to suit

expedient would be to cut the head off an earphone plug, but really you are better making up your own test cable, with two different coloured leads, preferably red and black so you can tell the earth from the hot lead.

This can later be used for testing different speakers which you suspect are faulty. Remember that some radios have positive earth and some have negative earths at their audio outputs; so you may have to switch the audio wires around to get a smooth signal out of the generator. *Figure 5* shows the construction of the test lead.

For those who may wish a more permanent arrangement when they are satisfied that the circuit is worthwhile, I have devised the coil arrangement shown in *Figure 6*.

Again, the idea was borrowed, if you like, from the circuit plans of an old valve signal service generator on which no coil details were given: so the following coil winding details are an estimate of those used in receiver circuits, but should be fairly close with sufficient circuit overlap.

To attempt to eliminate some of the chopping and changing that usually accompanies tapped coil windings, trimming capacitors of a fairly high value are placed across the individual tappings, as illustrated in *Figure 6*, but they are more for convenience than necessity.

The coil windings are for ½inch diameter coil formers and may have to be more or less according to whether using smaller or larger formers.

In the setup of *Figure 6* the centertap by-passes the three pcle/four way switch and solders direct to the positive line. 'A1/B1', etc in *Figure 6* refer to 'A' and 'B' sections of the switch and the 'C' section of this switch is not used. The trimmer capacitors should be as large as possible, with 0 to 170 pF being nearly ideal.

In next month's *Radio & Electronics World* Frank Ogden G4JST starts a series on test equipment

SPECTRUM ANALYSER

by Ernie Sumption, G3DQL

The boards are made from double-sided fibre-glass material which, though not essential for the power supply and sweep circuits, simplifies construction. With the exception of the VCO/mixer board, which has two layouts, the top surfaces of the boards are left un-etched to form a ground-plane.

I have found from experience that the quickest way of protecting the surface from etchant is to coat an area about half an inch wide round all four sides of the board with ink from an etch-resistant pen such as the Dalo, and when dry cover the whole surface with well over-lapped cellotape.

Without the ink there is a tendency for the etchant to seep under the tape and partially etch the edges, which gives the boards a rather tatty appearance.

Figure 1 shows how the components should be formed when an earth connection to the board is required. The black squares on the layout drawings denote leads which are soldered to the earth-plane. The black dots show where earth connections need to pass through the board.

In this case a wire should be passed through the board and soldered both sides. After drilling, the copper round the holes on the upper surface should be removed and this can be done by twisting a hand-held quarter inch drill inserted in the hole. This should not be done where a black dot is shown on the layout.

Pre-amp and log-amp

This board is rather long, and if you cannot obtain a large enough piece of board to cover the whole circuit, the pre-amp and log-amp can be made from separate pieces, joined at the cross screen, which is placed between the two circuits. The signal circuits are fed through the screen by either a piece of insulated wire through a hole in the screen, or preferably via a glass feedthrough insulator.

There is one error on the original circuit diagram which some constructors may have missed. The pre-amp emitter degeneration resistors marked 4K7 should, of course, be 4R7. Wes Hayward's formula $Rf=Zo^2$ confirms this.

Figure 2 shows the layout for the first pre-amp, the second being similar.

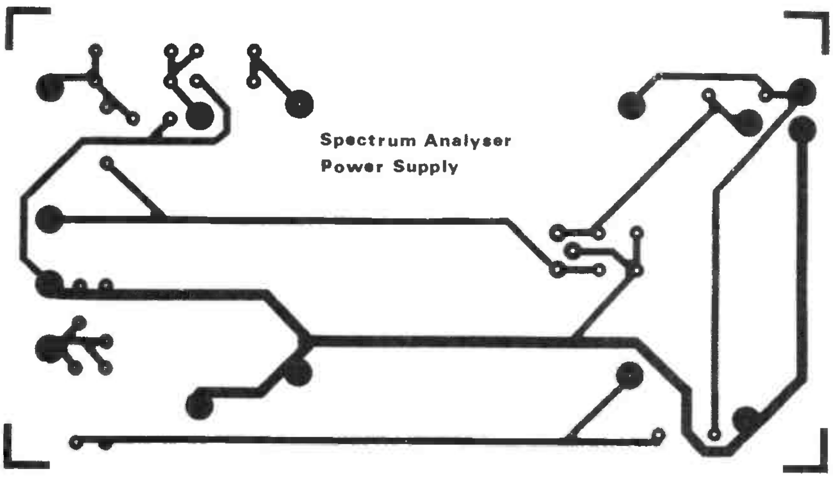
Figure 3 shows the layout for the buffer amp and the first log-amp. The other log-amps are similar in layout except for the additional .01µF capacitors in log-amps 2 and 4. The variation in the layout for the final log-amp output is also shown. It is suggested that the construction of the log-amp be undertaken working from left to right down the length of the board.

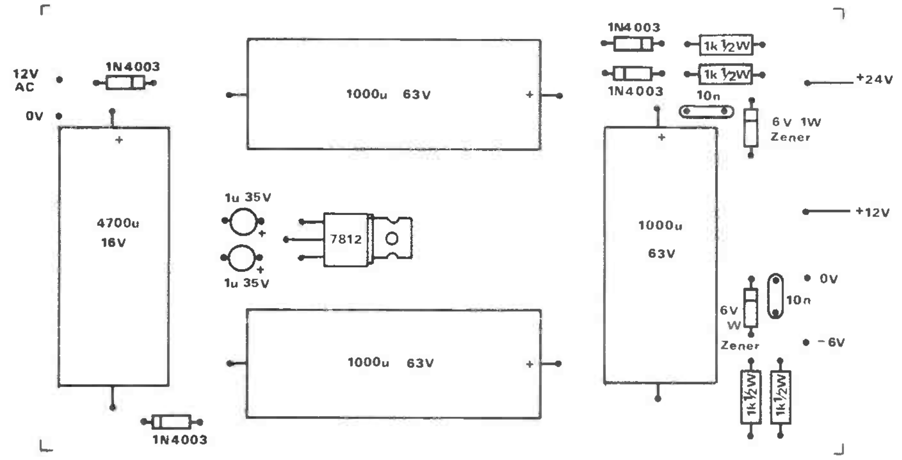
VCO/mixer

This board is not quite as easy to construct as the previous one and it is suggested that construction is done in the following sequence. Firstly, the filter screens should be cut from double-sided PCB material to the dimensions shown in *Figure 4*.

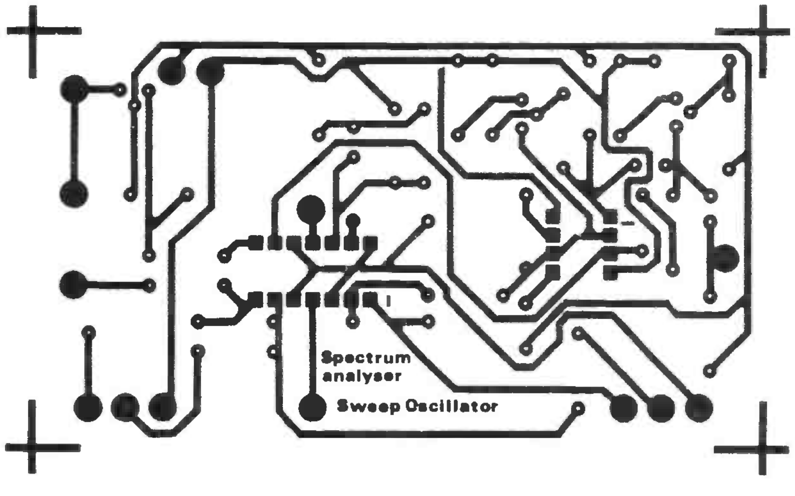
A cross shows the position of the holes for the glass feedthrough insulators.

The mixer circuit should be constructed first, the layout being shown in





Power supply component overlay



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The day after the fire we did not even have a single pen to write with, to say nothing of the non existant showroom and burnt out warehouse with direct access to the stars via our now non existant roof!!
The loss of stock and damage to the premises has resulted in losses in excess of £400,000 pounds in real money - no price can value time and effort.
We are still, although working under great difficulties, **VERY MUCH** in business. We owe this to supreme efforts by all our staff - perhaps knowing their jobs could have been at stake, stock being located at several different locations, help from business colleagues and our bank.
To these people, I say a very loud THANK YOU.
To both the mighty **PRUDENTIAL** and **GENERAL ACCIDENT** Insurance Companies who from the date of our fire have NOT even offered or paid **A SINGLE PENNY** in compensation or have not even offered an ounce of moral support . . .
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David Fisher, Managing Director, DISPLAY ELECTRONICS

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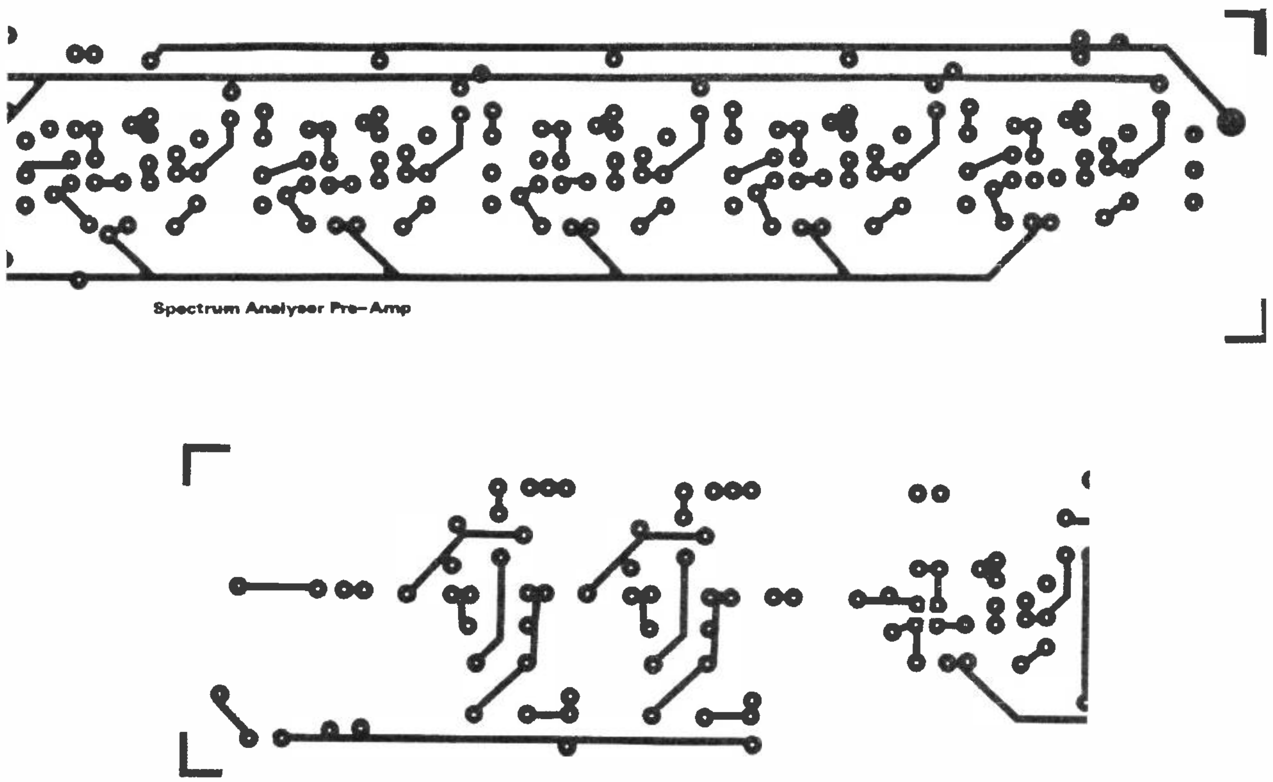


Fig 2a Pre-amp PCB layout

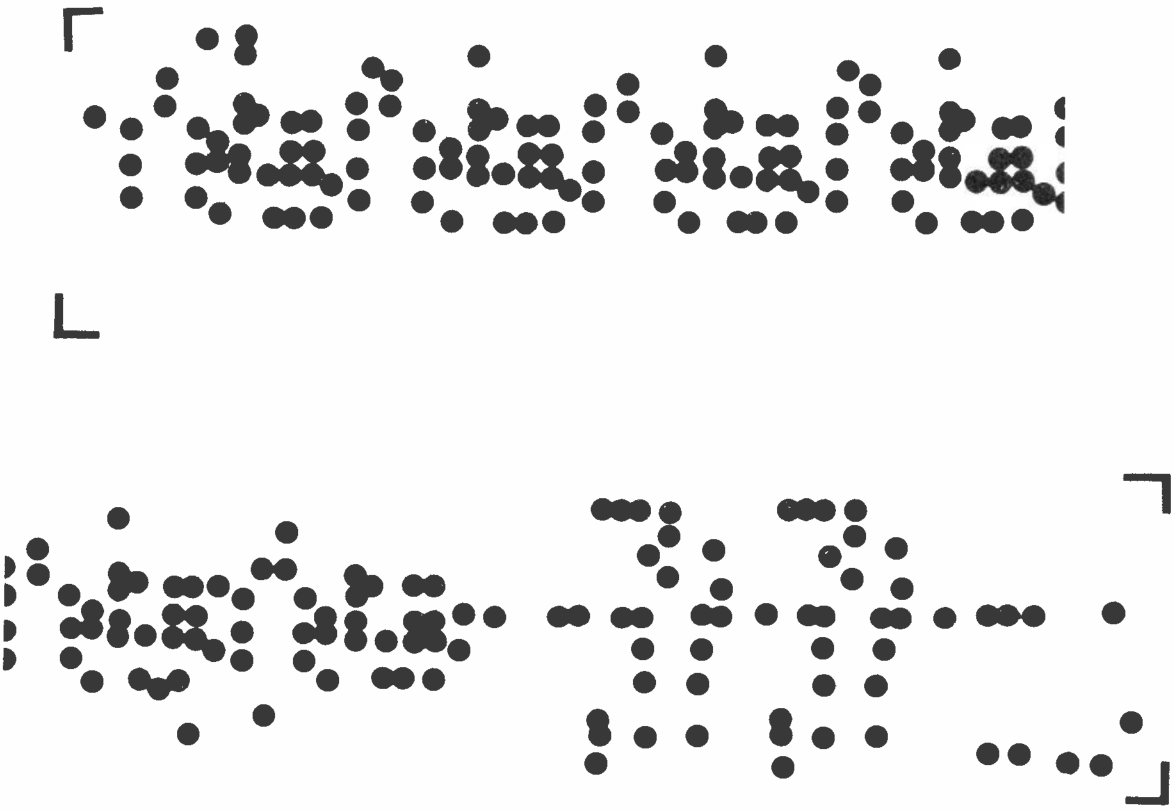


Fig 2b Pre-amp PCB top plane layout

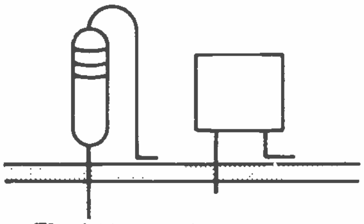


Fig 1 Method of mounting components

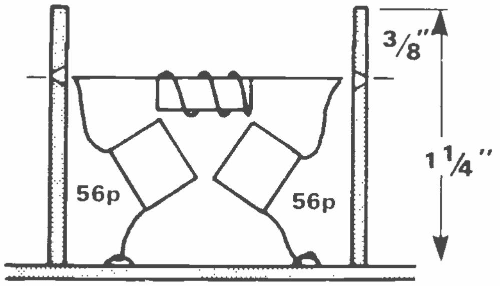


Fig 6 Side view filter section

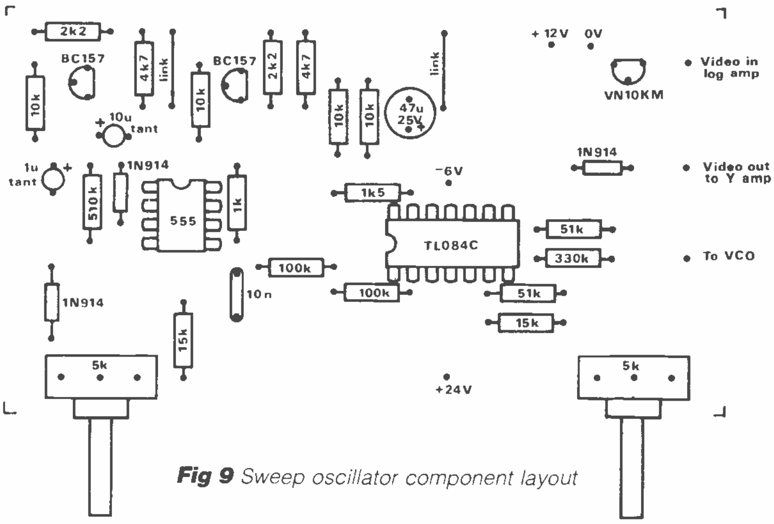


Fig 9 Sweep oscillator component layout

Figure 5. The DBM must be inserted the correct way round, the letter M from MCL which is stamped on the metal case being located in the position shown by an inverted M on the layout drawing.

The filter screen components should now be assembled, the black arrows on the edges of the board template show the location of the screens.

The best way to assemble the screens is to mark the position of the small cross-screens on the long screen, lay it flat on the bench and, holding the cross screens vertically, solder them both sides to the long screen.

The completed screen should now be soldered to the board, both sides where possible. The VCO layout is shown in *Figure 7*, the components being soldered to pads on the top surface of the board, the leads being kept as short as possible.

The layout of the filter sections is shown in *Figure 6*, and the VCO amp layout is identical to the pre-amp with the addition of the VCO voltage test components.

Power supply

The power supply board is straightforward, the layout being shown in *Figure 8*.

COMPONENTS LIST

Pre and log amps

1/4 watt resistors

Quantity	Value
7	22R
2	4R7
4	51R
8	100R
6	150R
2	510R
3	1K
2	3K3
12	10K
1	10K Pot (Ambit cermet pre-set 48-10302)
	Capacitors
12	.01μF ceramic
24	.001μF ceramic
6	50pF (or 47pF)
6	27pF Silver Mica or polystyrene
1	150pF ceramic
	Semiconductors
2	2N5179
6	3SK51
6	IN914
1	IN4739 (or 9V1 1W Zener)
	Inductors
2	Ambit Fairite 26-43006301
6	Maplin Can No 10 LB36P
6	Maplin Base Plates LB44X
6	Maplin Cores type 4 LB41U
6	Maplin Formers 722/1 TQ500

VCO mixer filter

1/4 Watt resisters

Quantity	Value
2	18R
1	39R
2	100R
3	150R
1	4R7
1	51R
4	300R
1	1K
2	510R
1	3K3
1	10K
1	100K
1	10K ½W
	Capacitors
	50pF (use 47pF)
2	200pF (use 220pF Silver Mica or Polystyrene)
1	470pF (Silver Mica or Polystyrene)
6	56pF Silver Mica
1	.001μF ceramic
5	.01μF ceramic
	Semiconductors
1	MRF901
1	2N5179
2	MV 109 (Use two Ambit KV1310)
1	IN4739 (or any 9V.1 1W zener)
	IN914
1	**Inductor Cores**
3	T37-6 (Ambit)

Sweep circuit

¼ Watt resistors

Quantity	Value
1	330R
1	510R
1	1K
1	1K5
2	2K2
2	4K7
5	10K
1	15K
2	100K
2	5K Pots (Ambit type VM10R)
	Capacitors
1	1μF 35V Tantalum
2	10μF 35V Tantalum
1	50μF 25V radial (use 47μF)
1	.01 ceramic
	Semiconductors
2	BC157
3	2N914
1	NE555
1	TL084 (or LM324 Tandy)
1	VN10 KM

Power supply

Quantity	Value
4	1K ½W
1	12 volt ½ amp transformer
2	1μF 35V tantalum
1	4000μF 35V (Use 4700μF 16V)
3	1 000μF 50V (use 63V)
	Semiconductors
1	7812
4	IN40003 (IN4002)
1	IN4742 (any 12V 1W Zener)
1	IN4735 (any 6V 1W Zener)

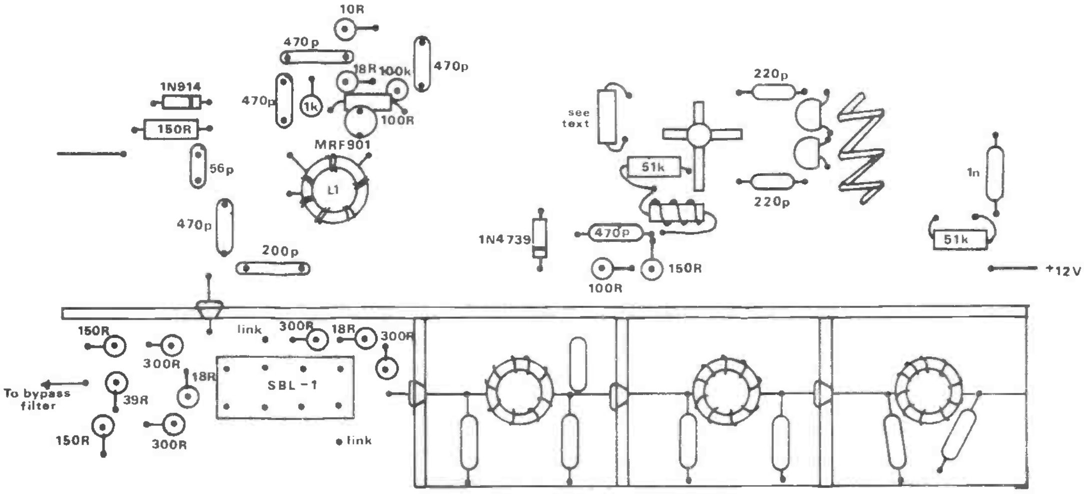


Fig 7a *Component overlay*

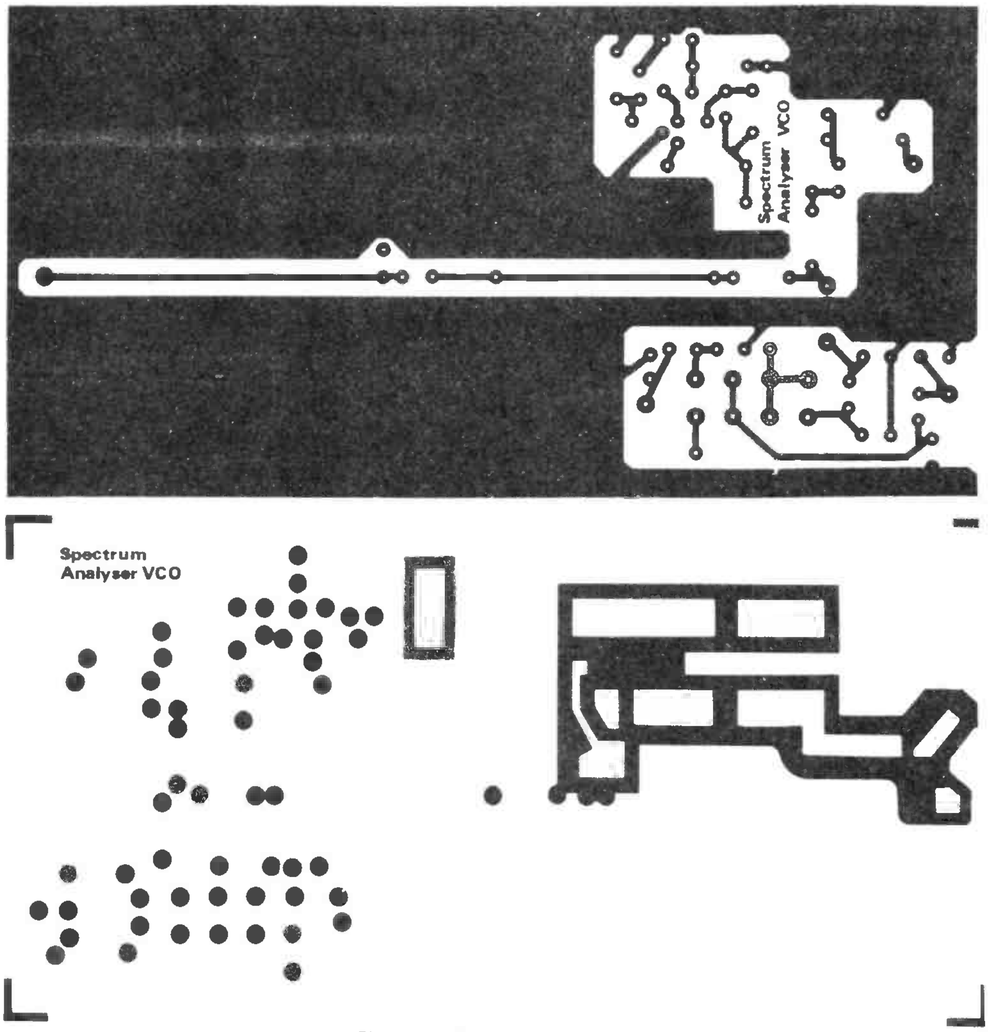


Fig 7b *VCO PCB layout*

Note that the working voltages of the electrolytics are different to those on the circuit diagram. This makes the capacitors easier to obtain.

For the ac supply, I have used an ordinary 12 volt ½ amp transformer mounted together with the power supply PCB in a tin-plate enclosure inside the analyser case, the three supply voltages being fed out via 1000pF feedthrough capacitors to eliminate any noise on the supply lines.

Sweep circuit

Once again the board is straightforward. Any make of potentiometer can be used with this circuit and connected by wires, but if the Ambit VM10R type or others with 5mm spacing are used, these will connect directly onto the board and support it without further fixing.

Pin 1 of the 555 is soldered to the ground-plane. The layout is shown in *Figure 9*.

I am currently experimenting with a matching sweep oscillator for this analyser which I hope to complete shortly, the biggest problem being the long delivery times for components!

FIVE STATION SCANNER

By M.A. BROWN

This article describes a 5 Channel Memory Scanner designed as an add-on unit to Keith Mitchell's 720 Channel Airband Receiver, described in September and October 1982, or any other with binary coded decimal switches.

The existing thumbwheel switches are retained and the design allows a rapid change of stored frequency.

It is constructed with 14 CMOS devices and incorporates a 4½ digit liquid crystal display. This keeps the current consumption very low, enabling the receiver and scanner to be battery operated. The current drawn by the scanner is approximately 10mA, 8mA of this being taken by the two LEDs; two is the maximum number of LEDs that are illuminated coincidently, therefore the scanner takes 2mA.

The scanner PCB should be small enough to fit into the existing receiver case, and the display panel is fitted to the rear of the front panel.

Circuit design

The unit is designed around RCA's 4039A, readily available from several sources. It has four separate address lines, and an extremely useful facility that allows information at the input pins to appear at the output pins without destroying information latched in the four internal stores.

Figure 1 shows the block diagram of RCA 4039A.

All that is needed to work as a scanner is a scan oscillator, which increments a decimal counter whose output addresses four read lines W1-W4 and memory by-pass sequentially.

Two 4039s are required, as each device is 4 words by 8 bits wide. 12 bits of information are required.

The 720 Channel Airband Receiver signal called Mute is used to control the scanner. This Mute signal goes low when receiving a transmission.

The design allows any of the five stations, four preset and manual BCD switches to be selected and held. Also incorporated is a 4½digit liquid crystal display and light emitting diodes to indicate which channel is on and if scanning.

This 4½digit LCD is used to indicate frequency. The circuit incorporates a retriggerable monostable to disable the display when scanning; this obviates an unreadable flickering display. It makes the display indicate frequency of the last transmission received and also ensures that short duration noise spikes like car ignition interference do not alter displayed frequency.

Circuit description

IC8 is the scan oscillator operating at 40Hz, and is controlled by IC7 if it has been reset by momentarily pressing the scan push button and if Mute signal is high. Inverted output pulses are delayed by R7/C5 clock counter IC9, whose outputs in BCD are converted to a decimal output by IC10. These binary

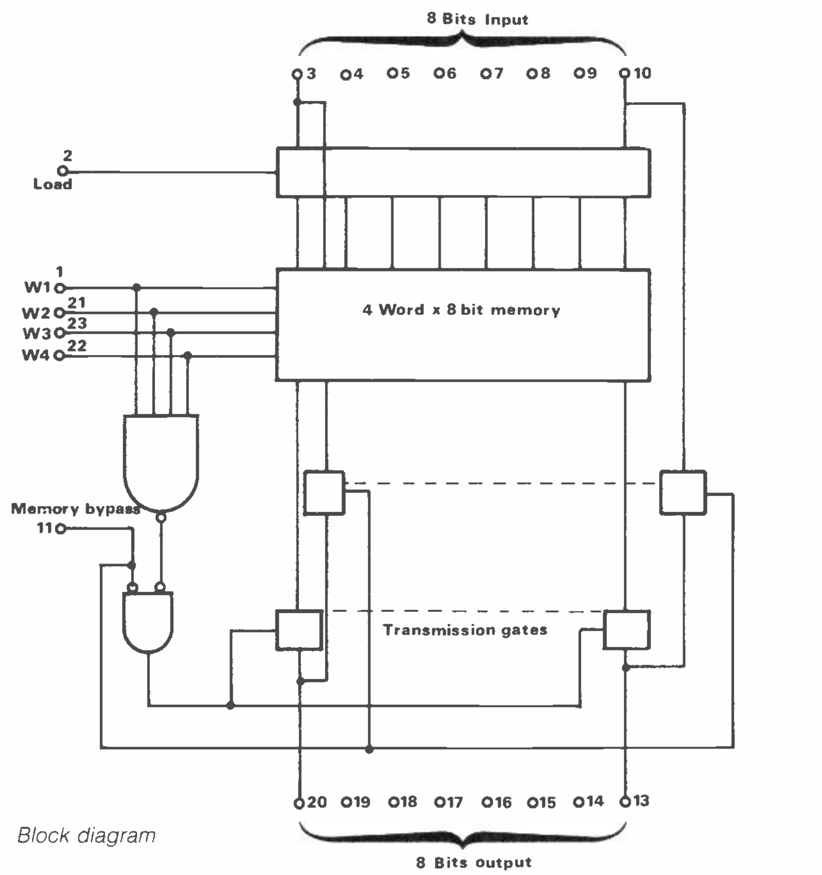


Fig 1 *Block diagram*

1	21	23	22	11	OUTPUT 13 – 20
H	L	L	L	L	WORD 1
L	H	L	L	L	WORD 2
L	L	H	L	L	WORD 3
L	L	L	H	L	WORD 4
L	L	L	L	H	MEMORY BYPASS

High on pin 2 (load) loads data on I/P to location shown in above table:
When P11 high contents of memory are retained

outputs address the 4039s IC12 and IC13 sequentially.

This corresponds to outputs 0, 1, 2, 3 and 4. The fifth clock pulse is present at pin 6 IC10, which is fed via D8 to pin 1 of IC9 (preset enable). This resets the BCD counter to zero, as all the four jam inputs are at 0 volts.

This sequence is repeated until any of the five station buttons are pressed. If any of these switches are momentarily pressed a relative code is connected to the jam lines, and at the same time a pulse is transferred coincidently to the load terminal pin 1 of IC9 via diodes D3-D7 and capacitor C4.

The same pulse changes the state of bistable IC7, stopping the scan oscillator; thus the counter remains loaded with a number which is identical to the particular switch pressed. The diodes D9 and D10 change the five switches to 1, 2 and 4 BCD code. These station-select switches can be pressed in any order to change stations or restart the scan.

The scan oscillator output also drives IC11, a retriggerable monostable, whose Not Q output via diode D1 is connected to the latch inputs of the BCD to the seven segment decoders which drive the liquid crystal display.

This Not Q output stays low until 0.3 seconds after the scan oscillator is held. If any of the five station-select switches are operated, the bistable IC7, via diode D2, updates the frequency display with no delay.

The R11/C5 delay network ensures that the display is disabled before IC9 is clocked, so that when scan restarts the frequency displayed is the frequency of the last transmission received.

The scan mode of operation and station addressed is indicated by miniature light emitting diodes.

R8 and R9 are the current limiting resistors for the LEDs; using the values listed this fixes the current at 4mA for each device. The light output for these high efficiency LEDs is adequate except in bright sunlight.

IC6 is a conventional buffered R/C oscillator for generating the back plane square wave, whose frequency is 34Hz. IC2 is hard wired to permanently produce a one display. IC1, IC3, IC4 and IC5 convert the four digits of BCD information to seven segment format suitable for the liquid crystal display.

These integrated circuits incorporate internal latches which are disabled when scanning, thus giving a static non-flickering display, and are only updatd when scan is held. The frequency displayed remains static until a new frequency is received.

The 25KHz switch legends were altered as suggested in the original article on the Airband Receiver;
The 'O' position on switch was unaltered.
The '1' position on switch was altered to read 2.
The '2' position on switch was altered to read 5.
The '3' position on switch was altered to read 7.

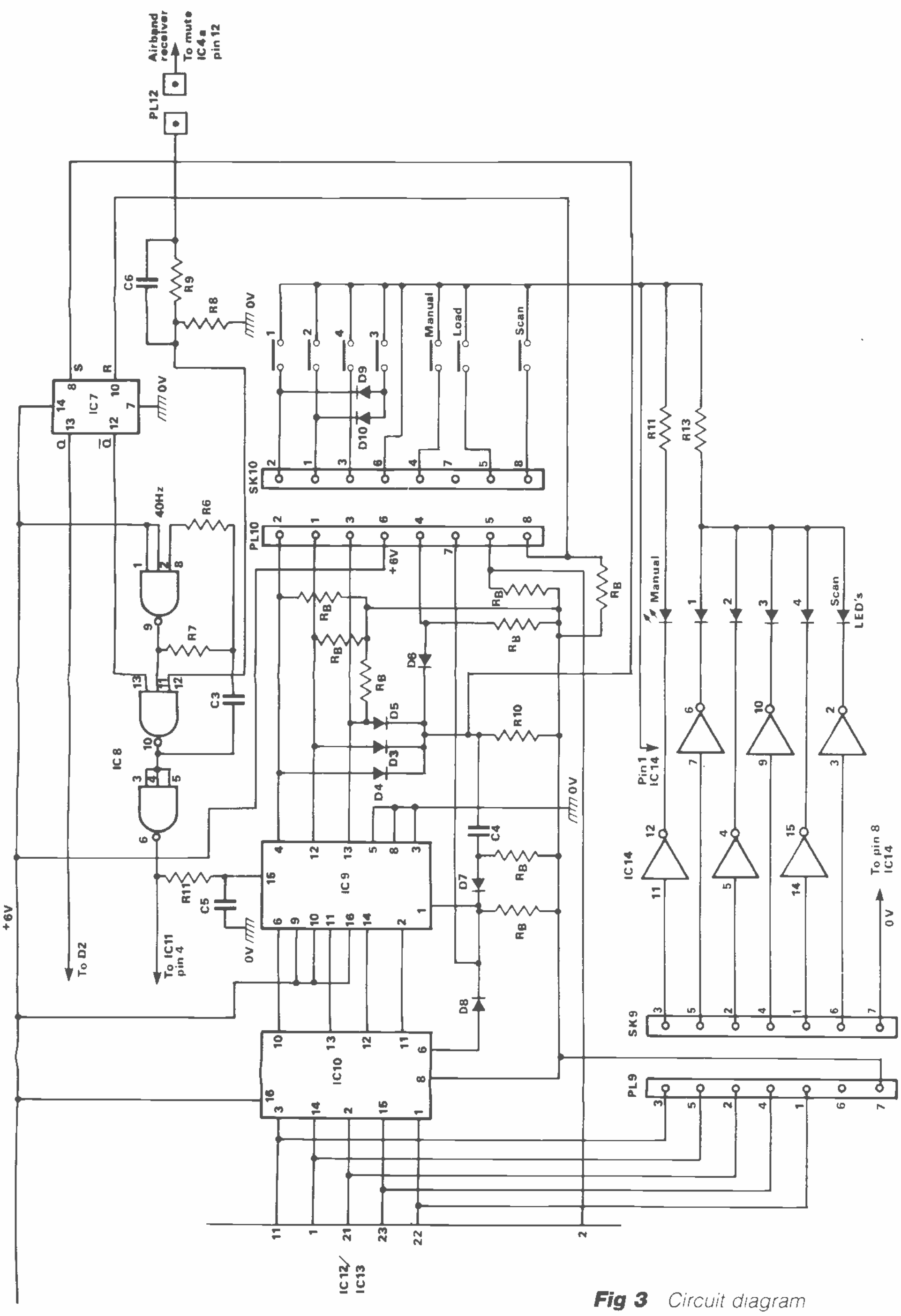


Fig 3 *Circuit diagram*

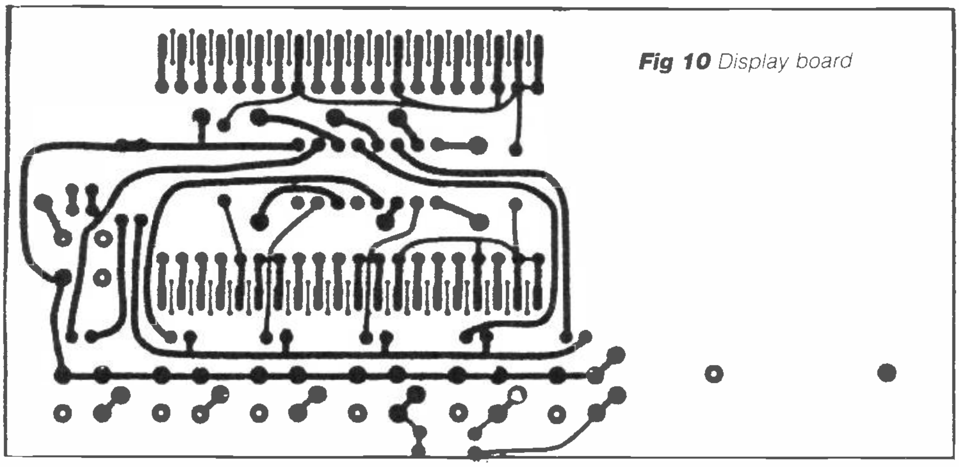


Fig 10 *Display board*

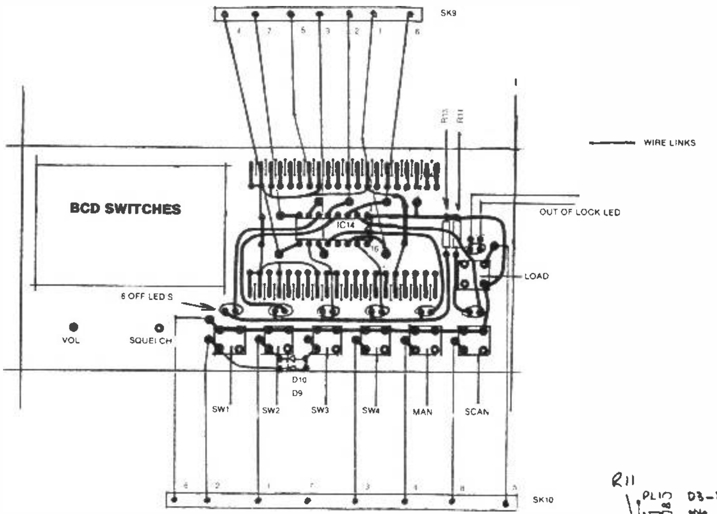


Fig 11 *Display board component overlay*

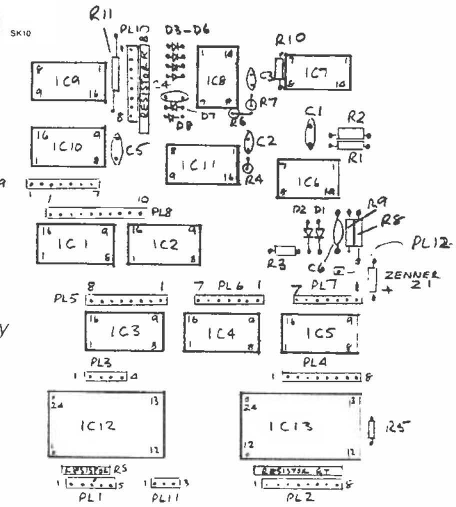


Fig 9 *Scan card component overlay*

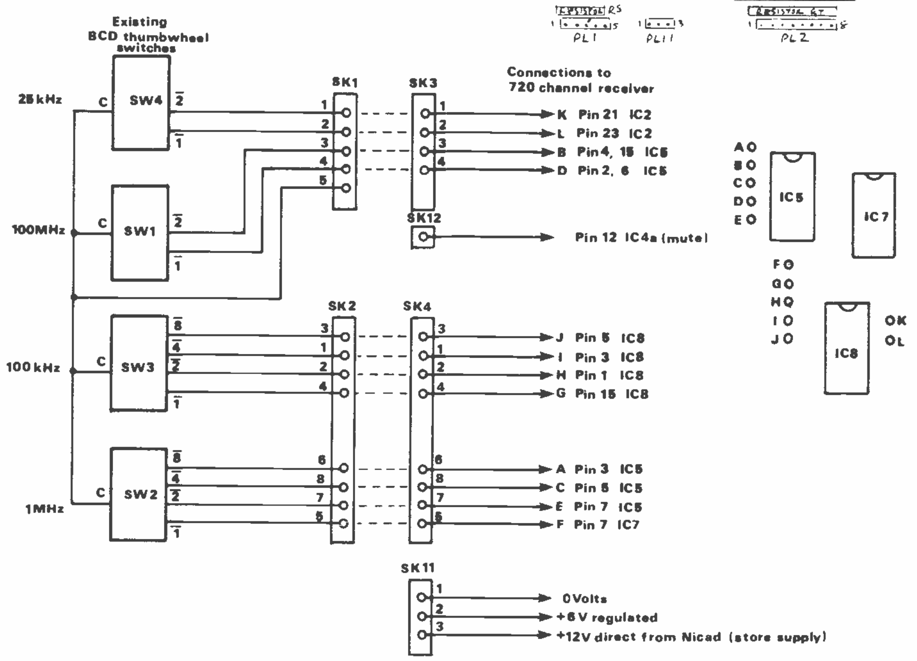


Fig 5 *Socket and switch connections*

The IC1 inputs are re-arranged to compensate for the former changes, and this allows the display to indicate 0, 2, 5 and 7 in the least significant digit.

Construction

The scanner uses CMOS devices, so observe the normal handling precautions.

Assembly of the scanner and display board needs a great deal of care as some of the tracks are extremely close to each other, especially where tracks go between integrated circuit pads. A fine pointed soldering iron and fine cored solder are recommended.

The scan card is assembled first: shown in *Figure 8*. *Figure 9* gives the component layout. The components are fitted in the following order: start by fitting the short wire links using sleeved single strand tinned copper wire. It is important that these links are fitted before the integrated circuit holders are soldered in place, as several pass under the holders. Now the IC holders may be fitted, followed by the five long connections using insulated stranded wire.

Next come the resistors, diodes, single in line resistor packs, capacitors, Zener diode and printed circuit plugs. 10 pin plugs were shortened to the correct number of pins required.

At this point it is advisable to examine the foil side of the PCB with a magnifying glass to ensure that there are no solder bridges or dry joints. If all appears correct insert the integrated circuits into the appropriate holders the correct way (note ICs face different directions). This completes the assembly of the scanner board.

The display board is assembled next; before fitting any components it is necessary to fit printed circuit pins to the board. Insert these pins from the component (top) side and press in flush. A pin is used where all wire connections will be. About 60 pins are required and they are soldered to the foil side of the board, before any components are fitted. Without the pins the foil could be inadvertently damaged.

Figure 11 shows the component overlay. Fit the two wire links. Next fit IC14 the correct way without a holder as a holder would make the IC protrude too high above the PCB; this will enable the LCD to be fitted above IC14.

The push switch buttons are inserted next, ensuring they are orientated correctly, then the two resistors and two diodes are fitted. Next fit the two spring clips to the liquid crystal display, which requires very careful handling. Page H1 of the Ambit catalogue shows how to fit the clips.

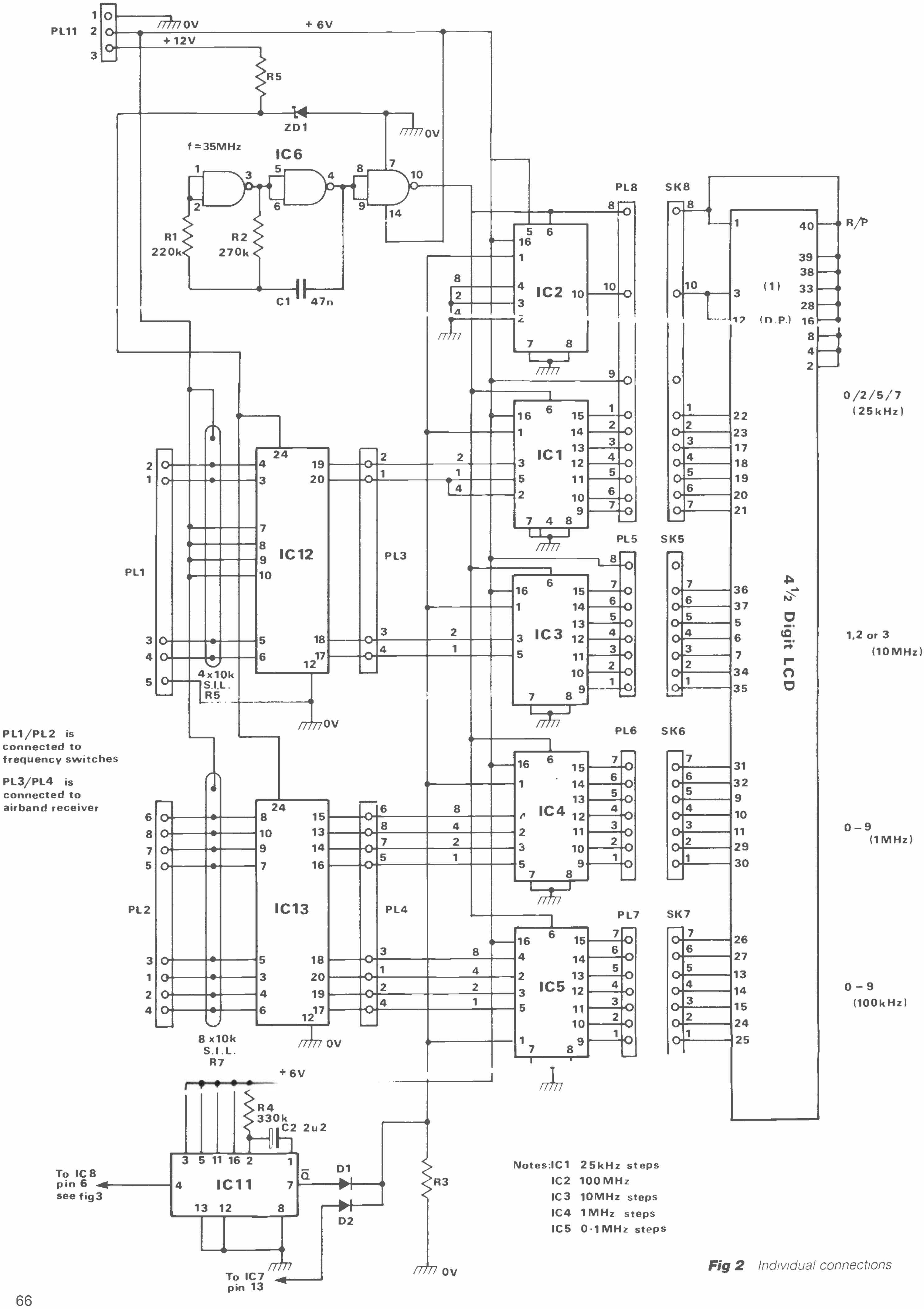
The display can now be fitted. Before soldering, position it at the correct height above the PCB so as to be compatible with the switches. Likewise fit the light emitting diodes so as to ensure that the ends just enter the rear of the front panel.

This leaves all the wire connections to be fitted. Use stranded insulated wires, preferably with different coloured insulation. This makes pin connection identification easier.

The 30 wires from the display need to be separated into four groups, for connection via sockets to plugs 5, 6, 7 and 8. *Figure 2* shows the individual connections. *Figure 11* shows how the push switches and LEDs are connected to socket 10 and socket 9 respectively. Two wires are connected to the 'out of lock LED' to eventually connect to the receiver.

Testing

Before connecting and applying power to the two boards it is advisable to double check all connections. If different coloured wires were used as specified this makes checking easy.



Notes: IC1 25kHz steps
IC2 100MHz
IC3 10MHz steps
IC4 1MHz steps
IC5 0·1MHz steps

Fig 2 *Individual connections*

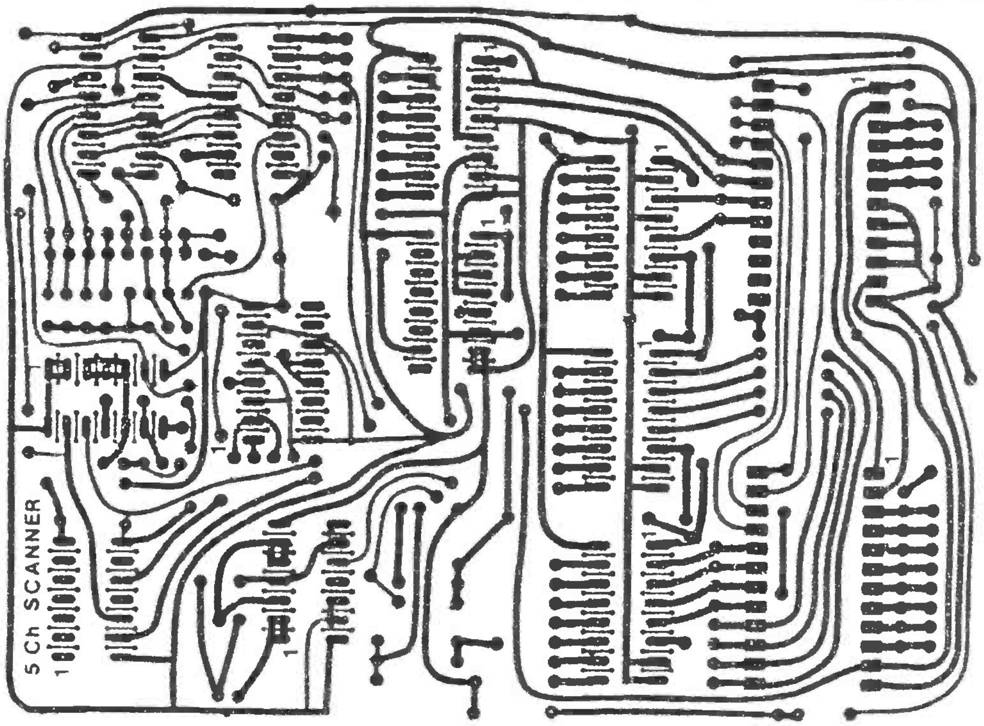


Fig 4
PCB foil pattern

If all is correct it can be tested with two 6 volt batteries before connecting to the airband receiver.

First, disconnect the existing BCD thumbwheel switches from the receiver; connect 13 leads as indicated in *Figure 5* to socket SK1 and SK2. Connect the two sockets SK3 and SK4 to the 12 leads that formerly were connected to the BCD switches. The remaining lead, 0 volts, with two new leads carrying switched 6 volts and direct 12 volts from the Nicad battery in the receiver will require to be connected to socket SK11, with another new extra lead from pin 12 of IC4a in the receiver (Mute).

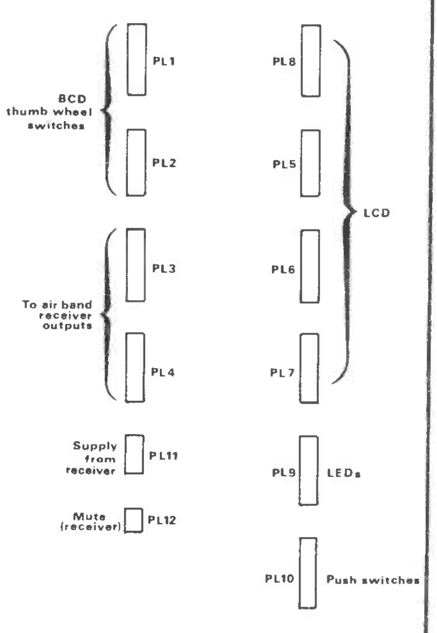


Fig 7 *Board connections*

Connect up the boards as shown in *Figure 7.* Switch on and carefully adjust the squelch control so that it just operates. Momentarily press the manual button and the display will indicate the same reading as the thumbwheel setting.

Before proceeding further this is a good point in the testing cycle to sequence the BCD thumbwheel switches, one switch at a time, to check all frequencies from 118.00 to 136.00MHz. This ensures all leads from switches and LCD are correct.

Initially the 4039 stores will have random data in memory, so before proceeding further they need loading with valid information. Loading is very simple: firstly momentarily operate the station one push button. Dial up the frequency required on the thumbwheel switches and now momentarily operate the store push button. The LCD will indicate this stored frequency. To load station 2, 3 and 4 repeat this operation.

When all four channels have been loaded with data press the scan button and note that the frequency display remains static. When a transmission is received the scan halts and after a small delay, display updates to this particular frequency. When the transmission ceases, scan restarts and the LCD will freeze the frequency of this particular transmission.

Pressing any station select push button immediately indicates frequency without the 0.3 second delay.

If less than five different stations are required, simply load the same frequency in more than one location.

In *Figure 2,* it can be seen that the Nicad supply fed via plug 11 is reduced as the zener diode to 5.6 volts. This ensures that when the receiver is switched off the information loaded in to the stores is retained for future use.

5 STATION SCANNER
Parts list

1/8 Watt 5%

R1	180K
R2,7	270K
R3	100K
R4	330K
R5	10K
R6	39K
R8,9	100K
R10	47K
R11	1KO
RB	8 x 4K7 SIL (9 pin)
RS	4 x 10K SIL (5 pin)
RT	8 x 10K SIL (9 pin)
R12,13	1K2
C1,3	47nF Ceramic monolithic
C2	2.2μF tantalum
C4	2.2nF Ceramic plate
C5,6	100nF Ceramic monolithic
LCD	4½ digit lucid 130FIII
2 off	spring clips for display KB2075
ZD1	5.6V Zener 400mW
DI-D10	BAW62 or any signal diode
IC1,2,3,4,5	4056
IC6	4011
IC7	4013
IC8	4023
IC9	4029
IC10	4028
IC11	4098
IC12,13	4039
IC14	4049

SW1-SW7 push button switches
LEDs 7 off red H efficiency
plug/sockets 9 off, 10 way
pins for above
IC holders 2 x 24 pin, 3 x 14 pin, 8 x 16 pin
Printed circuit pins
PCB
Insulated miniature multistrand wire sleeving

DATES FOR YOUR DIARY

Dates for your diary is updated every month.
Club secretaries and organisers are requested to send information of forthcoming events as early as possible
to ***Radio & Electronics World,*** Dates for your diary, Sovereign House, Brentwood, Essex CM14 4SE

Date	Function	Location	Contact
9 Aug	DF Hunt	Stowmarket District AR Society	G3 ZQU Stowmarket 676288
14 Aug	Fox Hunt	Bury Radio Society	Hon Sec G4TBT Burnley 24254
17 Aug	DF Hunt on 2m & 10m	Dunstable Downs AR Club	Phill Morris Dunstable 607623
19 Aug	HAMFEST 84	Flight Refuelling Social Club, Wimborne, Dorset	EK Howard 0202 762828 (daytime)
26 Aug	BARTG Rally	Sandown Park, Surrey	G8LWY
27 Aug	DF Hunt	Southgate AR Club	G4OBE (QTHr with SAE)
29 Aug	QRO Activity Night	South Bristol AR Club	G4RZY
5 Sept	AGM	South Bristol AR Club	G4RZY
5 Sept	Satellite Communication	Fareham & District AR Club	Brian Davey G4ITG
7-9 Sept	WACRAL Annual Conference	London Bible College Northwood, Middx	G3AGX or G4NPM both QTHr
8 Sept	Scottish Amateur Radio Convention	Cardonald College, Glasgow	West of Scotland AR Society
8-9 Sept	International Amateur TV Contest	British Amateur TV Club	G Shirville G3 VZX
9 Sept	Telford Mobile Rally	Telford Shopping Centre	G8DIR/G8UGL G3UKV
12 Sept	VHF/UHF Activity Night	South Bristol AR Club	G4RZY
13 Sept	Prototypes Night	Southgate AR Club	G4OBE (QTHr with SAE)
16 Sept	AGM	Glenrothes & District AR Club	Sec GM4 LYQ
16 Sept	Vange AR Society Mobile Rally	St Nicholas School, Basildon	G4IFD QTHr
19-23 Sept	The Personal Computer World Show	Olympia 2	
23 Sept	National Car Boot Sale	Shuttleworth Colletion, Old Warden, Beds	Dunstable Downs Radio Club
30 Sept	Welsh Amateur Radio Convention	Oakdale Community College Blackwood, Gwent	GW3KYA QTHr
7 Oct	Gt Lumley Annual Rally	Gt Lumley Community Centre	Gt Lumley AR Society G4OCQ
13 Oct	Midlands VHF Convention	BT Training College, Stone, Staffs	Peter Burdem G3 UBX
14 Oct	QRP Convention	Preston School, Monks Dale, Yeovil	G3GC QTHr

AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

It is no doubt true to say that 'in the early days', practically all radio amateurs got into the hobby through listening to shortwave broadcast stations. I certainly did and still remember with nostalgia, the excitement of hearing some shortwave station in some faraway part of the world.

It's all very different nowadays, of course, as signals from shortwave broadcast stations are normally strong enough to be classed as of good programme value. Quite apart from the programmes specifically directed at the radio amateur, which many of the shortwave broadcasters run these days, the programme material put out is often of much interest.

Regular listening to a few selected stations in different parts of the world, will give the radio amateur a good idea of how propagation conditions are. So even if you consider yourself to be a 'dyed-in-the-wool' amateur radio communicator, don't neglect the shortwave stations.

In some of our bands, they or their harmonics may be a nuisance, but a lot of genuine interest can be had from the better of them, as you can gather from my colleague Frank Baldwin's 'Shortwave News for DX Listeners' monthly feature.

Illegal use of radio transmitting apparatus

One of the difficulties in the past of getting a conviction for the illegal use of radio transmitters has been the view that unless the culprit was actually caught in the act of using the transmitter, he could not be convicted of having committed the offence.

This made it very difficult indeed to bring a successful case against the culprit – no matter how obvious it was to all who heard the transmission. A recent case reported in *The Times* seems to have overruled this previously held view.

The judgement in this case was that '. . . the offence of using apparatus for wireless telegraphy without a licence, contrary to section 1 (1) of the Wireless Telegraphy Act of 1949, was committed where the set was available for use at any time and it was unnecessary to prove that the set had been used or that the defendant intended to use it.'

Apart from the question of evidence of actual use, there has been a lot of discussion recently in amateur radio circles as to whether it is legal for a person anticipating obtaining an amateur radio transmitting licence in the foreseeable future – by reason for example of his sitting for the requisite exams – to purchase a transceiver and operate the receiving side of it.

The opinion was generally held that this was quite alright provided, of course, he did not in fact use the transmitting section of the equipment until he had obtained his licence.

With the results of this case, it would seem that this is not so – possession of such equipment could render one liable to prosecution.

Cable TV interference

Some years ago a friend of mine, resident in Holland, warned that if Cable TV came to England, one must be prepared for the most awful interference to such services as amateur radio, if his experience in Holland, where they were just introducing Cable TV, was anything to go by.

So, when Cable TV was announced here, I sat back and waited to see what was going to happen. I did not have to wait long! Almost immediately trouble appeared in Milton Keynes.

British Telecom's Cable TV distribution system there was found to be radiating sufficient RF at 144MHz to make that band unusable in certain areas of the town.

Complaints were made to the RSGB by radio amateurs in the affected area and, in due course, the cause of the trouble was located. It seems it was due to unscreened junction boxes and to insufficiently screened transverters used to convert the 144MHz main distribution frequency to the UHF frequency required by the TV receivers.

It was thought that the problem could be solved by fitting suitable filters, but this did not prove to be so. The interference continued. The RSGB prepared complaint forms and asked members affected to complete them. Over a hundred were returned.

The RSGB then asked BT to cease operations on the frequency being used. This they very obligingly did and the interference ceased, to the great satisfaction of those affected.

In a letter to *Radio Communication*, the Secretary of the Milton Keynes Radio Society, thanked the RSGB for the very prompt and efficient way they had dealt with the matter. He also thanked the Cable TV Company concerned, for their co-operation and the way they reacted to the situation, even to displaying a TV picture continuously for a week, telling viewers that the channel was closing down and they should retune their TV sets to a new channel.

In responding to this letter, the RSGB comments that their view is that the primary users of the radio spectrum should be radio transmitters and receivers and not Cable TV systems.

It is very ready to take up the cudgels on behalf of members experiencing similar interference, if they let the RSGB know about it, and they comment that a good deal of work continues to be carried out behind the scenes, to ensure that radio amateurs in the UK, do not suffer the crippling problems which have beset amateurs elsewhere in the world.

FAX – renewed interest

There seems to be a reawakening of interest in FAX – ie Facsimile. Some years ago when FAX was officially added to the modes permitted to be transmitted by British amateur radio stations, there was quite a bit of interest but this faded rather quickly, due probably to the difficulty of getting suitable equipment at 'amateur radio prices'!

The situation in this respect seems to have eased a bit lately. Also, there is much interest in recording weather maps, both from HF stations and satellites. Bob Sayers, G8IYK, 40 Royal Oak Drive, Leegowery, Telford, Salop, has undertaken to co-ordinate information on FAX as part of BARTG's activities and he would like to hear from anyone interested in this aspect of amateur radio. A number of local FAX nets are in operation, the latest to come to our notice is in the North Kent/South Essex area. G6TJP, 47 Robin Hood Lane, Chatham, Kent, has been organising a FAX Net on the first Thursday of the month on 144.7MHz. He would like to hear from anyone interested.

Amateur radio 'D' Day celebrations

The 'D' Day celebrations on June 6th, were participated in by amateur radio, by special event stations set up by GB4DD and F6PVX. A message was passed to HM The Queen, on board the Royal Yacht 'Britannia', which was duly acknowledged by Her Majesty. Special permission was granted by the Dept of Trade and Industry for this transmission which was on 7050KHz.

New 50MHz beacon

The HQ 50MHz beacon was recently installed at RSGB HQ and should be in 24 hour operation by the time this appears in print. An interesting feature of its transmissions is that it will give its QTH in the new International (Maidenhead) 6 character location system, which it was agreed should be brought into universal use by the IARU recently. This system replaces, or perhaps one should say extends, the old QRA Locator system, which up until now has been the most popular system for indicating one's QTH.

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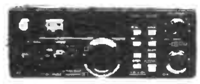

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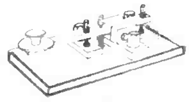

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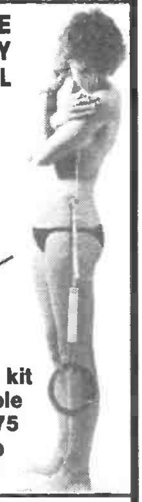

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LATEST LITERATURE

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

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Interproduct Limited, Lynton, Stanley, Perthshire PH1 4QQ. £4.90 +50p p&p.

A PRACTICAL INTRODUCTION TO MICROPROCESSORS

The purpose of this book is to provide a practical introduction to microprocessors by constructing a very simple microprocessor circuit that the reader can actually build and experiment with, and thus hopefully gain a clearer insight into this complex subject.

The complete unit is only intended as an educational aid and is unlikely to be usable in any actual applications, but it can be built at quite modest cost and many of the parts should be suitable for re-use when the unit has served its purpose.

This book is not intended for complete beginners at electronics. It is primarily aimed at those who have some knowledge of general electronics, but have little or no understanding of microprocessors.

Available from Bernard Babani Publishing (ISBN 0-85934-098-8) at £1.95.

25 SIMPLE INDOOR AND WINDOW AERIALS

Many people live in flats and apartments or other types of accommodation where outdoor aerials are prohibited, or a lack of garden space etc prevents aerials from being erected. This does not mean you have to forgo shortwave listening, for even a 20-foot length of wire stretched out along the skirting board of a room can produce acceptable results. However, with some additional effort and experimentation, one may well be able to improve performance further.

This concise book tells the story, and shows the reader how to construct and use 25 indoor and window aerials that the author has proven to be sure performers.

Much information is also given on shortwave bands, aerial directivity, time zones, dimensions etc.

A must for all amateur radio enthusiasts.

Available from Bernard Babani Publishing (ISBN 0-85934-111-9) at £1.75.

AN INTRODUCTION TO PROGRAMMING THE ATARI 600/800 XL

Learning to program in BASIC might at first appear to be a daunting task, however it can be made much easier if tackled in a sensible way. The step-by-step approach of this book starts with the fundamentals of BASIC and then moves on to more advanced topics such as animated graphics, so enabling the reader to make good use of the ATARI's exceptional graphics and sound capabilities.

LATEST LITERATURE

In a book of this size it is impossible to fully cover every aspect of a micro as versatile as the ATARI, but the authors have tried, as far as possible, to complement the information supplied by the manufacturer rather than just duplicate it. Having followed the book through, it is hoped that the reader will be able to write useful programs of his/her own and then progress, with relative ease, to more advanced programming.

The text is divided into the following chapters: 1. Variables and Arrays; 2. Strings and Codes; 3. INPUT, PRINT and DATA; 4. Decisions; 5. Sound Generator; 6. Ins and Outs; 7. Animation; 8. Graphics Modes.

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MICRO INTERFACING CIRCUITS BOOK 1

It is now perfectly feasible for the average amateur electronics enthusiast to build reasonably simple add-ons for a microcomputer that will transform it into a versatile and sophisticated piece of control or measurement equipment.

Methods of interfacing add-ons to home computers are not unduly difficult, but for those who are unaccustomed to microprocessor techniques it is easy to be put off by the plethora of unfamiliar terms and devices.

The aim of this book is to help those who have some knowledge of electronics, but not necessarily an extensive one, to understand the basic principles of interfacing circuits to microprocessor equipment.

The subject is not treated in a purely theoretical manner; the circuits used to demonstrate these principles are all practical ones, using real devices. The subjects covered include address decoding, parallel and serial interfacing, analogue to digital and digital to analogue converters, etc.

Companion volume to book No BP131: Micro Interfacing Circuits Book 2.

Available from Bernard Babani publishing (ISBN 0-85934-105-4) at £2.25.

COMPUTER PROGRAMS FOR AMATEUR RADIO

by Wayne Overbeck (N6NB) and James Steffen (KC6A).

This American book, a large paperback of 330 pages, is written by two amateurs who between them have 50 years of radio experience. It demonstrates most impressively that there are many more aspects of home computing to interest the radio amateur than simply applications to Morse and RTTY.

As the authors point out, amateur radio is a data-intensive hobby – what better tool to use for data-processing than a home computer.

The programs included are all designed for worthwhile jobs in the shack, and none are the sort which do minor calculations or data lists which would be better done on a calculator or looked up in a handy textbook.

The book begins with a useful chapter listing the programs, with a description of each one. There is something for everyone from beam-heading and sunrise calculator programs, to an antenna scaler and a moontracker. Morse & RTTY programs are excluded, as these are readily available elsewhere.

As with most such books there is an introduction to home computers, including a very interesting history of computers in general.

The style is clear and easily-read, and the contents very informative. The programs are all written especially for Apple II, Commodore 64 and computers that run Microsoft BASIC. There is also information on how to adapt some of the programs for Timex (the American ZX81) and VIC-20: it is not written with the British reader in mind, but given the comprehensive nature of the text the transatlantic jump should pose few problems.

The final few pages, an appendix headed 'In Case of Difficulty', are sure to be appreciated by many, being a series of troubleshooting tips for those experiencing problems running the programs.

Hayden Book Company, 10 Mulholland Drive, Hasbrouck Heights, New Jersey, USA.

South Midlands

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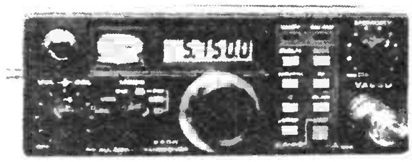
FT290R & FT790R MULTIMODE



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FL6010	6m 10W Amplifier	**£49.00**
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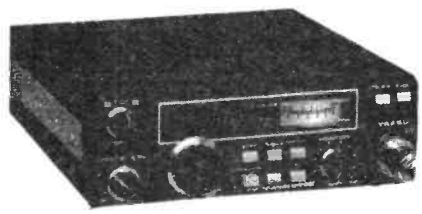
FT230R & FT730R FM MOBILES



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MMB15	Mobile mounting bracket	**£14.65**

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FT203R & FT703R HANDHELDS

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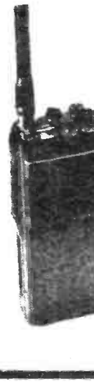

Ultra compact 65W x 34D x 153H mm, synthesised handheld. Computer aided design and component insertion (with chip capacitors and resistors) has produced this modern marvel: 2.5W RF (10.8v) (3.5W RF (12V)). It has VOX (for use with YH-2 lightweight headset, and built in 'S'/PO meter. Supplied with tone burst, helical and appropriate case.

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ATV on the Air

Presented by Andy Emmerson, G8PTH

Well, it's activity report time again and time has flown since I last dipped into the file of your letters.

Starting as ever with 70cm, the first letter comes from G8PX in Oxford who is constructing several items. He says he has just built the 'TV for Amateurs' RF probe... I wish some other people would, then they could put out properly modulated signals, instead of an all video and no syncs mess that nobody can lock on their receivers.

It's those power meters that are to blame; some people cannot bring themselves to believe that less indicated power out means a better signal at the other end!

Jeff has also made an upconverter and is now attacking a 2C39 linear.

He also has a Spectrum computer and says the 'Worthing' testcard tape is 'really fabulous'. Indeed it is and if you haven't got one yet send off your £5.50 to G8XEU (QTHr) and support the Worthing video repeater project into the bargain.

One of two letters from Maurice F1FVX, a BATC member, points out that many French stations cannot use 144.750 for ATV talkback. This frequency is used as the input of the Vernon repeater (halfway between Paris and Rouen). Instead, French stations use 144.170 plus or minus 20KHz, FM when conditions are normal and SSB when things get lively!

GM amateur television

Norrie GM4BVU sent in some nice pix from his QTH in Hamilton, Lanarks. All were created on the BBC Micro – it's a shame you can only see them in black and white. One shows the G8NVS test card, very reminiscent of the IBA Channel Four effort.

The second computer graphic is part of a sequence animated using machine code, used during a demonstration of ATV to the Mid-Lanark Club.

Norrie is doing a grand job spreading the word; if your club has not had a talk on ATV why don't you give one?

ATV in the Central Scotland area continues to take off, with several new transmitting stations coming 'on-air' in recent months. On the east coast Mark (GM4OMT, Grangemouth), Bill (GM6AOJ, Leven) and Keith (GM1FAI, Linlithgow) have appeared, bringing George (GM3RVK, Kennoway) and George (GM8CUS, Linlithgow) back on the band after a lull in activity.

Iain (GM6HFH, Stonehouse) has finally taken the plunge and was delighted with a P5 report from Bill, GM4UBJ in Motherwell, plus several other signal reports.

Attempts at cross-country working have not been too successful, mainly because linears are not yet much in evidence. Norrie (GM4BVU, Hamilton) can just about manage P1 to most stations, OK for contests, but not much good for anything more ambitious. Norrie writes that ATVers in the Edinburgh area seem reluctant to check in to the Monday ATV net – let's see your pix! Net time is approx 19.00 GMT, and recent weeks have seen enough activity to force QSYing from the calling channel, the east going up a channel, while the west coast boys go down one.

A quick guide to the relative activity is shown by monitoring contests.

Contest	Stations worked
1982 Winter Cumulative	
1st session	2
2nd session	4
3rd session	6
4th session	2
5th session	7
6th session	11
1983 Summerfun	Operated as G4BVU/P
1983 International	9
1983 Winter Cumulative	
1st session	11
2nd session	10
3rd session	10
4th session	9
5th session	12
1984 Summerfun	17 + other stations

Of these stations, some are using their normal domestic TV, often with no special aerial but none stranger than Alan (GM1BXG, Dollar) who gave a P3 report to GM4BVU using a coat-hanger suspended from the lamp-shade in his room! Some curious bounce (and double-bounce) effects have been noted to get pix to Bob (GM4PSV, Renfrew) and Stan (GM3KXQ, Neilston), with all antennae pointed north to the hills.

ATV DX has been observed by Steven, GM4SJL in Fife, who received an F3 and OF4 during his lunch break on Friday 8th June, but he went back to school without working any! Strange fellow!!!

DX; contacts GM to G have taken place many times, but on 19th March, Ray (G4WVI, Whitley Bay) and Norrie (GM4BVU, Hamilton) exchanged P2 pictures both ways. Is this the first TV QSO from west GM to east G?

Following recent on-air chat about 24cm operation and a total lack of funds from all concerned to try simplex working, a small group are now sounding out opinion with a view to setting up a 24cm ATV repeater group, possibly under the wing of the Central Scotland FM Group. Any reader interested is asked to contact GM4BVU.

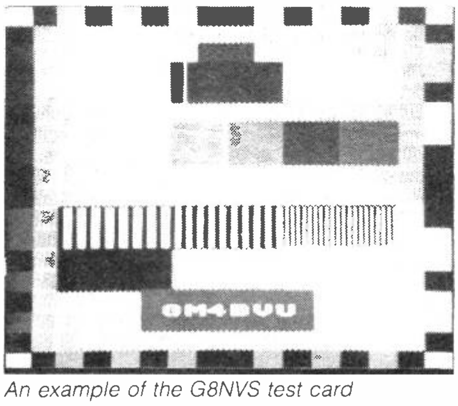
Finally, if you are unsure how to receive amateur TV transmissions or wish details of membership of the British Amateur Television Club, write or phone Norrie at 3, Townhill Road, Earnock, Hamilton, ML3 9UX (Tel: 423121).

Another batch of reception reports in the Netherlands has arrived from BDXC member Arthur Milliken. Noted at Beemster (2nd – 5th December) were G3UMF, G6CUQ, G6YLG, G6LIC, G4DVZ, G8LKW, G6HMS, G3VPC, G6XMG, G4SRF, G6LMG, G4RKP, G6YDI, G4CRT, G3DFL and GU8FBO. In February G3TOZ was seen in Geldermalsen.

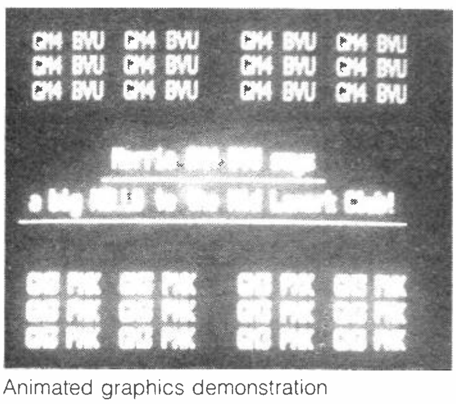
Twenty-four centimetres

More and more people are 'at it' on 24, and with the growing number of kits to help you transmit and receive signals there is little excuse for not joining in. Stations newly active include John G8UWS in Folkestone and Nick G4IMO near Southend-on-Sea; both are using the F3YX design of transceiver.

Although this design is now somewhat dated it has some good points, as Ian G4VTD (ex-G8CQE) pointed out. By using a Foster-Seeley discriminator the F3YX receiver can receive at lower levels of signal than the phase-locked loop



An example of the G8NVS test card



Animated graphics demonstration


GM8HGT on the air

designs can manage.

At the present time Marc, F3YX is redesigning the transceiver to use some of the newer ICs on the market.

I, too, am now equipped for this band; after earlier false starts, I am using the Sandpiper helical aerial and am very pleased with it. Reflected power is minimal and the broad bandwidth is a great blessing.

Allan G8CMQ writes from Southampton that new recruits to the band are Eddy G4PXH and Dave G6GXG in Romsey. Nick G4WHO (ex-G8MCQ) can put out a good few watts from Wimborne, achieving a P4 with Allan and P5 with Syd G4JQU over a 30 mile path.

Norman G6GNS has joined with some of the experiments, including tripling 70cm AM up to 1308MHz which works surprisingly well if you set up the Tx and tripler for it.

Allan continues 'On the May day holiday, I went down to Havant to see Pete G6RSV and his TV-DX gear. I took a few little bits and pieces: a 10mW Tx, converter and receiver.

After seeing the DX-TV, we tried a little walkabout with the QRP 23cm – cameraman in the garden and viewers indoors.

Who should we see in the picture but Hadrian G6XGH and Nigel G1DSO, coming round to see what I was up to.

We took the 23cm gear over to Nigel's QTH 100 yards away and Hadrian operated the camera and 10mW Tx.

Nigel patched the video onto 70cm and several stations in the Portsmouth and Chichester areas were able to watch as our roving cameraman filmed the surrounding area.

Results were excellent and about 100 yards range was possible. A delightful time was had by all and it made a talking point on the net that evening.

Those who missed it were a little disappointed and I expect it has created some enthusiasm for 23cm.'

Maurice F1FVX says it was a pity that no-one but G6AIW and G8KOE were around on 28.12.83 to receive his 1255MHz signals from his Paris suburb. They, it seems, were wised up to the 144.17 frequency!

Finally, the strange but true section- . . . Garry G4CRJ in High Wycombe, has been playing around with a 24cm oscillator and managed to get a P4 report with just this and a BFR96S linear from Mike G8LES, 25 miles away!

So there you are – two transistors and you're off! He also got a P2 report from G6HVQ in Thames Ditton, and gave P4 reports to both stations (the latter is AM).

A couple of items picked up at the RSGB convention; Peter G4LXC (ex G8EIM) is constructing for 24cm in Harrow Weald and SM6CVE reports that several Swedish stations are active on 24cm, including Helmer SM6CCD. What system they are using is not clear.

To the BATC event at the Post House, Crick, Dave G8GKQ/DA4DG brought his 24cm receive system. Dave has TV gear for 70cm and 24cm and is normally in Germany. From time to time, he is back in the UK and operates from Penge.

There has been no slow-scan activity reported during the last three months. Perhaps in the flurry of activity earlier this year, everybody overdid things!

At this stage, I thought I would throw in a hint: if, like me, you aim to keep your equipment in showroom condition – it makes it more resaleable – there is nothing more annoying than a small scratch to the paint finish.

Black sprayed diecast boxes seem particularly prone to getting scratched and it's boring getting out black paint and a small brush just for this little job.

But, if you visit your local hobby shop where they sell plastic kits you will find they sell 'felt pens' filled with enamel paint instead of ink. These are great for touching up small blemishes and are available in a number of colours. Price is just under a pound.

So, there we are: thanks for your letters. I always enjoy reading them and printing your news, even if I don't get a chance to reply to you personally. Let me have more news for next time and send it to me, care of the editor.

EAST CORNWALL COMPONENTS

TRANSISTORS DIODES

Type	Price (£)
AC126	0.35
AC127	0.30
AC128	0.30
AC128K	0.34
AC132	0.55
AC141	0.26
AC141	0.26
AC141K	0.40
AC142	0.26
AC142K	0.48
AC151	0.45
AC152	0.45
AC176	0.28
AC176K	0.46
AC187	0.26
AC187K	0.40
AC188	0.28
AC188K	0.40
ACY40	0.88
AD142	1.10
AD143	1.10
AD149	0.96
AD161	0.42
AD162	0.42
AD161/AD162	0.98
AF106	0.48
AF114	2.10
AF115	2.10
AF116	2.10
AF117	2.10
AF118	0.85
AF121	0.62
AF124	0.48
AF125	0.48
AF127	0.48
AF139	0.68
AF178	0.68
AF239	0.68
AF279S	0.72
AL100	2.50
AL102	1.88
AL113	2.20
ASY80	1.75
AU110	1.40
AY102	4.32
BA102	0.34
BA110	0.67
BA121	0.40
BA129	0.38
BA148	0.16
BA154	0.08
BA155	0.10
BA156	0.08
BA157	0.28
BA164	0.14
BB104B	0.52
BB105B	0.30
BB105G	0.48
BB110B	0.42
BC107	0.10
A or B	0.12

Type	Price (£)
BC108	0.10
A B or C	0.12
BC113	0.14
BC114	0.12
BC115	0.12
BC116	0.15
BC117	0.22
BC118	0.17
BC119	0.30
BC125	0.12
BC140	0.28
BC141	0.42
BC142	0.30
BC143	0.30
BC147	0.08
A or B	0.10
BC148	0.08
A or B	0.10
BC149	0.09
BC157	0.10
BC158	0.10
BC159	0.10
BC160	0.30
BC161	0.30
BC168B	0.10
BC169C	0.10
BC170	0.14
BC170B	0.12
BC171	0.10
BC171	0.10
A or B	0.08
BC172	0.08
A or B	0.10
BC177	0.20
BC178A	0.22
BC182	0.09
A B or C	0.09
BC182L	0.09
A B or C	0.09
BC183	0.09
A B or C	0.10
BC183L	0.06
A B or C	0.10
BC184	0.10
A B or C	0.10
BC207	0.15
BC208	0.10
BC212	0.09
A B or C	0.10
BC212L	0.08
A B or C	0.10
BC213	0.09
A or B	0.10
BC213L	0.10
A or B	0.10
BC237	0.11
BC236	0.12
BC239	0.14
BC251	0.12
A B or C	0.14
BC301	0.30

Type	Price (£)
BC302	0.32
BC303	0.32
BC307	0.10
BC308A	0.10
BC323	0.99
BC327	0.14
BC328	0.14
BC337	0.14
BC338	0.12
BC350	0.14
BC440	0.30
BC441	0.32
BC461	0.32
BC547	0.12
BC548	0.12
BC549	0.12
BC550	0.18
BC550C	0.18
BC557	0.12
BC558	0.12
BCX34	0.27
BCY70	0.15
BCY71	0.17
BCY72	0.18
BCZ10	1.68
BCZ11	1.45
BD124P	0.80
BD130Y	0.68
BD131	0.34
BD132	0.34
BD131/BD132	0.95
BD135	0.32
BD136	0.36
BD137	0.36
BD138	0.38
BD139	0.38
BD140	0.38
BD144	160
BD145	1.82
BD150A	0.51
BD159	0.65
BD160	1.65
BD165	0.45
BD175	0.60
BD182	1.00
BD183	1.10
BD184	1.20
BD201	0.72
BD202	0.87
BD204	0.80
BD222	0.80
BD225	0.86
BD232	0.45
BD233	0.60
BD234	0.62
BD235	0.63
BD236	0.63
BD237	0.66
BD238	0.56
BD241	0.40
BD243A	0.80

Type	Price (£)
BD244A	0.65
BD375	0.32
BD410	0.76
BD434	0.68
BD436	0.68
BD437	0.76
BD438	0.75
BD439	0.68
BD507	0.48
BD508	0.53
BD509	0.54
BD510	0.48
BD517	0.56
BD520	0.66
BD699	1.25
BD707	0.88
BDX18	2.35
BDX32	2.10
BF115	0.32
BF117	0.54
BF119	0.82
BF120	0.38
BF123	0.40
BF125	0.48
BF127	0.38
BF152	0.16
BF154	0.23
BF157	0.40
BF158	0.22
BF159	0.24
BFR160	0.23
BF167	0.30
BF173	0.25
BF177	0.42
BF178	0.36
BF179	0.32
BF180	0.35
BF181	0.35
BF182	0.35
BF183	0.32
BF184	0.32
BF185	0.32
BF194	0.08
BF195	0.10
BF196	0.10
BF197	0.10
BF198	0.14
BF199	0.16
BF200	0.48
BF222	0.48
BF224	0.20
BF224J	0.16
BF240	0.20
BF241	0.26
BF244	0.28
BF244A	0.28
BF244C	0.28
BF245A	0.26
BF254	0.15
BF256	0.40
BF257	0.32

Type	Price (£)
BF258	0.30
BF259	0.32
BF262	0.30
BF263	0.30
BF270	0.30
BF271	0.26
BF273	0.18
BF274	0.32
BF323	0.92
BF336	0.26
BF337	0.26
BF338	0.26
BF355	0.42
BF363	0.82
BF367	0.24
BF371	0.27
BF422	0.38
BF450	0.38
BF457	0.33
BF458	0.36
BF459	0.44
BFR39	0.22
BFR40	0.22
BFR41	0.22
BFR51	0.30
BFR61	0.32
BFR62	0.28
BFR88	0.34
BFR90	1.72
BFT41	0.38
BFT43	0.36
BFW10	0.79
BFW44	0.76
BFX29	0.28
BFX30	0.30
BFX80	3.56
BFX84	0.24
BFX85	0.26
BFX86	0.26
BFX87	0.26
BFX89	0.65
BFY50	0.21
BFY51	0.21
BFY52	0.21
BFY56	0.40
BFY57	0.90
BFY90S	1.34
BR100	0.20
BR101	0.44
BR103	0.58
BRC443	1.76
BRY39	0.38
BRY56	0.42
BRY61	0.86
BSS17	0.56
BSS27	0.92
BSX19	0.34
BSX20	0.34
BSX59	0.62
BSX76	0.29
BT100A/02	0.94

Type	Price (£)
BT101/300	1.15
BT101/500	1.25
BT102/300	1.35
BT102/500	1.65
BT106	1.50
BT108	1.30
BT109	1.18
BT116	1.25
BT119	3.62
BT120	3.60
BT121	3.02
BT138/600	1.30
BT151/560R	0.90
BT151/300R	1.15
BTY79/400R	2.80
BU100A	2.30
BU104	2.00
BU105	1.20
BU105/02	1.56
BU108	1.80
BU124	1.75
BU126	1.25
BU133	1.80
BU204	1.35
BU205	1.30
BU206	1.70
BU208	1.55
BU208A	1.62
BU208/02	2.05
BU326S	1.75
BU407	1.65
BU407D	1.80
BUX80	3.70
BUY20	1.75
BUY69A	2.60
BUY69B	1.98
DBY101	0.48
BY118	1.10
BY122	0.68
BY126	0.12
BY127	0.10
BY133	0.16
BY135	0.25
BY164	44
BY179	0.66
BY182	0.87
BY184	0.40
BY187	0.72
BY189	4.75
BY198	0.44
BY199	0.47
BY206	0.24
BY207	0.24
BY210/400	0.25
BY210/600	0.26
BY210/800	0.30
BY223	1.20
BY227	0.26
BY229	0.30
BY238	0.68
BYX10	0.24

Type	Price (£)
BYX36/150	0.22
BYX36/600	0.28
BYX48/300	0.72
BYX49/300	0.47
BYX55/350	0.29
BYX55/600	0.33
BYX71/600	1.18
BYZ12	0.42
C106D	0.80
E1222	0.40
E5024	0.30
GET872	0.48
ITT44	0.04
ITT2002	0.11
ME0402	0.20
ME0404/2	0.24
MEU21	0.60
MJ400	1.25
MJ2955	0.90
MJ3000	1.98
MJE240	0.60
MJE340	0.54
MJE370	0.88
MJE520	0.48
MJE2955	0.99
MJE3055	0.70
MPSLO1	0.28
OA47	0.16
OA90	0.08
OA91	0.09
OA95	0.18
OA200	0.06
OA202	0.15
OC25	2.10
OC26	1.70
OC28	1.50
OC29	2.47
OC35	1.75
OC36	1.75
OC42	0.72
OC42K	1.40
OC44	0.72
OC45	0.58
OC71	0.50
OC72	0.52
OC81	0.68
OC200	2.45
OC202	2.20
ORP12	0.85
R2008B	1.50
R2010B	1.52
SHG1.5	0.40
TAG1/100	1.40
TAG3/400	1.78
TIC44	0.40
TIC45	0.45
TIC46	0.48
TIC47	0.70
TIC106A	0.70
TIP30A	0.46
TIP31C	0.54

Type	Price (£)
TIP32	0.40
TIP32C	0.60
TIP33A	0.63
TIP34A	0.72
TIP41C	0.46
TIP42A	0.52
TIP47	0.60
TIP110	0.88
TIP2955	0.60
TIP3055	0.60
TIS43	0.32
TIS88	0.40
TIS90	0.25
TIS91	0.28
ZTX108	0.12
ZTX109	0.12
ZTX212	0.28
IN4001	0.05
IN4003	0.05
IN4004	0.06
IN4006	0.07
IN4007	0.07
IN4148	0.05
IN5400	0.12
IN5402	0.15
IN5405	.16
IN5406	0.18
IN5408	0.20
IS920	0.08
2N697	0.55
2N706A	0.33
2N2904	0.28
2N2906	0.24
2N2926G	0.10
2N3053	0.22
2N3054	0.56
2N3055	0.45
2N3702	0.10
2N3704	0.10
2N3708	0.10
2N3772	1.90
2N3773	2.70
2N3904	0.16
2N3906	0.16
2N5294	0.48
2N6107	0.71
2N6126	0.68
2SB337	1.60
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2SC1173Y	0.82
2SC1302	1.40
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40362	0.50
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78L12	0.30
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78M05	0.50
78M08	0.50
78M12	0.50
78M15	0.50
78M24	0.50
7805	0.55
7808	0.56
7812	0.55
7815	0.55
7818	0.55
7824	0.55
7905	0.65
7912	0.65
7915	0.65
7918	0.65
7924	0.65
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22nF 300V AC	32p
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ECC82	0.65
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ECC84	0.65
ECC85	0.90
ECC88	0.95
ECF80	0.90
ECH81	0.75
ECH84	0.75
ECL82	0.75
ECL86	0.98
EF80	0.65
EF86	1.65
EF183	0.75
EF184	0.75
EH90	0.54
EL34	2.50
EL84	0.69
EL509	5.50
EM87	2.55
EY86/87	0.67
EY500A	1.65
PCC84	0.50
PCC85	0.65
PCC89	0.74
PCC189	0.85
PCF80	0.75
PCF86	1.25
PCF200	1.55
PCF801	1.45
PCF802	0.85
PCF806	1.20
PCL82	0.90
PCL83	2.50
PCL84	0.90
PCL86	0.58
PCL805/85	1.35
PD500	3.75
PFL200	1.35
PL33	1.50
PL36	1.45
PL81	0.85
PL82	0.75
PL83	0.65
PL84	0.75
PL95	2.00
PL504	1.20
PL508	2.40
PL509/519	7.50
PY88	1.80
PY500A	2.40
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MC1327P	1.75
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MC13449P	1.85
MC1350P	1.20
MC1351P	2.60
MC1352P	1.50
MC1357P	.88
MC1358P	1.30
MC1496L	1.15
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ML232B	2.10
ML237B	2.30
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NE556	0.80
SAA1024	5.35
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SAS560A	2.50
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SN76115N	2.00
SN76131N	1.65
SN76226DN	1.80
SN76227N	1.10

Type	£
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SN76533N	1.60
SN76650N	1.05
SN76660N	0.75
SN76666N	0.80
STK015	6.50
TA7108P	3.20
TA7120P	2.20
TA7129AP	3.65
TA7130P	1.65
TA7172	1.80
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TA7223P	3.68
TA7227P	5.60
TA7310P	1.90
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TBA510Q	2.60
TBA520/Q	1.60
TBA530/Q	1.30
TBA540/Q	1.40
TBA550/Q	1.52
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Type	£
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TDA2541	3.80
TDA2560	3.50
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TDA2581	3.20
TDA2590	3.20
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TDA2593	2.98
TDA2610	3.20
TDA2611A	1.94
TDA2640	2.90
TDA2680	3.40
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UPC575C2	2.95
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600V	0.50
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200V	0.55
400V	0.61
600V	0.67
800V	0.60
6A 100V	0.66
200V	0.70
400V	0.74
600V	0.80
800V	0.90
10A 50V	2.20
100V	2.50
200V	2.35
400V	2.95
600V	3.50
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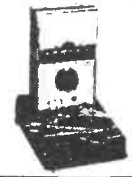

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DX–TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

There were very few qualms about DX reception during May. After a slow start Sporadic-E conditions livened up and things were really humming towards the end of the month.

Perhaps the most startling feature of the current Sporadic-E season is the number of 'exotics' already noted. At least one new country is now known to be using channel E3, possibly with considerable power output.

This is Greece and although there are no official listings of these transmitters, there have been several sightings of captions, news programmes and the test card.

The first inkling that an E3 outlet was in operation came towards the end of last year when Cyril Willis *(Little Downham, Cambs)* saw their identification caption with the inscription 'EPT' an abbreviation for Elliniki Radiophonia Tileorassis.

The first openings of any significance seen here in Derby were on May 16th during the late afternoon.

Two Yugoslavian transmitters were noted, both carrying the PM5544 test card.

One had the identification 'RTV LJNA' indicating that the signal was coming from the Ljubljana studios; the other was displaying 'TV BGRD' together with a digital clock in the upper black rectangle. This signal originated from Belgrade. Spanish and Portuguese signals on E2 and E3 were seen later in the day.

An opening on the 18th produced an Italian programme on channel IA at 1745 BST while on E3 a weak signal improved, revealing Arabic script and captions moving vertically.

These could have been the end credits of a programme or even a programme schedule. The signal almost certainly originated in Jordan. Reception lasted for several minutes before finally being swamped by JRT (Yugoslavia) with a regional musical programme with captions in the Cyrillic alphabet.

Historic event

May 24th must have made history in DX-TV circles when an incredible total of four exotic stations were logged within the space of two hours. Clive Athowe and Ray Davies (both in East Anglia) saw the Greek PM5534 test card at considerable strength on E3 shortly after 0800 BST.

The digital clock insert was two hours ahead of British time and the identification on the test card was 'EPT'. The opening sequence began at 0825 and featured the Greek flag.

At 0829 the Jordanian test pattern (PM5544) appeared with 'JTV AMMAN' identification for about two minutes until it disappeared into the noise. Clive noted a caption at 0859 with the inscription 'CHANNEL 3'. This was on channel E3 and is thought by Clive to be of Greek origin. We have other ideas!

The ARAMCO TV service at Dhahran in Saudi Arabia operates on this channel with approximately 5KW ERP. The test card and clock caption incorporate this particular identification. This station has occasionally been received in Western Europe and the clock caption with 'CHANNEL 3' beneath was seen in Finland last year.

The shock of the day occurred at 0932 when an FuBK test card emerged on E2. Clive and Ray assumed this to be from the West German transmitter at Grünten. However, the signal became more clear, revealing the letters 'IRIB' to the left of the centre bar and Arabic script to the right.

A digital clock in the left-hand corner of the screen displayed '1302' suggesting Middle Eastern origin. A quick flick through a reference book confirmed that reception was from Iran.

Congratulations to all those enthusiasts who saw it, and to those who didn't, join the club! Reception of the Iranian test card lasted some 30 to 40 minutes before going on to colour bars, with a digital clock in the left-hand corner.

Mysteries and more exotics...

At 1108 on the 24th, a multi-burst pattern was noted on channel C (82.25MHz) which must have been Albania (Radio Televizioni Shqiptar) since RAI Italy were on the PM5544. RAI were later seen on this channel from the Turin transmitter. Ray tells us that a test pattern not unlike the Spanish GTE type appeared briefly during this reception. It is suspected that this emanated from an Italian private TV network.

At 1246 BST on the 25th, another mystery occurred in the form of a blank EBU bar pattern from the south. It lasted for about thirty minutes.

The sound channel consisted of music with conversation in French between tracks. Could this have been another new E3 outlet possibly in North Africa?

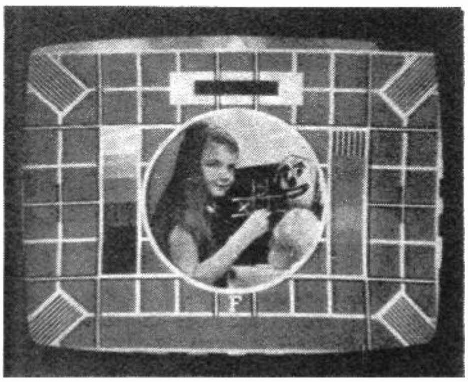
DX log for May

This month we are featuring an extract from Clive Athowe's amazing log report covering the period from the 21st to the 29th of May:-

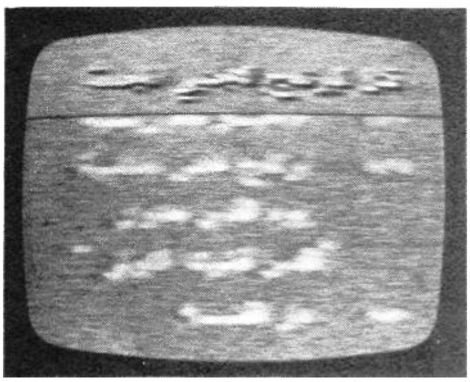
21/5/84: CST (Czechoslovakia) on channel R6 in Band III with the 'RS-KH' test card via meteor shower (MS); TSS (Russia) on channels R1, R2 and R3 with programmes via Sporadic-E (SpE).

22/5/84: RAI (Italy) with programmes on channel IA; TSS R1 and R2 featuring opera; TSS R3 radiating the 0249 monoscopic test card; NRK (Norway) on PM5534 test card with 'GULEN' and 'HEMNES' identification on E2 and E3 respectively; SR 1 (Sweden) E3, E4 with the 'TV 1 SVERIGE' PM5544 with the new digital clock insert (ie the PM5534 test card); YLE (Finland) E3 on FuBK test card. All reception via SpE.

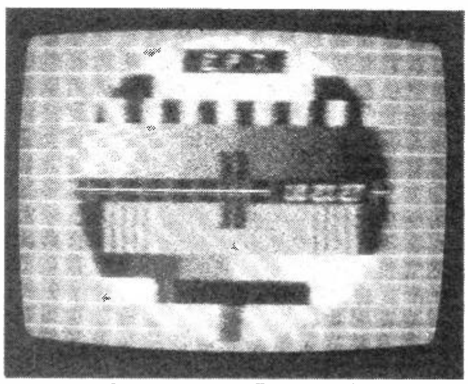
23/5/84: RAI IA (two stations) showing Videotext pages; unidentified FuBK test card on R2 at 0915 but probably TVR-Rumania; JRT (Yugoslavia) E3 with a science programme; TVE (Spain) E2 and E3 with the GTE test card and 'tve 1' identification; TVE E4 with 'RTVE MADRID 4' electronic bar pattern; TVE E3 with 'GAMONITEIRO 3' bar pattern; TVE-2 on E2 with colour bars; TVE E2 with 'NAVACERRADA 2' bar pattern; TVE E2 on 'SANTIAGO 2' bar pattern; TVE E4 with a regional test card showing 'GALICIA' TVE E4 with colour bars and



The new digital version of Test Card 'F'



Arabic caption from Jordan on E3



Unlisted Greek channel E3 transmitter

'TVE ANDALUCIA' inscription – see Reception Reports later; TSS R1 on electronic test card; TSS R2 with a concert; RTP (Portugal) E3 with a modified multi-burst pattern; TVP (Poland) R2 on programme; CST R2 with 'REKLAMA' caption, possibly heralding commercials; MTV (Hungary) R1 with programmes.

All stations noted via SpE propagation.

24/5/84: MTV R1 on 'MTV-1 BUDAPEST' PM5544 test card at 0714; TSS R1 and R2 with programmes and also the colour electronic test card at 0750 on channel R2; EPT (Greece) E3 on PM5534 with clock showing GMT +3 hours going on to the opening sequence with Greek flag at 0825; JTV (Jordan) E3 on PM5544; RAI IA with PM5544 pattern at 0834; TSS R1, R2 and R3 again on electronic test card; ARAMCO TV E3 on caption at 0859; RAI IB on sample teletext pages at 0906; MTV R1 and R2 on programmes at 0917; JRT E3 with programmes via the Beograd network; Iran E2 on test card and colour bars until 1015 with clock caption showing GMT +4½ hours; TVE E3 and E4 on GTE test card and various regional patterns; +PTT (Switzerland) E2 and E3 on '+PTT SRG 1' FuBK test card at 1137; RTS (Albania) on channel IC with a multi-burst pattern; RAI IC on programmes; RTP E2 on 'RTP-PORTO' FuBK pattern.

All reception via SpE.

25/5/84: RAI IA on PM5544; TSS R1 and R2 on 'UT 0167' test card; TVE E3 with 'GAMONITEIRO 3' bar pattern; mystery EBU bar pattern from the south with French sound channel on E3 at 1246; TVE E4 with regional news; ZTV (Zimbabwe) on channel E2 at 1650 with coloured news reader via F2/SpE for 20 minutes; TSS R3 with 'BPEMЯ' news programme; TSS R1 (EESTI TV) on programmes; RUV (Iceland) E3 and E4 with programmes during the late evening.

26/5/84: TSS R1 and R2 with programmes (two stations on R1); NRK E2 with the 'VARANGER' PM5534 test card.

The transmitter is located in the far north of Norway close to the Russian border; NRK E3 with the 'KAUTOKEINO' PM5534; NRK E2 radiating the 'GULEN' PM5534.

All reception via SpE.

28/5/84: TVE E2, E3 and E4 with the GTE colour test card and 'tve 1' identification; TSS R1 and R2 on colour electronic test pattern; CST R2 on 'BRATISLAVA' PM5544; RTP E2 and E3 on low-frequency test bars.

29/5/84: NRK E2 on 'GULEN' PM5534; NRK E4 radiating the 'BREMANGER' PM5534 via SpE; SR 1 in Band III on channel E5 with the 'TV 1 SVERIGE' test card via MS.

Reception reports

Graham Angel of Sheffield is using two multiband colour receivers for DX-TV work. One is a 24-inch Bush Model TV161 (dual-standard) modified for VHF/UHF 625-line working. The other set is a 5-inch Panasonic portable type 5032 which has continuous tuning throughout Bands I and III and UHF. Several countries have been seen via SpE this season.

These include Italy on channel IA, Spain on E2 and E3 and Norway on E3 from Gamlemsveten and Hemnes. Graham would like to know what the VHF radio transmitters are, often received around channels E2 and E3. Well, these are in fact radio links between Italian private transmitters and studios which operate within Band I to serve the numerous independent radio stations. Some of these are in stereo and the band can be literally choc-a-bloc with them during intense openings.

Kevin Jackson of Leeds claims the best day for DX was the 28th when very strong signals from Spain, Russia, Austria, Czechoslovakia, Switzerland, Italy and West Germany were logged. The modified Swedish test card carrying the new digital clock display was also seen during the month. A switched IF bandwidth DX-TV converter has just been purchased which should make his set-up easier to operate.

Nottingham enthusiast Colin Frost, is using an Italian made Pye Model 99 receiver for DX-ing in the Band II spectrum.

Although these sets are now obsolete, their tuning range embraces channel C (82.25MHz) and OIRT channels R3 and R4. Being in the aerial trade, Colin has built his own multi-element arrays for Band I but a commercially available system is used at UHF.

TV DXer Bob Brooks of South Wirral, has supplied a lengthy log report indicating that virtually every European country has been received. Apparently, Spain are using a few more test patterns this season prior to regional programmes at lunchtime. A colour bar pattern with the lower half blank in red is now radiated on channel E4 with the identification 'TVE ANDALUCIA' together with a digital clock insert. This was noted on the 23rd and 24th at 1240 BST. Norwegian stations were a feature of his log on the 30th, with test patterns from Steigen on channel E2 (located near to the Arctic Circle), Melhus E2, Gamlemsveten E3, Hemnes and Bagn on E3.

Everyone seems to be receiving the American programme MASH from Spain, this year. Tony Cater from Wigan, telephoned to say that he received this together with horse racing on the 20th during the afternoon on channel E4. The Spanish 2nd network test card from TVE-2 was logged by Tony on E2. This was a fairly widespread opening – for many, their first taste of the 1984 DX season.

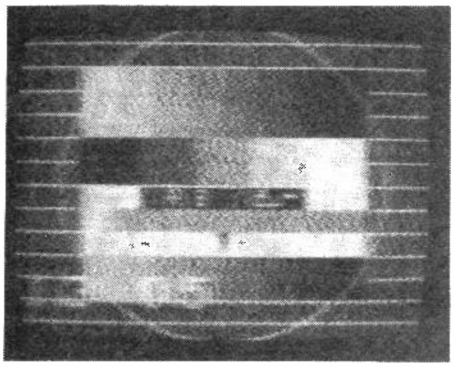
Iain Menzies (Aberdeen) is now a licensed amateur (callsign GM1FSU) and he intends to use the 70cm band. Changes have been made to his aerial system for DX work. Improved results have been obtained with UHF TV DX by mounting his stacked grid on top of a length of fibre-glass tubing.

The system is in the loft and he's not too sure whether the fibreglass mount would be satisfactory for outdoor use. Iain has noted a dramatic improvement and results are even better following the removal of the masthead pre-amplifier. Very weak signals from Bilsdale and Chatton can now be resolved and he is confident that only genuine signals will be received rather than spurious ones introduced by the amplifier!

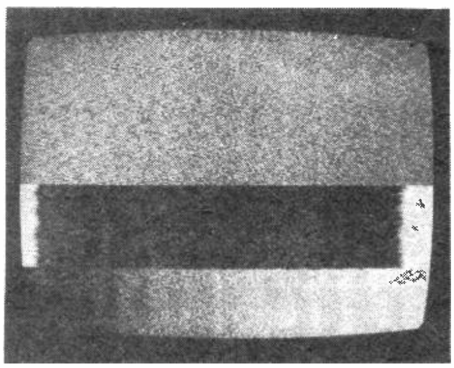
Sporadic-E brought in West Germany on channel E2 on the 5th with the 'Saarländischer Rundfunk' FuBK test card from the Göttelborner Höhe transmitter situated near Luxembourg. This was followed by the Bayerischer Rundfunk test card from Grünten.

To round off the month, a midnight opening produced the PM5544 test card and tone on E3 and E4 from RUV Iceland after the local BBC-1 405-line transmitter had closed down.

More Band III meteor scatter DX was witnessed by Clive Athowe (Blofield, Norfolk). Norway appeared on E5 with the test card on May 1st. On the 8th and 21st, the Czech 'RS-KH' test card fluttered up on channel R6. Improved tropospherics on the 14th produced



FuBK test card from Iran



EBU Bar with a French sound channel

Albanian newsreader on channel IC

Norway on the PM5534 test card from Halden on E11 and Lyngdal on E9. From a more easterly direction several West German stations in the north of the country gave excellent pictures.

Test card 'F' goes digital

Test Card 'F', which has graced millions of television screens since December 1967, has been revitalised! Since last May a new digital version has been radiated on BBC-2 between 0815 and 0900 on weekdays only. Regular Trade Test transmissions were, for some obscure reason, discontinued in May 1983 and were replaced by endless pages from Ceefax. Full details were given in the January 1984 ***R&EW.***

The new version still includes the central colour display with Carol Hersee and friend, the picture being stored digitally from one of the original slides. All the other features (including frequency gratings, grey scale, grid, etc) have been produced digitally.

On the old monoscopic test card the top blue castellation was partially covered by standard colour bars. On the new version the upper castellations are totally replaced by colour bars which include a white arrow for picture alignment. Sharp-eyed enthusiasts may also note that the white and black dots on the grey scale are square rather than round.

At the time of writing, BBC engineers were still developing the equipment to generate the identification beneath the stylised letter 'F' although we have received reports that the new digital Test Card 'F' has occasionally been noted with station information. The old monoscopic test card will be radiated in place of the new version from time to time.

DX-TV Transmitter Map

A new map is available for DX-TV enthusiasts to locate the transmitter from which signals are being received.

The map covers all the principal Band I TV outlets in Europe. The relevant ERP's are listed together with details of TV services country by country. It costs £1.65 including postage from HS Publications, 17 Collingham Gardens, Derby DE3 4FS.

Service information

Denmark: A final decision is expected soon from the Danish Government about a second TV service. If the plan is approved there will be a total of 18 transmitters (probably all on UHF). It will take about four years to bring them all into service.

The regional television service (TV SYD) now also broadcasts on Tuesdays from 1900 until 1930 local time.

West Germany: April 1st saw the start of Cable TV in Munich. There are 21 channels available to subscribers with programmes on offer from West Germany, Austria, France, England and Switzerland.

Japan: Direct Broadcasting via Satellite (DBS) began last May via the BS2a craft.

Mexico: DBS should begin next year via the Morelos 1 and Morelos 2 satellites. There will be capacity for ten television channels including facilities for schools TV and a Pay-TV programme.

Australia: The Australian Broadcasting Commission began a 10-week series of stereo TV programmes last April. Apparently the stereo sound channel was transmitted via ABC's FM network.

Luxembourg: Following repairs to the storm-damaged RTL-Plus transmitter, the ERP has been restored to 100KW.

Iceland: From January 1st, 1985, Rikisutvarpid Sjonvarp (RUV) willl broadcast TV programmes on Thursdays. Programme hours in Iceland are very limited with the PM5544 test card being radiated for much of the day.

Sweden: The 1st network of Sveriges Radio has started radiating the PM5534 test card which includes a larger than normal digital clock insert.

Netherlands: The PM5544 test card used by NOS-1 now carries the inscription 'PTT-NED.1' in larger letters than before thus making identification easier.

This month's Service Information was kindly supplied by Gösta van der Linden and Alexander Wiese.

ENFIELD ELECTRONICS

208 Baker Street, Enfield, Middlesex. EN1 3JY. Tel: 01-366 1873

BARCLAYCARD VISA

TRANSISTORS

AC125	30p	BC183C	12p	BF198	14p	TIP29C	45p	2N1304	80p
AC126	30p	BC183L	12p	BF199	14p	TIP30A	40p	2N1305	80p
AC127	30p	BC183LB	12p	BF200	35p	TIP30B	50p	2N1307	70p
AC128	30p	BC184	12p	BF224B	20p	TIP30C	45p	2N1308	80p
AC132	90p	BC184B	12p	BF244B	35p	TIP31	38p	2N1613	38p
AC141	30p	BC184L	12p	BF256	35p	TIP31A	40p	2N2222A	30p
AC142	30p	BC186	30p	BF257	35p	TIP31B	40p	2N2369A	28p
AC176	30p	BC187	30p	BF258	35p	TIP31C	45p	2N2646	68p
AC187	30p	BC212A	14p	BF259	35p	TIP32A	40p	2N2904A/5A	30p
AC188	30p	BC212L	12p	BF594	40p	TIP32C	40p	2N2906A	60p
AD149	80p	BC213	12p	BF595	30p	TIP36C	140p	2N2907A	30p
AD161	45p	BC213B	12p	BFR39	20p	TIP41A	50p	2N2926G	12p
AD162	45p	BC213L	12p	BFR79	30p	TIP41B	50p	2N2926R	12p
BC107	12p	BC214	12p	BFR80	30p	TIP42A	60p	2N2926Y	12p
BC107A	14p	BC214B	14p	BFX29	30p	TIP42B	65p	2N3053	30p
BC107B	14p	BC214L	12p	BFX84	30p	TIP120	80p	2N3054	75p
BC108	12p	BC237	18p	BFX85	30p	TIP121	80p	2N3055E	80p
BC108A	14p	BC238B	18p	BFX87	30p	TIP142	120p	2N3442	150p
BC108B	14p	BC307	18p	BFX88	30p	TIP2955	70p	2N3615	200p
BC108C	14p	BC308	14p	BFY50	28p	TIS43	36p	2N3702	12p
BC109	12p	BC327	18p	BFY51	25p	TIS44	40p	2N3703	12p
BC109B	14p	BC328	16p	BFY52	25p	TIS90	30p	2N3704	12p
BC109C	14p	BC337	18p	BFY90	80p	TIS91	30p	2N3705	12p
BC140	35p	BC338	18p	BRY39	40p	VN10KMA	75p	2N3706	12p
BC141	35p	BC441	36p	BSX20	30p	VN66AF	95p	2N3707	12p
BC142	35p	BC461	36p	BSX29	35p	VN88AF	110p	2N3708	12p
BC143	35p	BC477	40p	BU105	170p	ZTX107	12p	2N3710	12p
BC147	12p	BC478	40p	BU205	200p	ZTX108	12p	2N3711	12p
BC148	12p	BC517	45p	BU208A	220p	ZTX109	12p	2N3771	200p
BC157	12p	BC547	15p	MJ2955	90p	ZTX300	15p	2N3772	200p
BC158	12p	BC548	15p	MJE340	50p	ZTX301	18p	2N3773	200p
BC159	12p	BC549	16p	MJE371	90p	ZTX302	20p	2N3819	25p
BC160	50p	BC556	20p	MJE2955	110p	ZTX303	20p	2N3820	45p
BC161	45p	BC557	16p	MJE3055T	80p	ZTX304	20p	2N3823	50p
BC167	15p	BC558	16p	MPSA06	25p	ZTX330	35p	2N3866	100p
BC168	12p	BC559	16p	MPSA56	30p	ZTX500	18p	2N3903	15p
BC169	12p	BCY70	20p	MPSU05	65p	ZTX501	18p	2N3904	15p
BC170	20p	BCY71	20p	MPSU56	60p	ZTX502	18p	2N3905	15p
BC171	13p	BCY72	23p	OC22	150p	ZTX503	18p	2N3906	15p
BC172A	12p	BD131	50p	OC23	150p	ZTX504	30p	2N5172	30p
BC173	13p	BD132	50p	OC26	100p	ZTX531	30p	2N5194	80p
BC177	20p	BD133	60p	OC28	200p	ZTX550	30p	2N5457	42p
BC178	20p	BD135	50p	OC36	220p	2N696	35p	2N5458	48p
BC179	25p	BD136	40p	OC41	75p	2N698	45p	3N128	85p
BC181	23p	BD137	40p	OC42	75p	2N699	40p	3N140	85p
BC182	12p	BD138	40p	OC70	60p	2N706A	28p	3N141	85p
BC182B	14p	BD139	45p	OC76	60p	2N708	30p	3N163	110p
BC182L	12p	BD140	45p	OC81	60p	2N914	38p	3N201	110p
BC183	12p	BF194	14p	OC82	60p	2N918	30p	3N202	125p
BC183B	12p	BF195	14p	OC84	50p	2N930	30p	40406	80p
				TIP29	30p	2N1131	30p	40407	80p
				TIP29A	35p	2N1132	30p		
				TIP29B	50p	2N1303	80p		

TTL

7400	18p	7417	28p	7447	75p	7486	35p	74119	70p	74160	65p	74190	58p
7401	18p	7420	20p	7448	56p	7489	140p	74121	35p	74161	56p	74191	56p
7402	18p	7422	28p	7450	21p	7490	37p	74122	41p	74162	46p	74192	55p
7403	18p	7425	28p	7451	20p	7491	45p	74123	41p	74163	46p	74193	55p
7404	18p	7426	28p	4753	21p	7492	40p	74126	70p	74164	46p	74194	52p
7405	18p	7427	30p	7454	21p	7493	41p	74132	65p	74165	80p	74195	52p
7406	32p	7428	30p	7460	21p	7494	41p	74135	50p	74166	60p	74196	55p
7407	32p	7430	26p	7470	25p	7495	41p	74141	51p	74167	185p	74197	55p
7408	25p	7432	28p	7472	25p	7496	41p	74144	250p	74170	195p	74198	95p
7409	25p	7433	35p	7473	30p	7497	60p	74145	575p	74173	120p	74199	95p
7410	18p	7437	30p	7474	35p	74100	95p	74147	125p	74174	65p	74221	60p
7411	25p	7438	30p	7475	40p	74104	58p	74148	65p	74175	65p	74279	60p
7412	28p	7440	23p	7476	35p	74105	58p	74150	70p	74176	46p	74284	95p
7413	26p	7441	51p	7480	30p	74107	30p	74151	46p	74177	55p	74285	95p
7414	37p	7442	40p	7481	110p	74109	30p	74153	46p	74180	50p	74366	64p
7416	28p	7443	71p	7482	70p	74110	41p	74154	81p	74181	121p	74390	325p
		7444	95p	7483	58p	74111	70p	74155	46p	74182	70p	74393	100p
		7445	71p	7484	81p	74116	70p	74156	46p	74184	105p		
		7446	71p	7485	75p	74118	65p	74157	35p	74185	105p		

LS TTL

74LS00	40p	74LS28	20p	74LS85	80p	74LS148	180p	74LS173	80p	74LS244	140p	74LS293	88p
74LS01	40p	74LS30	40p	74LS86	68p	74LS151	60p	74LS174	120p	74LS245	180p	74LS353	90p
74LS02	35p	74LS32	50p	74LS90	38p	74LS153	55p	74LS175	65p	74LS247	80p	74LS365	80p
74LS04	60p	74LS33	22p	74LS93	30p	74LS154	220p	74LS181	130p	74LS248	80p	74LS366	50p
74LS05	30p	74LS37	60p	74LS95	55p	74LS155	80p	74LS183	195p	74LS249	80p	74LS367	98p
74LS08	60p	74LS38	47p	74LS96	125p	74LS156	78p	74LS190	75p	74LS251	45p	74LS368	150p
74LS09	21p	74LS40	38p	74LS107	52p	74LS157	140p	74LS191	75p	74LS253	45p	74LS373	80p
74LS11	45p	74LS42	68p	74LS109	38p	74LS158	78p	74LS192	75p	74LS257	85p	74LS374	80p
74LS12	36p	74LS49	22p	74LS113	38p	74LS160	46p	74LS193	50p	74LS258	50p	74LS375	70p
74LS13	25p	74LS51	22p	74LS122	45p	74LS161	50p	74LS194	50p	74LS259	80p	74LS386	244p
74LS14	160p	74LS55	180p	74LS123	180p	74LS162	50p	74LS195	50p	74LS260	45p	74LS390	80p
74LS15	20p	74LS63	60p	74LS124	125p	74LS163	60p	74LS196	65p	74LS266	55p	74LS393	150p
74LS20	30p	74LS73	68p	74LS125	95p	74LS164	75p	74LS197	68p	74LS273	160p	74LS398	170p
74LS21	20p	74LS74	30p	74LS132	100p	74LS165	130p	74LS221	130p	74LS275	160p	74LS541	130p
74LS22	20p	74LS75	30p	74LS136	38p	74LS166	150p	74LS240	110p	74LS279	55p	74LS629	200p
74LS26	20p	74LS76	30p	LS74138	165p	74LS168	200p	74LS241	180p	74LS280	140p	74LS669	180p
74LS27	40p	74LS78	25p	74LS139	80p	74LS169	90p	74LS242	50p	74LS283	70p	74LS670	120p
		74LS83	85p	74LS147	135p	74LS170	85p	74LS243	80p	74LS290	55p		

CMOS

CD4000	15p	CD4015	46p	CD4035	55p	CD4054	100p	CD4093	40p	CD4503	46p	CD4569	80p
CD4001	15p	CD4016	30p	CD4038	125p	CD4060	80p	CD4099	140p	CD4511	52p	CD4572	80p
CD4002	15p	CD4017	40p	CD4040	50p	CD4066	30p	CD4160	75p	CD4512	60p	CD4581	80p
CD4006	60p	CD4018	52p	CD4041	50p	CD4068	20p	CD4161	75p	CD4514	140p	CD4582	80p
CD4007	18p	CD4019	30p	CD4042	45p	CD4069	20p	CD4162	75p	CD4515	200p	CD4583	60p
CD4008	45p	CD4020	52p	CD4043	46p	CD4070	16p	CD4163	75p	CD4516	65p	CD4584	60p
CD4009	30p	CD4021	48p	CD4044	46p	CD4071	18p	CD4175	75p	CD4518	52p	CD4585	110p
CD4010	35p	CD4022	46p	CD4045	120p	CD4072	18p	CD4402	75p	CD4520	60p	CD40100	200p
CD4011	15p	CD4023	20p	CD4046	56p	CD4075	25p	CD4412	75p	CD4528	81p	CD40106	80p
CD4012	20p	CD4024	40p	CD4047	46p	CD4076	60p	CD4419	75p	CD4538	100p	CD40109	100p
CD4013	25p	CD4025	18p	CD4048	45p	CD4077	30p	CD4445	75p	CD4539	78p	CD40114	200p
CD4014	56p	CD4026	100p	CD4049	30p	CD4078	25p	CD4446	75p	CD4541	100p	CD40174	80p
		CD4027	25p	CD4050	30p	CD4081	25p	CD4449	75p	CD4555	80p		
		CD4028	45p	CD4052	70p	CD4082	25p	CD4501	35p	CD4561	110p		
		CD4029	55p	CD4053	60p	CD4085	72p	CD4502	70p	CD4568	80p		

LINEAR

CA1310E	185p	CA3090	415p	LM339	80p	LM3911	140p	SAA5020		TDA1008	347p	TL074	117p
CA1350E	90p	CA3130	105p	LM348	90p	LM3914	285p	SN76013N	285p	TDA1022	570p	TL081	40p
CA3020	230p	CA3140	52p	LM358	62p	LM3915	285p	TAA621A	290p	TDA1024	120p	TL082	65p
CA3028	110p	CA3240	125p	LM380	85p	LM3916	285p	TAA661B	175p	TDA2002	150p	TL083	92p
CA3035	270p	ICM7555	105p	LM381	170p	MC1458	70p	TBA120B	70p	TDA2003	345p	TL084	65p
CA3043	305p	ICM7556	200p	LM382	130p	MC1488	80p	TBA120S	68p	TDA2020	350p	UA748	40p
CA3055	65p	LF347	200p	LM384	160p	MC1489	90p	TBA120U	98p	TDA2030	340p	ZN414	95p
CA3065	150p	LF351N	56p	LM386	100p	NE555	20p	TBA540Q	161p	TDA2102		ZN424	150p
CA3080	80p	LF353N	100p	LM387	140p	NE556	55p	TBA651		TDA2522		ZN425	400p
CA3081	225p	LM224	150p	LM389	110p	NE564	405p	TBA800	95p	TDA9400		ZN426	345p
CA3085	145p	LM301	30p	LM732	55p	NE566	173p	TBA810S	110p	TL061	50p	ZN427	715p
CA3086	65p	LM308	100p	LM747	75p	NE567	161p	TBA820	81p	TL062	75p	ZN1034	230p
CA3089	230p	LM311N	81p	LM1458	45p	NE570	391p	TBA920Q	175p	TL064	150p	ZN1040	750p
		LM318N		LM3900	70p	NE571	387p	TCA270S	171p	TL071	50p		
		LM324	50p	LM3909	92p	SAA5010		TDA1004	345p	TL072	60p		

RIBBON CABLE

(Priced per ft)

COLOUR

WAYS	
10	26p
20	53p
26	76p
34	100p

DIODES

AA119	15p	OA200	9p	1N5060	18p
AA215	16p	OA202	9p	1N5062	20p
BAX13	10p	1N823	5p	1N5400	11p
BY100	30p	1N914	5p	1N5401	12p
BY127	18p	1N916	6p	1N5402	14p
BY133	20p	1N4000	5p	1N5403	15p
BY206	30p	1N4001	5p	1N5404	16p
BY207	30p	1N4002	5p	1N5405	17p
BY299	40p	1N4003	6p	1N5406	18p
BYX10	18p	1N4004	6p	1N5407	22p
OA47	10p	1N4005	7p	1N5408	25p
OA90	8p	1N4006	7p	1S44	5p
OA91	8p	1N4007	8p	1S921	7p
OA95	8p	1N4148	5p	1S922	7p
		1N4448	6p	1S923	7p

D CONNECTORS

	MALE	FEMALE
9 way	75p	100p
15 way	100p	1140
25 way	140p	195p

D-CONNECTOR COVERS

9 way	110
15 way	110
25 way	125

I C SOCKETS

LOW PROFILE D.I.L Type	Price	TURNED PIN D.I.L. Type	Price
8 pin	10p	8 pin	35p
14 pin	12p	14 pin	50p
16 pin	14p	16 pin	80p
18 pin	18p	18 pin	65p
20 pin	24p	22 pin	75p
22 pin	25p	24 pin	80p
24 pin	30p	28 pin	100p
28 pin	32p	40 pin	150p
40 pin	35p		

ZENER DIODES

BZX61C/1.4 watt: 3V3, 3V6, 3V9, 4V7, 5V6, 6V2, 7V5, 8V2, 10V, 11V, 12V, 13V, 15V, 18V, 20V, 22V, 24V, 27V, 30V, 33V, 36V, 39V, 43V, 47V, 56V, 68V, 75V, 82V, 100V, 180V, 200V 16p each

BZY88C/0.4 watt: 1V3, 2V7, 3V, 3V3, 3V6, 3V9, 4V3, 4V7, 5V1, 5V6, 6V2, 7V5, 8V2, 9V1, 10V, 11V, 12V, 13V, 15V, 16V, 18V, 22V, 24V, 27V, 30V, 33V, 36V 10p each

LEDs

5mm:	Red	10p	113:	Red	
	Green	13p		Red	20p
	Yellow	13p		Green	25p
3mm:	Red	10p		Yellow	25p
	Green	13p	323:	Tri	
	Yellow	13p		Red	20p
CQX21:	Red flashing	65p		Green	25p
				Yellow	25p
251:	Rect/stack		503:	Square	
	Red	20p		Red	20p
	Green	25p		Green	25p
	Yellow	25p		Yellow	25p

REGULATORS

LM304H	180p	UA723C	77p	78H12 (3A/5V)	480p
LM309H	80p	7805A	50p	78L05	35p
LM309K	130p	7812A	50p	78L12	35p
LM317K	350p	7812Kc	121p	78L15	35p
LM317T	130p	7815A	50p	78L18	35p
LM320/5	65p	7818A	50p	78L24	35p
LM320/12	65p	7824A	50p	78L62	35p
LM320/15	65p	7905A	55p	79L05	45p
LM320/24	65p	7912A	55p	79L12	45p
LM337T	180p	7915A	55p	79L15	45p
LM1469	324p	7918A	55p	79L18	45p
UA78P (8A/5V)	450p	7924A	55p	79L24	45p

RECHARGEABLE BATTERIES

HP2, 1.2v, 4.0AH	£3.95
HP2, 1.2v, 1.2AH	£2.60
HP11, 1.2v, 1.2AH	£2.40
HP7, 1.25v, 500mAH	£1.00
AAA, 1.2v, 180mAH	30p
PP3, 8.4v, 110mAH	£4.50

ALUMINIUM BOXES

3 1/4" × 19" × 9 1/4"	
80 × 50 × 25	80p
100 × 65 × 50	1.20
100 × 70 × 40	1.20
100 × 100 × 40	1.20
135 × 70 × 40	1.20
135 × 105 × 40	1.40
180 × 125 × 65	1.95
205 × 155 × 75	2.50

VERO PLASTIC BOXES

White 71 x 49 25	65p
Blk 71 x 49 x 25	65p
Blk 120 x 80 x 35	120p
Blk 180 x 110 x 55	210p

VERO BOARDS

127 x 63	1.25
95 x 63	1.10
431 x 63	3.80
127 x 95	1.40
95 x 95	1.25
431 x 95	4.95
454 x 119	5.50
63 x 25 pk of 5	1.50

SOLDER

20 swg, 3 core

500g 495p

THYRISTORS

BT101	104p	T05 1A/400V	104p	600mA/200V	45p	5A/400V	60p
BT102	104p	2N1599	40p	1A/50V	40p	5A/600V	70p
BT106	104p	2N4441	170p	1A/100V	45p	5A/800V	80p
BT107	132p	2N4444	150p	1A/200V	50p	7A/100V	55p
BT108	143p	2N5060	36p	1A/400V	60p	7A/200V	60p
TIC44	20p	2N5061	33p	1A/600V	75p	7A/400V	70p
TIC106D	40p	2N5062	42p	1A/800V	90p	7A/600V	80p
TIC106M	77p	2N5063	47p	3A/50V	46p	7A/800V	90p
TIC126D	99p	2N5064	47p	3A/100V	53p	10A/50V	55p
TIC206D	80p	600mA/20V	21p	3A/200V	58p	10A/100V	60p
TIC226D	90p	600mA/30V	24p	3A/400V	71p	10A/200V	65p
TIC246D	130p	600mA/100V	30p	3A/600V	79p	10A/400V	70p
				3A/800V	99p	10A/600V	88p
				5A/50V	43p	10A/800V	115p

TRIACS

2A/200V	50p
2A/400V	60p
2A/600V	60p
4A/400V	60p
6A/100V	80p
6A/200V	80p
6A/400V	90p
8A/400V	80p
10A/100V	80p
10A/200V	100p
10A/400V	110p
10A/400P	100p

BRIDGE RECTIFIERS

1A/50V	30p	6A/50V	75p
1A100V	30p	6A/100V	75p
1A/200V	35p	6A/200V	80p
1A/400V	40p	6A/400V	100p
2A/50V	35p	10A/200V	200p
2A/100V	45p	10A/400V	200p
2A/200V	50p	25A/200V	250p
2A/400V	55p	25A/400V	300p

Dalo Etch resist £1.10

POTENTIOMETERS

Carbon track, 1/4 watt log & linear values:

Range	Price
470R-2.2MR (single track)	40p
4.7K-2.2MR (dual gang)	100p
4.7K-2.2MR (single gang D/P switch)	90p

SLIDER POTS

60mm track, log & linear values:

Range	Price
5K-500K	80p

PRESETS

Pre-set pots 1/4 watt

Range	Price
50R-4.7MR (mini vert. & horiz.)	10p

RESISTORS

High stability, 1/4 watt, 5%

Range	Price (1-99)	(100+)
1R-10MR	2p	1p

High stability, 1/2 watt, 5%

Range	Price (1-99)	(100+)
1R-10MR	3p	1.5p

CAPACITORS

CERAMIC 1pF, 2p2, 2p7, 3p3, 3p9, 4p7, 5p6, 6p8, 8p2, 10pF, 12pF, 15pF, 18pF, 22pF, 27pF, 33pF, 39pF, 47pF, 56pF, 68pF, 82pF, 100pF, 120pF, 150pF, 180pF, 220pF, 270pF, 330pF, 470pF, 560pF, 680pF, 820pF, 1000pF, 1n5, 1n8, 2n2, 3n3, 3n9, 4n7, 5n6, 6n8, 8n2, 10nF, 22nF, 47nF, 100nF 6p each

MYLAR: 100V 1nF, 2n2, 3n3, 4n7, 6n8, 10nF 7p each. 15nF, 22nF, 33nF, 47nF 9p each. 68nF, 100nF 11p each. 220nF 15p. 330nF 18p. 470nF, 20p.

POLYSTYRENE 22pF, 47pF, 68pF, 82pF, 100pF, 120pF, 150pF, 220pF, 270pF, 330pF, 390pF, 470pF, 680pF, 820pF, 1000pF, 1200pF, 1500pF, 1800pF, 2000pF, 2200pF, 3300pF, 4700pF, 5600pF, 10nF 8p each

TANTALUM BEAD 3V: 100uF, 150uF, 220uF, 330uF 64p each. 470uF 110p. 680uF 160p. 6V3: 6u8, 12p. 10uF 13p. 33uF 33p. 47uF 25p. 100uF, 220uF 77p each. 470uF 160p. 10V: 15uF, 22uF 20p each. 33uF 33p. 47uF 40p. 68uF 63p. 220uF 110p. 16V: 2u2, 3u3 20p each. 4u7, 6u8 25p each. 10uF 32p. 22uF 35p. 16V: 33uF 40p. 47uF 60p. 100uF 95p. 220uF 105p. 25V: 15uF, 22uF 40p each. 47uF, 68uF 60p. 35V: 0.1uF, 0.22uF, 0.47uF 16p each. 1uF, 1u5 18p each. 2u2 25p. 3u3, 4u7 20p each. 6u8 30p. 10uF 40p. 47uF 60p.

ELECTROLYTIC Axial or Radial 16V: 10uF, 22uF, 33uF 10p each. 47uF, 68uF, 100uF 12p each. 125uF, 220uF 14p each. 330uF 18p. 470uF 24p. 680uF 36p. 1000uF 30p. 1500uF 40p. 2200uF 58p. 25V: 1uF, 10uF, 22uF, 47uF 10p each. 100uF 12p. 220uF 20p. 470uF 30p. 1000uF 40p. 2200uF 55p. 4700uF 115p. 35V: 120uF, 250uF 20p each. 40V: 6u8 10p. 470uF 30p. 1000uF 45p. 50V: 0.47uF, 1uF 8p each. 1uF (small) 12p. 220uF 35p. 63V: 1uF, 2u2, 4u7 7p each. 10uF, 22uF 10 each. 47uF 12p. 100uF 20p. 220uF 30p. 100V: 4.7F 48p. 160V: 10MF 32p. 250V: 0.01uF, 0.047uF, 0.1uF 10p each. 0.22uF 11p. 0.47uF 12p. 1uF 18p. 2u2 26p. 10uF 23p. 100uF 35p. 400V: 0.47uF 35p. 600V: 0.022uF, 0.047uF 30p each. 0.22uF, 67p. 1000V: 0.0022uF 27p. 0.022uF, 0.1uF 39p each.

POLYESTER C280 250V .01, .022, .033, .068, .1 8p. .15, .22, .33 10p. .47 12p. .68 20p. 1uF 26p. 2.2 50p.

SILVERED MICA 2p2, 3p3, 5pF, 10pF, 18pF, 20pF, 22pF, 25pF, 27pF 13p each. 30pF, 33pF, 39pF, 47pF, 50pF, 56pF, 68pF, 75pF, 82pF, 100pF, 120pF, 150pF, 180pF, 200pF, 220pF, 250pF, 270pF, 300pF 15p each. 330pF, 390pF, 470pF 19p each. 500pF, 560pF, 680pF 22p each. 820pF 24p. 1000pF 27p. 1500pF 32p. 1800pF 42p. 2200pF 45p. 2700pF 48p. 3600pF 55p. 3900pF 68p. 4700pF 83p. 5000pF 98p. 6800pF 115p. 8200pF 120p. 10000pF 125p.

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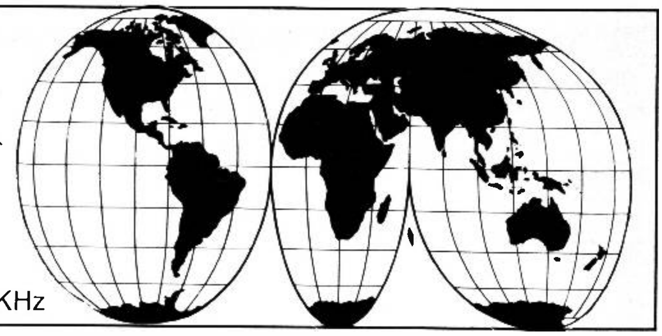
SHORT WAVE NEWS FOR DX LISTENERS

By Frank A Baldwin

All times in GMT, **bold** figures indicate the frequency in KHz



In the last issue I dealt with some of the Peruvian stations operating outside the broadcast band frequencies, providing all the information currently available, sparse though it may have been.

In this issue of the magazine I continue by bringing to your attention some more of the stations located in Peru: both those out of band and some inside the confines of the bands.

Dealing firstly with some more out-of-band transmitters, a start is made with: Radio San Jose, on **5742.7** noted with a music programme at 0130. Radio Acunta, Chota, Cajamarca on **5801.7,** logged at 2345, this being a reactivated station.

Radio Municipal Calca, Cuzco is on **6242** and is scheduled from 1100 to 0200. Radio Guyabamba, is reported as being on **6279** from 2300 to 0305. Radio Moderna, Moyobamba operates from 1055 to 2400 on **6364.** Radio Celendin, Cajamarca has been heard on **7053** where it operates from 2100 to 0400.

Radio Selva, Moyobamba is now on **7307** having moved from **7300.** It is on the air from 1100 to 0430.

The final out-of-band transmitter I am listing is Estacion 2000 located in Rioja, San Martin being scheduled from 1000 to 0340, mostly with programmes of a religious nature. The frequency is a variable **9988.**

The above information has been entirely retrieved from computer memory, many of the facts being originally culled from the SWL press, notably the DSWCI journal *Short Wave News* to which acknowledgement is made.

Turning now to some of the stations operating inside the broadcast band limits we commence with:

Radio Ayacucho, on **3220** where it operates from 1100 to 0500 with a power of 1KW.

Radio Qollasuyo, Juliaca on **3250** with a schedule from 1000 to 0300 at 1KW.

Or you could try **3260** for signals from Radio La Voz de Oxapampa, on the air from 2300 to a variable closing time of 0400. The power is 1KW.

Coming into the more popular 60 metre band, one that I logged a couple of years ago and originally thought the station identification was a promo for an alcoholic drink! I refer of course to Radio Tingo Maria, on **4760** and scheduled from 1100 to 0500 with a power of 1KW.

Another Peruvian logged on a couple of occasions last year is Radio Inca in Lima on **4762** working from 1100 to 0500 but reported closing sometimes at 0600. The power is 1KW.

Probably the easiest of the lot is Radio Atlantida in Iquitos on **4790** working from 0900 to 0500 (Sundays from 1130 to 0400) with a power of 5KW.

If you can hear this one at a good signal strength then it may be a safe bet that other less powerful Peruvians can be logged, QRM permitting.

Radio Andahuaylas, on **4840** is scheduled from 1000 to 0400 and with its 2KW signal can often be heard here in the UK.

On **4860** you will often find Radio Chinchaycocha in Junin with a 1KW transmitter operating from 1100 to a variable closing time around 0500.

OAX5V Radio Huancavelica, is on **4885** from 1100 to 0600 at 1KW and although it is a difficult channel due to other Latin American occupants, Huancavelica has been heard and reported by UK DXers.

Radio Chanchamayo in La Merced has an 0.4KW transmitter which is on the air from 1030 to 0500 (Sunday from 1100 to 0300) on **4896** but despite this low power it has been heard here in these islands, the best time being a weekday from 0430 until closing.

Radio Andina on **4996,** Radio Quillabamba often logged on **5025** and Radio Loreto in Iquitos on **5050,** 2, 5 and 1KW respectively.

AROUND THE DIAL

As is usual, we commence with some reports of African stations, the countries being listed in alphabetical order.

Benin

Cotonou on **4870** at 2034, OM with a talk in French all about internal affairs. Cotonou is on the air from 0400 to 2300 with a power of 30KW. It features a newscast in English from 2000 to 2015 but operates mainly in French and some eighteen local vernaculars.

Equatorial Guinea

Radio Nacional, Bata on **5005** at 2018, music in the typical fast rhythmic local style, OM with a song in vernacular, OM with announcements and station identification at 2019 in Spanish. R Nacional has a power of 100KW and is scheduled from 0430 to 0655 and from 0955 to 2135. This frequency is alternated with that of **4925**, to no known sequence I might add and much to the bewilderment of the local populace I suspect!

Kenya

Nairobi on **4804** at 1758, OM with a pop song in English, YL with announcements and station identification at 1800 and a newscast in English, mostly of African events. This was a transmission in the English language General Service which is on this channel from 0255 (Sunday from 0330) to 0630 and from 1300 to 2010 (Saturday until 2110). The power is 5KW.

Nairobi has also been logged on **4885** and on **4915** around 2030.

Libya

Tripoli on **9890** at 1355, OM and YL alternate with a news commentary in the Arabic language Domestic Service scheduled on this frequency from 0600 to 2350.

Mauritania

Nouakchott on **4845** at 2030, OM with the news in Arabic. This station is scheduled from 0600 (Sunday from 0800) to 0830 and from 1700 to 2400 with a newscast in Spanish at 2100.

During recent months however, the frequency has been reported varying from **4821** to **4828** on occasions although I have never heard them on these latter channels. The power is 100KW.

Nigeria

FRCN (Federal Radio Corporation of Nigeria) Kaduna on **4770** at 2020, YL with a pop song in English with announcements in the same language. This is Channel 2 which operates in English and Hausa from 0400 through to 0100 at 50KW.

Senegal

Dakar on **4890** at 2037, OM with a talk in vernacular. According to my information Dakar is on the air from 0600 to 0900, 1155 to 1600 and from 1715 to 0100. The power is 100KW with an English language 'slot' from 1845 to 1900.

Tanzania

Dar-es-Salaam on **5050** at 1750, YL with a local pop song in Swahili during the Commercial Service which is timed from 1300 to 2015, the National Service also being on this frequency but from 0300 to 0700. The power is 10KW.

Tunisia

Tunis on a measured **15226** at 1944, mixed choir with songs in Arabic in a programme for the Arabic world scheduled from 0600 to 2330 on this channel.

Uganda

Soroti on **5027** at 2047, pop records and OM with announcements in English. Also logged at 0300 when opening with the national anthem followed by a newscast in English on the occasion of 'Liberation Day from the Fascist regime of Idi

Amin'. Many promos followed, most of them congratulating Milton Obote and the present Ugandan Government. One promo announced that 'soap was available'! Surprising what one can hear on the short waves.

THE AMERICAS

Brazil

Radio Timbira, Sao Luiz on **4975** at 2333, OM with a football commentary in Portuguese. The schedule is from 0800 to 0300 and the power is 2.5KW.

Radio Cultura, Campos on **4955** at 0046, OM with a commentary on basketball (I think) – certainly not futebol (football). Radio Cultura operates irregularly from 0800 to 0400 with a power of 2.5KW but can vary in frequency down to **4953** at times.

Colombia

La Voz del Cinaruco, Arauca on **4865** at 0042, OM with promos then a sports commentary in Spanish.

This one operates from 0900 to 0400 (Sunday until 0200) but at times, just to confuse us, it does work to a 24-hour schedule. The power is 1KW.

Ecuador

Sistema de Emisora Atalaya, Guayaquil on a measured **4792** at 0448, OM with a sports commentary, OM with announcements, station identification, the national anthem and sign-off at 0455. Transmissions are irregular but, when on the air, the timings are from 0900 to 1330 and from 0100 to 0455 with a power of 5KW.

It will not have escaped many readers' attention that most of these LA (Latin American) irregularly operated stations are on the air for local sporting events – and this usually means at weekends. Listen then during Saturday night and Sunday mornings GMT if you want to log them.

Radio Popular Independiente, Cuenca on **4800** at 0457, OM with promos and full station identification, then YL with a local pop song. The schedule is from 1000 to 0530 but does sometimes operate around-the-clock. The power is 5KW.

Radio Quito, Quito on **4920** at 0339, OM with a ballad in Spanish and some local-style music. R Quito is scheduled from 1000 to 0500 (Sunday until 0400) and the power is 5KW.

Honduras

La Voz Evangelica, Tegucigalpa on **4820** at 0332, OM with a talk in Spanish with a mention of gasolina (petrol) and Biblia (Bible). This one is scheduled in Spanish from 1030 to 0600 except on Monday, when it has an English transmission from 0300 to 0500. The power is 5KW.

ASIA

Afghanistan

Kabul on **9665** at 1859, YL with station identification 'This is Radio Afghanistan calling Europe' then OM with the news in the English programme for Europe, timed from 1900 to 1930. This is, however, a USSR relay.

China

Yunnan PBS (People's Broadcasting Station), Kunming on **4760** at 2230, OM with a talk in Chinese. This is Yunnan 1 which is scheduled in Chinese from 2150 to 0100, 0250 to 0600 and from 0920 to 1600.

Xinjiang PBS, Urumqi on **5440** at 2045, Chinese orchestral music during a relay of the R Beijing Foreign Service in Russian, timed from 1800 to 2055. Xinjiang PBS is also scheduled from 0050 to 0230, 0530 to 0700 and from 1200 to 1720 with the Home Service in Kazakh, also including relays of the R Beijing Home Service.

Radio Beijing on **9860** at 1907, OM with the news and YL with a news commentary from the Chinese point of view in the English programme for Europe, timed from 1900 to 2000.

India

AIR Delhi on **11620** at 1945, YL with the station identification then the news in English in the General Overseas Service which may be heard on this channel from 1745 to 2230.

Iran

Teheran on **4990** at 2003, YL with station identification and announcements in English, trumpet fanfare. I ran the tape through several times to get this right, Teheran is new on this frequency and there is much co-channel QRM from Yerevan and Lagos at this time. Also confirmed that it was Teheran by switching alternately from **4990** to **9020** on the memory bank to ensure parallel operation.

Iraq

Baghdad on **13700** at 1948, OM with songs in Arabic, some local-style music in a Voice of the Masses transmission, all in Arabic from 1500 to 2200 on this frequency.

Saudi Arabia

Riyadh on **9870** at 1922, OM with a talk in Arabic then some music in the usual style. This is the Domestic Service which is scheduled at this point on the dial from 1700 to 2300.

Riyadh on **11820** at 2044, OM with a talk about Medina in a programme of the Arabic languaged Domestic Service, 1700 to 2130 on this channel.

Sri Lanka

SLBC Colombo on **4902** at 0015, monks with religious chants at the period of a full moon.

This is the Home Service 1 in Sinhala, the schedule normally being from 0000 to 0230 and from 0930 to 1745. On full moon this is extended from 1745 to 2400. The power is 10KW.

Turkey

Ankara on **11955** at 1434, local-style music, OM with songs in a relay of the Domestic Service TRT1 which can be logged on this frequency from 1000 to 1500.

EUROPE

Albania

Tirana on **5057** at 1745, OM and YL with a talk in the Home Service which is scheduled here from 0400 to 1930. Tirana may also be heard in parallel on **5020.**

Austria

Vienna on **12015** at 1500, OM with station identification, YL with announcements, OM with the local news. All in the English transmission to Europe, North Africa and South East Asia being timed from 1500 to 1530. Also logged in parallel on **11825.**

Italy

Rome on **11905** at 1430, interval signal then YL with station identification at the commencement of the French programme for Europe, scheduled from 1400 to 1455.

Romania

Radio Bucharest on **11940** at 0548, OM with station identification, OM and YL answering listeners letters during the English presentation to Africa, timed from 0530 to 0600 on this channel and also heard in parallel on **11840.**

Yugoslavia

Belgrade on **11735** at 0956, OM with station identification and announcements at the end of a relay of Radio Zagreb with a Serbo-Croat programme timed from 0900 to 1000. (Sunday only). Relays of local stations are made from 0600 to 1000 in several local languages but the sequence is subject to alteration.

Belgrade on **15240** at 1440, YL with a talk about tourism in Yugoslavia during an English programme for Europe, the Middle East, the Far East, South and South East Asia, listed from 1430 to 1500.

PACIFIC & SE ASIA

Australia

Melbourne on **11910** at 0621, OM with a talk about Australian politics in an English transmission to Africa, the Pacific and Papua/New Guinea. The schedule for the Pacific area is around-the-clock, for Africa from 0500 to 0630 and for Papua/New Guinea from 2300 to 0730.

Northern Mariana Islands

KYOI Saipan on **11900** at 1433, US made rock and roll recordings, YL with announcements in Japanese. These programmes are beamed to Japan on various channels, that listed here is used from 1000 to 1600. KYOI is a commercial station, it does QSL and the QTH is Marcom, PO Box 795, Saipan, CM 96950.

The Northern Mariana Islands are part of the United States Commonwealth.

CLANDESTINE

'Voice of the Free Sons of the Yemeni South' on **11180** at 1348, OM with a harangue in Arabic. This clandestine is hostile to the People's Democratic Republic government in Aden and operates daily from 1300 to 1500 entirely in Arabic.

In the next issue, I shall be bringing to readers' attention some of the Clandestine stations currently operating.

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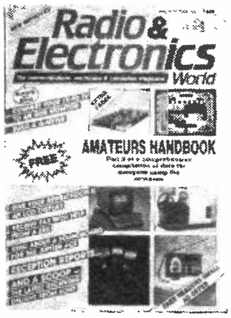
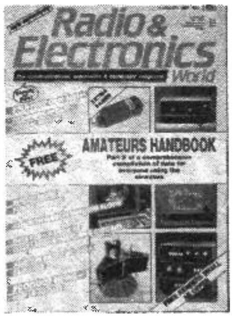
BACK ISSUE SERVICE

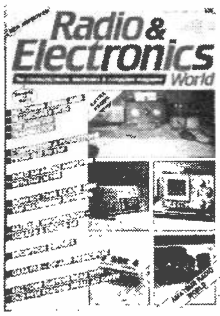
All issues from October 1981 onwards are still available, with the exceptions of January 1982 and February 1982. All orders must be pre-paid, the cost of each issue being £1.00 inclusive of postage and packing. A contents index spanning the issues from October 1981 to September 1983 is available on receipt 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.



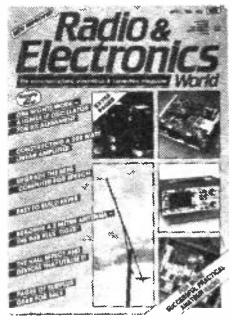
JANUARY 1984
Designs — Communication Building Blocks (Active Antennae); FAX Receiver; RGB Interface for the Ferguson TX-90; A Couple of Voltage Detectors; LCD Capacitance Meter; Cymar Q-meter (An aid to winding coils); Zener Diode Checker; A Drinker's Delight; LCD Display Option for the Rewbichron II. *Features* — A Novel Receiver (Sony); Capacitors for Coupling, De-coupling and Filtering; Data File on Op-Amps Part 2; Farewell to Test Card 'F'; A Soundboard for the Jupiter Ace; Data Brief - MC1377 Colour Signal Encoder.



FEBRUARY 1984
Designs - Switched Mode Power Supplies; Crowbar Protection Circuit; Switched Step Attenuator; Universal NiCad Charger; Communications Building Blocks (IF Amplifiers); Real Time Calendar Clock. *Features* - Data File on Op-Amps; Six Antennas from Three Wires (Double your directions without doubling your cost); Designers Update (Helical Filters); Moving Pictures from Wax - 'Phonovision'; Computers, Communications and Applications; Data Brief - Low cost, wide range varicap diodes.



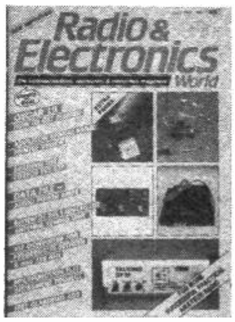
MARCH 1984
Designs — Modifying the Pye PF1 Pocketfone Receiver; Communications Building Blocks (IF Amplifiers); One Night's Work (Audio-Amp), 200W PEP Transmatch. *Features* — Sony ICF 7600D Receiver; Data File on Op-Amps; UOSAT-B; AKD Absorption Wavemeter, Data Brief — Hitachi HA 1197 AM Tuner; Oscar 10 and its Orbit Parameters, Programmable Sound Generator (the AY8910 family); Random Morse Computer Program; ICOM World Clock.



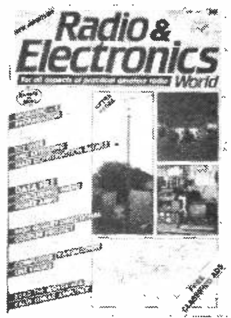
APRIL 1984
Designs — One Night's Work (IF Oscillator) ; HF Linear Amplifier; The Piano Keyer — only £5 for Perfect Morse; Peak-Reading LED RF Wattmeter; Speech and the Computer — Make the Beeb Micro Talk!; 2 Metre Tiger Antenna. *Features* — Hall Effect Devices — Exploiting Magnetisms' Effect on Conductors; 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; Hamey 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 Nights 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; QQV06-40A 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

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■ Morse TX/RX program for 48K Spectrum. This program tracks 5-35 wpm on receive, and includes a Type Ahead buffer on TX. Easy connection via ear & mic sockets-no extra hardware needed. Cassette £7.50. For 16K Spectrum and 1K ZX 81: as above, bur RX only, £5.20. Spectrum versions include a comprehensive Morse tutor. P Anderson, Wellands, Pilton, Shepton Mallet, Somerset.

■ 3½digit LCD plus 7106 or 7126 (A to D LCD driver) plus data sheet £10 ono. Will post. Pat, 2 Ridley Road, London, NW10 5VA. Tel: 01 961 6658.

■ 19in rack, Vero KM6 frame plus 1in front panel, card mounting brackets, card rails. New, still in original packing. Total cost over £26. Buyer to collect for £24 or will post for £26 ono. Pat, 2 Ridley Road, London NW10. Tel: 01 961 6658.

■ TR2200G 2m FM TX/RX, fully xtalled, five simplex, seven repeater channels, Nicads, charger, power lead, case, carrying strap, mobile mount, instruction manual, five other xtals, good condition. £50. Yaesu FRG7000, digital, general coverage communicatons receiver, excellent condition, instruction manual, original packaging, £155. Microwave modules, 2m, 144/28MHz converter, instruction sheets, good condition, £10. Tel: 0562 886272.

■ Creed 75, £50, 14/50 spares £15. 24dc/240ac motor generator £50. 24Vdc, 3hp motor £25. 3ph/ihp motor £15. Heavy duty mast, wall brackets £7. 13m RG8/U £6. Various junk, shack clearance, offers? Chris. Tel: 0734 734289.

■ Grundig Stenorette dictaphone with accessories. Works as is, or could be converted computer use? Uses standard tape on 3¼in spools. Microphone has remote on/off and back-space. Foot control for transcribing, with earphones. £50 ono. Tasker. Tel: 0476 860421.

■ Densei CBE 2003 voile activated microphone control unit and boom microphone. Also Altai headset/boom microphone combination OH20BM, £30 ovno or separate. Tel: 01 992 4678 before 3.30pm or anytime Sunday. Ask for Jon.

■ Datong FL2 variable audio filter. Perfect working order and condition £60 plus postage. High current psu 24amp at 13.8V £35 collected. New Farnell switch mode psu 60amp at 5V three off at £20 each plus postage. Together would make superb 60A 13.8V psu also Gould switch mode psu as new 10A at 12.5V very small £40 plus postage. G4GXE QTHr, Tel: Buxton 0298 71410.

■ CB equipment two York JCB861 rigs with mounts. Two aerial matchers Audiocine SWR meter. Amstrad antenna wih magnetic mount. Revco antenna no mount. £60.00 or swap for 2M handheld. Also Akai M8 reel to reel tape recorder takes 7inch reels working but needs a service £45.00 buyer collects. Tel: 0362 66993 evenings & weekends.

■ Shinwa CP80 dot matrix printer centronics interface swap for Yaesu FT 290R. Tel: Crowborough 63910.

■ Creed 7B/RP with 6S6 tape reader and silencer cover both items complete with creed workshop manual and servicing notes. Also details for using printer with home micro from Computing Today. Offers please. Creed 444 almost new with silencer cover and full creed manual. £50. Could deliver within Midlands but buyer inspect first. Tel after 6pm 0543 472054.

■ FDK 750E 2M multimode transceiver VGC. Very sensitive used for satellites £220 ovno. Also AR88D in good working order £45. Tel: Mansfield 513573.

■ Audio signal generator valve version £8. 11 metre mobile aerial 7 foot firestick with boot-mount £7.50. Large quantity of RTL logic 900 series. Offers please. 'Television' magazines 1976-82 bound volumes £5 each. Newnes Radio and television servicing 1956-77 offers. Rolf G1DCD QTHr Tel: 0734 883418 after 8pm.

■ Grundig satellit 3400 professional 150KHz to 30 MHz. FM VHF SSB digital all bands. LCD clock. 10 months old, as brand new, little used. Superb audio, £225 ono (cost £360). HK706 morse keyer (brand new) and oscillator thrown in! Lane. 19 Smugglers Way, Birchington, Kent.

■ ZX81 & 16K + professional keyboard, software, books, ICL cassette course with 2 manuals (How to Program the ZX81), all leads, psu £59. Tel: 0253 45431.

■ Yaesu FT902DM transceiver in immaculate condition. £475. Pan three element mini beam £25. Tel: Northampton (0604) 408155.

■ Telequipment S32A 'scope (10MHz) in nice condition, just been realigned £45. Handbook and circuit available. Philips N1502 video recorder some tapes available in working order ideal ATV reasonable offer Tel: Leeds (0532) 866897.

■ 2m Belcom LS-20XE packet transceivers with rechargeable batteries. Never used. Mains charger 2 units at £95.00 each will split. Tel: 061 573 7882 (Mr Jones).

■ ICL termiprinter type 7075. Excellent working conditon c/w keyboard (detatchable) and box of paper. RS232 interface, 120 column paper, upper and lower case (letter quality typeface), adjustable band rates and quiet operation can be seen working £75 ono. Buyer collects. Also EX MOD geiger counter with 3 tubes and battery or mains supplies vgc £40 plus postage. Tel: Mark Templeman Bath (0225) 23276, after 6pm weekdays or anytime at weekends.

■ Codar Q mutliplier £10.00. 2 power packs 300V dc 6.3 ac £3.50 each. Many mains transformers 6.3V to 2KV 500mA various turb. Fans Weller expert solder gun as new £10.00. 2 Cossor double beam CRTs £2.50 each. Lots of valves acorns to 6146s transistors, crystals BY127s. What do you want. Offers considered G3AFC QTHr Dartford 04747 2691.

■ 64K Vic20 plus over £200 software plus books etc imac 3 mth old £199 ono. National Panasonic RE3100 32 band com receiver plus jil SX200 scanner plus two CBs suit conversion plus ten xtals for 2mtr offers please. Few job lots components pots, res's, trans', leds, chips, relays, diodes and many other items £15. J Moores, 99 Armadale Road, Dukinfield, Cheshire SK16 5AG.

■ Bearcat scanner-model 200FB. Complete with power supply and manual. Still under g'tee, cost £184 – absolute bargain at £110! Buyer inspects and collects. Tel: 01 907 2253.

■ Icom IC240 2m TX/RX complete with mobile mount, mic, two power leads and manual £100. Tel: G4ANW 0730 61859.

■ Barco 26 inch colour receiver monitor. All channels and systems. Pal Secam NTSC. Covers VHF to UHF. Ideal DX/TV video and audio in and out. VCR or computer. Studio definition. £250 ovno. Tel: 01 452 9436 evenings.

■ HF station collins KWM2 + KW600 linear £575.00 swop for FT225RD cash adj. Hammurland SP600 RX .54 to 54MHz £85.00. Set new valves for SP600 £28.00. Liner2 £50.00. ETM3 keyer £10.00. Shure 202 ceramic mic new £10.00. Collectors items Cossor ganging oscillator Roberts valve and set analyser offers Pr. boxed spkrs £15.00 all carriage extra. G Morrison, Penang Lodge, Hassell St, Hastingleigh, Ashford, Kent TN25 5JE. Tel: 023375 316.

■ Leak point one mono valve amp complete working order offers. Tel: (0206) 68706.

■ Yaesu FT707 2325 IC4E with soft case only 8 months old £165. 2 BPI's £10 each. Contact Keith Tel: 0226 296108.

■ Yaesu FT101E MkIII fan cw filter, unmarked conditon original packing manual etc sale or exch for 70cms 2mtr multi mode with psu 70cms linear or why. Tel: Nottingham 874235.

■ Hundreds of valves. American UX and octals. British 5 pin, 7 pin, prewar, post war types. IE 6F6 metal £1.20 each. All valves unused. Lists sent. Pse sae. A E Jeffrey, 42 Dennis Road, Padstow, Cornwall.

■ Hitachi CCTV camera HV-62K c/w tamron lens 16/1.6 very good condition £60. Tel: Alan Basildon (0268) 45573 after 6pm.

■ Yaesu FRG7 receiver plus 2m convertor as new £150. Eddystone 770MII good condition requires slight attention £40. Pye 40W Hifi amp new boxed £40. Wireless World Mags new condition 1978 1982 £2. Tel: 051 327 6588.

■ FT208R 2 metre handheld with case/charger as new 6 months old £140 ono (£199 new) or would exchange for 70cm handheld IC4E or FT708R consider part exchange for FT790R 70cm multi-mode. Also for sale FM board (FMUT77) for Yaesu FT77 HF transceiver new not used £23. Post paid. Roger G4IPE (not QTHr) Tel: Louth (0507) 601030 night (0507 82) 8002 day.

■ Fully protected 30A psu £40. DSB top band receiver: with transmitter section nearly comp will make up into a neat TX/RX unit £17. Iambic keyer £10. Black/white portable TV battery only 12in screen, works but needs attention £5. Transformers ideal for 30A psu £15. Pye Cambridge £10. Pye Vanguard £10. Hudson TX/RX £8. Creed type 656 paper reader £4. Tel: 0664 500228.

■ Sommerkamp FT250 and FP250 power supply 80m-10m 200 watts pep £200. (same as Yaesu FT200). Ferrograph 4AN reel to reel tape recorder 7½in ips £40. Tel: 0329 287969.

■ Masts! Looking for a cheap mast or tower? I have a few hollow glass fibre poles, 8.5m long, tapered from 12in to 9in. Head loading in excess of ¼ton. Tel: David Pickett 0420 86512 (day) 04203 4140 (evening).

■ VLF Marconi 'Mercury', 5 band receiver, 15KHz to 4.0MHz, complete but not working. Also ex-WD infra-red binoculars with power pack, some spares and instructions £45. M Brown, 15 Hamilton Row, Waterhouses, Co Durham, DH7 9AU. Tel: Durham 0385 731585.

■ KW2000B transr, no mods, AC power unit. In regular use last 8 years. Well known on the air. Good condition and appearance. Spot on results. Call for demo in Halifax £195 ono. G8CB in callbook. Tel: 0422 43104.

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■ Yaesu FTV901R, 3-band transverter, 2,4 & 70, will work with any HF rig. FL2100Z linear. FC902 ATU SP901P phone patch speaker. FT1290R, all accessories, hand held rigs. TR3500 70cm Azden. PCS300, 2m, both with speakr mikes etc. MM432-30LS. Diawa, 2m, 3/30Watts RTTY & CW transceiver from Dragon 32 & PNP interface. Tel: Derby 383442 (G4TKP QTHr).

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■ Resistors Dubilier ¼W carbon 5-10%, approximately 35 boxes of 1,500 each type, total 50,000. £25 the lot. Buyer collects London. Tel: 01-286 7799 (daytime)

■ Trio R1000, very good condition, hardly used. Complete general coverage. £270. Eddystone 870A small Rx. Gen cov. £50. Mr A R Roxbee, 25 Toms Croft, Turners Hill, Hemel Hempstead, Herts HP2 4LL. Tel: 0442 66968

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■ Standard C58 2m multi-mode portable. £165 with nicads and charger. Microwave modules transverter 2 meters input 28-30 MHz output. £45. Thandar 600 MHz divide by ten prescaler. £30. Microwave modules advanced Morse trainer MMS2. £100. Sun KG309 SE2 ⅝wave mobile ant. offers? Microwave MM4001 KB RTTY Transceiver. £200, with keyboard. Fincher, 27 Albert Street, Tring, Herts HP23 6AX. Tel: Tring 6752

■ FT227RA, almost mint, 2M FM 10W transceiver, 25KHz channel scanner controlled by push buttons on microphone, 600KHz repeater shift + reverse repeater, can be changed to 1.6MHz for UHF repeater working. 4 memories for your favourite channels, including optional repeater channel, tone burst switchable auto-off-on. Hi-low (1W) power switch. Complete with mobile mount and handbook. Original packing, power lead with cigar lighter adaptor. £120 ovno. Prefer buyer collects. G4CRW. Tel: 0753 42301 (Slough)

■ Shack clear-out. Marconi Atalanta communication receiver, coverage 15KHz 28 MHz, clean condition, fault needs working on, hence price with circuit information. £30. Buyer must collect. Homebrew 2A 13.0V regulated power supply. £3. New valves W81, X81, N78, 6L6, new Denco coils range 1 blue, range 1 green. Prices arranged. Tel: 0903 66329

■ Yaesu FT230R, as new condition. Auto tone burst, extended receiver IE 144 to 149MHz. Boxed with brackets and manual. £190. Warren (G6XJS) QTHR. Tel: West Drayton 448832

■ 10GHz Klystrons, 75mW. £8. 25mW. £4. Reed contact push buttons, 12 for £9. QQVO640 tested. £8. QQVO310. £3. Mains reversible motor, suit small beam. £4. Lamp and 2 matched photocells assembly. £2. High resistance phones Browns 'A'. £15. Army PTT microphone. £2. Wanted 603KHz crystal. Mann. Tel: Cambridge (0223) 860150

■ Microphones. Lapel mic. £1. Cassette mic with off/on switch. £1. Miniature mic. £1. Still trying to clear out shack to make way for lathe, so still tons of electronic gear to go. Mixed bags 100+ items. £2.50. New, large number of ICs and valves. Send sae for list. Large number of well-made three-tone buzzers, new, run on 9V to 12V on PCB 3in x 1¾in. Cost £6 each, sell 3 for £6. D Martin, 29, St John's Close, Leatherhead, Surrey.

■ Collectors' Hi-Fi items. Chapman tuner mono FM AM & SW with six inputs pre-amp. Mullard stereo 5-10 amplifier Partridge o/p transformers. Brenell 8in reel to reel tape deck (3 motors). Truvox 7in reel to reel tape deck (3 motors), with tape pre-amps for both decks. Acoustical Quad mono FM tuner. Two 5-10 Mullard amps. Power packs. Many early Mullard construction pamphlets. Two construction books for 5-10 amps. Many spare valves for above. Almost any offer accepted. D Stewart. Tel: St Keverne 280 269

■ Sony 5090 portable radio AIR FM LW MW SW BFO squelch, built-in PSU or batts, nice tone. Bargain £60. Yaesu FRDX400 160-10metres CB and 2metres all filters fitted FM etc. £90 ono. Sharp V22000 portable music centre, 12volt or mains. Too many facilities to list. £200. Cost £310. Contact: Peter, 53 Maple Road, Penge SE20.

■ Robot 400 SSTV converter with two extra W9NTP memories for either colour RGB or black and white SSTV pictures. Sensible moderate offers invited to: Thurlow G3WW. Tel: 0354 740255

■ Telequipment oscilloscope D52 twin beam. £99. Mullard valve data book. £5. Aircraft radio Tx/Rx type 9X2/50 Xtal control 108-140MHz Tx valves 44A/160M output QVO4-7 driver E491, CV136, CV138. Rx CV131, CV138, CV140, CV4015, CV136, CV133 12 switched freqs, some Xtals made by STC. Also STC SR14 instrument landing receivers localiser glidepath markers. Localiser freq 108/118MHz marker fixed 75MHz SR15B glidepath Rx freq 329.6-335MHz Xtaled. Well made, silver-plated chassis manual for SR14/15 control boxes complete less aircraft harness, must have cost £1,000s. Price £250. Also army Tx/Rx type BC625A Tx BC624C Rx. Valves Tx 6 SS7, 12 A6's 6 G66 VT198A CV788 driver and output. Valves Rx 12 A6, 12 AH7 GTs 12 S97s 12 C8, some Xtals, outer case shabby, internal good. £75. Wilson, Aken House, Prudhoe. Tel: Prudhoe (0661) 32087

■ Microwave modules MMC 435/600 70cm ATV converter, UHF output, brand new. £25. Marconiphone b/w TV set with Thorn 950 series chassis, needs attention, spares or repair. £5. York JCB861 mobile FM CB complete with aerial, SWR meter and books about CB. £30. Buyer collects or pay carriage. Tim Boorman GW1FBL. Tel: Swansea 0792 201565 (evenings)

■ Wolec legal radio mic, pocket transmitter, mains receiver 174.8MHz. £125. NRD NDH-515 24 channel memory unit with manual, almost new. £125. Racal diversity unit MA168B with manual. £45. Nombrex type 31 signal generator. 160KHz to 340MHz. £15. ISKRA unimer 3 multi-meter. £9. Decade attenuator AT201 0dB-111dB 600Ω audio. £12. Sparkrite SX2000 electronic ignition unit, almost new. £20. All plus carriage. Tel: 0704 840328

■ HRO Senior and M, few available. Hallicrafters S27, S20R, Sky Buddy. Wartime 1132 valve VHF receiver. Heathkit DX100U amateur band transmitter, mod for SSB – not a portable! A510 transmitter, receiver CW and phone, complete with key, handset, whip, ATU as used in Burma. A510 Rx only, mod for 240V WS19 no case. Various other bits, accessories, valves, 1930s cabinet radios etc. Sae for list or valves wanted. John Baker, 13 Burrard Road, London NW6 1AB. Tel: 01-794 0823

■ Triax RB20 omni directional 45-860MHz active aerial internal amplifier (22dB gain) with 240V ac PSU unused. £80. Mr G Hall, 8 The Glen, Oakland Road, Newton Abbot, Devon TQ12 4EB

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■ Barlow Wadley receiver 500KHz to 30MHz £60 plus postage. P R Shepherd, Tel: 01 467 2023

■ Walkie-Talkies. Pair, fit pocket, low power 49MHz. Ideal for antenna tests, etc, £12. Mains transformer output 3.5-40-0-40-3.5V 10A, £5. Another, output 14.5V twice 14g wire, C.T 18g, offers. Gardners 450-400-0-400-450. 180M/A. 0-4-5V 3A, 0-4-6.3V 3A twice 2-0-2V 2A twice, £8. Following manuals, books, Aiwa AR158, 159. NC-121 National, Advance B4, type 78, £2 plus. Alan, Tel: 01-445 4321 (Nth London)

■ Cobra 148 GTL DX excellent condition HI MID LO LOLO channels plus all legal FM. Switchable Roger bleep and K-tone can be combined. Variable power 0-15W. Also brand new Bremi BRL 210 200W mains linear amplifier in box. will sell £160 or preferably swop for 934MHz radio. Will not separate. Buyer collect if possible. Tel: Tony, 231-2899 after 5pm

■ Joystick antenna £12. R Marris, Tel: Slough 75780

■ Yaesu FRG-7 Rx complete with Amtech 200 ATU and 2m converter. All in excellent cond. Also Codar AT5 Tx 80/160m with power supply. Sell for £150 or swop for 2 metre transceiver. Tel: Jeff G6ZGU, Days 01-439-6512 or eves 01-803 5235. Not QTHr

■ AOR AR2001 scanning receiver. Brand new. Boxed with power supply unit £299.00. Also Sony TC399 reel to reel three speed tape recorder in excellent condition £130.00. Mr T Manning, 24 Croftdown Road, London NW5. Tel: 485 4251

■ HAC Dx Mk3 with condenser, phones, battery elimator. Not used or assembled. £40 ono. Must collect. Realistic Dx 200 receiver (re-aligned). £60 ono.. Collect. Edward Bartlett, 20 Broadlands Avenue, Enfield, Middx EN3 5AH

WANTED

■ First two volumes (to August 1983) of Radio and Electronics World. R H Alderson, Old School House, Tattersett, King's Lynn, Norfolk. Tel: East Rudham (048-522) 385

■ Service sheets or manual for GEC communications receiver, will copy or buy. Cat No BRT 402K. M Brown, 15 Hamilton Row, Waterhousies, Co Durham. DH7 9AU. Tel: Durham 0385 731585

■ Trio-Kenwood TS599D transmitter and matching S599 speaker for companion receiver. State price and condition. Will collect at own cost almost anywhere! Write with details. Richard, 50 Roper Lane, Queensbury, Bradford BD132DQ.

■ R1155 receiver with power supply unit, must be working and in good condition. Write or telephone price and particulars to Borthwick, Torwood, Lilliesleaf, Melrose, Rox. Tel: 08357 314

■ Gemscan 70 or Pro 2002 50 channel scanner or similar AM + FM all bands. Also 70cm Rx TV convertor G8RHU. Tel: 0273-516801 (Newhaven)

■ Atom wants: 8271 floppy disc controller chip, 40 column VDU, Atom books; any other information, write Steve Allen, 54 Warwick Ave, Whitleigh Plymouth PL5 4BE or phone 0752 776082

■ 13.8V regulated 4A psu to run a FT-290R. Tel: 0253 45431

■ Data on SL1600 scanner RX. Also data, plug-ins, spares for Telonic sweeper SM2000. Simple morse key, not services plastic. Tel: Ralph C Taylor, 0766 770637 during evening

■ Bi-pak S450 FM stereo push button tuner. Tel: Aldridge 51591

■ Breadboard, any type, but must be cheap. Send details (type, number of contacts, layout, if possible) and price. I will write back if I am interested. Andrew Richards, 14 Birtrick Drive, Meopham, Kent DA13 0LR

■ Can anyone supply me with information on sending modulated signals along 240V 'live' mains for control purposes. Any book references application notes etc greatly appreciated. M L Dickie, 4 Shaw Place, Saltcoats, Ayrshire, Scotland

■ Wanted urgently a grid dip oscillator. Tel: Brixham 51664 after midday

■ Cheap low band AM rig Cambridge, Motofone etc. Any condition considered. Tel: Roger G4IPE (not QTHr) 0507 601030 night, 0507 828002 day

■ Young man, recently paralysed due to RTA, would like a 2m TX/RX, or even just RX, but must be cheap as pennies are precious at the moment! Also any unfinished kits that you've lost interest in. Garry Hickman, 77A Hollingsworth Road, Lowestoft, Suffolk NR32 4AT

■ Very cheap TVs wanted B&W or colour with the idea to renovate and give away at cost. I'm partially invalided and know what some people go through. I'd like sets with some life left even hybrids (not GEC) anything considered even radios stereos etc. These sets will go through recommended social depts so no misuse can be applied. I only need small amounts at any one time as transport & storage could be a problem. All your kindness will not go unwelcomed & with thanks. Trevor Rawson, Tel: Sheffield 338577

■ An Icom-ICB 1050 CB transceiver. Will pay any price if it has 3 crystals and an integrated circuit Motorola chip with the number MC145106 on it. Ian Macadams, 9 Walpole Road, Boscombe, Bournemouth BH1 4HA.

■ Eimac or similar valve socket with built in grid by-pass capacitor for 4CX250B valve. Would buy or have number of good radio etc exchanges. Mr J P Hupfield, 47 Leeward Road, West Worthing, Sussex. Tel: Worthing 66329

■ Radio Constructor 1947-1969. Practical Wireless 1930s. 1960 blueprint tutor citizen shortwave two. Good price paid. John Savage, 7 Weyhill Close Pk, North Swindon, Wilts

■ VLF converter: broadband VHF preamp. Old Marconi Marine 'Atalanta' Receiver 2207C. Any condition. Any old marine receivers considered. H G Woodhouse, 'Trenoweth', Porthrean, St Austell, Cornwall PL26 6AU. Tel: (0726) 3608

■ Info wanted on old valved oscilloscope made by Sontranic Ltd Edgware Model 2300. Also has name plate Crosfield London. Ron Wood, 130 East Lane, West Horsley, Surrey Tel: East Horsley 2185

■ Wanted: Heathkit RA-1 receivers. R Marris, 35, 35 Kingswood House, Farnham House, Slough

■ HQ1 mini beam in working order. Will collect (QTHR as G8UQN). Tel: John, G4XJS, St Albans (0727) 62052

■ IC740 workshop manual (not instruction manual), info, mods etc; either very careful short loan at your terms, or buy. Also require info RI937. Tel: 07292 2406

■ Oscilloscope tube, new or s/h for Telequipment scope type D83. Complete main frame considered. G Jackson, 17 Newnham Close Hartford, Huntingdon, Cambs. Tel: 0480 50865

■ Six green, rotary control knobs (dual ganged type) for Ferrograph 632 open reel stereo tape deck (owner restoring to original spec) so new parts only please. Mullard (boxed) valves 4 x ECL86, 3 x ECC807, blue PU adaptor for 'Rogers' Cadet III, HG88 amplifier. Mr J Townsend, 89 High Street, Barry, South Wales CF6 8DY

■ Racal RA 17L, must be in good condition. Price and particulars to: Wegg, 23 Kerdane, Orchard Park Estate, Hull HV6 9EB. Tel: 855052

■ Early valves for collection, restoration Clandestine 'Spy-Set' receivers, transmitters. B-2 'Major' 'Minor', BP5, AP4 etc. MCRI and similar receivers. Early National SW receivers and 1930s, or earlier, amateur radio equipment, magazines, trade catalogues, valve data manuals etc. Rider's manuals 1, 2 and 3 or similar. Interesting, compact, unusual military communications sets and WWI military sets, units. John Baker. Tel: 01-794 0823

■ Please help, urgently needed. HT aud AVC cable form. Imcis connecting cable and RF output cable for connecting Racal RA137A to Racal RA117E. Also for RA117E I need black bakelite facial plate, and film scale (frequency read-out), and the following capacitors: C197 100μF 50V electrolytic, C196 0.5μF paper 150V 20% C217A 0.01μF 750V silver ceramic 20%. Robin Filby. Tel: 0262 602278

■ Metal rectifiers, old type, 12V 4-6amp. Allen, 82 Heworth Green, York YO3 7TQ

■ Blue PU adaptor (for Rogers Cadet MkIII amplifier). Rogers Master II (stereo control unit, pre-amp). Rogers Master amplifier (17 x 17) WPC (cw manual) Ferrograph 8¼in spoke type clip-on tape reels, in good condition. Valves (boxed) 4 x ECL86, 3 x ECC807. Rogers Cadet III (teak finish) speakers (pair wanted). Mr James Townsend, 89 High Street, Barry, South Wales CF6 8DY

■ CB gear wanted, antennas, plugs, leads, SWR meters, power supplies, rigs. So if you want to clear it out, let me know. Write: D Martin, 29 St John's Close, Leatherhead, Surrey.

■ Help! Has anyone out there got a two metre rig I can buy, that's not too expensive? Or I would be prepared to exchange my photographic equipment, which is: Prinzflex SLR camera F1.7 55mm lens; metal vertical focal plane shutter; speeds 1sec to 1/1000th sec; through lens metering; with case. Meyer 135mm F2.8 telephoto lens. Miranda computer flash, plus various bits, realistic value about £70+. All good working order – WHY? Brian (G1ESG). Tel: 0274 727734

■ German WW2 equipment, technical manuals, parts etc. For collection. Will collect in UK. Also wanted WS 53 and WS 68 radar AI9 for Mosquito. Amplifier for WS12 – high power version. Radio S7N No 8 and No 1 needed by DEF museum. R Otterstad (LA5HE), Box 73, Ljan, Oslo 11, Norway.

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Nov 84	13 Sep 84	19 Sep 84	21 Sep 84	11 Oct 84
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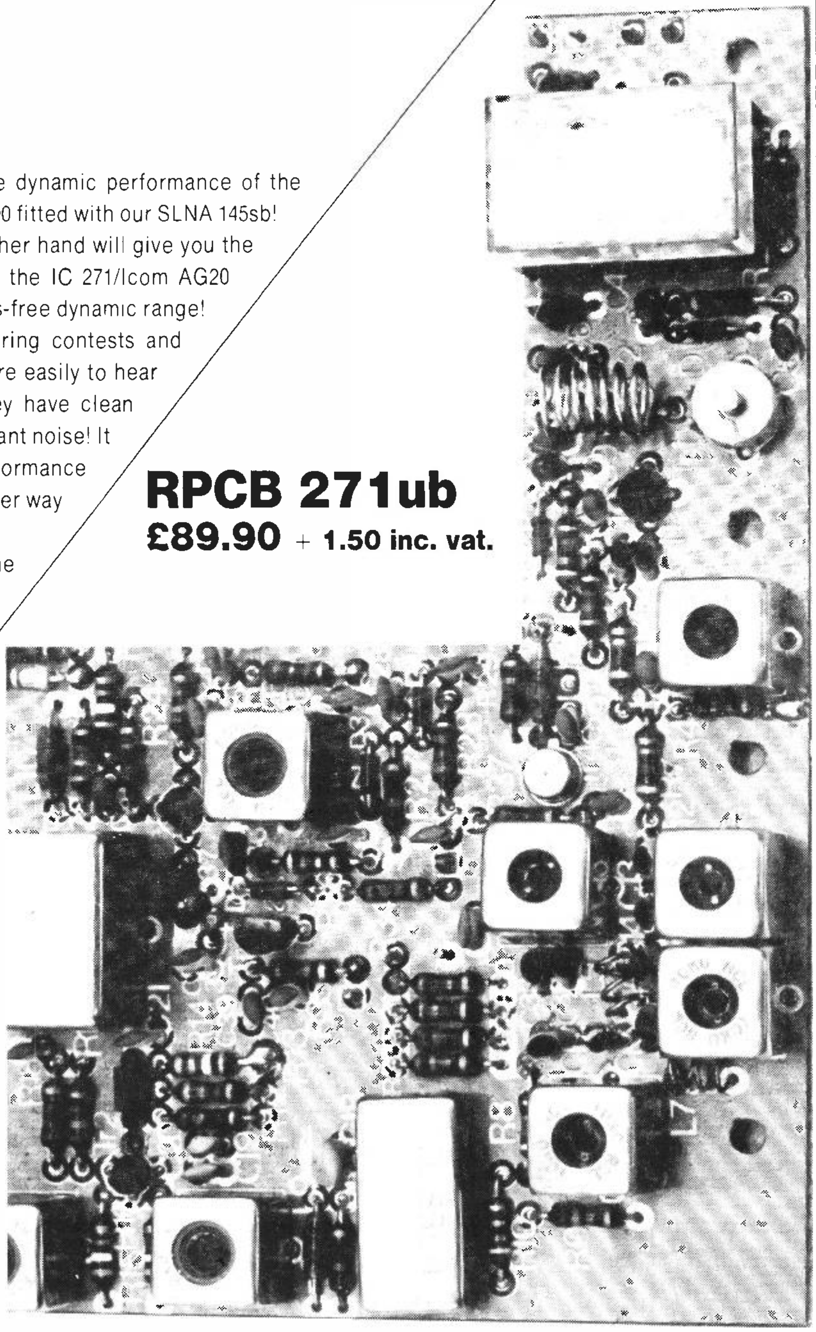

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