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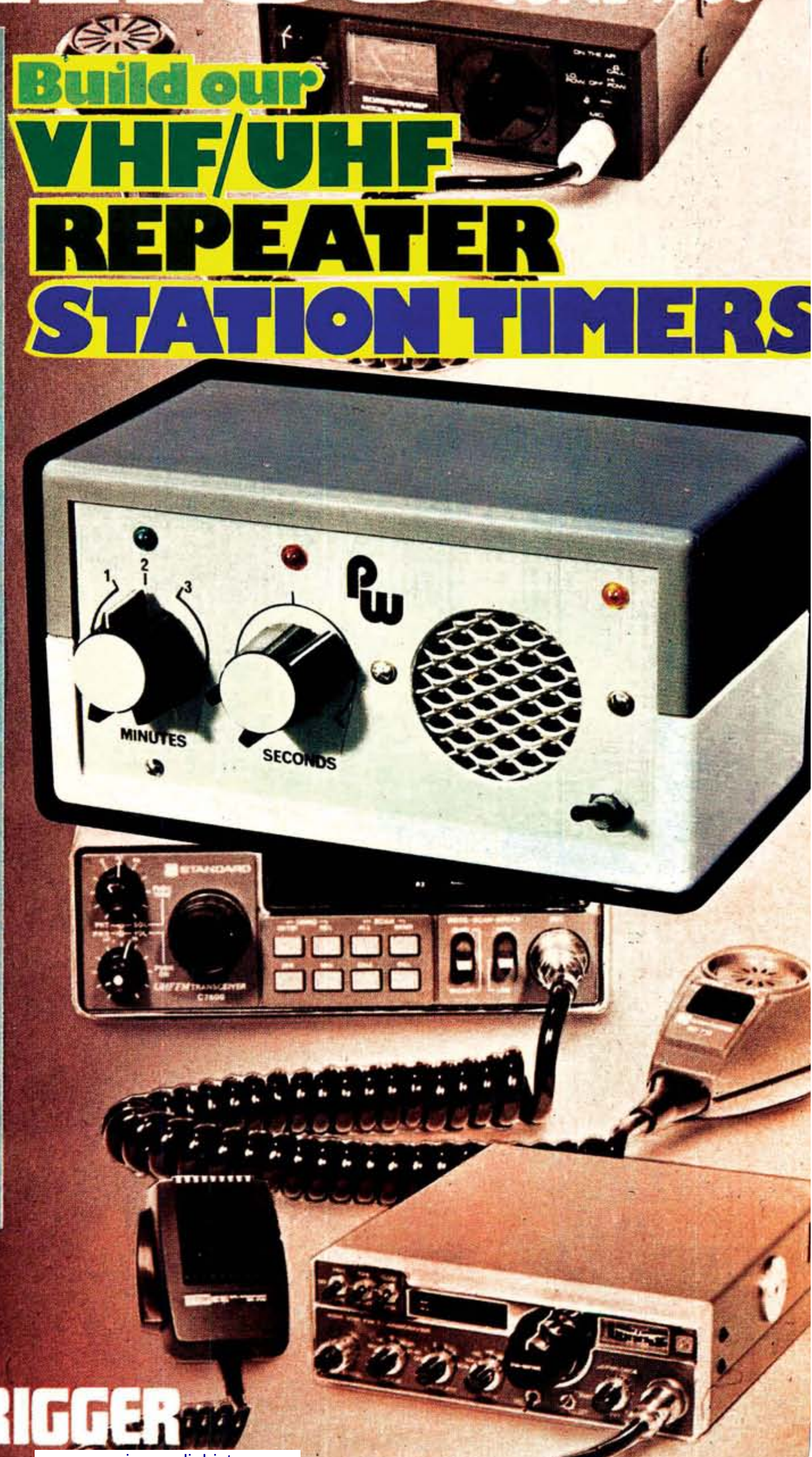

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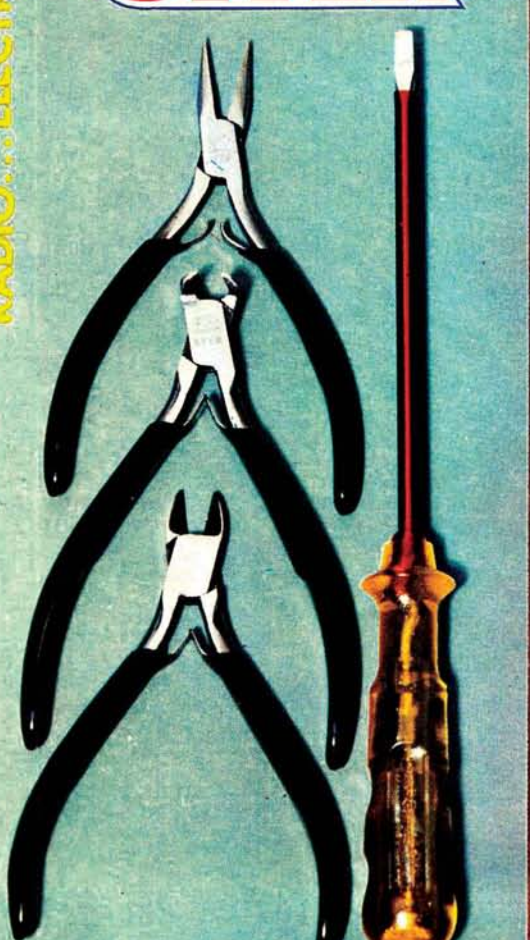

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JUNE 1980
VOLUME 56
NUMBER 6
ISSUE 880

BRITAINS LEADING JOURNAL FOR THE RADIO & ELECTRONIC CONSTRUCTOR

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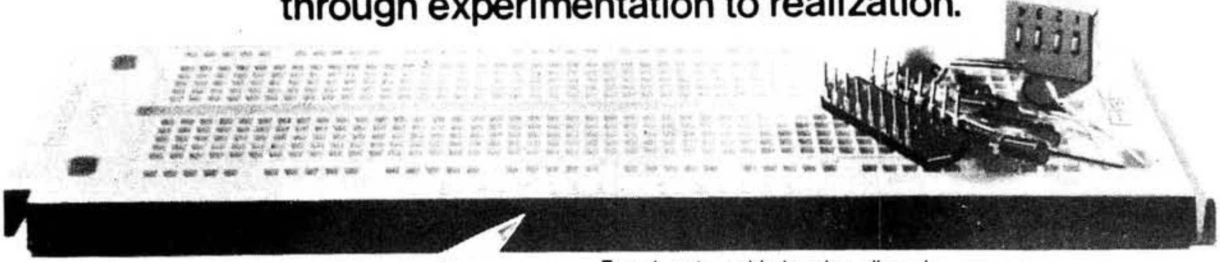

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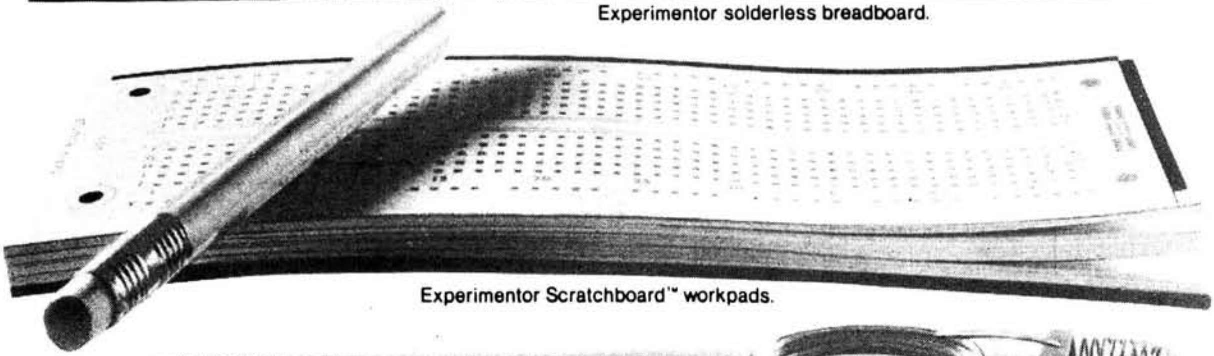

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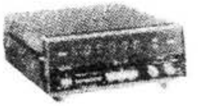

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CA3052	£1.84	LH381	£1.67	NE566	£1.73	72741	£0.28	TBA810S	£0.85		
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3143	10MFD	35V	£0.25
3144	22MFD	16V	£0.25
3156	33MFD	35V	£0.13

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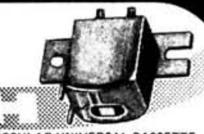

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3	.15	.10
4	.15	.10
5 (180°)	.15	.10
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TEXAS DIL

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28 PIN	.32
40 PIN	.47

T099
10 PIN

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BC108	.10
BC109 & C	.10
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BC157	.09
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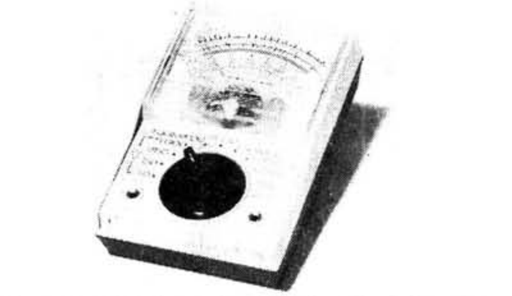

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- AC VOLTAGE: 0-10, 50, 250, 1000 volts 2000 ohms/volt
- DECIBEL: – 10 to + 22dB
- DC CURRENT: 0-100mA
- OHMMETER: 0-1 0 kilohms, 0-1 megohms, 60 ohms centre scale
- POWER SUPPLY: One 1.5V size "AA" cell ohmeter
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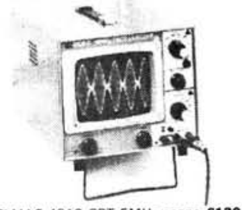

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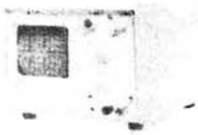

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The RAE

AT THE TIME that the leader article on the Radio Amateurs' Examination was being written for our April issue, I was, like many other radio enthusiasts around the UK, waiting eagerly for the results of the December RAE. I held an Amateur Licence early in the 1950s, but had let it lapse because my job then made it impossible to operate for more than a few weeks each year, and it seemed pointless to go on paying the annual fee.

When I decided to take up the hobby once more last year, I found that the regulations demanded that I take the RAE and the Post Office Morse Test, even though I had spent the intervening years working in radio and electronics, with ten of those years as a professional c.w. and 'phone operator. It all seemed a bit silly, but luckily I'm not one of those who find examinations worrying, so I just accepted it as a rule necessary to cater for the circumstances of the majority. In the event, I passed the RAE and Morse Test without much difficulty, and have got my old callsign back again, so at least my criticism of the examination papers cannot be dismissed as just sour grapes!

It is in some ways natural that letters received from readers commenting on the April leader should be mainly from "old hands" wishing to enter or re-enter the amateur field (some of their letters appear elsewhere in this issue). However, eavesdropping on other candidates discussing the December papers after the exam at the London centre (congratulations to the RSGB, incidentally, for organising things there so efficiently), I was struck by the fact that though many of them were young, and obviously fairly new to amateur radio, they mostly seemed to have found problems with the same questions as I had.

The fact that the City and Guilds of London Institute will not release past papers for the multiple-choice RAE, makes it difficult for us to give them the facility for reply to our criticisms which they obviously deserve, though they have in fact declined to comment on our April leader. Unfortunately, most of the comments in their letters to us would make little sense to our readers without details of the questions to which they refer. Of the observations which we made, they have accepted one, promised to consider two further, and rejected eight.

The CGLI comments which we find most disturbing are:

". . . it is important when considering questions on possibly contentious issues, to remember that this syllabus requires only an elementary knowledge of radiocommunication, as is made clear in the examination objectives, and that one should not infer more from the questions than is intended and expressed."

". . . analysis of the examination has shown that all the questions mentioned by you have performed satisfactorily both as regards discrimination and facility value. There is no evidence that the candidates found the questions misleading or ambiguous and there was no tendency to avoid any of them. The syllabus does only call for an elementary knowledge of radiocommunications and these items appear ambiguous only when the subject matter is taken to greater depth than required by the examination."

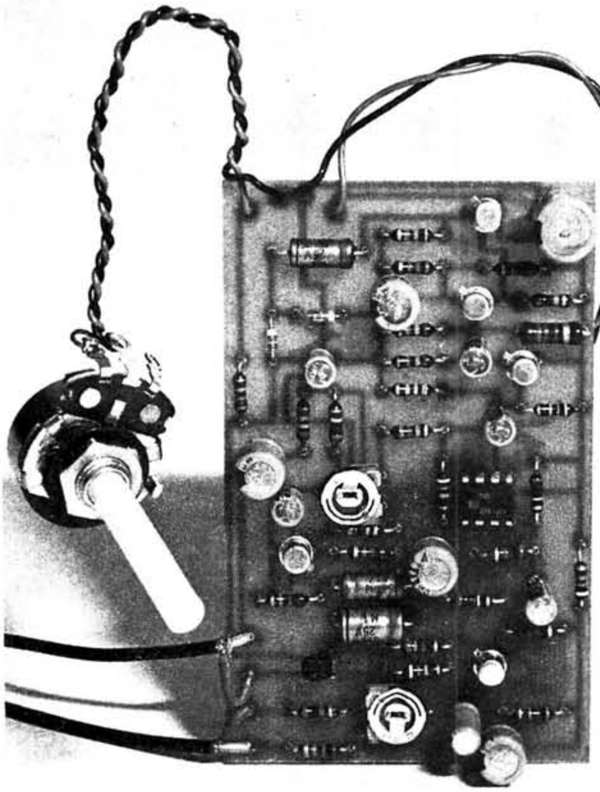
So far as I am aware, all the City and Guilds examinations apart from the RAE are related to craft or technical occupations, in which a candidate is likely to progress through the appropriate exams as his or her career develops. The RAE is unique in that, as a hobby-related exam, it can be taken by a schoolboy, or by a professional engineer who has spent a life-time in h.f. radiocommunications. Indeed, neither can enter amateur radio without passing it. In many parts of radio and electronics engineering, simplified models of components, devices and circuits are used to introduce the student to their behaviour, and these models are developed, expanded, and sometimes superseded, as a topic is later considered in greater depth. Hence, a Chartered Engineer will look at things in a different way from a technician, though the simple model can, on occasions, be just as useful to either.

It should not be impossible to devise questions within the RAE syllabus which have the same answer regardless of whether you use the simple model or the advanced treatment. If City and Guilds, with all the experience which is surely available from the various bodies who have run multiple-choice examinations successfully over several years, are unable to devise questions which will be unambiguous regardless of a candidate's background, then perhaps responsibility for the examinations should be transferred to some other authority.

Geoff Arnold

AUDIO LIMITER

M. MAURICE



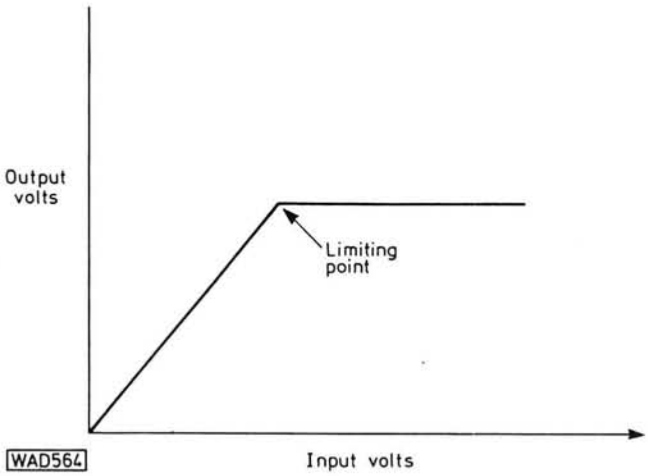


Fig. 1: Ideal limiting characteristic

Any audio limiter is, in essence, an electronic device which accepts an a.f. signal at its input and ensures that the voltage of the same signal at the output does not exceed a previously selected value. Well-designed and working correctly it should have no other effect whatsoever.

It is best regarded perhaps as an interface between the audio source and a subsequent stage which processes the signal in some way. It can guard against the overloading of an amplifier (avoiding distortion, damage to speaker cones, etc.), or of a modulator (preventing overmodulation and spurious emissions) or of any other audio device which requires an input guaranteed not to exceed a certain "threshold" voltage.

The ideal limiter therefore has unity gain up to the threshold point (see Fig. 1) beyond which it becomes an automatic attenuator (or, if you prefer, an amplifier with negative gain!). It introduces a loss which matches, dB for dB, any further increase in input signal amplitude; the output remains constant with its wave shape identical to that of the input.

This article describes an effective and reasonably low-cost way of realising the idea.

Circuit

Fig. 2 shows the block diagram of the limiter. The three most significant parts are a voltage-controlled amplifier (v.c.a.), an electronic switch and a rectifier circuit.

Taking these three basic "blocks" in turn, let us consider the operation of the v.c.a. first. Fig. 3(a)–(d) shows how the classic common-emitter amplifier is modified by the addition of a capacitor (C_e) across R_e (Fig. 3(b)) which increases its gain from R_c divided by R_e to

$$\frac{h_{FE} \times R_c}{h_{IE}}$$

where h_{FE} and h_{IE} are the parameters of the transistor. If a variable resistor is placed in series with C_e as in Fig. 3(c), the gain becomes R_c divided by the combined parallel resistance of R_e and VR1 and therefore becomes dependent on the setting of VR1. In order to control the stage gain by means of a d.c. voltage (Fig. 3(d)) VR1 is replaced by an f.e.t. which acts in the same role—the drain-source resistance increases in proportion to the voltage applied to its gate.

Referring now to the main circuit diagram (Fig. 4), it is Tr1 that is the voltage-controlled stage with Tr2 as the f.e.t. playing the part of the variable resistor in series with

C4 (the "C_e" of Fig. 3). The signal is now passed through amplifier IC1 which has an approximate gain of 47—thence to the output stage (Tr3) and also to the switching circuit (Tr5/Tr6) via Tr4, which is a buffer amplifier.

The switch, consisting of Tr5, Tr6 and their associated components, looks like an ordinary amplifier until it is realised that Tr5 is biased hard "off". It will not turn "on" until +2·6V is applied to its base—when this voltage is present it turns on very rapidly and becomes a high-gain amplifier buffered by Tr6.

The output from Tr6 is now rectified by D1/D2 and becomes the required negative d.c. control voltage; it is proportional to the input to Tr5 but is, as pointed out previously, only present when the "threshold" of +2·6V at the base of Tr5 is being exceeded.

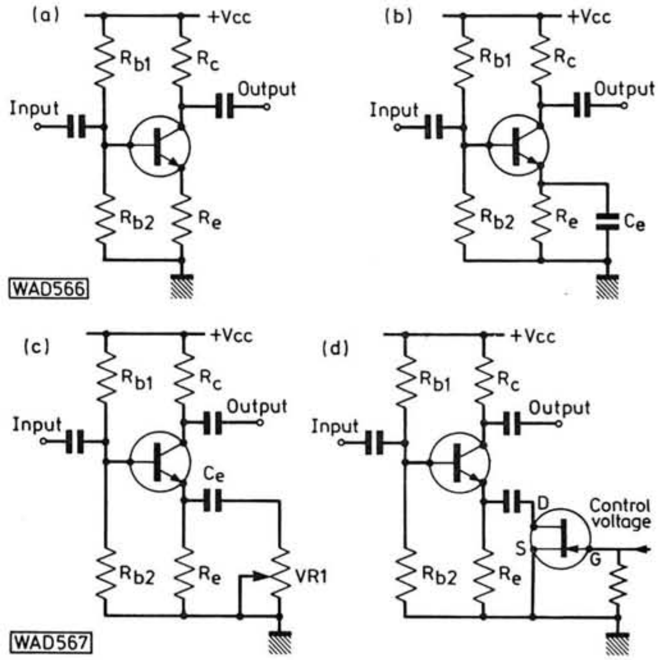


Fig. 3: Development of a voltage-controlled amplifier (d) from the basic common-emitter amplifier circuit (a)

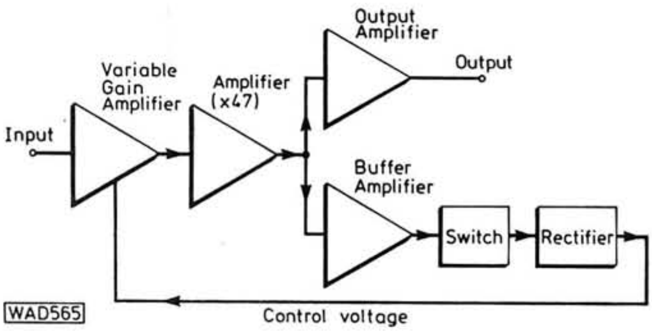


Fig. 2: Limiter block diagram

This control voltage is smoothed by C14 and loaded by R27 and VR3, a variable resistor which enables the user to set the "decay time". This is the time taken by the limiter to return to unity gain after an instantaneous peak of audio in excess of the threshold has subsided; the time taken, in fact, for C14 to discharge via R27 and VR3. The "attack time" (the time which elapses before the circuit responds to an instantaneous peak) can be defined as the product of the output impedance of switch Tr5/Tr6 and the value of C14. The Z_{out} of the switch, and therefore the attack time, is small because Tr6 is used in the common-emitter configuration.

To reduce distortion, negative feedback is introduced to the v.c.a. via R15 and C8.

Setting Up

The designed threshold level of the prototype limiter was 0·775V into 600Ω (0dBm); the "production" version described in this article is, however, a high-impedance development (around 50kΩ) of the original.

For accurate setting-up to an absolute level, an a.f. signal generator and voltmeter are required. Set the generator to the desired threshold voltage and, having connected it to the limiter input, observe the voltage across C14. Now adjust VR1 until the meter deflects, "back off" slightly and then set VR2 so that the output has the same amplitude as the input signal. If instability should result, an increase in the value of R15 should effect a cure.

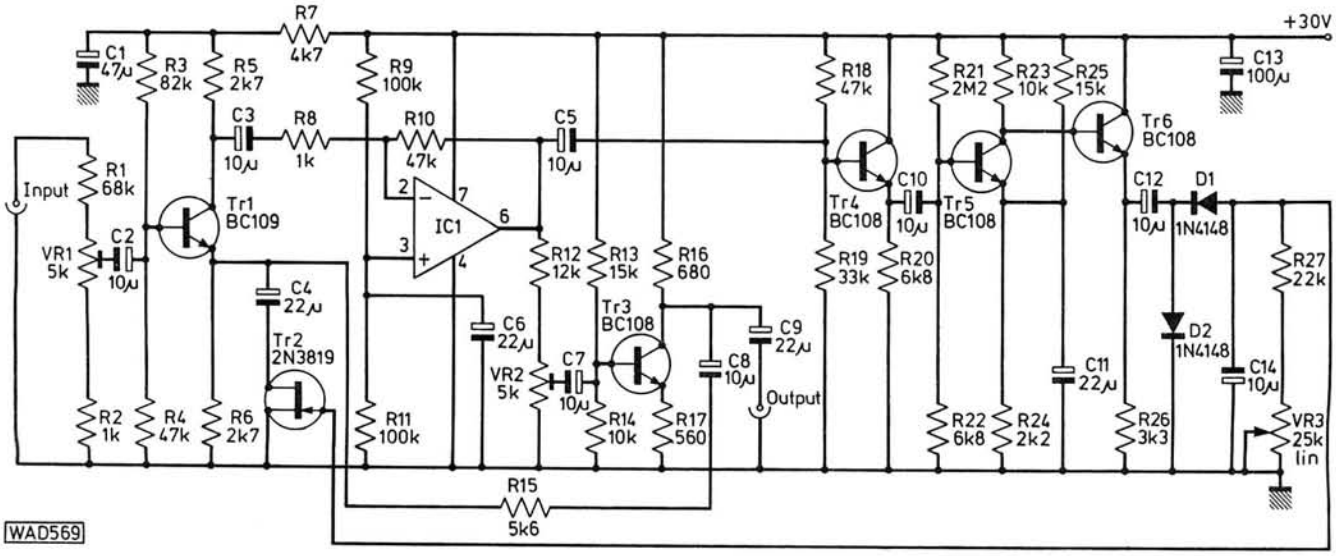


Fig. 4: Limiter circuit diagram

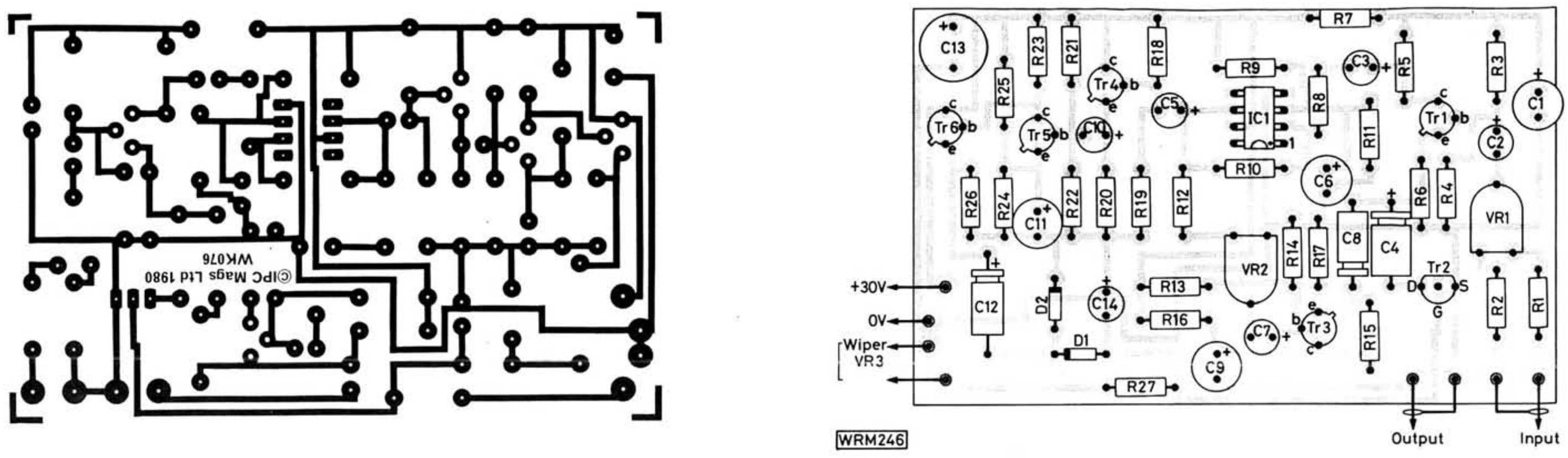


Fig. 5: Copper pattern and component layout for the audio limiter printed circuit board (full size)

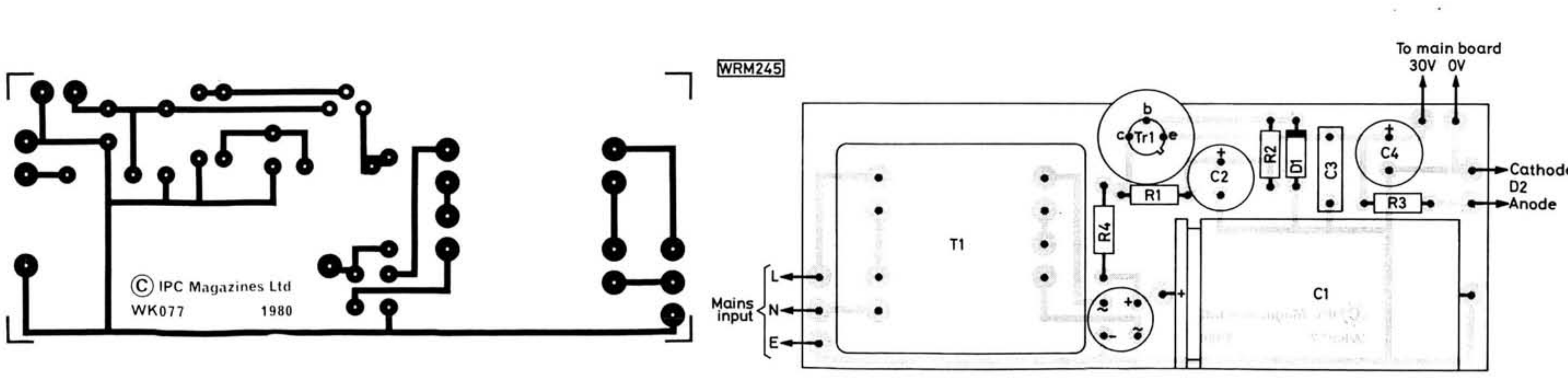


Fig. 6: Copper pattern and component layout for the power supply circuit shown in Fig. 8

AUDIO LIMITER

Resistors

¼W 5% carbon

560Ω	1	R17
680Ω	1	R16
1kΩ	2	R2,8
2·2kΩ	1	R24
2·7kΩ	2	R5,6
3·3kΩ	1	R26
4·7kΩ	1	R7
5·6kΩ	1	R15
6·8kΩ	2	R20,22
10kΩ	2	R14,23
12kΩ	1	R12
15kΩ	2	R13,25
22kΩ	1	R27
33kΩ	1	R19
47kΩ	3	R4,10,18
68kΩ	1	R1
82kΩ	1	R3
100kΩ	2	R9,11

½W 10% carbon

2·2MΩ	1	R21

Capacitors

50V electrolytic, p.c.b. mounting

10μF	6	C2,3,5,7,10,14
22μF	3	C6,9,11
47μF	1	C1
100μF	1	C13

25V electrolytic, double-ended

10μF	2	C8,12
22μF	1	C4

Potentiometers

Min. horizontal-mounting skeleton preset

4·7kΩ	2	VR1,2

Midget, linear track, 0·5W

25kΩ	1	VR3

Semiconductors

Diodes

1N4148	2	D1,2

Transistors

BC108	4	Tr3,4,5,6
BC109	1	Tr1
2N3819	1	Tr2

Integrated circuit

μA741C	1	IC1

Miscellaneous

Miniature single-core screened cable; printed circuit board; knob to suit VR3; equipment wire; fixings, sockets, etc., to suit individual requirements.

POWER SUPPLY

Resistors

¼W 5% carbon

680Ω	1	R1
820Ω	1	R2
4·7kΩ	1	R3

2·5W 5% wirewound

33Ω	1	R4

Capacitors

Min. polyester

0·1μF	1	C3

63V electrolytic

100μF	2	C2,4 (p.c.b. type)
1000μF	1	C1 (double-ended)

Semiconductors

Diodes

BZX61C30V	1	D1
Red l.e.d.	1	D2

Transistor

BFY50	1	Tr1

Bridge rectifier

100V 1A	1	BR1

Miscellaneous

Printed circuit board; 3VA 15-0-15V transformer, p.c.b. mounting (RS Type 207-841 or similar); heat shunt for Tr1 (case style TO39); equipment wire; 3-core mains cable, fixings, etc., to suit individual requirements.

Construction

Many constructors will undoubtedly wish to build the limiter into an existing piece of equipment—provided that a d.c. supply of approximately 30V is available, the existing power supply can be used. *Do not exceed 35V or damage to IC1 may occur.*

Because the device is a basic "building block" which can be used in a myriad of applications, the inclusion of details of a case, sockets, etc., is largely pointless—this is also the reason why the p.s.u. has not been built onto the main p.c.b. For those that do wish to build the limiter into a standard box with input and output sockets, Fig. 8 shows the circuit for a suitable power supply; the p.c.b. details for it are shown in Fig. 6.

For stereo use, two limiters can obviously be employed so that the input to each channel of the main amplifier unit is limited independently of the other—but as this might lead to some rather odd or inconvenient effects with, for example, bassy beat music you may prefer to arrange matters so that both limiters share the same control voltage. Figure 7 shows a way of doing this, but an "overload" on one channel will naturally affect the gain of the other.

So it is very much a case of swings and roundabouts and the constructor will have to determine the method which best suits his purpose and taste!

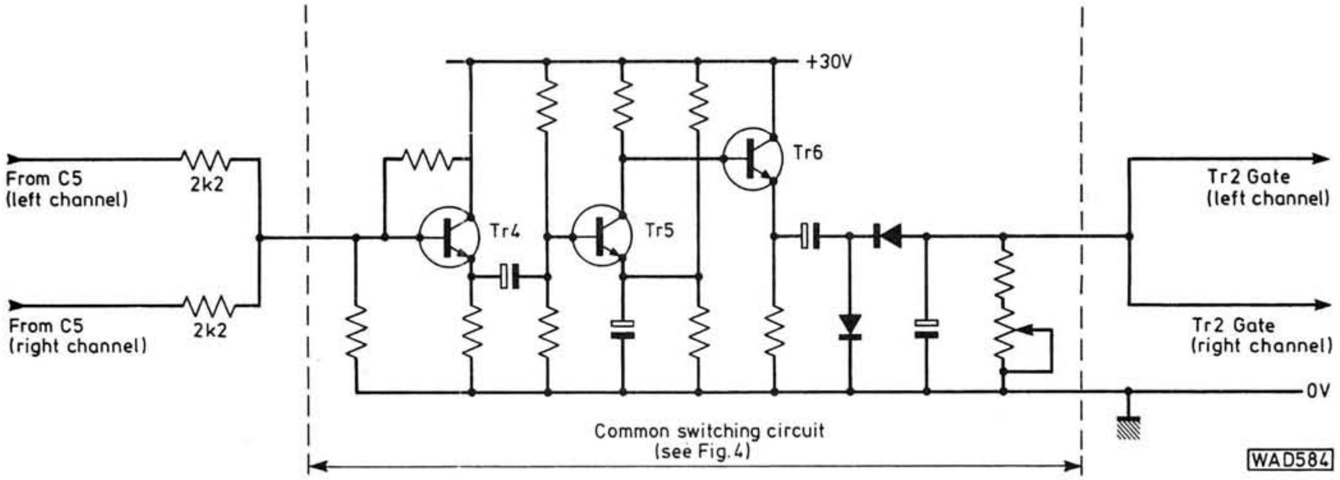


Fig. 7: A suggested method for enabling two limiters to share a common control voltage (stereo applications)

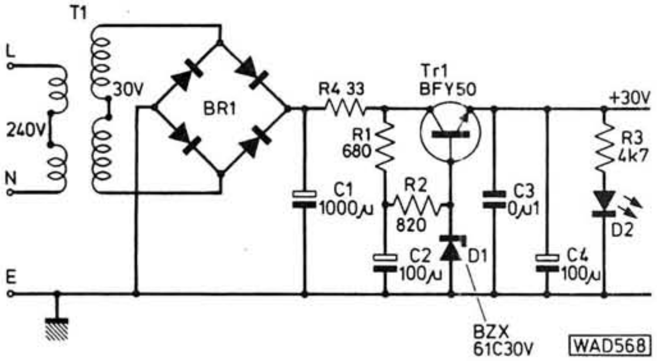


Fig. 8: Circuit for a 30V stabilised power supply

On Test

When tested in the *PW* workshop, the limiter drew approximately 40mA from a 30V supply. When a frequency of 1kHz was applied, the circuit was found to limit very successfully for input voltages between 400mV and 1·2V p-p. The 6dB bandwidth was measured as being from 17Hz–20kHz. ●

NEWS... NEWS... NEWS...

Club News

Steve Boler G8VEF, is now the secretary of the Derwent Valley Amateur Radio Society which meets on the first Monday of the month in Chatsworth Hall which is part of Matlock College of Further Education. All newcomers are welcome.

Steve can be contacted on: *Chesterfield (0264) 39204 (home) or Matlock (0629) 2430/2817 (work).*

The North Devon Radio Club meets twice a month, on the second Wednesday of the month at 7.45pm, the venue is Pilton Community College, Chaddiford Lane, Barnstable. At 7.30pm on the fourth Wednesday of the month the venue changes to Bideford School and Community College, Abbotsham Road, Bideford. Further details from: *The Secretary, H. G. Hughes G4CG, "Crinnis", High Wall, Sticklepath, Barnstable EX3 12DP.*

The Lagan Valley Amateur Radio Society GI4GTY, meet on the second Monday of every month and always includes a film or an interesting talk. Meetings are held at the Scout Hall, Dromore and visitors or prospective new members are always welcome. Further details from: *The Secretary, R. McClurg, 4 Alfred Terrace, Dollingstown, Craigavon, Co. Armagh, Northern Ireland. Tel: Lurgan (076 22) 3173.*

CB News

As recently reported in the national press, the Greater London Council and the Society of Motor Manufacturers have added their support to the campaign to legalise Citizens' Band Radio.

We have received letters from two groups supporting the campaign. First, the Harrow and Wembley Citizens' Band Group, whose members come from all over NW London. The group is strictly a non-user group and was started in September 1979, by two people who saw the need for local groups to assist in promoting the national campaign to legalise CB.

The group meet at 7.30pm on the first and third Monday of the month at the Queens Arms, High Street, Wealdstone, Middlesex. All interested parties are welcome. Further details from: *The Membership Secretary, Bill Ridgeway, 7 Sandringham Crescent, Harrow HA2 9BW. Tel: 01-422 7570.*

Second, a group who produce a monthly magazine/newsletter called "Bandstand" whose readers include, Councillors Theo Yard, Chairman of the recently formed Steering Committee and Richard Town, Technical Adviser to the All Party Group of MPs, and Patrick Wall MP, the Chairman of that group, also about 400 other people up and down the country.

An annual subscription to "Bandstand" costs £3.60 (12 editions) or 3 IRCs for overseas readers. Anyone writing to "Bandstand" will be sent some "Bumper Stickers" so long as an s.a.e. is enclosed. Further details from: *The Editor, Mike Evans, BM Bandstand, London WC1V 6XX.*

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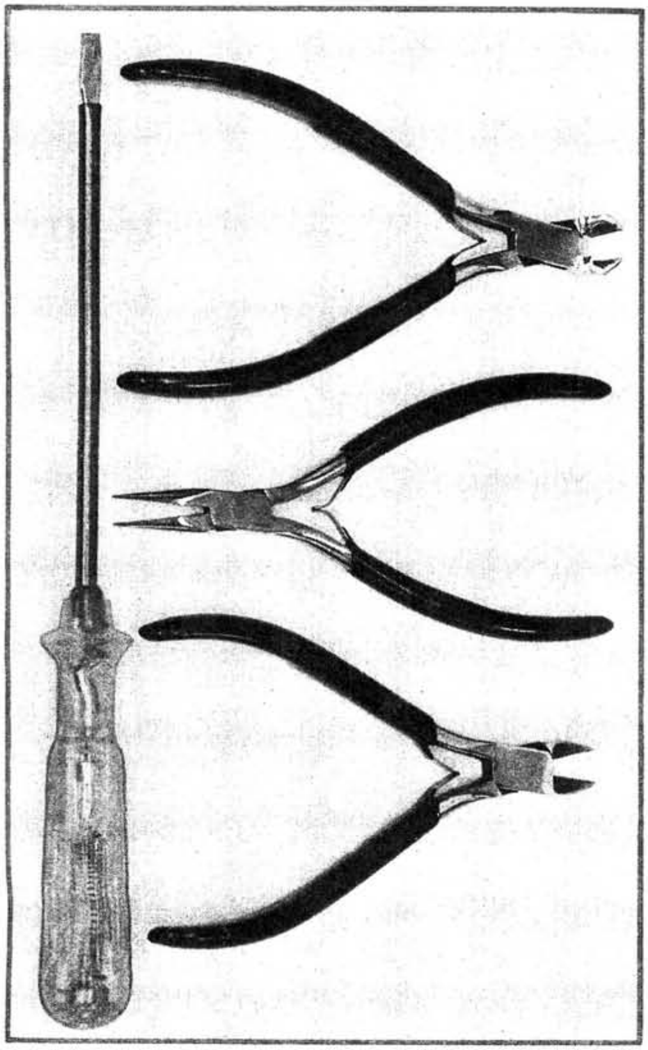

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Recently introduced into the UK by Wintjoy Ltd., is the K40 speech processor microphone.

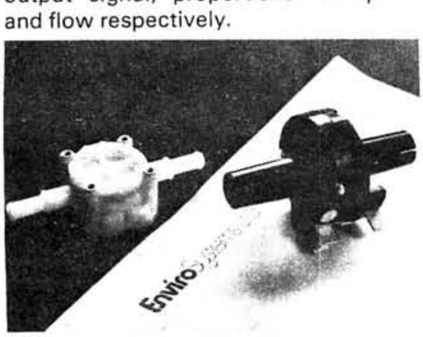
The K40, manufactured in the USA possesses full speech processing circuitry which provides a functional range of up to 50cm. Other features include a frequency response switch for selecting a high-pitched transmission for increasing readability in city traffic noise or a mellow bass for quieter rural conditions; inbuilt noise cancelling to blank-out background noise whilst transmitting; a novel power storage facility that charges in the listening mode and should provide sufficient power for your "over" when the p.t.t. switch is operated, thus eliminating the need for replaceable internal batteries, also moulded-in magnets enable the microphone to be clamped to any steel surface.

Costing in the region of £40, the K40 is available from: *Wintjoy Ltd., 103 High Street, Shepperton, Middlesex. Tel: Walton-on-Thames (09322) 48145.*

Digital Transducers

Fuel conservation and car electronics are areas of considerable interest, but projects dealing with these subjects have been seriously affected by either high cost or unavailability of a reliable set of digital speed and fuel flow sensors.

Now a set of realistically priced sensors are available, they are manufactured from high quality engineering plastics and produce a 5V square-wave output signal, proportional to speed and flow respectively.



The flow sensor, independent of flow direction, gives a linear output in the range 0·3–22g/hr (1·0–100 litres/hr) and can be used for liquids with a viscosity in the range of 1–10cST. The sensor connects to hoses with internal diameters between 4 and 8mm and is supplied complete with 2m of coaxial cable.

The opto-electronic speed sensor can be fitted to all standard speedocables with inner core diameters up to 3·2mm and is unique in that it is independent of speedocable fittings. Speed sensors for 4mm inner cores can be supplied on request. The sensor gives an output of 10 pulses per revolution and revs/mile figures are available for most vehicles.

These sensors are obtainable ex-stock at £12.65 (flow sensor) and £9.95 (speed sensor), both prices include VAT and P&P from: *Envirosystems Ltd., Hampsfell Road, Grange-over-Sands, Cumbria LA11 6BE. Tel: (044 84) 4233.*

Useful Tool

Generations of skinned knuckles and encyclopaedia of bad language are testimonies to the fortune to be made by the company which produces a reliable, one-handed ratchet screwdriver small enough to get into awkward corners.

A Sheffield firm believe they have done it. It is the Steadfast Screwmaster, a well-designed ratchet screwdriver with the popular $\frac{5}{16}$ in point on a $\frac{1}{4}$in square shank, mounted in a virtually indestructible handle—and the whole thing is just $3\frac{1}{2}$ inches long.

The secret of the Screwmaster is the ratchet mechanism, a miniaturised adaption of a well-established clutch principle, encapsulated in an immensely strong cellulose acetate handle. The blade is in chrome vanadium EN47, and the whole screwdriver has the "right feel" about it in the hand.

The ratchet system utilises roller bearings, which are allowed to freewheel or jam between flat surfaces on the blade and the outer casing. This provides drive and freewheel, full lock and unscrew and freewheel positions.

As long as the blade has the resistance of a screw slot to hold it, the three positions—marked "Forward", "Neutral" and "Reverse" on a rotating sleeve where handle meets shaft—can be selected at the touch of a finger of the hand grasping the handle. The makers claim that greater torque can be applied with this type of screwdriver than any other.

The Screwmaster is included in the Steadfast top "A" range of quality and the company proposes to introduce lighter and heavier types with round, square and hexagonal shanks.

Priced at £2.25, the Screwmaster is available through normal retail outlets.

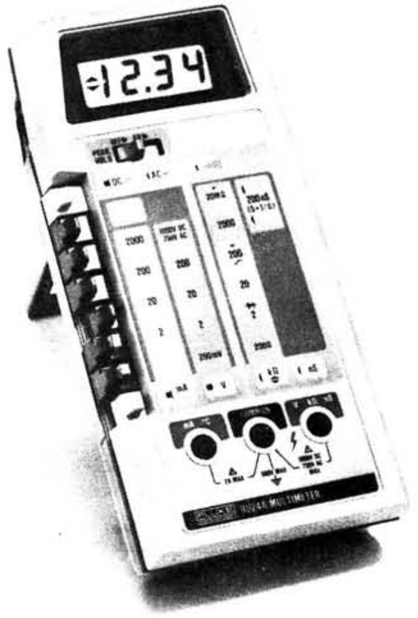
J. Stead & Co. Ltd., Greenland Road, Sheffield S9 5BW.

Please Note!

The MGC7 digital display for the FRG7, mentioned in May 1980, should have been priced £57.00 inclusive of VAT and P&P.

PRODUCTION LINES

alan martin



Updated d.m.m.

The latest d.m.m. to join Fluke's wide range is a low cost yet sophisticated $3\frac{1}{2}$ digit handheld d.m.m. ideally suited for test and service applications. Fluke claim it is the first handheld d.m.m. to offer logic level detection, direct temperature readout, a peak-hold facility and intermittent short-circuit detection in addition to a full d.m.m. capability. Cost of the instrument is £135 plus VAT.

The 8024A has all the same ranges, functions and features, including Fluke's unique conductance function as the 8020A handheld model on which it is based. Among the many new features on the 8024A are direct temperature measuring capability from −100° to 1625°C with any K type thermocouple, a peak-hold facility to store and display and a.c. or d.c. voltage or current peak, fast audible continuity checking and t.t.l. logic state indication by visual or audible signal.

The peak-hold facility opens up many interesting applications such as transient detection for example in motor or lamp starting.

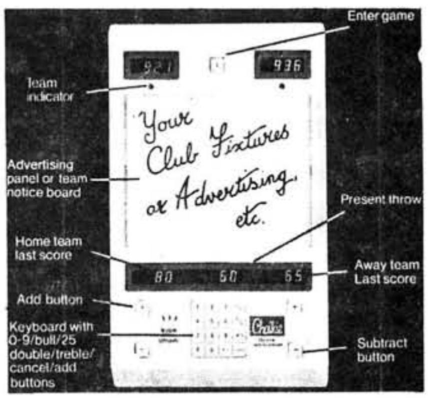
In logic circuits, the 8024A gives an instant visual or audible indication of t.t.l. logic high or low. Fast response means it can also detect pulses or pulse trains up to 100kHz. On low frequencies, the tone even warbles to give an indication of frequency level.

A fast 50µs settling time means that the 8024A is ideal for continuity testing and intermittent fault detection. Fluke claim it is practically impossible to beat its high speed response even by running the leads very quickly down, say, a p.c.b. edge connector. Continuity is positively indicated by an arrow pointing up or down or by a 100ms 2kHz bleep.

The 8024A d.m.m. provides a clear $3\frac{1}{2}$ digit readout and a basic d.c. accuracy of 0·1%. Temperature accuracy is $3° \pm 1$ digit from −20 to +300°C and the instrument is specified for a full one year. A full range of accessories are available.

For more details contact: *Fluke International Corporation, Colonial Way, Watford, Herts. WD2 4TT. Tel: (0923) 40511.*

Who Hates Chalking?



Most darts players—if they think like me—find the task of "chalking" a hassle, to say the least. What with your clothes decorated with chalk dust or fingers indelibly stained with ink from felt tip pens and handling that usually slimy wiping-off cloth.

Now "Chalkie" the electronic darts scoreboard, rockets darts into the era of the silicon chip. "Chalkie" is basically a manually-operated giant electronic calculator, specifically designed to accommodate the various darts games (i.e. 1001, 501, 301, etc.). The displays show the totals required, last scores and the present throw score. A team indicator light is situated beneath the total-required displays.

Powered from a.c. mains, "Chalkie" measures 305 × 508 × 50mm and carries approval of the British Darts Organisation.

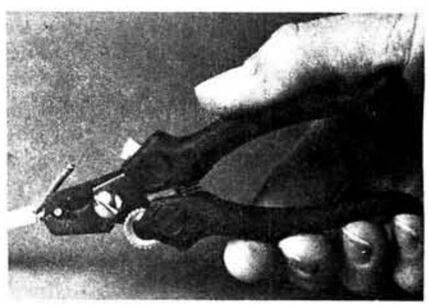
For details of price or hiring arrangements contact: *Electronic Scorers (Darts) Ltd., 94–96 Station Parade, Harrogate HG1 1HQ. Tel: (0423) 64661.*

Economy Stripper & Cutter

A new simple-to-operate wire stripper and cutter has been introduced by AB Engineering Company. Known as the AB MK 001, it features a knurled knob adjustment to control the stripping depth, a retaining clip to ensure it remains in the closed position in the tool box or pocket and a curved cutting edge which provides a secateur-like action for clean wire cutting.

Based on the well proven AB MK 100, the new MK 001 has an improved locking device and is priced at £1.85 plus VAT.

Further details of this model and the company's range of tools are available from: *AB Engineering Company, Timber Lane, Woburn, Beds. MK17 9PL. Tel: (052525) 322/3/4/5.*



A Reproduction Vintage Wireless Set
Part 2

Robert THORNTON, C Eng, M I Chem E

The Horn Loudspeaker

There is no reason why a conventional moving coil loudspeaker cannot be used with the set, but it is fun to construct a horn unit.

This can be done by making the horn out of *papier mâché*. Cut out thin pieces of card as shown in Fig. 8 and gum them together along the edges with strips of paper to form the basis of a swan-neck horn. Glue a piece of card rolled into a tube firmly into the narrow end, and cover the whole with several layers of newspaper and wallpaper paste, allowing the horn to dry out between layers. When thoroughly dry, glue a narrow wooden bead around the bell end to stiffen it up, and mount the horn on to a small wooden box as shown in Fig. 7. The whole may then be rubbed down with very fine glasspaper and painted; matt black looks good and hides any flaws.

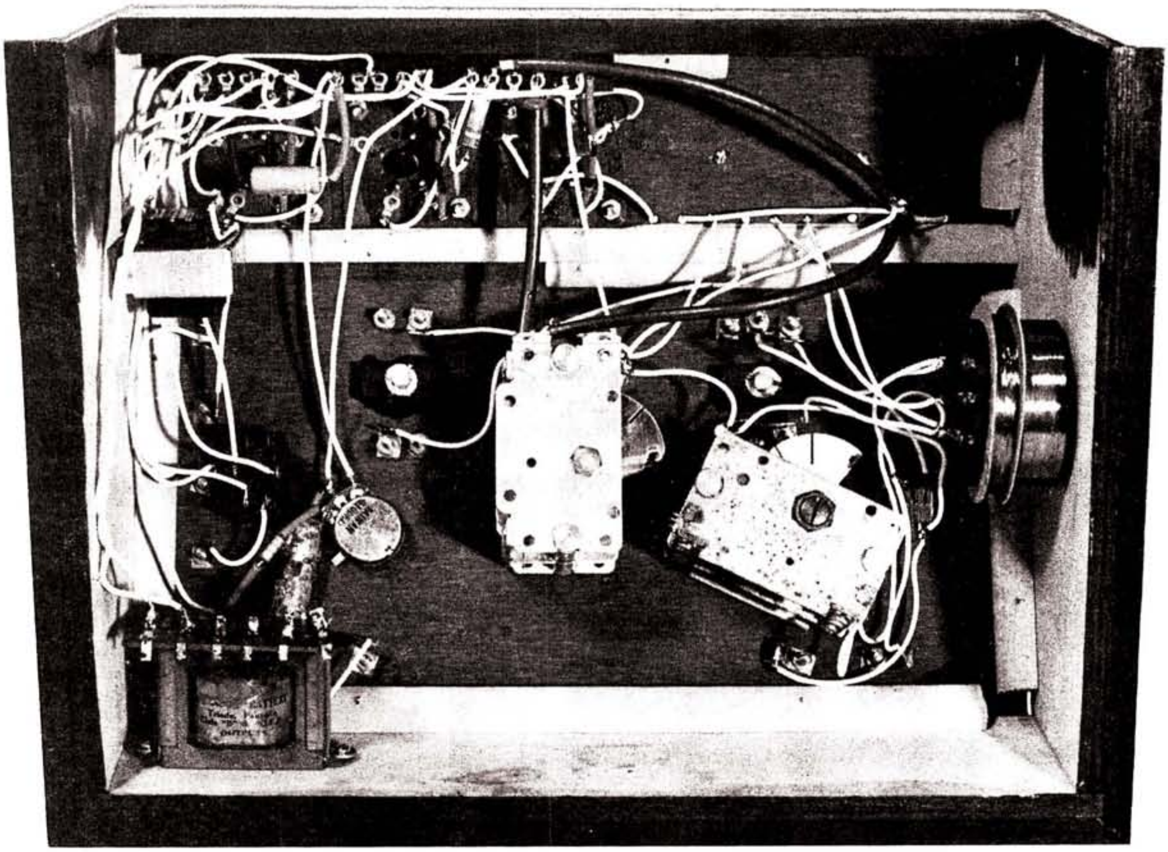
The author successfully used a number of drive units. An old ex-government high resistance telephone earpiece worked very well, and moderate results were even obtained with a magnetic earpiece (held in with "Blu Tack"). A sub-miniature loudspeaker (40–50mm) gives guaranteed results. Low impedance drivers can be connected across the secondary of the output transformer. High impedance units will work better if connected between the anode of V3 and the earth line, with a 2μF capacitor in series to prevent shorting the h.t. supply. In this case it is possible to dispense with the output transformer, using an l.f. choke as the anode load. Experimentation here is the key to success.

Setting Up and Operation

Check the wiring twice, especially the h.t. circuits. Accidental application of h.t. to the valve filaments is not recommended. Connect a 3·3MΩ resistor across the V1 grid leak terminals. Also connect a loudspeaker and an aerial (at least 20ft long: the better the aerial the better the performance of the set). In some districts an earth connection will markedly improve the results. Set VR1 about half way, and move the reaction coil L3 as far as possible from L5.

Connect the batteries; initially operate V2 with zero grid bias, and V3 with $-1\frac{1}{2}$ volts bias. Switch on and advance VR1, and move the reaction and tuning coils together.

At some point the set will burst into oscillation, as evidenced by a plop and loud howl. Immediately reduce the reaction until the howl just stops, and vary VC1 and VC2 and the coil tappings to pick up a powerful local



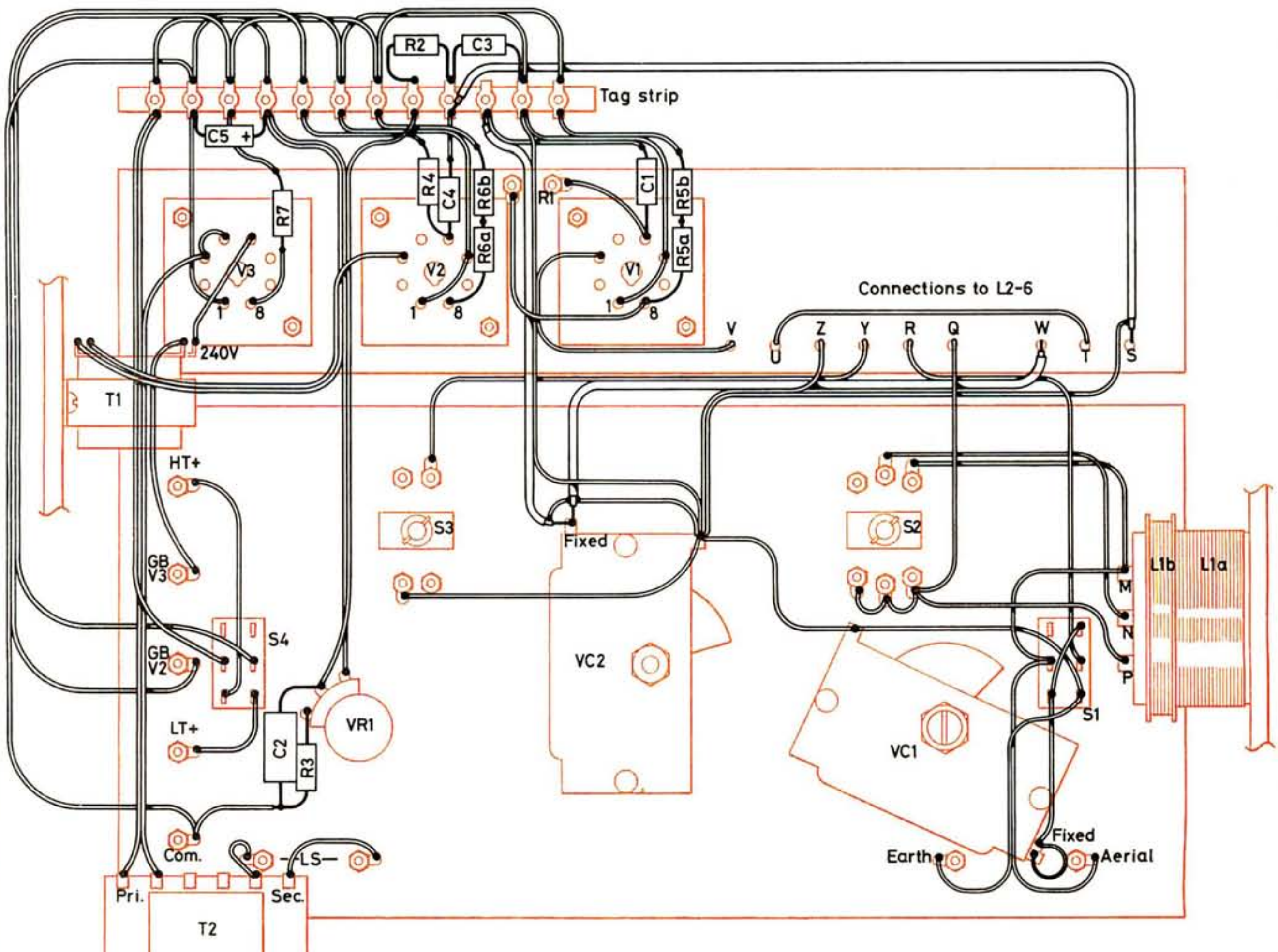


Fig. 6: Practical wiring diagram

WRM250

transmitter. The operation of the controls will quickly become apparent, but they are all interdependent to some extent. Weak transmissions will not be heard until all the circuits are brought into tune.

For some stations parallel tuning of the aerial inductance will be best: for others try series tuning. The type of aerial used will affect this. The anode voltage on V1 can be varied by VR1 to give maximum amplification without the reaction being too fierce, or minimum distortion (not necessarily the same setting!)

The set is at its most sensitive when brought just to the threshold of oscillation. It should not be allowed to oscillate continuously, as squeals and whistles will be transmitted to all and sundry.

Finally adjust the coils on their sliding collars to give optimum results, especially looking for smooth reaction over all wavebands. When no further improvement can be obtained, fix the coils with a coat of varnish. The grid tuning coils L5 and L6 should cover the standard long and medium wavebands.

The aerial coils can be brought to resonance at any frequency between about 2MHz and 150kHz. These coverages can be adjusted by adding or subtracting a few turns as necessary. If on attempting to increase reaction the signal weakens instead of building to the point of oscillation, try reversing the connection to L2.

Constructors may like to try the experiment recommended in 1922 for finding the optimum value of the grid leak resistor. In place of R1, fasten a strip of insulating material between the terminals, then draw a graphite pencil line to join them. Thicken the line until the best results are obtained. Generally the higher the value of the resistance, the greater will be the sensitivity, but the set will be more prone to overloading and distortion on powerful signals.

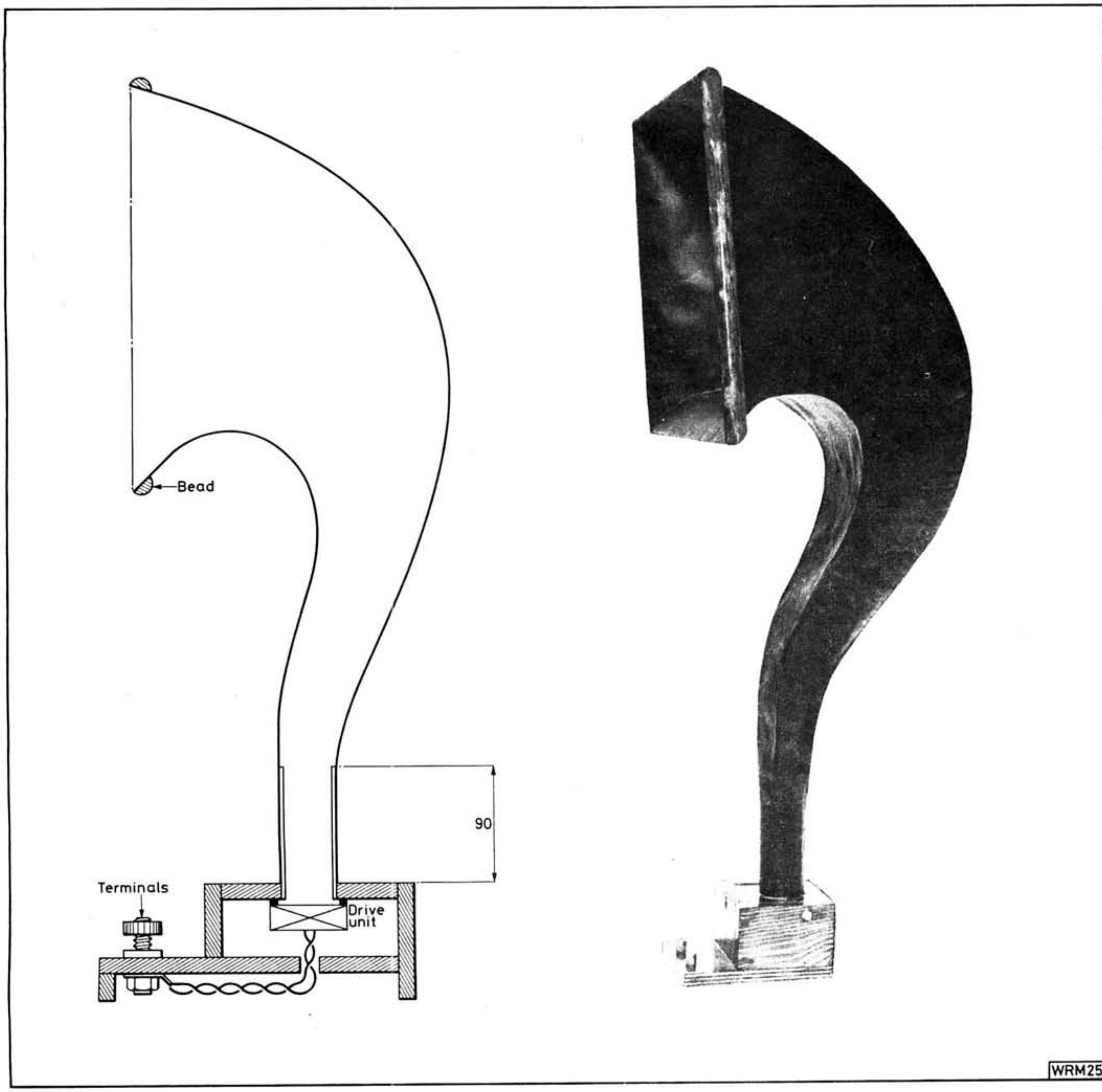


Fig. 7: The home-made horn speaker built up from *papier mâché* and plywood

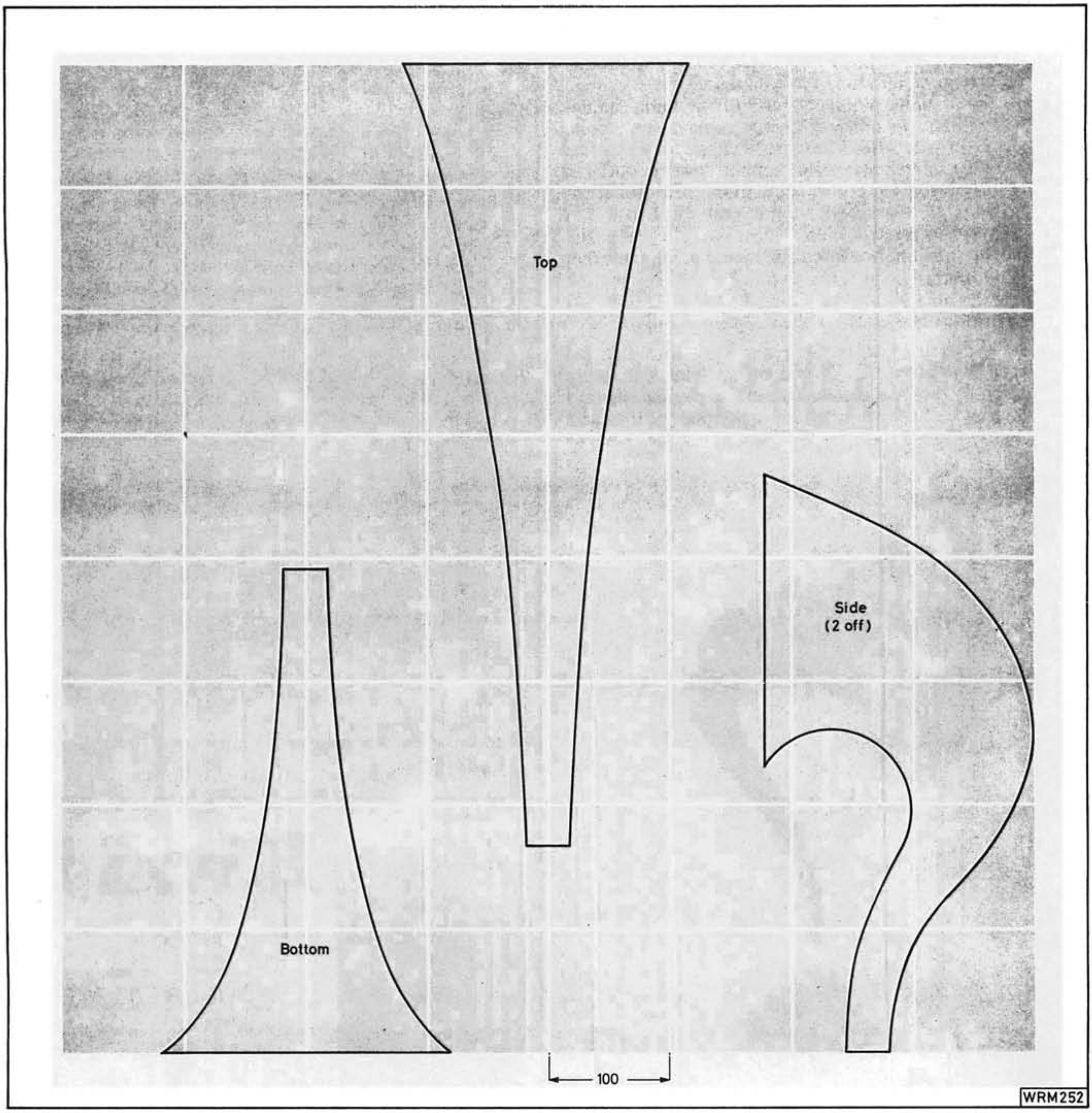


Fig. 8: (Above) the patterns for constructing the horn. The patterns should be scaled up using squared paper, each square being 100mm × 100mm

The original h.t. type of dry battery is now unobtainable. The picture on the right shows the author's solution to the problem. The more enterprising readers could make up a battery eliminator

Finishing Off

The appearance of the set is important, so take some care in finishing off. The case and all wooden parts should be stained and polished. Capacitor VC1 and VR1 should be fitted with large, black knobs. The main tuning capacitor VC2 can be equipped with a scale marked 1–100. Lettering on the panel can be carried out with white transfers, and the whole given a coat of matt varnish to protect it. The loudspeaker connecting wires should be twisted, cotton covered flex.

Finally, polish the brass terminals and studs until they glitter.

Excitement

There is plenty of scope for experiment to obtain the best results from the set. If you do so, you will surely recapture a little of the atmosphere of the pioneering days of radio, and perhaps some of the excitement of the early constructors.

Sources

We understand that the British Vintage Radio Co., 57 Weldon Park, Weldon, Corby, Northants, telephone Corby 1875, are able to supply some parts for this project, including the case and panel, valves and Mazda octal bases, and the audio transformers.

Further Reading

If you are interested in learning more about the history of radio and these vintage receivers, the author recommends the following books:

The Story of Radio Vols. 1, 2 and 3 by W. M. Dalton (Hilger).

The Cat's Whisker: 50 Years of Wireless Design by J. Hill (Oresko Books).

Much of the background information in this article was found in:

The Radio Experimenter's Handbook by P. R. Coursey (The Wireless Press, 1922). ●

KINDLY NOTE!

FM–80 Radio Control System, December 1979 and January 1980

Several receivers built by readers have exhibited interaction between channels. If this occurs C14 should be reduced to 10nF. It is suggested that this modification be carried out in all cases. If you find that the transmitter has a tendency to run at 54MHz instead of 27MHz—the transmitter is very "soggy" to tune and D3 tends to get hot—then the output network will need modifying. Remove L5 and L6 from the p.c.b. and replace L5 by a 2·2μH choke. (Ambit 7BA 144LY-2R2.) L6, D2 and C12 should be built onto the meter. A 56pF capacitor is placed in parallel with L6 to tune it to 27MHz. A sheet showing these modifications and giving some extra useful information on the FM-80 system is available from the Editorial offices on receipt of an s.a.e.

Semiconductor Tester, December 1979

It has been found that in order to ensure that the circuit oscillates correctly and produces the sine and cosine outputs it is necessary to be able to adjust R3. It is suggested that R3 be replaced by a 1MΩ potentiometer and adjusted until the output at pin 6 of IC2 is a good sinewave. Measure the value of the potentiometer and select the nearest value resistor to this for R3. The value of R3 will also affect the size of the display.

letters

The Editor,
PRACTICAL WIRELESS,
Westover House,
West Quay Road, Poole,
Dorset BH15 1JG

Radio Amateurs' Exam

Sir: I write to say how heartily I agree with your Editorial Comments in April's *PW* on the subject of the RAE examination. Your penultimate paragraph sums up my own views exactly.

I am 75 and, having an invalid wife, I could only prepare for the December RAE by home reading with the help of your excellent booklet. I *thought* I had a fair enough grasp of the examiner's requirements until I saw the actual paper! Your comments re. the Isle of Man, Emergencies, proximity to an aerodrome and mobile operation all hit the nail on the head fairly and squarely.

When the results were received I found that I had failed the first paper but had passed the second with Credit! I wrote to City & Guilds and was informed that I had "narrowly missed passing the first paper" and was then wished every success for a re-sit in May.

Now for some background fill-in—I took my Degree in Electrical Engineering at Edinburgh University in 1925. I made my first crystal set in 1919 as a schoolboy, then went on to valve sets when the BBC started and continued building (including a monochrome TV with Hi-Fi output). Now I have an excellent Hi-Fi equipment with a concrete-enclosed bass unit (because I am musical). My last home-build was the Triffid.

During the War I was Director of Radio and Radar Development at the Ministry of Supply and helped in the birth of microwave radar and the No. 10 set. Apart from the War years, I have been an industrialist all my life, finishing as Chairman of my own Companies before retirement at 71. It surely sounds as though I might be classed as experienced and responsible, but not by RAE standards!

My only reason for wishing to transmit was to graduate from being an active SWL, so that I could spend my time with my invalid wife but expand my hobby to further occupy my mind.

I'm afraid I shall not re-sit the RAE in May.

John Gray, BSc, CEng, FIEE
Edinburgh

Sir: Being semi-retired I thought it would be nice to re-associate myself with Amateur Radio as a hobby. I was licensed back in the late forties and early fifties, having a G3 call, however, due to frequent periods abroad, I had to drop the hobby and hence the call. Having made enquiries I found that the current regulations require that I pass the CGLI RAE examination and follow this with the Post Office Morse Test in order to obtain a full licence, despite the fact that my current Morse speed is around 18–20 wpm, that I spent eleven years as an operator before the days of Teletype, and that I spent thirteen years on the teaching staff of the Royal Air Force Radio School and the remainder of my life as a communications engineer. It was therefore interesting to read your article entitled *Multiple Choice* in the April *PW*, and to read with some considerable concern your comments on the exam.

During my time as an electronics instructor, I shared the task with fellow instructors of compiling this type of question for use in the RAF Radio School, and know from bitter experience how difficult it is to give four answers to suit a particular question. Looking at your quoted example concerning Ohm's law . . . is this the type of question I am to be up against in May! With a whole lifetime of electronics behind me I shall find it very difficult to follow the advice which the CGLI appear to have passed on to you i.e.: Don't read the questions too carefully and you could be penalised if you know too much! As for overlapping questions, this is totally unnecessary for a subject covering such a broad format as the RAE syllabus. I suggest they haven't put enough thought into it when putting the questions together.

With regard to the questions on the licence conditions my reaction is this. When one receives his licence it clearly states what one may or may not do, e.g. near an aerodrome, when away from home, etc. I feel it is unnecessary to learn these details to examination standard, as with the licence at hand to refer to, one would be a fool to disobey the rules.

I intend to sit the May exam come what may, but must confess that the more reaction I read concerning the format and question compilation, the more I feel I am wasting my time and money. Forty years as a communications engineer and ex-amateur and I have to follow through this perplexing wilderness of officialdom to get back my ticket! When I do get it back I'll not let it drop again!

A. G. Edwards
Yelverton
Devon

Sir: I read with much interest your editorial on the multiple choice RAE, since your views closely paralleled my own after taking the December exam.

In any such criticism, one must of course distinguish between those who have something constructive to say, and those who make excuses for having failed! Let me, therefore, put your mind at rest by saying that I did manage credits in both papers.

However, I was quite convinced that I had failed in view of the ambiguity of many of the questions. As you say, the choice between temporary premises or location while entering Douglas harbour on the Isle of Man one week after leaving home QTH is not easy.

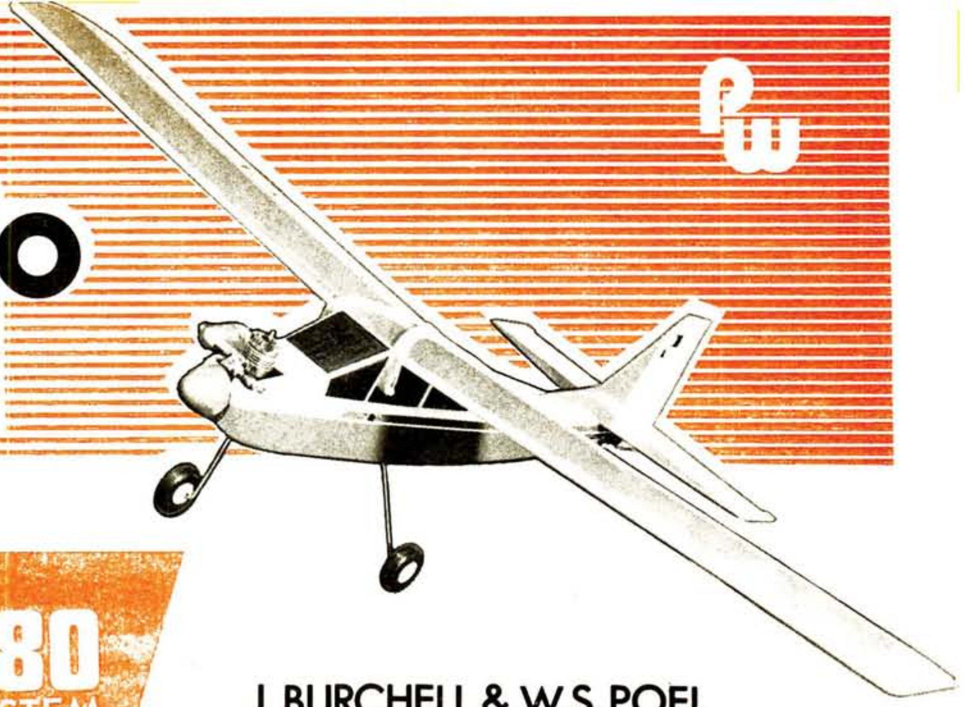
We must equally, however, be very careful to restrict criticism to the accuracy of wording of the questions and the choices, and not to include the nature of the exam itself. Multiple choice has been around for a long time and has been well tested in the achievement of qualifications far more complex than the RAE.

I doubt very much whether the old style exam ensured that a successful candidate could "design" his own equipment any more than can the new one, as you seemed to suggest. A degree in electronic engineering will take care of that. Amateur radio is about "communication" in all its aspects. Its devotees cover a broad spectrum between the purely technical person and the one who uses radio to communicate with others.

Please do not in any way spread the suggestion that those of us who have achieved a really worthwhile ambition via the multiple choice exam are second class amateurs. As an old hand at many exams I know that multiple choice is more difficult and more searching.

John Acton, MSc, FRIC, G8UXT
Iver
Bucks

Model Radio Control



Part 7

THE PW FM-80 SYSTEM

J. BURCHELL & W.S. POEL

The servos used to control the movement of control surfaces or the speed of motors in models invariably operate from an input pulse which is nominally 1·5ms for the central position, changing to 2·0ms for full right to 1·0ms for full left. There are a few makes that use different pulse widths, but most, including the *PW* FM-80 use 1·0 to 2·0ms with a 20ms OFF period.

Having built the servo amplifier or electronic speed controller it is necessary to test that it is functioning correctly.

This can be done using a correctly aligned transmitter and receiver to check that the servo responds correctly.

However this is not always a practical proposition—a transmitter may not always be convenient. In any case on the flying field you cannot use your transmitter for testing your servos—you could cause someone else to crash.

The most satisfactory way to check the action of a servo is to use a servo tester.

The tester described here is very simple and should prove to be easy to build. Alternatively Micron make a kit for a simple servo tester.

The Circuit

The circuit (Fig. 1) uses c.m.o.s. inverters to form a multivibrator with an unequal mark to space ratio. This is achieved with the timing capacitor C1 and the resistor chain associated with D1 for one half of the cycle and the resistors associated with D2 for the other half.

The pulse is fed to the remaining two inverters on the chip to provide some buffering for the pulse generator part of the circuit and also to allow the output pulse to be inverted if required. This makes the tester more useful as it can be used for servos which operate from negative pulses.

A licence is required to operate radio control equipment. This costs £2.80 for five years. Application forms are available from: The Home Office, Radio Regulatory Dept., Waterloo Bridge House, Waterloo Road, London SE1 8UA

The pulse width is variable by altering the value of VR3 while the OFF period can be changed by setting VR1. R1 can be increased if it is found to be impossible to achieve 20ms.

This OFF period should be set to around 20ms but is not too critical.

Construction

The circuit is built on Veroboard but the layout is not critical. The usual precautions must be observed when inserting the c.m.o.s. integrated circuit into the socket—do not touch the pins and do not remove the i.c. from its protective material until it is to be installed.

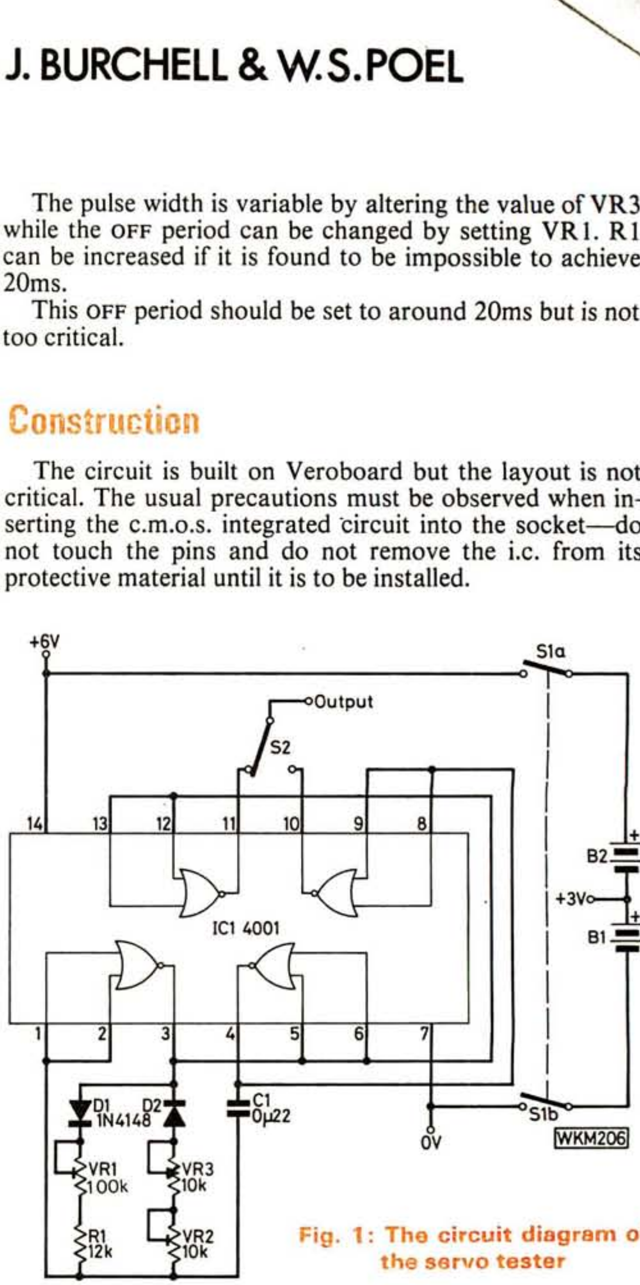
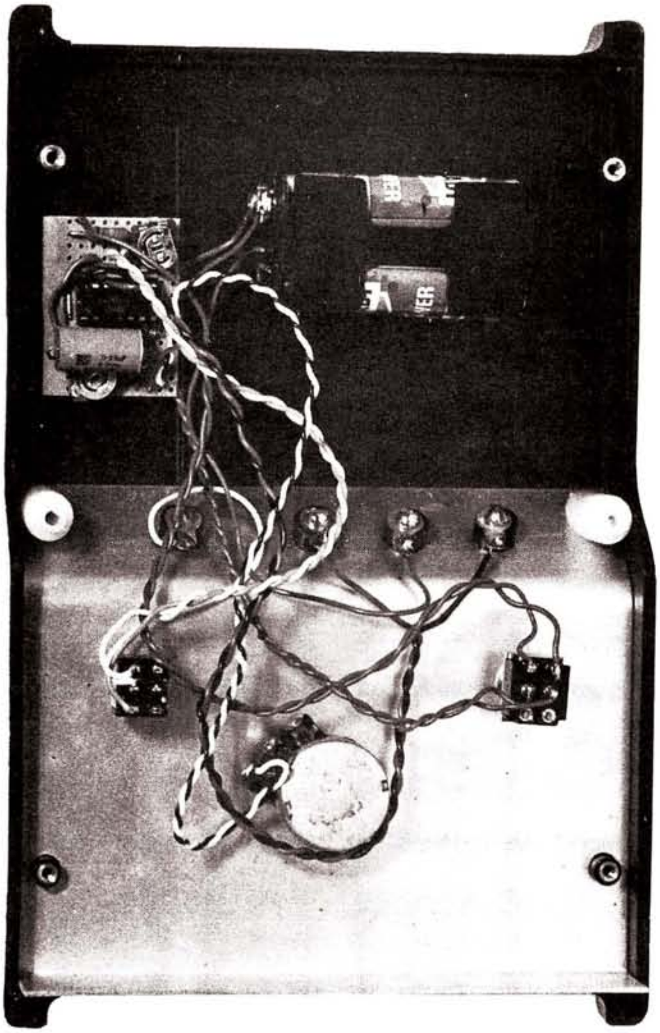


Fig. 1: The circuit diagram of the servo tester



The servo tester was built into a plastics box with a metal front panel. The size and shape of the box is not important and if the constructor felt so inclined the tester can be incorporated with the battery charger described last month

The tester can be built into any suitable case and is powered from four HP7 size batteries in a suitable holder.

Setting Up

To set up the tester you really need an oscilloscope to get the pulse width to exactly 1·5ms. However it can be done using a known good servo. The servo is powered from the testers batteries via the appropriate terminals or socket on the front panel.

Set the overall time for the waveform to around 20ms using VR1 and then, with VR3 set to midtravel adjust VR2 to give a pulse width of 1·5ms. Now turn VR3 to give 2·0ms and mark this position on the front panel. Repeat this for 1·0ms pulse width and the tester is calibrated.

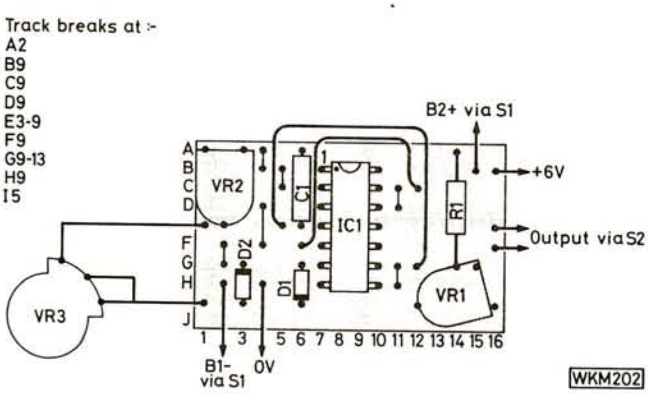


Fig. 2: The layout of the components on a piece of Veroboard. A socket should be used for the c.m.o.s. integrated circuit

★ components

Resistors		
¼W 2%		
12kΩ	1	R1
Potentiometers		
Min. horizontal preset		
10kΩ	1	VR2
100kΩ	1	VR1
¼ inch shaft		
10kΩ lin.	1	VR3
Capacitors		
Polyester		
0·22μF	1	C1
Semiconductors		
Diodes		
1N4148	2	D1,2
Integrated Circuits		
4001	1	IC1

Miscellaneous
Min. toggle switch d.p.d.t. (1); Min. toggle switch s.p.d.t. (1); Knob; Battery holder for 4 × HP7; Veroboard 16 holes × 10 tracks; Case; Push terminals, blue (1), black (1), red (1), yellow (1); 14 pin d.i.l. i.c. socket (1).

Part 8 will describe a complete test unit for use at the flying field.

RADIO SPECIAL PRODUCT REPORT

SOMMERKAMP

TS-280 FM

"Not just another synthesised rig, but a transceiver worthy of anybody's car dash board or glove shelf," is the opinion of the author about the TS280FM 2m f.m. transceiver. Sommerkamp, the European connection with Yaesu-Musen of Japan, have produced this rig with a 75W input capability to a fully frequency synthesised, all solid-state design for the 144–146MHz band.

Frequency control employs state-of-the-art digital circuitry combined with a precision phase-locked v.c.o. to provide a total of 80 transmit and receive channels in 25kHz increments. The operative channel number is displayed by a large, bright l.e.d. display, and a special feature is its receive frequency flexibility whereby the standard repeater shift of 600kHz can be accommodated.

The TS280FM has been designed for continuous heavy-duty mobile and base station applications and can be operated with either a standard p.t.t. microphone and internal speaker, or with a telephone type handset complete with VOX facility. Provision is made so that an external selective call facility can be fitted, with an automatic answer back system.

Under normal mobile conditions, the TS280FM proved to be an exciting rig to use. The front panel of the set has five easily accessible controls which, after a short while, may be operated successfully without even looking, making for most desirable safer driving conditions which are certainly needed on the roads of today.

The transceiver can be used very effectively as a base station, but a quality, heavy-duty, well-regulated power supply is required.

Synthesiser

Obviously, the most important part of any synthesised rig is the actual synthesiser, so lets start there. The p.l.l. section consists of a CMOS i.c. incorporating a reference crystal oscillator, 10 bit divider chain, 8 bit programmable binary counter and an edge type phase detector. Also included are a voltage controlled oscillator, limiting amplifier, balanced mixer, down conversion oscillator and voltage regulators. In addition, this unit contains the lock detector circuit, modulation amplifier and limiter.

Transmitter

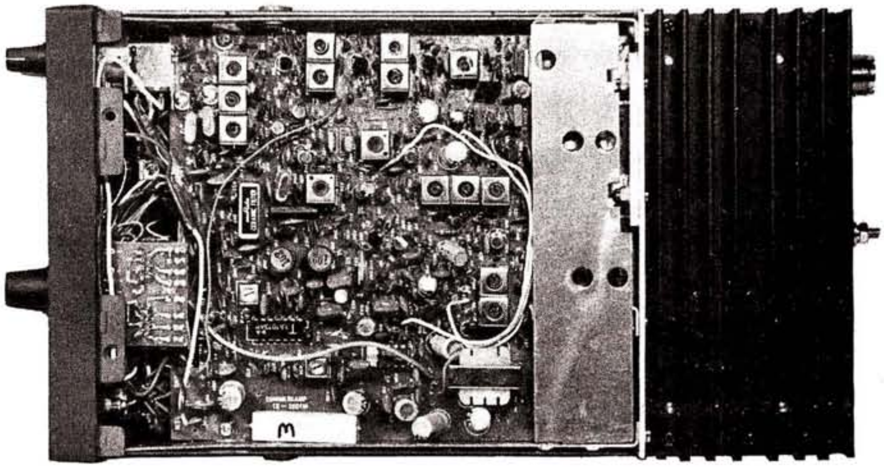
The output from the p.l.l. unit is amplified and multiplied to 134MHz. This signal is mixed with 10·7MHz and the resulting signal is further amplified in the driver and power amplifier circuits of the transceiver.

The output of the power amplifier is fed via a matching network, low-pass filter and aerial change-over switch to the output socket on the back drop of the rig. Between the low-pass filter and aerial socket, an s.w.r. bridge detects the standing wave ratio in the aerial system and if too high, will result in the shut-down of the r.f. output stage of the transmitter.

Receiver

The receiver section is designed to receive frequency or phase modulated signals in the 144–146MHz band. The unique combination of low noise field effect transistors, double conversion, a combination of mechanical-ceramic and LC filters, integrated limiting amplifier/discriminator and a high quality audio output stage provides exceptional reception quality on all but the very weakest of signals. In addition, the above combination coupled with the latest technology, provides a sensitivity and spurious signal suppression previously only available in much more expensive equipment.

The power supply, r.f., i.f. and second mixer/oscillator sections are stabilised by an extremely sharp cut-off zener diode in conjunction with a series regulator to provide the excellent sensitivity and stability required. The high squelch sensitivity is achieved by using a separate noise amplifier, detector and



Top view of the TS280FM with the cover removed. In use, some space is required under the set for sound to escape from the loudspeaker

switching circuit with carefully balanced hysteresis.

The transformerless quality audio power amplifier will drive any load between 4 and 8Ω, such as the internal speaker, external speaker or telephone handset earpiece.

Metering

The large, clearly read meter on the front panel provides for monitoring received signal strength, and indicates relative power output in the transmit mode. Receiver/transmitter switching is achieved by a single pole, single throw switch on the microphone combined with *npn* and *pnp* switching transistors which also function as voltage regulators.

On the rear panel are the aerial socket (SO239 u.h.f. type), d.c. power connector, external speaker jack and Sel-Call connector.

Channels

Numbers 1 to 9 indicate repeater channels, i.e., R1 to R9; the odd one out being RO which is on number 40. Indicated numbers of from 10 to 39 are all designated simplex channels, i.e., S10, S11, etc. Channel selection for repeaters is used in conjunction with the squelch control knob on the front panel which, when pushed or pulled, selects high or low receive frequencies, thus enabling the operator to immediately listen on repeater input frequencies.

Results

Using the TS280FM is a delight both as a mobile or as a base station rig. The display-indicated channel numbers were easy to view from all angles, the channel numbering being one of the most logical of systems.

The author had only two basic criticisms about the rig which were apparent at the time. The microphone plug being of the DIN type, tended to get pulled out if the microphone lead was stretched to near its full limit. Also, tone burst is not automatically sent by the p.t.t. switch when operating on the repeater channels, the CALL button on the rig has to be pressed each time.

The 45W output power is certainly advantageous with mobile operation and the receiver sensitivity was a good match to the transmitter range when used with a $\frac{5}{8}$ wavelength aerial on the roof of the car.

All in all, then, a very good proposition for anyone looking for a versatile base station-cum-mobile and by the visible quality of the construction, it should perform very well for a long time to come.

★ specifications

GENERAL

Frequency range:	144·000–145·975MHz in 25kHz steps
Stability:	8×10^{-6}
Usable temperature range:	−10 to +50°C
Power source:	10 to 16V d.c. negative earth
Current consumption:	0·3A at 14V (receive) 8·0A at 14V for 45W (transmit) 1·5A at 14V for 1·5W (transmit)
Aerial impedance:	50Ω nominal, unbalanced
Dimensions:	58 × 156 × 290mm
Weight:	2·3kg

TRANSMITTER

Power output:	45W (high), 1·5W (low), r.f.
Emission:	F3 (frequency modulation)
Deviation:	±5kHz (factory set)
Spurious emission:	Better than 70dB below carrier
Microphone:	600Ω dynamic with p.t.t.
Repeater tone:	1750kHz continuous
Duty cycle:	100% transmit at 14V d.c.

RECEIVER

Sensitivity:	0·4µV for 12dB sinad
Squelch sensitivity:	0·1µV threshold
Bandwidth:	±7·5kHz (3dB), ±12·5kHz (70dB)
Intermediate frequencies:	10·7MHz (1st), 455kHz (2nd)
Image rejection:	Better than 70dB
Output impedance:	8Ω internal loudspeaker 4–8Ω external loudspeaker
Audio output:	2W at 10% t.h.d.

Price

Costing around £200 including VAT, the TS280FM transceiver was kindly loaned by Arrow Electronics Limited, Leader House, Coptfold Road, Brentwood, Essex CM14 4BN. Tel: Brentwood 219435 and 226470, and we would like to thank them for their invaluable assistance. ●

ACOUSTIC Flash TRIGGER

J.S.B.Dick GM8OWX

As every photographer knows, a good photograph is one which will command attention and produce a gasp of admiration from all who see it. There are two classic ways of achieving this, namely photographing objects in an unusual manner or by introducing dynamics into the picture. Have we not all stared in wonderment at the "macro" photograph of the head of an insect, the "micro" photograph or a silicon chip, or the dynamically impressive image of Concorde taking to the air?

This article describes an acoustically triggered flash; little to do with insects or Concorde. True, but it has everything to do with photographing objects in rapid motion. In a medium, whenever anything moves, a disturbance is propagated—the faster the movement, the sharper the disturbance. For a rapid, dynamic object a shock wave is produced. Using this acoustic effect to trigger a camera or flash-gun can produce some of the most remarkable photographs: the millisecond life of a bursting balloon frozen for eternity, the fragmentation of a bottle, the pyrotechnics of an igniting match-head. The list is endless, limited only by the imagination of the user.

Circuit Description

The operation of the unit is simple to understand. In the quiescent state the 741 op. amp. has its inverting (−) input at a higher potential than its non-inverting (+) input and hence the output is near to zero volts. When a voltage applied to the non-inverting input causes its potential to rise above that of the inverting input, the output will produce a fast, positive going edge which is differentiated by C2 and R5. This is applied to the base of Tr1, momentarily turning it on, thus grounding pin 2 of the ubiquitous 555 i.c. and starting its timing cycle.

For this application, the 555 is operated in a monostable mode. When triggered, by temporarily grounding pin 2, the output (pin 3) will go positive, towards the supply voltage, for a time T where: T (approx) $= 1{\cdot}1 \times (R7 + RV2) \times C$. This can be varied in two ways; RV2 acts as a fine range control and C provides a coarser control. The one pole, two-way, centre-off switch enables 3 ranges to be selected as follows:

Range 1 — $1 < T < 10$ms
Range 2 — $10 < T < 100$ms
Range 3 — $100 < T < 1000$ms

The small capacitor, C5, is always connected, but this does not degrade the other ranges and simplifies the switching requirements.

After time T, the output of the 555 returns to the ground state, producing a fast, negative-going edge which, when differentiated by C7 and R8, turns off Tr2 sending the collector voltage up to the supply voltage. This positive pulse is transmitted through C8 and activates the thyristor. Diode D1 and resistor R10 deal with any negative-going pulses applied to the thyristor gate. The current consumption of the whole unit is around 10mA with a supply of 9V.

Construction

The circuitry was constructed on a single-sided p.c.b. measuring 70 × 50mm. The holes were all drilled with a 0·8mm drill except for the thyristor pin holes which require a 1·6mm drilled hole, the board being etched and masked in the usual way. Track layout is shown in Fig. 2 and the component overlay in Fig. 3. When completed, the electronic assembly can be mounted into any type of box available, this being not at all critical. The unit shown in the pictures was built into a small Verobox with an integral PP3 battery compartment.

In the prototype unit, sockets were not used for the input and output leads, these being wired directly to the p.c.b. A crystal microphone insert was used as the input transducer, being cheap and otherwise totally adequate for the job.

To allow the p.c.b. to be fitted into the Verobox as shown the terminals of S1 will need to be trimmed.

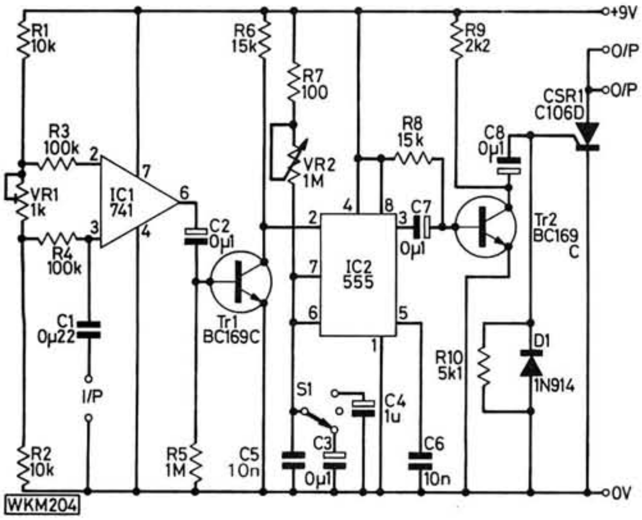


Fig. 1: Circuit diagram of the Acoustic Flash Trigger Unit. The outputs each go in screened lead (as shown in Fig. 3) to the flash-gun/camera connectors. Note that C8 should be shown as 0µ22, and is non-polarised

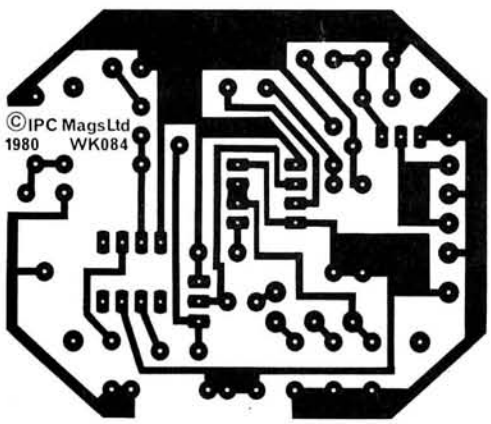


Fig. 2: Copper track pattern shown full size

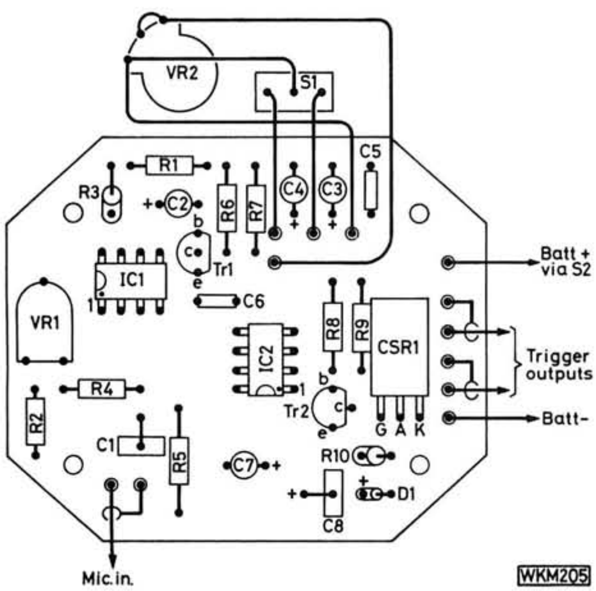


Fig. 3: Component overlay on the p.c.b. CSR1 is fitted with its normal mounting surface facing away from the board

★ components

Resistors
¼W 5% carbon

100Ω	1	R7
2·2kΩ	1	R9
5·1kΩ	1	R10
10kΩ	2	R1,2
15kΩ	2	R6,8
100kΩ	2	R3,4
1MΩ	1	R5

Potentiometers
Min preset

1kΩ (lin.)	1	RV1

Standard midget ¼in shaft

1MΩ (lin.)	1	RV2

Capacitors
Polyester, miniature

10nF	2	C5,6
0·22µF	2	C1,8

Tantalum

0·1µF 35V	3	C2,3,7
1µF 35V	1	C4

Semiconductors
Diodes

1N914	1	D1
C106D	1	CSR1

Transistors

BC169C	2	Tr1,2

Integrated circuits

555	1	IC2
741	1	IC1

Miscellaneous
Miniature s.p.d.t. centre-off switch S1, (1); Crystal mic. insert (1); audio coaxial cable (1m); PP3 battery and connector (1); printed circuit board (1); suitable leads for flash/camera sync. (1 of each); Verobox 65-2036-H 68 × 110 × 33mm.

Application

The unit was designed to interface with two options: (a) an electronic flash unit, or (b) an electromagnetic-type shutter release s.l.r. camera. For (a) the synchronising lead is connected to the socket on the flash gun. Whenever a noise impinges on the microphone, the circuit will fire the flash gun after the delay set by the control and the delay can range from practically zero to just over 1 second. The equipment is set up so that the camera is pointing at (and is focussed for) the object to be photographed. The room is then darkened as much as possible and the camera shutter opened on "B" setting. After the exposure has been taken, for example, bursting a balloon, the shutter is closed and the film wound on for the next shot.

Subsequent processing of the film will show if the delay was correctly set. Since this is hard to estimate, a good range of values should be tried using black and white film for economy before colour is attempted.

The actual length of the exposure is determined only by the duration of the flash, being typically 1 to 2ms. Many flash units now incorporate computer or thyristor type

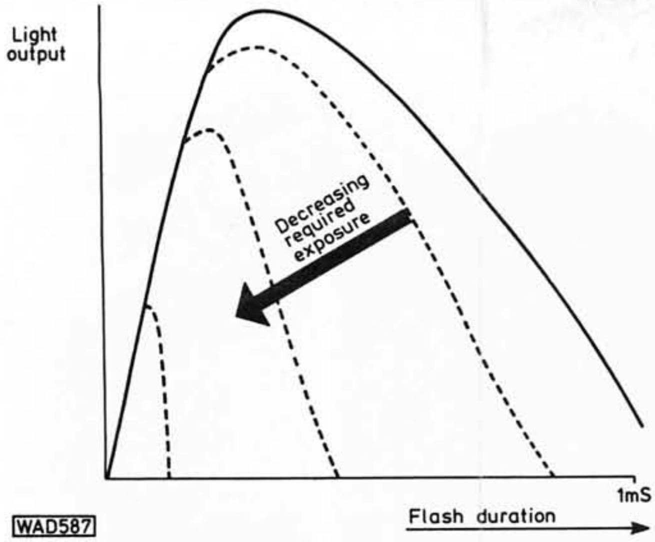


Fig. 4: Effect of thyristor circuit on the duration of the flash

These four pictures illustrate a Flash Gun, triggered by sound, capturing the death of a balloon. Picture one—the pin punctures the balloon and a split is seen surrounding the hole. Picture two—the balloon creases as it contracts. Picture three—the balloon shreds. Picture four—final stages of the punctured balloon.

control. A fast acting photodiode monitors the illumination from the flash discharge and cuts off the flash when enough light has fallen on the subject for correct exposure. Rather clever and extremely effective! The diagram in Fig. 4 shows the effect. With some flash units available, the minimum duration may only be 20μs. The motion stopping ability is incredible; an object travelling with the speed of sound only travels 6mm during this time!

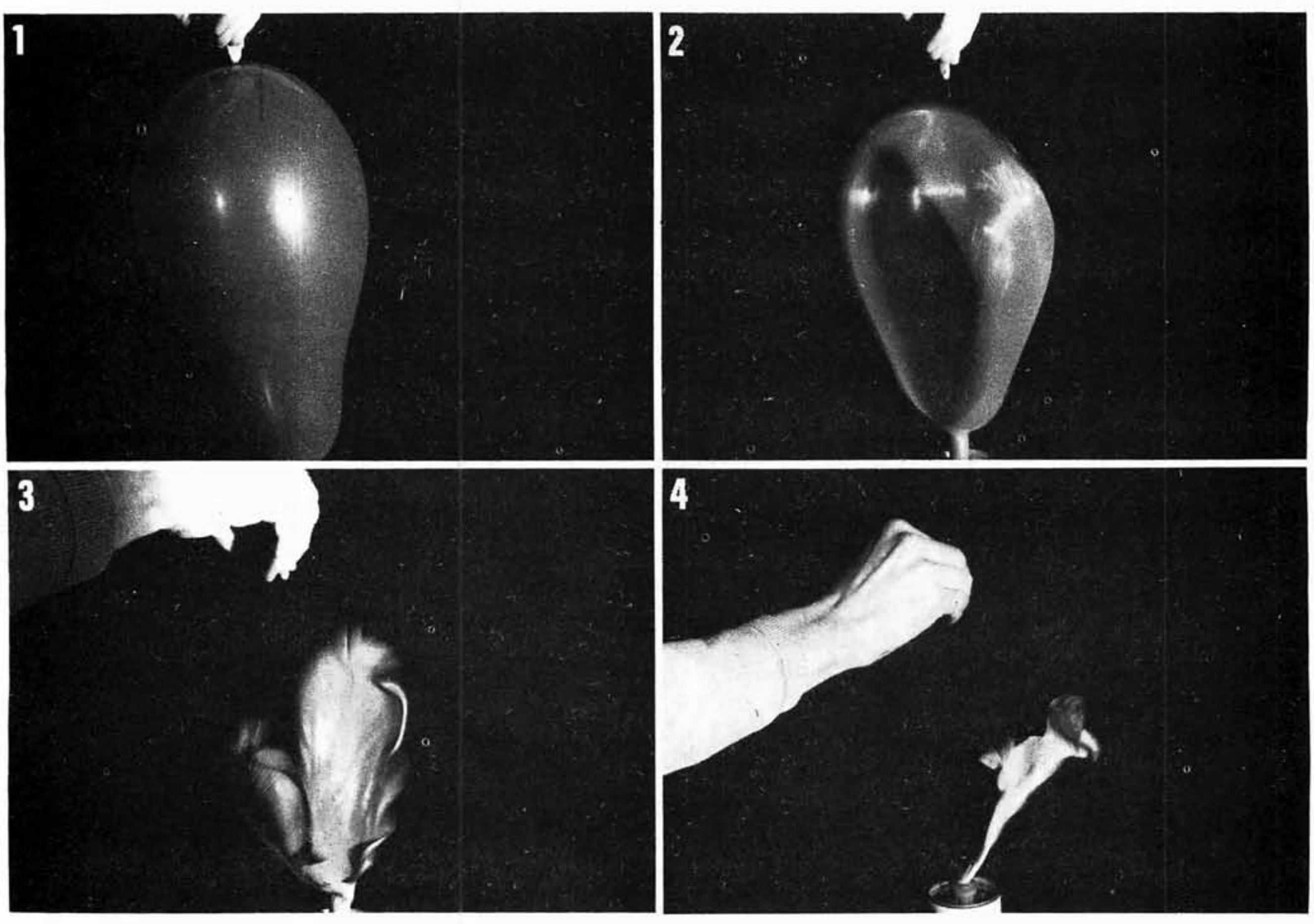
The second option is usable only with cameras which have an electro-magnetically operated shutter. With these, the conventional mechanical shutter release is replaced by a micro-switch which controls a solenoid inside the camera which, in turn, operates the shutter. The acoustic trigger can also be used in conjunction with this type of camera, although good results are harder to get compared to the flash method. Great care has to be taken when interfacing with a multi-hundred-pound camera. Tread softly is the key!

Calibration

Calibration of the trigger delay is not really required—there is usually so much error in event timing that errors in the electronics are negligible. Remember to place the microphone as close to the sound emitting object as possible; sound takes 3ms to cover one metre, and that is a large enough delay to ruin photographs of very fast phenomena.

One photographic friend who has used the device pondered idly about using the device to photograph flashes of lightning. Having pointed out that this is impossible, since

continued on page 49 ▶▶▶



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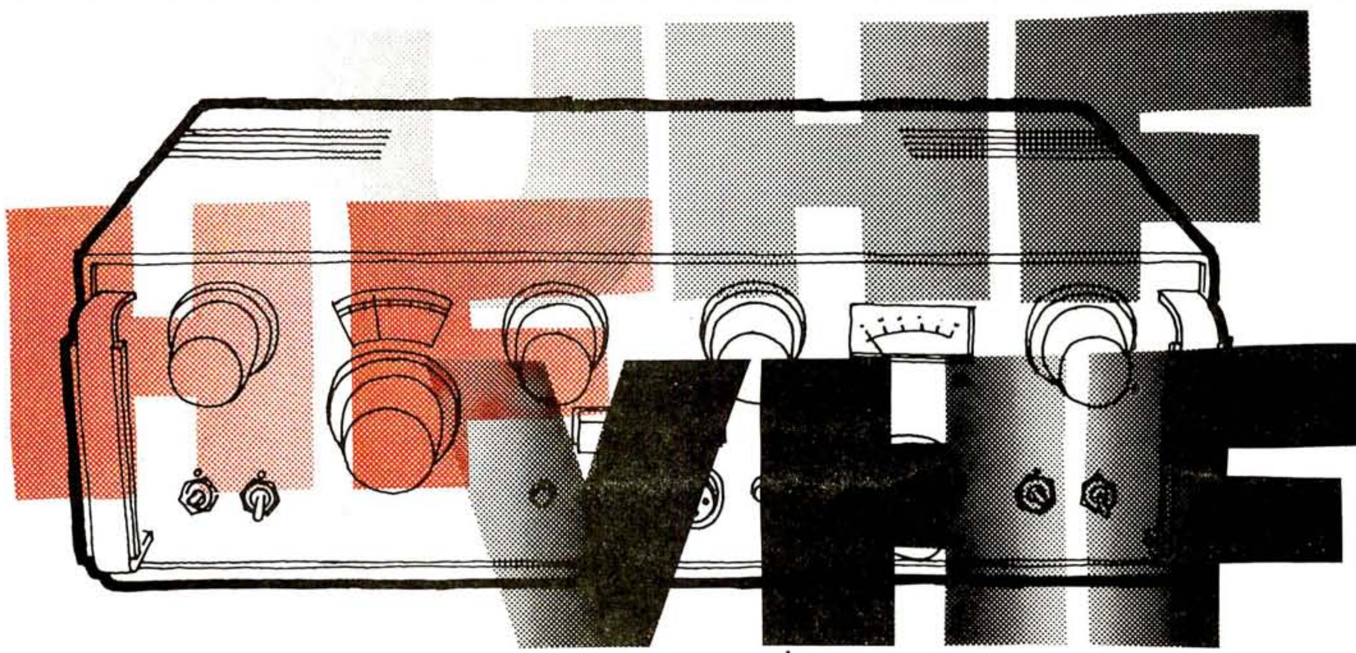

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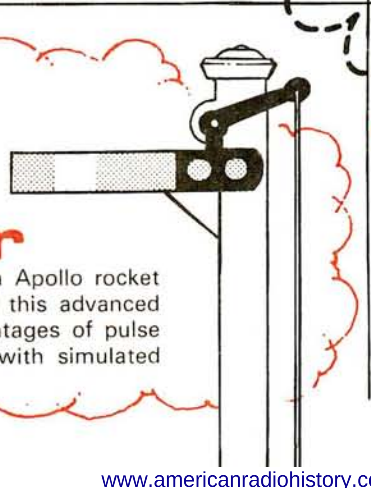

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POWER GAIN from TRANSMITTING AERIALS

Understand your aerial is the key to better transmission and reception from almost any QTH. This theoretical article will help you to appreciate the intricacies of emanating r.f. correctly and in the direction which is of most use

VHF/UHF REPEATER STATION TIMERS

F. C. Judd G2BCX

There are now a large number of v.h.f. and u.h.f. repeater stations operating in the UK and the time available through these stations after access may be anything from one minute or less to over two minutes although there are several stations, such as the GB3NB Norfolk repeater, which have no time out, at least at present. However it is annoying to the station you are working, as well as others, to "time out" but continue to occupy the repeater. What you say after time out will not be heard anyway and any repetition of what was missed plus the time out period means that the repeater will be occupied for longer than necessary.

The repeater timer circuits described in this article range from a simple flashlamp indicator type, operated automatically from the transmitter 12 to 14V supply rail, to a rather sophisticated activated system with l.e.d. and audible bleep indication of time together with automatic set and reset.

The basis of these circuits is, of course, the ubiquitous 555 timer and the first but fairly basic circuit is shown in Fig. 1. This is powered from the transmitter supply rail which, in transistorised rigs, will be 12 to 14V. The timer is activated when the transmit button is operated and the time depends on the values of Rt and Ct. When activated, the lamp LP1 lights up and at the end of the set time (Rt Ct) this is extinguished and LP2 comes on. *Note:* the values of Rt Ct should be chosen to provide the full repeater time available *less* about 10 seconds or so to allow time to switch back to receive before the repeater times out. If Ct is 20µF then Rt will be in the region of 2MΩ for about 1 minute. If the value of Rt consisted of, say, a 1MΩ fixed resistor in series with a 2MΩ variable then a time of between about 1 minute and 3 minutes would be available.

In addition to the "time up" indicator lamp, a sustained audible warning tone can be obtained by adding the circuit shown in Fig. 2. The 555 i.c. in this circuit operates as an audio oscillator and is switched on by the transistor Tr1 which may be any general purpose *pnp* type. The preset VR1 controls the loudness of the tone. If the transmitter 12 to 14V rail is not accessable the timer circuits could be run from a battery or built-in power supply and operated with a control switch mechanically coupled with the microphone or transmitter send/receive switch.

The timer circuit in Fig. 1 resets only when the supply voltage is broken or when the time up is exceeded, so if less than the full repeater time is used when a short transmission is made, the timer will reset ready for the next transmission.

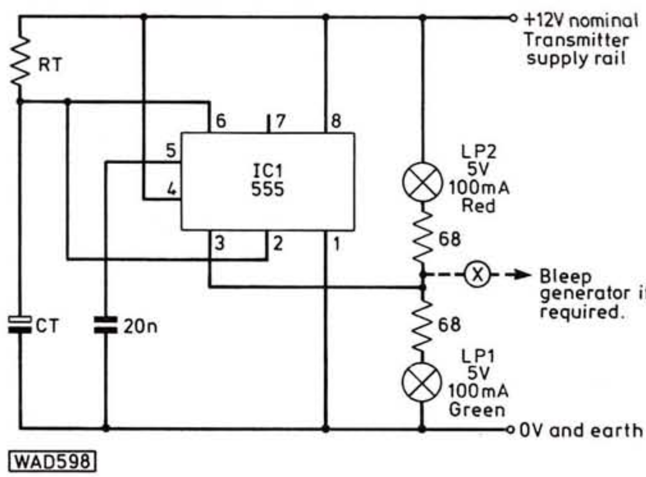


Fig. 1: The basic timer circuit using a 555 timer integrated circuit

Dual Function Timer

The next circuit, Fig. 3, is a little more complex and also automatically resets after the set time or when a transmission is shorter or longer than the set time. On being activated the lamp LP1 lights up and after a time set by IC1 and Ct Rt, the second 555 (IC2) switches on and lights the lamp LP2 for a period of say 5 to 10 seconds, set by C4 and R2, after which reset is automatic regardless of whether transmission is still taking place.

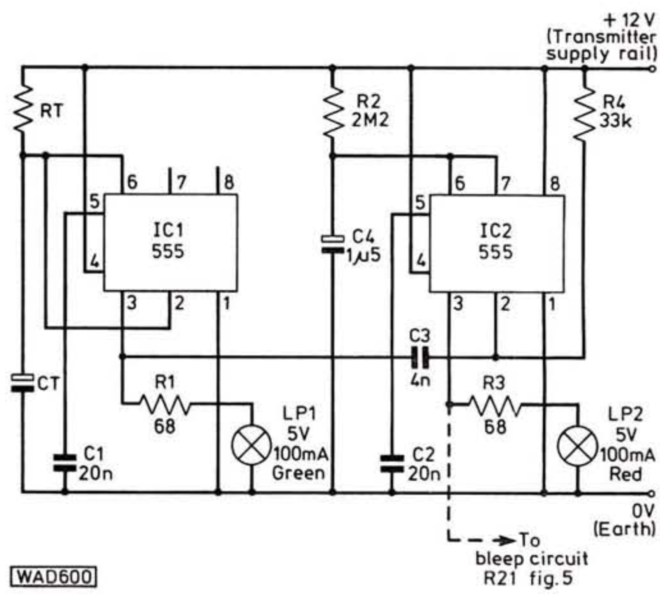


Fig. 3: This circuit resets itself no matter how long the transmission. If the transmission is longer than the set time the timer will reset itself automatically

★ components

RF ACTIVATED TIMER

Resistors		
¼W 5%		
68Ω	1	R10
100Ω	3	R7,16,19
470Ω	1	R11
5·6kΩ	2	R8,9
6·8kΩ	2	R24,28
10kΩ	2	R22,26
15kΩ	2	R1,2
22kΩ	4	R3,4,5,6
33kΩ	1	R20
47kΩ	1	R21
68kΩ	2	R15,17
100kΩ	3	R23,25,27
120kΩ	1	R14
2·2MΩ	3	R12,13,18
Potentiometers		
Min. horizontal preset		
4·7kΩ	2	VR2,3
¼inch spindle		
2MΩ (lin.)	1	VR1
Capacitors		
Polyester		
0·1μF	2	C2,3
20nF	2	C9,11
4nF	3	C10,14,15
Polystyrene		
470pF	1	C1
Electrolytic		
1·5μF 25V	2	C13,t (see text)
750μF 18V	3	C4,5,6
Tantalum		
4·7μF 35V	1	C12
10μF 16V	2	C7,8
Semiconductors		
Diodes		
OA5	1	D1
Green l.e.d.	1	LED1
Red l.e.d.	1	LED2
Yellow l.e.d.	1	LED3
1A bridge rect.	1	BR1
Transistors		
BC108	4	Tr1,2,3,4
Integrated Circuits		
NE555	2	IC3,4
741	2	IC1,2

Miscellaneous
Min. toggle d.p.s.t. switch (1); rotary switch 4p3w (1); speaker 8Ω 50mm dia.; Min. mains transformer 12V (1); Verobox 150 × 80 × 85mm; p.c.b.s (2); Knobs (2); Phono socket; RFC1 see text.

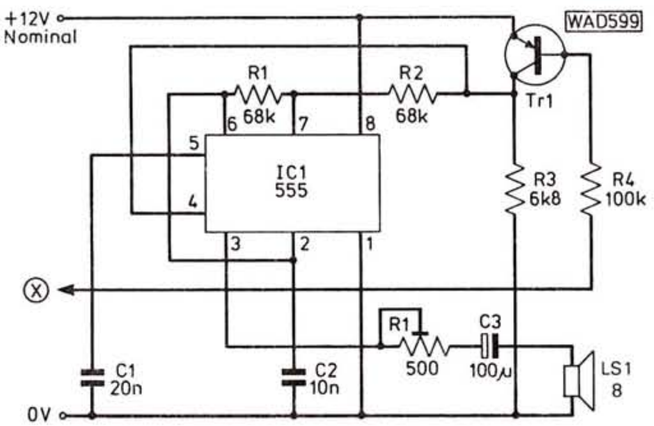


Fig. 2: Adding this circuit to that of Fig. 1 will give an audible warning of the end of the set period

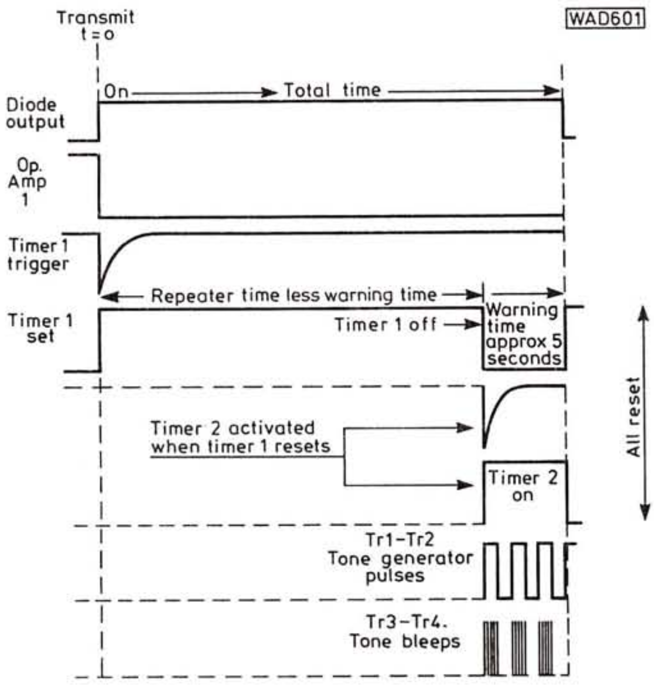


Fig. 4: The timing sequences used in Fig. 5

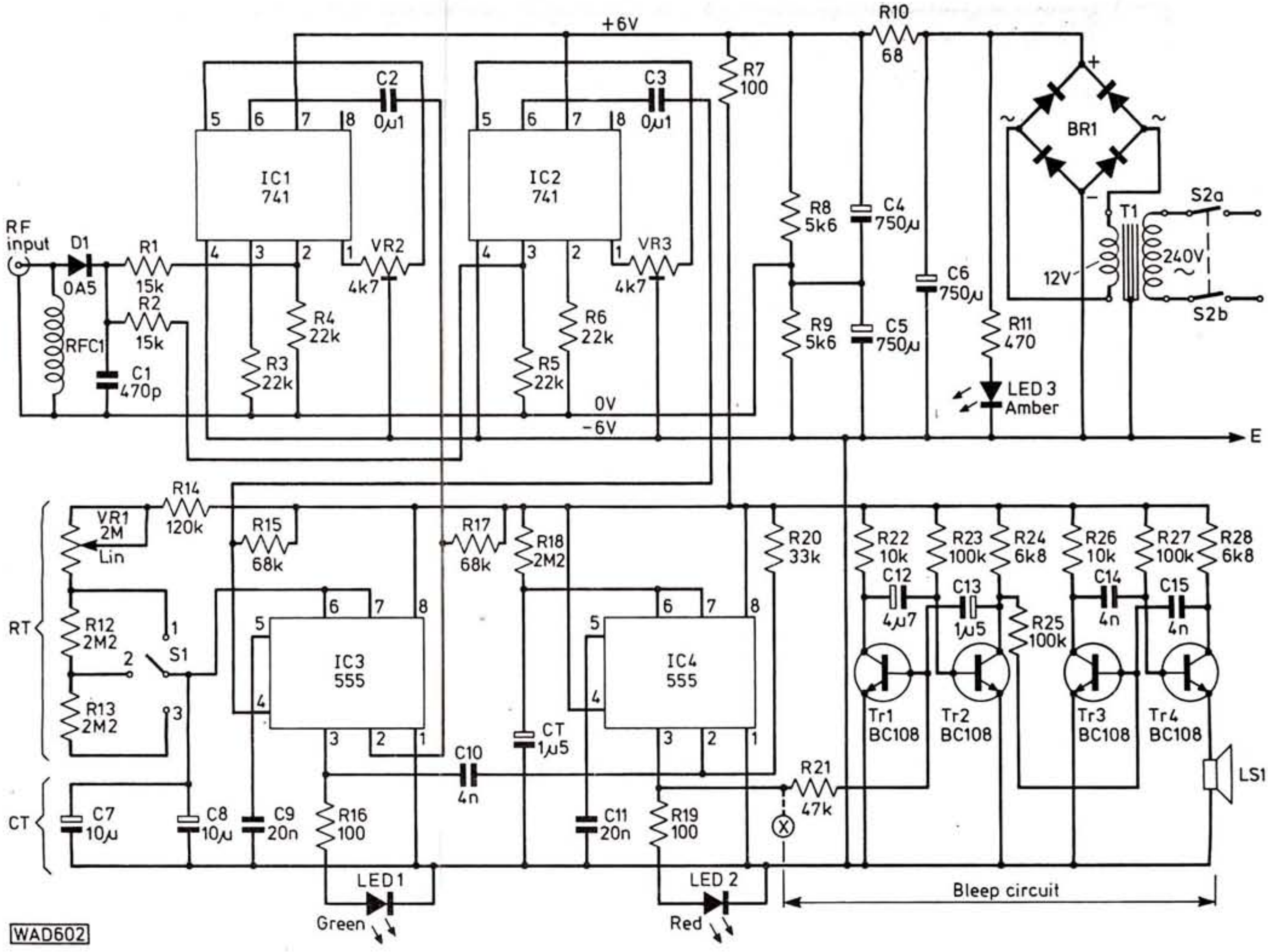
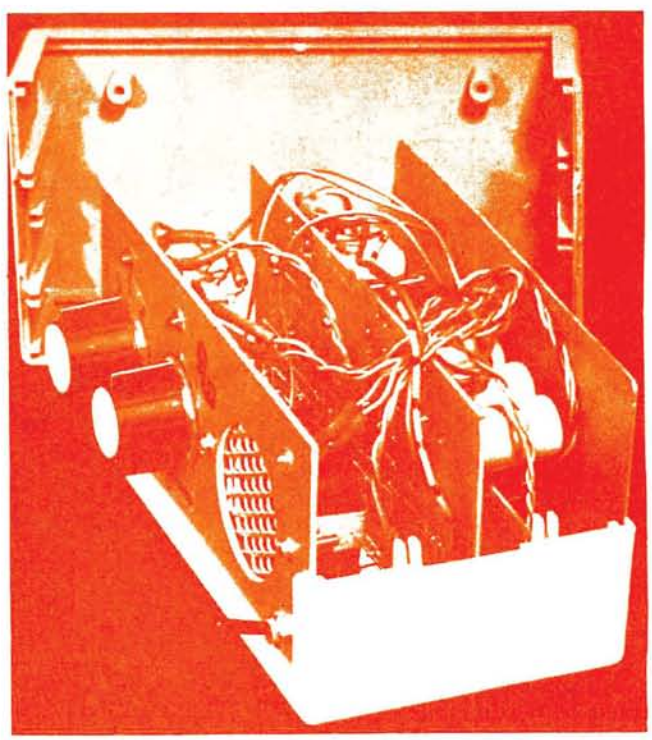


Fig. 5: The complete circuit diagram of the r.f. activated repeater timer

A tone bleep can be added by using that part of the circuit (Tr1, Tr2, Tr3, Tr4) indicated in Fig. 5. In this case the tone bleep is repeating. If the values of C4 and R2 in Fig. 3 are used the warning bleep time will be about 10 seconds, which should of course be included in the total repeater time available. For example, if the repeater time is 2 minutes then IC1 with Ct Rt should provide 1 minute 50 seconds after which IC2 will allow a 5 to 10 second lamp on and bleep which is the signal for returning to receive before the repeater station times out. The function is clarified by Fig. 4 although this applies largely to the next circuit to be described which is r.f. activated, may be battery or mains operated and is completely automatic.

RF Activated Timer

This circuit (Fig. 5) is operated by a very small amount of r.f. voltage picked up from the transmitter coaxial feed cable to the transmitting aerial. The r.f. is rectified by the diode D1 and the resultant d.c. used to switch the 741 op. amps. (IC1 and IC2). IC1 is in a normally conducting state. The d.c. signal from D1 switches IC1 to a non-conducting state, the result being a fast negative going pulse to IC3 which brings on LED1 (green). IC2, normally non-conducting, is switched to a conducting state. At the end of the set time (Ct Rt) IC3 switches off and the resultant negative going pulse from pin 3 turns on IC4 which causes LED2 (red) to light and the bleeper circuit Tr1, Tr2, Tr3, Tr4, to operate for 5 to 10 seconds.



The two p.c.b.s fit into a Verobox

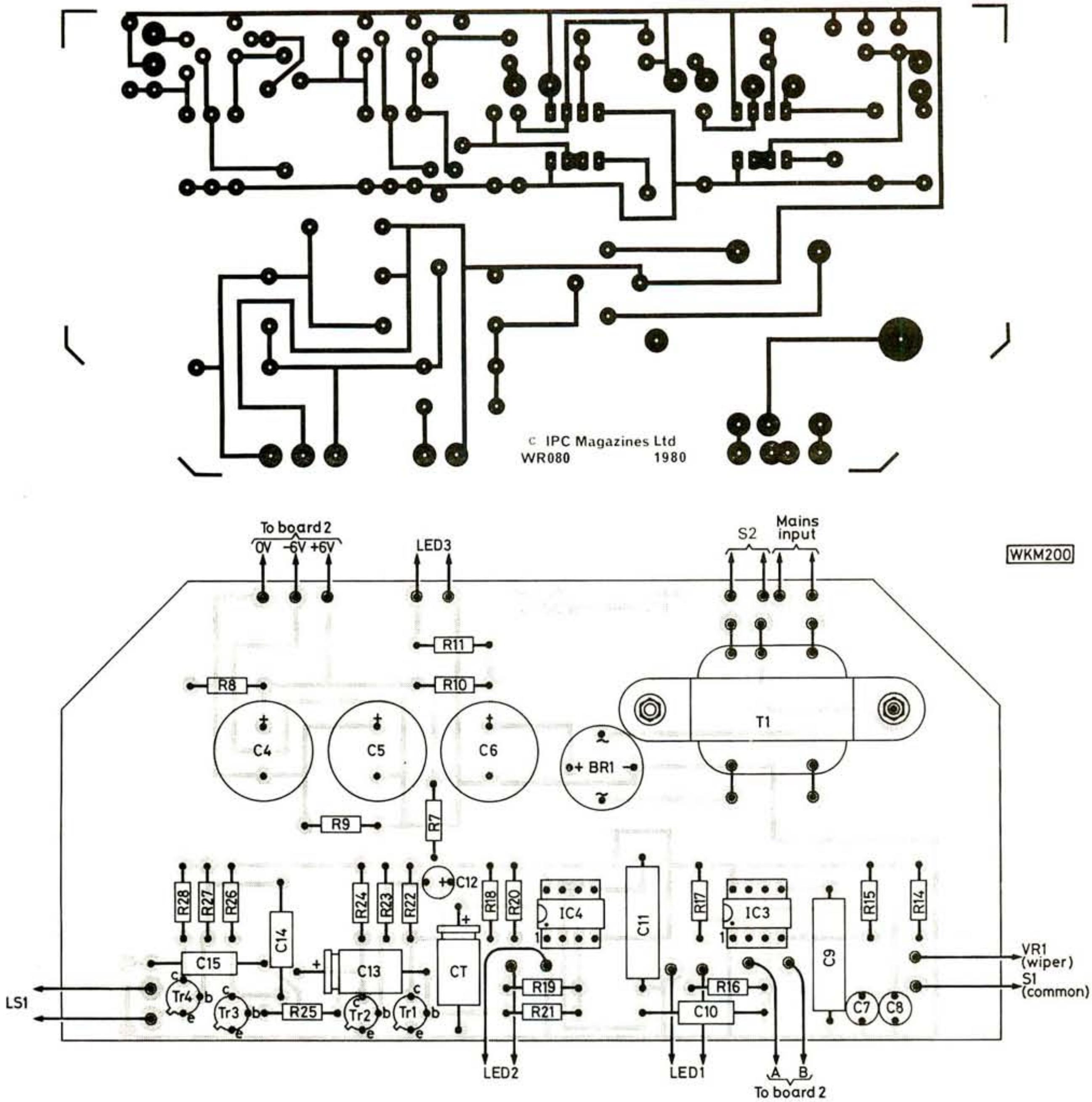


Fig. 6: The copper track pattern (top) is shown here full size with the components layout below it

Providing one returns to receive within the 5 to 10 second period of warning, the timer will automatically reset with the green and red l.e.d.s off. However, should a transmission shorter than the allotted time be made, the warning bleep will sound after which the 741 op. amps. will be returned to their original states and IC3 will be reset ready to be triggered again on the next transmission. The timer will automatically reset itself at the end of the warning period even if you continue to transmit over time.

Construction—General

No special layout is required for these circuits and each could be accommodated on plain Veroboard with component to component wiring. It would however be advisable to house the circuits in a metal box to prevent pick up of stray r.f. when transmitting.

Construction

Although actual board layout is not critical that shown in Figs. 6 and 7 is recommended. The sizes of p.c.b. used for each part of the circuit were such that they fitted into a small Verobox as shown in the pictures of the prototype.

It is important not to earth the r.f. input socket except at the 0V rail of the board containing IC1 and IC2 because of the split potential supply of these i.c.s.

The loudspeaker for the warning bleep may be any small transistor radio type but preferably with an impedance higher than the usual 8Ω.

The r.f. choke (RFC1) is quite easy to make and consists simply of a winding of 30 s.w.g. enamelled wire about 20mm long and 4mm in diameter. A piece of thin round wood or plastic serves as a former.

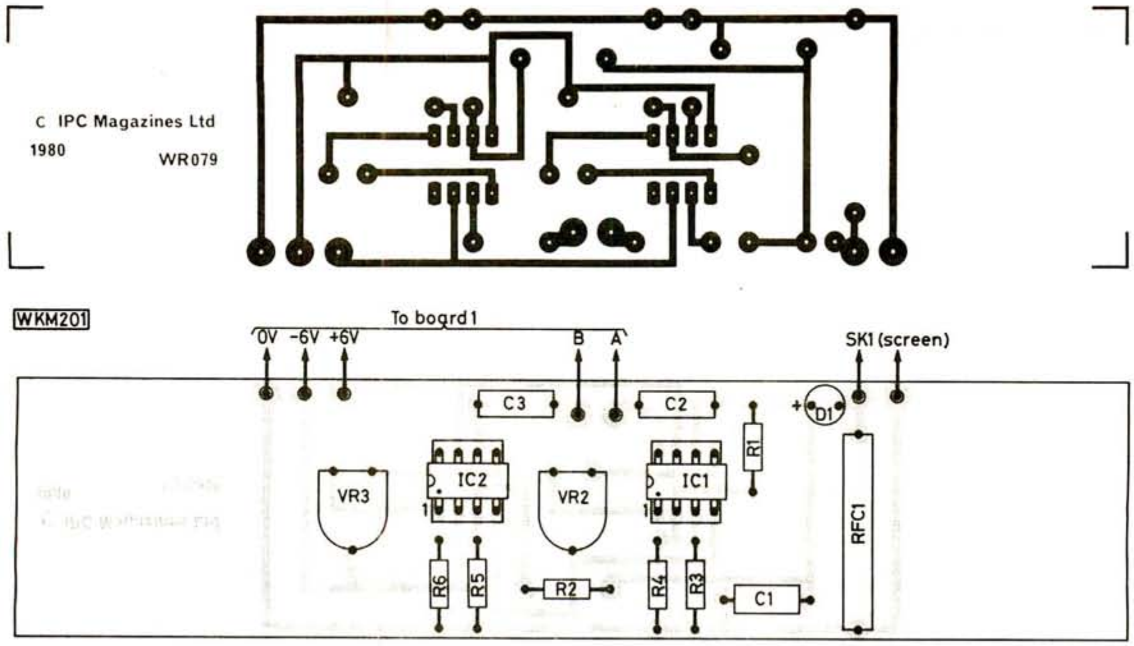


Fig. 7: The copper track pattern (top) of the r.f. input board shown full size with the component placement drawing below it

Adjustments

The op. amp. IC1 is set to a conducting state by VR2 and the voltage at pin 6 should be about 4·25V positive with respect to the 0V rail. Next adjust VR3 so that IC2 is just switched to a non-conducting state with about 4V negative at pin 6 with respect to the 0V rail. In the quiescent or reset mode LED1 and LED2 should both be extinguished.

The r.f. activating signal is picked up by means of a few turns of wire wrapped round the transmitter aerial feed cable as in Fig. 8 and connected to the timer via a length of coaxial or ordinary screened cable terminated with a phono type plug.

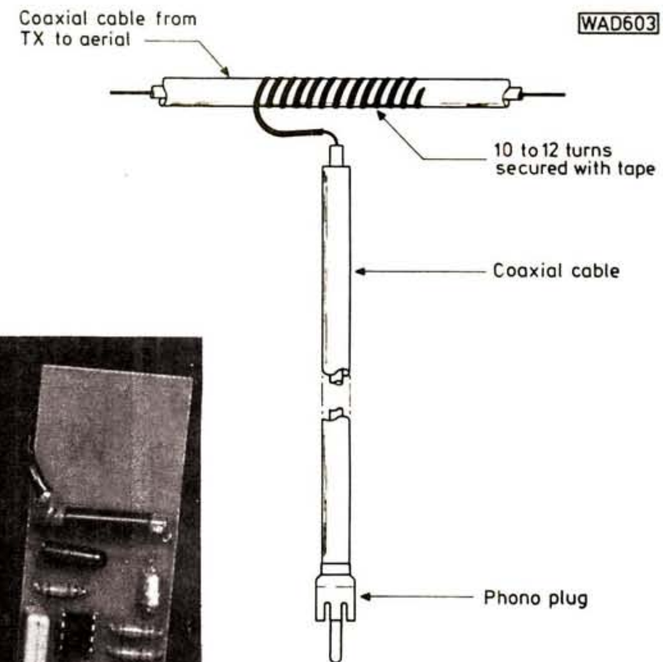
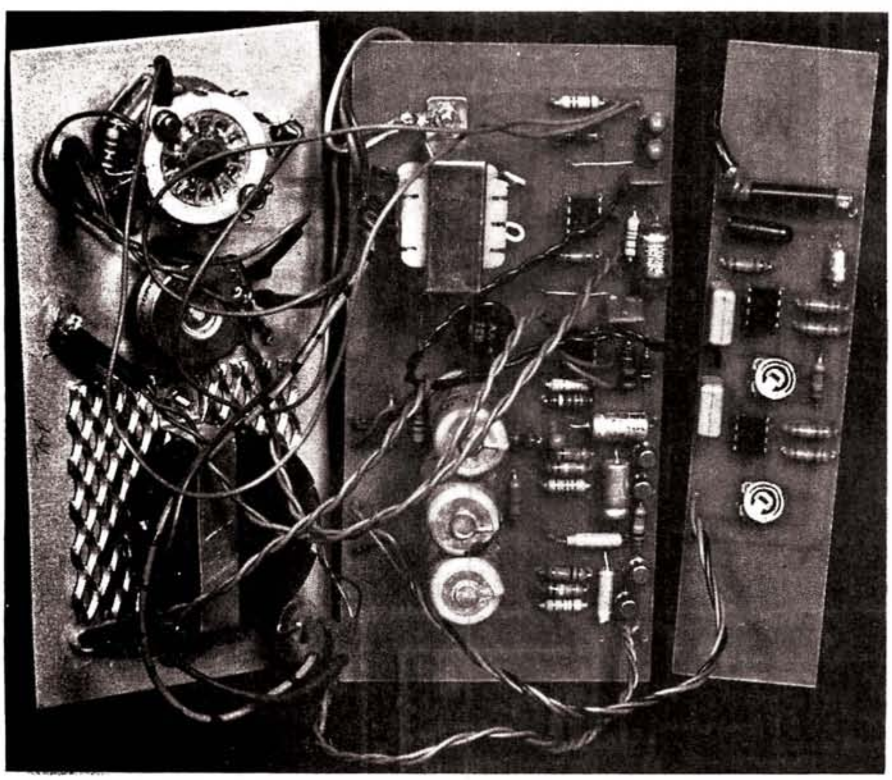
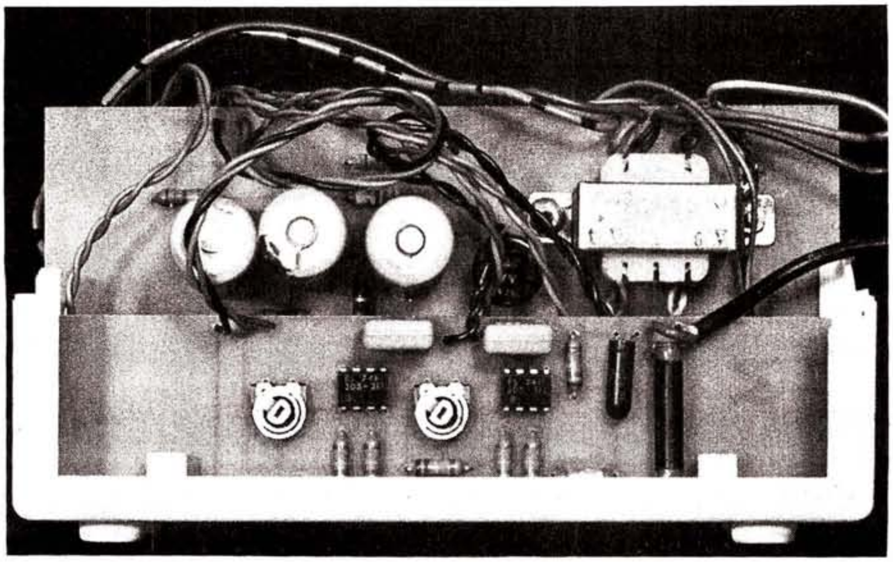


Fig. 8: The construction of the r.f. pick-up. The ten or twelve turns of wire are wound round the coaxial cable from the transmitter to the aerial



The two p.c.b.s and the front panel before slotting into the Verobox



The rear of the repeater timer with the back and top removed to show the relative positions of the two boards

Table 1

S1	VR1	Time
1	Min. Max.	15s 1m 15s
2	Min. Max.	1m 15s 2m 15s
3	Min. Max.	2m 15s 3m 15s

With the transmitter ON the LED1 (green) should light and extinguish only after the time set by VR1 and the switched values in the timing network of IC3. As LED1 goes out then LED2 (red) should light and the audible bleep activate for 5 to 10 seconds, after which, if the transmitter is still on, will stop and LED2 will extinguish. In normal use the red indicator and bleep is the signal to return to receive before the repeater times out. If a very short transmission is made then LED1 will light but extinguish as soon as the transmitter goes off whereupon LED2 will light and the bleep will sound after which the timer will completely reset.

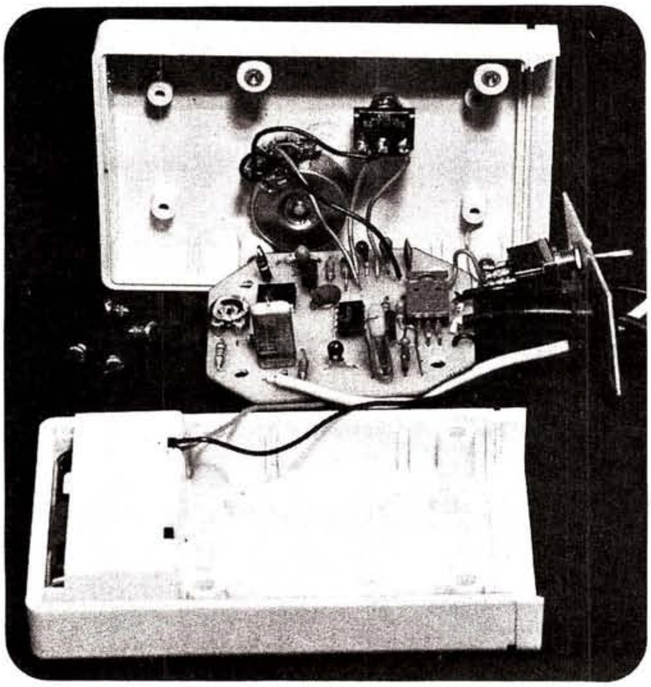
The response of D1 and the op. amps. is such that the timer should operate with a transmit power of less than 1 watt. It may however be necessary to move the r.f. pick-up coil one way or the other along the Tx aerial feed cable to get maximum r.f. at low power.

Finally, the timing available with the switched Ct Rt network (IC3) in Fig 5, should be approximately as shown in Table 1.

The potentiometer VR1 could of course be calibrated in seconds or a small chart made with the most used repeater callsigns and access times set against appropriate positions of S1 and VR1. ●

ACOUSTIC FLASH TRIGGER

▶▶▶ *continued from page 42*



the sound travels slower than the light, the author was left with the feeling that his friend's next suggestion might be to construct a light-operated trigger to photograph the thunder clap! ●

NEWS... NEWS... NEWS...

Exhibition

2LO Ashford Radio Museum, has organised an exhibition of vintage radio equipment.

The exhibition will include a collection of classic radio receivers, WW2 receivers and transmitters, and a unique collection of spy radios.

The exhibition will be held at Ashford Library, Church Road, Ashford, Kent, from Wednesday, 28 May until Saturday, 31 May and will be open between 10.00am and 5.00pm.

Further details from the organiser: *Bob Warner, 45 Eastry Close, Ashford, Kent. Tel: (0233) 36185.*

RAE Course

The Kingston and District Amateur Radio Society have organised a summer RAE course which should prepare students for the December 1980 examination.

The lecturer will be Andy Martin G3ZYS, and the classes will be held on Tuesday evenings between 1930 and 2130hrs, from Tuesday, 15 April until Tuesday, 28 October. The classes will be held at "Alfriston", Berrylands Road, Surbiton, Surrey.

Further details are available from: *Norman Smith G3HFO, 7 The Byeways, Surbiton, Surrey (Tel: 01-399 9526),* with whom applicants should register. The local education authority is not associated with this course.

New Catalogues

West Hyde Developments Ltd. the instrument case specialists, advise us that their latest catalogue is now available.

The 80-page catalogue describes nearly 1000 different instrument cases, in almost 650 sizes. Also featured is an extensive range of tools and accessories which includes test gear, knobs, handles, switches and indicators.

To obtain your free copy of this very useful catalogue, call-in or apply to: *West Hyde Developments Ltd., Unit 9, Park Street Industrial Estate, Aylesbury, Bucks. Tel: (0296) 20441.*

Designed to a new format, their latest 52-page "Hobbyist Catalogue" has just been released by Vero Electronics.

The catalogue contains a selection of products that are particularly useful to the home constructor.

To obtain your copy, send 40p—to cover post and packing—to: *Vero Electronics Ltd., Industrial Estate, Chandler's Ford, Eastleigh, Hampshire SO5 3ZR. Tel: (042 15) 69911.*

Mobile Rallies

The Nunsfield House Community Association Amateur Radio Group—G3EEO, G3ZBI, G8KGC, have organised the Elvaston Castle Mobile Rally to be held on Sunday, 8 June 1980.

The rally will be held on the showground at Elvaston Castle Country Park, which is five miles south-east of Derby on the B5010. Talk-in will be available from 0930hrs from GB2ECR. The rally will have all the usual attractions including a grand Bring-and-Buy sale, RSGB publications, prize draw, refreshments, children's entertainments, plus various displays and events.

The organisers anticipate having over 60 trade stands and expect an attendance in excess of 6000 people. Further details from: *Ian M. Cage G4CTZ, 25 Petersham Drive, Alvaston, Derby DE2 0JU.*

Another outdoor amateur radio event for the whole family is the East Suffolk Wireless Revival, organised by the Ipswich Radio Club and Martlesham Radio Society.

To be held at the IACSSA Sportsground, Straight Road, Bucklesham, Nr Ipswich on 25 May 1980, will include among all the usual rally attractions, a transceiver clinic, aerial testing range and model aircraft flying display. Open from 1100hrs, admission will be 50p (children under 14 and car parking free).

Further details from: *Jack Toothill G4IFF, 76 Fircroft Road, Ipswich, Suffolk IP1 6PX. Tel: (0473) 44047.*

Amateur radio clubs and societies in Sussex, have joined forces and organised a mobile rally and exhibition. The date of the event is 1 June 1980, and the venue is the Brighton Racecourse, Brighton, Sussex. The racecourse is a particularly suitable site, as there is ample covered accommodation to house trade stands and demonstrations and there is also plenty of free car parking space.

As well as the usual trade stands there will be demonstrations by Raynet, Amateur Television, RTTY, Satellite Communications, Microwaves and Repeaters.

For the amateur whose family wish to visit the Brighton beach while he enjoys the rally, a free minibus service will take people to the beach and bring them back. Talk-in stations will operate on 70cm, 2m and 80m, together with a special QSL card for those who care to collect it from the talk-in station, which will be using a special "GB" callsign. It is also planned to feature a working amateur station, to provide more interest for the uninitiated.

Further details from: *The Hon Sec, Sussex Mobile Rally, 7 Dale Crescent, Patcham, Brighton, Sussex BN1 8NT. Tel: (0273) 693655 Ext. 2266, during office hours.*

New B/W Portable TV

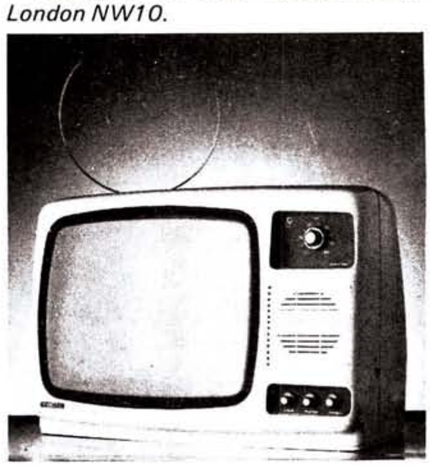
Fidelity Radio Limited, become probably the first British manufacturer to enter the monochrome TV market for many years with a totally new 12in portable, designed and produced exclusively by themselves.

Features of the new set include: simple design, easy operation and servicing, good reliability and a two year guarantee.

Powered by a.c. mains or 12V battery the white moulded cabinet houses circuitry employing the latest techniques. Programme selection is by rotary tuning and a single control combines on/off and volume. A brightness control and earphone socket are included together with a loop aerial and battery leads.

The new Fidelity television is expected to reach the shops by autumn 1980.

Fidelity Radio Ltd., Victoria Road, London NW10.



NIMBUS

Modular 2m Transceiver System

Base-Station Adaptor

(Part 4)

Michael TOOLEY BA G8CKT
&
David WHITFIELD BA MSc G8FTB

Anyone who uses a low-power, portable transceiver will, sooner or later, feel the need for increased r.f. power output in order to provide a greater working range. Another worthwhile modification is the addition of an r.f. pre-amplifier to improve the receiver sensitivity and thus aid the reception of those elusive weak signals.

Although the unit described was designed primarily for use with the *PW* "Nimbus", it may also be used in conjunction with almost any low power 2 metre transceiver having an r.f. output of between 250mW and 1W. The amplifier module provides signal gain in both the transmit and receive paths and offers several additional features including an automatic changeover system, using r.f. sensing, automatic protection of the power amplifier transistor and relative power (both forward and reverse) indication. The design uses readily available, low cost components and makes use of a single-sided printed circuit board. Self-contained power supplies are incorporated for both a.c. mains and a nominal 12V d.c. derived from vehicle batteries.

System Description

The basic arrangement of the add-on amplifier module is shown in block schematic form in Fig. 1. The transmit and receive paths are selected by means of a relay switching circuit which is itself operated by an automatic changeover circuit. This senses the level of r.f. appearing at the transceiver output and causes the amplifier module to switch from receive to transmit mode whenever the transceiver is transmitting. The level of r.f. required to produce this switching action is quite small, typically 50mW, but when no r.f. is detected the changeover circuit reverts to the receive mode.

A low noise r.f. pre-amplifier using a second generation dual gate MOSFET device is incorporated in the receive path. This provides very high gain, typically around 20dB, coupled with a very low noise figure of less than 3dB. The cross-modulation performance is excellent and the stage does not require neutralising. The input and output impedances of the r.f. pre-amplifier are matched to the 50Ω system used in the "Nimbus".

A single stage r.f. power amplifier is incorporated in the transmit path and this uses a high gain, ballasted emitter v.h.f. power device designed primarily for mobile and marine applications. The transistor is capable of providing a power gain in excess of 12dB (approximately 16 times), when operated from a 12V supply. Even though the transistor is electrically rugged and will withstand a severe mismatch under driven conditions, an additional protection circuit is incorporated in order to remove the collector supply from the stage whenever an unacceptably high voltage standing wave ratio is present. This would occur, for example, if the amplifier module were to be operated without an aerial connected!

The input voltage to the protection circuit is derived from a directional coupler standing wave bridge. This also permits measurement of the relative power levels in the forward and reverse directions. This facility is not only useful in the setting-up procedure but can also be very advantageous when optimising aerial and feeder systems.

Internal 12V d.c. supply rails are derived from a regulated power supply which operates from 240V a.c. mains. As an additional feature, a facility is included for powering the amplifier module from a nominal 12V battery. This ensures that the amplifier can be operated both mobile and portable as well as from a fixed station. A further refinement is that a 12V d.c. output is available

★ components

Resistors

$\frac{1}{4}$W 5% carbon

100Ω	2	R8,9
220Ω	2	R3,4
470Ω	1	R6
1kΩ	2	R7,13
3·3kΩ	3	R1,10,11
100kΩ	2	R2,5

Wire-wound 2·5W

1Ω	1	R12

Potentiometers

Miniature preset (horizontal mounting) 0·1W

1kΩ	1	VR1

Standard lin.

50kΩ	1	VR2

Capacitors

Min. ceramic

22pF	1	C16
4·7nF	11	C1,2,3,4,6,10,11,12,13,15,17

Polyester

10nF	1	C18
100nF	1	C8

16V Tantalum bead

10µF	3	C5,7,14

25V Electrolytic

2200µF	1	C9

Min. ceramic trimmers

3–30pF	2	TC1,2
3–40pF	4	TC3,4,5,6

Semiconductors

Transistors

2N3819	1	Tr3
2N6080	1	Tr2
3N204	1	Tr1
BC548	1	Tr5
TIP31A	1	Tr4
BTX30–400	1	CSR1

Integrated circuits

7812	1	IC1

Diodes

OA91	4	D1,2,3,4
1N4001	1	D10
1N4148	3	D5,8,9

Light emitting diodes

0·2in red	1	D6
0·2in green	1	D7

Rectifier

RS262–141	1	BR1 (50V 1A)

Transformer

RS207–532	1	T1 (12V 1·6A)

Miscellaneous

Min. toggle switches d.p.s.t., 1 (S1); s.p.s.t., 1 (S2); 12V p.c.b. relay d.p.c.o. RS349–658, 1 (RL1); SO239 sockets, 2 (SK1,2); 4mm sockets red and black, 1 of each (SK3,4); 3-pin min. chassis mounting mains socket, 1 (SK5); anti-parasitic beads, 3; printed circuit board, 1; diecast box (220 × 146 × 56mm), 1; 100µA meter RS259–561, 1; mica washers for TO220 devices, 2 sets; material for heatsink.

Table 1: The full coil winding details

Coil	Wire s.w.g.	Wire Type	Turns	Inside diameter in mm	Winding length in mm	Tap details
L1	18	t.c.	5	5	16	$1\frac{3}{4}$T from common end
L2	18	t.c.	5	5	16	$1\frac{1}{4}$T from positive supply
L3	18	t.c.	4	5	7	—
L4	18	t.c.	7	5	15	—
L5	18	t.c.	5	5	16	—
L6	18	t.c.	straight	—	80	—
L7	20	enam.	straight	—	70	—
L8	20	enam.	straight	—	70	—
L101	14	t.c.	$3\frac{1}{2}$	8	24	$\frac{1}{4}$T from earth end
L102	14	t.c.	$3\frac{1}{2}$	8	24	$\frac{1}{4}$T from earth end
RFC1	30	enam.	3	wound on ferrite bead	see Fig. 5	—

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Trio TS 820S	£669.00
Trio TS 180S	£679.00
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FDK Palm 11	£99.00
Yaesu FT 202R	£119.00
FDK Palmsizer	£149.00
Trio TR 2300	£166.00
Yaesu FT 207R	£199.00
Trio TR 2400	£210.00

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FDK Multi 750	£295.00
Icom IC 260E	£369.00
Icom IC 251E	£479.00
Trio TR 9000	£365.00

HF RECEIVERS

Lowe	£178.00
Yaesu FRG 7	£214.00
Trio R 1000	£298.00
Yaesu FRG 7000	£372.00

2 METRE FM MOBILES

FDK Multi 700EX	£199.00
Trio TR 7625	£246.00
Standard C 8800	£250.00
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Icom IC 255E	£265.00

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The STANDARD C8800 is one of the most sophisticated FM transceivers available on the market today. We have compared its receiver performance with several other rigs and can confirm that it is the most sensitive rig that we have found. The meter is a two-colour LED array, thus removing any potential meter reliability problems.

The tuning buttons on the microphone step the frequency up or down by 25kHz (or 5kHz as required). S20 or S22 can be instantly selected by a single button. Other extras include a 3-position attenuator, 5 programmable memories and scanning of memories or 1MHz band sections with stop on busy or clear channels.

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ONLY **£298** inc. VAT & Carriage

The new R1000 general coverage receiver incorporates all the features you would expect on a high quality product from TRIO.

A PLL synthesiser covers 30 switch selected bands up to 30MHz with both digital and analogue tuner for ease of use.

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Built in noise blanker to cut pulse type noise.

Simple RF tuning without pre-selector. Band pass filters are automatically switched in on the MHz band switch.

Other features include built in digital clock, large speaker, RF attenuators, tone controls, recording jacks, multiple antenna inputs etc. etc.

Why not try this new receiver? It would look good on any bookshelf and out performs many receivers presently available.

To order any of the above items simply write to the above address or telephone 0444 400786,, giving your address or Barclaycard number to ensure same day despatch.

2 METRE RECEIVERS

Search 9	£45.00
FDK TM56B (+ scan)	£105.00
Bearcat 220	£241.00

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ROTATORS (Carr. £2.50)

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CALLERS WELCOME

BREDHURST ELECTRONICS

MAKE IT A GOOD START

EXPERT ADVICE

A GOOD START is essential to short wave listening and good, sound advice is important in achieving this – So here's some – If you've made up you're mind to buy a receiver you should be aware it will perform only as well as the antenna it sees. The old adage regarding wireless antennas "As long and as high as you can" is still good, but at best is only good for PEAK PERFORMANCE on one or two frequencies, at worst none.

Whichever frequency you tune your receiver to, for PEAK PERFORMANCE on all frequencies you need good matching between your Receiver and Antenna to hear the best from it. If you plan to listen on the high frequency bands up to 30MHz then you know you can't have an antenna for every frequency! Or can you? – Well Not quite! BUT we can offer you MUCH IMPROVED PERFORMANCE from your receiver by using an antenna tuning unit, that will electrically change the length of your antenna to match the frequency you select – In other words – A MATCH AT ALL FREQUENCIES.

You'll see many attractions being advertised under gimmicky names, but when it comes down to it they're only random wires or odd configurations. At the end of the day, if you're expecting the performance the manufacturers specified, that you'll still have to buy an antenna tuning unit.

Tell you what we'll do – we'll prove it to you – we'll give you one ABSOLUTELY FREE when you buy your FRG 7 or FRG 7000 and we'll give you complete advice on an antenna to suit your available space, which should only cost you a couple of pounds!

So let's put the offer in big print for you!

1 YAESU FRG 7 + AMTECH 200 ATU £214.00
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What's the difference between the Amtech 200 and Amtech 300? Well both will tune any random length of wire but the Amtech 300 will do a little extra – it will also tune co-axial fed antennas – Their normal selling price? The Amtech 300 £39.95 – The Amtech 200 £25.95 – What can you lose?

So get cracking MAKE A GOOD START! HAVE PEAK PERFORMANCE FROM THE OFF.

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FT 307CBM 300W SSB 80–10 + 11 m Transceiv. with all access. built-in	£860.00
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FV 307 VFO for FT 307 CBM	£92.00
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FL 2277B 1.2KW Power Amplifier 220V	£399.00
FT 901DM 200W SSB/AMFM Transc. 12/220V 80–10+11m w. Keyer memory AM+CW filter	£914.00
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RE-CHARGEABLE BATTERIES & SUPPLIES	
"AA" Nickel cadmium (Nicads) 500mA/hr.	£1.08
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C8800 "STANDARD" 2 metre FM Mobile transc. 5 or 25kHz steps over the whole band. S20 & 22 are pre-programmed. Two repeater offsets 600kHz fitted as standard. Scanning by two speed scan, five programmable memories TB.S meter.	£252.00
C7800 "STANDARD" 70cm FM Mobile covers 430-439.975 in 25kHz steps. Five programmable memories, fast/slow scan, 1.6 & 4.6MHz offsets, digital readout, TB, 10 watts	[illegible]
SR-9 2 metre monitor receiver with VFO and Xtal positions (extra).	£51.95
BK1-00 Semi-automatic "Bug" key, heavyweight base.	£17.88

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Made in our own factory to exacting standards, well rated transformers, plated/anodised/stove enamelled/screen printed cases of steel, first quality components only, glass fibre PCB's roller tinned, full size heatsinks, combine to produce highly reliable robust DC supplies of exceptional DC characteristics	
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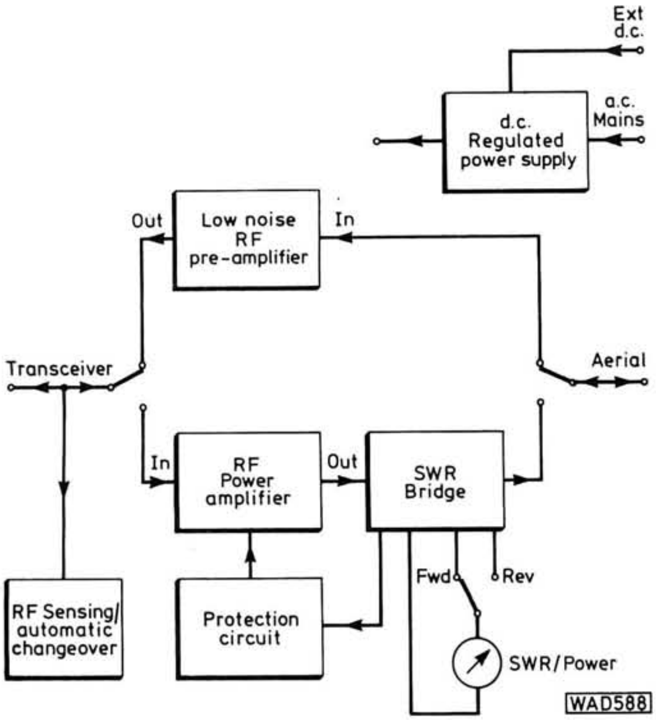
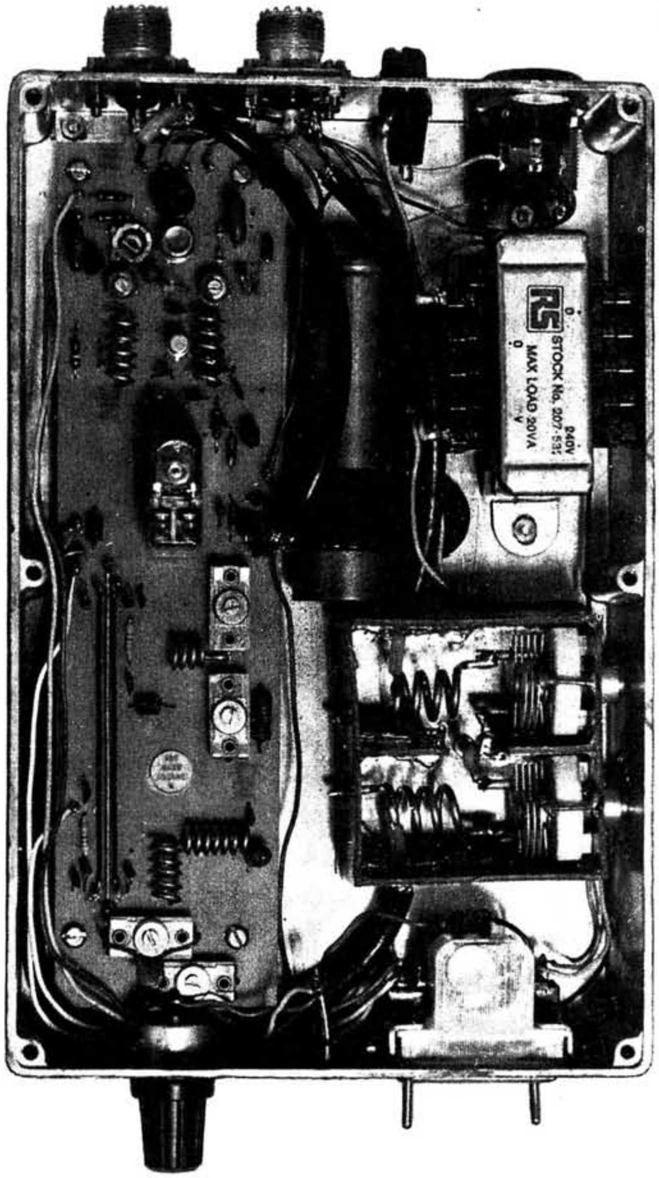


Fig. 1: Block schematic of the power amplifier module but not including the aerial filter



★ specification

RECEIVE PRE-AMPLIFIER

Frequency range:	144–146MHz
Gain:	18dB typical
Noise figure:	2·4dB typical
Input impedance:	50Ω
Output impedance:	50Ω

TRANSMIT POWER AMPLIFIER

Frequency range:	144–146MHz
Gain:	10·5dB typical
Output (r.f.):	6W for 500mW input 5W for 400mW input 3W for 200mW input
Efficiency:	65% typical
Input impedance:	50Ω
Output impedance:	50Ω

OPTIONAL FILTER

Bandwidth:	±1·5MHz (−3dB)
Centre frequency:	145MHz
Insertion loss:	less than 1dB
Loaded Q:	50

GENERAL

Supply:	240V a.c. or 12 to 14V d.c. at 1A
Changeover:	Automatic (minimum r.f. input to actuate is 50mW)
Protection for p.a.:	Automatic (adjustable for v.s.w.r.)
Meter:	Switched for forward or reverse power (s.w.r. calibration optional)

from the amplifier module to provide power for the "Nimbus" or any other transceiver used as the exciter. This makes a considerable saving on the internal battery consumption of the "Nimbus" when it is operated in conjunction with the amplifier module.

An optional r.f. filter unit may be fitted in the aerial line at a point where it is common to both the transmit and receive paths. The filter not only helps to ensure a "clean" transmitted signal, but also improves the performance of the receiver when strong out-of-band signals are present.

Circuit

The complete circuit diagram of the power amplifier unit is shown in Fig. 2 but does not include the optional filter unit. Transistor Tr1 operates as a conventional common source amplifier using a dual-gate field effect transistor. The potential divider formed by R1 and R2 sets the bias voltage at gate 2 of Tr1. The d.c. voltage at gate 2 has a major effect on the performance of the stage and, if desired, R1 can be varied in order to alter the operating parameters of the stage.

For example, the value of R1 may be usefully increased to, say, 10kΩ to provide extra front-end gain. In practice,

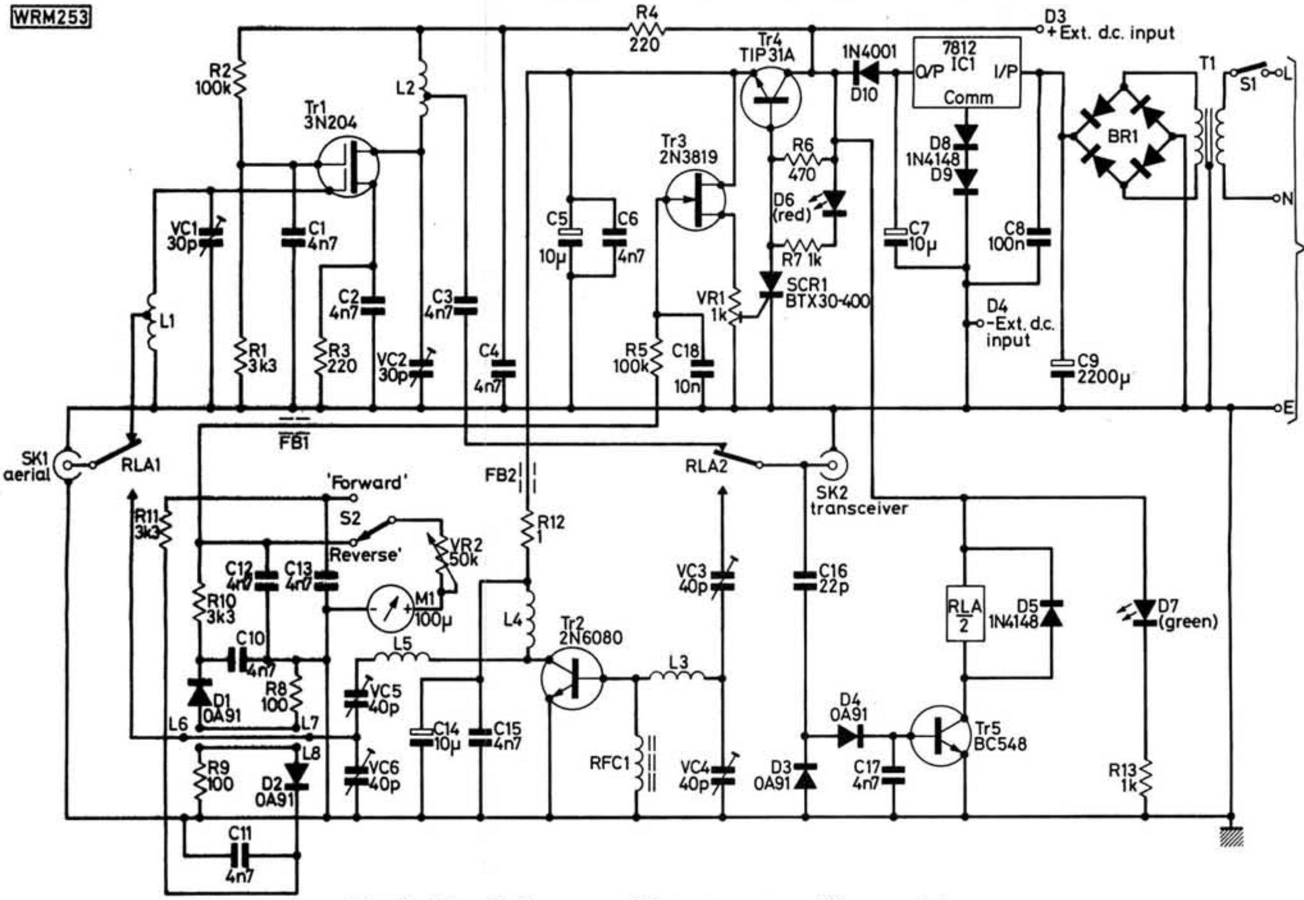


Fig. 2: Circuit diagram of the power amplifier module

however, the value of bias voltage at gate 2 affects not only the voltage gain of the stage but, since the bias controls the value of drain current, it also has an effect on the cross-modulation performance.

The actual value chosen for R1 is thus something of a compromise between adequate gain and cross-modulation performance. In any event, the value should be low enough to ensure that the front-end is unconditionally stable since with such a high gain device there is a tendency for the stage to go into self-oscillation with more than 2·5V of bias on gate 2. Input and output matching is achieved by suitable tappings on L1 and L2 which both tune to 145MHz by means of TC1 and TC2 respectively.

Transistor Tr2 operates in the common emitter configuration in Class C mode. Wide-band supply line decoupling is provided by R12, C14 and C15 which is essential with most types of v.h.f. power transistors in order to ensure complete stability at all frequencies. Input matching is obtained by the capacitive potential divider formed by TC3 and TC4 with L3 matching the extremely low input impedance of Tr2. Inductor L4 acts as a "quarter-wave" choke in the collector supply to Tr2 and thus represents a high impedance at 145MHz. Inductor L5 and the combination of TC5 and TC6 are resonant at 145MHz and output matching is achieved by the capacitive potential divider formed by TC5 and TC6.

The r.f. sensing circuit is formed by D3, D4 and Tr5. When D3 and D4 conduct (by the application of a few tens of milliwatts to SK2), a forward bias voltage of approximately 0·6V is applied to the base of Tr5. This causes Tr5 to saturate and consequently the collector voltage falls and the relay becomes energised. Diode D5 is incorporated to absorb the back e.m.f. generated by the relay inductance.

Diodes D1 and D2 and associated components form the directional standing-wave bridge. The diode D1 provides an output which is proportional to the reverse power and D2 provides an output which is proportional to the forward power travelling along the transmission line formed by L6 and the copper earth plane of the p.c.b. The voltage proportional to the reverse power is also used to operate the protection circuit.

Transistor Tr3 acts as an impedance matching device and the output voltage developed across RV1 is used to trigger CSR1. The sensitivity of the protection circuit is set by RV1 and, once triggered, CSR1 will remain conducting until the supply is interrupted. When conducting, CSR1 holds the base voltage of Tr4 at a very low level which, in turn, prevents Tr4 from conducting and removes the collector supply voltage from Tr2.

Power Supply

A conventional power supply arrangement is used. Full-wave bridge rectification is provided by BR1 and feeds an integrated circuit regulator. Diodes D8 and D9 are used to raise the output voltage slightly and compensate for the voltage drop across D10. This diode prevents d.c. from entering the regulator when the amplifier module is operated from an external d.c. supply.

Construction

In order to realise the design specifications it is important that the constructional notes and diagrams are closely followed. Use of the recommended single-sided p.c.b. layout is essential and most of the components for the amplifier module are mounted on this. The copper track layout is shown in Fig. 3 with the corresponding component layout in Fig. 4. All coils should be carefully wound

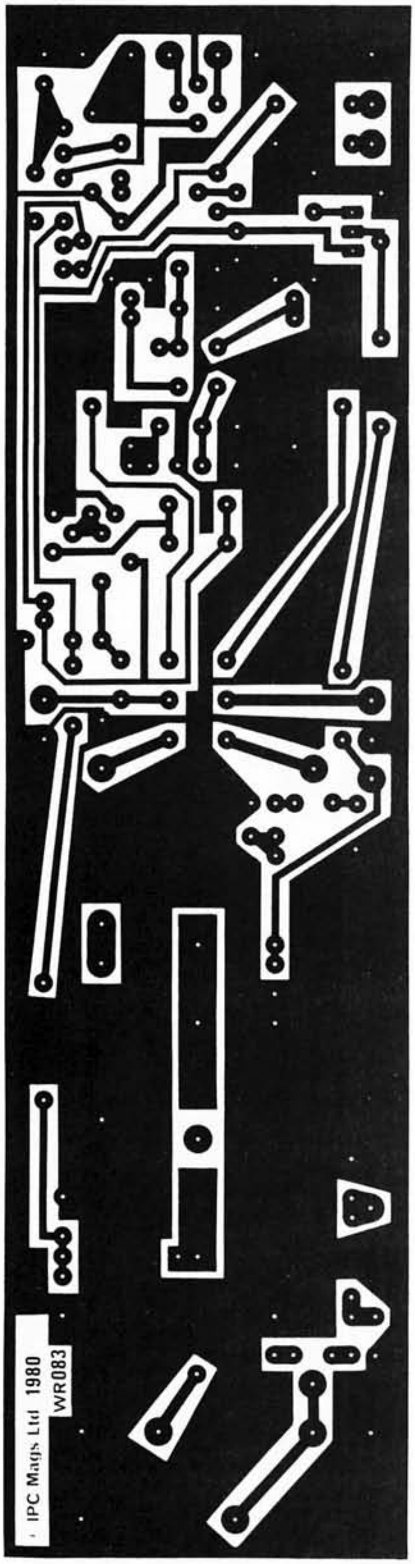


Fig. 3: Copper track layout of the amplifier p.c.b. module shown full size

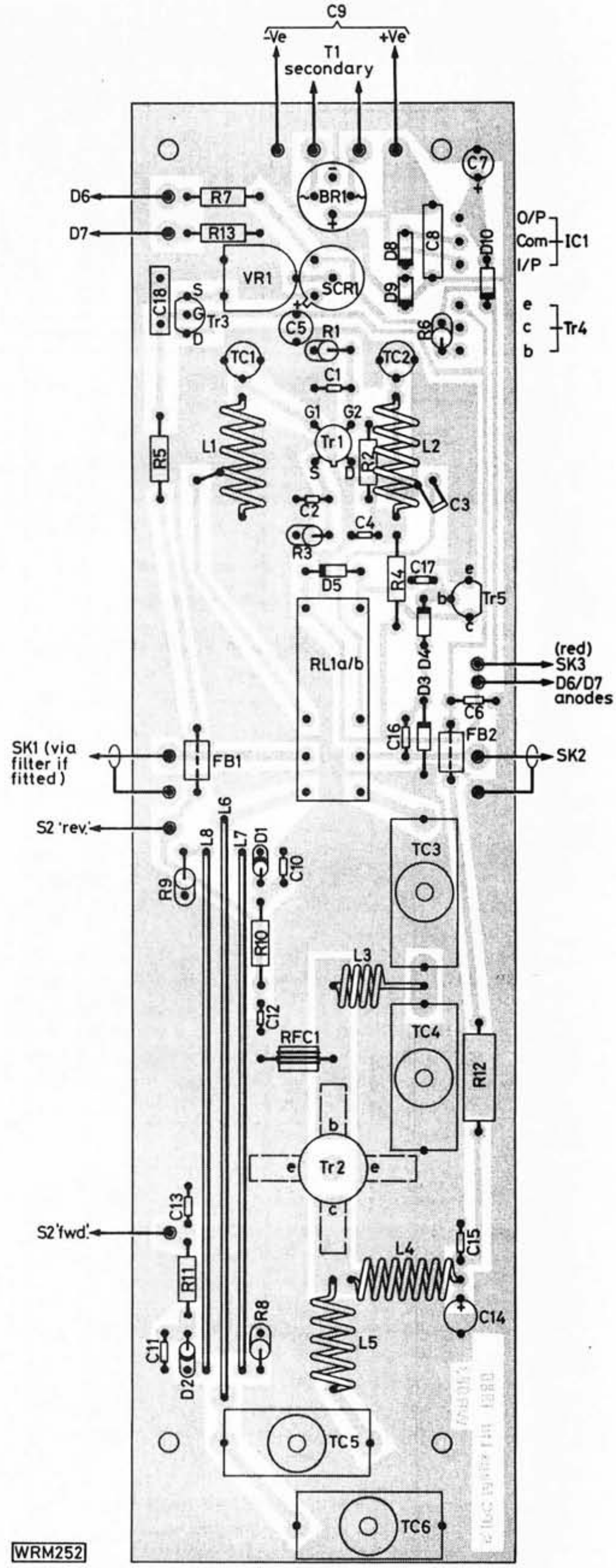


Fig. 4: Component layout on the amplifier printed circuit board

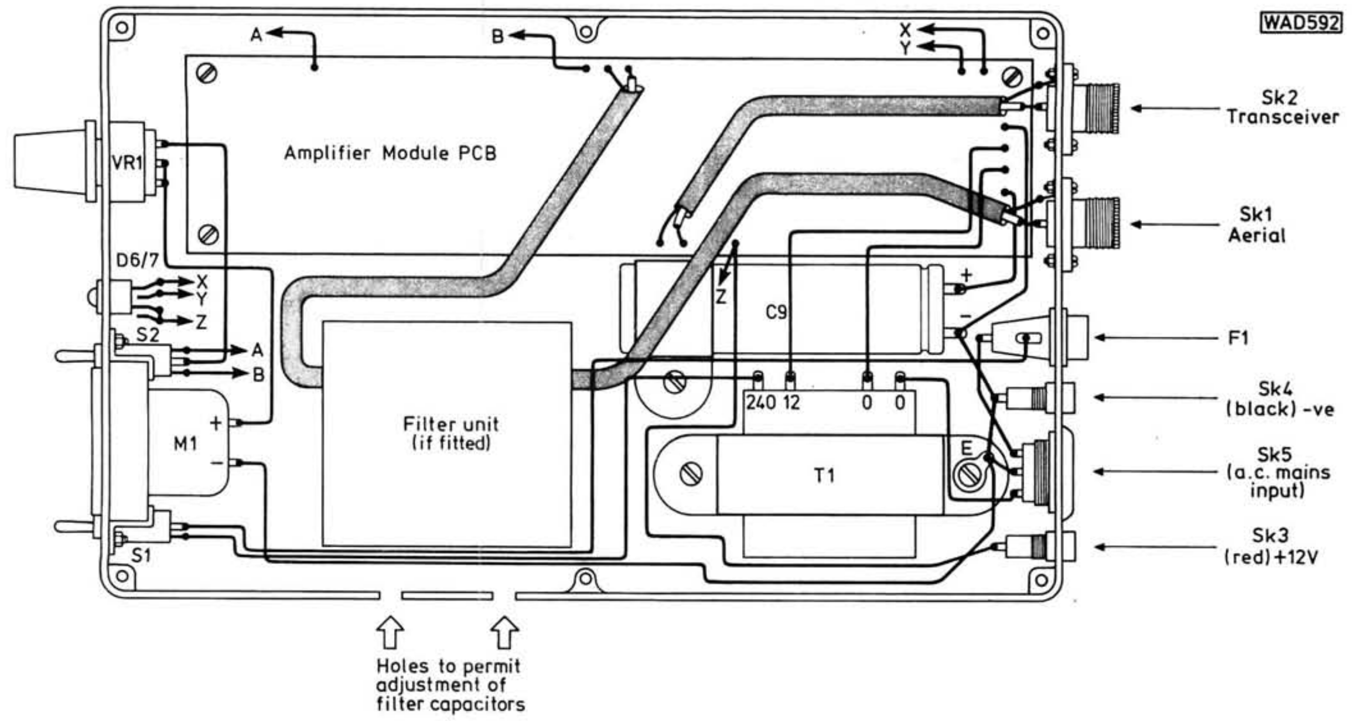


Fig. 5: Interconnecting wiring and internal layout of the complete p.a. module also showing the position of the filter unit

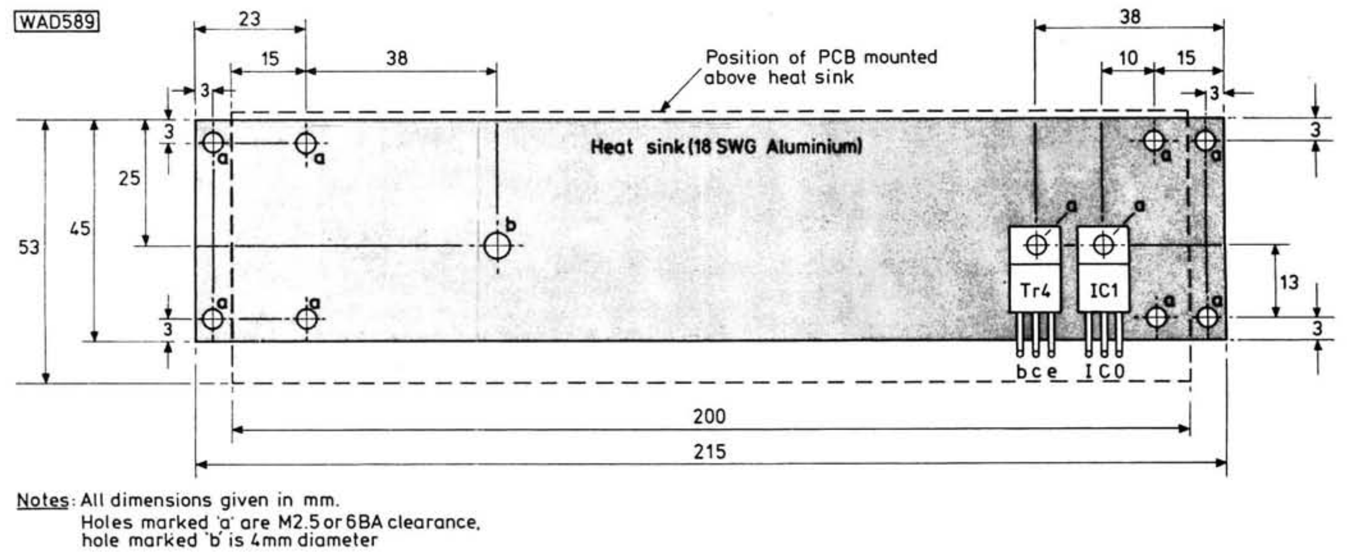


Fig. 6: Drilling details and layout of the heatsink. Holes marked "a" are 2·5mm clearance; the hole marked "b" is 4mm in diameter

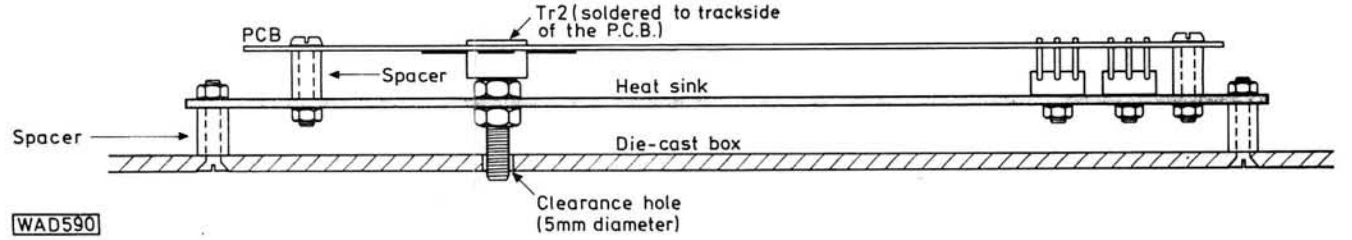


Fig. 7: Side view of completed p.c.b. and heatsink assembly. The clearance hole shown should be 5mm diameter

according to the details given in Table 1 and RFC1 is constructed using a ferrite bead.

The main line, L6, and the pick-up lines, L7 and L8, of the s.w.r. bridge should be in close proximity (not quite touching) and should run along the surface of the p.c.b. This is important in order to maintain the correct ratio of inductance to capacitance, the capacitance being formed between the line and the copper earth plane on the underside of the p.c.b.

Although Tr1 has internal gate protection, it is wise to treat it with care and only a properly earthed soldering iron should be used. Transistor Tr2 should be soldered to the underside of the p.c.b. with its mounting stud facing downwards ready to accept the heatsink plate. Devices IC1 and Tr4 should not be soldered down until after the heatsink assembly has been attached. Once the construction of the p.c.b. has been completed and carefully checked, the heatsink (shown in Fig. 6) should be fabricated using 16 or 18 s.w.g. aluminium, the p.c.b. being supported above the heatsink by means of four short spacers. Care must be taken not to strain Tr2 package.

The leads of IC1 and Tr4 (previously mounted on the heatsink before attaching the p.c.b.) should be bent upwards and soldered to the underside of the p.c.b as shown in Figs. 4 and 7. Note that both IC1 and Tr4 require mica washers and insulating bushes.

The completed p.c.b. and heatsink assembly is secured to the base of the diecast box using four countersunk screws and spacers, as depicted in Fig. 7. The internal layout and wiring of the amplifier module is shown in Fig. 5. For clarity, the coaxial interconnections have been shown taking the most direct routes. It is, however, important that all cables and wiring are kept clear of the components mounted on the p.c.b. In practice this means that the coaxial cables should run around the periphery of the p.c.b. and heatsink assembly. The reservoir capacitor, C9, is retained by means of a suitable mounting clip. If the filter unit is incorporated, two holes should be drilled in the side of the diecast box to facilitate adjustment of the trimmer capacitors.

Next Part

In Part 2 we will deal with the complete testing and alignment procedures in association with the "Nimbus" transmitter/receiver and also the construction and testing of the optional filter assembly which may be included in the finished unit if required.

Please note that in the PW Nimbus components' list in the March issue, page 26, R110—330Ω and C120—10nF were not listed.
In the April issue, Fig. 8, page 47, the capacitor to the right of R105 is C106. Resistor R122 is shown twice; the lower one should be R133. Resistor R100 is also shown twice, the upper one adjacent to R124 should be R109. Capacitor C238 should be marked C138.
In Fig. 10 on page 48 of the April issue, C12 in L3 should read C17, C55 in L7 should read C35 and C25 in L5 should read C23. Capacitor C30 (10nF) is omitted from Fig. 8 on page 47 and should be connected between the junction of R22 and L9 to the nearest earth point.
Instruction 5 under "Wiring and Internal Layout", April issue, should read as follows:
The modulator board should not be placed in close proximity to the p.a. transistor, Tr6 and associated components.

ON THE AIR

AMATEUR BANDS

by Eric Dowdeswell G4AR

From handling over 50 letters a month from readers of this column I get a fairly broad idea of general thinking on amateur radio matters. The one point on which there seems to be some rather confused ideas and misunderstanding at the moment is that of sunspot activity and its significance.

I am sure that most readers by now realise that high sunspot activity infers good DX conditions on the higher frequency bands, particularly the 10m (28MHz) band which can otherwise be quite dead for long periods during the quieter moments on the sun's surface. But I was quite alarmed at the ideas of one reader, who was very dubious about buying a new receiver because "We have passed the peak (of sunspot activity) and I won't be able to hear any DX after that!"

The so-called 11-year cycle of solar outbursts is in fact a very slowly changing phenomena with the unfortunately-named "peaks" being quite flat in fact. So flat indeed that we don't really know when the "peaks" have occurred until some months afterwards, when all the information collected by solar laboratories has been collated and evaluated to produce the "smoothed" sunspot number for the period under review.

There is no question of fairly low sunspot activity ambling along and then suddenly jumping up to a definite peak every 11th year and then dropping back again. At the moment there is a general impression that we may have passed the point of maximum sunspot activity for the 21st solar cycle, but only if the present slight fall off continues for several months to come shall we be proved right. It may be that this trend is just a slight dip in activity with an even higher maximum to come. That is how much we know about the subject! In any case, from past experience we know that the decline in activity takes place over a longer period than does the increase, which can be relatively fast.

The period between maxima also varies considerably, sometimes by a year or more, yet the oft-quoted "11-year cycle" is another term that is frequently taken as gospel. One expert has recently suggested that the true cycle of sunspot activity follows a 22-year period rather than 11 years, so it would not be impossible to have one long period superimposed on two shorter ones.

So, if you are just starting in amateur radio, don't let stories of failing sunspot activity deter you from going ahead with your plans for the h.f. bands. We still manage to communicate around the world at the bottom of the sunspot cycle, when no sunspots may be seen at all for long periods, by using the lower frequency bands. Then working all continents on the 160m band becomes possible, where such an achievement is extremely satisfying and the result of much hard work, which is more than can be said for the ease with which QSOs around the world can be made at present on the 10m band.

Out and About

I knew those two lads **John** and **Steven Goodier** were up to something at their Marple (near Stockport) QTH! They used to send in logs regularly, then it was "studying for the RAE" and no logs. Well, it's all paid off nicely for they are now G8VHF (what a call!) and G8VHE, respectively. They have an FT225RD rig and are already active on 2m. Just to encourage others they mention that they did all the work for the RAE at home from textbooks, but "we just stuck to it and things turned out for the best". The task took them just a year "but it was worth it in the end". Good luck chaps and plenty of DX as I pass you over to Ron Ham!

Another of the ilk is **Arthur White** (Aisby, Lincs) who has been too busy studying to listen! He is also swotting on the code to take his G4 straight away, not being very happy with what he has heard on 2m around his way. In Tetbury, Glos, **Jim Rowlands** is still pondering on which receiver to put his money on, but he is being spurred to do something soon by the news that his eldest son has joined a radio club in EI land.

W. F. Daniels of 59 Eastleigh Road, Devizes, Wilts wonders if anyone can help him with information on a Marconi six-band communications receiver that he thinks is a CSR5, with bands ranging from 60kHz to 30MHz and a large 1155-type dial. It was working but isn't now!

The DX Scene

One of my European readers has told me about a remarkable bit of DXing with low power. He built a 2-element beam for 15m band using galvanised iron clothes line and, using a Heathkit QRP rig with just 2·5W input, promptly worked the States. More recently he called a VK3, never really expecting an answer, only to get a reply and report, and it would appear, by the long-path route! I await further reports! This surely must be very much more satisfying than working the stuff with hundreds of watts and a multi-element beam.

Ron Newall (Bracknell, Berks) has been playing about with an aerial which is essentially a dipole with the wire elements wound into a helix, the thing being adjusted to suit the limited space available. Main band of interest is 15m, which produced HC1EE, HK4CCW, KH6CK, P29JS, TR8GM, VK7NQC, XT2AW, YB1BSA, 5T5CM, 9X5GB and 9Y4NP. I gather from **Allan Stevens** of Crowthorne, Berks, that he too has passed the RAE and I was hoping to hear of his callsign 'ere this went to press. Congrats Allan and keep up the good work with the code practice. In the meantime, Allan has heard VQ9KJ (Chagos) and 6W8MW on 15m with J7DBB (Dominica) and TN8AJ logged on 20m, ending with the not-so-rare VO1FG on 80m.

Sad news from **Dennis Sheppard** (Sheerness, Kent) who had the burglars in, nicking his receiver but not his teleprinter! He has managed to borrow a Drake receiver for the time being. RTTY catches this month by Dennis include JA3VLD, JA4ONZ, VE1TX, VE4BF and ZS6ANZ on 10m, with HP1XAW, JA1JDD and VE6KV for 15m, plus DM3BBM/4X, JA1ADQ, ZS1Z and ZS6BLV on the 20m band. Dennis also tackled s.s.b. on Top Band, finding EA5TD, UQ2GBU and YU3EF.

In Maidenhead, Berks, **Sean Richards,** using his FR-50B and 66ft aerial, concentrated on 14MHz to log such as HS1ABD, SU1AL, S8AAT, TA2KS, VP2KAH, VK8NE, ZB2BL, 5N0AAS, 6Y5MT, ET3PG (QSL Box 5327, Addis Ababa) and 5V7GE for a pretty wide selection. The FR-50B is a new acquisition and a decided improvement over the old SX28, says Sean, with a digital frequency readout about to be added. Sean comments on the Caribbean Round Table net of an evening on 14 175kHz run by VP2MH and his 5-element beam and 1·2kW! Shouldn't have much trouble maintaining discipline with that combination!

John Dainty residing in West Wickham, Kent, has now got his KW2000 transceiver which reflects the confidence he has in the outcome of the forthcoming RAE in May. Like many readers this month, John comments on the fantastic conditions during the ARRL contest but, in fact, it was just the enormous increase in activity on the bands that gave that impression, at least in my humble opinion! On 80m John tracked down VP2AH and PY7WGB, with 20m providing FB8YY, FH8CL, J3DFS, JD3DE (Ogasawara Is), VP2ML and M1D. Only station of note on 15m was YC1BSA with a couple of ZS6's on 10m.

Another FRG-7 found a home with **Jeff Weston** (Borehamwood, Herts). He writes in as a newcomer, but his log shows things like EA9IB, FP8HL, HL9BW, VP2ML, VP5WJR and 5N0OLG for 10m, plus EL7H, OY2A and ZL4BX on 15m. JX9WT and KS4I (S. Baker Is) came up on 20m, with KG4W a loner on 80m. Jeff has joined an evening class to study for his RAE, which he has already scheduled for 1981!

The steel strike has affected **Peter Hawks** (Stourbridge, W. Mids), giving him extra time to do some DXing with his DX160 and dipoles at 20ft. Best on 10m was 3B8CF, while on 20 it was P29JS; 40m provided VP2ML, with TG4NX, CN8AK, YV3AZC, 5B4IJ, TF3YH, 9H1FG, HP3AL and HI8XBH appearing in the log for 80m. A later note from Peter suggested looking for S2MN on 14 240kHz around 1800 daily, S2BTF 21 198 at 1330, and YI1BGD on 20m about 0845 daily. In addition later loggings were VP9L, 4M3AZC (YV land), and K7SE/VP2A on 28MHz, C5ABK, 9Q5GB, EP2TY (PO Box 94, Esfahan), TU2HQ and 3D6BP on 21MHz, with VP2SAB, C5ACG and HI8XJO on 14MHz.

Yet another FRG-7 lives with **Callum Lawlor** BRS42922 in Wrexham, Clwyd, and with a 33ft wire accounted for TA2KS, VP2VVK and 6Y5GB on 20m, with 10m coming up with JA8BMK, 9K2FO and 9G1JU. In Sunderland **Paul Barker** gets on the air as G4HPS and still manages to drop me a line on his c.w. QSOs. Problem now is lack of space for a decent aerial, but he still worked LU8DQ, UH8HAI and ZS6OS on 10m, plus EA8RU, KG6DX and KV4AD with VP2KAH, VP2MFC and ZL1BLA on 15m and JA2GBO and ZS1DZ on 20, all c.w. as noted.

Bill Rendell's contribution this month from Truro, Cornwall, runs to TG4NK and VO1IT (3·5MHz) and then VK3XI on 7MHz, with the bulk on 14MHz like C5AAS, C6ABC, D4CBC, JW7FD, JX9WT, VK1WB, VK9NS (Norfolk Is), VP2MH, VP2VBK, VP5WJR, VQ9JJ (Diego Garcia), ZD7HH, 3D6BP, 5T5ZR, 6W8MW, and 8Q7AP who said QSL via N6NI.

Dave Coggins (Knutsford, Cheshire) concentrated on Top Band during the ARRL contest and logged dozens of US stations on s.s.b. in 12 states, plus three VE provinces, with 4U1ITU, EA5TD and YV4TI as extras, using his FRG-7 and 66ft of wire plus a.t.u. Others found since on 1·8MHz are NP4A in Puerto Rico and W3HHN/MM 500 miles east of Bermuda. On 3·5MHz Dave got HP3FL, J7DBB, OA4AKP, VK3XI (3675kHz), XE1MEX and 5T5CJ. 7MHz produced CO2DC, OX3ZM, VK6AS, XT2AW and 6W8IJ. Dave is one of the 150 or so readers who sent in to me for details of the FRG-7 filter mod by G3IMI, which has obviously helped many to get to grips with s.s.b. on the amateur bands.

Another note from **Allan Stevens** in Crowthorne, Berks, comments on both VK5's and west coast US stations appearing together in the early afternoon on 15m, which I presume could be a mixture of short and long path propagation. Recent loggings include VK1KB, VK5AZ, VP5EE, YB0ADW and YC1BZ on 15m, with 20m coming up with C6ANI, JY3ZH, ST2SA, VK9NS (Norfolk Is) and a couple of ZL1's.

Although now licensed as G8SNG, **Phil Charlesworth** of Southport, Lancs, still manages to listen and report on the h.f. bands. Set now in use is an Eagle RX60N, although Phil thinks it a bit optimistic to call it a communications receiver! But he did manage to copy HI1ECS, VK7AE, VP2ML, and VE6EP/4U on the Golan Heights on 20m.

A QSL card direct from CT4UE asks me to mention that WB8LDH is the QSL manager for VP2KAL, KAJ, KAK and KAM, which stations were very active during recent contests. Thanks OM.

Your scribe heard WA1AER reporting that a senior American Embassy official in Peking has been issued with the call BP1A and would be operating initially on c.w. only on 14 080kHz from the middle of March.

Club life

Several club scribes have been kind enough to write in and report that mention of their clubs in this column has resulted in the recruitment of three and four members at least. Well, that's what it is all about, so it's up to clubs to let me know what they are doing, and when, if they want their numbers to increase.

North Bristol ARC. Reminder of new QTH at the Self-help Enterprise, Braemar Crescent, Northville, Bristol 7 on Fridays at 1930. Sec G. E. Taylor G2HDG, 66 Burley Crest, Downend, Bristol BS16 5PW.

Wirral & District ARC. Excellent newsletter mentions that 17 of 25 candidates in last December's RAE at the North Wirral Tech were successful. Wait for the QRM! Sec Ian Brooks with XYL Susan G8SUE points out that there are two other XYL/OM teams in the club plus "a few" licensed YLs! So lads, don't hang about, contact Ian at: 59 Mosslands Drive, Wallasey L45 8PF, for details of meetings of club which meets Wednesdays 2000 hours in the committee room of the West Kirby Sports Centre. Something might be organised for anyone needing a lift. In the meantime May 14 meeting is on Japanese (Morse?) code by G3CSG with G. A. Walker LLB talking on women's lib and the law on the 28th. Guess this is aimed at the XYL/OM licensees in the club! "It's my transmitter" . . . "no it's not, it's mine" situation?

St Helens & District ARC. Change of QTH. YMCA, North Road, St Helens, weekly on Thursdays 1945, as old YWCA premises about to be sold. Now, pin back your lugholes. On the occasion of the 150th anniversary of the Liverpool to Manchester railway, BR is re-running the 1829 Rainhill Trials which were then won by Stephenson's *Rocket*. So, on Whit Bank Holiday, May 24, 25 and 26, special event station GB2RST (Rainhill Steam Trials) will operate on h.f. and v.h.f./u.h.f. bands from the Rainhill Cricket and Tennis Club with special QSLs for QSOs. Visitors will be most welcome at this station says Sec Paul Gaskell G8PQD, 131 Greenfield Road, St Helens, Merseyside WA10 6SH or ring 0744 25472.

Ipswich Radio Club. Second and last Wednesdays of the month during school term-time at Handford House, Ranelagh Road, Ipswich, with car parking facilities. Club offers warm welcome to visitors, newcomers or otherwise. Morse classes held on Wednesdays. Full details from: Jack Toothill G4IFF, 76 Fircroft Road, Ipswich, or ring 0473 44047, but in the meantime May 14 sees meeting to discuss planning for a couple of NFDs and the East Suffolk Wireless Revival. This big event is on May 25 at the IACSSA sportsground, Straight Road, Bucklesham, adjacent to the Suffolk Show Ground, offering something for all the family, with bring-and-buy, licensed bar, hot snacks and many displays and stands, and obviously well worth a visit. GB4SWR is talk-in station on 2m and 70cm plus h.f. bands.

Bury Radio Society. May 13 sees talk on DF techniques at the Mosses Community Centre, Cecil Street, Bury, with meetings on the second Tuesday of the month generally, but every Tuesday sees activities such as code practice and constructional work. Contact: Chris Marcroft G4JAG, 24 Lancaster Avenue, Ramsbottom, Bury, or 070-682 2168.

Edgware & District RS. Also concerned about its programme for NFD, so discussion on May 22 plus constructors' contest. Meetings second and fourth Thursdays at the Watling Community Centre, 145 Orange Hill Road, Edgware, at 8pm. Club net meets 10pm on Mondays on 1875kHz, but there is also code practice over the air on Top Band and 2m by club station G3ASR, so details from: H. D. Drury G4HMD, 39 Wemborough Road, Stanmore, Middx.

Northern Heights ARS. A junk sale on May 7 is followed on the 21st by a demonstration of equipment by SMC Ltd in the shape of G3PSM. So get to the Bradshaw Tavern, Illingworth, Halifax, by 8pm these evenings, or any Wednesday come to that, or try: Geoff Theasby G8BMI, 12 Southfield Avenue, Riddlesden, Keighley, or ring 62859.

West Kent ARS. At the Adult Education Centre, Monson Road, Tunbridge Wells, alternate Tuesdays throughout the year, like May 9 when there is a construction contest. Ask Brian Castle G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent, for info, or try him on 0732 56708.

Liverpool & District ARS. It's also NFD preparation time on May 13, with a talk on North American travels by G3YBH on the 20th, ending the month with a chat on RTTY matters on the 27th. So it's every Tuesday 8pm Conservative Rooms, Church Road, Wavertree, with Morse classes held over the air on 144·25MHz from G3AHD every Thursday at 8.30pm. Contact: Al Neilson G4CVZ, 78 Ackers Hall Avenue, Liverpool L14 2EA, or 051-220 5470.

Saltash & District ARC. Nice to hear from this group after a long break. A warm welcome awaits any visitors on the first and third Fridays of the month at the Burraton Toc H Hall, junction of Warraton Road and Oaklands Drive, Saltash, Cornwall, at 1930 hours. You may get *PW* in time to tell you that chief engineer of Plymouth Sound will talk on May 2, while the 16th is club station G8SAL on safari, an outdoor meeting on Kit Hill working the DX on 2m, WX permitting. Club call is also G4GXK with some pretty good equipment it seems for h.f. bands. So try Chris Gallacher G4JCX, Moor View, Carkeel, Saltash, for info.

North Bristol & Chippenham DARC's. The Toghill Mobile Rally organised by these two clubs will take place on Sunday, May 11, starting at 2pm, the site being the Toghill Picnic area half-a-mile along the A420 from the junction of the A420 and A46, on the Bristol side. So says the Sec of the North Bristol DARC George, G2HDG, who can be contacted for more information at 66 Burley Crest, Downend, Bristol BS16 5PW.

Do write to me direct rather than via *PW* offices, to address in the box. Editor assures me it will appear this month after April's boo-boo! Reports and especially logs by 15th of the month, general correspondence at any time!

Reports on the various bands are welcome and should be sent direct, by the 15th of the month, to:

AMATEUR BANDS Eric Dowdeswell G4AR, Silver Firs, Leatherhead Road, Ashtead, Surrey KT21 2TW. Logs by bands, each in alphabetical order.

MEDIUM and SW BANDS Charles Molloy G8BUS, 132 Segars Lane, Southport PR8 3JG. Reports for both bands **must** be kept separate.

VHF BANDS Ron Ham BRS15744, Faraday, Greyfriars, Storrington, Sussex RH20 4HE.

BROADCAST BANDS

MEDIUM WAVE DX

by Charles Molloy G8BUS

Recent correspondence from readers suggests that it is now difficult to purchase a new receiver suitable for medium-wave DXing, since it is current practice these days to fit a ferrite-rod aerial in place of the normal m.w. aerial coil. The advantage of doing this is that the receiver will not be overloaded by strong signals, as might occur if the receiver is switched over to the medium waves when a long wire is in use. Transistorised receivers are much more prone to overloading than valved types.

There are, of course, plenty of secondhand receivers about, either communications or domestic types, and the dedicated m.w. DXer should be able to get hold of suitable gear from this source. It is the newcomer, the potential recruit to the medium waves, who will have a problem when he finds that his new receiver, which is giving excellent results on the short waves, cannot be used with a m.w. loop aerial because of the internal ferrite-rod aerial. The latter will pick up signal and mask the null of any loop that is used, and consequently the m.w. DXer's main tool—the null of the loop—is ineffective. In order to cater for potential recuits to the band, a new section dealing with DX picked up with a portable receiver is starting this month.

DXing with a Portable

My portable is the Vega 204, which is an early version of the current Vega 206, used by a number of readers of this column. The scale markings are in metres and are not very

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accurate, but this does not matter on the medium waves as there are plenty of frequency markers on the band; 120 of them on the channels between 531kHz and 1602kHz that are in use in Europe under the Geneva Plan of 1978. No need to use a calibrator if you have a frequency list such as the one in the 1980 *World Radio and TV Handbook,* which lists the stations that are actually on the air.

Locate BBC Radio 2 on 909kHz (330m) and tune down the band until 873kHz (334m) is reached, where you should be able to hear the American Forces Network (AFN) in Frankfurt. Turn the receiver (rotate it about its vertical axis) to minimise interference (QRM). Do not waste time sending a report as AFN do not QSL.

Continue down the band to 819kHz (366m) which is just above BBC Radio Scotland on 810kHz. Sud Radio Andorra, with programming in French, shares this frequency with Warsaw, and they can be separated quite easily by rotating the set. After Sud Radio signs off, look for Rabat in Morocco which often comes in well in the UK. Remember the slow fading that occurs on the medium waves. A station may be strong one moment and inaudible a couple of minutes later.

When tuning round the band remember to investigate frequencies with more than one occupant, as they may be separable using the directional properties of the internal aerial when the receiver is rotated.

Long Wave Loops

Reader **Les Richards** (Walsall) who is making a long-wave loop, is concerned about the 0·25in spacing between turns which is standard with medium-wave loops. He feels that a l.w. loop with such a spacing would be bulky and difficult to handle. On the other hand he is worried about close-winding the turns since he thinks the inductance of the main winding would be affected.

At least 25 turns are required for a "40 inch" long-wave loop, and they will have to be close-wound for electrical and mechanical reasons. The inductance of the main winding depends on the number of turns but not on the spacing between them, so inductance will not be changed by close winding. The winding will, however, have a high self-capacitance. The wires act like the plates of a simple capacitor and the closer they are together the higher this capacitance will be. This is not important on the long waves, as the frequency range of 300kHz to 150kHz has a ratio of 2:1 in place of 3:1 on the medium waves.

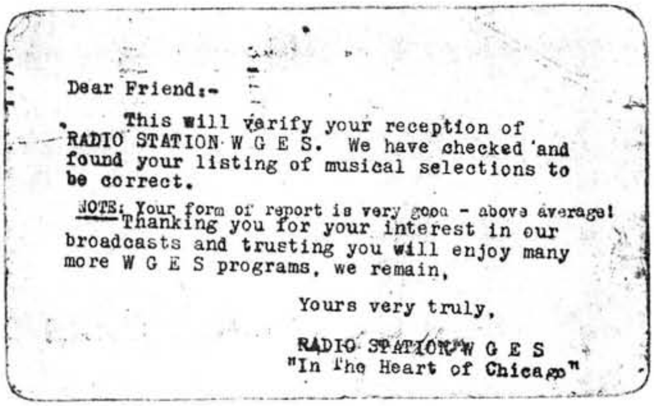
Wind your l.w. loop until it self-resonates at 300kHz, i.e. without a tuning capacitor. Now connect the variable capacitor across the main winding and there should be little difficulty in reaching 150kHz.

If you make a 25-turn loop with 0·25in spacing then the main winding will be 6in deep and the overall effect will be the same as if a 6in single-turn loop had been connected across, and at right angles to, the main winding. Its pick-up might be enough to reduce the depth of the null, so you really have to reduce depth of the main winding by close-spacing the turns.

The box-type winding is fine so long as the depth of the winding is small compared with the other dimensions. The standard "40 inch" m.w. loop with seven turns at 0·25in spacing has an equivalent loop at right angles to the main winding of only 1·5in, whose pick up is negligible.

It is worth experimenting with the number of turns for the coupling winding. A single turn appears suitable on the medium waves but two or even three may give an improvement with a l.w. loop.

A spirally-wound loop (with all turns in the same plane) gets round the problem of depth, but a spiral loop is difficult to construct even for m.w. use. I have a 9-turn spiral loop which does not perform any better than a box type, and I would hesitate before making one for the long waves.


Dear Friend:-

This will verify your reception of RADIO STATION W G E S. We have checked and found your listing of musical selections to be correct.

NOTE: Your form of report is very good - above average!
Thanking you for your interest in our broadcasts and trusting you will enjoy many more W G E S programs, we remain,

Yours very truly,

RADIO STATION W G E S
"In The Heart of Chicago"

Readers' Letters

Old-timer **Cliff Keel** sent me a QSL card he received in 1933 from WGES in Chicago. At that time he was living in Winnipeg and WGES was on 1360kHz with a power of 500 watts. The call sign is no longer in use, so presumably the station is no longer on the air. The card from WLS is a more recent QSL of my own of another Chicago broadcaster, logged in Southport.

Bob Bell reports again after a long absence. His interest has turned to beacons and he pulled in quite a bag of them between 280kHz and 370kHz using his Vega Selena Mk 2 and 25m long wire. Sorry Bob, I cannot cover this subject, interesting as it is, as beacons are not broadcasting stations. Those referred to previously were causing interference with broadcasts on the medium waves, and it was hoped that if their location was known they might act as pointers to reception conditions.

Reader **Andy Small** (Barking) has picked up a total of six North Americans since reading this column last October and he wonders if North American DX would be good in the Azores. Anyone been there? The farther west you are in Europe then the less QRM there should be, and I would expect the most favourable QTH to be on the west coast of Ireland or in the Hebrides.

"Why do you use a tuning capacitor on a loop?" asks **Jeff Weston.** It enables the loop to be peaked up on the station you are listening to, so you get a stronger signal relative to other stations than you would if you used an untuned (aperiodic) loop. Without such tuning the loop would resonate at the frequency determined by its inductance and self-capacitance, which would be around 1600kHz for the 7-turn "40 inch" model, and the performance would fall off as you tuned down the band.

SHORT-WAVE BROADCASTS

by Charles Molloy G8BUS

Until recently, receivers on offer for broadcast band DXing were really general-coverage versions of those available to radio amateurs. Good selectivity was an important feature, and the Q Multiplier incorporated in some of the lower-priced models gave a peaky type of response that was very useful for digging out DX. Good selectivity led to poor audio quality, which did not bother anyone much as few DXers listened to the programmes anyway.

Now there has been quite a dramatic change. Listening to broadcasts on the short waves has become more popular, the programmes have improved enormously and the trend is reflected by the type of receiver on offer in the shops.

Receivers for Short-Wave Listening

In past issues I have highlighted a few of the qualities to look for in a receiver intended for DXing. It is now the turn of the SWL, and we will look at some desirable characteristics that should be found in a set to be used for short-wave listening.

Stability

Electrical stability means freedom from drift. If you switch on a short-wave receiver and tune in a programme you do not want to have to retune five minutes later and perhaps every 15 minutes thereafter. Modern receivers employ the Wadley Loop or the phase-lock-loop principle which practically eliminates drift. Not a great advantage if you are continually tuning around the bands but a boon if you want to stick to one station.

Station Selection

Accuracy of tuning is obviously desirable. You want to locate a short-wave station with certainty. Digital readout is the answer of course, for with it you can tune in Radio Canada International on 15 325kHz as easily as you can locate BBC Radio 2 on the medium waves. Set the band switch to the appropriate range, rotate the tuning control until 15 325 is displayed, turn up the gain and there you are. Digital readout is putting short-wave listening on the map!

Audio Quality

Reasonable audio quality is required if you want to listen to a programme, especially if there is music. Consequently the receiver cannot have good selectivity as the two do not go together. Good selectivity means poor audio response; good audio then poor selectivity. It is not an accident that some quite expensive sets are classed as "selectivity poor" by DXers. If your interest lies in short-wave listening as well as DXing then get a receiver with more than one degree of selectivity in the a.m. mode.

Range

The international short-wave broadcast bands lie between 5950kHz and 26 100kHz. At the moment they consist of the 49 metre band (5950kHz to 6200kHz), 41m band (7100–7300), 31m (9500–9775), 25m (11 700–11 975), 19m (15 100–15 450), 16m (17 700–17 900), 13m (21 450–21 750) and 11m (25 600–26 100). These are the official limits, though there is some spread beyond them. Divide 300 000 by metres to get kHz and similarly divide 300 000 by kHz to get metres. A wavelength of 50 metres equals 6000kHz, which is the same as 6MHz.

The 49m band is at the low frequency (l.f.) end of the spectrum and the 11m band is at the h.f. end. Every receiver should tune to the 49m band. With a few sets the range extends only up to 12MHz, leaving out the four h.f. bands which are long distance daytime frequencies. A larger number of receivers finish as 18MHz omitting 13m and 11m. Few go as far as 11m, but this does not matter a great deal, since the 11 metre band is used only near the date of the sunspot maximum which occurs every ten years or so.

Radio Andorra International

As reported by **Roy Patrick** last month, Radio Andorra International is now on 6215kHz in the 49 metre band. This station, which is located high in the Pyrenees, is probably the lowest power s.w. station in Europe, as it transmits with a power of only 3kW. The primary coverage area is Southern England, the Benelux countries and Northern France, but it can probably be heard over a much wider area as it comes in well at my QTH in Lancashire. When a new 10kW transmitter and aerial system come into use later in the year, the station should cover most of Western Europe.

World Music Radio, which broadcasts over Radio Andorra from 2100 to 2200 GMT on Sundays, is operated by a small team of broadcasters and DXers from several countries in Europe. Their aim is to provide a type of programme suitable for young people of Europe who are interested in short-wave listening and DXing.

Since February 17 the WMR programme has included *DX World*, which is edited by **Andy Sennitt**, the Assistant Editor of the *World Radio and TV Handbook*. Andy says that the opportunity is being taken to make use of the large amount of information arriving at the *WRTH* office each week and he hopes this programme will supplement the *WRTH* and the Newsletter.

Andorra is an independent state situated between Spain and France, and it can be found on the short waves just beyond the high frequency end of the 49 metre (6MHz) band. Reception reports can go to: Radio Andorra, BP1, Andorre-le-Vieille, Andorra along with a single International Reply Coupon to obtain the station QSL, or to: WMR, PO

The QSL Card of Radio Andorra International

Box 4078, Amsterdam, Holland along with two IRCs for the WMR QSL.

What is DX?

Reader **Dave Farran** lists some stations logged recently and asks if they could be classed as DX. There is really no definition of DX that applies to the broadcast bands. It depends on a number of factors such as the location, receiver and type of aerial, and is very much a matter of opinion anyway. What is difficult for one DXer may be easy for another, so why not enjoy the hobby and make the most of whatever is available. There is a lot of fun and interest for everyone on the s.w. bands these days.

Radio New Zealand

The latest schedule received from RNZ is: Pacific Service, 1800–2105 on 11 835kHz or 17 860kHz; 2115–0815 on 17 860; 1800–0625 on 15 345; 0640–1030 on 6105. The Australian and NW Pacific Service, 0730–1115 on 11 945; 0945–1115 on 6105. All times in GMT.

120 metre Band (2300-2495kHz)

Last November, **David Wyatt** of Oswestry, reported hearing an unidentified station on 2480kHz using an AR88LF and a 25m long wire. David has approached the BBC Monitoring Service, who suggest he might have heard Radio Ponta Pora at Rondonópolis in Brazil, though the BBC were unable to obtain a positive identification.

More news of 120m comes from *DX World*, who report a tentative logging in Europe of the Falkland Islands on 2370kHz at 0030. This station has recently increased power from 500 watts to 5kW, and it is on the air during the period April to September from 2230 (Sat. 2030 and Sun. 2200) until 0100. The address is: Falkland Islands Broadcasting Service, Broadcasting Studios, Stanley, Falkland Islands.

Readers' Letters

Reader **P. Carter** asks for the best frequencies for a number of countries but unfortunately there is no easy answer. Schedules change four times a year in March, May, September and November and in order to keep up with latest changes you have to listen to programmes such as *Sweden Calling DXers* on Tuesday or *DX World* on a Sunday. In reply to **Donald Steward** (Hamilton) you have been listening to commercial stations, which is illegal and I cannot identify them for you.

by Ron Ham BRS15744

Solar

Although both **Cmdr Henry Hatfield,** Sevenoaks, and I recorded a large, 7-minute duration, burst of solar radio noise at 1205 on February 28, and a few small bursts on the 29th, the sun, at our observational frequencies of 136 and 143MHz respectively, was quiet from February 19 to March 16.

Fig. 1: The QSL Card of Tony Green VS6EZ, Hong Kong

HONG KONG AWARDS.

NINE DRAGONS AWARD
= One contact with a country in each of the following 9 zones: zones 18, 19, 24 to 30 inc.
= Contact for zone 24 must be a VS6.
= Stations within the 9 zones require 2 contacts in each zone, with 2 VS6 contacts.
= Contacts after 1 Jan 79 only valid.
= Fee US$3 or equivalent. = £1.50 OPEN P.ORDER

FIRECRACKER AWARD
= Six contacts with different VS6 stations.
= Stations in zones 18, 19, 24 to 28 require 10 contacts with different VS6 stations.
= Contacts after 1 Jan 64 only valid.
= Fee 10 IRC or equivalent. = £1 OPEN P. ORDER.

Usual conditions
Certified log extracts only required. NO CARDS!
HARTS, Box 541, Hong Kong.

Fig. 2: Details of the Nine Dragons and Firecracker Awards of the Hong Kong Amateur Radio Transmitting Society

At midday on March 11, Henry located three sunspots with his spectrohelioscope and then found, high in the northern hemisphere, the largest prominence he has ever seen, rising some 120 000 miles above the sun's surface. "Whatever caused it," said Henry on the phone, "is on the other side of the limb, and what's more, it has a visual bandwidth of 3 angstroms and three bright patches."

Ted Waring, Bristol, using his optical telescope, counted 47 sunspots on February 16, 14 on March 4, and 8 on March 9 and 13.

Cross Band, 10m to 6m

Tony Green VS6EZ is looking for cross-band contacts with European stations and can be found on 21 150kHz to make arrangements. Tony uses a Microwave Modules 2m to 6m transverter (10W p.e.p./f.m.) to a 5-element beam and calls on 50·150MHz and listens on 50·150, 52·100 and 28·490MHz. He has made a CQ tape, with breaks of 10 seconds after each minute. Tony is QSL Manager for the Hong Kong Amateur Radio Transmitting Society and in addition to his own QSL card (Fig. 1), he enclosed details of the Nine Dragons Award and the Firecracker Award which can be won by both transmitting stations and SWLs (Fig. 2). **Frank Emery** G3ZMF, Tadworth, Surrey, is now listening on 6m with a Microwave Modules converter, and **Harold Brodribb,** St Leonards-on-Sea, Sussex, has obtained an ex-military, RL85 communications receiver, tuneable through

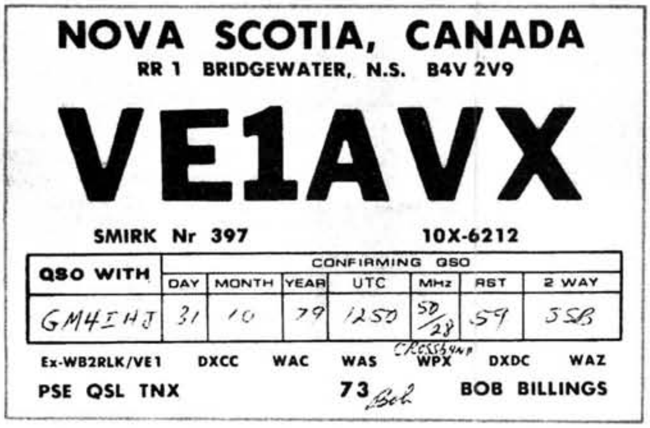


Fig. 3: A QSL Card confirming a cross-band QSO on 50/28MHz between VE1AVX and GM4IHJ

28–40, 39–57 and 56–84MHz, which, in conjunction with his AR88 will be very useful for listening to cross-band QSOs. If anyone can help Harold with gen about the RL85, please let me know and I will pass it on.

At 1025 on March 9, **John Branegan** GM4IHJ, Saline, Fife, heard signals from the 6m beacon ZS6PW at 329 and heard ZS6LN working G stations. I think we would all agree with John when he says that **Bob Billings** VE1AVX (see Fig. 3) was the bright star of the recent 6m activity. John received bursts of signals on 50MHz, via meteor trail reflection, from stations in EI, KP4 and PY1 on February 28 and March 2, 3, 4 and 7. John intends to keep all his gear ready, because he is expecting another brief 6m opening in October. Let's hope so.

The 10 Metre Band

Throughout the 28-day period from February 18 to March 16, the band has been about the same as in previous months, with strong signals from Russian stations during the early morning and from both north-American and Russian stations, often in QSO, at midday. I usually listen on 10m during the early morning and again at lunch time, and heard strong signals from Japanese stations around 0930 on February 18, 20, 23, 24, 25, 27, 29 and March 2, 4, 5, 6, 8, 11 and 13 to 16. Following the pattern of recent months, I heard signals from the International Beacon Project stations in Bahrain A9XC, on 28 days, Cyprus 5B4CY on 22 days, and Germany DL0IGI and DK0TE on 26 and 28 days respectively. The majority of IBP signals were seldom more than 539.

My thanks to **Colin Phillips** G3RLA, Wirral, who sent me a gen sheet about the Metroplex repeater system, which he received from WB2MGB, who, along with K2KLN, conceived the idea back in January 1978. "The present repeater systems are located in New York City and North Bergen, New Jersey. Additional repeater sites are under construction and will substantially increase the coverage areas," says the gen sheet, which continues: "The 2m antenna is a 4-bay, 6·2dB gain, omni-directional, vertically polarised array. The transmission line is $\frac{7}{8}$in nitrogen-pressurised Heliax. The antenna is 560ft a.s.l. and the e.r.p. is 260 watts. The Metroplex 10m f.m. repeater operates from dual sites and is heard all over the world. The receiving facility is located in North Bergen, New Jersey. The signals are relayed to New York City where the 10m transmitter is located. The antennas are vertically polarised, 560ft a.s.l. and produce an e.r.p. of 100 watts. The 10m repeater is cross-linked to the 2m repeater so that 2m operators can take advantage of 10m DX conditions. All Metroplex repeaters are set up on an emergency generated power system, stay on 24 hours a day, and are equipped with 2-minute time-out timers." More information available from the Amateur Communications Association, PO Box 237, New Jersey 07605.

Slow Scan Television

Between 1440 and 1500 on February 17, **Sam Faulkner,** Burton-on-Trent, received SSTV pictures from WA2YJD, W1GNS, W2SBN, W2UOX and WA4UUV. During the excellent 10m conditions between 1730 and 1830 on March 5, Sam had another good haul of 10 Ws, an EA and a VE. For the Stateside SSTV Contest, Sam monitored between 1700 and 1850 on March 8 and regularly between 1300 and 2040 on the 9th, copying strong video around 28·680MHz from VE, VP2, Ws 1, 2, 3, 4, 5, 6, 8, 9, 0, ZS6, IT9 and 5N0. He also received signals from G3WW and G4JBV who were taking part in the event.

OSCAR

Readers who require information about the OSCAR programmes can listen to the AMSAT net, which meets each Sunday at 1800GMT on 14·280, and at 1900 on 21·280MHz. Many AMSAT enthusiasts may be found on 28·880MHz each Saturday and Sunday, on the hour between 1400 and 1800. Anyone wishing to join AMSAT-UK and receive their publication, *OSCAR NEWS,* should contact Ron Broadbent G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ. Like many other enthusiasts, John Branegan has been testing gear ready for the launch of AMSAT-OSCAR-9, expected between 1500 and 1800 on May 20. Information should be available from WA2LQQ on 28·880MHz, or if propagation is poor, 21·280MHz will be used. WA2LQQ will transmit from 1400 until well into the post launch period.

DXTV

During the tropospheric opening on February 24, **David Appleyard,** Uppsala, Sweden, had his first practical experience of DXTV, when he saw two different Soviet stations, Channels R10 207·25MHz and R11 215·25MHz. One of them was also on u.h.f. Channel 28 and sound to match the other one was heard on f.m. radio at 91·7MHz. David's choice of DX viewing was either ice-skating from Lake Placid or a programme about the Soviet armed forces. He picked up another Russian station on R8, 191·25MHz, and on several days he has received pictures from Finland in Band III, over a distance of 200–250 miles. **Nicholas Wythe,** Folkestone, is off to a good start with TV DXing, because, with his Ekco T545 and Sanyo T234 portable receivers, using their own loop aerials, he received signals from Wavre, Belgium, Channel 28, and Dortmund, Channel 25 (Fig. 4), on February 27. Among the many stations he identified during the morning were test cards showing "Haardkopf Kanal 35" and "Angelburg Kanal 24." **Ken Willis** G8VR, Hartley, Kent, has an American standard, 525-line, Zenith receiver and intends looking in that direction for television pictures. John Branegan received weak, short-lived pictures, mainly on Channel E2, via sporadic-E, on February 19, 21, 22, 26, 27 and March 1 and 2.

Around 1730 on February 28, with his barometer reading 30·4in, Sam Faulkner was not surprised to receive pictures from Radio Telefis Eireann—1, Channel H and a test card on RTE-2 Channel I. At 1730 on the 29th he logged several RTE channels in Band III between 175 and 216MHz. RTE-1 H was very strong and Sam watched such programmes as *Mork and Mindy, Nuach and Feach, Shop Around* and a children's programme. For most of the evening of the 28th, Sam received strong pictures from BBC Television South, Channel 39 and the IBA station, Southern Television,

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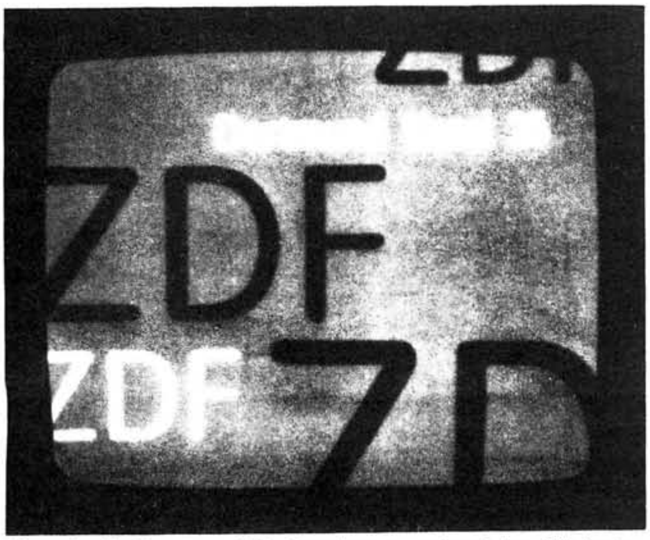


Fig. 4: A German TV Caption received by Nicholas Wythe in Folkestone, Kent

Channel 42, using his 91-element, wide-band Yagi, which enabled him to see the programmes *South Today* and *Day by Day*.

I see from the catalogue sent to me by **Roger Bunney,** my opposite number in the IPC magazine *Television* and a director of South West Aerial Systems, that his firm stocks aerials, amplifiers, converters and aerial installation components suitable for the DXer. Readers interested should send an s.a.e. to Roger, who will also give technical advice on aerial problems, at South West Aerials, 10 Old Boundary Road, Shaftesbury, Dorset.

Tropospheric

The atmospheric pressure rose sharply from 30·05in at midday on February 16 to 30·3in at midnight on the 17th, when it began to fall through the 18th, to reach 30·0in by 1600 on the 19th. True to form, the v.h.f.s opened with the falling pressure and at 0027 and 0920 on the 18th and 0925 on the 19th, I heard many GW and G mobiles working through the Bristol Channel repeater GB3BC, R6. Around 0930 on the 18th, I heard several French broadcast stations coming up in Band II, and received a strong "Good Morning" caption from the IBA transmitter at Lichfield, Channel 8, 189MHz. About 1300 on the 17th, David Appleyard heard strong signals around 91·2MHz from what he is sure was TRT-3, the third channel of the Turkish Radio-Television Corporation. "Looking at the European weather map for midday on the 17th, I am convinced that I experienced an opening between Turkey and Scandinavia," writes David, who also heard a couple of Finnish stations, Aland 91·3MHz and Turku 94·3MHz.

Two Metre Contest

The annual March open contest, organised by the RSGB, is always well supported and every competitor hopes for a lift to bring that extra DX and make the event even more exciting. It was fortunate that the pressure, which had hovered around 30·0in from midday on February 19 to midnight on the 22nd, began to rise sharply and by midnight on the 23rd it reached 30·4in. Although there was a slight drop during the 24th and 25th, it returned to 30·4in at noon on the 26th and continued to rise, reaching a peak of 30·55in at midday on the 28th, but by midnight a slow fall had begun. The pressure fell slowly through the 29th and accelerated through March 1 and 2, just right for the contest.

At 2021 on the 1st, **Alan Baker** G4GNX, Newhaven, worked DB2VZ/P on 2m s.s.b., and between 0200 and 0213 on the 2nd he had s.s.b. QSOs with DL0EE/P, DK0VL, F1CTH/P and HB9AHD/P, a few minutes of super DX! At 1224 he had a c.w. contact with GJ3YHU/A. During the event, Frank Emery G3ZMF, using an FT-221R and 45 watt p.a. plus an 8-element Yagi at 35ft a.g.l., worked 105 stations. His best DX was DK0VL, 688km and his contacts ranged over DL, F, G, GD, GW, ON and PA0. **George Grzebieniak** RS41733, London, looking for points for the RSGB VHF/UHF Listener's Championship, logged 175 stations on 2m spread over F, G, GJ, GW, ON and PE and 45 stations (all G) on 70cm. George recently changed his 8-over-8 70cm aerial for a Jaybeam MBM48 and is pleased with the results.

The lift was brewing up on the 27th, because at 0910, I heard signals through the Bristol Channel and Birmingham repeaters and was getting a reasonable picture from Lichfield on Channel 8. By monitoring these particular signals, with dipole aerials feeding the receivers, I can tell the extent of a developing or prevailing disturbance. These signals were again strong at 1000 on the 28th, and at 0140 and 0800 on March 1. At 2154 on the 1st, I heard PE1DTS working G4MB/M through the Kent repeater GB3KR, R4. Signals were again heard through GB3BC, BM and KR on March 15 and 16 as the atmospheric pressure moved up around the 30·2in region once more.

VHF Convention

The organisers of the RSGB's 25th VHF Convention, held at the Winning Post Hotel and Whitton School, Whitton, on March 8, were well satisfied with an attendance of almost 1000 people and the support of some 40 trade exhibitors. The afternoon lectures, in Whitton School, covering such subjects as "WARC 1979", Microprocessors, VHF Contests, Moonbounce, Working DX, OSCAR and Microwaves, were all well attended.

BATC

A stand which I visited at the Convention was that of the British Amateur Television Club, who told me that plans are under way for their bi-annual convention at Post House Hotel, Leicester, on October 5. Confirmation and further details will be available from Mike Cox G8HUA, 2 Holme Lane, Bottesford, Scunthorpe.

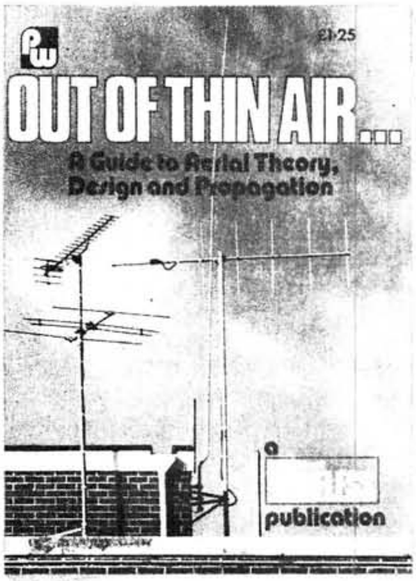
The BATC was founded in 1949 to co-ordinate the activities of amateur radio enthusiasts experimenting with television transmissions. They are affiliated to the RSGB and have a representative on the Society's VHF Committee. Membership information for BATC is available from Brian Summers G8GQS, 13 Church Street, Gainsborough, Lincs.

News Items

Good progress is being made with the 70cm repeater for Horsham GB3HO, by the Sussex Repeater Group. When it is heard on RB14, reports will be welcome by G4EFO, QTHR.

The Sussex Mobile Rally, due to be held at Brighton Race Course on June 1, promises to be a great affair with some 15 000sq ft of exhibition area for trade exhibitors and the ever-popular Bring-and-Buy stall. There will be a special QSL card for those stations who work or hear the demonstration and talk-in station GB2SMR.

Can anyone help **Ed Watkins** G8RKI, 45 Heidelberg Road, Southsea, Portsmouth, Hants, with a circuit or manual for an old HMV Model 1200 radio? Ed says it has a duff mains transformer and if he can get the correct gen he will endeavour to re-wind it.



Aerials and aerial accessories are very definitely among the most popular topics covered in *Practical Wireless*. In response to requests from readers, we've reprinted a selection of articles from the past three years, plus two new features—one by Ron Ham on v.h.f. propagation, the other describing the "Ultra-Slim Jim", a new version of that most popular 2-metre aerial design by Fred Judd.

Out of Thin Air has 80 pages, 295 × 216mm, and is available from W. H. Smith price £1.25, or by post from Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF, price £1.50 including postage and packing to UK addresses, or £1.80 by surface mail overseas. Please ensure that your name and address are clearly legible.

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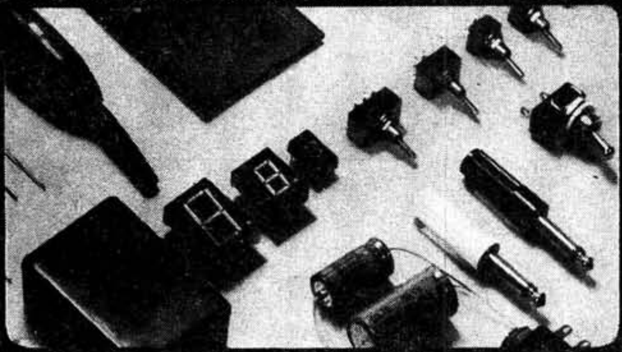

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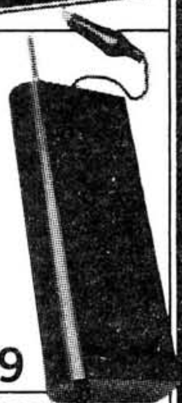

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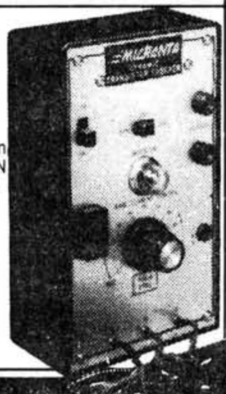

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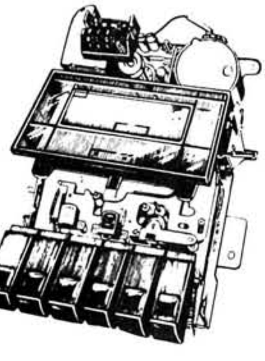

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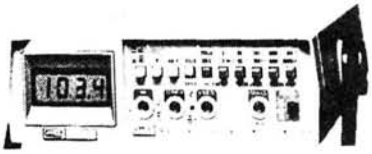

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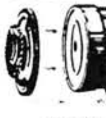

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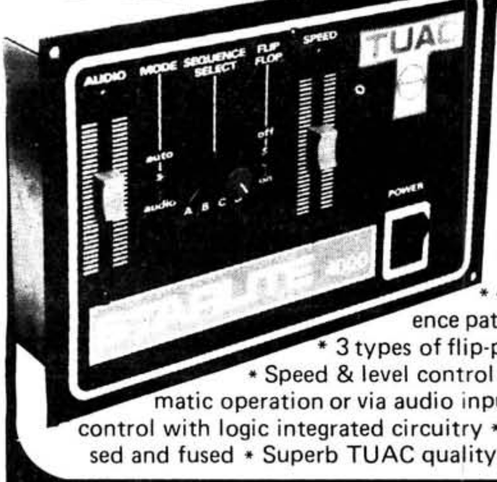

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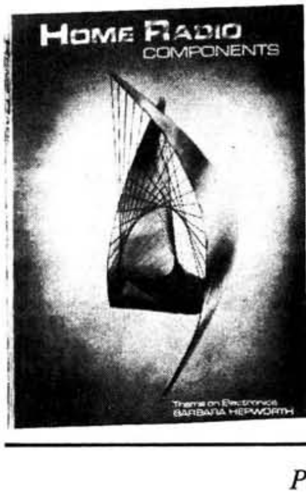

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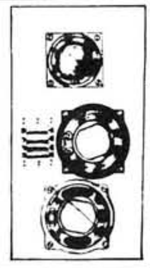

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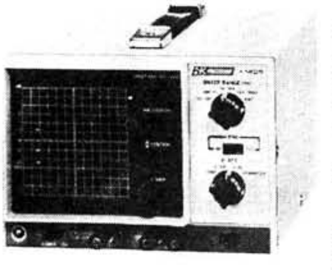

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21	4.0	**8.79**	1.31
51	5.0	**10.86**	1.52
117	6.0	**12.29**	1.67
88	8.0	**16.45**	1.89
89	10.0	**18.98**	1.89
90	12.0	**21.09**	2.24
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Sec 50V Voltages available 5, 7, 8, 10, 13, 15, 17, 20, 33, 40 or 20V-0-20V or 25V-0-25V.

Ref	Amps	Price	P & P
102	0.5	**3.75**	0.90
103	1.0	**4.57**	1.10
104	2.0	**7.88**	1.31
105	3.0	**9.42**	1.52
106	4.0	**12.82**	1.73
107	6.0	**16.37**	1.89
118	8.0	**22.29**	2.39
119	10.0	**27.48**	O.A.
109	12.0	**31.89**	O.A.

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Ref	VA	Price	P & P
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149	60	**7.37**	1.10
150	100	**8.38**	1.31
151	200	**12.28**	1.31
152	250	**14.61**	1.73
153	350	**18.07**	2.12
154	500	**22.52**	2.47
155	750	**32.03**	O.A.
156	1000	**40.92**	O.A.
157	1500	**56.52**	O.A.
158	2000	**67.99**	O.A.
159	3000	**95.33**	O.A.

*Pri 0-220-240V Sec 115 or 240V. State sec. volts required.

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VA	Price	P & P	Ref
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2K	**54.97**	O.A.	95W

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Pri 220-240 volts

Ref	Amps 12V	Amps 24V	Price	P&P
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71	2	1	**3.86**	0.90
18	4	2	**4.46**	1.10
85	0.5	2.5	**6.16**	1.10
70	6	3	**6.99**	1.10
108	8	4	**8.16**	1.31
72	10	5	**8.93**	1.31
116	12	6	**9.89**	1.52
17	16	8	**11.79**	1.52
115	20	10	**15.38**	2.39
187	30	15	**19.72**	2.39
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Pri 220/240V sec 0-24-30-40-48-60V. Voltages available 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60 or 24V-0-24V or 30V-0-30V.

Ref	Amps	Price	P & P
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126	1.0	**6.50**	1.10
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67	500	0-115-200-220-240	**12.09**	1.91
84	1000	0-115-200-220-240	**20.64**	2.39
93	1500	0-115-200-220-240	**25.81**	OA
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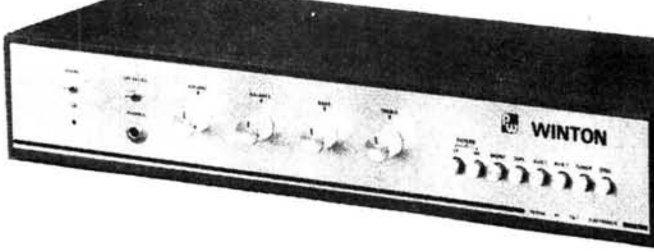

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