D-i-Y RADIO

AN INTRODUCTION TO AMATEUR RADIO - FOR BEGINNERS OF ALL AGES

November-December 1993 Volume Three: No 6

Available only by subscription from RSGB, Lambda House, Cranborne Road, Potters Bar, Herts. EN6 3JE

COVER PICTURE:
Did you realise that you can power a radio from fruit juice? If you get fed up with the programme you can always eat the fruit!

comment

I FIND IT DIFFICULT to believe that this is the last issue of 1993! So much has happened to *D-i-Y Radio* this year.

The new format has certainly proved popular with our readers. Back numbers are constantly in demand and these are available to subscribers for just 50p each.

Many readers are involved in the Novice RAE or full RAE Courses and will be taking the December examination. If you are among these I wish you the very best of luck - stay calm, take time over answering each question and, if time permits at the end, don't walk out on completion of the paper - just read through your answers again. It is amazing how you can pick out the correct answer the second time around, and this is an excellent way of correcting silly errors!

The *D-i-Y Radio* team wishes you a very happy and peaceful Christmas and a prosperous New Year, and stand by for new and exciting projects in *D-i-Y Radio* in 1994!

Marcia Brimson, Editor

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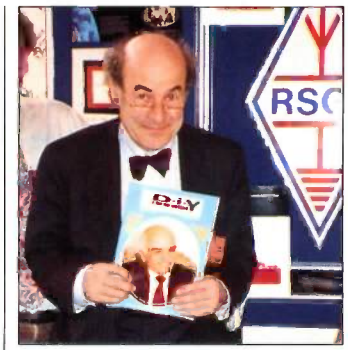

Professor Heinz Wolf takes a look at *D-i-Y Radio* at the recent Interactive Science Exhibition at Keele University. He is well known for his involvement in BBC Television's *Great Egg Race*.

As part of Flight Activities Week in August, the ATC held a special event station, GB4ATC, at the Royal Air Force Museum in Hendon, north London. The HF antenna for the radio station was tied to the tail of a spitfire - luckily it was stationary at the time!

Managing Editor: Mike Dennison; Editor: Marcia Brimson; Prod Ed: Sid Clark; Tech Ed: Paul Lovell; Draughtsman: Derek Cole; Ed Asst: John Davies; Prod Asst: Jennifer Preston; Secretary: Erica Fry. *D-i-Y RADIO* is published six times a year by the Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts. Filmset by JJ Typographics Ltd. Printed by Southernprint (Web Offset) Ltd. © Radio Society of Great Britain, 1993. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the RSGB. All reasonable precautions are taken by the Radio Society to ensure that the advice and data given to our readers are reliable. We cannot however, guarantee it and we cannot accept legal responsibility for it. Prices quoted are those current as we go to press. ISSN No: 0959-843X.

Fifteen-year-old Tim is Young Amateur of 1993

TIM MUNN from the Isle of Wight was chosen to be the 1993 Young Amateur of the Year by representatives of the Government's Radiocommunications Agency (RA) and the RSGB. His callsign is G7OTO (Novice callsign 2E1AMX).

Tim's interest in amateur radio started when he was 10 and, with help from local radio amateurs, he passed his Novice Exam in 1992 and his full RAE this year.

He decided to help others enjoy the hobby, so he started an amateur radio club in Sandown High School. This proved so popular that he became one of the youngest RSGB Novice Instructors. His classes are very popular as he has had a 100% pass rate.

Constructing his own amateur radio equipment is one of Tim's pastimes. He has built a 3.5MHz receiver and a 50MHz transmitter/receiver.

His main interest though is in packet radio (*where amateur radio equipment is linked up to a computer, and data is sent to and from other computers*) and he has exchanged messages via 70cm packet as far as Australia.

RUNNER UP

BURY RADIO SOCIETY Newsletter editor Simon Kahn, G0STU/2E1AAB, is this year's runner-up. Simon passed his NRAE at 11, obtained his G0 callsign on his 14th birthday in January this year, and is now a Novice Licence instructor. Simon enjoys Morse and amateur radio contests.

RSGB Young Amateur of the Year Tim Munn, G7OTO/2E1AMX, from the Isle of Wight.

On 10 October the lucky winners were presented with their prizes from the RSGB, the RA and from industry (The Mobile Radio Users Association, Icom UK, Cirkit Distribution, and Siskin Electronics).

HMS Warrior Exhibition

DURING AUGUST AN amateur radio exhibition was put on at *HMS Warrior*, the ship that became the pride of Queen Victoria's fleet. After extensive restoration at Hartlepool the ship is now a floating museum in Portsmouth Harbour.

The exhibition was organised by the Fareham & District Amateur Radio Society with equipment from Len Newnham, G6NZ, and the museum at *HMS Collingwood*, the Royal Navy's shore base at Fareham. A special event station, GB4HMS, proved very popular, running on the HF, VHF and UHF bands. Station operator Ray McLean, G0JVE, explained that aerials for the amateur radio station were carefully disguised as part of the rigging.

88-year old Len Newnham, G6NZ, demonstrates one of his own Morse keys on *HMS Warrior*. (From left) Cpt Wason of *HMS Collingwood*, Cpt Allen of *HMS Warrior 1860* and Cpt Sutermeister of *HMS Mercury*.

- Live '93 was a resounding success with nearly a quarter of a million visitors. Over 4,000 took away copies of *D-i-Y Radio*.
- The RSGB's weekly news bulletin *GB2RS* can be heard on 3650kHz SSB, 7.048MHz AM, 51.53MHz FM and 145.525MHz FM on Sunday mornings, or can be found on packet mailboxes.
- According to Government figures radio amateurs now top the list of all transmitting licences held in this country, with a stunning 59,243 licences. These overtake Citizens Band licences which have dropped by 11,000.
- GB2VK celebrated the 75th anniversary of the first wireless contact with Australia by operating from the site at which this historic event took place at Caernarfon on 22 September 1918. GB2VK was on the air throughout the 22nd and 25th of September.

SUMMER 1993 CATALOGUE

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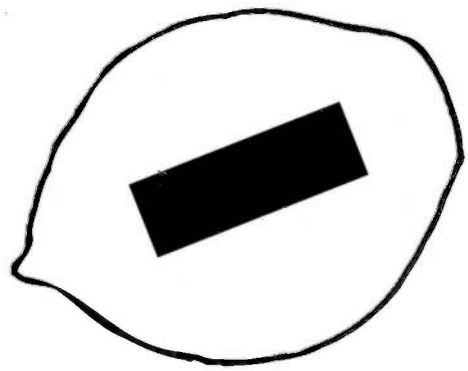


SO THERE YOU ARE, shipwrecked on a desert island, thousands of miles from anywhere! Wouldn't it be nice to sit under a palm tree and enjoy a little music. You've saved a few components from the sinking ship so you can build a radio, but there's no mains supply and no batteries. Help!

CITRUS CIRCUIT

FORTUNATELY you've also salvaged this copy of *D-i-Y Radio* so the solution is obvious - use a little lemon juice. Here's the recipe for a really neat little project you can build in an evening. [See our front cover - Marcia.]

Take three lemons or other acidic fruit and insert copper (or brass) and zinc (or galvanized nail) terminals as shown. These are connected in series as shown in the circuit diagram (**Fig 1**) and give a total voltage of about 1.8V.

The circuit needs no soldering as it uses a plug-in board, so the next thing to do is insert the components as shown in **Fig 2**. Soldering is not required - just twist the wires round the terminals where shown, or plug them in (or you could use a screw-terminal strip). The ferrite rod coil can have plastic covered, or enamel insulated, wire - you may need to adjust the number of turns for best results.

FRUITFUL CONSTRUCTION

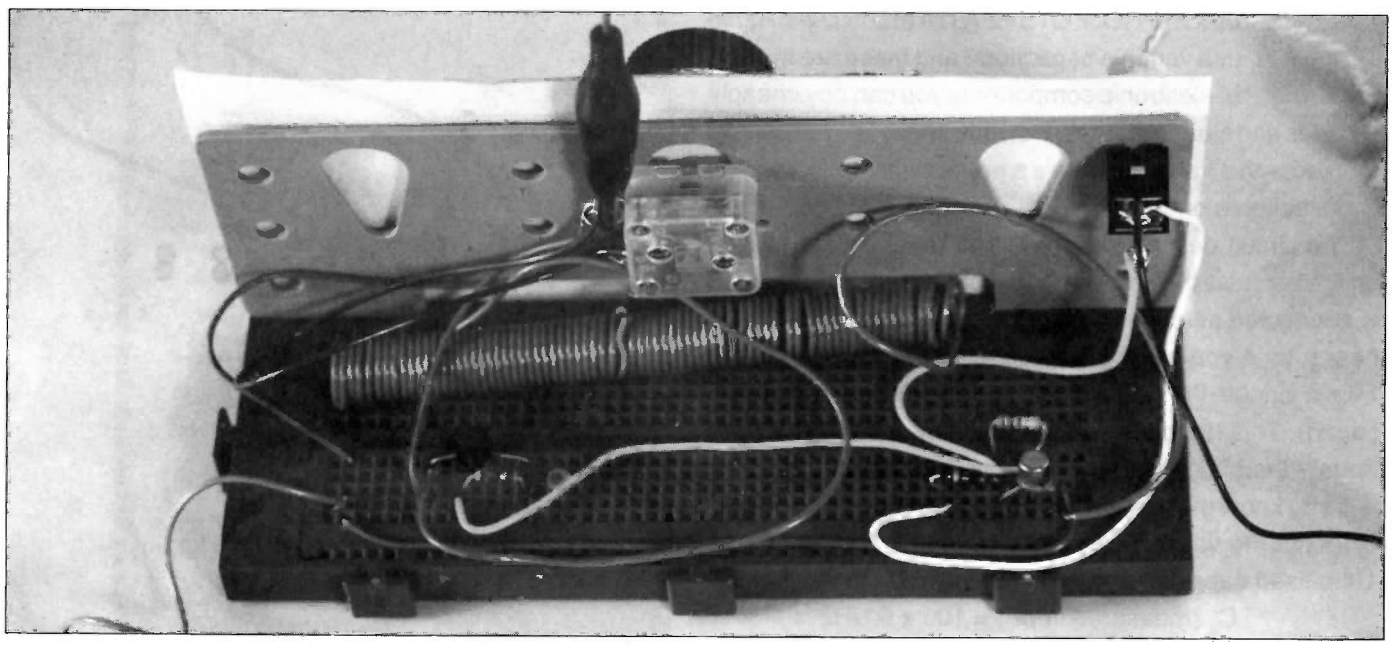
ONLY ONE TRANSISTOR is needed for the Fruit Machine, and with a reasonable antenna it should be possible to receive several stations. The tuning capacitor, VC1, selects the required one and following the detector D1, an audio amplifier (TR1) boosts the signal. Transistor TR1 needs a small positive voltage on its Base which is provided by resistor R1.

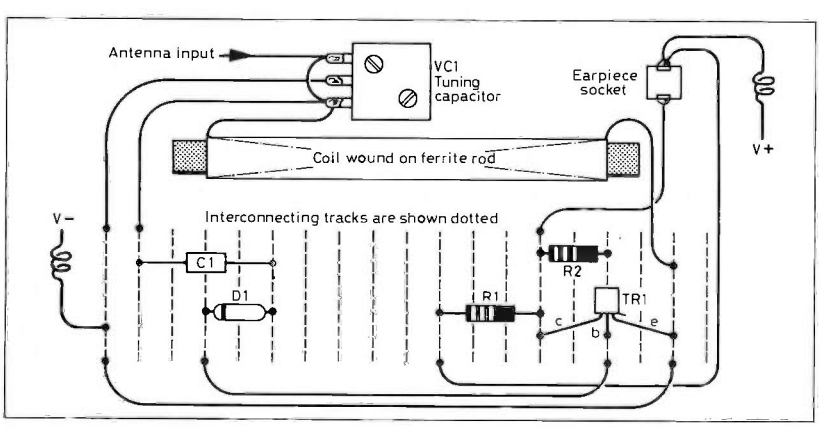
The earpiece connected across load resistor R2 should be a crystal type - low impedance ones (eg 'Walkman' type) are not suitable here. You will find that the value of the tuning capacitor is not too important, but for smaller values (eg 250pF) you may need more turns on the coil.

Tests by the *D-i-Y Radio* team showed that the radio ran for about a week on three lemons. Let's hope you've been rescued by then!

The Fruit Machine

A Juice-powered 'Green' AM Radio





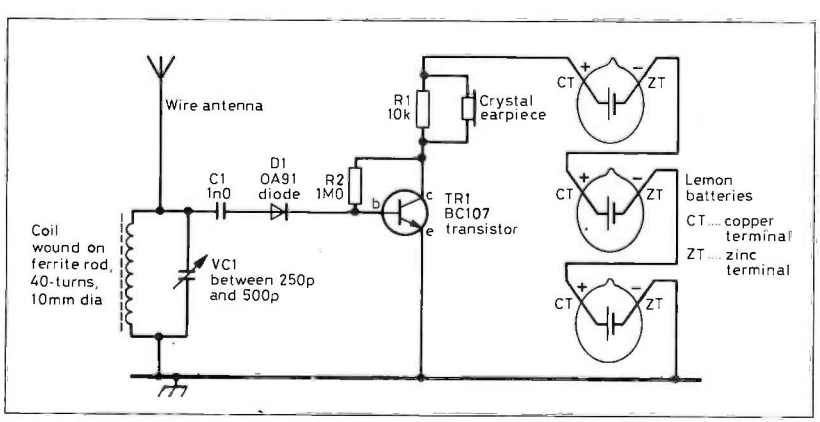


Photo (above) : The radio can be built using a plug-in board, which makes it easy to try different components.

Fig 1(left) : Three lemons power the radio, which gives good results for such a simple circuit.

Fig 2 (below left) : Most parts are plugged into the board as shown - soldering is not required.

COMPONENTS LIST (Ingredients!)

Resistors - All 5%, 0.25 watt

R1	1M0
R2	10k

Capacitors

C1	Ceramic, 1n0
VC1	Variable 250 to 500pF

Semiconductors

TR1	BC107 transistor or similar type
D1	OA90, OA91 or similar germanium diode

Coil

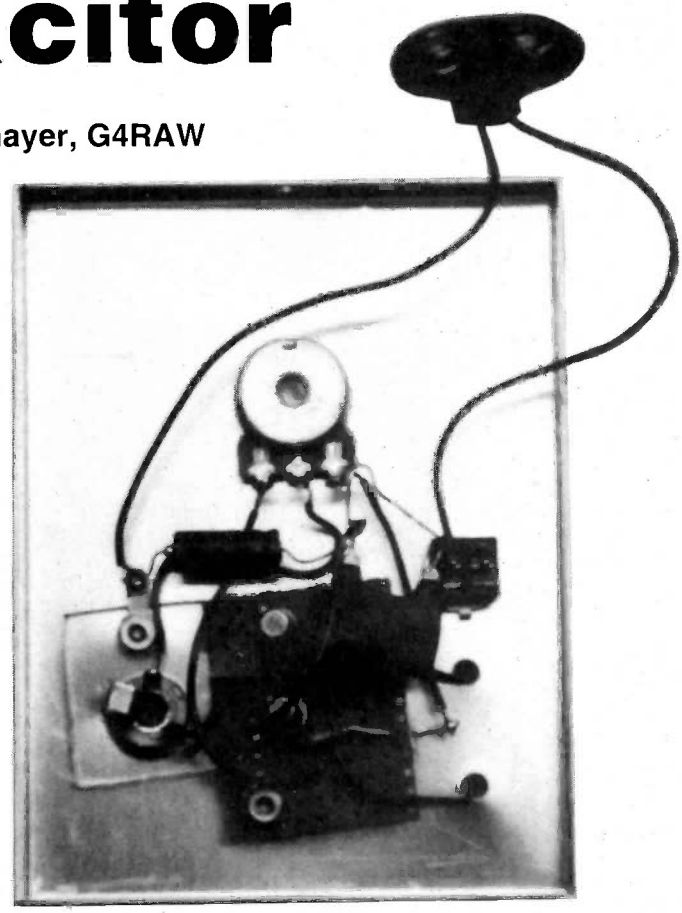
L1	2 metres of insulated wire on a ferrite rod

Other parts

Plug-in prototype board eg Maplin YR84F
Wire antenna at least 3m long
Crystal earpiece
Three juicy fruits

Measure That Capacitor

By Steve Ortmayer, G4RAW



MANY PROJECTS FEATURED in *D-i-Y Radio* use variable capacitors, and these are the sort of electronic components you can buy cheaply at rallies and club junk sales. However these are not usually marked with a value, so here's a project which will help you find a suitable one.

The circuit described here is known as a capacitance bridge because the detector (in our case, a crystal earpiece) is connected across two pairs of resistors (see **Fig 1**). To hear a tone you need a voltage across the earpiece, but with a bridge the resistor R1 is adjusted for a **null** (no sound). This happens when the voltages V1 and V2 are equal - the bridge is then said to be **balanced**.

If you know the values of resistors R1 and R2 it's easy to work out the value of the unknown capacitor C_X. For the 100p fixed capacitor shown the calculation to use is:

C_X (measured in pF) = 100 x R1/R2

BRIDGE BUILDING

NEXT, LOOK AT THE circuit diagram in **Fig 2** to discover a practical circuit using this principle to determine unknown capacitance. Transistors TR1 and TR2 form an oscillator, and this gives an AC voltage which is fed into the bridge. RV1 is a potentiometer (variable resistor), which takes the place of both R1 and R2 in Fig 1. The voltage on one lead of the earpiece is in proportion to the value of a known capacitor and an unknown one. When this is in the same ratio as the upper and lower sections of RV1 the sound in the crystal earpiece disappears. RV1 is adjusted until this happens.

The two transistors and most other components were mounted on a small piece of perforated board, as shown in **Fig 3**. This is the kind which doesn't have copper strips. I built the project in a small aluminium box as shown in the photograph and **Fig 4**. All earth connections are taken to a

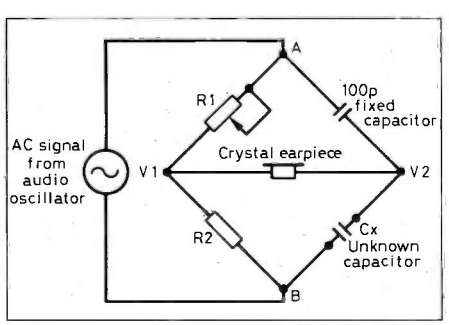


Fig 1: Simplified circuit of a capacitance brigde. R1 is adjusted for minimum sound.

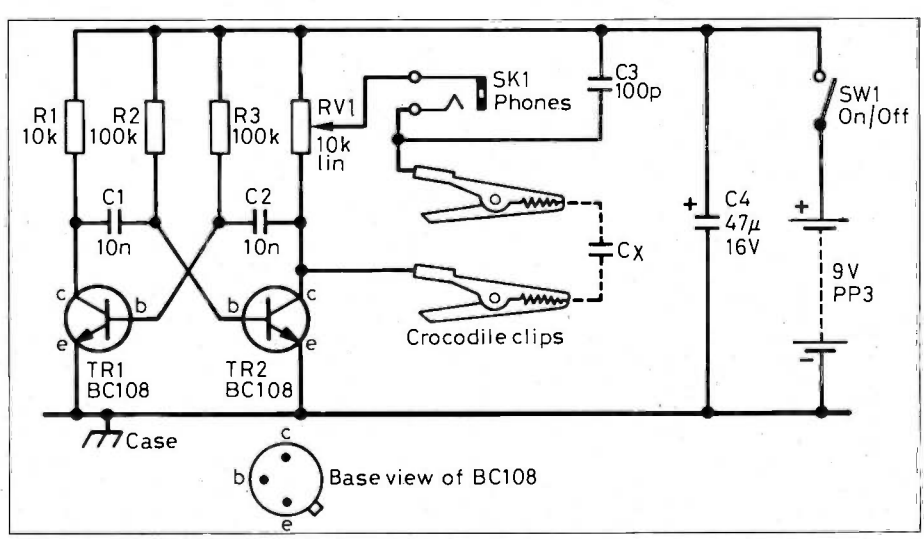


Fig 2: Transistors TR1 and TR2 give an audio signal which is adjusted by variable resistor RV1.

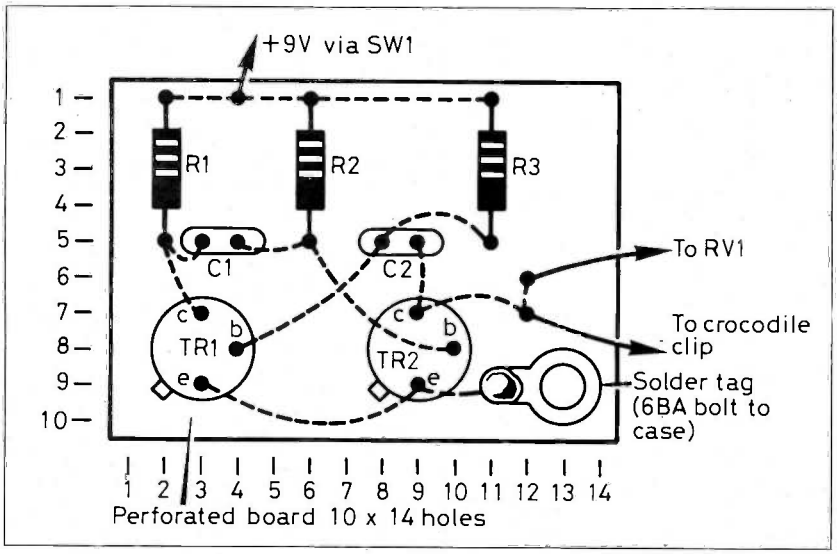


Fig 3: Components are soldered together on a small prototype board.

solder tag and when this is bolted to the box it will be earthed. A long bolt with extra nuts is required or a brass stand-off to support the board. The rest of the components are wired using point to point wiring.

Make sure that the earpiece socket does not short to the case. I drilled a large hole and bolted a small square of perspex over it, the 3.5mm earpiece socket was then mounted into the perspex keeping it clear of the aluminium box. The unit will work only with high impedance head phones or a crystal earpiece, but these are quite easy to obtain from suppliers such as JAB Electronic Components or Maplin. The unknown capacitor is connected by two small crocodile clips - insulated ones are best as they must not touch the case. Mount potentiometer VR1 with plenty of room for a pointer knob and a scale of picoFarad (pF) values.

SCALING THE BRIDGE

WHEN THE WIRING is complete check the connections carefully. When you switch on, a buzz will be heard in the earpiece if all is well. The scale is calibrated with the aid of some close tolerance (eg 1%) silver mica capacitors between 10 & 1000pF. Clip on each capacitor in turn and listen for a null in the earpiece, when you turn the control on the front panel. Mark the scale at each position - a neat dial can be made with stick-on numbers if desired. I used a square of thin plastic card to make the scale, and it is useful if there are marks every 50pF or 100pF. If the fixed 100pF capacitor (C3) is replaced by a 1nF (1000pF) type, the bridge will measure values up to about 10nF (10,000pF). Commercial instruments use several switched capacitors to measure over a wide range. A similar bridge can measure inductance.

COMPONENTS LIST

Resistors - 0.25W 5% carbon film	
R1	10k
R2,R3	100k
VR1	10kΩ linear potentiometer
Capacitors	
C1,C2	10nF Ceramic
C3	100pF Silver Mica or polystyrene
C4	47µF 16V electrolytic.
Semiconductors	
TR1,TR2	BC108
Additional items	
SW1	On/off SPDT switch
Battery connector	PP3 type
Earpiece	Crystal type
SK1	3.5mm socket or to suit your earpiece.
Battery 9V	Type PP3
Perforated board 10 x 14 holes	
Aluminium box approx. 10 x 8 x 5cm	

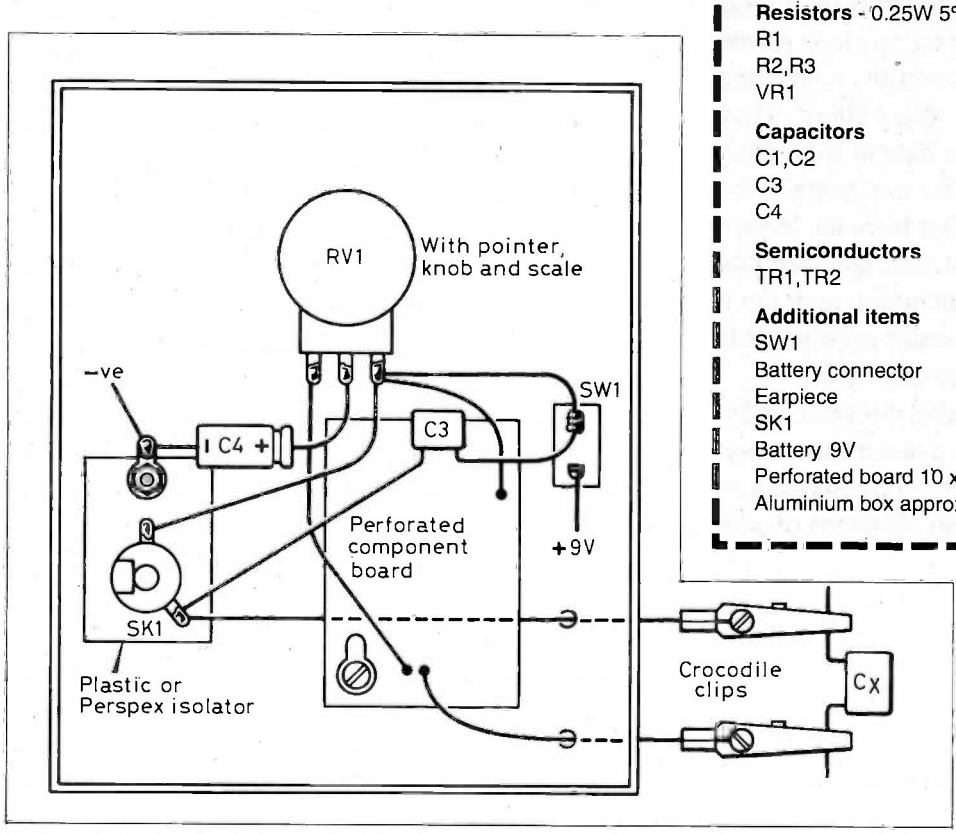


Fig 4: Layout of the parts inside an aluminium box. The earpiece socket is insulated from the case.

A full kit of parts is available from: J.A.B, Electronics Components, 1180 Aldridge Road, Great Barr, Birmingham B44 8PE. The price is £7.80 inc p&p.

The Dawning of International DX

Part 2 of the history of amateur radio by Pat Hawker, G3VA

WHEN THE WAR ended in 1918, the authorities were anxious to preserve the use of the radio spectrum for official purposes and at first were opposed not only to amateur transmitting but also to radio broadcasting which had become possible with the rapid wartime development of reliable valves.

It was only with the support of the wireless clubs, organised by the Wireless Society of London (encouraged by Marconi and some of the other professionals), that radio broadcasting by the British Broadcasting Company (BBC) was started in 1922. A few experimental receiving licences were issued from 1919 but it was another year before the first transmitting licences were issued with callsigns of the form 2AA etc.

At first British amateurs used wavelengths of about 1000 metres but, when this interfered with the Croydon airport radio, they were moved to 440 metres and 180-200 metres. This was still the time when the professional engineers believed that the only way of transmitting over long distances was to use massive power on very long waves of around 10,000 metres using high-speed alternators that directly generated AC power at up to about 50kHz. They were happy to let the experimenters dabble with 'short waves', convinced that they had little hope of being heard much beyond their own backyards. But Marconi, always willing to support amateur experimentation, stressed that "the existence of a body of independent and often enthusiastic amateurs constitutes a valuable asset towards the further development of wireless telegraphy".

How true this proved to be in showing the value of the radio spectrum below 200 metres has passed into history. By 1920-21, the American amateurs who had been allowed back on the air in 1919, were covering distances of 500, 1000 and even 2000 miles on wavelengths of about 200 to 230 metres using both spark and some of the earliest amateur valve transmitters.

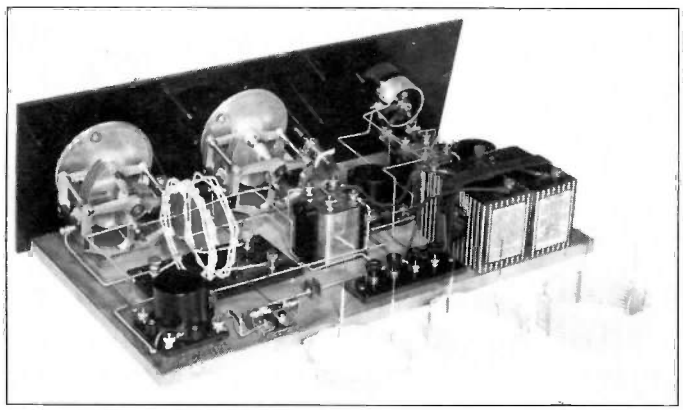
ACROSS THE POND

SOON PLANS WERE launched for transatlantic tests, with British listeners organized by Philip Coursey, 2JK, the research editor of *Wireless World* which was until 1924-5 the official journal of the Wireless Society of London (which became the RSGB in 1922).

A famous station: Gerald Marcuse, G2NM, in 1924.

The first test in February 1921 proved a failure with no American signals heard in the UK. The Americans believed that the British receivers were to blame and for the second test in December 1921 sent over a leading American amateur, Paul Godley, 2ZE, with receivers which he set up at Ardrossan in Scotland with a long 'Beverage' antenna [Harold Beverage, by then a leading radio engineer with RCA, had been W2BML]. During the test he logged 27 American and one Canadian stations, but this time several British listeners also heard transatlantic signals.

On 11 December, the special Radio Club of America station, 1BCG, sent the first complete amateur message across the Atlantic - one of the signatories was Howard Armstrong (one of the most famous names in the development of radio, including the first practical superhet, and the inventor of high-fidelity frequency-modulation). Armstrong, who worked closely with a number of American amateurs, had helped set up 1BCG. These tests finally



The 1925 receiver of Fred Schnell of the American Radio Relay League (ARRL).

settled the spark versus 'continuous wave' controversy, overwhelmingly in favour of valve CW transmitters.

During his stay in England, Paul Godley in a lecture to the Wireless Society of London said "one has far greater hopes of being able to travel greater distances on shorter wavelengths than on higher wavelengths." A firm hint of things to come - the historic pioneering of short-waves (HF) by amateurs in an era when the professionals were still firmly wedded to very long waves and massive power for long-distance telegraphy.

MUSIC OVER THE AIRWAVES

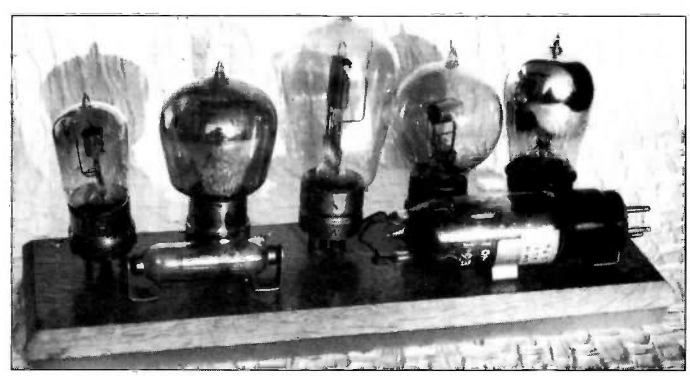
EVEN IN 1921-22 not all amateur experimenters were interested in long-distance telegraphy. With no regular broadcasting in the UK, British amateurs began putting out gramophone records and even live concerts - sometimes with official blessing. The Wireless Society of London organized a massive petition, signed by 63 clubs representing 30,000 enthusiasts, asking for regular broadcasting to start - resulting in the weekly transmissions from Writtle, 2MT, run by P P Eckersley, G2OO, who was to become the first chief engineer of the BBC.

Later, in 1927, Gerald Marcuse, G2NM, from his home in Caterham, Surrey began a series of authorised broadcasts to the British Empire on 32 metres - the first such transmissions from the UK, using a 1.5 kilowatt transmitter built with the assistance of Cecil Goyder. As a 16-year-old schoolboy at Mill Hill School, Cecil had in the autumn of 1924 made the first two-way contact with Frank Bell, Z(L)4AA in New Zealand on a wavelength of about 80 metres. Goyder later became Chief Engineer of All-India Radio and then in charge of United Nations Radio. Amateur radio had 'girdled the world' for the first time.

But we are running ahead of our story. The discovery that, as Paul Godley had suggested, the key to long distances with low power lay in the use of shorter waves. The breakthrough came in late November 1923 when Leon Deloy, (F)8AB a leading French amateur in Nice, was able to contact the ARRL (USA) station of Fred Schnell, 1MO, on about 100 metres (3MHz). News travels quickly and this contact initiated a rush by many stations to the higher frequencies - no easy matter with the triode valves of that era never intended for use above about 1MHz. Jack Partridge, (G)2KF, was the first British station to have two-way contact across the Atlantic on 8th December 1923.

In January 1924 E J Simmonds, (G)2OD, made contact with the States with a transmitter power input of only 30 watts - and when Cecil Goyder worked New Zealand the following autumn, the professional communications people really woke up to the possibilities of the short waves they had previously scorned. Marconi, who had experimented with short waves during the 1914-18 war without discovering the unusual effects of ionospheric reflection, was one of the first to appreciate the significance of the amateur contacts, and resumed experiments on short waves in 1922. He was soon urging the British government to abandon plans for a very-long-wave Imperial Wireless Scheme that had been proposed before the 1914-18 war and instead to build, at much lower cost, an Empire Beam System on short waves.

Within months the amateur experimenters were exploring even shorter wavelengths. From 80-100 metres they coached their home made transmitters down to 40, 30 and even 20 metres - opening the way to daylight DX (long distance contacts).



A collection of valves of the early 1920s.

In October 1928 Jimmy Mathews, G6LL, worked W2JN for the first 10-metre transatlantic contact - and another British amateur (G2FN) got across using just 8 watts. But the influence of the 11-year sunspot cycle was still not recognised - and amateurs were disappointed when the 10-metre band went dead. This lasted until 1934 when, as the cycle moved up again, Miss Nell Corry, G2YL became the first in the world to work all continents on 10m (28MHz).

. . . to be continued

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The RX1 Single

THE RX1 SUPERHET RECEIVER KIT from Hands can be supplied for use on the 80 or 40 metre amateur bands. It's a comprehensive kit and includes a ready drilled case and all the components you need.

PUT YOUR HANDS TOGETHER

THE RECEIVER USES one double-sided silk-screened printed circuit board (PCB) with part numbers on the component side. This is the first kit I have seen where the case comes ready prepared with the speaker and sockets already fitted which is a bonus for someone who is not too good at metalwork. The front panel already has the slow motion coupling installed and two holes are ready drilled for the IF and AF gain controls. The front facia panel is provided with printed lettering. Electronic components are packed in separate polythene bags which makes checking easier, and nearly all the parts are assembled on a fibreglass PCB, approximately 10cm x 8cm.

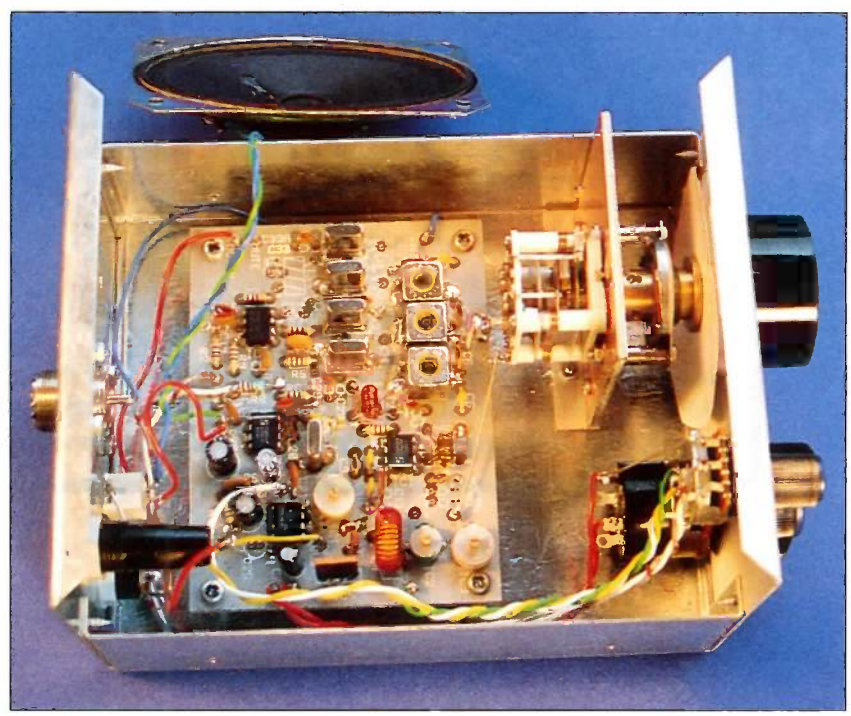
MANUAL EXPLANATION

A SEVEN- PAGE MANUAL is included which explains how the radio works and what each stage does, as well as providing full construction details. Once the radio is built the manual tells you how to test it and carry out the adjustments

- Hands Electronics' Band Receiver Kit

A user-review by Dave McQue, G4NJU

for best performance. A circuit diagram and PCB layout are also included. There are many links between the ground-plane surface (copper side) and the wiring side of the board and these are best made after the resistors have been soldered - then you can use their lead off-cuts. It pays to use a good quality hot soldering iron to tin areas of the board which are used for component ground connections! The circuit layout is compact and there are several extra holes provided in case you want to experiment by adding some additional parts.



The RX1 uses just four integrated circuits and has a crystal filter for sharp selectivity.

ADJUSTMENTS GIVE RESULTS

I USED A SIGNAL generator to set the tuning circuits to give a tuning range of 3,485kHz (3.485MHz) to 3,815kHz (3.815MHz). The BFO (beat frequency oscillator) capacitor was set to maximum for best results on lower sideband (LSB). LSB speech is used between about 3.6MHz and 3.8MHz by European amateur stations on the 80 metre band, with Morse code at the low frequency end between 3.5MHz and 3.6MHz. Very weak signals of less than one microvolt can be heard on the RX1 and interference from out-of-band stations is more than 50dB (over 300 times) lower than the signal you want to listen to - quite a reasonable figure for a receiver of this type. This interference is known as second channel (or image) and IF breakthrough. An antenna tuning unit (ATU) can be used to reduce this type of interference still further and a simple design for a home built ATU was described in *D-i-Y Radio* Vol 2 No 6. (Back numbers are available to subscribers, price just 50 pence each).

In some ways the sensitivity and selectivity performance was nearly as good as my Kenwood TS-530S transceiver. There was, however, a little frequency drift from the variable frequency oscillator (VFO) for a few minutes after switching the radio on. The supply voltage needs to be about 12 volts. Current consumption is about 40mA on quiet signals rising to 120mA on very loud ones. There is no automatic gain control (AGC) so the audio gain (volume) control should not be turned up too high when using headphones!

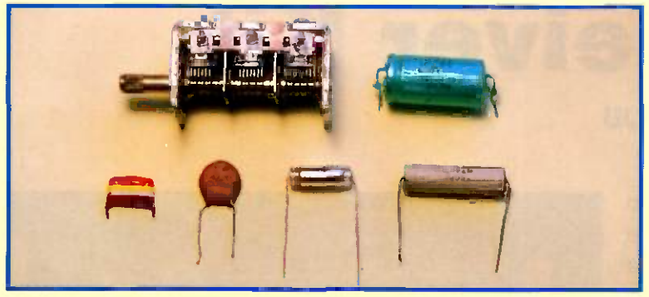
GOOD FOR EXPERIMENTERS

THIS LITTLE RECEIVER is most suitable for those with sufficient soldering practice to handle the compact layout. The options with this set will appeal to constructors who like to experiment a little - for instance you can give the filter a narrower bandwidth to improve CW (Morse code) reception. I feel that the Hands RX1 is ideal for the more experienced constructor, looking for a cheap but high performance receiver. See page 23 for how to win this review receiver.

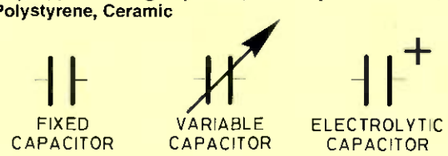
The complete kit costs £71.49 (inc P&P) from Hands Electronics, Tegryn, Llanfyrnach, Dyfed, SA35 OBL. (Telephone 0239 77427).

AMATEUR RADIO AND ELECTRONIC COMPONENTS

CAPACITORS

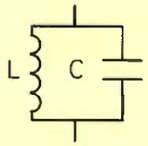


(Left to right), Upper: Tuning Capacitor, Electrolytic. Lower: Polyester, Disk Ceramic, Polystyrene, Ceramic



Capacitors are used for timing and tuning circuits. They are also found in power supplies and for connecting the different stages of a radio together.

TUNED CIRCUITS



Tuned circuits are used to select the wanted (resonant) frequency.

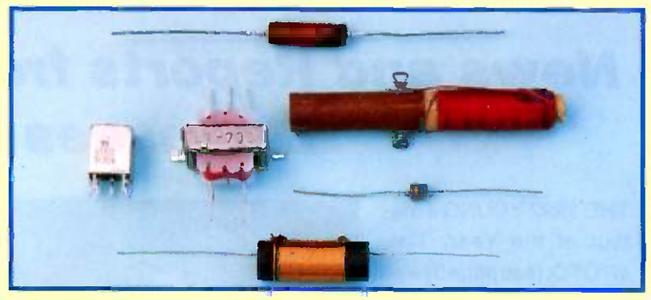
$$\text{Resonant Frequency } (f) = \sqrt{\frac{25330}{L \times C}}$$

L = Inductance in microhenries (μH), C = Capacitance in picofarads (pF)

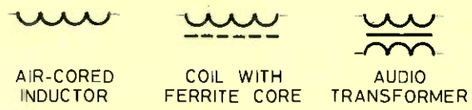
Example: A coil of 10μH and capacitor of 200pF are used in a tuned circuit. What is the resonant frequency?

$$f = \sqrt{\frac{25330}{10 \times 200}} = 3{\cdot}56\,\text{MHz}$$

INDUCTORS

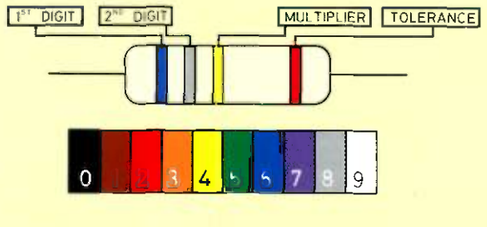


Left to right from top: RF choke, Tunable screened coil, Audio transformer, Aerial coil, Colour-coded inductor, Ferrite cored inductor



Inductors are used for circuits such as filters and matching one stage to another. They are also used in tuned circuits and ferrite rod antennas can be found in AM radios.

RESISTOR COLOUR CODE



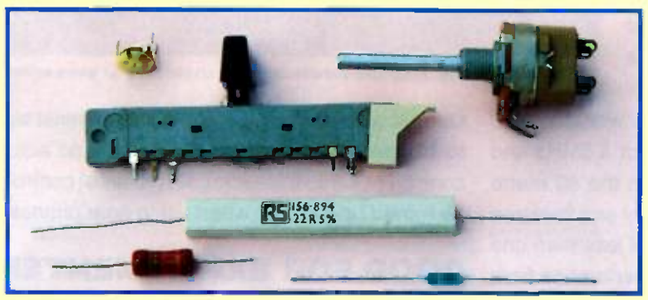
The value of a resistor is found from its colour code. With the 'tolerance' band on the right, the value is read from the left.

In the example above, the first digit is 6 (blue), and the second is 8 (grey). The third colour gives the number of zeros, ie 4 for our example.

Thus the value is 680,000ohms (Ω) or 680kilohms (kΩ). The red tolerance band shows that the resistor is always within 2% of this value.

A similar means of identification is also used on some capacitors and small inductors.

RESISTORS



Left to right from top: Preset resistor, Rotary variable resistor, Slide potentiometer, Wire-wound ceramic, Carbon film (1 Watt), Carbon film (low power)

Resistors are found in most electronic circuits. The variable types are used as volume or tone controls and the large power types are found in transmitters and power supplies.

OHM'S LAW

Ohm's Law can be used as follows:

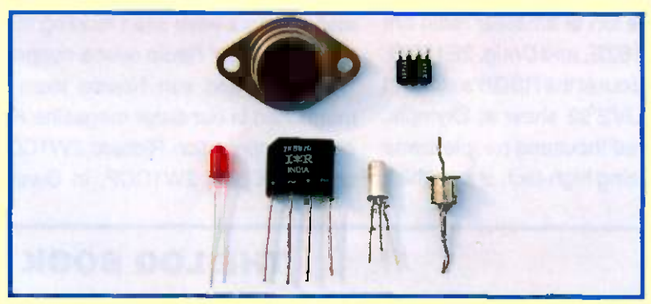
$$R = \frac{V}{I} \quad \text{or} \quad V = IR \quad \text{or} \quad I = \frac{V}{R}$$

Example: 10 Volts across a resistor, means that a current of 80mA flows through it. What value is the resistor?

$$\frac{10}{0{\cdot}08} = 125\,\text{ohms}\,(\Omega)$$

R = Resistance in Ohms (Ω); V = Voltage in volts; I = Current in Amps.

SEMICONDUCTORS



Left to right from top: Power transistor, Integrated circuit, Light emitting diode (LED), Bridge rectifier, Transistor, Diode (rectifier)

Semiconductors come in many shapes and sizes, and you may have seen diodes and transistors used in many *D-i-Y Radio* projects. The bridge rectifier has four diodes inside.

D-i-Y RADIO RSGB, Lambda House, Cranborne Road, Potters Bar, Herts. EN6 3JE

2's Company

News and Reports from Novice Licensees

THE 1992 YOUNG Amateur of the Year, Tim, G7OTO, (see page 3) was a Novice licensee, as was the runner up, Simon, G0STU (who featured on the front page of our second edition back in 1991). They have both gone on to get their full 'G' licences and, what's more, have both become qualified RSGB Novice Instructors. This really is what our wonderful hobby is about; not just enjoying yourself but passing on that enjoyment to others. Well done Tim and Simon.

LIVE '93

TWO NOVICES who helped to demonstrate the fun of amateur radio are Martin, 2E1BZE, and Craig, 2E1BZG, who helped out at the RSGB's stand at the huge LIVE'93 show at Olympia. Two hundred thousand people came to this amazing high-tech show which

Two Novices demonstrate amateur radio to the thousands of visitors to Olympia's LIVE '93 exhibition.

featured all sorts of electronic gadgets for the home, including a virtual reality exhibit. The RSGB stand - with its slogan of "Amateur Radio - the Space Age Hobby" - was very popular and many visitors were seen reading their copies of *D-i-Y Radio* over a cuppa.

A father and son Novice team is mentioned in our sister magazine *Radio Communication*. Richard, 2W1CCK and son Chris, 2W1CCP, in Gwent, were first introduced to the hobby by GW6VZW. He suggested they join the Pontypool Amateur Radio Society and as a result they passed their Novice exam last June. Their station is a Kenwood TS-690S which runs 3 watts on the 50MHz band to an indoor dipole aerial. With this they have had spectacular results (see *The Log Book*).

YOUNGEST CLASS A?

TEN-YEAR-OLD David, 2E0AFD, (is he the youngest Class Novice?) operated in this year's National Field Day (NFD) contest, helping out with the station of the Chichester and District Amateur Radio Club (G2NM/P). The club came 38th out of 52 entries in the Restricted Section. The club's callsign G2NM is a very old one, having been issued some fifty years before David was born.

THE LOG BOOK

LAST MONTH's *Log Book* referred to the excellent VHF contacts made by Sporadic E propagation this summer. How good this has been is shown by a report that Welsh Novices had several long distance Sporadic E contacts using 3 watts on 50MHz. Richard, 2W1CCK, worked **EH**3LL (**Spain**), **9A**1CCY (**Croatia**), **OK**2BGW and **OK**2KK (**Czech Republic**), **SP**6BTI (**Poland**), **LA**9ZV (**Norway**) and **OH**1NSJ (**Finland**). His son, Chris, 2W1CCP, logged **OK**1VQ, **SP**5CCC, and **OH**1LEU.

Have you started your QSL collection yet? Whether you are a listener, a Novice or a full licensee, you can have your own cards and send them to those you hear or work. A listener report should include details of your own receiving equipment, how well you received the station and what the propagation conditions were like (in other words was this station just one of many heard from that area, or was his signal unusual?). Don't forget to add your name and address for a return card. And by the way, there's much more chance of a reply if your report is useful to the station you heard.

The organisers of the Chinese Pow Wow '93 event sent us this fine QSL card. We've got twenty cards to give away to *D-i-Y Radio* readers who write to us about their amateur radio activities.

If you want to see what a real QSL looks like, we've got twenty Chinese QSL cards to give away. Special event station BT5HPW was one of the many activities available at Pow Wow '93 in Hangzhou, China. The camp included Hong Kong Girl Guides and

Prefixes

Everything You Need To Identify Amateur Callsigns: Part 3

EVERY CALLSIGN starts with a combination of letters and numbers to indicate in which country the station is located. In this issue we list the common prefixes used in **Africa**. A complete list of prefixes can be found in the *RSGB Amateur Radio Call Book and Information Directory* which costs £11.50 (inc p&p) from RSGB (Sales), Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.

A2	Botswana
C5	Gambia
C9	Mozambique
CN	Morocco
D2	Angola
D4	Cape Verde
D6	Comoros
EL	Liberia
ET	Ethiopia
FT8W	Crozet Is
FT8X	Kerguelen Is
FT8Z	Amsterdam & St Paul Is
FH	Mayotte
FR	Reunion
J2	Djibouti
J5	Guinea-Bissau
S7	Seychelles
S9	Sao Tome, Principe
ST0	Sudan
SU	Egypt
T5	Somali Rep
TJ	Camaroon
TL	C African Republic
TN	Congo
TR	Gabon
TT	Chad
TU	Ivory Coast
TY	Benin
TZ	Mali
V50, 1	Namibia
VQ9	Chagos Is
XT2	Burkino-Faso
Z2	Zimbabwe
ZD7	St Helena Is
ZD8	Ascension Is
ZD9	Tristan da Cunha Is
ZS1, 2, 4, 5, 6	South Africa
ZS8	Prince Edward & Marion Is
ZS9	Walvis Bay
ZS	Penguin Is
3B8	Mauritius
3C	Equatorial Guinea
3C0	Pagalu (Annobon Is)
3D6	Swaziland
3V	Tunisia
3X	Guinea
3Y	Bouvet Is
5A	Libya
5H	Tanzania
5N	Nigeria
5R	Madagascar
5T	Mauritania
5U	Niger
5V	Togo
5W	Western Samoa
5X	Uganda
5Z	Kenya
6W	Senegal
7O	Yemen
7P	Lesotho
7Q	Malawi
7X	Algeria
9G	Ghana
9J	Zambia
9L	Sierra Leone
9Q	Zaire
9U	Berundi
9X	Rwanda

THE LOG BOOK

Chinese Young Pioneers who were pleasantly surprised at the way in which amateur radio allows people to talk to the rest of the world. If you want one of these cards, just write in and tell us a bit about your radio activities. The senders of the twenty best letters will receive a BT5HPW card.

Two contests are coming up which are guaranteed to let you hear or work some new and exotic countries. These are the 48-hour-long Worldwide DX Contests run by an American magazine *CQ*. The phone (SSB) contest takes place over the weekend 30/31 October, with the Morse (CW) event on 27/28 November. Contestants will send to each other signal reports and a number indicating which 'zone' they are in. A map showing the Zones can be found in the *RSGB Amateur Radio Operating Manual* (price £8.75 including postage, from RSGB Sales, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE), or you may find someone at your local club who can lend you a copy.

A visitor from Germany, Chris, G/DB4RC (centre), was awarded the 'worked All the Elliott Family' certificate for contacts with John, G3WFK; Jayne (17), 2E1BVV; Mark(13), 2E1BUX; and Elaine, 2E1BVS.

As we go into winter, conditions on the HF bands (14, 18, 21, 24 and 28MHz) will become poorer but 1.8, 3.5, 7 and 10MHz will come to life.

On VHF, the Sporadic E season has ended but there are still plenty of opportunities for DX on those foggy days when the atmospheric pressure is very high.

Lightning Never Strikes Twice

Part 2 by John, GW4HWR, Chairman RSGB Training & Education Committee.

THE NORMALLY CLEAR signal from the 2m repeater, high on a hill top just five miles away sounded as if someone up there was frying eggs. In answer to a user, one of the repeater group members said that it was probably due to static! What does this have to do with the electrophorus described in Part 1? (*D-i-Y Radio* Jul-Aug '93).

A thunderstorm is the result of a huge charge generated in a similar way to that in our experiment. High clouds in the upper atmosphere, and moving in opposite directions sweep past one another and the friction causes electrons to be lost and gained. As the clouds move apart the voltage rises because the capacity between them goes down. If the voltage becomes high enough a spark may jump from one cloud to another or from one cloud to some point on the ground. The heat created by the spark causes a rapid expansion of the surrounding air and the following implosion provides the bang. It was only a tiny click in our experiment!

You will remember that there can only be a spark when the air in between the two points becomes ionised by the high voltage. When air becomes ionised, electrons are able to move around and before a spark (lightning) takes place the movement is random. This movement represents currents having a very wide range of frequencies and some of them will fall in the 2m band where they will cause the background noise which was referred to as 'static'.

SHORTEST DISTANCE

THERE IS ANOTHER result of the above effect which is of great importance to radio amateurs and many other sections of the community. In **Fig 1** the cloud has developed a very big charge and the air between it and the ground has become ionised. The conditions are becoming 'ideal' for a spark to jump. The spark will normally travel the shortest possible distance. This could be to another cloud, the top of a tree, the chimney on a building or our aerial, stuck up as high as we can get it, on the roof. In the picture the 'spark' jumps to the tree - why? If the spark does take place the current will be enormous - tens of thousands of amperes, more than enough to hit the chimney, the tree or our aerial and mast.

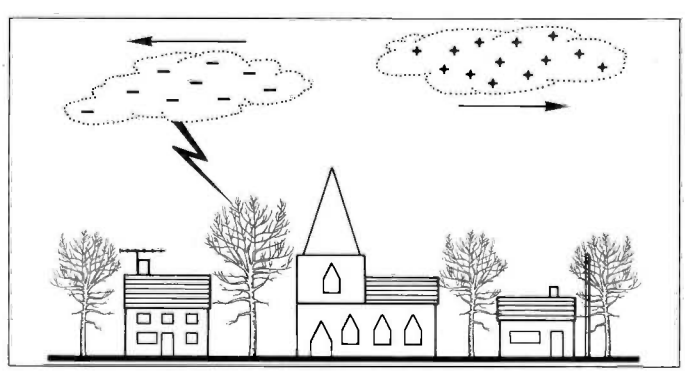


Fig 1: The charge in the cloud and the ionised air around it combine to cause the lightning strike.

Sometimes it could be even worse and some of the building may disappear. Remember that this current is the result of static electricity and is not the static itself.

Why doesn't this happen more often than it does? Many tall buildings are provided with a lightning arrester. This usually consists of a strip of copper mounted right at the top of a building,

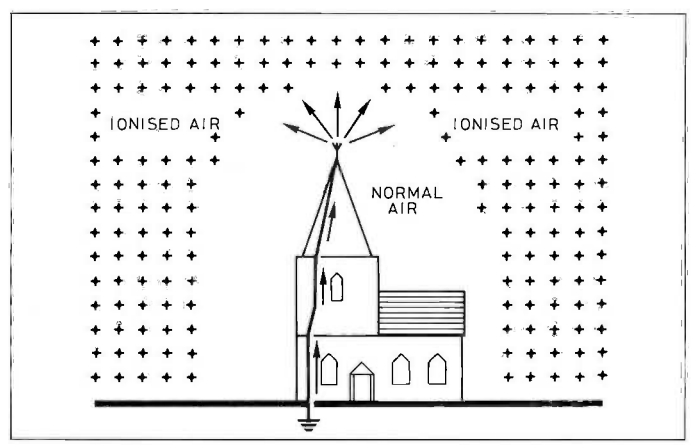


Fig 2: Ionised electrons flow up the copper strip and off the top, thereby protecting the building.

higher than any other part: (see **Fig 2**).The top is pointed and the rest of the strip goes right down the building and is connected to an excellent earth point in the ground. When the air around the building starts to become ionised electrons flow up (or down, if the air is negatively ionised) the copper strip and leave the pointed end at the top to move on to an ion of air, the now normal molecule of air transfers an electron to an adjacent ion which in turn passes an electron to another ion.

The process is virtually the reverse of that described in the last issue when the air was ionised. If this process can take place quickly enough a blanket of normal (not ionised) air will be formed around the building - it has become insulated and any lightning flash will occur somewhere else even though the distance travelled by the spark is greater.

LIGHTNING ARRESTER

IF OUR AERIAL installation is well earthed via the radio it will act as a lightning arrester and will help to guard the building against lightning strike. ***Never be tempted to remove the aerial plug from an amateur rig or a television receiver during a thunderstorm. You will put yourself at risk by doing so and nothing is gained by the removal.***

We can't stop the thunderstorm but we can reduce the risk of damage to our installation and property by the use of good earthing of the aerial mast and antenna. Note that the lightning arrester stops the lightning strike it does *not* conduct it to earth as the name lightning conductor suggests.

Lemons, Lead and Lithium

What Do These Have In Common? They Can All Be Used In Batteries!

MANY PEOPLE TAKE batteries for granted, but there are now quite a number of different types available and it's important to choose the right sort for your equipment. The simplest type is the one we're using to power the Fruit Machine radio (on page 4). It's made from a citrus fruit such as a lemon or lime (**Fig 1**), and even a rotten fruit seems to work OK! The fruit juice is known as the **electrolyte.** A piece of copper or brass is used to make the **positive terminal**. For the **negative** one a large galvanised (zinc plated) nail is used. Home-made batteries such as this give a voltage of only about 0.6V, so two or three are needed to power our radio. Try some different fruits to see which give best results.

All batteries need an electrolyte and terminals made from different materials. Some batteries must be thrown away when they're worn out - these are called **primary cells**. On the other hand **secondary cells**, such as car batteries, can be recharged many times. **Fig 2** shows a lead-acid accumulator - six cells are used in a car battery to give 12V.

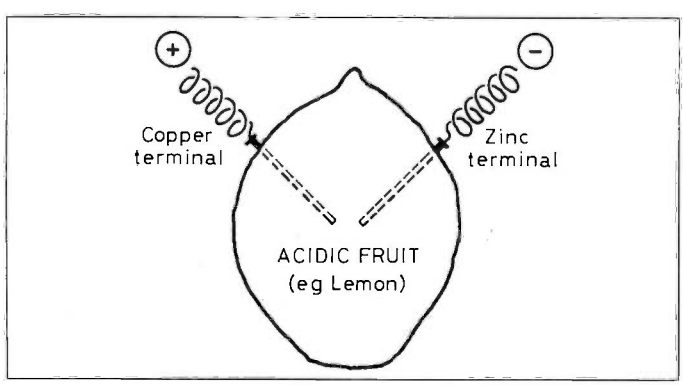


Fig 1: Juice from the lemon acts as an electrolyte, making a simple battery.

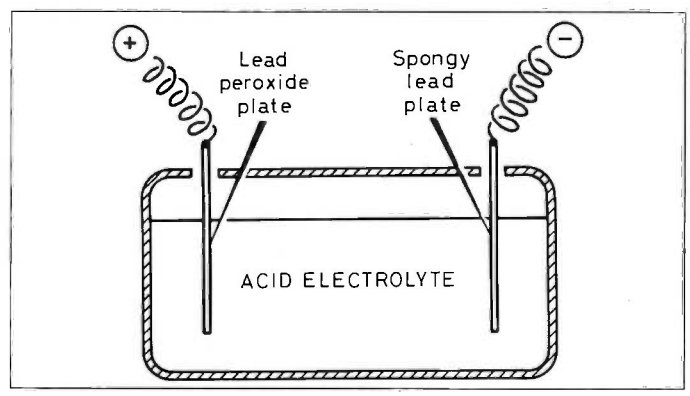


Fig 2: Fully charged lead- acid battery with sulphuric acid electrolyte.

Primary types	Volts per cell	Uses
Zinc Carbon	1.5V	Torches, Radios
Mercury Oxide	1.35V	Clocks, Calculators
Lithium MnO_2	3V	Cameras, Memory back-up on computers
Alkali Manganese	1.5V	Toys, Tape Recorders
Secondary types	**Volts per cell**	**Uses**
Lead Acid	2V	Car batteries
Nickel Cadmium	1.25V	Many uses including portable transmitters.

Table 1: You need different types of battery for different jobs.

C.M.HOWES COMMUNICATIONS

Mail Order to: Eydon, Daventry, Northants NN11 6PT
Tel: 0327 60178

EASY TO BUILD HOWES KITS!

Building your own equipment is half the fun of amateur radio! Whether you are a Novice or an old hand, you should find an interesting project in our range.

DcRx80 plus DCS2 kits in HA80R hardware pack

RECEIVERS

TRF3 Easy to build TRF receiver with AM, SSB & CW shortwave reception from 5.7 to 12.8MHz in 3 bands Kit: **£15.50** Assembled PCB: **£22.90**

DcRx Single Band SSB/CW receiver for 160, 80, 40 or 20M Amateur Bands or 5.45MHz HF Air (air-sea rescue etc.) Kit: **£16.90** Assembled PCB: **£24.90**

DXR10 Three Amateur Bands, 10, 12 & 15M SSB & CW receiver with excellent sensitivity and dynamic range Kit: **£27.50** Assembled PCB: **£42.50**

Optional hardware packs are available to go with the above receiver electronics kits. The amateur band receivers can all be expanded into transceivers by adding on the relevant transmitting kits.

CTU30 Antenna Tuning Unit covering all shortwave bands and 6M. For receiving and up to 30W RF transmitting. Suits all antenna types. Top quality performance. **CTU30** kit plus **HA30R** hardware pack: **£57.80**

XM1 Crystal Frequency Marker for calibrating receivers and helping to meet amateur licence requirements. **XM1** kit plus **HA11R** hardware pack: **£28.80**

PLEASE ADD £1.50 P&P for kits or £4.00 P&P if ordering hardware.

HOWES KITS contain good quality printed circuit boards with screen printed parts locations, full, clear instructions and all board mounted components. Sales, constructional and technical advice are available by phone during office hours. Please send an SAE for our **free catalogue** and specific product data sheets. Delivery is normally within seven days.

73 from Dave G4KQH, Technical Manager.

The Nicky Receiver

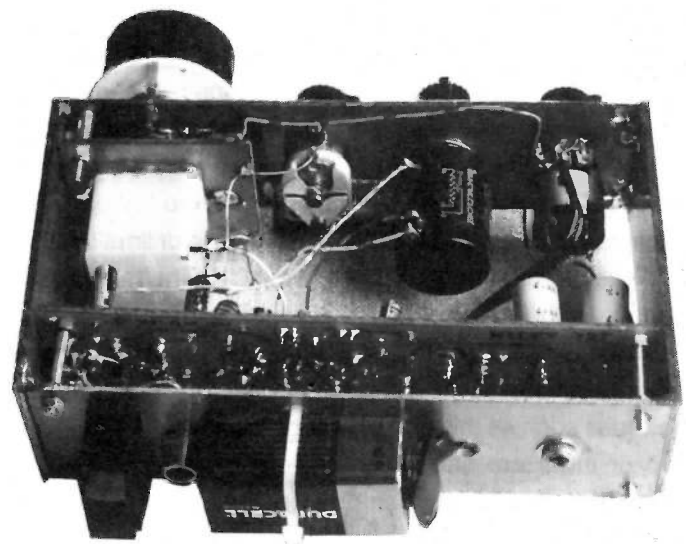
A Simple Short Wave Radio

Part two of an article by Rev. George Dobbs, G3RJV

THE RECEIVER IS LAID out on a printed circuit board (PCB) which can be obtained with the Kanga Products kit, or separately. The layout of the board is shown in **Fig 3**. The parts are merely slotted into the board and soldered on the rear. Good soldering is essential as in all electronic projects. Take care to position all the components correctly - remember that some will not work if they are the wrong way round. T1 and T2 must be mounted the correct way round as must the transistors and LM386 chip. Electrolytic capacitors are polarised, and marked with a + sign at one end and must also be mounted the right way round. The controls are connected to the terminals as shown. Follow Fig 3 carefully.

I decided not to buy a case for the Nicky but to make a front and back panel from un-etched PCB to form the structure. This can be seen in the photograph, but you can build the receiver in a metal case if you like. **Fig 4** gives the dimensions for cutting and drilling pieces of blank PCB for my method. These can often be bought cheaply at radio rallies or obtained from electronic parts mail order companies (eg Maplin).

I used a small slow motion drive for the main tuning - the band-spread control simply has a knob. The main tuning capacitor is mounted onto a smaller panel held by two stand-off pillars behind the front panel for the slow motion drive. This variable capacitor is of the Polyvaricon type used in cheap AM radios. Sometimes these can be difficult



to mount so I fixed mine to the small back panel with glue. I added a small tuning scale made from a disc of cardboard and an LED as a pointer. Notice that the LED is pushed through the front panel and has a series resistor of 1k8 soldered to a corner of the small panel. This corner has been isolated as a solder pad by drawing a saw blade across the printed circuit board to make an insulated pad. The LED is connected to the 9 volt supply via this resistor.

The volume control potentiometer has its own on-off switch for the PP3 battery mounted on the back panel. Antenna input sockets and the headphone/speaker socket are also mounted on this panel.

The way the Nicky PCB is used depends entirely upon

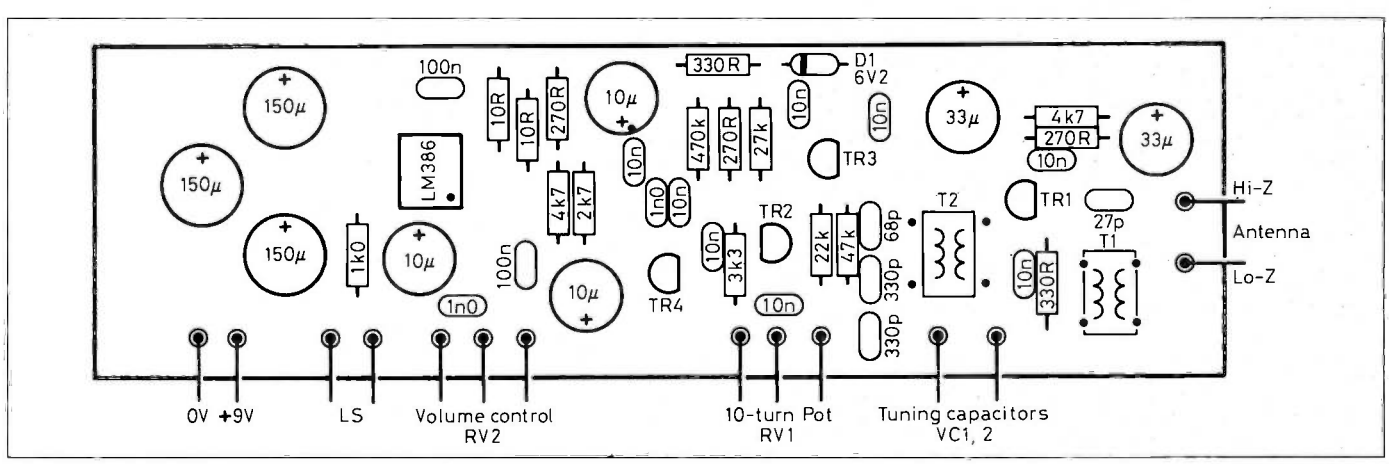


Fig 3: Layout of the Nicky receiver circuit board

how you want it to look. You may like to follow my ideas in the photograph or do it your own way. This is the joy of radio construction.

CHOOSE YOUR INPUT

CONNECT THE RECEIVER to an antenna. If a conventional amateur band antenna is being used, perhaps through an Antenna Tuning Unit, use the low impedance input. I had excellent results from the Nicky by connecting about three metres of wire to the high impedance input and using this as the antenna. Switch on the Nicky and set the volume control to a gentle hiss in the headphones or loudspeaker.

Turn up the reaction control until a definite hiss is heard. If a station is being tuned, this hiss will be more like a whistling (oscillating) sound on signals. Either way, you will notice a distinct change in the reception at this point. Back off the regeneration control just short of this point and the receiver is set for AM short wave broadcast stations.

On the amateur bands, the signals will be either SSB or CW and these need the reaction to be set just above the point of oscillation. The reaction will change as the Nicky is tuned, and the control will require re-setting from time to time. Juggling the tuning, reaction and volume controls to get the best reception is part of the fun of such receivers!

NICKY IN ACTION

A RECEIVER USING the regenerative method of reception needs practice to get the best results. The secret lies in the use of the regeneration control. For Morse code (CW) or single sideband (SSB) reception the control is set to the point of oscillation.

Tuned circuit T2 is arranged so the Nicky receives signals from roughly 6.5 to 11MHz. This includes two broadcast bands and the 7MHz and 10.1MHz amateur bands. Since there is only one tuned circuit coil T2 could be changed to cover other frequencies. Adding turns will let you receive lower frequencies, removing turns will cover higher frequencies.

I was amazed at what I heard on the Nicky. With my short piece of wire connected, it was a very useful receiver on the 7MHz (40 metre) amateur band. I also heard many stations from all over the world on the broadcast bands. The Nicky is certainly fun and works surprisingly well.

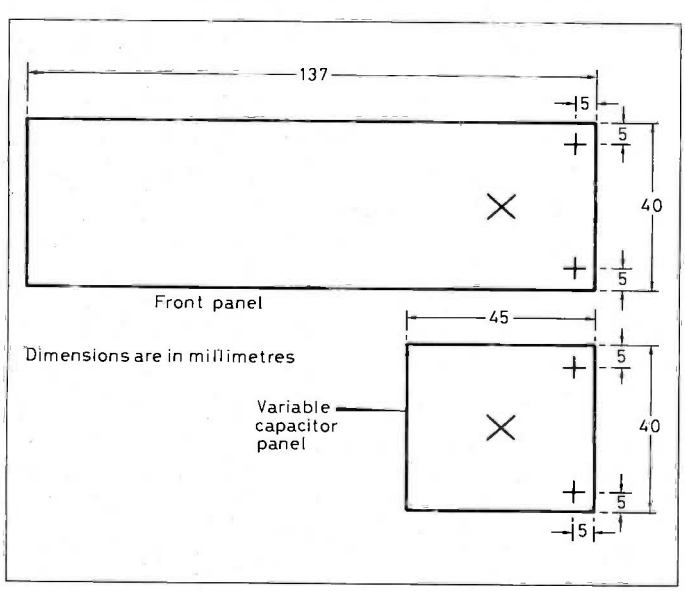


Fig 4: The case can be metal or made from PCB material.

COMPONENTS LIST

Resistors

R1,R10	330R	R8	27k
R2,R5,R11	270R	R9	470k
R3	22k	R13	2k7
R4	47k	R14,R15	10R
R6	3k3	R16	1k0
R7,R12	4k7*		
RV1	10k 10-turn linear potentiometer (20k or 50k types are also suitable)		
RV2	10k log potentiometer		

* Please note that the value of R12 shown on the circuit diagram in part one was incorrect. The value should be 4k7. Also the 10k potentiometer connected to IC1 is RV2.

Capacitors

C1	27pF	C8,C9	330pF
C2,C18,C22	100nF	C15	1n0
C3,C4,C12,C13,C14	10nF	C16,C17,C20	10µF
C5,C11	33µF	C21,C23	150µF
C6, C10	10nF	VC1	10pF
C7	68pF	VC2	200pF

The capacitor connected to TR2 collector on the circuit diagram is C10 - not C13 as shown.

Semiconductors

TR1,TR3	2N3819
TR2,TR4	BC182
IC1	LM386
D1	6V2 zener diode

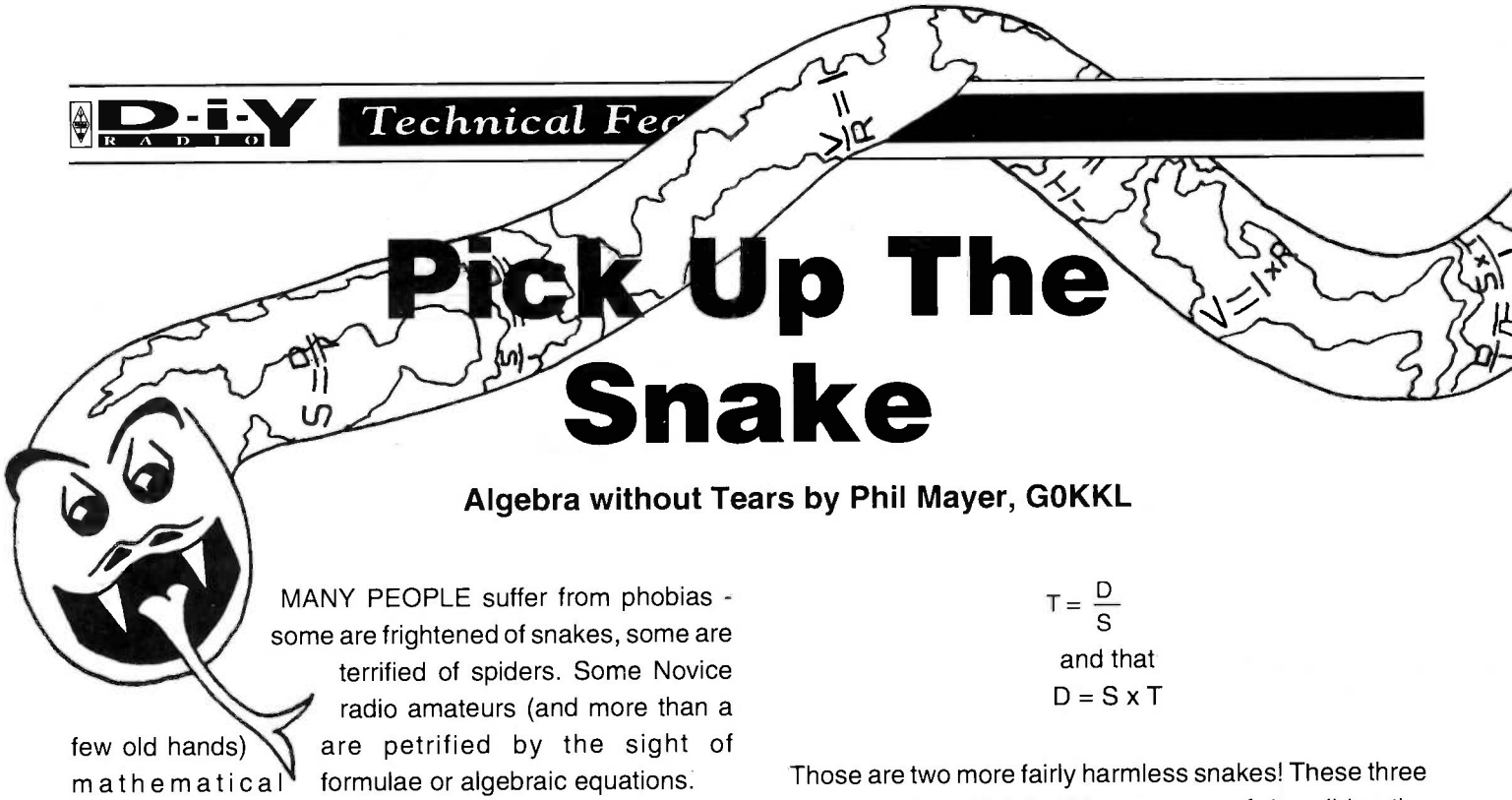
Inductors

T1	3 turns primary, 15 turns secondary wound on a 2-hole ferrite bead. 36SWG wire.
T2	2 turns primary, 17 turns secondary wound on a T68-2 toroidal former. 28SWG wire.

Additional Items

Printed Circuit Board; Battery connector; PP3 battery; 8-pin IC socket; 8ohm speaker or headphones (eg Walkman type); Case made from PCB material or aluminium

A kit of parts for the Nicky is available from Kanga Products, Seaview House, Crete Road East, Folkstone CT18 7EG, tel 0303 891106. Price is £18.95 inc. VAT + P&P. Use our special Voucher on page 23 to get 50p off this kit (eg £18.45 inc P&P). State band required when ordering. This does not include the tuning capacitor but the Maplin type FT78K is suitable. Price is £1.10 + P&P from Maplin.



Pick Up The Snake

Algebra without Tears by Phil Mayer, G0KKL

MANY PEOPLE suffer from phobias - some are frightened of snakes, some are terrified of spiders. Some Novice radio amateurs (and more than a few old hands) are petrified by the sight of mathematical formulae or algebraic equations.

A girl I knew was cured of her fear of snakes on a school visit to the London Zoo; she went behind the scenes in the Reptile House and the keeper encouraged her to pick up some of the more harmless snakes. Scared at first, she soon got used to the peculiar feel and within minutes was confident enough to put one round her neck like a scarf.

If you are one of those people who freeze at the sight of things algebraic like:

$$X = 2 \pi fL,$$

or

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

Now is the time to pick up *your* snake!

You don't need to be a mathematical genius to know that if you travel 60 miles in 2 hours your average speed is 30MPH. Or that if you have 150 miles of motorway to cover and your speed is 50MPH it will take you three hours. Or that if you drive at a steady 56MPH for one-and-a-half hours you will travel 84 miles.

The first answer shows that you already knew the general rule that to find the speed you divide the distance by the time taken. Using the letters D, S and T as abbreviations for Distance, Speed and Time you can write this statement as:

$$S = \frac{D}{T}$$

But this is an algebraic equation! That snake wasn't very frightening was it?

Using the same abbreviations to describe the other two answers, it is clear that you also knew that:

$$T = \frac{D}{S}$$

and that

$$D = S \times T$$

Those are two more fairly harmless snakes! These three equations are all slightly different ways of describing the relationship between Time, Distance and Speed. Remembering that any number divided by one remains the same, we can emphasise their similarity by rewriting them like this:

$$\frac{S}{1} = \frac{D}{T}$$

$$\frac{T}{1} = \frac{D}{S}$$

$$\frac{D}{1} = \frac{S \times T}{1}$$

It doesn't require Sherlock Holmes to draw the deduction that you can turn one into another by moving the letters around, or to find out that the rule for doing this is: "To move any letter (**term**) from one side of the equation to the other you must also move it from the top to the bottom of the fraction - or vice-versa".

Is that all there is to it? Well, no not quite. Suppose you visit Air Traffic Control at Heathrow and they tell you that the Boeing 747 showing up 30 miles away on the radar will be over the airfield in three minutes. What is its speed?

Using the first equation above you get an answer of 30 divided by 3, which is 10. But 10 what? Certainly not 10MPH - that's a likely speed for a bicycle, not for a jet plane! In this case the answer is obvious - it's ten miles per minute which is equivalent to 600MPH. But later, when you are dealing with equations about things you are less familiar with, the error may not be so obvious. To avoid them we must be more precise than we have been so far.

The first rule should have been stated as "to find the speed in *miles per hour* divide the distance *in miles* by the

time in hours". So when using the equation to solve a particular problem we have to remember that S stands for the speed in miles per hour when D stands for the distance in miles and T for the time taken in hours.

Had we done our calculation using these units (and remembering that one minute is a sixtieth of one hour) it would have looked like this:

$$S = \frac{D}{T}$$

or 10 divided by one-sixtieth, which equals 600. If you didn't already know, you have now learnt that dividing by one-sixtieth is the same as multiplying by 60. Putting the wrong units into equations is the commonest cause of mistakes in electrical calculations.

● Algebraic equations are merely general rules for doing simple calculations, using letters as abbreviations.

● If an equation doesn't tell you what you want to know you can rearrange it using the 'cross-over' rule so that it does.

● You must use the units the equation was designed for.

● You should check the result if possible to see if the answer appears to be reasonable.What has all this got to do with amateur radio? Well, most of the rules for doing the calculations you will need as a radio amateur are of the 'S = D divided by T' type; here are a few examples:

● Volts divided by Amperes equals Ohms:

$$\frac{V}{R} = I$$

from which, by using the cross-over rule you can get:

$$\frac{V}{R} = I \text{ and } V = I \times R$$

Note that we use **I** as the symbol or abbreviation for electrical current because capital C is used for capacitance. This is the mathematical expression of **Ohms Law**.

● Volts times Amps equal Watts:

$$V \times I = W \text{ and } \frac{W}{V} = I \text{ and } \frac{W}{I} = V$$

This is **the power law**. If you are a Novice Licence holder you need this one to make sure you are operating within the terms of your licence - not more than 5 watts of DC power to the transmitter output stage.

● Frequency times Wavelength equals the speed of light.

$$f \times \lambda = c$$

We use the Greek letter λ (**lambda**) for wavelength because W and L are used for other things [Now you know why our address is Lambda House - *Marcia*].

Watch out when picking up this snake - it can bite! The speed of light - and of radio waves - is 300 million metres per second. So to get the right answer you must remember that the wavelength will be in metres only if you put in the frequency in cycles per second, or Hertz in commemoration of the scientist who first demonstrated the existence of radio waves. But most amateurs think of frequencies in Megahertz (MHz), and one Megahertz is one million Hertz.

Try working out what wavelength corresponds to a frequency of 3.75MHz. If you don't lose any of the noughts on the way you will soon see why the amateur band from 3.5 to 3.8MHz is also called the 80 metre band.

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Readers' Letters

Keep sending your letters and photographs to the Editor, D-i-Y Radio, RSGB, Lambda House, Cranborne Road, Potters Bar, Herts, EN6 3JE, and we will send a pen to the sender of each letter published.

READER FROM INDIA

I am addicted to your wonderful magazine and would like to purchase past issues of Vols 1 and 2 - all copies. Please make a proforma invoice of the amount to be sent to you and I will send the money for your priceless back issues.

H Dass, Howrah, India

REPRINTS

Articles published in *D-i-Y Radio* are found to be interesting and useful. You may kindly permit us to publish in NIAR's monthly newsletter 'Ham News'. We will be pleased to give your source credit.

S Suri, VU2MY, National Instiitute of Amateur Radio, Hyderabad, India

BACK TO RADIO

Like Mr Tennant in *D-i-Y Radio* Volume 3: No 5, I am 72 years young and I was also into wireless when I was about nine years old. I came out of it to go into engineering and now have found an interest in short wave radio.

I would like to see more on Test Gear and how to use it, such as Digital Multimeters Signal Generators etc, and how to use them in a circuit.

Best of luck to *D-i-Y Radio*,

A R Hartland, Worcester

D-iar-Y NOV-DEC

NOVEMBER

7	North Wales Radio & Electronics Show, Aberconway Conference and Exhibition Centre. Adults £1: Under 14s free. Details: Mr B Mee, GW7EXH, tel: 0745 591704.
12	432MHz Contest. 8.30 - 11pm
13	1.8MHz Club Contest: 8pm - 11pm
21	West Manchester Radio Club Winter Rally. Bolton Sports & Exhib.Centre, Silverwell St, Bolton. 11am. Adults £1: Children free. Details: Dave, G1IOO, tel: 0204 24104 (evenings).
27/28	CQWW Contest (CW). 0000
29	432MHz Contest. 8.30 - 11pm.

DECEMBER

6	Radio Amateurs Examination (RAE)
13	Novice Examination (NRAE)
14	432MHz Contest. 2pm - 10pm.

NICKY KIT OFFER

The Kit for the Nicky featured on page 18 is available from Kanga Products, Seaview House, Crete Road East, Folkestone CT18 7EG, tel: 0303 891106. The cost is **£18.45 (inc P&P)** with one of the special *D-i-Y Radio* vouchers (Page 23). Kits ordered without a voucher cost £18.95. NB Kits do not include the tuning capacitor (see page 19).

OFFER CLOSES 31 DEC 1993

Become a regular D-i-Y'er

Get the next six editions of *D-i-Y Radio* PLUS a bag of goodies for the special price of **£9** (overseas prices on application). Send cheque or postal order to:

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Amateur Radio . . .

RADIO AMATEURS are qualified radio operators who are licensed to talk to other operators, often in distant countries, from their own homes. Amateur radio is a hobby for all ages but it is different from CB radio because a very wide variety of frequencies (wavelengths) can be used, and contacts can be in different 'modes'; by Morse code or teleprinter, between computers or even television. Many amateurs build all or part of their station equipment.

. . . and the RSGB

THE RADIO SOCIETY OF GREAT BRITAIN (RSGB) is the national society for all radio amateurs (transmitters and listeners) in this country. It has 32,000 members, including many in overseas countries.

The Society looks after the interests of radio amateurs throughout the UK. Talks between the RSGB and the Governments' Radiocommunications Agency have resulted in the popular amateur radio Novice Licence.

In particular the RSGB is keen to encourage the experimental side of electronics and radio and the Society's monthly magazine *Radio Communication* is sent free to all members. We're having lots of fun with our hobby, so why not join us?

If you would like more information on the RSGB or the Novice Licence, write for an Information Pack to Sylvia Manco (enclosing a large stamped self-addressed envelope), at:

RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.

DI-DI-DAH-DAH-DI-DIT

Win an 80 Metre Receiver

WIN THE HANDS RX-1 RECEIVER reviewed on page 10. Our author has built this for his review, and it is now ready and waiting for our first prize winner in this super competition. Thanks to Hands Electronics for donating the receiver.

1st Prize: Hands RX-1 Receiver
2nd Prizes: RSGB 5WPM Morse Practice Cassettes
3rd Prizes: Mini Photo Albums

Using past copies of *D-i-Y Radio*, and with the help of the Components Poster in the centre of this issue, correctly identify the components below. These are shown as they would appear on a circuit diagram. When you think you have found all the answers, write down A, B, or C next to the relevant number on a postcard. All entries to the Editor, *D-i-Y Radio*, Cranborne Road, Potters Bar, Herts EN6 3JE, by 31 December 1993 please.

	Symbol	A	B	C
1		Switch	Antenna	Resistor
2		Resistor	Transistor	Integrated Circuit
3		Capacitor	Resistor	Antenna
4		Inductor	Variable Capacitor	Transistor
5		Transistor	Loudspeaker	Earpiece
6		Antenna	Coil	Integrated Circuit
7		Resistor	Earpiece	Battery
8		Diode	Crystal	Antenna
9		Switch	Coil	Loudspeaker
10		Variable Resistor	Preset Resistor	Transistor

WINNERS!

WINNERS OF THE D-i-Y Radio Happy Hams' Headphones competition (Sept-Oct issue):

1st Prize: Matthew Hearn from Kent wins the MFJ-8100 Short Wave Receiver.

2nd Prizes: Brian Curtis from Gwynedd and Mr R B Symes from Warwick win Duffle Bags.

3rd Prizes: Matthew Moore from Belfast and Eric Carver from Barnsley win Bicycle Drink Holders.

For information there were 13 headphones!

Special Offers

Every *D-i-Y Radio* includes a special offer, indicated by the 50p coin symbol. This issue's offer appears on page 19. If you would like to save 50p off the price shown, then send in this corner token with your order. If you still have any of the old coupons left you can still use these instead, but remember - just one coupon per order.

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