CONSTRUCTION AT HOME
Special issue with ideas and information for the home construction enthusiast
In the battle of the stations, the FT-990 all-mode HF transceiver is the clear winner. Based on the same remarkable performance, ease of operation and the features of the FT-1000. The FT-990 is an extraordinary achievement, compare the advantages yourself. Feel the silky smooth tuning, hear the dual digital SCF (Switch Capacitance Filter) provide unsurpassed reception quality never before obtained. Be heard with the CPU controlled RF FSP (RF Frequency Shifted Speech Processor) for the extra pile-up “PUNCH.” See the lightweight and compact FT-990 with built-in AC switching power-supply. The FT-990 is a true champion HF rig without compromise. Leave it only to Yaesu to offer powerhouse performance that leaves the rest far behind.

**FT-990 HF All-Mode Transceiver**

- **Adjustable RF Power Output:** With internal heatsink and whisper-quiet temperature switched squirrel cage blower.
- **Adjustable Level Noise Blanker:** For a wide variety of noise and woodpecker.
- **CPU Controlled RF FSP (RF Frequency Shifted Speech Processor):** For better intelligibility and pile-up “PUNCH” for competitive situations.
- **High Speed Automatic Antenna Tuner:** With 39 memories.
- **50 Memories:** Independent ATU and mode/IF filter memory
- **Multimode Selection on Packet/RTTY:** Switchable FSK, RTTY, shift and CW patch.
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13 win an Allinco DJ-180, worth £169, in our prize competition this month.

Due to pressure on space 'Satellite Scene', 'Packet Panorama', and 'Reflections' have been held over.

Before ordering equipment, readers are advised to check current prices of imported equipment with our advertisers, due to the recent fluctuations in the value of the E.

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Don't miss it!

Practical Wireless, December 1992

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INSIDE THIS ISSUE
Marco Trading 32-page Winter Supplement Pull-out Catalogue

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Our new column 'Bits & Bytes - The Computer in Your Shack'. We will help you get the best practical use from your computer.

Practical Wireless 144MHz DJ-180 Hand-Held VHF Transceiver

TX2 Swann G1TEX
The Howes Speriboard
A Table-Top Project Bench

Don't miss it!

Practical Wireless 144MHz DJ-180 Hand-Held VHF Transceiver

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Practical Wireless, December 1992
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For example you now have ALINCO's patented circuit that retains full operation with dry cells even when battery voltage falls by 50%. Great for emergency applications. You get a programmable auto power off feature, battery saver, digital telephone dialler and three output power levels. And we've only just started! Key in a special code on the keypad and your rig will turn into a fully operational automatic crossband repeater. Key in another code and you will open up the receiver for a.m. airband reception and frequency segments up to 995MHz! You can even use the DTMF feature to send and receive two digit code messages.

To learn more about the transceiver that has already taken the Japanese and American markets by storm, phone or write for a full colour brochure.

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- Humidity
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  - Backlit LCD display.

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- Wind chill to -134°F
- Barometric pressure (with memory recall)
- Inside humidity
- All highs and lows recorded with time and date
  - Alarms for wind speed, wind chill, temperature and time
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- Wind direction in 1° or 10° increments
- Wind speed to 126 mph
- Wind chill to -134°F
- Barometric pressure (with memory recall)
- Inside humidity
- All highs and lows recorded with time and date
  - Alarms for temperature, wind speed, wind chill, humidity, & time
  - Barometric trend alarm
  - Time & date
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ROTATOR CONTROL CABLE

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Daiwa

- **LA2080H**
  - 2m 1.5-5W in 30-80W out pre amp
  - £159.95
- **DLA80H**
  - 2m 70cm 0.5W-25W in 80W out
  - £339.00

Here at SMC we do stock a wide range of power supplies to suit all applications. There are two major ranges to choose from, the Daiwa range and the Yaesu range. Both ranges are high quality products which will provide many hours of continuous fault free use.

The models range from 4A to 32A continuous with convenient models at 9, 12, 20 and 24A. Many models have comprehensive current/voltage metering with prices to suit all pockets.

- **FP700**
  - 13.8v fixed
  - £223.76
- **FP775HD**
  - 13.8v fixed
  - £264.38
- **FP800**
  - 13.8v fixed
  - £249.00
- **FP400C**
  - 13.8v fixed
  - £163.33
- **FP8**
  - 13.8v fixed
  - £158.62
- **SMC 120406**
  - 13.8v fixed
  - £20.39

All the Daiwa range, except the PS140MKII, feature variable voltage with switchable voltage/current metering. Both the PS304 and R540X feature a cigar lighter socket, convenient for powering your handheld transceiver.

- **PS120MKII**
  - 3-15v variable
  - 9A cont/12A max
  - £69.95
- **PS140MKII**
  - 13.8v fixed
  - 12A cont/14A max
  - £65.00
- **PS304**
  - 1-15v variable
  - 24A cont/32A max
  - £129.95
- **R540X**
  - 1-15v variable
  - 32A cont/40A max
  - £189.00

POWER SUPPLIES
Where have all the old receivers gone? To the attic every one! You may think I'm parodying a well-known (and sad) song, but where have all the old receivers got to?

For many of us, getting our first communications receiver proved to be a great delight. My first 'proper' receiver was an ex-RAF 1155. I'd seen it in a second-hand shop and paid for it in weekly instalments earned from my Saturday morning job, which boosted my schoolboy pocket money.

My 1155 provided years of good service, and I eventually passed it on to another s.w.l. I've no doubt, that providing the infamous 0.1pF decoupling capacitors haven't gone leaky again, that it's still working!

I've always been an advocate of home-breeding. In my opinion, there's nothing more satisfying than building your own receiver and hearing those first signals.

Despite my support for home-breeding, there comes a stage where many listeners need a professionally-made receiver. This is where the internal market within amateur radio comes into play.

Once the keen listener has their first communications receiver, it often provides an extra burst of enthusiasm. The enthusiasm then helps in gaining the coveted RAE passport.

I'm always on the look-out for older receivers, because there are many newcomers to the hobby who can make use of them. Recently, I even managed to buy a (rather dishevelled looking) Heathkit general coverage communications receiver for £5 at a car boot sale.

That bargain-priced receiver is now proudly owned by a school radio club member, and he's studying hard for his RAE. Needless to say, the Heathkit receiver now shines like a new pin, although it's still waiting for a thorough检查 and realignment session.

So, where have all the old receivers gone? There must be many thousands of older receivers stored in attics and lofts. If these could be passed on via 'Bargain Basement' and clubs, many newcomers to the hobby would benefit.

To add weight to my suggestion, I must mention one young man, James who lives in North Wales. He wrote to me last year, expressing how he could start off in the hobby. He was delighted with the purchase, studied it and is now a happy listener.

To add weight to my suggestion, I must mention one young man, James who lives in North Wales. He wrote to me last year, expressing how he could start off in the hobby. He was delighted with the purchase, studied it and is now a happy listener.

Perhaps you could help someone in the same way, by rooting out that old receiver and passing it on. Maybe you've got an old Heathkit RA1, a CR100 or other old stag that could help a listener.

Don't forget, that by passing on your old receiver, you'll be keeping a vital 'circle' of older equipment going, and helping newcomers to the hobby. I've no doubt that the money, even if it's only £30 or so, will help you too!

In the November issue of PW, we published a letter from an amateur who'd been wrongly issued with a reserved callsign. Mr Burton G6SFL, had written to tell us of his problems with his original callsign. His difficulties had apparently been caused by computer teething problems at Subscription Services Ltd. in Bristol. This organisation is now handling amateur radio licensing.

We will always try to help readers having difficulties with a Practical Wireless project, but please note the following simple rules:

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice must be accompanied by a stamped, self-addressed envelope (or envelope plus IRCs for overseas readers).
4. Make sure you describe the query adequately.
5. Only one query per letter please.

Back Numbers & Binders
Limited stocks of many issues of PW for past years are available at £1.00 each including post and packing. Binders, each holding one volume of PW are available price £5.50 each (£1 P&P for one, £2 for two or more). Send all orders to the Post Sales Department.

Subscription
Subscriptions are available both for the UK and overseas. Please see current issues for the latest prices.

Constructional Projects
Each constructional project is given a rating to guide readers as to its complexity.
Beginners: A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.
Intermediate: A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.
Advanced: A project likely to appeal to an experienced constructor and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on their own.

Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article.

The printed circuit boards are available, mail order, from the Post Sales Department.

Mail Order
All PW services are available Mail Order, either by post or using the 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque (overseas orders must be drawn on a London Clearing Bank), Access, Mastercard or Visa please.
Dear Sir

I have been very happy to read your article 'Using those Versatile Vacuums' in the October issue of PW. I think that it is a nice idea to evoke valves. I hope PW will present a project every month.

I am a radio ham since 1983, 37 years old and I think it is a great pleasure to use these older components. My job is not electronics and I consider that it is easier to realise valve transmitters without any sophisticated measurement tools (Multimeter, Hertz loop, etc.).

The projects are 'living'. I have built a small transmitter with EF80 plus EL81 p.a., and tune the anode i.c. circuit by looking at the colour of the gas! I am impatient to read you again.

Christophe Pierre
Juvisy, France

Editor's reply: Thank you Christophe, we'll be featuring the occasional valved equipment article. Readers might like to let us know what valved projects they'd like to see in PW.

Dear Sir

Having recently retired and thinking of taking up short wave listening again I bought a copy of Practical Wireless for the first time for 50 or so years.

Congratulations on your Diamond Jubilee year. Upon reading this, the thought struck me that I have just the little memento for you to mark the anniversary! Two superb little BA spanners marked with your magazines name. These were given to me as a young lad who was a keen builder of one, two and three valved t.r.f. sets by kind Mr Camm, who was Editor of PW at that time.

In the days of plywood, baseboards, valves almost as large as Coca-Cola cans, condensers the size of cigarette packets, and resistors almost as large as cigarettes, all connections could be made by BA size nuts and bolts. These spanners were put to good use in my radio building days. I think it's appropriate therefore that they return home in your jubilee year.

I apologise that they are not in pristine condition, but they are nearly as old as PW, and have survived much use, wartime bombs, V2s and many years in my tool box.

I intend to return to my old hobby again, once I have sorted through the jungle of sets available nowadays. Good luck to you, and who knows what you will reporting on and advertising when you celebrate your centenary.

K. N. Harris
Witney
Oxon

Editor's reply: Thank you for your delightful gift Mr Harris. We only have one other set of the PW tools in the archives, I wonder how many others have survived? As regards the magazine's centenary, I've no doubt I'll be either using a shovel, firing the boilers in the basement, or using a genuine 'halo' antenna by then!

Dear Sir

I thought your name was Mr F. C. Camm or Mr Scott-Taggart!

Whilst I was wandering round my local W. H. Smiths, I noticed a Practical Wireless Diamond Jubilee issue. A quick look revealed a letter from Douglas Byrne, whom I was pleased to have met at a barbecue in Shanklin last August.

However, your other letters seemed to have ignored the fundamental research and discoveries made by myself in 1936 when I was 11. My laboratory was a 6ft shed in my parents' garden.

Amongst other discoveries, I list two items of note: Crystals are not necessary for detection of signals. My first crystal fell from my hands. It slipped through a gap in the floorboards and into a rat's nest. In wrapping the earphone lead to the rusty nail which terminated the tuning coil, I had perfect reception. So, it was rusty nails for the future for me!

I also found that enormous explosive energy is available from the gases from accumulators. I applied a lighted match, resulting in a dreadful bang and a spray of clear liquid onto my trousers. I thought that I had discovered a new explosive! Strangely, my trousers developed a number of small holes. I blamed them on moths.

Now retired, I have time to ponder on future research. I wonder if there can be a substitute for such things as: PM1LF, PX4, PX2S or even 807s?

Peter Boden
Kettering
Northants

Editor's reply: Thank you for your amusing letter Peter. The most amusing 'point contact' rectifier (your rusty nail) story I know, concerns a crane working near the Brookman's Park BBC transmitter near London. Everytime the hook touched a nearby metal pipe, voices could be heard. The crane, cable, hook and pipe were acting as a crude receiving station! And hands up those of us who haven't discovered the corrosive effect of battery acid!

Dear Sir

The letter from Mike Hahn GA4JRJ, in 'Receiving You' mentioning used computer bargains at junk sales, was mouth-watering! I wish we had such well stocked sales in this area! Having bought a used (very) BBC model B micro earlier this year (the excuse being my 11-year old son) I find it fascinating, if baffling at times.

Purchase of the appropriate monthly computer magazine has helped. A search of the children's explanations and programs in BASIC also helped.

It has been said that amateur radio loses too many people to the computing world. Could this be because no radio amateur magazine at present caters for those radio amateurs interested in computers with regular technical info, descriptions of suitable micros, computers and programs (LARGE PRINT PLEASE) and applications? Software suppliers please note that I can't order from you if you do not advertise your existence and products in PW from time-to-time.

Would you consider including in PW, a monthly page for those of us who dabble with computers, and would love to find amateur radio applications for them? Those lucky enough to be able to afford PCs might also need more information.

Dick Goodall GM0OOGZ
Culloden
Inverness

Editor's Reply: Thank you for your letter Dick. We've got something arriving right up your street in the January issue of PW. In the meantime, I know there are several auction rooms in Inverness, and there's the excellent regular auction sales in Dingwall. Try them for bargains, I've been lucky several times!

Letters to the Editor

Send your letters to the editorial offices in Poole. They must be original, and not duplicated in any other magazine. We reserve the right to edit or shorten any letter. The views expressed in letters are not necessarily those of Practical Wireless. The Star Letter will receive a voucher worth £10 to spend on items from our Book, PCB or other services offered by Practical Wireless. All other letters will receive a £5 voucher.

Practical Wireless, December 1992
Dear Sir
In 1979 I bought my first radio equipment. It was a CB transceiver. I suddenly became very interested on DX. It’s wonderful to contact other radio operators all over the world and this activity is still one of my favourites.

After a couple of years I purchased a short wave receiver, and I began my listening activities on the amateur bands and broadcasting stations. But something was missing. There was a lack of information in my country for radio enthusiasts. I was completely lost. No magazines neither books were available at the book store and all I had to do, was search for new frequencies. And what about those strange noises I heard?

One day I saw PW magazine in a store 50km away from my town. I ran to buy the magazine, because it was a unique item in the store and someone could take it first! After that day I am a happy DXer. I know what those strange signals are about, and I can decode them. Wonderful, all thanks to you!

Today I buy PW every month at the exact same place I first saw it.

I want to thank you for the excellent service you’re doing to the world of radio enthusiasts.

Paulo Santos Pinto
Guimáriaes, Portugal

Editor’s reply: Thank you Paulo, PW seems to get everywhere doesn’t it? I’ve just started to learn Portuguese, hopefully if we meet I’ll be able to greet you in your own language...despite the fact you obviously speak English very well!

Dear Sir
Mike Hahn’s letter (Receiving You Sept 1992) requesting radio related software for older computers such as ZX81, Atari, etc. reminded me of a subject about which I had intended to write to you.

Some years ago PW mentioned a replacement ROM for the ZX81, known as the FORTH ROM which contained a Forth language operating system by David Husband. There was a promise of forthcoming (pun intended) projects and listings to make use of this ROM. I still have my FORTH/ZX81 and have been reading PW every since, patiently waiting for the projects to appear.

Seriously though, whatever became of the projects? There surely must still be many FORTH ROMS in existence which could be put to good use so here’s a challenge: Produce five projects, able to make use of the multi-tasking capability of the FORTH ROM, all of which must be able to run concurrently!

1. All mode data decoder
2. RS232 port & software for RX/TX control or modem link
3. Database
4. Satellite predictor
5. AZ-EL beam motor control directed by project no. 4

An impossible task in 16k, but I’m sure you’ll accept the challenge with your usual enthusiasm!

M. Bradbury
Stoke-on-Trent

Editor’s reply: Thanks for the challenge Mr Bradbury, and I’m passing your letter on for further attention. You should also look out for the January 1993 issue!
Thursday October 1 saw a presentation held at BBC House, London. Service, played host to many specialists from many hundreds of journalists. The Managing Director, Tusa, before a BBC World Service, video told the story of the world-famous Empire Service, which has a unique reputation. It was speeded up when he eventually heard he'd passed!

The world-famous head-quarters of the BBC World Service, played host to hundreds of journalists and radio specialists from many countries. They were greeted by the Managing Director of the BBC World Service, John Tusa, before a promotional video told the story of the unique reputation the BBC’s global service has gained over 60 years.

Since the beginning of the BBC’s Empire Service in 1932, listeners around the globe have used the London Calling guide to check on frequencies, and to see what programmes are coming up. But, in its 60th anniversary year, the World Service is to replace the 28-page programme guide with the 100-page full colour magazine BBC Worldwide.

Published monthly, the new magazine is packed with features written by BBC correspondents and programme makers. It also provides the usual frequency guide and daily and weekly programme listings for the World Service in a revamped centre London Calling section. It also includes comprehensive listings for the current world Television Service available in Europe, Africa and Asia.

However, the BBC are aware that not everyone can afford or obtain the new magazine. Because of this, London Calling will still be available in developing countries free of charge.

The first edition of BBC Worldwide, the November issue, was available from October 1. Full details on subscriptions are available from BBC Worldwide Magazine, PO Box 76, Bush House, Strand, London WC2B 4PH, tel: 071-240 3455, FAX 071-240 4899.

**John GOSKR - Against All Odds**

John Goodall, now on the air as GOSKR, is determined to pay tribute to everyone who helped him to get active in amateur radio. Against all odds, or so it seemed at the time, John has now attained his goal of a full A licence. Former policeman John, is now partially paralysed following an accident when his police-dog chased a suspect across a building site at night. The dog made it over a trenched, but John didn’t. He suffered serious spinal injuries which eventually led to the paralysis.

John now walks with great difficulty, helped by crutches. However, he’s very mobile, and when not driving his car, GOSKR can be seen piloting a fascinating ‘moon buggy’ lookalike electric vehicle.

Now living in the Bournemouth area, John, encouraged by his wife Shirley, was determined to pass the RAE. He’d been interested in the hobby since 1966, and he’d had many false starts in passing the examination.

Following a great deal of support and help from the Flight Refuelling Amateur Radio Society, and many other friends, John was ready to take the RAE in May 1992. Unfortunately, disaster struck when he suffered a heart attack, three days before the RAE was to be taken.

Fortunately, everyone rallied round, and with the agreement and support of the City & Guilds and Bournemouth hospital authorities, John took the RAE from his bed. Although he stayed in hospital for a while, recovery was speeded up when he eventually heard he’d passed!

Briefly licensed as G7MMD, John soon passed his Morse test, thanks to much practice and encouragement from other friends. And now, thanks to the Radio Amateur Invalid & Blind Club, particularly their local representative Bob GGDUN, John’s on the air.

John Goodall thanks everybody, especially his wife Shirley who supported him over the long, stony road to GOSKR. "Without help from all my friends" John says "I would never have made it. Thank you one and all".

**Silent Key - Seamus Hannaway GI4OZT**

It's with deep regret that we have heard of the passing of Seamus Hannaway GI4OZT. Seamus made many friends during the 1992 PW trip to Dayton in April, and thoroughly enjoyed himself despite being terminally ill with cancer.

A courageous and kindly Irishman, Seamus promoted friendship and gentle humour to everyone he met. Although he knew he was terminally ill, Seamus was determined to visit the Dayton HamVention and have fun. He made it, and we enjoyed his company and that of his friend and companion Ray McAteer GI4MMF.

It was a great privilege to have known Seamus. Everyone on the 1992 PW HamVention holiday will remember him as a radio amateur in the very best tradition of the hobby.

**Martin Saunders G7JCJ - Young Amateur Of The Year**

Martin Saunders G7JCJ, who comes from Broadstone in Dorset, has been chosen as the Young Amateur of the Year for 1992. Martin, a member of the Flight Refuelling Amateur Radio Society, is a keen packet radio enthusiast.

The first prize of £250, was presented to Martin by Stephen Spivey, the Radiocommunication Agency’s Head of Mobile Radio, at the Radio Society of Great Britain’s HF Convention in Windsor on Sunday September 27. Martin also received an invitation to visit the RA’s monitoring station at Baldock, Hertfordshire.

During the ceremony, Stephen Spivey announced that the Radiocommunications Agency’s continuing support for the Young Amateur Of The Year Award. The RA has pledged its support for another two years.

Martin Saunders received a number of prizes, including gifts from Icom UK and Siskin Electronics Ltd. Martin is mainly interested in packet radio and has assembled his own equipment, and operates his own mailbox. He’s also written articles explaining packet radio, has been appointed secretary of his local packet group, and serves on the forward planning committee of the FRARS.

The close runner-up in the 1992 Young Amateur Of The Year award, was Neil Mothew G7NGM. Neil, from Loughton Essex is another amateur who is keen on home-construction. Neil has also been invited to visit the RA’s monitoring station at Baldock.

**New Magazine For BBC World Service**

Thursday October 1 saw the launch of the new magazine BBC Worldwide, at a special presentation held at Bush House, London.

The world-famous head-quarter of the BBC World Service, played host to hundreds of journalists and radio specialists from many countries. They were greeted by the Managing Director of the BBC World Service, John Tusa, before a promotional video told the story of the unique reputation the BBC’s global service has gained over 60 years.

Since the beginning of the BBC’s Empire Service in 1932, listeners around the globe have used the London Calling guide to check on frequencies, and to see what programmes are coming up. But, in it’s 60th anniversary year, the World Service is to replace the 28-page programme guide with the 100-page full colour magazine BBC Worldwide.

Rob Mannion G3XFD

Martin Saunders G7JCJ, Young Amateur Of The Year 1992.
Ken Smith G3JIX - Practical Wireless 'Elmer' 1992

The 21st anniversary Leicester show provided the ideal opportunity to present the first PW 'Elmer' award, and Ken is pictured receiving a framed watercoloured cartoon from Rob Mannion G3XFD, the Editor on Saturday October 24. The cartoon, especially commissioned from John Worthington GW3COI, depicts Ken working in his shack surrounded by young people, so it seemed very appropriate for the members of the Thanet Electronics Club to be invited to the presentation.

Military Wireless ARS

The Military Wireless ARS has been formed with the club callign GOPTZ by licensed radio amateurs and shortwave listeners who are interested in Navy, Army and RAF radios. With a view to circulating information between members, visiting radio meets/fairs and holding special event radio stations (by licensed members using modern amateur radios). Members will be able to send lists of 'sales and wants' to the Secretary, who will collate these into a master list and send a copy to each member. The yearly subscription will be £5. Membership forms are available from (0705) 250463.

Stolen Equipment

Stolen from Stockton & Billingham Radio Group, Community Centre, The Causeway, Billingham, were an Icom 740E s/n 18004066 and a Yaesu FT290R s/n S130519. Information to Malcolm Hotson G0NRP on (0642) 249067 or Stockton Police on (0642) 616600.

Penpal

I read about your address in the PW magazine. I am a young Nigerian of 16 years old and I am interested in communication but the development of telecommunications is far more advanced in your country than Nigeria. And I had loved to have a friend overseas who can be enlighting me more on communications. I had tried many penpal clubs but all proved abortive, therefore I would like you to kindly connect me to a boy or girl of about 13-16 years old who can be writing with me as I promise to furnish the person with any information about communication and other fields in Nigeria. Stephen Anokwurui. All letters to Stephen to be sent c/o Practical Wireless, and we will kindly pass them on to him in Nigeria.

Transatlantic Link

On Thanksgiving weekend, the Whitman (Massachusetts) ARC will commemorate the 500th anniversary of Christopher Columbus' epic discovery of North America by operating special event stations from Plimoth Plantation. This is a re-created village set in the year 1627 and located close to the site of the landing of the Pilgrim Fathers from England in the ship Mayflower. Operation will be from 1200 to 2400UTC/GMT on both Saturday 28th and Sunday 29th November, using the callsigns W41NP, N1X and N1FRE. The club will be looking for s.s.b. contacts with UK stations on these frequencies, dependent upon propagation: 28.370, 24.970, 18.140, 14.270 and 7.270MHz. All contacts and s.w.l. reports will be confirmed. QSL via Bureau or direct to PO Box 48, Whitman Mass. 02382, USA.

The 1992 Practical Wireless 144MHz QRP Contest

Overall winners of the 1992 QRP Contest, the operators of the Mansfield Contest Group station G0MCG/P, are pictured being presented with the winner's cup, by contest adjudicator Dr. Neill Taylor G0MCG/P, are pictured being presented with the winner's cup, by contest adjudicator Dr. Neill Taylor. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello. The runners-up, 'The Pack of Three' signing G8NTD/P, operated very successfully from a high driven 12V d.c. generator, donated by Marlec Engineering of Corby, Northamptonshire, and presented by Marlec's representative Teresa Auciello.
Avon
Bristol ARC meet at 19th Scout HQ, Fitzre Lane, St George, Bristol. November 12/December 10 are QRP home brew play & display nights with Dave G4ZBT, the 19th is ‘Test Gear Calibration’ by John G4WOD, the 28th is a Computer evening with Barry GG3FM & December 3 is ‘The Internal Combustion Engine Explained’ by Lance GOCCU. More details from G80ZH. For more details contact Mike G6YAL, 6 Victoria Street, Aylesbury, Bucks HP20 1GA. Tel: 081-504 1581.

Berkshire
Maidenhead & District ARC meet at the Red Cross Hall, The Crescent, Maidenhead, 7.30pm. November 17 is Construction Contest Further details, contact Derek Carson G41H0 on (0708) 43656 or 612207.

Buckinghamshire
Aylesbury Vale RS meet 1st & 3rd Wednesdays, 8pm in the Village Hall at Hardwick. November 18 is ‘The QRP Contest & Its Uses’ by Nigel Pritchard GAYM & December 12 is GBN8 Construction Contest Further details about the club from Martin G4XJZ on (0292) 81097.

Cheshire
Stockport RS meet 2nd & 4th Wednesdays, 7.45pm in Room 14 of the Dialstone Centre, Usborne Lane, Offerton, Stockport, Cheshire. November 18 is Hot Pot Supper, the 25th is ‘G3YPE Memorial Lecture’ by DSMY & December 9 is their AGM. Further details from Jim France G3KAP on 061-439 4922.

Chelmsford
Delyn RC meet every other Tuesday, 8pm at the Gwynennydd Community Centre in Gwynennydd, near Mold, Clwyd, North Wales. November 17 is St Johns & December 1 is a Quiz & demo. For more details, contact Steve Studdard GW7AAV on (0244) 810918.

Clwyd
Wrexham ARC meet at the Maesgwyn Community Centre, Maesgwyn Road, Wrexham. November 17 is Radio Usage/Requirements (Raynet/Events). More details from Ian Wright GW4MLV, ‘Derwyrdd’, 2 Duke Street, Wrexham, Clwyd LL14 1SY. Tel: (0756) 945058.

Cornwall & Isles of Scilly
Cornish RAC meet at the Memorial Hall, Perranwell Station, Perranwell, nr. Truro, 7.30pm. December 3 is their Christmas Party with RGB Videos & others & the 8th is an Activities night. For further information, please contact Geoff Berrington, 6 Trevinity Road, Carharrack, Redruth, Cornwall TR16 5DZ. Tel: (0299) 290636.

Greater London
Acton, Brentford & Chiswick ARC meet every third Thursday, 8pm at the Watling Community Centre, Watling Hill Road, Acton, 7.30pm. November 17 is ‘Members Reminiscences Of Hamming’. Further details from Colm Mulvany GOJRY, 11 Maesgwyn Community Centre, Maesgwyn Road, Wrexham. Tel: (0292) 810975.

Derbyshire
Buxton Radio Amateurs meet at the Lee Wood Hotel, Buxton at 8pm. November 25 is the EM0 Discussion & December 6 is a Quiz night. For further details, contact Derek Carson G41H0 on (0292) 25906.

Derbyshire ARC meet Wednesdays, 7.30pm at 119 Green Lane, Derby. November 15 is ‘Mobile HF Aerial Construction’ by Barry Walker GO6LU, the 25th is ‘Home Weather Forecasting’ by Roy Williamson G4NPT, December 2 is a Junk Sale & the 9th is a Constructor’s Contest. Further details from Richard Buckley G6YDH & 20 Eden Bank, Actingtree, Derby DE5 2SG. Tel: (0773) 852745.

East Sussex
Southdown ARS meet 1st Mondays, 8pm in the main hall of the Chasewater Home for the Disabled, South Cliff, Eastbourne. December 7 is their Christmas Social. Details from John Vaughan G3DDY on (0233) 485704.

East Yorkshire
North Ferrilty United ARS meet Fridays, 8pm at the North Ferrilty Ltd. FC Social Club, Church Road, North Ferrilty, East Yorkshire. November 13 is a night on the air, the 20th is ‘Emergency Planning Communications’ by Mike Norrie, the 27th is a night on the air & December 4 is a Surprise Equipment Sale. Further details from Mark Lee G3YCY on (0490) 304010.

Essex
Bromley & District ARC meet at rooms 14, 15 & 16 at the Silverthorne Hotel, Liphook Hampshire. November 18 is a Members’ Buys - & why they are a good or bad buy & December 7 is a Junk Sale. Eddy Scherer, 21 Mayes Road, Braintree, Essex CM7 5ST.

Great Britain
Clacton ARC meet alternate Wednesdays in The Imperial Public House, Rosary Street, Clacton-on-Sea. November 25 is a talk by Andy G6IPG on ‘Four Play Radio’. For their membership details, phone (0205) 757208, 435659 or 613297.

Hampshire
Southdown ARS meet 1st Mondays, 8pm at the community Centre, Victoria Street, Braintree. November 16 is Members’ Buys - & why they are a good or bad buy & December 7 is a Junk Sale. Eddy Scherer, 21 Mayes Road, Braintree, Essex CM7 5ST.

Hertfordshire
SOUTH DORSET RS meet 1st Tuesdays, 7.30pm in the Wessex lounge of Wessex Hotel, Maidenhead. November 26 is a club meeting. Mike Lenzi G6QAH, 12 Potton Lane, Chicksgrove, Weymouth DT3 4AG. Tel: (0203) 7738660.

Hereford & Worcester
Bromsgrove RS meet 2nd & 4th Tuesdays, 8pm at The Railway Hotel, Lightmoor Road, Hereford. November 18 is a talk about a visit to the Dayton Hamvention in the USA by Rob Mannion G3XFD, Editor of Practical Wireless & December 2 is ‘Amateur Television Transmission’ by Mike Sanders G6NLS. Keine Roche G6GDS on (0429) 309319.

Hertfordshire
Devon ARC meet at the 1st & 3rd (formal) Tuesdays, 8pm at Heath Park, Cotterells, Hemel Hempstead. November 17 Mike Goodwin GDN1 will give a talk on aerial design. Further details from Dennis Booth G1AX on (0442) 259020.

Hereford & Worcester
Bromsgrove RS meet 2nd & 4th Tuesdays, 8pm at the Royal Oak, Northfield, Bromsgrove. November 24 is a night on the air & December 8 is Construction Contest judging for the November contest. Further details from Maurice Chesser G4THO on (0703) 726764.

Hampshire
Basingstoke ARC meet 1st Mondays, 7.30pm at the Ring Community Centre, Sycamore Way, Basingstoke. November 29 is a 144 MHz Foray to Middlesex & Essex & December 7 is their Christmas Social & Quiz night. For further details, phone (0256) 25117.

Hertfordshire
Dacorum AR & TS meet 1st (informal) & 3rd (formal) Tuesdays, 8pm at The Heath Park, Cotterells, Hemel Hempstead. On November 17 Mike Goodwin GDN1 will give a talk on aerial design. Further details from Dennis Booth G1AX on (0442) 259020.

North Yorkshire
Dragon ARC meet at the Derwent Hotel, Liphook Hampshire. November 13 is ‘Liquid Crystal Displays’ by David Coates of Merck Ltd & the 27th is ‘Building & Operating Low Power (GPR) Equipment For The HF Bands’ by Keith G7UKI. Further details from Maurice Chesser G4THO on (0703) 726764.

Norfolk
Boroughbridge RS meet alternate Wednesdays in The Imperial Public House, Rosary Street, Clacton-on-Sea. November 25 is a talk by Andy G6IPG on ‘Four Play Radio’. For their membership details, phone (0205) 757208, 435659 or 613297.

South Gloucestershire

Southend on Sea
Southend RS meet alternate Wednesdays, 7.30pm at the Four Crosses Hostel, Bridge. November 16 is Sale of Surprise Equipment & December 7 is a Ron Watson Jones - with more amazing pictures. Tony Rees GWWFGM on (0628) 600563.

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Practical Wireless, December 1992

Humberides

Doolies & E S meet most Fridays, 7.30pm at the West Park Pavilion, West Park, Goole, last Fridays at the 'Black Swan' pub. Askkey, November 13 is a 'Contest' talk by Richard GISLZ, the 20th is a Quiz & the 27th is a Social evening. Further details from Steve Price GWRII on (0405) 781930.

Kent

Maidstone YMCA ARS meet Fridays, 8pm at the YMCA Sports Centre, Mere Lane, Maidstone. November 13 is a Construction competition, the 20th is RAE & December 4 is RAE. More details from Colin Robinson on (0227) 670966.

Sevenoaks & District ARS. October 19 is 'More Medical Electronics' by Peter Donaldson. November 16 is 'Fasc, Fallacy & Foible' by Jack Brown. Details from The Secretary, c/o Sevenoaks District Council, Social Offices, Argyle Road, Sevenoaks. Kent T11 1HG.

Lancashire

Bury RS meet Tuesdays, 6pm in The Mosses Community Centre, Cecil Street, Bury. Lancashire. 2nd Tuesdays are Lecture/Talk nights & other Tuesdays are general natter evenings or (0827) 533444.

Yorkshire

Practical Wireless, December 1992

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Neill Taylor G4HLX, presents the results of what turned out to be a very good entry for the 10th anniversary PW QRP contest.Neill also has some good news for listeners to this 'fun' event, as they'll be able to join in the 1993 contest with their own special category and prizes.

The tenth annual Practical Wireless 144MHz QRP contest attracted a high level of activity. Because of the extra activity, I'm pleased to report that 162 entries were received, and this resulted in the highest number of entrants since 1985.

The increased activity on the day, was accompanied by generally good weather. The propagation was also reasonable, providing a combination which made it a very enjoyable event.

The team who made the most of these conditions were The Mansfield Contest Group, GOMCG/P. As a result, this group has won the contest for the third year in succession, operating from their Derbyshire site.

The exceptional station at GOMCG/P, with an antenna array comprising a total of 90 elements, has proved hard to beat. They fully deserve the first prize of the Rutland Windcharger wind-driven generator, donated by Marles Engineering of Corby in Northamptonshire.

A new group, the 'Pack of Three', operating with the callsign G6NMD/P operated very successfully from a high spot in Staffordshire. They gained second place, winning the runners-up prize of a set of 12V solar panels, presented by Bob Keyes GW4WVO.

### Table 1 Practical Wireless 144MHz QRP Contest 1992

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### Tennamast Trophy

The Tennamast Trophy for the leading Scottish station this year, goes to the Aberdeen VHF Contest Group GM4ZUK/P. They did well from locatior square JD8. Lists of stations leading in the various categories will be found in the tables. Congratulations to them all.

As a special celebration of the tenth year of the QRP contest, as well as the 60th anniversary of PW, all entrants who submitted an s.a.e. will be awarded a certificate to mark their achievement. A large number expressed similar sentiments to those of G0KGP/P. "Wherever we come, our certificates will be proudly displayed!"

Many groups and individuals (there were 79 single-operator entries) put a lot of effort into their stations. A large number expressed similar sentiments to those of G0KGP/P. "Wherever we come, our certificates will be proudly displayed!"

### Nothing Spectacular

Nothing spectacular happened to conditions on the 144MHz band during the contest despite this, the general impression was fairly summed up by G2H3/P who said that "Propagation seemed fairly good on the whole."

The comment from G6ARC/P was: "slight lift conditions enabling more squares to be worked", compared with recent days bad propagation. Some operators noticed that early morning conditions seemed even more promising: "an early hint of a good one."

At the end of the contest, there were some sporadic-E openings at 144MHz. But nothing of this sort occurred during the contest, unless the incomplete contact by G6MFX/P with an EAS was via this mode. However, they 'suspect this should have been GM6EAS from the Glasgow docks! It's many years since we've enjoyed an Es opening during the PW contest, despite the scheduling in the height of the season. I'm pleased to hear that G6VAP/P was...
amongst those groups who found “lots of stations to work”, thanks to the high level of activity. Even from Scotland itself, G8DDY/P commented that there were: “more GMs about, and that’s common during a contest”. The lack of activity from France puzzled a few operators. Even the winners GOMCG/P remarked “for some reason we only worked two French stations. Don’t the French read PWR?” You’d think that G8L7LKP on Guernsey was perhaps best placed to catch any French stations on the air. However, he reported that “I didn’t even hear a French station”!

Weather Talking Point
The weather during the contest is always a talking point. “It was a scorcher”, says GOMCG/P, “the cans in the cooler box were in demand”!

In the first few years of the PWQRP contest, the event gained a reputation for wet and windy conditions to groups in some areas trying to contest operating, comes this plaintive plea: “It would be helpful if stations calling CO Contest also gave their location to allow those answering them to point their beams in the right direction”. Advice Ignored
The advice given with the contest rules to portable stations, about having an alternative site in reserve, was ignored by some groups to their cost. “On arrival at the site, we built the mast and antenna with haste” report GW1VK/P. “Moments later other stations came to use our site which shows that it is worthwhile having an alternative site”.

Well Organised
I expect a number of groups are wondering (like G8NTD/P), “how do GOMCG/P do it?” The answer is simple!

The Mansfield group won with an extravagant and very well organised station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organised, station. It was located at a good site in the centre of England. The team comprises of five operators plus three s.w.l.s logging. All the s.w.l.s were very well organise...
Receiver Only

The Tonna antennas are routed to an IC275, which is used as a receiver only. This technique enables other parts of the band to be monitored, in the constant search for DX and sample reports.

Both antenna stacks are fed with Andrews Helix LDF4-50 cable, and are mounted at heights of 30m above ground. This system makes for a state-of-the-art receiving system, as well as guaranteeing all 3W of transmit power are very efficiently transmitted.

But the Mansfield group don't stop there! Another sophisticated scheme is used for handling the audio leaving the receivers.

Paul GC3TB, explains the system: "We designed a new audio system, to enable the operator to select the audio from either of the two receivers, and to also feed that audio to the people rotating the antennas."

The system was very successful. Enabling us to beam up on stations quicker and cutting down on the abuse that's generally hurled at the antenna man by the frustrated operator".

So, now we've all heard how it's done, we know what to aspire to for next year. Well done Mansfield!

Gremlins

A few stations experienced equipment problems and gremlins. Of these, the misprints befailing GB16S should surely attract some sympathy.

He returned early from a trip to Spain, thinking that the contest was on June 14. On discovering his error (the contest was held a week later), he had to cancel his daughter's birthday party in order to take part.

After just one contact in the contest, he reports that his rotator "froze solid" with the antenna pointing south-east, the worst possible direction. If this wasn't bad enough, the receiver front-end then "went very quiet" and "contact number two was practically next door, and the last was actually made using a Slim Jim! At last, the gremlins must have had a good day!"

The unfortunate GB16S expected that this year, allowing only three contacts, would leave him at the bottom of the table. However, this was not to be the case because GB2ME, a regular QRP contest entrant, did not let his badly timed holiday in Ibiza spoil his fun!

He took his rig with him, complete with rotator. He also used a home built measuring circuit "trying to explain this contradiction to Airport Security" he wrote (presumably after he'd been released!). Unfortunately, the problems didn't end there, as he called CQ as EA0/GE2RZ for four hours before making his first and only contact.

Problem Lighthouse

On the other hand, G6KX/P experienced a problem of an altogether different kind. This station had arranged to operate from the top of a lighthouse on the north coast of England.

Unfortunately, the lighthouse manager was satisfied when shown the copy of PW containing the contest rules. But perhaps this episode suggests that it would be wise to also carry your licence validation document at such times.

Contest Organisation

There was only one complaint about the contest organisation. It came from GW13Q and who asked "is there any chance of extending the two-week log submission date to three?". They cite holiday arrangements as causing difficulties in meeting the deadline.

"I'm afraid that as adjudicator, I have to answer no to this one, as my family also want a summer holiday. The checking of the logs is a considerable burden, the job has to be squeezed into a short period, in order to get the results published as soon as possible."

"Now it's time for adjudicator grumbles! Although the vast majority of entrants submit neat, well-presented logs and covering information, there are exceptions. A few logs always give me a headache. Some are very hard to read. The difficult-to-read records are usually because they submit poor photographs of the original 'tough log', written during the event, complete with illegible corrections. Others have not read the rules properly, and have the log columns in the wrong order or omit some of the covering information. A few logs fail to highlight, or otherwise indicate, their contact in each locatorsquare. This, of course, gives extra work for the adjudicator."

I had 162 logs to deal with, and each entrant only has one. So, it doesn't seem unreasonable to ask the entrant to do his best, and to also indicate, if not in the log, whether or not they had a problem with the antenna pointing in the wrong direction.

"My policy is to penalyse entries by deducting 5% from the score. This is lenient in many cases where a contestant may have simple vital information would result in disqualification."

"This year, 10 stations lost 5% in this way. But let me reiterate that most of the complaints are about the allocation of locator squares, rather than the quality of logs, anyway, I'd like to thank all those who have entered the 1992 event. I must also thank G4KXE and G4OM for their useful checklogs, and indeed all those who have supported the contest during its first 10 years."

In a forthcoming article I shall be reviewing all 10 contests, and I shall also answer the question "which groups have achieved the leading positions, taking the results of all ten events together?". Who will be the overall leading station of the decade?

The 1993 Contest

Meanwhile, many groups seem anxious to start planning for the 1993 contest. The provisional dates for this is Sunday June 20 1993.

Due to the interest shown by listeners, I'm pleased to report that next year's contest will cater for the s.w.l. too. Both the Editor and I are conscious that the s.w.l. has been neglected in previous years.

Although we know that listeners did take part, no formal logs were received. However, to encourage s.w.l.s to participate, a new section of the QRP Contest will be introduced. A special prize will be awarded to the highest s.w.l. score for the 1993 event. Full details of how s.w.l.s can enter will be published in time for the contest.

Finally, I again, thank you all for entering. And, like many other Practical Wireless QRP Contest entrants, I'm looking forward to our 11th contest.

Neill Taylor G4HLX

Practical Wireless, December 1992
Although you can buy all sorts of boxes and enclosures, they rarely seem to exactly fit your needs. They also tend to be rather expensive.

The alternative to buying ready made boxes, is to build your own. Many people fight shy of this because they say they don't know how to do it, and I'm aiming to give you a starting point for exploring the possibilities.

TOOLS NEEDED

Another stumbling point with box and enclosure construction, concerns the number of tools needed. My approach to the hobby, is that you should not have to go out and buy anything specifically in order to make things for amateur radio.

If you do have to go out and buy, make sure you spend your money wisely. There's no point in buying professional quality tools if you are not going to earn your living with them.

At the same time, there's no point in buying very cheap tools. They rarely last and give inferior results.

Nor is there any point in going out and buying tools for the sake of it, unless you are going to make a model. If you can use a particular tool, think at least twice before committing your money. Look for alternatives that you already have, and if you can, spend the money you save on materials and components.

Whatever tools you do buy (or already have) it's important that you take care of them. Tools represent a considerable investment.

Cutting tools in particular should be stored safely, and kept sharp. They perform much better, and are less of a danger to the user this way.

THE MATERIALS

The materials I'm suggesting you use for construction don't require specialised or expensive tools. They'll only require the sort of tools you're likely to have around the house and shack.

Before you consider using a particular material, it's worthwhile considering what it is you want the box or enclosure to do.

You can also make your units user-friendly (to you!). How many times have you complained that the controls of a piece of commercial equipment are too close together, inaccessible, or badly labelled?

FINISHED ITEM

To start the design process, just consider where the finished item is going to be. Then decide how it will fit in with the rest of the shack equipment.

Will the proposed item be used fixed or moveable? What will it be next to and connected to? Is there a vital display that you must be able to read from 10 paces? And so on.

Before you start, it's worthwhile doing a few simple drawings. You don't need anything elaborate as you're the only person who has to understand them anyway!

IDEAS CRYSTALISING

Once the ideas are crystallising, a mock-up casing made in card is very useful to confirm sizes and shapes.

Switches and other controls that you need to operate, can be put on your mock-up. You can then test whether you can get your hand to them comfortably.

Don't be afraid of giving yourself a little more space than you think you need. This is especially important if the equipment inside generates heat.

You'll also need to think about airflow paths through the case, and where the air gets in and out. Generally it's wise to vent at the highest point of the box.

Before you start the final design, it will help if you make some fairly decent drawings of each face of the enclosure, including the vital measurements. Keep it simple! Don't attempt three dimensional drawings, leave that to the professionals and artists. You'll need a view of the front, the back, the two sides, the top and bottom. Six drawings in all.

When you do the drawings, make sure you mark in the vital measurements. Keep it simple! Don't forget to leave spaces for labels and other markings, and don't be in too much of a hurry to finalise things.

TRADITIONAL CASES

It's traditional that cases for amateur equipment have been made out of metal, either sheet steel or aluminium. They have the advantages of strength, easy mass production and good radio frequency screening. But metals are quite hard to work, and getting a good finish can be difficult.

Modern plastics are light, cheap, self-coloured, easy to shape and very versatile materials. Their only two disadvantages are their response to heat, and poor r.f. shielding.

I'll mention the r.f. shielding later. And, providing airflow has been carefully considered, heat should not be a problem.

MODERN PLASTICS

With modern plastics, the only real problem is which one to use! The most widely available in high street DIY shops is acrylic sheet, better known by its trade name Perspex.

Unfortunately, Perspex is a very abrasive material to work with, and quickly blunts tools. It's also rather hard and brittle, requiring little force to shatter it like a piece of glass.

The only tools suitable for use with Perspex are those made from metal, and even good quality twist drills will need sharpening frequently. Despite the difficulties, very nice looking enclosures can be made with Perspex.

POLYSTYRENE: FAMILY

The polystyrene family, in particular, high impact polystyrene, often known as HIPS or vacuum forming plastics, are very useful. This material comes in quite a wide range of colours and several thicknesses from 1mm up to 6mm.

This form of plastics can be bought from model-making shops, or the suppliers I've listed. It's easy to cut, shape, drill and form, and will take a variety of finishes.

The most useful thickness is 3mm, which is easy to cut and gives a very light but strong box. Larger boxes may need some strengthening sections, but avoid making them too heavy. A box 300mm x 200mm x 100mm will cost around £5 for materials.

There are two methods you can use to build a case from polystyrene. The easiest method is to make all the flat surfaces of the box individually, then assemble it.

Don't worry about great accuracy in cutting out. There are many ways of disguising your mistakes!

However, it pays to take care in marking-out. Right angles will need the use of a try-square. Accurate marking-out needs a thin line, and this can be done by using a fine tip spirit-based felt-tip pen.

MARK ON INSIDE

I always mark out the inside, as the pen colours can penetrate through several layers of paint. Cutting is best done by scoring the surface, and then breaking it. This provides a clean and square
edge, for joint making.

Scoring on thin sheet, can be done with a Stanley knife held against a steel straight edge. Take care with your fingers!

For a box having all the sides the same height, one long strip provides the individual pieces. A sloping

acrylic sheet, as the edges produced are very sharp.

The solvent comes in a small bottle, and you don’t need very much. A fine paint brush is all you need to apply the solvent. Make sure it has

suppliers.

The solvent dissolves the plastics, and as it evaporates it leaves a ‘welded’ joint. When the joint is strong enough, you can put on the next side, making a corner.

A little sticky tape, Sellotape

Once you’ve cut the pieces, the box can be assembled.

Don’t worry about how to get the gear into it, that comes later!

Some very good results can be obtained with plumber’s plastics piping solvent adhesive. Most DIY stores sell this, but experiment on some scrap material first, to see how well and how quickly it works.

ADHESIVE

APPLIED

The preferred method of joining polystyrene and acrylic is to use a solvent adhesive. The best is a chemical called dichloromethane, easily purchased from model making

natural bristles, because if they’re not natural they’ll be dissolved!

The adhesive can now be applied, starting with the base and one of the sides. Put the base on a flat surface, a section of plate-glass would be ideal (those from old TV sets are useful).

Set the side up on the base, or insulating tape, as in Fig. 3, will hold the job together while the solvent is evaporating. The strength of the joint depends on how tight the individual pieces are held together during the setting stage.

MATCHING UP

The next job is matching up the height of the box sides. The easiest way is to stick a sheet of abrasive paper to a flat surface, Fig. 4.

By using ‘wet and dry’ paper, illustrated with a grit of about 120, you can achieve some rapid results without much effort. Another advantage is that it can be used wet (surprise surprise!), producing a better finish.

Place the part-formed box upside down on the abrasive surface, as shown in Fig. 5. Then move it around in a

natural bristles, because if they’re not natural they’ll be dissolved!

On thicker sheet, a scoring tool can be made from a small piece of circular steel bent at right angles and then filed as shown in the diagram, Fig. 1a. You can use an old screwdriver for this tool.

Another type of cutting tool can be made from a broken section of hack-saw blade. The tool is shown in Fig. 1b.

The best way to use the tool, is to draw it towards yourself while pressing down firmly (as shown in Fig. 1a). If it’s done correctly, a thin spiral of swarf will rise in front of the cutting edge. To break the sheet, simply place it with the scored line over the edge of a

thicker box needs a piece that’s the width of the base, and as tall as the long and short sides added together.

Mark out the sloping line across the sheet, and you should have both pieces marked with the same angle of slope. If you make a mistake, don’t throw away the pieces of polystyrene as you may be able to use them later.

BOX ASSEMBLED

Once you’ve cut the pieces, the box can be assembled. Don’t worry about how to get the gear into it, that comes later!

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Place the part-formed box upside down on the abrasive surface, as shown in Fig. 5. Then move it around in a
JOINT FACES

Once the six faces of the box are assembled, make sure that all the joint faces meet correctly, forming decent corners. The box can now be trimmed.

Once the area has been cleaned, keep your fingers off, as the natural grease on your skin may be enough to affect the way the filler sticks. Mix the paste according to the manufacturer's instructions.

Editorial note: Heavy petroleum vapours are given off by Plastic Padding, follow the manufacturer's advice and mix the paste where there's good ventilation and no naked lights (including cigarettes!).

FILLER APPLIED

As soon as you have prepared the filler material, it can be applied to the case using an old knife as a spatula. Force the filler material into any gaps, leaving it slightly proud.

In practice, I've found that most fillers shrink slightly on curing. Because of the shrinking, it's almost impossible to get a good finish straight from the knife.

Once the filler has cured, it can be sanded down smooth. If you don't have a sanding machine, a block of wood with some 80 grit production paper wrapped round it will aid sanding down. When sanding, rub over the whole surface so that any imperfections are spotted. You can then deal with them just before you get to the painting stage.

If there's a lot of material to be removed, a file is very efficient, Fig. 6. Once you've used a file in this way, it's best to keep it for this purpose.

A half-round file, can be used for shaping flat corners on the flat side, and curves with the rounded side. A ratcheted file is useful for opening out holes for instruments and controls.

Always use the files so that you are putting the pressure into the joint, not away from it, as I've shown in Fig. 6. By doing this, the chances of you breaking the welded joint are minimised.

There'll probably be one or two joints that need filling. Body fillers, such as Plastic Padding, used to repair accident and rust damage on cars, is suitable.

Before using it, you must make sure that the surface is clean and dust free by wiping it over with tissue paper soaked in methylated spirits (no smoking please!).

Practical Wireless, December 1992
LOOKING SOFTER

Your home-brew boxes don't have to look square and hard. You could get them looking softer, because they don't have to have that harsh, sharp-edged look.

The softer-look can be done relatively easily. All you have to do, is to exploit the thermal properties of plastics.

Put simply, when you warm plastics up, they become pliable and can be formed into any shape required. Provided the material is held in shape whilst the material cools, the plastics will retain that shape.

If the process goes wrong, you can have another go! However, before you do, I have a few words of warning.

Plastics need to be heated to around 120°C. This is hot enough to cause serious burns. So, some heat resistant gloves are needed and oven gloves should be quite adequate.

If you overheat the plastics, it will start to boil off some of the base chemicals. This permanently spoils the surface. If you really overdo the heating, there's a real fire risk. Burning plastics give off poisonous fumes, so please be careful!

HEATING PLASTICS

So how do you go about heating plastics? The answer is that there are basically two methods open to you.

One method of heating plastics, is to use the ordinary domestic oven and heat the whole lot. It's very effective, but handling a large section of hot floppy plastics is quite entertaining!

The other method of heating plastics, involves a localised thermal source. Here, you just heat the area you want to shape. This technique uses hot-air guns, sold for paint stripping and similar jobs.

Providing you keep the air blast moving, so that a localised hot spot doesn't develop, the hot-air guns are very effective. The other method is to use an infra-red strip heater, of the type frequently found in bathrooms.

You can heat the material, by holding the plastics sheet about 75mm away from the heater, turning it frequently. This is so that heat is applied from both sides.

You'll find that the material quickly gets hot enough to bend. Make sure the heat has penetrated right through the plastics, before you start bending, or it can break.

You're less likely to have problems on thin sheet where heat penetration is quick. Problems are more likely on thicker sheet, as heat penetration takes longer and it's quickly dissipated.

SUITABLE FORMER

Obtaining the shape you require, is best achieved by forming the plastics material around a suitable former or pattern. A block of wood is convenient because it's easy to work and can stand up to hot plastics.

Ensure that all the corners are rounded, as the plastics will tear as you form sharp corners. The wood's surface finish has to be fairly good. This is because thin plastics sheeting will pick up grain definition quite easily.

You don't have to go out buying good wood. Look for the nearest building site, home improvement scheme, joinery works, etc. Go scrounging!

Once you're satisfied with your former or pattern, you can think about the plastics. Mark out and cut the pieces, making the section for the box sides about 20mm longer.

The longer length is so that when you fold the sides round your pattern, they'll overlap a little. They can then be clamped together by using a little solvent on the edges, with a cut made through the middle of both layers.

The two sides should then match up perfectly. A little filler after you have stuck a reinforcing plate on the inside to hold the join together, will disguise the line.

Now heat the plastics, and when it's ready fold it round your former, holding until it has 'set' in position. Take care, as it will still be hot!

BASIC SHAPE

Once you have the basic shape, the assembly of the plastics material into a box follows the procedure already outlined. Finishing is carried out with the sanding block.

You don't have to make your shapes from scratch, as existing materials in ready-formed shapes can be modified. The beauty of it is that you can tailor things to suit yourself, and the way you
use them, rather than having to put up with the commercial compromises.

The limit is your imagination, and what you can scrounge or buy from your local hardware store. Plastics, like radio amateurs, are versatile!

RESULTS WORTHWHILE

Some of you might feel intimidated by the idea of working in plastics. My advice is don't worry, because the results can be very worthwhile. Despite the advantages, I realise many radio enthusiasts prefer working in metal. So, next time I'll be taking a look at the techniques and workshop methods used with metals.

In the meantime, keep busy. You too can get your radio and other equipment neatly boxed up!

PW

Fig. 12 (see text).

Fig. 13 (see text).

Suppliers for most of the materials mentioned in this article are:

Design Craft & Graphics Ltd.
12 Hanborough Business Park,
Long Hanborough,
Oxford OX7 2AB.
Tel: (0993) 882588.

K & M Ltd.,
1 Wharf Lane,
24a New Wharf Road,
Lowgates, Barlborough,
Stavely, Chesterfield,
Derbyshire S43 4HZ.
Tel: (0246) 477471 or 812872.

More information on Finigans paints from:
Huntings Specialised Products Ltd.,
Acorn House,
New Lane,
Leeds LS11 5DZ.
Tel: (0532) 441100.

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RING THE MANUFACTURER – DIRECT!
A K Electronics is a small electronics firm branching out into the supply of workshop equipment. Their major item, at present, is a temperature controlled de-soldering station for less than £300. More information is available from A K Electronics, 54 Sheldrake Road, Christchurch, Dorset BH23 4BP.

Cirkit has a 192-page catalogue available through most high street newsagents, which costs £1.70. Somewhat hidden towards the back, is a comprehensive section of test equipment. In this section, oscilloscopes (both mains and battery powered) and signal generators, both audio and r.f. are featured.

There are also two spectrum analyser adapters that work using your 'scope as a display. Just the sort of thing to check out that home-brew rig you're building.

Cirkit Distribution Ltd., Park Lane, Broxbourne, Herts EN10 7NQ. Tel: (0992) 440779 (24h) or FAX (0992) 464457.

Electromail is the non-trade outlet for RS Components, who are one of the main suppliers to trade and industry. The quality of their catalogue, and of the items they supply reflects this position. The catalogue, in full colour and three parts, comes out every four months, and costs £6.50. A charge of £2.95 p&p is made to every order and VAT also has to be added to the prices shown. All part numbers are the same as those for RS Components, making them easy to get hold of.

Electromail, PO Box 33, Corby, Northants NN17 9EL. Tel: (0536) 204555 or FAX (0536) 405555.

Greenweld have a 160-page catalogue, costing £2. They can supply security components to make up a system to ensure you keep your workshop and equipment. Included in the comprehensive catalogue are sections on audio, video, graphics, stationery supplies, tools, measuring and test equipment.

Greenweld have no minimum charge, but make a flat charge of £2.75 p&p on all orders sent out by normal post.

The catalogue is free to schools, colleges and trade. Apply to Greenweld Electronics Ltd., 27 Park Road, Southampton SO1 3TB. Tel: (0703) 236383 or FAX (0703) 236307.

Henry's Audio Electronics have a colour catalogue with almost 300 pages filled with many items to suit the electronics workshop. Their range of measurement equipment is very comprehensive with eight pages covering meters, including one that can be interfaced to an IBM PC (or clone). Also included are light-meters, signal generators (at r.f. and audio), oscilloscopes and frequency counters.

The catalogue costs £2.85 plus an A4 s.a.e. (or £4 cash or cheque to cover costs). Free to schools, colleges and industry.

Henry's Audio Electronics, 404 Edgeware Road, London W2 1ED. Tel: 071-724 0322 or FAX 071-258 1831.

Kenwood, the manufacturers of the Kenwood/Trio radio equipment, also make...
oscilloscopes. They have three new models available now, these are: the CS-5130 - a 40MHz with digital readout, CS-4025 - a 20MHz low-cost starter model and the CS-6020 - a 150MHz 10-trace four-channel oscilloscope.

For more information contact Tony Starling, Trio-Kenwood UK Ltd., Kenwood House, Dwight Road, Watford, Herts WD1 8EB. Tel: (0923) 816444 or FAX (0923) 819131.

Mainline Electronics supply ultrasonic cleaners, as well as the wealth of specialist r.f. electronic components.

Their catalogue is available in the November 1992 issue of Practical Wireless, or from Mainline Electronics, PO Box 235, Leicester LE2 9SH. Tel: (0533) 777648/780891 or FAX (0533) 477551.

Marco Trading may be seen at many rallies, where their stall is covered in tools of all descriptions. Their catalogue reflects the many lines of stock they carry, and it's full of all sorts of tools and test equipment. In their Winter Supplement they have a particularly nice 50MHz oscilloscope (Tektronix D755) for just under £300 + carriage.

Other sections cover almost anything that you could want for the workshop. Tools and components, boxes and kits, and semiconductors of all types may be found in the catalogue priced at £2. Marco Trading, The Maltings, High Street, Wem, Shrewsbury SY4 5EN. Tel: (0939) 32763 or FAX (0939) 32689.

Maplin Electronics has a catalogue to be found in almost every high street newsagents. Several hundred pages are laid out in alphabetical order making it very easy to find items. The sections on test equipment and tools are particularly comprehensive, covering most requirements for the workshop.

The catalogue costs £2.95 at newsagents, or £3.45, including postage, from Maplin Electronics, PO Box 3, Rayleigh, Essex SS6 8LR. Tel: (0702) 554161 or FAX (0702) 553395.

SAJE Electronics 117 Lovell Road, Cambridge CB4 2QW. Tel: (0223) 425440 or FAX (0223) 424711.

Ungar have designed a new high-tech soldering station, the entry level Ungar 2110. The low-leakage military specification soldering station, has a 60W 24V iron, temperature controllable over the range 300-450°C (±6°). For more information about the ESD-safe iron, contact Ungar, Eldon Industries UK Ltd., Clifton Road, Shefford, Beds SG17 5AB. Tel: (0462) 814914 or FAX (0462) 815543.

The SAJE Electronics company have just released a piece of test equipment for the smaller shack or workshop, the MAXCOM MX-9000. Contained in one case are: a triple-output p.s.u., an eight digit 100MHz counter, a function generator covering 0.2Hz to 2MHz, and completing the quartet of equipment, a digital multimeter. This multimeter will read volts and currents on both a.c. and d.c. (max. reading 1999).

We hope to be able to review one of these ‘Four-in-ones’ in the near future. More information is available from SAJE Electronics, 117 Lovell Road, Cambridge CB4 2QW. Tel: (0223) 425440 or FAX (0223) 424711.
Are you stuck for a place to work? Does your family complain about the damage you’re causing to the kitchen table? If you’re in this position, Vic Flowers G8QM has a really practical table-top project bench that could help solve the problem.

**SHOPPING LIST**

- Hardwood (for framing) 8m length of 25 x 13mm, suitable plywood or hardboard for small panel measuring 575 x 90mm. Brass hinges (these are still sold in imperial measurements) to suit (price depends very much on quality) 4 x 2 x 1/2in. Suitable 240V strip lamp and sockets, push-on/off switch, toggle switch, mains neon indicator, Chrome-plated carrying handle.

**How Much?**

£12 (depending on material to hand)

**How Difficult?**

Beginner
PROJECT BENCH

If you’re one of the many radio enthusiasts who have minimal workshop facilities, you may find my table-top project bench useful. It’s a very simple idea, and the complete unit is made up from three sections, each lightiy pinned and glued.

Many of my QRP projects have been assembled using this project bench on the living room table, I designed and made it up before attempting the major task of building the Heathkit SW7800 Communicator receiver (which worked first time!).

OPENED OUT

Under good lighting conditions, the unit may be fully opened out. When the project bench is closed down, the mains lead and the soldering iron (see diagram) are retained inside.

The only other modification I’ve carried out is to provide a mains socket. This was done so that I could use a p.s.u. to power 12V d.c. equipment.

REFLECTING SURFACE

It’s a good idea to cover the top inside surface of the bench with aluminium kitchen foil.

The foil provides an effective reflective surface, and it can be glued in position and carefully smoothed down.

The hinges used in the bench are mounted so as to be set flush in the wood surface. Although they’re more expensive, it’s best to use good-quality brass hinges, rather than the cheaper steel types.

The actual wiring-up, and the cable layout of the table-top project bench is up to the individual. Having said that, you may find my approach helpful.

I took the supply to a connecting strip (‘choc block’ type) in the allocated compartment. From there, I took the supply to the strip lamp and associated switch using flexible cable which can be secured by sleeving and gluing to the wood surface.

As the projects bench folds away after use, I had to make allowances for cable protection. So, to prevent damage to the wiring, I left loops at the points where the sections open or close.

IRON SUPPLY

In my version of the bench, the soldering iron is permanently connected. The iron supply is taken from the connecting strip via a toggle switch, with a neon lamp connected across the wires to provide indications of whether it’s on or off.

Whatever method you’re using, you must observe all electrical safety precautions. Don’t forget that this means all live connections should be made safely, by using the plastics junction boxes, etc., available at DIY stores.

This useful little bench isn’t difficult or expensive to build. Having your own portable work-surface could save you a lot of domestic trouble and strife!

PW
SPERIBOARDS

A recent addition to the kits available from Howes Communications, is the SperiBoard. We asked 'Tex' GITEX, our technical sub-editor, to tell us what he thought of them.

It's been said that there's nothing new in electronics. This may, in many cases, be true, however, there are many cases when innovation is not really required. What is more necessary is that an idea is improved significantly, to make it better than the original.

REGULAR MATRIX

The SperiBoard system from Howes Communications is one of those improved upon ideas. The SperiBoard system is a regular matrix of four-sided lands on a high-quality glass fibre board.

I wonder how many of you have been interested in the 'drawing-pin' system of construction, that Steve Ortmayer G4RAW uses? This idea is the 'Rolls-Royce' version of that system.

No longer do you have to find an unused piece of floorboard. Neither do you need to bend your thumb back at right-angles, pressing the drawing-pin into a wood knot, located in the only place where all the components will reach.

Using an easy-to-see layout method, circuits can be built up quickly and cheaply. The traditional 'bird-nest' method of making up a prototype is a valid one.

Your initial idea can, rapidly, be turned into a working model on the kitchen table. By following the circuit diagram layout, this eases finding those inevitable mis-connections. More to the point, it minimises the chance of actually creating them.

FOUR TYPES

There are four types of SperiBoard available at present. A least one of them will be suitable for the circuit you're building.

All four are based on the Eurocard size of 160x100mm. Two of the boards are etched clean of copper, other than the lands themselves. The other two have only a narrow channel around each 'island', leaving what could be used as a groundplane available beside each 'island'.

The SperiBoard wins hands down over the drawing-pin method, by having pad shapes available for dual-in-line Integrated circuits. One board is dedicated to take up to four i.c.s with a maximum of 16 pins on each.

Another board will take two i.c.s. Again each i.c. may have up to 16 pins. The other half of this board has an area with isolated 'lands'.

EASE OF CONSTRUCTION

Take a look at the photographs on this page, and I'm sure you will immediately see the ease of construction. This idea is such a good one that I think every Novice Licence instructor should consider using one, or more, of these boards in his, or her, course training.

The boards appear robust enough to withstand several rounds of construction. Even with the inevitable heavy-handed soldering that goes along with the initial attempts at soldering.

Each board is big enough to build several circuits. Each trainee could build several related circuits on the board, and could interconnect to become a receiver, Morse oscillator and audio amplifier. This could really fire the enthusiasm of those much needed hobbyists.

My thanks go to C. M. Howes Communications, Eydon, Daventry, Northants NN11 6PT, tel: (0327) 60178 for the opportunity to try out the SperiBoard series.

SperiBoards are available in the following sizes, those marked with a * are shown in the heading shot.

<table>
<thead>
<tr>
<th>Type</th>
<th>Dimensions</th>
<th>Lands</th>
<th>Rails</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF01S</td>
<td>160x100mm</td>
<td>60</td>
<td>9</td>
<td>10x6, 10x12.5mm, nine-land supply rails along each long side.</td>
</tr>
<tr>
<td>SF02S</td>
<td>160x100mm</td>
<td>98</td>
<td>1</td>
<td>7x12 + 14, 8x5mm, with one supply rail around the board and a common earthplane.</td>
</tr>
<tr>
<td>SF03S</td>
<td>160x100mm</td>
<td>100</td>
<td>2</td>
<td>Half similar to SF02S, the other half with areas for two i.c.s, with up to 16 pins each, plus associated component pads.</td>
</tr>
<tr>
<td>SF04S</td>
<td>160x100mm</td>
<td>100</td>
<td>4</td>
<td>Four symmetrical areas, each for one i.c. with up to 16 pins and associated component pads.</td>
</tr>
</tbody>
</table>

Each board costs £2.90, inclusive of VAT, or a 'Four Pack' at £9.90, a saving of £1.70. A post and packing charge of £1.20 is made regardless of quantity ordered.

PW

Fig 1: The beginnings of a circuit idea laid out on part of Speriboard type SF03S (the type not shown in the heading shot).
**Workshop Special Review**

**The Expo Mini-drill**

As PW has a workshop theme this month, Rob Mannion G3XFD has tried out a useful bench accessory in the form of a miniature 12V d.c. drill and stand.

When it comes to p.c.b. working, my favoured method is to use the surface-mount technique. In other words, I don't bother to drill mounting holes, instead I mount the components on the copper foil side of the board.

The main reason why I've adopted the surface-mount method, is that drilling a multitude of component mounting holes is tedious. Mounting the components onto the copper track side means that I don't have to drill those holes.

However, there are times when I can't mount the components onto the same side as the tracks. This is the time when a small drill is a handy tool to have.

A standard-size workshop mains electric drill is helpful, but quite frankly they're too large for p.c.b. work. An old-fashioned hand-drill is okay, providing you've got the energy!

In my case, using a hand-drill with my artificial arm is difficult and tiring. Years ago, I was able to hold the handle in my teeth, while turning the hand-wheel. But with increased dental charges, that's not such a good idea nowadays!

About 20 years ago, I bought an extremely useful 12V d.c. electric drill, made by Low Voltage Motors Ltd. This company, a subsidiary of Lucas, specialised in these little drills, well-made, and complete with a long lasting epicyclic gearbox.

I'm still using my original 'Low Voltage Motors' drill. The small size (about the length of a soft drinks can) makes it ideal for work in the car and other small spaces. I originally bought it for work on a boat and motor-caravan, although I've also used it where other people would use a hand-drill.

TOO LARGE

Despite the fact that it's only about the size of a soft drinks can, my original 12V drill is too large for p.c.b. work. So, as I'm now doing much more work on p.c.b.s, I decided to look out for a suitable drill and stand for board work in my shack.

Looking through the various catalogues, I spotted the Expo drill and associated stand supplied by Cirkit. After I had explained my needs to Cirkit, the drill and stand soon arrived in my office.

I was in for a surprise, because I'd expected the Expo drill itself to be imported. However, it turned out to be made here in the UK.

As I planned to try the drill out specifically for p.c.b. drilling, I also ordered the associated stand. I'm pleased I did, because the stand proved to be extremely useful.

**STAND IDEAL**

I've used drill stands before, but never one as small as the version that's available for the Expo drill. It's an ideal size for p.c.b. work.

The pull-down lever action on the drill stand, made the drilling of the p.c.b. mounting holes much easier. Drilling p.c.b. holes is inevitably tedious, but with the stand it was so easy that I wondered why I hadn't tried one before.

The lever, and the whole mechanism is just right for those small jobs. Although not up to professional precision standards, it's perfectly satisfactory for radio workshop use.

In fact, I think the Expo drill would be ideal for any workshop. I can imagine model-makers and model railway enthusiasts making full use of the drill, and the associated tool kit.

**RUNS SMOOTHLY**

The drill itself is well-made, and runs smoothly. The miniature chuck that's supplied seems to be of good quality and is also well-finished. However, after several evenings of use in the shack, I came to the conclusion that some form of speed control was needed. The drill runs at a very high shaft speed, and I found it was easier to use, when operated by a variable voltage power supply.

In operation, the drill works quite happily between 6 and 12V. When drilling p.c.b.s I found that 9V was about the best setting on the p.s.u.

**Conclusions**

My conclusions regarding the drill and stand are that they would be a valuable addition to the workshop of any keen home-brew enthusiast.

Personally, I would buy the drill and stand together. This is because I found most of the advantages to be in this useful combination.

If you're aiming to do any constructional work, I think that this little drill would prove to be a great time saver. It also provides a professional-looking finish to p.c.b.s and panels.

My thanks go to Cirkit Distribution Ltd, of Park Lane, Broxbourne, Hertfordshire EN10 7NQ, tel: (0992) 441306 for the opportunity to use the Expo mini-drill and optional stand. They can supply the drill (ref: 54-10150) for £11.58 plus £1.40 p&p. The associated stand (ref: 54-10210) for £24.13 plus £1.40 p&p. The drill and tool-kit are available (ref: 54-10250) for £21.99 plus £1.40 p&p (all prices include VAT).

**Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working voltage</td>
<td>6 to 12V d.c.</td>
</tr>
<tr>
<td>Dimensions</td>
<td>75 x 34mm</td>
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<tr>
<td>Chuck</td>
<td>3-jaw pin type</td>
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<tr>
<td>(accepts drills up to 2.3mm)</td>
<td></td>
</tr>
<tr>
<td>Drill stand dimensions</td>
<td>230 x 190 x 79mm</td>
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<tr>
<td>Maximum drill stand clearance</td>
<td>250mm (without bit)</td>
</tr>
<tr>
<td>Leverage depth control</td>
<td>30mm maximum</td>
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</tbody>
</table>

PW
Radio Diary

November 22: Bridgend & District ARC will be holding their rally at the Bridgend Recreation Centre, two miles from junction 36 on the M4. Doors open 11am (10.30am for the disabled). Cafeteria open all day, bar opens at 12, entrance fee £1 for adults. Full recreation facilities available for all the family. Further details from Charles Sedgebeer GVR3VRG on (0656) 860434.

November 19/22: Blenheim PEL's Christmas Computer Shopper Show takes place at Olympia's Grand Hall. The show offers the complete buying solution for home and business. For further details on The Christmas Computer Shopper Show '92, contact: Merv Mann at Blenheim PEL on 081-742 2828.

November 22: The West Manchester Radio Club’s ‘Winter Rally’ will be held at the Bolton Sports & Exhibition Centre, Silverwell Street, Bolton (town centre). All the usual trade stands, societies, Bring & Buy, etc. All at pavement level. Refreshments available all day & bar. Doors open at 10.30am for disabled & 11am for general public. Admission £1, children free. Further details from Dave GI100 on (0204) 24104 evenings only.

November 22: The Bishop Auckland Radio & Computer Rally will be held at a new venue, The Spennymoor Leisure Centre, Spennymoor, Co. Durham. There will be catering & bar facilities on site, as well as all the other amenities of a top-class leisure facility, for those members of the family not wishing to partake in the rally. The venue is very easy to find from major routes through the area A1(M). Further details from Mike G0PRQ on (0388) 766264.

November 28: The Greater London Amateur Radio & Computer Show will be held at Harrow Leisure Centre, Christchurch Avenue, Harrow, Middlesex. Major suppliers & manufacturers of radio equipment, computers, accessories, antennas, computer software & second-hand gear, close to Harrow-Wealdstone BR & tube station. Easy access from motorways M1, M4, M25 & the A408 north circular road. Fully signposted by the AA. Ample car parking available. Two bars & cafe serving hot meals & drinks all day. Large Bring & Buy, Easy access for the disabled. Rally information centre on site. Talk-in on S22 & SU22. Doors open from 10.30am until 4.30pm. CLKP, 18 Litchfield Close, Clacton-on-Sea, Essex CO15 3SZ.

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Radio Diary

November 22: Centre of England Christmas Radio, Computer Electronics & Communications Rally will be held at the National Motorcycle Museum, near the NEC, Birmingham, junction 6 M42. Opens 11.30am (11am for disabled visitors). Admission £1, with a reduction for RAIBC members. Over 60 traders in three large halls, ample parking, bar & restaurant facilities. Concessionary rates for those wishing to visit the museum. Talk-in on S22, Christmas Special - 'spot the cracker', which will be on many of the trade stands to win a free prize. Details from Frank Martin G4UMF on (0952) 598173.

1993

January 24: The Lancastrian Rally will be held at the University of Lancaster. Doors open 10.30am for the disabled. Further details from Sue G101HH on (0524) 84239.

February 7: South Essex ARS Radio Rally will be held at The Paddocks, Long Road (A130), Canvey Island, Essex. Doors open 10am. Trade stands, Bring & Buy, home-made refreshments, free parking. Parking outside main door for disabled visitors. Talk-in on S22. Ken Hendry GD6BN on (0268) 755350.

February 27: Tunside ARC 5th Annual Rally will be held at the Temple Park Leisure Centre in South Shields. All usual trade stands, free parking. Talk-in on S22. All the amenities of the Leisure Centre, including heated pool & gymnasium. More details from Jack Pickersgill G0DZG on 081-265 1718.

*March 13/14: The London Amateur Radio & Computer Show will be held at Picketts Lock Centre, Picketts Lock Lane, Edmonton, London N9. Large trade presence, free parking, lectures, disabled facilities, Bring & Buy, special interest group section. Talk-in on 2m/70cm. Further details on (0923) 678770.


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Practical Wireless, December 1992
Angus Ellefsen G3FJO, thought that making his own p.c.b.s was messy, difficult and time consuming. Read how his novel use of pre-drilled boards changed his ideas.

I like making my own p.c.b.s, whether for my own projects, or for those in PW. But it was not always so. I used to have many boards with disappointing layouts. That was before I began using matrix board to help in marking up the p.c.b.

With projects from PW, or any other published p.c.b.s, all the layout has been done. For my own projects, I prepare layouts on a computer. The computerised process is quite straightforward and has the advantage that the circuit is drawn from the component side of the board. I can then use the 'mirror' function to show the pattern as seen from the track side. The actual layout can be printed using either a 'normal' dot-matrix printer or a laser printer for better quality.

**TRANSFERRING LAYOUTS**

The tedium came when transferring these layouts to the copper clad board. One of the various methods I tried, consisted of scribing a fine 0.1in grid directly onto the copper. This method was far too time consuming, and the results were less than satisfactory.

The idea that I came up with, is so simple that it must have been thought of before. But just in case it hasn't, here it is!

**PRE-DRILLED MATRIX**

What is it that makes my p.c.b. work so much easier now? The answer is, a piece of 0.1in matrix board (or perfboard) taped along two adjoining sides to the p.c.b. I want to mark out. See Fig. 1 for more details. Matrix board is probably better known as 'perfboard'.

With the matrix board on top, it's very easy to mark off the various pad centres through the holes of the matrix board onto the copper clad board underneath. To mark the centres, I use a bradawl with its point kept sharp with a file. Don't press too hard with the bradawl, as this can raise a small copper blister, which does not provide a very flat surface for the subsequent application of the dry transfer.

It's also a good plan to file the bradawl point sharp with a file. Don't press too hard with the bradawl, as this can raise a small copper blister, which does not provide a very flat surface for the subsequent application of the dry transfer.

**ETCHING DISHES**

Cheapness and cleanliness, is brought about by using old polythene ice-cream or margarine containers as etching dishes. Another container, half filled with water, is used to drop my board into when it is etched, so I can examine it carefully.

So don't just sit there saying you don't have the facilities to make your own p.c.b.s. Get on with the job, it really is fun, and much easier and cheaper than you think.

**SIMPLE TIP**

Another simple tip, picked up during a conversation with a friend, is to use glass fibre boards for etching. The extent to which the etch is proceeding can be easily detected through the dark brown chloride solution. The colour of the copper contrasts well with the light colour of the glass fibre board.

Fig. 1: The matrix board is taped to the copper-clad board as shown here.

Matrix board

Copper clad board to be marked out

Masking tape

Fig. 2: A sharp pointed bradawl is used to mark through the holes in the matrix board. A burr on the matrix board, around each marked hole signified that it has been marked.

Burr on matrix board shows where centres have been marked

Flats filed on Bradawl point

Matrix board and rub on etch resistant pad transfers. It's quite easy to see the bradawl markings through the clear holes in the centres of the pad stencils. After placing all the pads, draw in the tracks connecting the pads with an etch resist felt-tip pen.

**Simple Tip**

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So don't just sit there saying you don't have the facilities to make your own p.c.b.s. Get on with the job, it really is fun, and much easier and cheaper than you think.
A SIMPLE 430MHZ PRE-AMPLIFIER

Mike Rowe G8JVE shows you how to make a simple pre-amplifier to liven up the receive side of your u.h.f. transceiver.

I bought an ex-p.m.r. Pye M296 for conversion to the 430MHz band. While it worked very well on transmit, the receive side was less than brilliant.

This small pre-amplifier is the result of my experiments to bring the receive side of the transceiver up to the same standard.

IMPORTANT FACTORS

One of the most important factors was that the pre-amplifier had to be as small as possible. Although this unit isn't micro-miniature in size, at about 38x25x10mm in size, it fits the space inside the ex-p.m.r. rig quite well.

SIMPLE

You can see how simple the unit is, by looking at the circuit in Fig. 1. The circuit consists of a bipolar transistor operating in common emitter mode.

Both input and output circuits, consist of tapped tuned circuits. This allows the correct impedance matching for the input, output and the transistor.

CONSTRUCTION

To start the construction, the inductance, L2, should be wound first. This item is formed by winding eight turns of 0.25mm enamelled copper wire tightly round the body of R3, a 27Ω2 resistor. Then comes the fiddley bit. Keeping the winding tight, solder the ends onto the wires of the resistor.

Now you have to make the coils L1 and L3. These two coils are made from two lengths of 0.71mm tinned copper wire. Silver-plated wire would provide a slightly better performance if available.

REMOVE KINKS

Stretch each piece of wire, to remove kinks. Then bend each length, so that it looks like the drawing of L3 in Fig. 3. The ‘flat’ top is 18mm long, the distance from the groundplane is 4.4.5mm.

On L1, the input tapping is made on the link point. On L3, the output line, the tapping point for the coaxial line is made at the bend point at the ‘earthly’ end of the loop as shown in Fig. 3.

With the transistor type number on top, bend the legs to fit the p.c.b. and fit the transistor on the board. Carefully solder the emitter (middle) lead to the earth plane. The transistor should be tight against the p.c.b. Solder and fit the two trimmer capacitors, C2 and C5.

ANTENNA CHANGE-OVER

Now you have to find where to put it! Trace the lead or track that goes from the antenna change-over relay to the receive input stage. The pre-amplifier goes into this line. Break the original circuit, and wire the pre-amplifier input to the change-over relay. The pre-amplifier output goes to the original receive input stage.

Find a source of +12V d.c., preferably available only on receive, and connect the pre-amplifier ‘+12V’ pad to this +12V supply point. The amplifier unit is then ready to be adjusted.
FINALE ADJUSTMENTS

All that now remains to be done is to do the final adjustments on the amplifier for maximum signal gain, and best signal-to-noise ratio. To do this, find a signal that is very noisy. If you find a test point that shows the signal strength, then adjust C2 and C5 to give maximum signal with the best signal-to-noise ratio.

To help achieve best signal-to-noise ratio, the tapping points on the input and output tuned lines can also be slightly adjusted. Be warned, don’t move very far from the points shown in the drawing, impedance changes are very sudden on tuned lines.

SHOPPING LIST

Resistors
- Carbon film 5% 0.25W
  - 220Ω  1  R3 (used to form L2)
  - 1kΩ  1  R2
  - 47kΩ  1  R1

Capacitors
- Miniature ceramic
  - 470pF  2  C3, 4
  - 10nF  2  C1, C6

Variable foil trimmers
- 10pF  2  C2, 5

Semiconductors
- BFR34a  1  Tr1 (or BFR90)

Miscellaneous
- Enamelled copper wire, (0.25mm), silvered copper wire (0.71mm), miniature coaxial wire (UR176 or similar), a length of single strand insulated ‘hook-up’ wire. A board is available from PW PCB Service.

Special Offer

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...now going QRT.

...now returning to the calling channel.

...now changing frequency to...

... now monitoring this frequency and waiting for any call.

... now signing off and clear with

This is ... signing off and clear with

May I wish you 73, 55, 88 and make this my final.

So best wishes and good DX.

Back from... to... for a final final remarks from you.

May I thank you once more for this call/contact and wish

Concluding Remarks

This is my address and my telephone number.

What is your postal code/telephone code?

Can you give me your address and telephone number over the air?

Is your name and address in the callbook?

My name is in the American/British callbook.

I shall send you my QSL card via the bureau/direct.

I would be very pleased to get a QSL card from you.

Could you please send me your QSL card?

Can we continue in English?

I wish I could speak your language as well as you speak mine.

Excuse my German.

We had a nice time.

I hope to visit your country.

I have a friend/wife/children in the shack with me.

QSL
Basic QSOs In German

**Weather and Radio Conditions**
The temperature is ... degrees centigrade.
Today the weather is fine/sunny/(very) cold/hot misty/windy.
It is raining. It is snowing. The snow is 300mm thick.
Today/yesterday/during the weekend it has been raining/snowing
Winter/spring/summer/autumn has come.
It is/was very windy. There is/was thunder and lightning.
Working conditions are poor/bad/good/very good/excellent.
All the bands are open. The 10, 15,20,40,80 metre band is closed/open to North/Central/South America,
Eastern/Northern/Southern/Western Europe, Asia, Australia, Africa, the Far East, Japan.
I have just heard a ... I can hear but cannot work a ... There is an opening on 2 metres/70cm.
This lift is getting better/getting worse. Hope it lasts.
Nice to speak to you.
It is ... o'clock approximately here local time.
What time is it in ... ?

**Arranging a Sked**
May I speak to you again?
Are you free tomorrow/this time next week at ... hrs GMT?
How about this frequency or alternatively let's try the 10, 15,20,40,80 metre band.
No I'm sorry, I am not free at that time.
I am usually on 20 metres at ... UTC on (days of week) except ...
I have to go to bed/to work now.

**Technical**
I have a new rig/linear/antenna which I am testing.
Is my modulation OK? Your modulation is good/bad.
What is my exact frequency?
I am using a speech compressor.
Does this make any difference?
Thank you for the test.

**Social**
From the shack I can see mountains/sea/moors.
Vom Shack (von der Funkbude) aus sehe ich das Gebirge/
die See/die Heide.
Fom shak (fon deu foonkboode) ows zay-e ich dus gebeurge/
dee zay/dee hide-de.
Getting Started - The Practical Way

Last month, I provided you with a block diagram of a simple direct conversion receiver. The diagram showed how it was possible to mix two radio frequency (r.f.) signals, to produce an audio frequency (a.f.) signal.

The process I described, known as a mixer, is shown simply in Fig. 1, on page 48 of PW November 1992. The mixer is a 'three port' circuit. This is because two signals go in and one comes out.

In fact, more than one signal comes out! But we only require the one that contains the signal information from the station we want to receive.

Mixing Complications

The mixing process may sound like a simple function, but there are a number of complications. For a start, the r.f. input from the antenna contains all the radio signals that the antenna picks up. And that means a lot of signals!

Secondly, the v.f.o. signal itself complicates the process. It contains not only the frequency controlled by the tuned circuit, but also harmonics of this frequency.

The v.f.o. can contain a whole host of signals. These may not only be the required products \( f_i \pm f_o \), but also \( f_i \) and \( f_o \), and other products of the input signals we don't need. Mixing can be a messy business!

Thankfully in this project, we're aiming to keep it simple. Although we're not building one of the best mixer circuits, it will work well enough for the 'Getting Started' receiver.

The mixer circuit of the project shown in Fig. 3 on page 48 in PW November 1992, actually contains more than the mixer. It also has the input tuned circuits, and an a.f. pre-amplifier. So, let's consider them in turn.

Input Tuning

The d.c. receiver project uses two stages of input tuning, comprising T1, C1 and T2, C3. The antenna input is linked to T1, using the small coupling winding on T1 which provides a low impedance input.

It's usual for the antenna signal, in amateur radio equipment, to be at an impedance of approximately 50Ω. The link winding matches the input to roughly this impedance.

The common name for an input circuit of the type we're using at the front-end of this receiver, is a band-pass filter. This is because the circuit should allow signals from the required band to pass through to the receiver, and attenuate (or reject) out-of-band signals.

Sometimes, a variable tuned circuit is placed on the input of a receiver. This can provide sharp input tuning, but the user then has to constantly use the tuning control to peak signals as the receiver is moved in frequency.

The circuit used in the 'Getting Started' receiver is one of the simpler band-pass filters. It's made up of the two tuned circuits coupled by a small value capacitor, C2.

The two tuned circuits are said to be 'loosely top coupled'. The value of C2 is critical to the function of the filter over the required range.

Dual Gate Device

The mixer is again a very simple option, and it uses a dual gate m.o.s.f.e.t. device. In practice, this transistor, Tr1 is best seen as an f.e.t. type transistor which can accept two inputs.

The device has a source and drain, like a normal f.e.t., but has two gates for inputs. Its operation in this circuit is straightforward.

In our receiver, the radio frequency input from the antenna, after passing through the band-pass filter, appears across R1, which supplies gate 1 (G1) of the m.o.s.f.e.t.

The v.f.o. input signal is fed to gate 2 (G2). The mixed output then appears on R4 at the drain of the m.o.s.f.e.t. The other resistors and capacitors associated with Tr1 provide the appropriate levels of biasing and signal decoupling.

Direct Conversion

Now, it's time to remember what I was saying about the complications of mixer circuits! It's important to bear in mind, that in direct conversion receivers, all we require from the output of the mixer are the audio frequencies.

Unfortunately, as I've mentioned already, there are a lot of unwanted products generated by the mixing process. To get the best results, only the signals needed should be selected by the appropriate filters.

Fortunately, there are several methods of filtering the output to reduce the level of unwanted r.f. signals which come through the mixer. And, like the other circuit elements in this receiver, the filtering is also very simple.

The filter is made up from C8, R5 and C9, and together they form a rudimentary low-pass filter. In other words, this circuit allows the audio frequencies to pass and the higher frequencies to be attenuated.
Audio Preamplifier

The a.f. signal produced by the mixing process is coupled via C10, to an audio pre-amplifier stage Tr2. Once again, this is about as simple as a circuit can be in practice.

In the circuit, R7 sets the bias to obtain a high gain, and the amplified audio signal appears on the collector at R8. The capacitor, C11, then couples the amplified signal to the output of the board.

The signal level at this point is still at a low level. It would be unable to drive a loudspeaker or a pair of headphones. Despite the low output, it might be possible to hear the louder signals using a pair of high impedance headphones placed between the output and the circuit ‘ground’.

However, it’s not a problem because the board is designed to drive an a.f. amplifier which then provides a useful level of output. This amplifier, by the way, is the audio section of the ‘Oscamp’ published in ‘Getting Started’ in February 1992.

Building The Board

Last month’s Fig. 5, showed the p.c.b. and associated component overlay. This layout could also be used in perf-board construction, although beginners are recommended to use the p.c.b. design.

If the perforated board method is used, extra wiring must be provided. You must add wires under the board to ‘ground’ the band-pass filter coil screening cans.

With either approach, the construction stage should be straightforward. You’ll avoid problems, if you compare your layout with the circuit diagram as work proceeds. This is a good way to keep a ‘running check’ on the work.

The only slightly difficult part of the mixer board assembly, is aligning the tuned circuits in the band-pass filter. This operation can only really be done when the audio amplifier is added, in the next part of the series.

However, if you have been following ‘Getting Started’ and want to ‘jump the gun’ you already have an advantage. The advantage comes about because it’s possible to feed the output of the mixer board to the amplifier in the ‘Oscamp’.

The ‘Oscamp’ project as I’ve already mentioned was described some time ago, in the February issue of PW. The oscillator circuit, Fig. 1, on page 33 of this issue, is very simple and can be built very quickly.

You only need a cheap crystal, and fortunately there are several suitable crystals available cheaply at rallies and shows. However, if necessary you can buy a new 3.5795MHz crystal for around £1 from Circit (reference 45-35795) which will provide a suitable reference source.

Finally on this point, you could even tune-up, by using signals on the band (during the evening is best). This simple method is quite practical, and it’s one I use if I have tuned up a band-pass filter using a signal generator. I always give it a final ‘tweak’ with signals on the band I want to use.

The Testing

To start the testing, you should provide the receiver with an signal input. This can be either from the signal source (or the dip-meter) or the antenna.

I usually begin with a frequency somewhere near the middle of the required band. The secret is then to peak the required signal or signals, using the cores.

The process of peaking the signals should then be repeated at the high and low ends of the band. I usually repeat the whole sequence a couple of times, until I’m satisfied with the results.

Well, that’s the lot for this month, but you’ve got more than enough to keep you busy! Next time I’ll describe the audio amplifier, show you how to join the boards and put the project in a suitable case.

Errors & Updates:

There were several errors in November’s ‘Getting Started’. The first involved Tr2, (the BC183) in Fig. 3, on page 48, which was inadvertently given the wrong number. Please note that the BC183 (on the right in the diagram) is Tr2, and not as shown.

The second error involves the resistor, R7, in the same diagram. The top end of R7 should be connected to the collector of Tr2, and not to the 9V supply as shown in the diagram. Please accept my apologies for these errors.

Editor
Mathematics For The RAE

As usual, as I left you some 'homework', I'll start with the answers to last month's questions. There were four questions last time about inductive reactance, and the answers were:

i) c  ii) a  iii) d  iv) b

They weren't that bad, were they? I'm sure you had them all right!

Varies With Frequency

Now for this month's topic. We turn our thoughts to the way the reactance (or impedance), in Ohms (Ω), of a capacitor varies with frequency. From last month, you'll remember that the reactance of an inductor goes up when the frequency goes up, but capacitors do just the opposite. For any capacitor the reactance falls as the frequency rises. In other words, it follows a reciprocal law.

So let me put that mathematically, and give you another little formula to learn (and remember!)

\[ X_c = \frac{1}{2\pi f C} \]

This is where \( X_c \) is the required capacitive reactance, again in ohms (Ω), \( f \) is the frequency in Hertz (Hz), and \( C \) is the capacitance in Farads (F).

General Curve

The general curve for the reactance of a capacitor is shown in Fig. 1. As you will see, it's very different from the inductive reactance curve which was a straight line. For capacitive reactance the curve really is a curve as in Fig. 1. The curve never quite reaches 0Ω (a dead short) at high frequencies.

An Example

I'll put some figures into the formula and give you an example. What is the reactance of a 1µF capacitor at a frequency of 1kHz?

Let's put in the formula again:

\[ X_c = \frac{1}{2\pi f C} \]

and then put the figures into it

\[ X_c = \frac{1}{2\pi \times 1000 \times 1\mu F} \]

\[ = \frac{1}{2\pi \times 1 \times 10^{-6}} \]

\[ = \frac{1}{6.282} \times 10^{-3} \]

\[ = 10^3/6.282 = 159\Omega \]

Second Example

As a second example, let's work out at which frequency will a 100µF capacitor have a reactance of 50Ω?

So let's start from the formula:

\[ X_c = \frac{1}{2\pi f C} \]

We know the reactance along with the capacitance, so how do we work out the frequency? Start by taking '2π' to the other side and the formula becomes:

\[ 2\pi f = \frac{1}{X_c C} \]

Then we can take over the 'C' to become:

\[ 2\pi f C = \frac{1}{X_c} \]

Now we only need to invent both sides to become:

\[ \frac{1}{2\pi f C} = \frac{1}{X_c} \]

When we put the figures into this new formula, it becomes \( \frac{1}{2\pi \times 100 \times 10^{-12} \times 50} = f \). We can turn that round at the same time to become:

\[ f = \frac{1}{6.282 \times 1 \times 10^{-10} \times 5 \times 10} \]

\[ = \frac{10^9}{31.41} \text{Hz (or } 10^3/31.41 \text{MHz).} \]

This gives an answer of 31.83MHz.

Reactive Direction

If inductive and capacitive reactances are both given in ohms, how do we know which is which? Fortunately there is a convention:

- Inductive reactance is considered to be positive (+)
- Capacitive reactance is considered to be negative (-)

This is only a convention, and is to enable combinations of inductance and capacitance to be evaluated. The '+' and '-' signs are used to indicate that inductive reactance has an opposite effect to capacitive reactance. This will become more obvious in the next bit where we look at resonant circuits.

Homework Again

Before I leave you for this month, I'll leave you with a little homework again. Here are four questions to be answered before next time. See you then.

Take π to be 3.141 in all these questions.

i) What is the reactance of a 100nF capacitor at 1kHz?
   a) 1.5916Ω  b) 159.16Ω  c) 3.184kΩ  d) 1.5916MΩ

ii) A capacitor of 10 000pF is to be used for smoothing in a p.s.u. What is its reactance at 100Hz?
   a) 159mf2  b) 62.895Ω  c) 159f2  d) 1.591kΩ

iii) In an r.f. filter circuit, a capacitor must have a reactance of 150Ω at 28MHz. What capacitance value should it be?
   a) 853pF  b) 475pF  c) 8.53nF  d) 15.6pF

iv) In a circuit, a capacitor is known to be 330pF, and is found to have a reactance of 55Ω. What frequency is this measurement taken at?
   a) 769MHz  b) 87.69MHz  c) 876.9kHz  d) 8.769kHz

This time, after first giving the answers to last month's inductive reactance questions, Ray Fautley G3ASG, turns to discussing the reactance of capacitors.
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Write your advertisement in BLOCK CAPITALS - up to a maximum of 30 words plus 12 words for your address - and send it together with your payment of £2.35 (cheques payable to PW Publishing Ltd.), or subscriber despatch label and corner flaps to: Donna Vincent, PW Bargain Basement, Ennefo House, The Quay, Poole, Dorset BH15 1PP. Subscribers may include the despatch label bearing their address and subscription number to qualify for their free的那种.

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It never rains but it pours! To add to the rapid decline in sunspot numbers, this time there have been various flares and similar disruptive manifestations.

The effect in September on the bands has been to reverse the character of some of the earlier manifestations.

This month we have no news from the bands.

The 1.8MHz Band

On the 1.8MHz band, Ted G2HKU mentioned his regular sideband contacts with Qt7GW and Q7SF, but Ted seems to have spent more time picking apples in what he described as the best year ever for apple picking.

The 7MHz Band

Our first port of call on the 7MHz band is with Eric Masters G0KRT at Worcester Park, Surrey, who uses a Lake DTR7 low-power rig at around 1W output into an antenna comprising about 26 metres tops.

The 3.5MHz Band

Not a lot of news on the 3.5MHz band! I haven't been able to get on the band at all for several weeks, other than for the occasional Sunday-morning natter and no one else has reported. Nonetheless, we do know that the long-distance contacts are being worked, both on sideband and c.w. - it just that no one tells us!

Our reporter John ZEBCN, however, does give it a whirl but he only managed 2Z5AAU and 4H0MR.

Back-Scatter

HF Bands

Reports to
Paul Essery G6KSK
287 Heol-y-Coleg, Vaynor, Newtown Powys SY16 1RA

Jim Smith, writing to DXNS, indicated that the proposed Heard Island DX-pedition was coming forward, albeit there is a mountain of work to be done. More news on this as it comes in. (Late flash - cancelled in favour of an operation from Willis which will be over by the time this reaches you. The reason, essentially, was lack of support.)

The WARC Bands

Let's make a start on the WARC bands, with Mike G6KDKZ in Tirsch, who mentions S21ZZ, 9D0RR, FP/G3TKN, ZL2ACY, ZL3KR, VK2BH and VK3UX on 10MHz, in the summer bouts of grass cutting.

The letter from John ZEBCAN in Northfield came alas, just one day after the outgoing copy last month had been shipped, but was nonetheless welcome. For the record, if a letter misses the deadline but arrives while I'm putting it together, it is best if you can send it in.

I may now safely say that the '90108 Reply to Sim! Oh, yes, talking of old Sim, another of his manifestations was the '7012Z' - neither VE1ZV or VE72ZG given as his call and he's written to me of this new manifestation.

The 3.5MHz Band

Not a lot of news on the 3.5MHz band! I haven't been able to get on the band at all for several weeks, other than for the occasional Sunday-morning natter and no one else has reported. Nonetheless, we do know that the long-distance contacts are being worked, both on sideband and c.w. - it just that no one tells us!

Our reporter John ZEBCAN, however, does give it a whirl but he only managed 2Z5AAU and 4H0MR.

The 14MHz Band

Always a popular band is the 14MHz band.

As always, the 14MHz band is where the majority of the real DX is worked. Ted G2HKU, despite the problems he has, managed to get on and key with 4L0FWW, 4KNN, UA6KCN and UL7VU.

The sideband list from Don G3NOF was sent to DXNS and received with much enthusiasm. It appears that the band has been a bit of a disappointment for some time.

The 28MHz Band

A first report on the 28MHz band comes from Reg G600F in Stroud. Reg is somewhat of a 28MHz addict and has a T58BS at a normal output of around 60W into a monoband 3-element beam plus a half-sized 5SRV for the other bands.

I was greatly amused by Reg's comment on why he reads the columns - 'for savage amusement to find out what I have missed!' What Reg found included C6E8Z, C2PEN, C3GS9, XU1BB, P8Y6E, ZG5C, F6FED, 3X0HNU, D2FEC, D4AB5, F1HCD, J6/F2WT, J5UAL, EL2PZ, DL3JFN, 4104NA, K1DSBP, D65BN8, SP9VOT and 9A3ER, all sideband signals.

The only other report on 28MHz this time was Don G3NOF in Yeovil, who mentions 2Z1AV, 5H4DJ and 5J2FR.

The 7MHz Band

Our first port of call on the 7MHz band is with Eric Masters G0KRT in Worcester Park, Surrey, who uses a Lake DTR7 low-power rig at around 1W output into an antenna comprising about 26 metres tops as originally proposed by W3EDP, but with a quarter-wave counterpoise.

In the two-way QRP line, Eric keyed with G3GCD, G4YPC, DJ2B, DJ6BV, D/2FGC and SM2SLC. With stations running higher power, Eric scored with GW0TP, a couple of others DL1HQE and a dozen other assorted DLs, A68JF, F6JG and a dozen other F stations, HB90Y, HB9IOP, H1O1B, ZD5A, ZD8E, ZXY2F, Z2LZ2B, K8MBJ, 2W0BN and for a band new one, O89MR, OH6MMC, ON4GU, OH6VR, OH6YMC, 2Z2AG/R, D3EDR/P, D2/G0BR, SM4AGL, P8IILJ, UV3JWW, UV5FDM, R4BSH, SP6DAY and UV4L8B. Just goes to show what a simple antenna, 1W and a direct-conversion receiver can do given a bit of patience.

Ted G2HKU mentions keying with ZA1W, UD60CP, SO4CW and 3A/G3JSJ/M.

The 3.5MHz Band

Not a lot of news on the 3.5MHz band! I haven't been able to get on the band at all for several weeks, other than for the occasional Sunday-morning natter and no one else has reported. Nonetheless, we do know that the long-distance contacts are being worked, both on sideband and c.w. - it just that no one tells us!

Our reporter John ZEBCAN, however, does give it a whirl but he only managed 2Z5AAU and 4H0MR.
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Solar Data For July-September 1992

Because of my coverage of v.h.f. history in the last two issues of PW, I have much solar data to catch up on. So I start where I left off, at the end of June, with news of M type flares and proton events.

On June 29 and 30th, there were magnetic storms and consequent aurorals but these were fairly small events. During the first two weeks of July there was a considerable increase in flare activity and by July 13 the solar flux had reached a level of 176 units. The quiet side of the sun then came into view with the flux dropping to 99 units by July 23.

The geomagnetic activity was very quiet up to July 21, but on the 22nd the A index rose to 33 units and auroral propagation was observed on the v.h.f. bands. The more active side of the sun was in view with the geomagnetic activity increasing to sub-storm levels. By September 3, a full storm was in progress. There were numerous sudden ionospheric disturbances (s.i.d.) and short wave fade-outs (s.w.f.) and a number of auroras were recorded on September 2, 3 and 4.

An outbreak of flare activity in which 13 M type flares were recorded started on September 5 and caused auroras on September 9 and 10, the latter being quite intense. Geomagnetic activity then declined, but reached major storm level on September 17 and another auroral effect on the v.h.f. bands. The solar flux was quite low during this period sinking to 106 flux units by September 20, only rising to 116 units by September 26.

Forecast

Now I'll take a look at the forecast. Although it is unlikely that F2 propagation on the 50MHz band will be anything like as good as in previous years, it would still be wise not to check the band for the occasional opening. During November and early December, check the 50MHz band, between 1200-1400UTC, for Caribbean and North American DX. If conditions are really good, then this path might stay open through to January.

There is every likelihood that a number of good auroral openings should be observed in the next few months. Don't forget to beam north initially to ascertain there is an opening, and then to move the antennas towards more easterly beam-headings to work the real DX!

Sporadic-E

A few letters have arrived since my last Sp-E report, and the first out of the bag is from Colin Robertson 4M0OHB (1077), who mentions working nine stations on the 144MHz band during an opening on June 20, including E7, CT1WV (IN61) and ZBOT (IM76). In the 'big one', on June 22, he worked 722 stations between 1239-2056UTC, including 130 x DL, 41 x L, 13 x H9, 12 x YU, 11 x OE, 8 x E, 4 x HG, 2 x DK and 1 x PA.

Mervyn Rodgers GM0GDL (ID68) was also active during these Sp-E openings, working CT1WW, EA2LU/4 and EB4CXZ on June 20 and 77 stations in DL, F, HB9 and YU on the 22nd.

Andy Napier GM1TBW (ID92) runs 25W into a 19 -element Yagi and found this sufficient to work 1KIIMTZ (JN25), IK2NCJ (JN45), FJ1FHF (JN22) and FJ4HLL (JN26) during an opening on June 7 and 32 x 1, 5 x 2H9, 2 x E and 1 x DL on June 22.

Alan Mills GOEX (J001) caught YL2MB (K027) at 1039UTC and DX100 (J053) at 1935UTC. One interesting station that appeared during this event (and on September 3) was LAUGH/P, operating from a lighthouse in J037.

Finally, Peter Bates GM4BYF (ID08) reports that he just received a QSL card from RB5CCO (KN98), confirming an auroral contact made on 1 December 1989 at 0230UTC. The distance? Only 2455km!

Auroral Events

A number of openings via auroral mode have been observed since my last report in the September issue of PW. Auroral events were recorded in central England on July 22, August 14, 20, 22, 23, September 2, 3, 4, 9, 10 and 17th. There may well have been other minor events, but I am not aware of them.

The opening on September 10 was quite significant with stations in DL, E, F, G, GI, GM, LA, OH, ON, OZ, PA, SM and YL being worked from the UK on the 144MHz band. Weak signals were first heard by Simon Freeman G3LOR (J002) around 1430UTC. With the intensity of the event increasing a number of good DX contacts were made, including OHSJ (KP50) at 1350UTC. The event continued for a few more hours with Richard Gardner G4WKX (ID09) finding SM1MTU (J097), S5MSBSZ (J089) and SM5MTX (J078) between 1905-1650UTC.

Andy Cook G4PIQ (J001) caught YL2MB (K027) at 1039UTC and DX100 (J053) at 1935UTC. One interesting station that appeared during this event (and on September 3) was LAUGH/P, operating from a lighthouse in J037.

Finally, Peter Bates GM4BYF (ID08) reports that he just received a QSL card from RB5CCO (KN98), confirming an auroral contact made on 1 December 1989 at 0230UTC. The distance? Only 2455km!

Fig. 1. The 5m dish at the QTH of G3LTF - circa 1963.
Fortunately coincided with the second leg of the RSGB 144MHz c.w. cumulatives, being held between 1930 - 2200UTC on September 16. At my QTH (IO8I) I made 76 c.w. QSOs (only six with the UK) with much DX, including HB9QU (JN47), CE5UK (JN67), OE3JPC (JN71), O1K1PP (J08I), O1K1KL (J060), O1KPGS (JN69), O1UNK (JN69), O3KCGF (JN88), SP6CIC (J08I), SP6GYY (J08I) and many German stations in JN48, JN49, JN58 and JN59.

Activity on s.s.b. was also high and UK stations were heard working DX such as O21GEH (JN20) in the north-east round to HB8STYP in the south-east. For some, the opening also extended throughout southern France into the north coast of Spain.

Meteor Showers

The following data, concerning meteor showers during November - December, will help you determine which is the best direction to beam at specific times and when the shower is below the horizon.

- The Leonids meteor shower will be encountered between November 13-19, peaking on Tuesday 17th. Between 0100 to 0300UTC beam north or south, 0300 to 0400UTC beam north-east or south-east, 0400 to 0800UTC beam east or west, 0800 to 1100UTC beam south-east or north-west.

- The usefulness of the Leonids shower for radio communication purposes is not very good from 1100UTC onwards, and between 1700 to 2300UTC the radiation of the shower is below the horizon, and it therefore cannot be seen from the UK.

- The Geminids shower lasts from December 6-15, with the predicted maximum activity occurring on Sunday 13th. Between 2000 to 2200UTC beam north or south, 2200 to 0100UTC beam north-east or south-west, 0100 to 0300UTC beam east or west, 0300 to 0600UTC beam south-east or north-west. The shower radiant is low between 0900 to 1900UTC.

- The Ursids shower will occur between December 16-24, peaking on Tuesday 22nd. It's not particularly good in the north-south direction, but to compensate for this all paths from north-east through east to south-east are quite good and are available at all times of the day.

- The east-west path is especially good. And the Ursid shower will enable contacts to be made with countries like Poland, Czechoslovakia and Hungary at any time during the 24-hour period.

Moonbounce

In a last month column, I described some of the pioneering moonbounce work carried out on the 144MHz, 1.3GHz and 10GHz bands by Peter Blair G3LTF. The photograph in Fig. 1, taken in 1963, shows the original 5m dish (0.5f/D) located on a polar mount being used with a linearly polarised feed for the 1296MHz band.

The dish was replaced in 1970 with another of 5m diameter, but of 0.5 f/D ratio and an increase from 8 to 12 ribs. Incidentally, the f/D ratio is the fundamental factor governing the design of a feed for a dish, and it's based upon the diameter of the dish (D) and its focal length (f). The f/D ratio determines the beamwidth of the feed necessary to illuminate the dish efficiently, and for most amateur applications the range 0.5 to 0.75 is generally optimum.

In 1974, G3LTF moved to Harlow, Essex, and the dish was rebuilt as the photograph, Fig. 2, shows. It was to remain there until 1987, when another move of G3LTF occurred, this time to West Sussex. In West Sussex the dish survived two hurricanes, but had to be dismantled because the local authorities would not grant it planning permission despite being located on a one acre plot surrounded by trees and hedges.

According to Peter, the 1989 law specifically forbids all dishes, even below a height of 5m, which is the height you don't need permission for any structure.

ARRL Contest

For those of you with a good single-Yagi tropo system, the ARRL e.m.e. contest provides a unique opportunity to hear, and maybe work, some of the mega-stations active via this mode of communication. Although you may have missed the first leg of the event in October, there is another one being run during the weekend of November 14-15.

The data in Fig. 3, gives details of moon rise and moon set times, to enable those of you with fixed Yagis to perhaps hear signals off the moon. I have based the calculations on central England. With a good antenna system, something like a 16-element Yagi fed with low loss feeder, you should hear a number of stations if you listen very carefully around the bottom 20kHz of the 144 or 430MHz bands. You may not hear stations such as 73rd, because the polarisation of the incoming signal will, in all probability, not be matched up with the polarisation of your antenna.

However, after several minutes, or sometimes hours, it should have rotated, and you may begin to copy weak c.w. signals.

The technical term for the polarisations shifts is one of rotation, and sometimes you may hear operators saying that "Faraday had locked up". This means that signals were weakened for some time, because of mis-aligned polarisation.

Propagation Experiments

Last month, I described ionospheric time-delay experiments carried out on the 28, 50 and 144MHz bands between Ray Cracknell ZE2JV (now ZF4BW) and ZS6PW. However, I had not realised that these tests are still continuing today, with Fred Anderson ZS6PW in Pretoria transmitting on 28.800MHz and measurements being made at the QTH of G2AHU, G6JF and SV1DH.

The transmission from ZS6PW carries a pulse train mimicking the Loran C transmission, and the second markers. At the QTH of G2AHU, the signals from ZS6PW are picked up on a home-made receiver, and the 10.7MHz i.f. output is fed directly to an oscilloscope.

The 60kHz MSF transmission from Rugby is simultaneously received on a standard receiver with no detector. The resultant 60kHz carrier is suppressed and sometimes you may hear this 60kHz modulate the signal of a receiver. The 60kHz modulates the signal of a receiver. The 60kHz modulated signal is used to generate a burst of 1ms every 100ms, which can be used to trigger the oscilloscope.

All allowances have to be made for transmission delays (1ms for every 300kHz) and for delays through equipment at each end. But, as Ray mentions, it's fascinating to watch...
Russian Operations

A few years ago, nobody could have believed that it would be possible to obtain a permit allowing operation from Russia. But as we now know, dramatic changes took place quite recently, allowing such operations.

Early in 1992, Rolf Nielend DK2ZF and Ulrich Mueller DK4KV, began making enquiries as to the possibility of operating on the 50MHz band from Kaliningrad (U22). After several telephone calls to Moscow, they were informed that special permission had been granted to the club station UZ2FWA to carry out tests on that band for a limited period, ending June 1992. A few weeks later, after the 50MHz permit for UZ2FWA had expired, both DK2ZF and DK4KV obtained permission to operate as UZ2F/DK2ZF and UZ2F/DK4KV. Thus was created a unique situation, whereby the only legal 50MHz operation from Kaliningrad was actually being performed by foreign operators!

Their operation, from the UZ2FWA club station, began just after midnight on July 4. Contacts were immediately made with 11TKC, M7CMV, D60L and D8UK. At 0600 UTC they awoke to see, for the first time, the impressive installation at UZ2FWA. There were three towers and antennas so high that they would be visible from 50 to 100 km, even from U22. Meanwhile, eight DK2BV 16-element Yagis, each with a boom length of 10m. The 50MHz rig was switched on again at 0030 UTC, and for the whole day the band was full of stations from G, DN, PN, PA and IH. DK reports and their operation were monitored from the calling UK stations, with not a word of criticism. As far as we know, it was the first time that a British station had been heard by a foreign operator in Europe, and it certainly generated a great deal of interest across the country. Many operators have been reporting the location of this beacon as Balise. This is not the case, and we have to make it clear that this is a beacon for the Russian Navy, located on the Shetland Islands.

In 1992, the Russian operations took place on the 70 and 144MHz bands. The Perseids meteor shower on August 11 enabled me to work GM4IPK (IA9) on 70 MHz and GM4IPK (IA9) located on the Shetland Islands. The random (unscheduled) QSO was made on s.s.b., in which both parties had worked.

A number of other stations were active on the 70 and 144MHz bands during the Perseids meteor shower. They included EJ60 in 404 (QLS via E12A), E4MTR in 404 (QLS via E8BF) and GB95S in IO88 (QLS via GB7TCM). From Holland PA2AT (U032GF) passes on the news that he regularly listens to the band and is especially looking for contacts on 28MHz. He is using a PM/90 converter and HBBCV antenna and prefers to use an SSB filter. On the band, P38ADZ.

Back-Scatter
Radio Shopper has now been developing its policy of low cost and service for nearly a year and in this time we have seen exchange rates yo-yo up and down. The recent performance of the pound has had effect on all imported product but if you check out the costs around at the moment I can confirm that we are PROBABLY the best deal you can lay your hands on. We don't stock everything but if you need it or we can get it for you then I am sure that you will be more than pleased with our after sales as well as our original low cost. I look forward to talking with you soon.

Did you know...

We are able to reserve any piece of equipment from our stocks for just a £50 non-returnable deposit. This will enable you to reserve the rig of your dreams without any supply difficulties. This deposit will hold your rig for up to 30 days.

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Back-Scatter

Broadcast Round-up

Reports to Peter Shore via the PW Editorial Office

The biggest story of the month concerns a small European country with two official languages: Belgium.

The country is made up of a French and a Flemish speaking community, and the two lead quite separate lives in many respects.

Broadcasting is also divided into two, with Radio - Television Beige de la Comunaute Francaise serving the French speaking population and Belgische Radio en Televisie (BRTN) serving the larger Flemish speaking populous.

Earlier this year, RTBF stopped, rather abruptly, its overseas broadcasting operation because of financial difficulties. But international broadcasting continued from Belgium through BRT International with programmes in six languages including English.

But BRT International felt that it needed a new direction, and so at 1000GMT on Saturday September 26, relaunched itself as Radio Vlaanderen International. An enormous party was held at the Wavre transmitting station about 20km outside Brussels.

More than 500 listeners, BRTN staff and guests from around Europe were present to celebrate the first transmission of the renamed station from a special studio in the antenna field. The station has a new callsign, jingles and interval signal and an attractive new logo. But it is now concentrating its main broadcasting effort in two areas: serving the expatriate Flemish speaking community overseas, and offering a high quality signal to Europe, in particular to Belgium itself, to serve the large international community in the country.

Programmes remain much the same: a complete list of the English service appears in European news later in this column. But the station hopes to inaugurate a low-powered v.h.f.-f.m. transmitter in Brussels later this year to complement the medium wave transmitter on 1.512MHz.

It struggles on with antiquated equipment at its Wavre transmitting station, around 20km outside Brussels. One of the short wave transmitters dates back to 1952 and the antennas include elderly curtain rhombic antennas. But the 250kW transmitter at Wavre, running at just 100kW for the first nine months of this year, is now operating at full power again.

Albania is in discussion with a number of international broadcasters to earn hard currency by hiring out its transmission facilities. The first station to successfully sign an agreement is religious broadcaster Trans World Radio.

A two year contract will allow broadcasts on the powerful medium wave transmitter on 1.395MHz for up to three hours a day. The transmissions are heard daily at 2130, and started at the beginning of October.

The BBC World Service, celebrating its 60th anniversary this December, has broken new ground. It will be using transmitters in the former Soviet Union to broadcast programmes in to the Indian sub continent and to China. Transmitters in Russia at Vladivostock, Irkutsk or Khabarovsk in the Far East and Tchita will be used. A site at Tashkent in Uzbekistan will also beam BBC programmes.

Radio Netherlands has also reported that it is negotiating with the Russian authorities to hire time to transmit its programmes to South and South East Asia.

Radio Norway International may lose its English service next year. The half-hour programmes heard at weekends only are presently funded by the Norwegian foreign ministry, but it has indicated its intention to withdraw support in 1993.

The Norwegian Broadcasting Corporation, NRK, says it will not pay for the service, as its mandate is to provide Norwegian language programmes to Norwegians at home and abroad. It is unclear whether there will be a stay of execution.

Broadcasts from the Democratic Voice of Burma continue over the Norwegian transmitters at Kvitsoey. The station's transmissions now last for 55 minutes and are noted on 17.94MHz. The station is reported to be jammed in Burma.

The South African Broadcasting Corporation is launching a pan-African television service due to be on the air from October, called Channel Africa. It will be in English and French with half-hour broadcasts and will not be encrypted. At the same time, Radio RSA changes its name to Channel Africa.

Will there be a new US international radio service? A Congressional Committee has recommended establishing Radio Free Asia, along the lines of Radios Liberty and Free Europe. It cites the success of those stations in helping to hasten the end of communism in the former Soviet empire.

Radio Free Asia programmes would act as surrogate broadcasting to the closed societies of Asia (China and Burma, for example), with news, music and entertainment. The committee's decision was not unanimous: some members suggested that US foreign policy would be better served by concentrating resources in the Voice of America instead.

The problems surrounding the proposed VoA/RAE/RL relay station in Israel's Arava Desert continue. Environmentalists still protest that the r.f. signals will interfere with birds whose migratory routes overfly the site, whilst the government seems keen to go on with the scheme. But now the VOA has reportedly signed an agreement with the Kuwaiti government for the construction of a new relay station in the Emirate. The agreement which will last 20 years, allows up to 11 medium wave and short wave transmitters to be constructed.

**European Stations**

All times GMT (=UTC)

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<thead>
<tr>
<th>Radio</th>
<th>Country</th>
<th>Language</th>
<th>Schedule</th>
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</thead>
<tbody>
<tr>
<td>Radio Vlaanderen International</td>
<td>Belgium</td>
<td>International</td>
<td>0730-0800 on 11.695, 9.905, 5.91 &amp; 1.512MHz</td>
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<td></td>
<td></td>
<td>English</td>
<td>1000-1030 on 8.905 &amp; 5.91 &amp; 1.512MHz (not Sunday)</td>
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<td>1230-1300 on 21.81 (Sundays only)</td>
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<td>1400-1430 on 17.55 &amp; 1.512MHz</td>
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<td>1900-1930 on 15.54 &amp; 5.91 &amp; 1.512MHz</td>
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<td></td>
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<td>0300-0330 on 13.655 &amp; 9.33MHz</td>
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<td>Radio World</td>
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<td>2200-2230 on 9.905, 5.91 &amp; 1.512MHz</td>
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<td>0300-0100 on 13.655 &amp; 9.33MHz</td>
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<tr>
<td>Radio World presented by Frans Vossen</td>
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<td>0730-0800 on 11.695, 9.905, 5.91 &amp; 1.512MHz</td>
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<td>0300-0100 on 13.655 &amp; 9.33MHz</td>
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The Voice of Turkey in English operates:

- 0300-0400 on 9.645MHz
- 1230-1300 on 8.675MHz
- 2000-2100 on 8.445MHz
- 2200-2300 on 11.895, 8.445 & 7.185MHz

**Asian Pacific And American Stations**

Radio Australia's transmissions are often audible in Europe. At peak listening times, the schedule is:

- 0730-0830 on 21.59, 21.525, 17.75, 17.63, 15.24, 11.88 & 11.72MHz
- 0830-1000 on 25.75, 21.59, 17.75, 17.63, 9.58, 9.56, 7.25, 7.18 & 7.125MHz
- 1100-1200 on 11.91, 11.88, 9.58, 7.25 & 7.24MHz
- 1500-2100 on 19.91, 19.88, 11.85, 11.72, 9.58, 7.26 & 7.24MHz
- 2100-2300 on 13.705, 11.88, 11.85, 11.72, 9.58, 9.54 & 9.51MHz

The WJCR station is a religious broadcaster based in Kentucky, USA. It operates 24 hours-a-day on 7.49 and 7.465MHz.

**African And Middle Eastern Stations**

Channel Africa from Johannesburg has English to Africa:

- 0200-0300 on 7.93MHz
- 0300-0400 on 9.72 & 3.955MHz
- 0400-0500 on 15.22 & 3.935MHz
- 0500-0600 on 15.22MHz
- 0600-0700 on 15.22MHz
- 1900-2100 on 11.80MHz
- 2100-2200 on 15.57, 15.135, 12.0, 9.865, 9.60, 7.25 & 5.894MHz

**Programme Media Network**

On Thursdays is now heard at 1151.

**Radio Ukraine International** has English:

- 0000-0100 on 15.57, 15.355, 12.06, 12.04, 12.0, 11.79, 11.52, 10.344(u.s.b.), 9.64, 7.25 & 7.195MHz
- 2100-2200 on 15.57, 15.135, 12.0, 9.865, 9.60, 7.25 & 5.894MHz

**Transmitter hall at BRRT Wavre site. Two short wave transmitters shown.**
Back-Scatter

The World of ATV

How old is amateur television? Probably older than most readers would think, although Andy Emmerson G8PTH had to do some investigation himself to be certain.

First ATV Activity

The first ATV activity we can date was in 1927, when vision signals were transmitted across the Atlantic by the British amateur Ben Clapp 2KZ. No pictures were seen in New York, as no TV receiver was available - short wave receivers were used.

Success came the following February with the world's first transatlantic television transmission of five pictures. They were sent from amateur radio station G2KZ at Warwick Road, Coulson, and received by Robert Hart W2CJ and Ben Clapp G2KZ in New York. In March of the same year, live TV pictures sent by the Baird laboratories in London were received on SS Berengaria in mid-ocean. Video recordings of these pictures on 136m; this was a project of the Waverley Radio Club.

Move Forward

We now move forward to the year 1932 and to Australia. Amateur station VK2K transmitted 30-line pictures on 136m; this was a project of the Waverley Radio Club.

In January 1934, G2AD of Eastbourne was transmitting 30-line TV on 160m. Ray G2KU himself received amateur TV signals on 40m on July 15 and 22 at 2200hrs, but could not get a picture.

December of the same year saw 30 and 60-line transmissions being made by Harold Bailey G2UF of Denton, Manchester, on 10m. He was in fact the first person to transmit TV on 10m, and did a lot to publicise television: he published a sixty-page booklet popularising the subject and held public demonstrations in Blackpool and elsewhere.

It is G2UF too, who was the person behind a note in Wireless World (3 April 1938) entitled 'Amateur Television in Yorkshire'. The text is one tantalising to the subject and held public demonstrations in Blackpool and elsewhere.

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The story now moves back to the USA and to the New York World's Fair of 1933. Dave Ingram writes in his book Video Electronics Technology that ATV was demonstrated in the amateur station there. 'The manager-director of W2USA, Art Lynch W2DKJ (now W4DKJ), after seeing a successful demonstration of amateur television equipment at a radio show in Chicago in June, was convinced that television communications should be added to the station at W2USA, "the most visited amateur radio station in the world".

Since the World's Fair was scheduled to close at the end of October, time was short. But Art lined up the necessary talent, and with some help from industry, the group built two complete television systems in an effort to establish the first two-way television contact. "Their goal was accomplished on September 27, 1940 when amateurs at W2USA and W2DKJ at the New York Daily News building in Manhattan began exchanging fair quality television pictures on the amateur 112MHz band.

Accompanying sound was transmitted on 56MHz. Distance between the two stations was about eight miles.

The television equipment at each end of the circuit consisted of a camera-modulator unit, a receiver and a transmitter which were duplicates of equipment described earlier in GST. The system used 30Hz vertical scanning, 3600Hz horizontal scanning and a 128-line raster. Considering that the pictures were viewed on a CRT with a P1 phosphor, the results were quite gratifying. Each station boasted the very latest in electronic equipment, including electro-magnetically deflected cathode ray tubes, inter-running sweep tubes synchronised by external pulses, and iconoscope camera tubes.

The equipment was donated by
The World of ATV

Pre-War Amateur Operation

Another description of pre-war amateur operation in the USA is to be found in the December 1942 issue of Electronics magazine. Here Robert Mautner and Frank Somers (calls not given) describe their extremely professional camera, monitor, sync pulse generator and transmitter. This equipment, they say, was constructed just before the war and was used successfully in the 114MHz band for several months.

The comprehensive list of references also mentions a couple of articles on ATV in the May and July 1940 issues of QST. All these transmissions were on the RMA standard of 441 lines, with 60Hz vertical frequency.

The war put paid to further ATV development and the next mention of this subject occurs in 1948, in the British magazine Mechanics. The October 15 issue devoted its centre spread to an Australian amateur, VK3LN, who had built his own television camera and receiver. The system's line standard is not mentioned, but the illustrated article stated that he proposed to transmit speech on 144 megacycles and that clear vision reception was expected within line-of-sight.

Onto The Year 1950

We move on to the year 1950, when W2LNP in the USA published a three-part article in Radio and Television News describing his home TV station. This conformed to the very same standards used by American ATVers, namely 525 lines, 60 fields, audio subcarrier and transmitted on the 420-450MHz band. The article is extremely progressive for its time and set the scene for all subsequent development.

From now on amateur television activity generally conformed to broadcast standards, allowing the use of domestic TV sets for reception. The British Amateur Television Club was formed in 1949, and a whole new era of ATV began. Its story will be recounted on a later occasion.

Inevitably this article has been only a brief summary, and I hope to give the subject a fuller treatment in the future. I would like to acknowledge the assistance of Ray Herbert G2KU with the research for this article.

DEWSBURY ELECTRONICS

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<th>Model</th>
<th>Description</th>
<th>Price</th>
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<tr>
<td>FT890</td>
<td>Compact TX/C</td>
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**Accessories**

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<th>Model</th>
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<td>ATU2</td>
<td>Antenna Tuner</td>
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<tr>
<td>FT890</td>
<td>Matching PSU</td>
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<td>PV52</td>
<td>Voice Storage</td>
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<td>SP6</td>
<td>Base Speaker</td>
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<td>SP7</td>
<td>Mic Speaker</td>
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<tr>
<td>FT990</td>
<td>With PSU</td>
<td>£1659.00</td>
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<td>Without PSU</td>
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<th>Model</th>
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<tr>
<td>IC728</td>
<td>HF</td>
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<td>IC729</td>
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**Accessories**

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<td>PS55</td>
<td>PSU</td>
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<td>SP7</td>
<td>Speaker</td>
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<td>AT50</td>
<td>Auto ATU</td>
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<td>SM8</td>
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<td>IC765</td>
<td>HF Base Station</td>
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**KENWOOD**

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<tr>
<td>TS450</td>
<td>HF</td>
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<tr>
<td>TS695</td>
<td>HF/40M</td>
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<td>PS31</td>
<td>PSU (SSB only)</td>
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<td>PS33</td>
<td>PSU (Full Duty Cycle)</td>
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<td>SP23</td>
<td>Est. Speaker</td>
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<td>MC90A</td>
<td>Desk Mic</td>
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**Yaesu**

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<th>Model</th>
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<td>FT210R</td>
<td>2m, 45 watt</td>
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<tr>
<td>FT210RX</td>
<td>New 2m, 50 watt</td>
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<td>FT5200R</td>
<td>2m/70cm, Full Cross Band</td>
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**ICOM**

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<th>Model</th>
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**HANDHELDs**

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<td>TM232</td>
<td>2m, 45 watt</td>
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<td>ICOM</td>
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<td>Kenwood</td>
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**Miscellaneous**

- DIY Inexpensive radio projects.
- Easy to make. SAE.
- To order reference number.
- 39 Parkside Avenue, Southhampton S01 9AF.

### Valves

- Most valves wanted for cash: Must be unused and boxed. C.B.S. 107 Dicken Road, BLACKPOOL FY2 6EU. Tel: 0525 781 986.

### Recruitment

- Northampton Communications required to prepare a new mail order catalogue for trading to be November/December 1992. Experience of the retail sales and of Radio Communications is essential. Initially the hours will be long and the capability to work on one's own initiative severely tested.
- If this is you, contact: Alistair Jefferson on (0604) 882 133.
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IC-781
HF All band transceiver
- The HF master model designed for serious DX'ers.
- Advanced spectrum scope.
- Twin PBT, dual watch capability and fully automatic antenna tuner.
- 150W output power.
- 425(W)x149(H)x411(D)mm.

IC-765
HF All band transceiver
- Superior basic performance.
- First-class C/N characteristics and rapid lockup time.
- High-speed, fully automatic antenna tuner.
- Band stacking registers.
- DDS system.
- 424(W)x150(H)x390(D)mm.

IC-735
HF All band transceiver
- Offers both compactness and high performance.
- Full and semi break-in.
- Passband tuning and adjustable notch filter.
- 10dB preamp and 20dB attenuator.
- 241(W)x94(H)x239(D)mm.

For further information about ICOM products and your nearest authorised dealer please contact:
ICOM (UK) Ltd, Dept PW, Sea Street, Herne Bay, Kent CT6 8LD
Telephone: 0227 741741 (24hr). Facsimile: 0227 741742