D-i-Y RADIO

AN INTRODUCTION TO AMATEUR RADIO - FOR BEGINNERS OF ALL AGES

January-February 1995

Volume Five: No 1

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COVER PICTURE:
Paul, 2E1DBI, operating from the Prescelly Mountains in West Wales as 2W1DBI/P.

comment

IN THIS EDITION we have our usual wide range of articles which should be of interest to those of you with transmitting licences, as well as those without. Our poster covers the most important - and, fortunately, usually the cheapest - part of an amateur radio station: the aerial or antenna. Many amateurs enjoy experimenting with antennas, and there's no best one - just the most suitable for your garden and your own pattern of operating.

Thinking Day On The Air takes place in February and I would like to say "welcome to amateur radio" if you are a Guide reading this during TDOTA. We'd love to hear from you if you want to know more about the hobby. Just drop a line to the address on our cover and say where you learned about ham radio.

Sorry that this edition is a little late - we've had a few difficulties this end - normal service will be resumed next time.

Marcia Brimson, 2E1DAY
RSGB Marketing

C O N T E N T S

CONSTRUCTION CODE

FOR THE COMPLETE BEGINNER . . . . (one pliers)

REQUIRES A LITTLE EXPERIENCE . . . . (two pliers)

FOR THE MORE EXPERIENCED (three pliers)

Sheila Elden, G8HYE, demonstrates amateur radio to her 20 month old grandson James. Sheila and her husband Reg, G8VNP, are readers of *D-i-Y Radio*.

Managing Editor: Mike Dennison; Production Editor: Jennifer Preston; Technical Editor: Peter Dodd; Illustrator: Bob Ryan; Editorial Asst: John Davies; Production Asst: Brione Meadows; 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. ISSN No: 0959-843X.

● THE NEW CO-ORDINATOR of the RSGB's Project YEAR (Youth into Electronics via Amateur Radio) is Dorset's Senior Novice Instructor Phil Mayer, G0KKL. He takes over from Hilary Claytonsmith, G4JKS who has carried out this voluntary task for several years.

● THE RADIOCOMMUNICATIONS Agency may now publish the names of convicted amateur radio 'pirates'. Previously, the Agency believed this information to be confidential.

● THE RSGB NEWS Bulletin, GB2RS, has an extra transmission. It will be broadcast from Enfield, North London, on channel S21 (433.525MHz) FM at 8pm on Sunday evenings.

● THE RSGB HAS donated £3000 to the amateur radio satellite organisation AMSAT-UK. The money will go towards the Phase 3-D satellite due for launch next year.

● ON DISPLAY AT THE headquarters of the American Radio Relay League (ARRL) is the Elser-Mathes Cup which will be presented to the first amateurs to make two-way communication between the Earth and Mars.

● SIXTEEN AMERICAN schoolchildren had lunch with astronaut Linda Godwin, N5RAX, a few weeks after having an amateur radio contact between their school and the space shuttle *Endeavour*.

TAPES FOR BLIND NOVICES

FOR THE BENEFIT of blind Novice licence trainees, two publications - *The Novice Student's Notebook*, the official RSGB training manual, and *BR68a/N*, the detailed licence conditions - are now available on audio tape. Just send five C90 cassettes, plus £1.60 to cover post and packing, to: Julian Myfield, 9 Middlefell Way, Clifton Estate, Nottingham NG11 9JN.

JOTA Success for IoM Scouts

THE 37th JAMBOREE On The Air (JOTA) took place last October. One of the most well-known JOTA stations is GB2MSR, operated from the Isle of Man by Denys Hall, whose own callsign is GD4OEL, and by the 1st and 5th Douglas Scouts.

From their location at Eary Cushlin the Manx Scouts passed greetings messages to Scouts in the UK, Canada, USA, the Netherlands, Norway and Sweden.

The log was kept on a computer (an old 286) by three keen youngsters. Many Scouts took the opportunity to train for their Communicator and Information & Technology badges.

Other radio interests on site were Private Mobile Radio - an exhibit provided by the IoM Education Authority - and 27MHz citizens band (CB) radio.

Denys Hall at the microphone of GB2MSR, watched by members of the 1st and 5th Douglas Scouts. In the foreground Brian Cowley inserts entries in the computerised log.

Denys has persuaded a number of IoM companies to donate prizes for *D-i-Y Radio* competitions - see our *Di-di-dah-dah-di-dit* pages for the next few editions.

● GUIDES Thinking Day On The Air is on 18/19 Feb.

TEACHERS SOUGHT

THE STELAR Group - Science and Technology through Educational Links with Amateur Radio - is again running a course aimed at teachers who want to start up an amateur radio club in school, or use amateur radio as a cross-curriculum link.

The group is looking for teachers working in schools where there are no radio amateurs. If readers know of any teachers who have expressed an interest in becoming involved with amateur radio please ask them to contact Richard Horton, G3XWH, on 01423 871027.

The course, which is sponsored by Trio-Kenwood UK Ltd, runs 17 - 21 April in Watford. Accommodation and meals are free but the course is not for the faint hearted and students must look forward to some really hard work.

100 YEARS OF RADIO

1995 IS AN IMPORTANT year for amateur radio. Several anniversaries will be celebrated during the next twelve months, but the most important is the centenary of radio itself.

It was one hundred years ago that Guglielmo Marconi first demonstrated the practical application of radio over a one-mile path near Bologna, Italy. This followed experimental work in Britain by Sir Oliver Lodge, who later became President of the RSGB, and in Germany by Heinrich Hertz.

The Merulius Moisture Meter

By Steve Ortmayer, G4RAW

DRY ROT (Merulius Lacrymans) can strike havoc in buildings causing the timbers to decay and crumble to dry dust. Hence the name Dry Rot.

Wood is only attacked if its moisture content rises above about 20%. If you make this project then you will be able to keep a check on how damp the timbers are in your house.

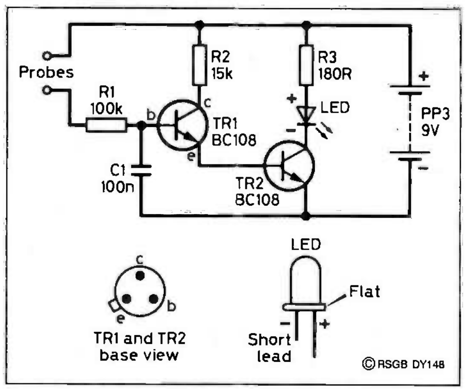


Fig 1: Circuit diagram of moisture meter

The circuit, shown in **Fig 1**, is very simple, the two probes are touched onto the wood and if the wood is dry then no current flows between them. If the wood has a high moisture content then a very small current will flow and this will be amplified by the transistors to make the LED (light emitting diode) glow.

CONSTRUCTION

THE METER CAN be made on a piece of perforated plain board, ie without the copper strips as shown in **Fig 2** (you could even use a piece of thick card). The components are pushed through and the wires soldered together underneath the board. The board is big enough to take the PP3 battery. A case is not needed unless you want to leave the meter in a damp location.

Take care to get the transistors and the LED the correct way round (Fig 1). When construction is complete check the wiring and connect the battery. I did not bother with an on/off switch because only a tiny amount of current slows when the meter is not in use. Lick your finger and hold it across the probes; the LED should glow.

HOW TO USE THE MOISTURE METER

I COMPARED THE completed project with an expensive commercial meter I use for surveying buildings in connection with my work. The LED glowed when the moisture content was about 20% which was quite a fluke! This will depend on the distance between the solder tag probes and the gain (amount of amplification) of the transistors.

What if you find some damp timber? Well you must find the cause - it could be a defective drain or rainwater pipe or gutter or a defective damp proof course. But having carried out the hard part with our meter, let's leave the easy bit to a builder!

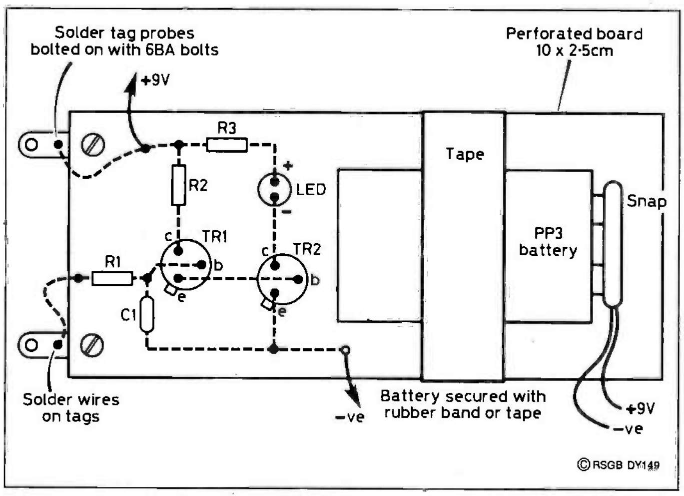


Fig 2: Moisture meter, component layout

COMPONENTS

Resistors - 1/4 watt carbon film

R1	100k
R2	15k
R3	180R
Capacitors	
C1	100nF
Semiconductors	
TR1,TR2	BC108
LED	Any light emitting diode

Additional Items

PP3 Battery and snap connector
Solder tags (used as probes)
Plain perforated board 10 x 2.5cm

Note

I USED TWO BC108 transistors bought at a rally - 100 for £1.00! We Yorkshire persons are taught the Scots thrift! If you buy a cheap batch like this you must test them before use.

Amateur Satellite Update

The latest news about the OSCARs

THERE ARE TWO items of news that have occurred since the last *D-i-Y Radio*, which featured amateur radio satellites. 1: OSCAR 21 no longer appears to be operational. 2: A new satellite was launched by the Russians on 26 December at 0245UTC. This satellite, known as RS-15, transmits an identification CW (Morse) beacon on 29.352MHz. This signal was heard clearly at RSGB HQ on 5 January.

Orbit data for RS-15 satellite is given in **Table 1.** You should be able to hear the beacon at the times given and hear contacts between 29.357MHz and 29.397MHz. The uplink frequencies are 145.857MHz to 145.895MHz. For more information, see *D-i-Y Radio*, Vol 4: No 6.

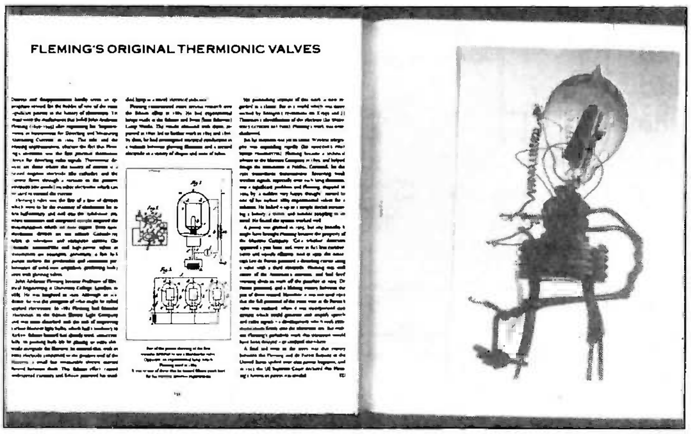
18 JANUARY 1995		**22 JANUARY 1995**		**26 JANUARY 1995**	
0012:00	0015:00	0000:00	0009:00	0154:00	0215:00
0212:00	0233:00	0203:00	0224:00	0406:00	0427:00
0424:00	0445:00	0415:00	0436:00	0621:00	0642:00
0639:00	0700:00	0630:00	0651:00	0836:00	0857:00
0854:00	0915:00	0845:00	0906:00	1051:00	1109:00
1109:00	1130:00	1100:00	1121:00	1306:00	1312:00
1321:00	1339:00	1312:00	1327:00	2312:00	2324:00
		2324:00	2333:00		
19 JANUARY 1995		**23 JANUARY 1995**		**27 JANUARY 1995**	
0139:00	0157:00	0127:00	0148:00	0118:00	0139:00
0348:00	0409:00	0339:00	0400:00	0330:00	0351:00
0603:00	0624:00	0554:00	0615:00	0545:00	0606:00
0818:00	0839:00	0809:00	0830:00	0800:00	0824:00
1033:00	1054:00	1024:00	1045:00	1015:00	1036:00
1245:00	1303:00	1236:00	1251:00	1230:00	1239:00
				2239:00	2248:00
20 JANUARY 1995		**24 JANUARY 1995**		**28 JANUARY 1995**	
0103:00	0121:00	0054:00	0112:00	0042:00	0103:00
0312:00	0333:00	0303:00	0324:00	0254:00	0315:00
0527:00	0548:00	0518:00	0539:00	0509:00	0530:00
0742:00	0803:00	0733:00	0754:00	0724:00	0748:00
0957:00	1018:00	0948:00	1009:00	0939:00	1000:00
1209:00	1230:00	1200:00	1218:00	1151:00	1206:00
21 JANUARY 1995		**25 JANUARY 1995**		**29 JANUARY 1995**	
0030:00	0045:00	0018:00	0036:00	0009:00	0027:00
0239:00	0300:00	0227:00	0251:00	0218:00	0239:00
0451:00	0512:00	0442:00	0503:00	0433:00	0454:00
0706:00	0727:00	0657:00	0718:00	0648:00	0712:00
0921:00	0942:00	0912:00	0933:00	0903:00	0924:00
1133:00	1154:00	1124:00	1145:00	1115:00	1133:00
1351:00	1357:00	2345:00	2357:00	2333:00	2351:00

Table 1: Orbit data for RS-15 satellite from 18 January 1995 until 29 January 1995. The satellite can be heard between the times given in the left and right columns.

Making of the Modern World

Milestones in Science and Technology

PUBLISHED IN 1992 by the Science Museum, this superbly produced hardbacked book brings together one hundred key developments in science, technology and medicine.



These range from the Byzantine sundial-calendar invented in the year 520 to genetically engineered mice from 1988, taking in the slide rule, Arkwright's spinning machine, the 'Puffing Billy' locomotive, Davy's miners' lamp, Babbage's calculating engines - the first computers, the first plastic, the Kodak camera, the first tube train, Alcock and Brown's aircraft, the Austin Seven car, the discovery of polyethylene, the Rolls-Royce Merlin engine, the V2 rocket, the modelling of DNA, the Caesium Atomic Clock, the scanning electron microscope and the first brain scanner.

Each subject occupies two pages, The text is on the left with the right hand page filled with a beautifully reproduced photograph of an exhibit from the Science Museum.

A GOOD READ

BECAUSE THERE IS such a wide range of subjects, everyone will find something of interest in this book. It also corrects popular misconceptions, for instance page 42 says that Watt did not invent the steam engine, he just made it more efficient. And there are funny stories, too, such as the one about the inventor of radar, Robert Watson-Watt who was later caught by his own invention when he fell foul of a radar speed trap in Canada.

ELECTRONICS

RADIO, ELECTRONICS and communications have, of course, been included. There's Cooke and Wheatstone's telegraph, Kelvin's galvanometer, Bell's telephone, the Wimhurst machine, the cathode ray tube, Marconi's first tuned transmitter, the Telegraphone - the fore-runner of the telephone answering machine, thermionic valves and Logie Baird's television.

CONCLUSION

MAKING OF THE Modern World is a lovely book to read, look at or just keep on the shelf for reference. Anyone with an interest in science will find it a gold-mine of information and it should find a place in school libraries.

Each invention is, of course, displayed at the Science Museum in London, and this is a wonderful way to sample what is on show at the Museum. Anything which you find particularly fascinating can be followed up by a visit to see the real thing, and to learn more.

Making of the Modern World (ISBN 0-7195-5121-8) costs £17.95 and is available from Dillon's Bookshop, Science Museum, Exhibition Road, London SW7 2DD. If you are buying by post, you will need to include £1.50 for UK postage.

Simple Antennas

By Peter Dodd, G3LDO

IT IS GENERALLY accepted that the most important part of a radio communication installation is the antenna. All the sophisticated and expensive radios that fill the advertising pages of amateur radio magazines have one thing in common - their performance is limited by the effectiveness of the antenna.

Two of the questions most frequently asked are:

- Which is the best sort of antenna to use?
- Where is the best place to locate an amateur radio antenna?

The first decision to be made is what sort of operating do you want to do. Are you into short distance chatty contacts (QSOs) on the lower frequency bands or VHF; or are you into long distance (DX) contacts, and if so what is your favourite band?

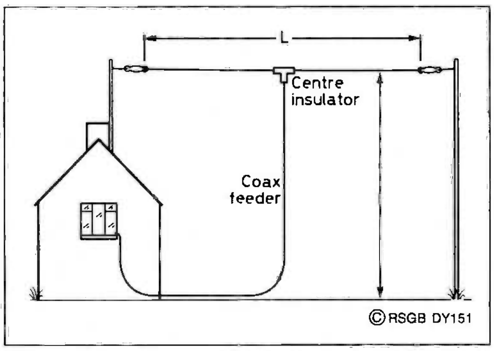


Fig 1: Layout for a dipole antenna.

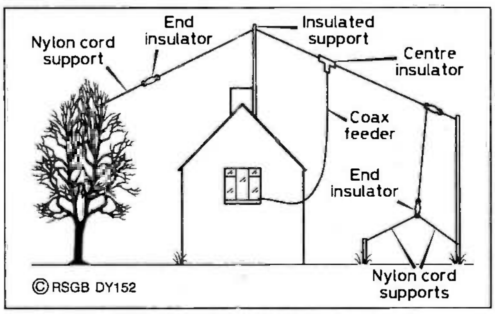


Fig 2: Possible layout for a dipole antenna in a confined space.

Band (MHz)	Dipole length (m)	Trim each end (mm/10kHz)
1.8	83.33	2,190
3.5	42.86	595
7	21.43	150
10	14.85	70
14	10.71	35
18	8.33	20
21	7.14	15
24	6.03	12
28	5.36	10
50	3.00	6

Table 1: Dipole lengths for lowest frequency of each band and the length to be trimmed from each to raise the resonant frequency by 100kHz.

A house with a moderate sized garden is shown in our centre-spread poster to illustrate the configurations of some simple antennas. In practice you would not need all these antennas festooned around the house because one or two would be adequate for most needs. Also many modern houses are built on smaller plots of land and the problem of restricted space will be mentioned later.

VHF ANTENNAS

FOR VHF OPERATION the antenna should be mounted as high as possible, either on a mast or on a chimney as shown on the poster. For all round coverage on FM and the repeaters a vertical collinear type is a good choice. For SSB or CW DX and satellite operation a horizontal beam will give better results than the vertical antenna.

If the VHF antenna is mounted on the chimney then a strong double mounting bracket should be used, particularly if you are using a beam antenna with a rotator.

The TV and broadcast FM antennas will probably have to share this mounting bracket, and this increases the possibility of television interference. This problem can be minimised by running the coax feeders for the amateur and TV antennas as far apart as possible (as shown in the poster).

THE DIPOLE ANTENNA

ONE OF THE SIMPLEST type of antenna for single band use is the halfwave dipole. It is fed in the centre using coax cable as shown in **Fig 1**.

The lengths of the dipole, shown in **Table 1,** are for the lowest frequency in the band and, ideally, will have to be trimmed to the centre frequency of the part of the band that you wish to operate. For example if you wish to set your antenna to 3.7MHz; take the length of the 3.5MHz from column 2 of Table 1 and take off 1190mm (595 x 2). The dipole length is reduced by this amount because 3.7MHz is 200kHz above 3.5MHz (see column 3). In practice reducing the length by 1m is sufficient but you will have to allow some extra wire for fixing the element to the end insulators. See the poster.

As you can see from Table 1 the lengths of the lower frequency dipoles can be rather large and very few of us have long gardens. The dipole will still work quite well even if it is bent. A bent dipole arrangement is shown in **Fig 2**. You may have to alter the overall dipole length to give an SWR of less than 2:1 on transmit. If you are using the dipole for receive then the length is not so important.

A dipole is a single band antenna, although a 7MHz dipole will work reasonably well on 21MHz. But it can be made to work on other bands by connecting several dipoles in parallel. Interaction between the dipole elements can occur unless they are spaced at least 100mm from each other.

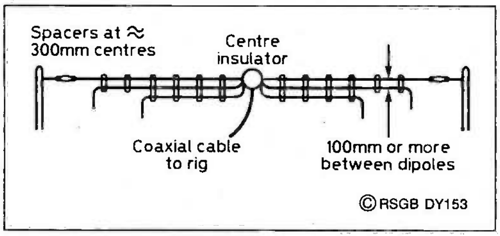


Fig 3: Multi-band dipole antenna.

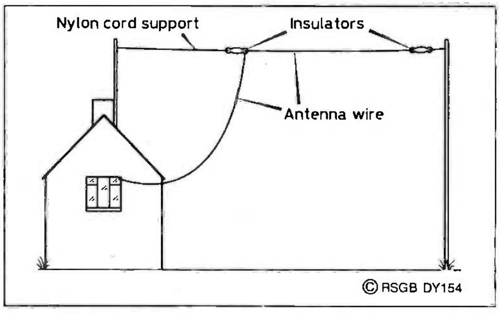


Fig 4: Long-wire or inverted-L antenna

The multi-band dipole is built as shown in **Fig 3** with the elements held together with plastic spacers. The ends of the elements should be allowed to droop so that there is maximum spacing between the ends of the dipoles. The coax cable is connected as shown in the poster.

THE LONG-WIRE ANTENNA

THIS ANTENNA IS simple, cheap, easy to erect, and suits many a house and garden, see **Fig 4**. The total length of an end-fed long-wire antenna can be optimised to serve a given set of bands when using an ASTU (Aerial System Tuning Unit-see *D-i-Y Radio*, Vol 2: No 6). Such an antenna can then be operated against a radial or counterpoise wire as shown in **Fig 5**.

An inverted-L wire with a length of 10.5 metres will work on the 40, 30, 17, 15 and 12m bands.

A wire length of 15.5 metres will load on transmit, via an ASTU on the 80, 40, 20 and 12m bands, and may load, depending on your ASTU, on the 17 and 15m bands. A wire, 26.5 metres long, will operate on all the bands but may be difficult to load on transmit on 10m. For transmitting the wire lengths quoted here may need some small adjustment when the practical system is built. For receive the wire lengths are far less critical.

Band (MHz)	Element length (m)
1.8	39.66
3.5	20.40
7	10.20
10	7.14
14	5.1
18	3.96
21	3.4
24	2.95
28	2.55

Table 2: Lengths of elements for vertical antennas, radials for verticals and counterpoises for end-fed long wire antennas.

In general you cannot get a good RF (Radio Frequency) earth from a first floor radio shack. Unless the earth can be reached within a very short distance, the 'earth substitute' (radial or counterpoise) comprising a single λ/4 (quarter-wavelength) wire from the aerial feed point. You will need a separate counterpoise wire (lengths given in **Table 2**) for each band as shown in Fig 5.

THE VERTICAL

THIS SINGLE BAND antenna is sometimes favoured by DX operators because it has a low **angle of radiation**. This characteristic tends to favour communication with long range DX stations. For the vertical antenna to work it must be clear of obstructions and it must have a good counterpoise or radial system.

The vertical antenna is shown in the poster. The lengths of the element and the radial wires are given in Table 2. The centre of the coax is connected to the vertical element and the coax braid to the counterpoise system. The counterpoise or radial system is made up of four or more wires buried just below the surface and joined together near the base of the vertical.

ANTENNA AND CABLE ENTRY

ALTHOUGH YOU CAN bring coax cable into the house through a partly opened window this is only suitable as a temporary measure. If you have wooden windowframes then you can drill holes in them, one for each cable. The holes must slope downwards from the inside to the outside so that any moisture will run out. The holes in the wood should be treated with a suitable wood preservative. The long wire, or inverted-L antenna lead should be kept separate from the other cables.

Alternatively, a plastic pipe, large enough to take all the antenna cables, can be fitted into the brickwork (again sloping downwards from the inside). A masonry drill of sufficient size is an expensive item and it may be advisable to employ a contractor to fix the pipe in the wall.

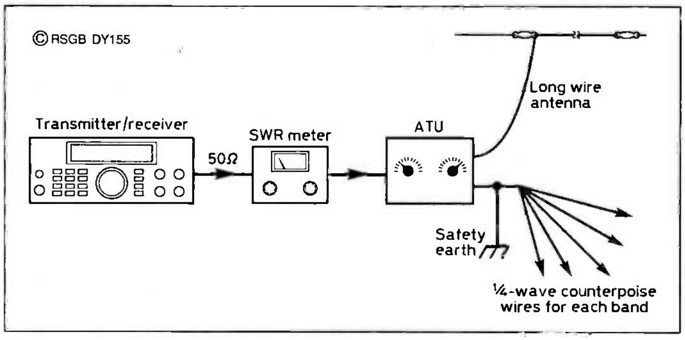


Fig 5: How to connect a radio to a long-wire antenna.

Conductors, Insulators and the Third Kind

By John, GW4HWR, Chairman RSGB Training & Education Committee

ALL MATERIALS conduct electricity but some are good conductors, some are bad and a third type has very strange properties.

CONDUCTORS

MOST METALS fall easily into this group. Copper, silver, aluminium and brass are some of those more commonly used in electronics. Atoms of metals such as copper have orbiting electrons which are not very firmly held by the nucleus and they tend to wander about in the mass of metal of which they are a part. They are sometimes called **migratory** electrons.

Take a long distance view of a wide pedestrianized area of a large town and the people will appear to be milling around with no set purpose. This is very similar to the way electrons behave in any conductor. Now suppose that one of the pedestrians at one end of the area goes crazy and starts giving away five pound notes - the pattern of movement of people will rapidly change with a well defined movement towards the unknown benefactor!

A similar pattern emerges when a voltage is applied between two points on a conductor. Electrons at the negative of the supply voltage repel the electrons in the conductor and similarly electrons are attracted to the positive of the applied voltage and a general drift of electrons occurs. Note that electrons move away from the negative of the supply and make their way towards the positive. This does not conflict with the convention which says that electricity flows from positive to negative - it is just a convention which was adopted a long time ago and there is no real reason to change it.

INSULATORS

THESE DO NOT fall into a well defined group like conductors. It is tempting to think that if a material is not a conductor it must be an insulator. *This is an extremely dangerous thought - believe it and your life is at risk.* A damp floor or wall, a wet cloth or a stick freshly broken from a tree are not 'conductors' but *they all conduct!* **Fig 1** shows what could happen if you forget this.

Real insulators include, rubber, plastic such as 'perspex', glass and wax. There are many others which are not much like the ones just mentioned. However all of those mentioned have one thing in common, they are made of molecules whereas the conductors are atoms. A molecule is a group of atoms held together by the very electrons which would have made them conductors. They act like the string which ties a number of items together. There are no electrons left to roam around and the material can't conduct. Pay another visit to the shopping precinct - the generous man is still there, trying to give his £5 notes away but there is no-one to take up his offer. The people are all doing something more important.

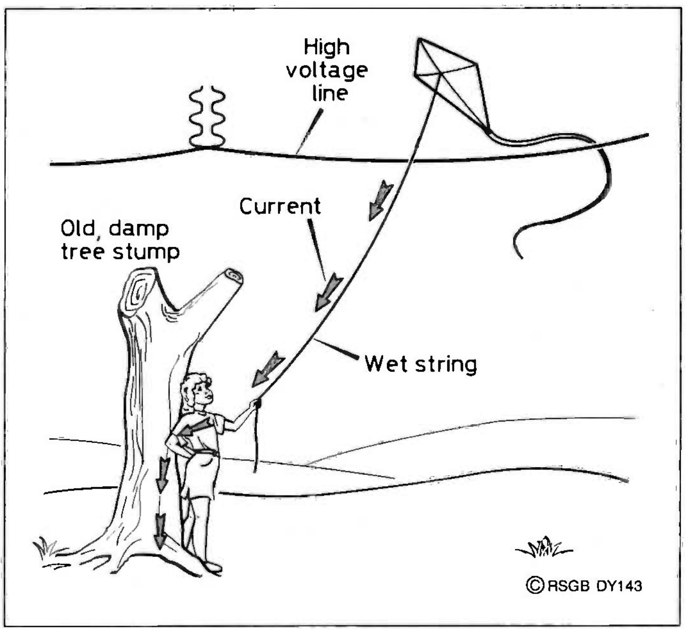


Fig 1: Beware of bad 'insulators'. You wouldn't normally use wood to conduct electricity but a damp tree can conduct enough electricity from a power line or lightning for the situation above to be *very* dangerous indeed.

SEMI-CONDUCTORS

THESE ARE NORMALLY metals and as such, are normally conductors but if they are carefully refined to make them almost 100% pure they will crystallise. Crystals are formed when every migratory electron is used to hold the material in its crystalline shape. The electrons are now referred to as **bonding** electrons. Every atom must provide four such bonds. Carbon, Germanium and Silicon all become crystalline if carefully refined and processed.

A piece of silicon material will not conduct because, like an insulator there are no electrons available to be moved. If a very small proportion (about one in every million silicon atoms) of a different atom such as **antimony** is added, the crystal formation will not be altered but because each new atom provides five bonding electrons, one is not needed and becomes a **free electron** within the crystal. These free electrons once again allow the material to conduct. The material is known as **N-type** semi-conductor.

A similar effect will occur if the added material is one such as **indium** which only provides three bonding electrons. This means that there will be places in the crystal which should be filled with an electron - these spaces are called **holes** and although it is not so easy to see why, these holes also allow the material to conduct. This material is called **P-type** semi-conductor. In the next column we will put these two new materials to work.

Twenty go to The Isle of Man

by Ted Walker, G0KAQ, 1989 Young Amateur of the Year.

THE 1994 RADIO EXPEDITION ('DXpedition') from Warwick School was to the Isle of Man. The whole party of twenty were qualified radio amateurs, with four thirteen-year-olds learning only the day before that they had passed the Novice exam. Callsigns held ranged from G0GNF to 2E1CRS.

The Isle of Man Amateur Radio Society warmly welcomed the invaders from the 'adjacent island', lending us their HF beam and an impressive mast to support it. During the ten days, we operated on the HF bands, 2 metres, 70cm and 6m. Six metres (50MHz) produced the most impressive results, proving what an Isle of Man callsign prefix (GD or 2D) can produce from a quiet band. All contacts using the 2D1 prefixes would have been the first; we believe that no Novices had operated on 6m from the Isle of Man before. Germany, Switzerland, Finland and France were among the countries worked.

Nine of the twenty amateurs on the DXpedition pose with their radios on an Isle of Man hilltop. A small beam was mounted on the wooden post.

The present low level of the solar cycle hampered our efforts on HF, with bands above 7MHz rarely open. Steve's famous late-night attempts to work all American states and the early morning pile-ups of Australians must wait until next year. Both areas, however, were contactable via packet, once the satellite link and chat node from CRV at Heysham was discovered.

A simple 2m packet station was in constant use throughout most days, impressing some of the boys who were not yet familiar with what just a few watts into a simple antenna can produce.

On the summit of Snaefell mountain: (L to R) Gerald, G0GNF; Joe, 2E1CAV; Chris, 2E1CCS, and Tim, G7JUH.

Operation was not limited to base camp; the island provides plenty of hills to climb. Snaefell was a disappointing transmitting site considering its height (620m or 2,034ft ASL) and the effort taken. But Colden Hill, just as much of a climb, produced impressive results for 2.5 watts of 2m SSB and an HB9CV antenna - as far as Argyll and Shropshire. For the Novices and newer G7s hand-helds were in constant use. GD7PIO/P went on during the 2m low power contest, and rapidly made 150 contacts from Creg ny Baa, half way up Snaefell, covering most English counties and well into the continent. And even a severe thunderstorm could not deter GD7JUH/P, from exposing his call to the 70cm low power event. Whilst watching aerial masts half a mile away being struck by lightning, Tim worked into Paris and Holland on only 10W of 70cm SSB.

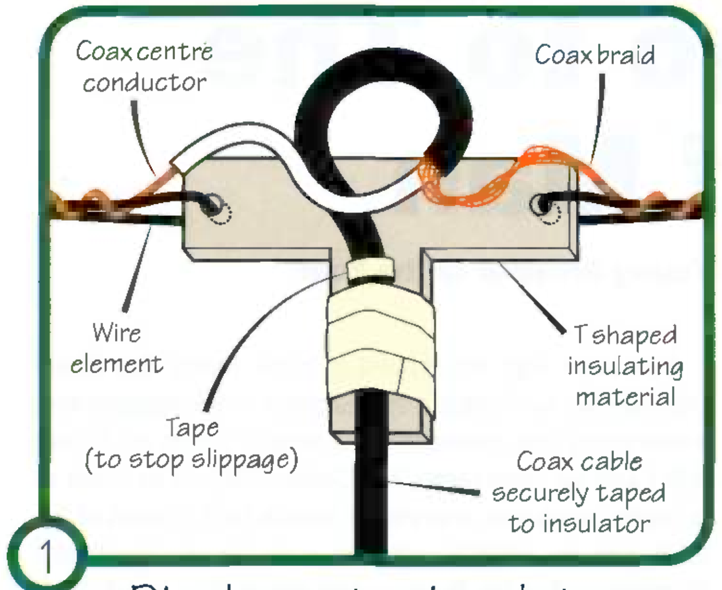
Ian, G7IAB, climbs a mountain with the Snaefell radio mast (which carries the amateur radio repeaters) in the background.

Those with little operating experience gained much exposure to amateur radio, and began to understand the potential of their licences. Novices and Class Bs resolved to use their licences as much as possible.

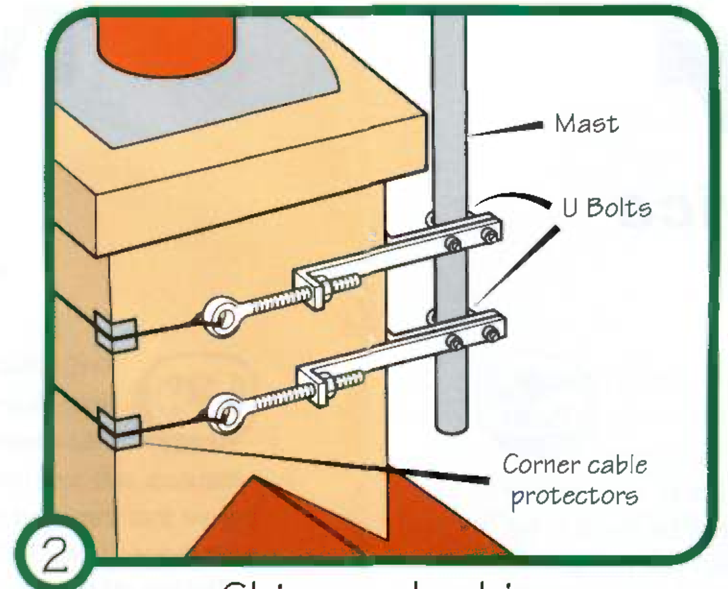
This may be the last opportunity for serious radio for some time, since the school radio shack was declared unsafe, and no replacement has yet been found. Nearly 30 licensed amateurs in the largest society at Warwick School await news with bated breath. It would be a shame to allow a healthy society, originally formed in 1922, to wither away.

Meanwhile plans must be made for next year's camp . .

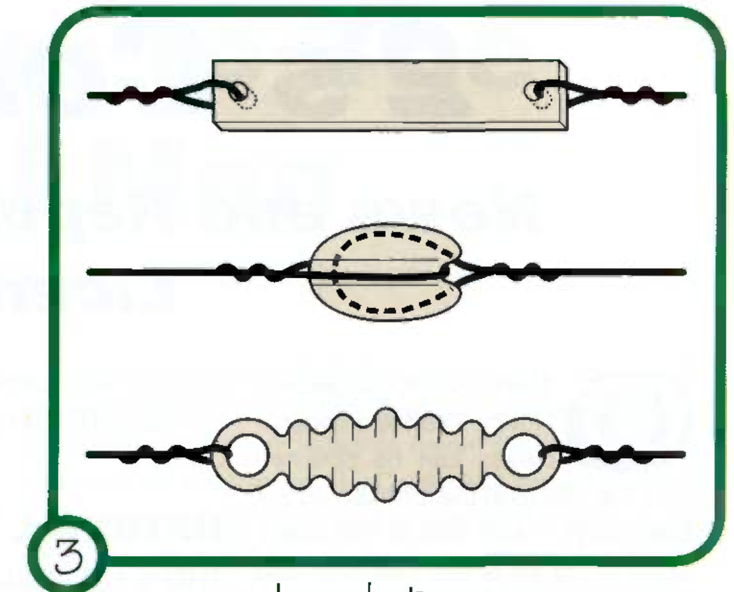
AMATEUR RADIO & SIMPLE ANTENNAS



Dipole centre insulator



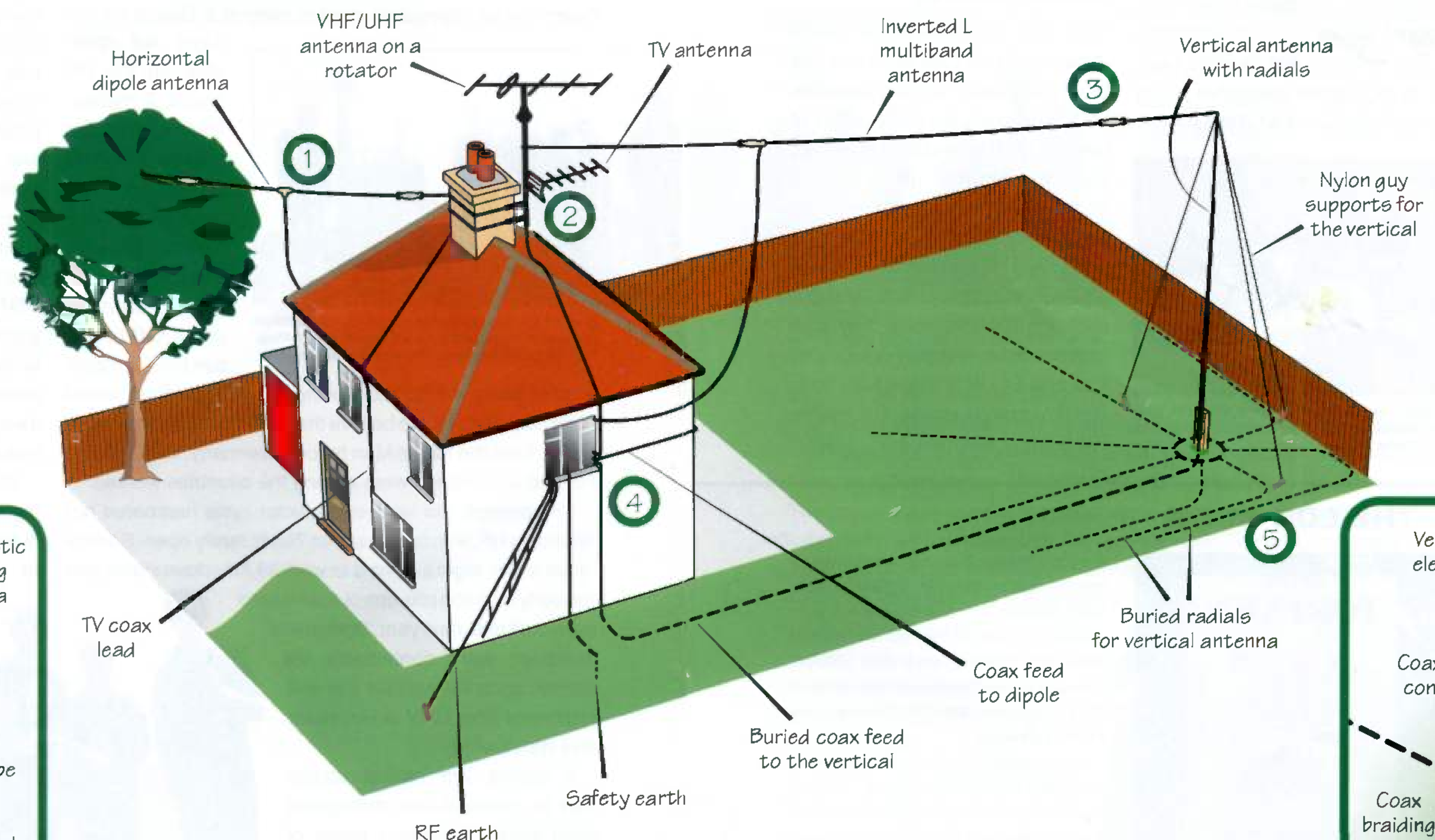
Chimney lashing



Insulators

Dipole lengths for each band, and amount to be trimmed from each end to raise the resonant frequency by 100kHz

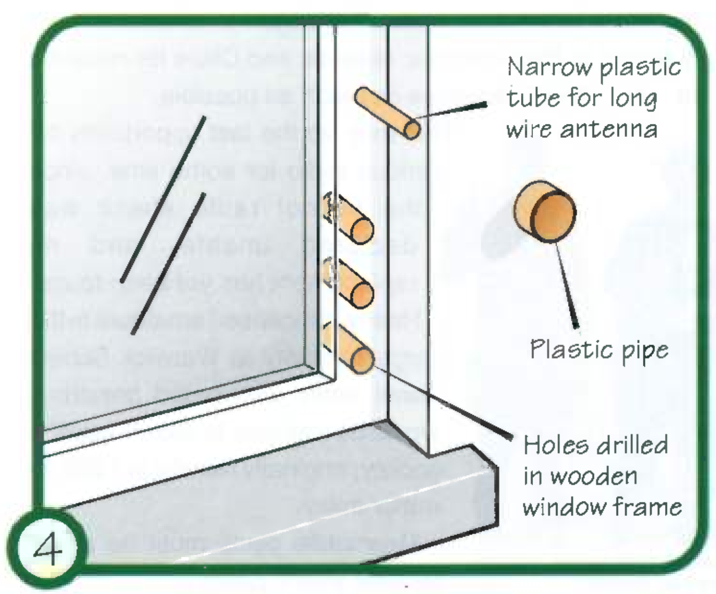
Band (MHz)	Dipole length (m)	Trim each end (mm/100kHz)
1.8	83.33	2,190
3.5	42.86	595
7	21.43	150
10	14.85	70
14	10.71	35
18	8.33	20
21	7.14	15
24	6.03	12
28	5.36	10



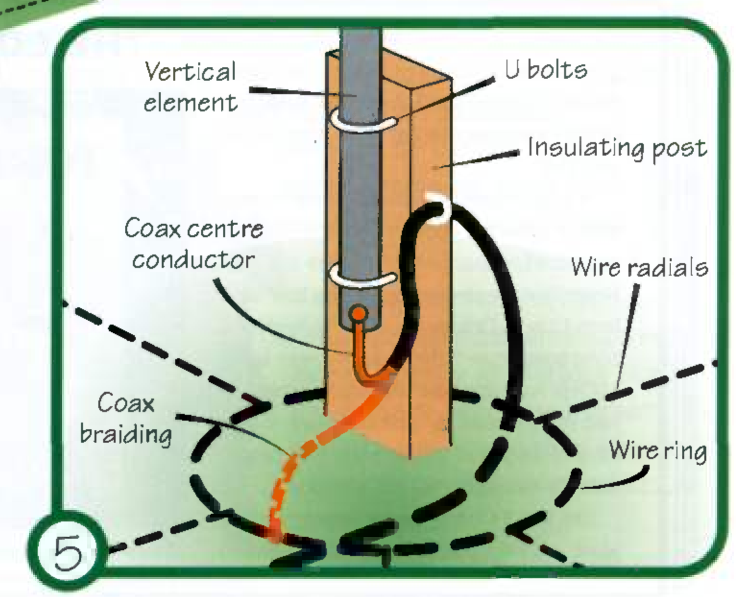
Inverted L preferred lengths 10, 15, 26.5 metres

Counterpoise (RF earth) lengths

Band (MHz)	Counterpoise length (m)
1.8	39.66
3.5	20.40
7	10.20
10	7.14
14	5.1
18	3.96
21	3.4
24	2.95
28	2.55



Shack antenna cable lead in



Vertical antenna connections

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

2's Company

News and Reports from Novice Licensees

MANY RADIO CLUBS run Novice licence classes - details can be obtained from the RSGB at the address on our front cover - and one of the oldest clubs to do so is the Liverpool and District Amateur Radio Society. Last Autumn, the RSGB's 1995 President Clive Trotman, GW4YKL, visited the club and is pictured here meeting the Novice students. Clive is a great supporter of the Novice training scheme and has run courses himself.

TOP ELMERS

NOVICE INSTRUCTOR Alan Turland, G7LNV, has been awarded first prize in a competition in *Practical Wireless* to find the most popular 'Elmer'. An Elmer is an American expression meaning someone who befriends and helps others to become licensed amateurs. *D-i-Y Radio* writer Robert Snary, G4OBE, won second prize. Robert is the Senior RSGB Novice Instructor for London.

NATIONAL CLUBS

THERE ARE SEVERAL national radio societies, affiliated to the RSGB, for specialists. It is interesting to see more and more Novices in their membership lists. For instance, the G-QRP Club, which is for anyone interested in low power operating, has 41 Novice licensees as members, mostly Class As. The Royal Signals Amateur Radio Society also has a number of Novices listed. Details of membership of these clubs can be found in the *RSGB Call Book* - see below.

RSGB 1995 President Clive Trotman, GW4YKL (left) visits the Novice course run by Liverpool and District Amateur Radio Society.

CALL BOOK

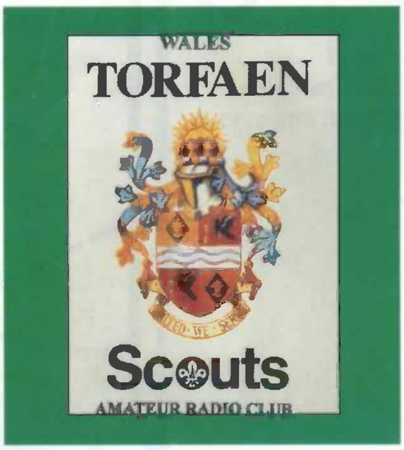
THE 1995 EDITION of the *RSGB Amateur Radio Call Book* has just been published. Not only does this 500-page book list the location of over 61,000 UK and Irish licensees (including Novices up to 2E0AIS and 2E1DHP) but there's over 100 pages of amateur radio information - country prefixes, bandplans, club addresses etc. And this year the callsigns are also indexed by town and surname. A shack essential at £10 plus £1 UK post/packing from: RSGB, Lambda House, Cranborne Rd, Potters Bar EN6 3JE.

THE LOG BOOK

RADIO CONDITIONS during the latter part of 1994 were excellent at times, both on HF and VHF.

A large region of high atmospheric pressure is often the cause of good VHF radio conditions, especially if it hovers over the North Sea for several days. The four days from 12 to 15 October saw a large 'high' and conditions from 70MHz all the way up to 10GHz were the best that many amateurs had experienced for several years. It also caused very bad interference with broadcast TV reception.

On the 144MHz band, many stations were working into Scandinavia, Eastern Europe and even Russia. Similar distances were worked on 432MHz. 1.3GHz contacts were available with Scandinavia and Switzerland and even on the 10GHz band contacts were made at more than 1000km, including a new European 10GHz record of 1218km between **SM6HYG** (**Sweden**) and **F6DKW** (**France**).



QSL card of the district of Gwent Scouts ARC.

Novices using only a few watts on 432MHz could hear and work Europeans - for most this was the first time they had experienced such an 'opening'. Paul, 2E1DBI (pictured on our cover), ran just 1W and an indoor aerial to work **DL9YAO** in near Münster in **Germany**. Until that day, his furthest contact

Band by Band

The Amateur Radio Spectrum: The 40 metre Band

FORTY METRES, 7MHz, is a very narrow allocation - only 100kHz in Europe. Being close to the middle of the short-wave band, it provides good sky-wave signals at most times of the year and most times of the day.

Typical daytime ranges are 800km (500 miles) with shorter distances being unworkable because of the **dead zone** (**Fig 1**). After dark, world-wide contacts are possible, particularly using CW (Morse).

Because there are popular broadcast bands above and below the 7MHz amateur band, most cheap short-wave broadcast sets can receive amateurs on 40m. Amateurs use CW or SSB, so you will need a radio equipped with a BFO, or you can build one (see *D-i-Y Radio*, Vol 2: No 2). Alternatively, try building the *D-i-Y Radio* Super 7 from Vol 4: No 2.

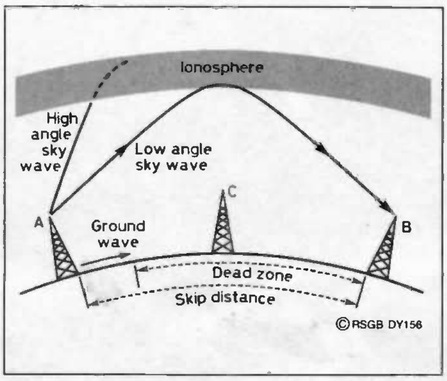


Fig 1: Ground-wave signals propagate only a few tens of miles. High angle sky-wave signals pass through the ionosphere and are lost. Low angle signals are reflected back to earth several hundred kilometres away. The range between the furthest ground-wave and the nearest sky-wave is known as the dead zone.

It is also simple to build a CW transmitter for this band and may contacts can be made around Europe using only a few watts. Kits are available from several of the regular *D-i-Y Radio* advertisers.

An antenna for 7MHz is easy and cheap to make. Try a wire dipole - with each leg 10 metres long. Or make a quarter-wave vertical using a 10m pole (or 10 metres of wire going up to a tree branch) and 10 metre long radials (see this month's poster for both types).

The American band is wider than ours and SSB signals from North and South America can be heard between 7.1 and 7.3MHz. This part of the band is shared with broadcast stations, so expect to have to search carefully for amateur signals.

BAND FACTS

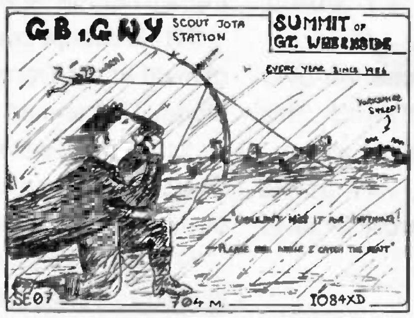
Allocation: (Full licence) 7.0 - 7.1MHz. No Novice allocation.
American band: 7.0 - 7.3MHz.
Activity: CW 7.00 - 7.035MHz, Data 7.035 - 7.045MHz, SSB 7.045 - 7.100MHz.

THE LOG BOOK

from home without using a repeater had been a mile or so across town.

The SSB part of the huge *CQ* World-Wide Contest, which took place over the weekend 29/30 October, coincided with very good conditions on the 28MHz band - most unusual for this (low) part of the sunspot cycle. All continents were audible during the contest and some of the best DX heard is listed below.

The best HF DX reported in October and November was: 1.8MHz - **CT3/DL3DXX** (a German station operating from **Madeira**), **JH1REP** (**Japan**), **VP5VW** (**Turks & Caicos Islands**); 3.5MHz - **SU1MT** (**Egypt**), 9G5AA (**Ghana**); 7MHz - **PY0FF** (**Fernando de Noronha**, off Brazil), **TU5EV** (**Ivory Coast**); 10MHz - **J8/F9IE** (**St Vincent**); 14MHz - **HS0ZBI** (**Thailand**), **J28EN** (**Djibouti**); 18MHz - **9Q/F5FHI** (**Zaire**); 21MHz - **P40F** (**Aruba**), **ZP0Y** (**Paraguay**), **7Z5OO** (special prefix for **Saudi Arabia**); 28MHz - **D3X** (**Angola**), **XR3A** (special prefix for **Chile**), **YC8DDU** (**Indonesia**), **ZV5A** (special prefix for **Brazil**), **5H3AJ** (**Tanzania**), **5T5JE** (**Mauritania**), **9K2ZZ** (**Kuwait**).

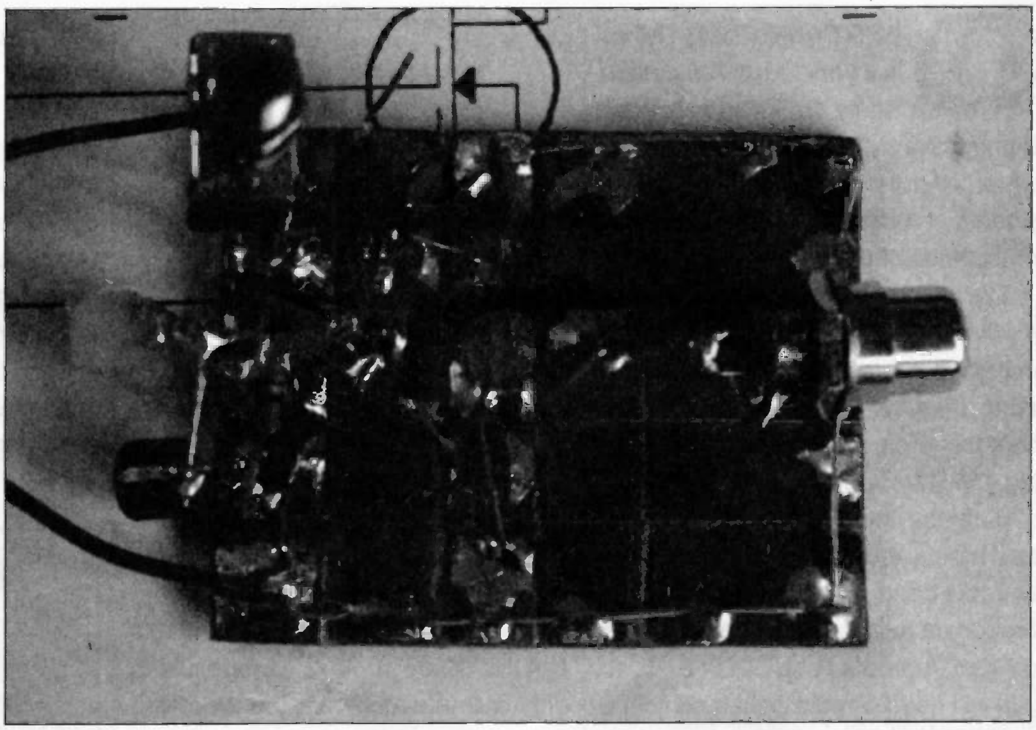


Harrogate & Nidderdale District Scouts ran GB1GWY during JOTA but operators 2E1BLO, and G1ZBO, had to abandon their hill-top site because of bad weather.

The LF bands will be very good for the next few weeks - check the CQ World-Wide 160m SSB Contest and the RSGB 7MHz CW Contest, both over the weekend 25/26 Feb. And watch out for those high pressure regions - good DX!

Simple Breadboard 80m Transmitter

Two articles by the Reverend George Dobbs, G3RJV


The Breadboard transmitter, showing its construction on PCB pads.

IN THE EARLY days of radio many items of equipment where built on a wooden baseboard. All the parts were screwed down to the board. These were called **breadboard** radios because often that is what was used.

Recently I had need to knock up a simple amateur bands transmitter for display purposes. I turned to a well known amateur radio circuit called the ONER. It was so called because the original design, by George Burt, GM3OXX, was built on a one inch square circuit board. The circuit appeared in the G QRP Club journal *SPRAT* and since that time many hundreds of ONER kits have been bought and used on the air. This is a well proven circuit.

This simple transmitter circuit has no selective tuned circuits in the power amplifier. This means that the output from the transmitter has rather a high **harmonic** content and must be used with a low-pass filter such as that described on page 18. If a low-pass filter is not used, interference will be caused to other stations.

The transmitter has simple antenna change-over switching that works with the transmitter on/off switch. This allows it to be used with any of the 80 metre receivers described in earlier editions of *D-i-Y Radio*, such as the Colt. It can also be used with any kit or commercial receiver for the 80m band.

THE CIRCUIT

THE CIRCUIT OF the transmitter is shown in **Fig 1**. TR1 is a crystal oscillator, the frequency of which is controlled by crystal X1. A small trimmer capacitor TC1 is added to allow the frequency of X1 to be varied by a small amount. If this capacitor has a control knob on the front panel it is useful to allow the transmitter to dodge any stations already on the frequency of the crystal. The resistor, R2, in the collector of TR1 can be varied to allow more, or less, power from TR1. A value of 3.3k seems to work well on 80 metres to give the transmitter the legal Novice output of 3 watts.

TR1 is directly coupled to TR3, a VMOS transistor (a type of Field Effect Transistor). This acts as the power amplifier stage. TR3 should give a power output of some 3 watts which is coupled to the output by C3. The Radio Frequency Choke (RFC) which provides the drain load of TR3 is a few turns of wire on a ferrite bead.

TR2 is an interesting addition to the circuit. This transistor is used as a switch, to key the power amplifier, TR3. It would be possible to build the transmitter without TR2 and just place a morse key between the top of RFC and the 12 volt supply. Adding TR2 is helpful because it means that one side of the morse key can be joined to ground and also some **shaping** of the keying is added with R3 and C1. This makes the morse transmission sound a little better. TR2 is an PNP type transistor. This type of transistor is connected the other way around from the more common NPN transistor, like TR1. Notice that the emitter of TR2 goes to the positive [+] side of the supply.

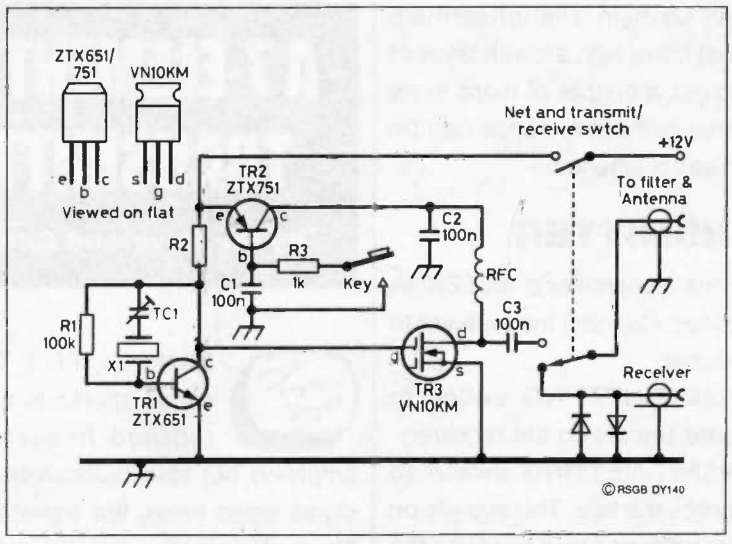


Fig 1: Circuit diagram of the breadboard transmitter

Some form of change-over switching is needed for the antenna. A **double pole** (two part) changeover toggle switch can be used. One pole is used to switch the antenna between receiver and transmitter. The other pole is connected in the 12 volt supply line. The switch is labelled RECEIVE/TRANSMIT-NETTING and its use is described under 'Using the Transmitter'.

In this simple circuit, when the key is open the power amplifier cannot work because there is no supply voltage at RFC. On closing the key contacts, TR2 is **switched on** and the supply appears at the top of RFC. C2 is a **decoupling capacitor** which prevents any radio frequency signals getting into the line between RFC and TR2.

BUILDING THE TRANSMITTER

FOR SPEED of constr-uction I decided to build the circuit in the old breadboard style using a piece of printed circuit board. I cut a piece of blank printed circuit board material to measure 5cm by 4cm. Then taking a junior hacksaw and placing the teeth flat on the surface of the copper surface of the board, I cut a pattern of square pads as shown in the photograph. This is best done with a new, sharp, blade drawn gently across the surface in a series of slow movements.

The method of building the transmitter is shown in the photograph. All the parts are soldered directly to the square pads made on the printed circuit board material. This is a form of surface mount construction. It is important to make good clean solder joints. To this end **tin** the square where connections are to be made. Before a solder joint is made to a square pad, firmly place the soldering iron tip on that pad to heat it up. Then touch the end of the solder onto the pad: not the soldering iron tip. The heat will melt the solder and it should flow cleanly over the square pad. This provides a good surface for making the soldered joints.

The easiest way to join the leads of the components to the square pads is to cut them to about 1cm long and bend about 2mm of the end at right angles. Tin this bent portion, place the lead firmly on the pad and melt the solder with the iron tip. When the joint has cooled, tug the lead to check that the connection is firm. Each transistor has to straddle three pads, so the centre lead needs to be a little shorter than the outer two leads. Do take care to mount the transistors the right way round on the board (see Fig 1).

When the wiring of the board is complete closely inspect all the connections and check them against the circuit diagram. Also check that no solder has run between the pads. Plug in a crystal for the 80 metre band. The oscillator can be tested by switching on the 12 volt supply and listening on a receiver for the signal. Do not test the full transmitter without a 50 ohm load connected to the output.

Winding RFC is a simple task. It uses a small ferrite bead as a former. Seven turns of thin enamelled wire are threaded through the bead and wound round the outer edge. This does require some care. The bead is small and the wire is thin. It is important not to scratch the enamel coating off the wire because this could lead to shorted turns. When the turns are completed trim the ends of the wire back to about 1cm from either end of the bead. Scrape

COMPONENTS

Resistors	
R1	100k
R2	see text
R3	1k
Capacitors	
C1	100nF
C2	100nF
C3	100nF
CT1	3 - 60pF Trimmer
Semiconductors	
TR1	ZTX651
TR2	ZTX751
TR2	VN10KM
Additional Items	
RFC	7 turns of 32SWG enamelled wire on a small ferrite bead
SWITCH	double pole miniature toggle
Crystal Holder	HC25 type

these ends clean of enamel and **tin** them. That is heat them with the soldering iron and coat them with a clean layer of solder. If you can manage to get a couple of extra turns through the bead, do so, a little extra inductance can be helpful. Who says radio is an exact science!

USING THE TRANSMITTER

CONNECT THE antenna to the transmitter's ANTENNA socket via the filter (see opposite). Connect the receiver to the transmitter RECEIVER socket.

Set the RECEIVE/TRANSMIT-NETTING switch to Receive. You should hear some signals on the receiver.

Set the RECEIVE/TRANSMIT-NETTING switch to Transmit-Netting but do not press the key. The signals on the receiver should have almost disappeared because the antenna will have been disconnected by the antenna changeover contacts on the switch.

Tune the receiver until a loud signal from your own transmitter is heard on the receiver. This is known as NETTING, which is a term used to describe tuning your transmitter and receiver to the same frequency.

Your station is now set up to enable you to call any station on, or close to, you crystal frequency. To transmit just press the key with the RECEIVE/TRANSMIT-NETTING switch in the Transmit-Netting position and switch to Receive for signals coming back to you.

A KIT IS AVAILABLE

KANGA PRODUCTS sell a kit of parts for this transmitter in its original ONER form. That is all the parts and a one inch square printed circuit board. It might sound difficult to build on such a small board but the layout is such that anyone capable of making good solder joints should have no problems.

Kanga can also supply a suitable Crystal in the 80 metre Novice Band.

Kanga Products, Seaview House, Crete Road East, Folkestone, CT18 7EG. Telephone: 01303 891106.

IMPORTANT NOTICE

You must have an Amateur Radio Licence before you may operate a transmitter. The maximum penalty for transmitting without a licence is an unlimited fine and two years in prison.

Fortunately, it's easily to qualify for a licence. See 'Become a Licensed Radio Amateur' in *D-i-Y Radio* Vol 2: No 4, or write to: Novice Licence, RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.

A 7-ELEMENT LOW PASS TRANSMITTER FILTER

By the Reverend George Dobbs, G3RJV

SIMPLE LITTLE TRANSMITTERS often use circuit shortcuts which result in not only the required frequency being generated and amplified but also harmonics: the signal times two, the signal times three, the signal times four . . . . and so on. These harmonics can be quite strong and it may be possible for a station who is transmitting on 3.5MHz to be heard on the 7MHz amateur band; both at the same time!

The answer is harmonic filtering: adding a circuit that will reduce the harmonics without a lot of reduction of the required signal. Even when using a low power transmitter a **low pass harmonic filter** should be used.

A low pass filter is a circuit which allows frequencies below a chosen frequency to pass through but greatly reduces (**attenuates**) signals above that frequency. This is called the **cut-off frequency** and is usually designed to be just above the required frequency of the transmitter.

A 7-ELEMENT LOW PASS FILTER

THE CIRCUIT FOR a seven-element low pass filter is shown in **Fig 1**, so called because it contains seven parts

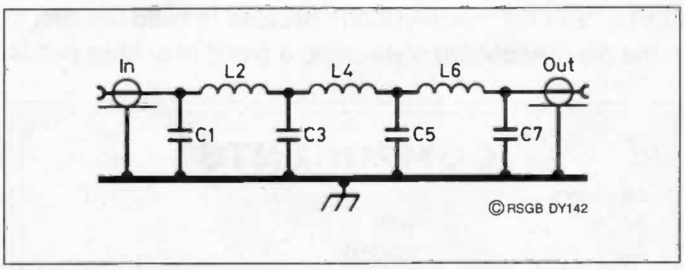


Fig 1: Circuit diagram of filter.

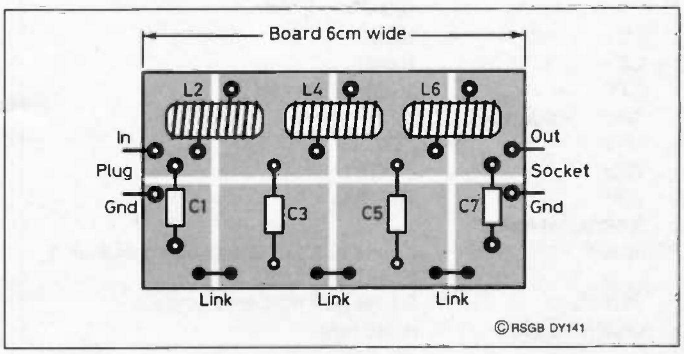
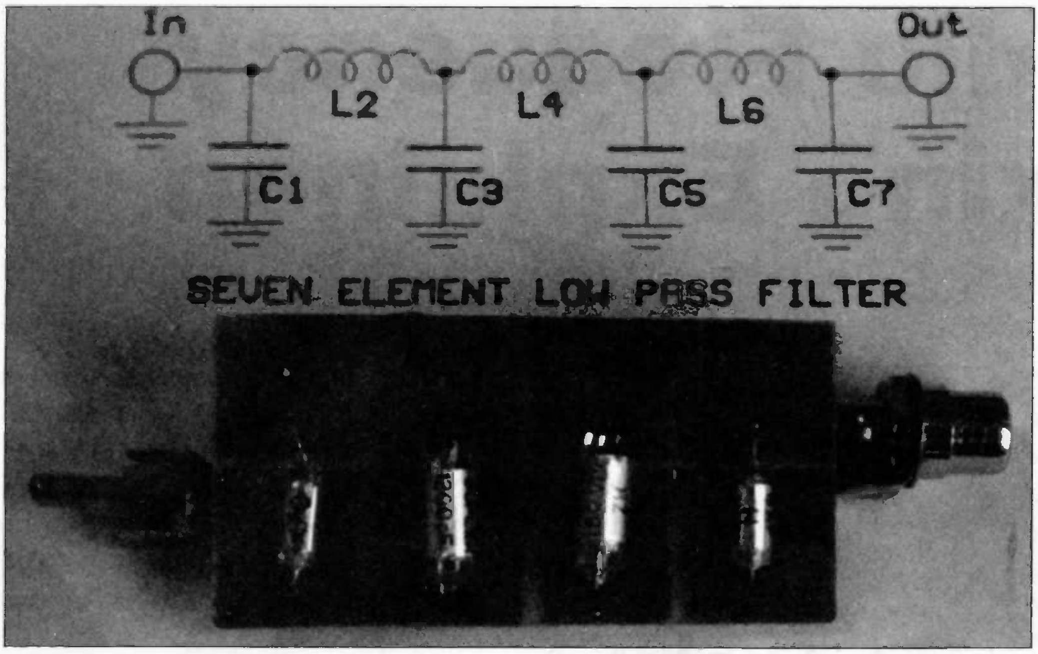


Fig 2: Layout and construction of filter.



Filter components soldered to PCB board pads.

(or circuit **elements**). Three-element and five-element low pass filters are also common. The three-element would only contain the part of the circuit shown in C1, L2 and C3. This is often called a **pi network** because the three parts of the circuit look like the Greek mathematical symbol pi (π) Fig 1 is like three pi elements in a row. It is worth the extra complication of a seven element filter to obtain a cleaner signal.

The Low Pass Filter circuit in Fig 1 is designed to have an input and output impedance of 50Ω which means it can match any common transmitter. It simply connects to the tranmitter's antenna socket. Working out the correct values for a low pass filter can be quite complex. Not only has the filter got to have the correct cut-off frequency but it also has to have the correct input and output impedance and at the same time reduce the required signal as little as possible. To make life even more difficult, cheap capacitors come in a limited range of **preferred** values.

Some years ago Ed Wetherhold, W3NQN, who is the Filter Consultant for the American Amateur Radio Relay League (ARRL), designed a very useful set of seven element low pass filters. His computer calculations used preferred capacitor values to give good filter characteristics and cut-off frequencies for the amateur bands.

They have become a standard for many builders of amateur radio equipment. The values of the inductors and capacitors required for filters for the main amateur radio bands are given in **Table 1**. The inductors (coils) are wound on standard toroidal cores. The table shows the capacitor values with the number of turns of wire and the core for each inductor.

MAKING A LOW PASS FILTER

THE WAY I made a low pass filter is shown in Fig1 and in the photograph. As with the Breadboard Transmitter, I used a scrap piece of printed circuit board with square pads cut using a hack saw. The photograph shows that I drilled holes through the board and mounted the components in the same way as a normal printed circuit board. There is no need to do this, the components could be soldered directly on the pads, breadboard fashion. I also mounted a plug and socket on each end of the filter so it can be plugged directly into the output of the Breadboard Transmitter.

Making the low pass filter is very simple. Just remember that each time the wire passes through the core counts as one turn. Also remember to scrape the enamel off the ends of the coil and tin the bared wire. Short wire links are added between the pads on the 'ground' end of the circuit board.

COMPONENTS

THE TYPE OF CAPACITORS used in the filter are not very critical but they do have to handle some power. I have found that polystyrene capacitors work well in these filters. The component values for the different bands are shown in Table 1.

T37-2 and T37-6 cores are available from JAB Electronic Components, 1180 Aldridge Road, Great Barr, Birmingham B44 8PB.

Band Metres	C1,7 pF	C3,5 pF	L2,6 turns	L4 turns	Core type	Wire SWG
80	470	1200	25	27	T37-2	28
40	270	680	19	21	T37-2	26
30	270	560	19	20	T37-6	26
20	180	390	16	17	T37-6	24
15	82	220	12	14	T37-6	24
10	56	150	10	11	T37-6	22

Table 1: Filter component values for each band

Radio Frequency Mixing Explained

By Ian Poole, G3YWX

MIXERS FIND widespread use in radio circuitry. The mixer is one of the most useful building blocks available to radio designers, and today virtually every radio found around the home or radio-shack will have one or more of these circuits.

AUDIO MIXERS

MIXERS USED IN radio frequency circuits should not be confused with audio mixers. They perform totally different functions and work in different ways. An audio mixer is used to add two or more sounds together. Audio mixing desks are found in recording studios, radio broadcast stations and the like. Here they are used to add audio signals from several different sources. It may be that several microphones have been used and the sound signals need to be combined onto one channel. Alternatively a DJ may need to combine and control the outputs from a CD player, record deck, cassette deck, and his microphone. In all these instances an audio mixer would be used.

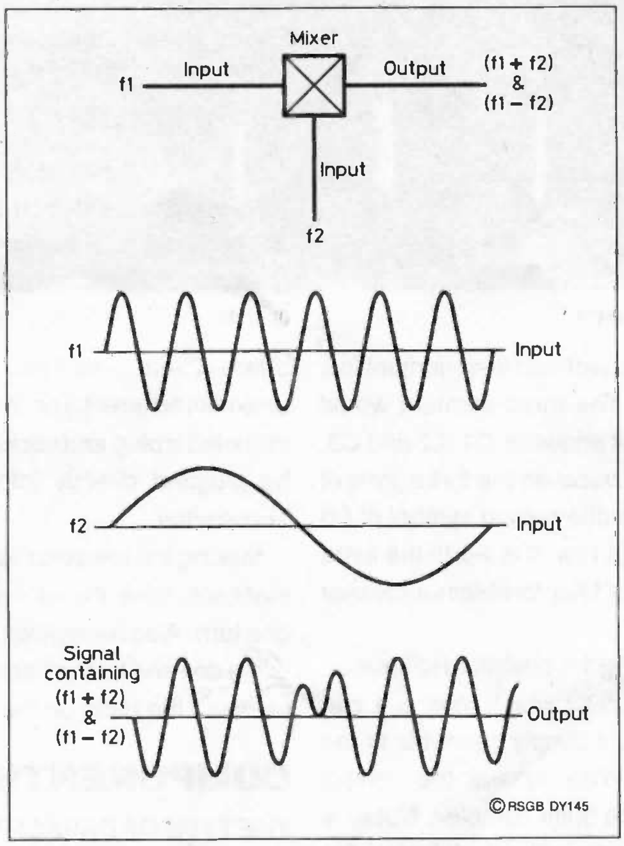


Fig 1: The effect of multiplying or mixing two signals together.

RF MIXERS

MIXERS USED FOR RF circuits are totally different. Instead of adding signals together, these mixers multiply them. This has a totally different effect. The two signals entering the mixer **beat** or **heterodyne** with one another to produce signals on other frequencies.

One example of this process can be heard when two musical tones, whose frequencies are nearly the same, are heard simultaneously. The two notes appear to reinforce one another at one moment then cancel out at another, producing a slow **beat** note. The rate at which this reinforcement and cancellation occurs is equal to the difference in frequency between the two notes.

TUNING UP

IF THE FREQUENCY of one of the tones were adjustable you would notice that the frequency of the beat note is very sensitive to the difference between the two tones.

When the beat note frequency falls to zero, it means that the musical tones are on exactly the same frequency. This technique of adjusting one tone with another until the beat note disappears completely is used by musicians to tune their musical instruments together.

SPECIAL CIRCUITS

WHEN TWO SIGNALS are to be mixed in this way a special circuit is required. It multiplies the two signals so that at any instant the output is proportional to the level of the signal at the first input, multiplied by the level at the second. This gives the beat note which is equal in frequency to the **frequency difference** between the two signals. For example if the two signals have frequencies of 1MHz and 100kHz then the beat signal will be found at a frequency of 900kHz (ie 1MHz - 100kHz).

In addition to this, another signal is generated at a frequency equal to the **sum** of the two input signals. With the same signals this would produce an output at 1.1MHz (ie 1MHz + 100kHz). In other words, if the signals at the

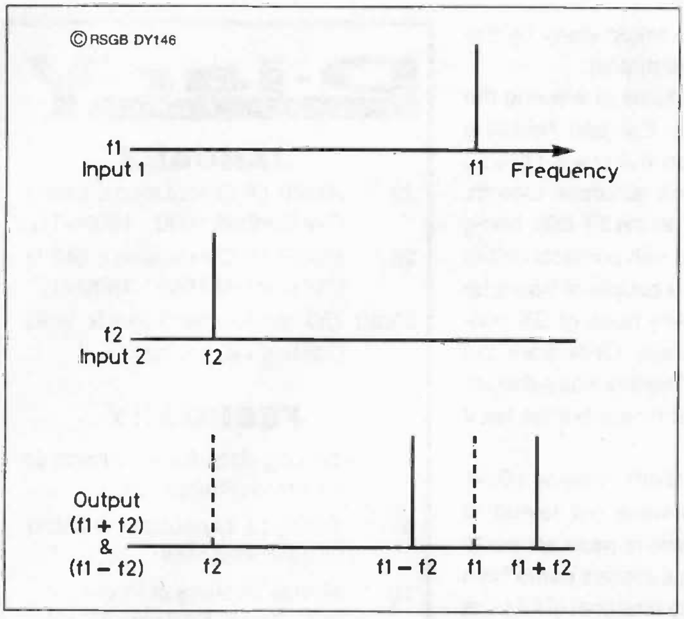


Fig 2: The result of multiplying or mixing two signals together as seen on a spectrum analyser.

input have frequencies of f1 and f2 then the output will contain signals at frequencies of (f1 - f2) and (f1 + f2).

The effect of multiplying the signals together can be drawn out in a diagram as shown in **Fig 1**.

When each point on the two waveforms is multiplied together the third more complicated waveform is produced. If this is analyzed it will be found to consist of two components. The first is equal to the frequency difference between the two inputs, and the second signal is at the sum of these two signals.

The **spectrum**, or where the signals would appear on a radio dial, can also be plotted and this is shown in **Fig 2**. In this diagram the two original signals are shown, because they will appear to some degree on the output dependent upon the type of mixer circuit used (a **balanced** mixer would remove one or both of the original signals, f1 and f2). In addition to these are the two new signals: (f1 - f2) and (f1 + f2).

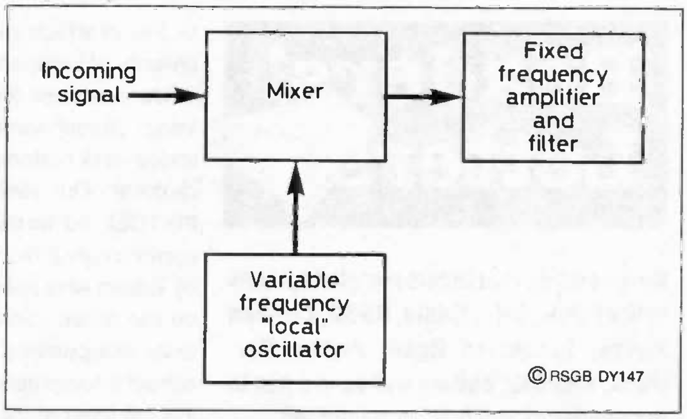


Fig 3: The basic idea of a superhet receiver.

A MIXER IN EVERY RADIO

BASICALLY A MIXER is used to change a signal from one frequency to another. It does this without altering its other characteristics. For example if the incoming signal were amplitude modulated (AM) then it would appear on the output as an identical AM signal but on a different frequency. Similarly SSB, CW and FM signals will have their frequencies changed without altering their other characteristics.

This process of frequency changing is very useful. It is the key process in a type of radio called the superhet or **superheterodyne** receiver (**Fig 3**). By mixing the incoming signal with a variable frequency local oscillator, the signal can be converted to the fixed frequency of an amplifier and filter. This is very useful because it is possible to make a very high quality filter and amplifier for a single frequency. By varying the frequency of the local oscillator, different signals will be converted down to the frequency of the filter and amplifier.

It was the discovery of this principle which enabled receiver design to improve dramatically. In fact the idea was so good that it is used in virtually every radio (and television) today. It is also used in most modern transmitters (see 'Radio Transmiters', *D-i-Y Radio,* Vol 3: No 2).

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.

MORE FROM WALES

MANY THANKS for another *D-i-Y Radio*. Our Open Morning at Llandovery College found us having to consider what could be set up at short order in our new shack. The long wire had been moved over by the hard pressed grounds staff, not so high as the apex of the Science Block but well out in the clear. We have no earth yet - plastic water piping!

We have a 'slice' at the back of a well-equipped work-room, each bench having a power supply unit with a digital read-out of the voltage and a supply for soldering irons.

For the Open Morning , the walls were covered with A3 posters of our hand-out which listed the range of radio topics touched on. There was also a range of maps, including a 'great circle' and one which showed how the QTH Locator system works. One table had a display of course work, another had QSL cards and another had a 'fan' of *D-i-Y Radio* samples (a few of which were taken away by the parents of prospective pupils).

Our new lads took turns at wearing the 'cans' *[headphones - Ed]* and twiddling knobs and buttons on the Lowe HF-225 receiver. Our resident amateur Gareth, 2W1CSI, did his stuff on the FT-690, being convincingly provided with contacts on 6m by Eileen who spent a couple of hours up on the castle ruins. Any hope of DX contacts disappeared under QRN from the school's computers. The day was exhausting - at least to us old timers but we felt it was worth it.

What a pity the SWR meters (*D-i-Y Radio* Vol 4: No 6) were not tested at 50MHz -surely the band of most appeal to our Novices. Our three meters came from the Swansea Rally at a total cost of £5 (with faults but these were easily cleared with a soldering iron) and certainly the Altai ones work enthusiastically.

Your printing of my last letter led to a nice letter to me from a person in Llandyssul and I was pleased to invite him here and to advise him of his proximity to two radio clubs. This included the Aberaeron Club whose Secretary sold us a decent 'starter' receiver and made us welcome a year and a half ago.

The boys take copies of *D-i-Y Radio* from the School Library and seem to glean something from each one, bearing in mind that for them it's early days yet. We are hoping that Gareth can fit in some study time in his first GCSE year to emulate his grandfather and take the Radio Amateurs' Exam in May.

Wyn & Eileen Mainwaring,
GW8AWT & 2E1BPS

D-iar-Y JAN - FEB

JANUARY

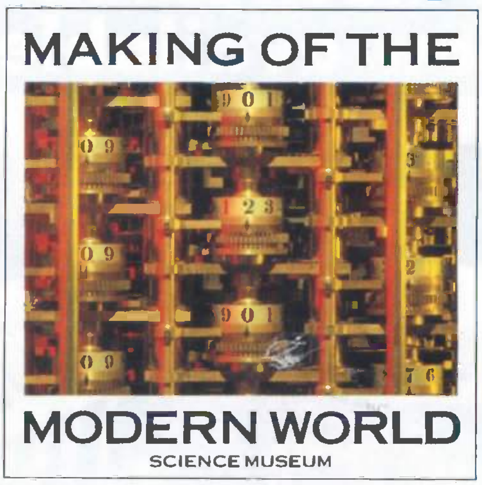
22	RSGB LF Cumulative 3.5MHz CW Contest 1600 - 1800UTC.
28	RSGB LF Cumulative 3.5MHz CW Contest 1600 - 1800UTC.
29/30	*CQ* Worldwide 1.8MHz SSB Contest (48 hours)

FEBRUARY

1	Closing date for enrolment to 13 March Novice RAE.
5	RSGB LF Cumulative 3.5MHz CW Contest 1600 - 1800UTC.
10	Novice Evening at Poole (Dorset) Radio Society. All local Novices are welcome. Call Vernon Cotton, G3BCI, on 01202 762110 for details.
18/19	Guides Thinking Day On The Air.
19	RSGB VHF Convention at Sandown Park Race Course, Esher, Surrey; 10.30am to 5.30pm. Lectures, trade stands, RSGB stand, specialist groups, trophy presentations, refreshments, parking. Admission £3 (over 65 - £1.50; under 18 - £1; under 14 - free). Contact RSGB on 01707 659015 for full details.
25	Tyneside Amateur Radio Society Rally, South Shields. RSGB Books available. Details from Stuart Hill, G0BEV, on 0191 281 0999.

DI-DI-DAH-DAH-DI-DIT

Win: The Making of the Modern World



YOU COULD WIN this beautifully illustrated hard-backed book from the Science Museum (see review on page 7) in this issue's competition.

1st Prize: *The Making of the Modern World*, plus a set of Isle of Man first day covers, and an Isle of Man Steamship Packet Co Ltd sweatshirt.

2nd Prizes: Isle of Man Steamship Packet Co Ltd tee-shirts and money boxes.

3rd Prizes: Isle of Man first day cover and a money box.

IN FEBRUARY EACH YEAR, Guides worldwide use amateur radio to send greetings messages to each other. This is Thinking Day On The Air (TDOTA) which takes place this year over the weekend 18/19 February.

Take a listen on the HF bands, or perhaps 2m and 70cm, and log any of the special stations you hear - most UK stations will use 'GB' callsign prefixes. The senders of the first three correctly completed logs out of the 'hat' **on 28 February** will win the prizes listed above.

Completed entries should be sent to: The Editor, D-i-Y Radio, Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE. The winners will be announced in the May-June issue of *D-i-Y Radio*.

DATE	TIME (UTC)	BAND (MHz)	CALLSIGN WORKED/HEARD	LOCATION OF STATION WORKED/HEARD

WINNERS!

HERE ARE THE WINNERS of our JOTA Log Competition (Sept-Oct 94 issue). Amazingly, this time we have three winners from the same family!

1st Prize: Amy Orchard, 2E1BJM, of Milton Keynes, wins the Antex Soldering Iron.

2nd Prizes: Chris and Anthony Heald, both of Leiston, Suffolk win a 3-hour blank video cassette each.

3rd Prizes: John Heald of Leiston, Suffolk and Elliott, 2E1BVS of Dukinfield, Cheshire win RSGB World Prefix Maps.

Additional prizes from the Isle of Man have been kindly arranged by Denys Hall, GD4OEL. A money box and a set of IoM First Day Covers go to each of the above winners. **And for the first two Isle of Man entrants out of the hat:** the Isle of Man Scout Association wins a selection of IoM mint postage stamps in a presentation folder (donated by the IoM Post Office), and Brian Cowley of Douglas wins a Rail Rover Ticket (donated by the IoM Passenger Transport Board). Consolation prizes of IoM postcards will be sent to all those who didn't win. Thanks Denys.

Special Offers

Every *D-i-Y Radio* includes a special offer, indicated by the 50p coin symbol. This issue's offer appears on page 6.

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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