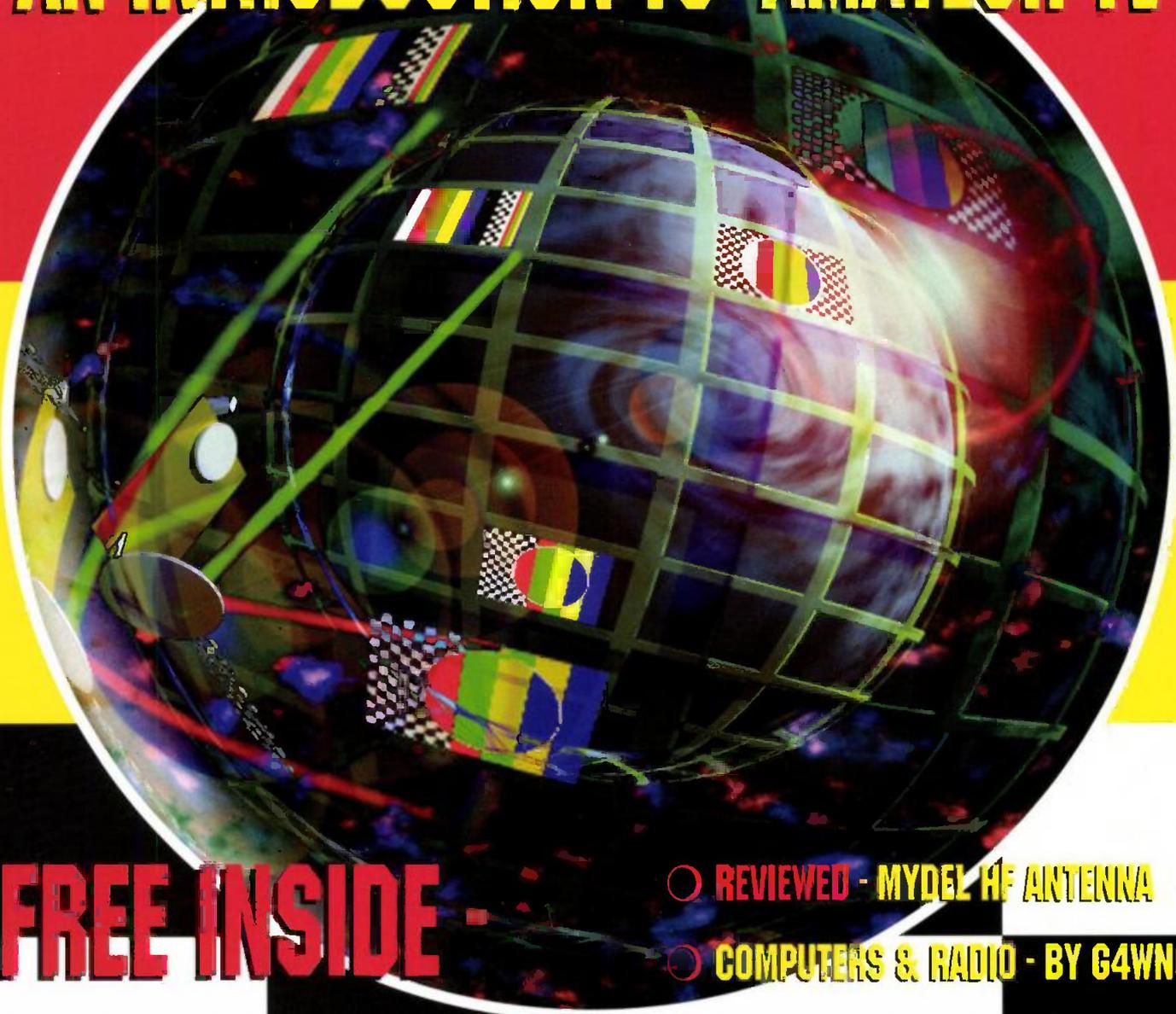


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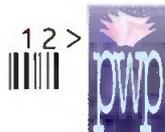
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## 9 EDITOR'S KEYLINES

## 9 RADIO DIARY

## 10 RECEIVING YOU

## 12 NEWS 1996

## 13 HOLLY'S HOBBY

Budding Novice Holly Sibley shares her thoughts on building the Pitney.

## 16 CLUB SPOTLIGHT

## 18 AMATEUR TELEVISION - AN INTRODUCTION

Graham Hankins G8EMX's comprehensive article will leave you wanting to enter the world of ATV.

## 24 XMAS SUBS

Order a PW Subscription as a present for a fellow radio enthusiast and they'll get a free gift too!

## 26 COMPUTING & RADIO - DO THEY MIX?

Mike Richards G4WNC shows you how you can use a computer in conjunction with amateur radio.

## 28 BITS & BYTES - THE COMPUTER IN YOUR SHACK

PW's monthly round-up of computing news.

## 30 COMPUTING TECHNICALLY

Gerald Stancey G3MCK advises you on how the computer can help with radio calculations.

## 32 REVIEW - THE MYDEL MULTI-TRAP ANTENNA

Eric Gray G3PCS, a keen h.f. operator, tests an antenna designed to fit in most suburban gardens.

## 34 TIPS & TOOLS - WORKSHOP PRACTICES

Clive Hardy G4SLU offers some handy hints and tips for the home-brew enthusiast.

## 36 SOLDERING SUCCESS ISN'T A SECRET!

After reading Paul Essery GW3KFE's article you too should see that there are no secrets behind making a good solder joint.

## 39 PLUGGING COILS

Ray Loveland G2ARU describes how to make plug-in coils from 'party poppers'!

## 40 ANTENNA WORKSHOP

Gerald Stancey G3MCK helps you overcome your fears when faced with a Smith Chart.



## 42 VALVE & VINTAGE

It's Phil Cadman G4JCP's turn to man the 'wireless shop' and whilst in charge he continues with his look at valved regenerative receivers.

## 44 CARRYING ON THE PRACTICAL WAY

George Dobbs G3RJV shows you how to build a regenerative short wave receiver.

## 48 BOOK REVIEW

Rob Mannion G3XFD gives Basic Radio & Electronic Calculations by Ray Petri G0OAT his vote.

## 49 HF FAR & WIDE

Leighton Smart GW0LBI provides his monthly report on the h.f. bands.

## 50 VHF REPORT

This month David Butler G4ASR has news of trans-equatorial propagation.

## 54 EQUIPMENT SPECIFICATIONS

Ian Poole G3YWX looks at power supplies in the last of his popular series.

## 55 BROADCAST ROUND-UP

Peter Shore takes you on a trip around the broadcast bands.

## 56 THE PRACTICAL WIRELESS 1996 INDEX

## 58 BARGAIN BASEMENT

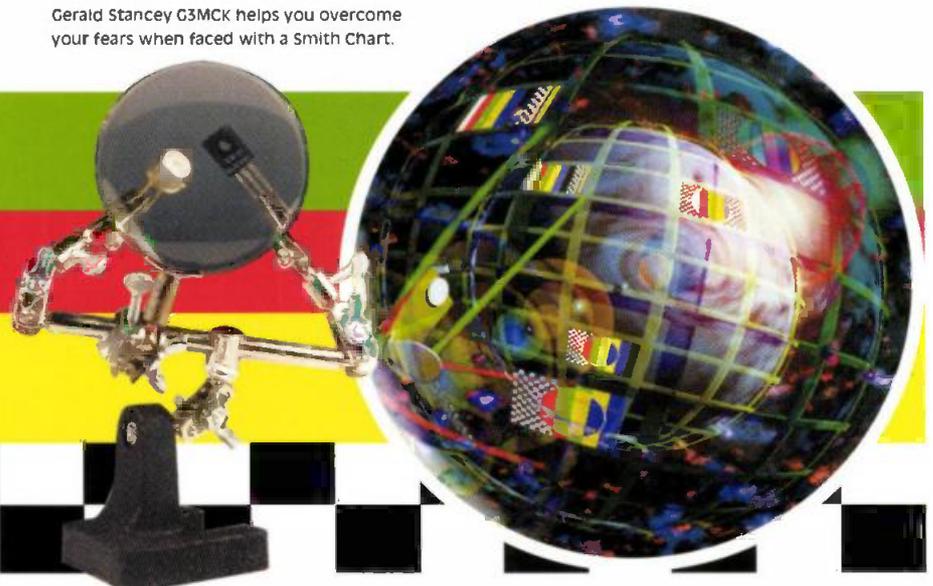
## 63 BOOK STORE

## 64 PROFILES

Looking for a Christmas present - look no further!

## 67 COMING NEXT MONTH

## 68 ADVERTISERS' INDEX



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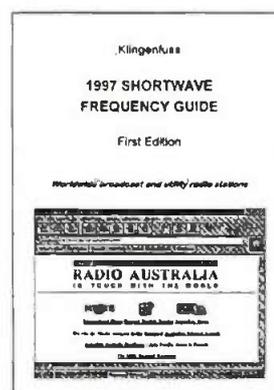
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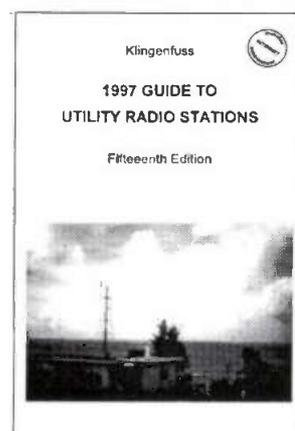
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Reviewed PW  
November 1996

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ACCESS

# EDITOR'S Keylines

Rob Mannion's viewpoint on the World of Amateur Radio



Last month's issue saw the introduction of a new feature in *PW* in the form of our 'Buyer's Guide'. The guide is aimed at providing potential buyers and those interested in finding out details on what's available...with all the important features of equipment.

Although by no means complete, the first edition of the 'Buyer's

Guide' provided some interesting details. The editorial team - lead in this case by Donna Vincent G7TZB who is researching and compiling the guide - have already learned a great deal. Personally...I was surprised to find out how many hand-helds there are to choose from!

As she gets going on the new project Donna G7TZB ably assisted by Tex Swann G1TEX, will add items to the list. Of course, we're only too aware that it's far from complete at the moment...and that's where we need your help!

You can help us by writing to Donna to advise her on what specification/categories you'd like to see in the guide. The assistance we get from readers on this aspect could help the guide become an invaluable source of information for everybody, which as times goes by will be updated.

The most obvious category missing from the guide is that dealing with older equipment and I can promise you that this very important aspect is not being ignored. In fact, Donna and Tex are busy researching and compiling lists of second-hand equipment now. We intend to cover all aspects of main station, portable and mobile equipment for h.f., v.h.f. and u.h.f. use.

Particular care is being taken in providing a 'guide price' for second-hand equipment. Donna will be pleased to hear from you with your suggestions and ideas on this topic. So, we look forward to reading your letters so that *PW*'s 'Buyer's Guide' - which will be published on a regular basis - can provide the best service possible.

## Novice Natter

In the three years or so 'Novice Natter' has been published, Elaine Richards G4LFM has developed the column into a popular series with a dedicated following. Indeed... 'Novice Natter' was Elaine's own idea and I'm afraid it was also her own decision to stop writing the column.

Due to pressure from all her other journalistic work Elaine has (very reluctantly) decided to step down from writing 'Novice Natter' and the November's column was the last. Everyone on *PW* wishes her well, but I'm delighted to say we're not losing contact with the Richard's family as Elaine's husband Mike G4WNC is to continue with his 'Bits & Bytes' computing-in-radio column. We wish them both good fortune.

## New Column

So, as from the January 1997 issue of *PW*, 'Novice Natter' will be replaced by a new column aimed at helping newcomers to the hobby. The new columnist is well known to you and (appropriately enough) he wrote the original series in *PW* entitled 'Getting Started - The Practical Way' some ten years or so ago. The new author is none other than myself! (No surprise I suppose if you can remember that far back).

Although I've got many ideas aimed at helping newcomers and those wanting to get going in the hobby...I'd like your ideas and suggestions. However, you can be sure that I'll be using my experience from over 35 years of encouraging others to share our marvellous hobby. But your input, encouragement, help and advice are bound to help us start off 1997 on the right track!

Rob Mannion  
G3XFD

# RADIO Diary

Compiled by Zoë Crabb

## 1996

**November 16:** The Rochdale & District Amateur Radio Society are holding their 2nd Traditional Radio Rally at St Aiden's Church Hall, Sudden, Rochdale. (Same venue as the QRP Convention). This rally is for the constructor and fettle, with components and 'junk' being the main theme. Tables are available at £5, so why not empty your loft! Doors open 10.30am (10am for disabled visitors). Entry is only £1. Talk-in on S22. Two minutes from M62, J.20. John G70AI on (01706) 815737 (office) or (01706) 376204 (home).

**November 16:** The London Amateur Radio & Computer Christmas Rally is being held at the Lee Valley Leisure Centre, Picketts Lock Lane, Edmonton, London N9. Doors open 10am to 5pm. New, pre-Christmas one-day event. Trade shows, Bring & Buy, on-demand Morse tests, talk in on 2m & 70cm, facilities for the disabled, priority admission for disabled visitors, bars, restaurants, ample free parking. (01923) 893929.

**November 17:** The Bishop Auckland Radio Amateurs Club (BARAC) rally will take place at Newton Aycliffe Leisure Centre. There will be the usual stalls, Bring & Buy, catering and bar facilities. The venue also boasts good parking with easy access. As you can imagine, there is lots to do for all the family within the confines of the leisure centre for those of the family not quite so interested in radio. Doors open at 11am (10.30am for disabled visitors). More details from rally organiser Mike G0PRQ on (01388) 766264.

**November 24:** The Red Rose Rally is being held at Horwich Leisure Centre, Victoria Road, Horwich, Nr. Bolton off J6 M61. There will be a cafe, bar, Bring & Buy, RSGB stand, special interest groups, parking for 300 cars, free cash draw every hour, children's activity room up to seven years, supervised by parent. Doors open at 10.30am and admission is £1, free for children. Talk-in on S22. Albert G7RZW on (01204) 62980.

**December 8:** The Portland Amateur Radio Club are holding their 2nd Annual Radio Rally and Craft Fair at the Burton Cliff Hotel, Burton, Bradstock, nr. Bridport, Dorset, from 10am till 5.30pm. More information from Mrs C. Haddon (Secretary), 1 Victoria Place, Easton, Portland DT5 2AA.

**December 8:** The SDX Cluster Support Group Radio, Electronics & Computer Rally is being held at the Maryhill Community Centre Halls, Maryhill Road, Glasgow. The halls are located approx. 1 mile from junction 17 of the M8 motorway and five minutes walk from St. Georges Cross underground station. As well as the normal traders, radio, electronics, computers, antennas, etc., a series of lectures are planned for the day. There will also be an RSGB Forum, which will be attended by members of the RSGB General Council. A cafe will be run throughout the day, serving hot/cold drinks and light snacks. Talk-in will be provided by Strathclyde Raynet on S22. Fees: Adults, £2, UB40 holders, £1.50, Senior Citizens, £1.50 and children under 14, free of charge with adult. John Dundas GM00PS on 0141-638 7670 or packet @ GB7SAN, GB7SDX.

**\*December 15:** The Verulam ARC Rally is to be held at the Watford Leisure Centre, Horseshoe Lane, Garston, Watford, Herts, off A405 near M1 junction 6 and M25 junction 21A. Doors open 10am to 4pm. Features include trade stands, Bring & Buy, grand raffle, cafe, licensed bar and free parking. Morse tests will be available. Details from Walter G3PMF on (01923) 262180 or Ralph G1BSZ on (01923) 265572.

## 1997

**January 19:** The Oldham ARC Mobile Rally will be held at the Queen Elizabeth Hall, Civic Centre, West Street, Oldham, Lancs. Doors open at 11am (10.30am for disabled visitors). This event will feature all the usual traders and a Bring & Buy stall. Morse tests are available on demand. Talk-in on S22 via GB4ORC, commencing at 7.30am. Mobile contact prize up to 2pm. Refreshments and free parking available. (01706) 846143 or 0161-652 4164.

If you're travelling a long distance to a rally, it could be worth phoning the contact number to check all is well before setting off.

The Editorial staff of *PW* cannot be held responsible for information on Rallies, as this is supplied by the organisers and is published in good faith as a service to readers.

If you have any queries about a particular event, please contact the organisers direct.

Editor

\*Practical Wireless & SWM  
in attendance

The Star Letter will receive a voucher worth £10 to spend on items from our Book or other services offered by Practical Wireless. All other letters will receive a £5 voucher.

# RECEIVING You

PW's Postbag. If your letter is published you'll win a prize.

**Letters Received Via The 'Internet'**  
Many letters intended for 'Receiving You' now arrive via the 'Internet'. And although there's no problem in general with E-Mail, many correspondents are forgetting to provide their postal address. I have to remind readers that although we will not publish a full postal address (unless we are asked to do so), we require it if the letter is to be considered. So, please don't forget to include your full postal address and call sign along with your E-Mail hieroglyphic! Editor

## Limited Companies

Dear Sir

The RSGB Again! It is fashionable nowadays to treat all organisations as if they were limited companies, in business to sell their goods or services. Limited companies have shareholders, management, a work force and customers and they trade in competition with other companies. I believe that many critics treat the RSGB in this simplistic way.

The RSGB is not that kind of organisation. Its purpose is not competitive trade, but the furtherance of amateur radio. It has something in common with a learned society or a professional institution. It has neither share holders nor customers (except perhaps for the sale of books). It is a special interest society and like other similar societies, it has members. The members are the society and the society's interests are the consensus of those members who bother enough to express their views.

In common with other societies it does employ a

small management/work force team, but most of its activities are 'run and done' by unpaid members, and especially by those who are voted into office by other members - those who care enough to vote.

The RSGB exists because the early wireless experimenters needed a national society to represent their interests in dealing with our government. In a sense it is kind of 'trade union', reacting to the policies and attitudes of the government's licensing authority.

Unfortunately, the attitudes of the various national authorities over the years have not always been helpful. At times, government departments attitudes are downright hostile to our activities, forcing the RSGB members to fight for amateur radio's corner. The present authority, the RA, seems co-operative, but has to reflect the views of government politicians, as well as having to oversee international rules and regulations. It is hard enough to get a committee of 6 to agree to anything, let alone international governments!

I would like to see 'phone patch permitted, free passage of third party messages, a progressive licence, a more relevant RAE and something more sensible that the Morse test to grade amateurs. At a time when government politicians talk of 'selling off' bits of the radio spectrum, as though it was a nationalised industry, the RA is unlikely to agree to radio amateurs doing as well please on the air. The British government is unlikely to change the rules for me, but politicians might listen more closely to the RSGB is the great majority of radio amateurs belonged to it. Criticism of the RSGB is not likely to change things - joining it might.

David H. Wright  
Dorset

## Awards Data

Dear Sir

You ask in the current PW for a source of data on

awards. Clearly the Internet isn't the fount of all knowledge, which I suppose is just as well for PW. Anyhow, I doubt if you will find a more comprehensive list than the *K1BV Awards Directory*, produced annually by K1BV (Ted Melnosky).

It contains details of 2445 awards (in this year's edition), from the basics (WAC, DXCC, WPX, WAZ, etc.), through fairly sane ones (working all the Polish provinces or all the Japanese perfected) to some that are downright whimsical. Some are fairly easy (Worked Twelve Islands) and some fiendishly difficult or they would be for me (Worked 300 countries on 5W).

Costly? Surface mail (doesn't take too long), \$18, air mail, \$25. Ted is at: 65 Glebe Road, Spofford, New Hampshire Tel: (01346) 24411 and on Internet k1bv@top.monad.net and no, I'm not an agent and I don't get a cut! But,

mention my name/call, he might give me a percentage off my next copy!

Rod Stevens G3TVI  
Hampshire

Editor's comment:

Thanks for the information Rod, which I'm also passing on to Leighton Smart GW0LBI (compiler of 'HF Far & Wide' column). Leighton would find any information such as that supplied by G3TVI, to be of great interest for his readers. So, to help other DXers, I ask all you keen 'Certificate Hunters' to keep Leighton informed by writing to the address on his page.

## Samuel Morse

Dear Sir

I was interested to read in your July issue about Samuel Morse and his original code. It reminded me of my days as an operator at ZLB, Awarua Radio in the deep south of South Island in New Zealand. Sadly, the station closed some time ago as the use of Morse in the maritime service decreased.

Most of Morse's code was different to the 'modern' version and has been forgotten but his 'O' is still to be heard and was certainly used in the maritime service. Morse's 'O' was two dots, not quite an 'I' and not quite two 'E's' but somewhere in-between and is often used in 'OK' or the abbreviation 'OM' (Old Man). A bit of a trap to the new operator.

I enjoyed the July issue as, for those who appreciate it, Morse operating is a delight. But I can also understand the feelings of

## Apologies To Rudyard Kipling

Dear Sir

Please find enclosed an item for 'Receiving You'. I was reading Rudyard Kipling recently and was inspired to compose an amateur radio version of 'IF'. This may seem an unusual subject for verse, but I think I have summed things up quite well.

At least it is a change from your standard diet of RSGB knockers (though I am not over enthusiastic about the organisation myself) and the 'I don't want to play until they move the goalposts for me'. Morse test moaners.

Incidentally, I have been reading PW for a long time on and off and still have the first copy I purchased in 1961.

M. Rathbone G3ZII  
Lancashire

**IF**  
*If you can keep your frequency when all about you  
are losing theirs and blaming it on you,  
If you go back to any station that will shout you  
and never once give way to shouting too!  
If you can say how circuits are constructed  
to multiply, divide or synthesise,  
and how and rf. current is conducted  
and yet not sound too smart, nor talk too wise!  
If you encourage each and every small sign  
of interest from the young fraternity,  
maintain the continuity of call sign  
keep hands on bands when you're a silent key,  
If you can copy code and contacts spoken  
all accurately logged within the rules  
and when you find the field day rig is broken  
get back upon the air with makeshift tools.  
If when it's over, though you did not win it  
you're glad that you took part and found it fun,  
yours is the earth and everything that's in it  
and which is more, you'll be a 'Ham' my son!*

those for whom it is a curse and merely an obstruction on the route to h.f. operation.

**Brian Drumm**  
New Zealand

**Editor's reply:** Nice to hear from one of our New Zealand readers Brian. But it's a great pity I can't get down to see you for the price of an airmail stamp. Any chance of an invitation (complete with airline ticket) to provide a club talk in New Zealand?

## Bricks & Flying Objects!

**Dear Sir**

Having sat down and digested all the comments, bricks and other flying objects over the last few months I thought it was time to put pen to paper. What the amateur population needs to realise is that as far as the regulatory body is concerned we serve very little purpose and contribute small amounts of revenue for the amount of work we generate.

Professional bodies would give their eye teeth for our v.h.f. allocations and be prepared to pay the going commercial rate (far more than our licence fee). Unless we stick together and negotiate with one voice we stand no chance of surviving in the 21st century.

Look in the amateur press and you'll find bickering about c.w., RSGB, CB, Novice and now the UKRS. What has to be realised is that we serve no real purpose, the days of providing a core of people trained in the art of wireless telegraphy (and telephony) are over. Listen on the bands, 'black box' operators taking to 'black box' operators.

We have to be seen to be progressing and improving at all times. I had some time QRT and returning to the bands found the concessions gained by the RSGB including: 50MHz, operation by Class B operators above 30MHz.

The Novice scheme, c.w. operation by Class B operators, representation on professional bodies, the list goes on. Lets look at ourselves and improve, support the RSGB and clean up our act.

**Tim Hague M0AFJ**  
Milton Keynes

## Mail Order Charges

**Dear Sir**

I wonder how many of your readers have noticed the excessive increase in the small order handling charges brought in with the issue of the new MPS (Maplin) catalogue. Last year the handling charge was £1.55 and, considering the cost of a 'padded' bag and a first class stamp, I would have thought that this left a quite reasonable margin to cover the cost of picking and packing the order, especially as this was probably done on a computer generated list.

This charge has now gone up to £2.95 (nearly double!). True, there has been a slight increase in the cost of a first class stamp, but I very much doubt that jiffy bags have soared in price by a factor of over a pound. (If they have, I'd better get some shares in the company).

You do get free delivery if you order over £30 worth of goods, but how many people experimenting in electronics put together an order of that magnitude. Are Maplin trying to tell us in a roundabout way that they are not really interested in supplying the lonely Hobbyist? It would be interesting to hear how they justify such a swingeing increase which is many times the inflation rate.

**Mike Rowe G8JVE**  
West Sussex

**Editor's comment:** To seek an answer to Mike Rowe's questions and comments, I wrote to Maplin and received a reply from their Managing Director:

"Maplin Electronics remain fully committed to both its

hobbyist and trade customers. We have chosen to realign our carriage charges to reflect normal industry practice and to provide free carriage for the first time to the large number of hobbyist customers who order goods to the value of over £30 inclusive of VAT.

Last year the carriage and packing charges varied between £1.55 and £7.55 depending upon the weight of the items ordered. You will appreciate that we incur a fixed administration and picking cost with each order and we believe that the new charge structure reflects more fairly the nature of our cost base. We do not seek to make any profit out of this charge, but simply to recover our costs.

The new September catalogue does bring the following benefits to our many hobbyist customers:-

- quantity discounts available to everyone
- improved section layouts
- products easier to find
- over 17000 hobbyist and industrial products in one catalogue
- full semi conductors pin-out information for the major logic families
- same day despatch for all orders received before 5pm

We are launching a new store opening programme (starting with the new Luton Store in the Arndale Centre on 10 October 1996) to bring the 'world of electronics' directly to many more hobbyists. Remember, many hobbyists go to their nearest Maplin store and thus avoid carriage charge altogether.

We now publish our full catalogue twice yearly to ensure that the latest products are more readily available. Far from abandoning the hobbyist, we are investing significantly to serve his developing needs and provide value for many products and services".  
**A. D. 'Sandy' Black**  
Managing Director  
Maplin Electronics PLC,  
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Essex SS6 8LU

## This Month's Star Letter

### The 934MHz Citizens' Band

**Dear Sir**

Reference the pending closure of the 934MHz Citizens Band. Representing all 934MHz users along the south coast from Hastings to Littlehampton, and on their behalf, I would like to express a vote of thanks to you for your comments in the Editor's Keylines (October edition) of *Practical Wireless*.

How nice to hear the Amateur Radio Fraternity, sympathising with us in our hour of need. We do condemn the decision to close this very pleasant and user friendly citizens band and we will fight on until the very final 'over' at the end of 1998.

Multi-million pound radio telephone businesses go on expanding, taking up every spare section of the radio frequency spectrum, and obviously the RA has given way to the pressure for even more of it, including our little segment at 934MHz. It's no way to treat the stepping stone frequency to amateur radio, since this is how it has developed. In fact, many users have gone 'amateur' and have even turned back to it occasionally.

The loss of 934MHz Citizens' Band radio could be the thin edge of the wedge for cuts into the amateur radio band plan, who knows what the future holds. Those of us still using 934MHz have indeed spent vast sums of money over the years since 1982, so why

should we have to ditch all this equipment? Without response from anyone either! Perfectly good radio equipment that will become obsolete and useless and illegal after midnight December 31 1998.

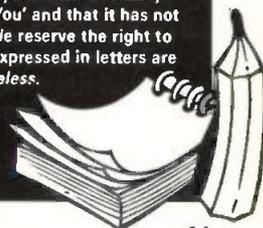
I appeal to all users of 934MHz nationwide, fight for the postponement of the closure, write to your MP, to the Minister for Telecommunications, to the 934MHz Club UK, the Radiocommunications Agency, the DTI, to the Publishers of the *CB Magazine*, in fact, everyone and anyone who may help use in our cause. Remember, united we stand, divided we fall!

Thanks again Editor, please, please keep up the pressure, we are a minority but we do love our 'gentleman's band' as you call it. It has been, and always will be, an example of how Citizens' Band radio should be used and all users are proud to be associated with it.  
**John Hardy**  
West Sussex

**Editor's reply:** In my opinion John is right...the loss of the 934MHz CB allocation could really be 'the thin edge of the wedge' as the pressure on the 'non professional' (limited revenue earning) spectrum such as Amateur Radio and CB is unrelenting. We should not be complacent, the 430MHz band is already a prime target as recent events have proved!

Reader's letters intended for publication in 'Receiving You' must be original and not be duplicated. Letters are accepted on the understanding that they have only been submitted to *Practical Wireless*. Please ensure that your letter is clearly marked 'for publication in Receiving You' and that it has not been submitted to other magazines. We reserve the right to edit or shorten any letter. The views expressed in letters are not necessarily those of *Practical Wireless*.

Send your letters to the PW Offices, marking it clearly for 'Receiving You'



## Short Wave Home Page

The International Short Wave League (ISWL) now has its own Home Page on the Internet. The page contains details about the ISWL's activities, current Club Call operators, QSL information, Net times and Membership details. The page can be viewed at <http://www.aber.ac.uk/~srj5/iswl.html>

# NEWS 1996

## New Books

Several new titles have been added to the Book Store shelves this month and three that you should look out for are the *RSGB Amateur Radio Call Book And Information Directory 1997* priced at £13.50, the *ARRL Handbook For Radio Amateurs 1997* priced at £25 and *Passport To World Band Radio 1997* priced at £15.50. All the books mentioned are in stock and available now!

So, don't delay place your order today. That way you'll be sure of getting your books in time for Christmas.

Compiled by Donna Vincent G7TZB

## Young Amateur Of The Year Is M0AAU

The 1996 Young Amateur of The Year is 14 year-old **Christopher Davies M0AAU** from Shrewsbury in Shropshire. Runner-up is **Benjamin Clarkson G7WHO**, also 14 years-old from Reading in Berkshire.

The announcement of the winner and runner-up was made during a special ceremony at the RSGB's HF & IOTA Convention at the ICL Beaumont Conference Centre in Old Windsor on Sunday 6th of October.

Christopher Davies M0AAU became interested in radio at 12, became the youngest Novice in Shrewsbury and sat the RAE when 13. He's a keen antenna constructor, Raynet member and is working for his Duke of Edinburgh's Award at school. Benjamin Clarkson G7WHO passed his Novice RAE soon after



his 12th birthday - despite suffering from colour blindness and severe dyslexia. He regularly helps the St. John's Ambulance Brigade and has supported the JOTA event and has broadcast on the BBC Activ-8 programme.

Prizes were presented by Roger Louth on behalf of the Radiocommunications Agency, RSGB President 1996 Peter Sheppard G4EJP, Peter Simpson of Wray Castle (College), Dennis Goodwin G4SOT of Icom (UK)

**Young Amateur of the Year 1996 Christopher Davies M0AAU (left) and runner up Benjamin Clarkson G7WHO.**

and Tom Crosbie G6PZZ of Lowe Electronics.

Everyone on the *PW* team would like to congratulate Christopher and Ben, and pass on our good wishes to them. **Editor.**

## Nevada's New Addition - The PW Baby

**Mike Devereux G3SED** of Nevada Communications and **Marcia Brogan** formerly of *PW*'s Advertising Department are pleased to announce the birth of their first baby, **Marianne**, who weighing in at 6lbs 1oz was born on the 10th September. Mike and Marcia first met through *PW* and when Marcia left the magazine she moved to Portsmouth to set-up home with Mike, where they have lived for the past four years.

Mike says he has already enlisted Marianne's help in reading weak DX stations on 'Top Band' but that her Morse technique still has some way to go! So, no doubt it won't be long before Marianne is helping out 'Dad' on Nevada's shop floor.

Both Mike and Marcia say they would like to offer a big 'thank you' to *PW* Publishing for the birth of their baby, as if it hadn't been for the magazine they never would have met! So, you could say it's *PW*'s baby!

Everyone on the *PW* team would like to congratulate Mike and Marcia on the birth of Marianne and pass on their good wishes to all three. **Editor.**

## Weekend Workshops

A series of practical workshops are being run by **Rob Keyes GW4IED** of **KeySolar Systems** starting in November and running through 1997. The idea of the workshops is to give people the opportunity to work with others in a well equipped workshop on projects that they perhaps wouldn't normally be able to undertake.

The workshops will be held in Newport close to the M4 Junction 25 on **Saturdays 12 - 6pm** and **Sundays 9am - 4pm**. There is accommodation available close by and an area suitable for caravans.

For more information and details on how to get involved telephone or FAX GW4IED on **(01633) 280958** during office hours.

## Mosley Winner

**John Morris G4BXS** of Yelverton in Devon was the lucky winner of a Mosley Beam antenna kindly



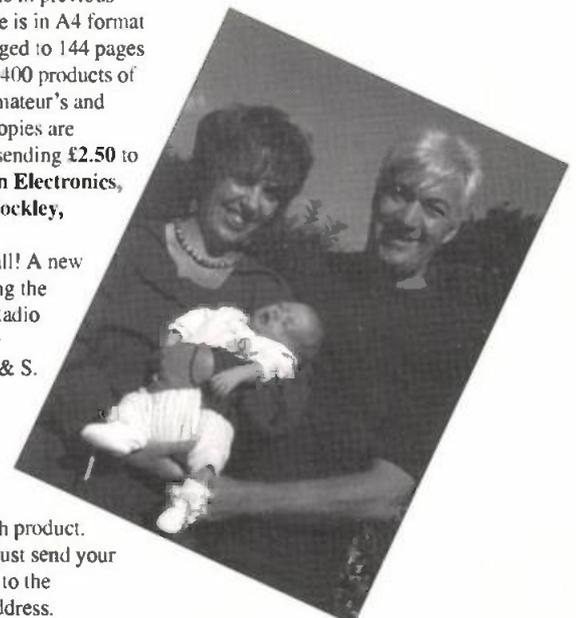
donated by **Tim Thirst** of Eastern Communications of Norfolk for a *PW* competition. John entered the *PW* Antenna Wordsearch competition run in the April '96 issue and his was the first entry pulled from the Editorial biscuit tin!

John is pictured here holding one of the trap assemblies from his Mosley Beam antenna. If you would like to know more about the range of Mosley antennas why not contact Tim of Eastern at **Cavendish House, Happisburgh, Norfolk NR12 0RU. Tel: (01692) 650077.**

## New Catalogue

The newly published **Waters & Stanton 1997 Annual Product Catalogue** has recently landed on the 'Newsdesk'. As in previous years the catalogue is in A4 format but has been enlarged to 144 pages and contains over 400 products of interest to radio amateur's and hobbyists alike. Copies are available now by sending **£2.50** to **Waters & Stanton Electronics, 22 Main Road, Hockley, Essex SS5 4QS.**

And that's not all! A new brochure containing the range of Watson Radio accessories is now available from W & S. The full colour 4 page brochure contains a brief description together with a photograph of each product. To get your copy just send your name and address to the aforementioned address.



# Saturday Is PW Award Day At Leicester 1996!



Dave Wilkins G5HY (left) of Kenwood Electronics (UK) Ltd., presents the 'Spotlight' Club Magazine Trophy to representatives of the Hoddesdon Club while Editor of PW Rob Mannion G3XFD looks on. The Hoddesdon RC scored a maximum 48 points (out of a total of 50) for their winning Newsletter. Hoddesdon are the first winners, and will hold the cup for a year. (Please see the forthcoming January 1997 issue for the 1997 Spotlight Trophy Competition rules and dates).



**Warrington win the Cup!** (left) In this case, it's the Practical Wireless 144MHz QRP Competition Cup in question, and it was presented to the Warrington Contest Group G3CKR/P. Contest Adjudicator Dr. Neill Taylor G4HLX (left) presented the winner's cup to Dan Leong G4WDL while Barry Cooper G4RKO of Yaesu (UK) - centre right - presents Eric Gedvilas G8XVJ with the Yaesu donated prize of a Yaesu FT-10R 144MHz hand-held transceiver.



The runners-up (right) in the 1996 QRP Contest were the 'North Wales Wafflers' GW0NWR/P. The group, seen accepting their (second!) Solar Panel Unit (Kindly donated by Key Solar Products) from Neill Taylor G4HLX are determined to win next year...even if the sun doesn't shine!

## Drayton Now In Somerset!

The latest kit to come from the Walford Electronics stable is the Drayton broadband crystal controlled c.w. transmitter. The Drayton is capable of working anywhere within the 1.8 to 15MHz band and is supplied with a 3582kHz ceramic resonator for

3.5MHz.

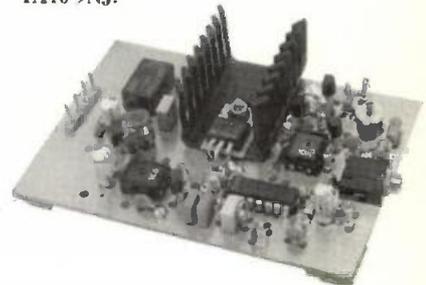
The Drayton's on-board trimmer allows a 40kHz swing thus making it possible to cover all the 3.5MHz QRP and Novice sections. For use on other bands the operator only has to change the crystal.

Also included is a side tone oscillator, RX muting, antenna changeover relay with a set of spare contacts, semi or full break-in control with netting facilities. The Drayton kit comes complete with

all the hardware for use with Martock and Pitney receivers and is said to be an ideal project for the Novice.

The Drayton is available for £24 plus £1 P&P but if you order a Martock receiver at the same time the pair will cost you £60 post paid (normal price of the Martock is £36 plus P&P). For more information on the Drayton or any of the other kits in the Somerset Range send an s.a.e. to Tim Walford at Walford

Electronics, Upton Bridge Farm, Long Sutton, Langport, Somerset TA10 9NJ.



## Holly's Hobby -

### Building The Pitney

*We start them young in Dorset! And nine year-old Holly Sibley describes in her own words how she tackled The Pitney receiver from Walford Electronics with guidance and advice from Clive Hardy G4SLU.*

I am nine years old and am a member of the Badgers group at the Wimborne Division of the St. John Ambulance. This year I took the Communications



badge, which I needed to pass before I could use the St. John Ambulance radios.

I had to learn the proper radio procedures. It is very important to use the correct procedure, especially when it gets busy, or there are urgent messages to pass.

As I was taking the badge, I decided to try for the Novice Radio Amateur Exam as well. As part of the badge work our group visited the Dorset Police control room, where Richard GORSN gave us a guided tour. He is a member of the Dorset Police ARS, and together with some other members,

Clive G4SLU and John G0SKR, he helped me to pass Part 1 of the Novice exam. I have started preparing for Part 2 and learning Morse Code now.

The radio and the audio amplifier I built for the Part 1 work well. To keep them safe my Dad has fitted them into an old biscuit tin.

Clive suggested I could try building the Pitney receiver. This was the first proper radio that I had built. As a novice I thought the kit looked rather daunting, but once I had read the instructions it seemed simpler.

All the parts were clearly marked on the layout diagram, and no pieces were missing. The layout diagram was quite easy to follow, but it would have been better if the p.c.b. had been screen printed to show where the parts go. Otherwise, the kit went together beautifully.

My Dad gave me a little bit of help with the kit. He's not a radio amateur and hasn't built a radio kit before either, so building the Pitney was almost all my own work.

I altered the tuned circuit of the

Pitney as suggested in the instructions so that it covered three amateur bands, 1.8, 3.5 and 7MHz.

For an antenna I'm temporarily using an indoor long wire which my Dad fixed around the ceiling of my bedroom. It works very well and I have had great fun listening to the Pitney.

The tuning is very precise, so a very steady hand is needed to pick-up stations clearly, but that's all part of the fun. I would certainly recommend it to other novices for a first time kit. I'm looking forward to seeing the matching c.w. transmitter that is being designed to go with the Pitney.

Practical Wireless gratefully acknowledges Tim Walford G3PCJ's help in donating the Pitney kit built by Holly. The kit costs £27 plus £1 P&P and is available from Walford Electronics, Upton Bridge Farm, Long Sutton, Langport, Somerset TA10 9NJ. Tel: (01458) 241224.

PW

# HAYDON COMMUNICATIONS

**WARNING!!** Not all advertisers in this magazine are authorised stockists for the products they sell. Manufacturers advise customers to purchase from authorised dealers to ensure full company guarantee back-up. HAYDON COMMUNICATIONS sell only brand new factory sealed stock direct from the manufacturers and are authorised for all its brands.

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Zoë says:  
"keep the News and  
those Club  
magazines coming!"

# CLUB Spotlight

Compiled by Zoë Crabb

## Weekend On The Air '96

Following the success of the special event station **GB100NT** last year, the **Bury St Edmunds Amateur Radio Society** asked the National Trust at Ickworth House if they could operate a station at the same site again. They agreed and the weekend of the 10 and 11th August was fixed.

The idea was to run a demonstration station using the club callsign **G2TO** with the addition of the club 'X' prefix, which meant that non-licensed members could send greeting messages under supervision. The club also asked **Chris Brown G0JRM** if he would like to take advantage of the glass display cabinets in the lecture theatre at Ickworth to stage an exhibition of vintage broadcast receivers and equipment depicting the history of radio.

The chairman of the club, **Kevin G1VGI** 'arranged with some of his friends' to put ropes over the upper branches of an oak tree some distance from the house on the Saturday, prior to the event so that one end could be anchored to the **G5RV** antenna. The other end was fixed through a ring in the wall outside the House Manager's kitchen window near the top of the famous Rotunda! This time it was the help of the Treasurer's friends!

On the evening of Friday 9th, a working party assembled to put up the **G5RV** and install the equipment. **Chris Brown** arrived with a car full of exhibits and returned for a second load, which were duly set out in the display cabinets. It was decided that the club's **FT-101ZD** and the home-

built a.t.u. would be used in order to minimise the amount of equipment which members would need to provide.

Saturday came with a fine morning and a good attendance of members to operate. Things started off with a session on the key on '80', then continued on s.s.b. throughout the rest of the day with a break in the afternoon to give **Chris** a chance to give working demonstrations of 1920s receivers. **Roger GOKME** had kindly brought along his **KW Atlanta** transmitter as a back-up and had a session on '80', using a little more power than the 100W max from the **FT-101!**

Sunday dawned with the weather turning thundery with heavy showers which became prolonged as the day went on! In spite of static, the club managed quite a few contacts and **Roger GOKME** put his **Atlanta** to good use in the afternoon.

The DX bands were not very good, so the club decided to stay on '80' and have a bit of a natter with

## Glamorgan Success

The **Mid-Glamorgan Amateur Radio Group** was primarily set-up as a teaching group. The club boasts 21 passes in the Novice RAE and six in the full RAE, with a total of five Novice instructors and two Morse instructors.

The Morse group is always busy and can also boast many successes. Construction projects are run and the group have recently completed eleven 'Sudden' receivers.

The **Mid-Glamorgan Amateur Radio Group** are an unusual group in that there is no committee as such, just several key people who have lots of experience to give advice when needed. No committee means no formal meetings so its radio, radio and a bit more radio!

All the members agreed that there is too much 'hassle' at work with meetings, stress and decisions. So, they say by having no committee means no arguments, and it apparently it works like clockwork! There is no joining fee and all tuition is free!

Members meet every Thursday night in the **Sports & Athletic Club** in **Aberkenfig, Bridgend**, and normally about 25-30 people turn up. Find out some more details from **Roger GW3XJC** on (01656) 733729.

each station rather than the contest style of rubber stamp QSO! Just under 100 stations were worked over the two days and nearly 90 QSL cards were sent out via the bureau.

Taking the antennas down and loading the equipment into the cars was rather a wet operation, but in the end, the weekend was declared a success and enjoyed by those who came along to join the fun. Several of those present asked if it would be possible

to repeat the visit another year, so it is up to you all!

Perhaps if the club can get a station on the air at **Culford**, it will fulfil the same purpose and give members a chance to operate and when the **GX2TO** call is in use, the club can allow non-licensed members to send greeting messages. We shall see!

The club would like to say thanks to everyone who came to help to make the weekend the success it was. In

particular, there's a special thanks to **Chris G0JRM** for his exhibition and demonstrations, which attracted more attention than the modern amateur equipment and really did have the visitor's 'dancing in the aisles' to the 1930s strict tempo dance bands, such as the **Savoy Hotel Orpheans** and crooners like **Al Boley!**

Last, but certainly not least, the club are indebted to the **National Trust** at **Ickworth** and in particular the **House Manager, Alan Langstaff** and his wife **Linda** for allowing the club to hang antennas from their flat windows. A suitable letter and a small thank you gift has been sent.

## What's With The Web?

**Bob Glasgow GM4UYZ** from the **Cockenzie & Port Seton Amateur Radio Club** has recently E-mailed 'Club Spotlight' with news that their radio club has a World Wide Web (WWW) page. The Web page appeared back in February of this year and has been read a great number of times. It can be found at: <http://www.eece.napier.ac.uk/~ajd/cpsarc.html>

Information, including the history of the club and organised events for the year are all on the Web page. **Bob** says that in a way the club is special as they are a club in name only. Apparently, there is no official structure ie. chairman, treasurer, etc., and since the club was formed in 1984, this has worked extremely well.

Find out more by looking the club up on the Web page, or get in contact with **Bob** on (01875) 811723.

A member of the **Felixstowe District Amateur Radio Society**, **Alan Taylor G7UAJ**, has E-mailed with news that they, too, have a Web page, and have done for quite a few months! He says to check out: <http://homepages.enterprise.net/agtaylor/fdars/club.html>

**Ray Gamble** of **Sharward Promotions** has also notified 'Club Spotlight' that they are on the Internet. You can obtain a complete list of events from <http://www.keme.net/~sharward/htmdocs/> for the remainder of 1996 and all of 1997.

Or, alternatively, write to: **Knightsdale Business Centre, 30 Knightsdale Road, Ipswich, Suffolk IP1 4JJ** or 'phone on (01473) 741533, FAX on (01473) 741361 or E-mail on [services@sharward.keme.co.uk](mailto:services@sharward.keme.co.uk)

## Hambleton Amateur Radio Society

The **Hambleton Amateur Radio Society** recently contacted 'Club Spotlight' with details of their forthcoming programme schedule and news of **Tim G0TYM** (Chairman) in winning the **G3AWL Trophy**, the competition established in memory of **Tom Luxmore**. Well done **Tim!**

Others who took part in the competition included **Brian G3KJX** and **Brian G7PLR**. The competition is an ideal way to encourage Morse and to benefit a charity at the same time.

A few up and coming events for the Society are: November 21 - Talk on electricity safety by Richard G7HHK, 28th - Operating night on vintage and d.i.y. equipment, and on December 12 - Social event.

All meetings are held at **Allertonshire School, Northallerton**, 7.30 to 9.30pm and more details are available from **John G0VXH** on (01845) 537547.

## Lightships & Lighthouses Wanted!

**Anne-Grete Eriksen OZ3AE** has written into 'Club Spotlight' in a plea to explore the possibility of making a joint European Lightship (& Lighthouse) Award. Here she tells us all about it. It's very interesting!

"Almost three years ago a group of Danish amateurs got together to make an amateur radio station in the radio room of the museum lightship **FYRSKIB XXI**, which is lying in a newly built museum harbour for wooden ships that were formerly in public service.

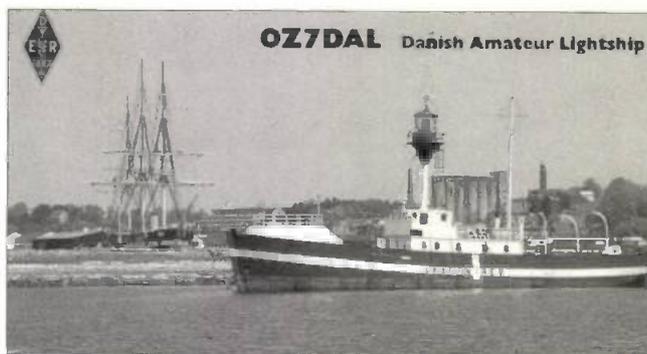
**OZ7DAL** 'Danish Amateur Lightship' has been the National (Club) Station since 25 March 1994. One cabin is reserved by Danish amateurs and all year round they live on board and use the ship's facilities. By being QRV in the old radio room and talking to the museum's visitors, we can show an otherwise 'hidden' hobby, create goodwill and possible help in 'procuring' the next generation of radio amateurs.

We also invite all radio amateurs to visit and become QRV in the radio room is manned. As Ebeltoft is the centre of a recreation region, by now almost 700 Danish and about 125 foreign amateurs have visited, making the old galley-cum-mess a cozy meeting place when Gallons of 'lightship'

coffee is consumed (amateurs only) and many stories of life on the airwaves is being narrated. The radio room is open if a Danish radio amateur has 'signed on', which was the case in 155 days during 1995!

Also, Germany has amateur activity in museum lightships. Following an article about **FYRSKIB XXI** in *CQ DL*, we received a request from the Awards Manager of the German 'Feuerschiff Dipolm' - did we want to join? After some discussion, a conclusion was reached in full agreement with the Germans.

The German Diploma is OK, but, with known activities in Portuguese lighthouses, British lighthouses (national lighthouse weekend), North Carr Lightship **GB2NCL**, Le Port Musée in France - there simply had to be activities that we did not yet know of.



So, we set about to contact the known activities and possibly find new in order to determine the interest in making a **Joint European Lighthouse & Lightship Award**. We have thought of the lamp as the dominant feature on the award.

In spite of having sent letters (during the latter part of April and in May) to almost all national amateur radio societies in Europe (bordering the sea). I have yet to receive just one letter of response!

For some countries, I know I'll have to wait a little longer as I had a cheap-chance of reaching Finland, the Border States, Russia and

**OZ7DAL 'Danish Amateur Lightship' is on board FYRSKIB XXI, a museum ship built in 1910-11.**

Poland via the XI Baltic Seminar, where the theme was Pilots, Lighthouses and Navigational Aids, which was held in Finland during the first days of August.

For more information, please write back (preferably by country) to **OZ7DAL, DK-8400, Ebeltoft, Denmark** including your ideas, suggestions and opinions. It saves postage getting it altogether at once!"

## Only Another 1400 Miles To Go!

The **Sutherland & District ARC's** AGM was held back on 31 August 1996, in Golspie, Sutherland (IO78AX) at the club shack at Dunrobin Farm. The SADARC is probably one of the smallest clubs in Britain with only 12 members, but with a membership travelled a combined distance of over 1400 miles just for an AGM! That must be a world record.

**Kevin G1FYS** and **Len**, s.w.l., travelled up from Huddersfield, Yorkshire (467 miles) just for the AGM! Other members come from Inverness (54 miles), Naim (70 miles), Betty Hill (95 miles), Achfary (85 miles), Inver (25 miles), Edderton (19 miles), Laig (20 miles) and Domoch (12 miles). Add that lot up and it comes to 1438 miles, now, that's not bad for only 12 local members!

A great night was had by all, cakes being provided by **Ken GM2CWL's** wife, which went down very well, in fact, not a crumb left! Ken and his wife **Dorothy** are better known throughout the Highlands as **Mr Bun & Mrs Bun!**

This Mr & Mrs Bun title was given by another local amateur, **Norman GM4JNB** (Great Uncle Bulgaria) due to the fact that when you visit Mr Bun's QTH, you get a cup of tea and a lovely slice of cake, this along with a great aroma of baking coming from the bakery brings in amateurs for miles around!

'Mr Bun' now has a whole 'bakery on the air' now. His son **Colin MM1AEL** and Colin's son **Bryan 2M1EAU**. All members of the Sutherland club.

Sutherland is the biggest county in Europe, with least number of people. In fact, it has more deer than people! It also has one of the rarest squares in the UK, IO88 or the good old X-ray Sierra (XS) which up until a year ago had no amateur living in it. Now it has three, **GM0HLV**, **GM7ASN** and **GM0JOL**. All active, so there is no excuse not to work it!

The Sutherland club meet every Friday night at 1930 at Dunrobin Farm throughout the year. Visitors are always welcome, so if you're around or just passing through, give **GM0IYP** a call on 145.500.



**After travelling all that distance, I'm surprised all of the members of the Sutherland club aren't sat down! Do you travel a long way to go to your club meetings? If so, write in and let's hear all about your club and it's activities. You never know, you might even recruit new members too!**

# Amateur Television

By Graham Hankins G8EMX

*If you're an avid reader of Graham Hankins G8EMX's 'Focal Point', but haven't actually got around to ATV operating or want to know more, read on - this comprehensive introduction will no doubt leave you wanting to have a go!*

Picture this. It's 10am on a Sunday morning, date - somewhere in the nearish future. All over the UK, thousands of radio amateurs and electronics enthusiasts are ready to receive the national and local news transmission from the Radio Society of Great Britain (RSGB).

For years, receiving the RSGB news had just meant turning on their h.f. or v.h.f. rig and listening to a voice. But for the next half hour, Class A licencees, Class B stations and Novices to the amateur bands are going to be watching their favourite hobby on TV.

The network of 1.3GHz Amateur Television Repeaters have been temporarily joined together by 10GHz links and are about to deliver, in vision and sound, the weekly RSGB news service for all radio amateurs.

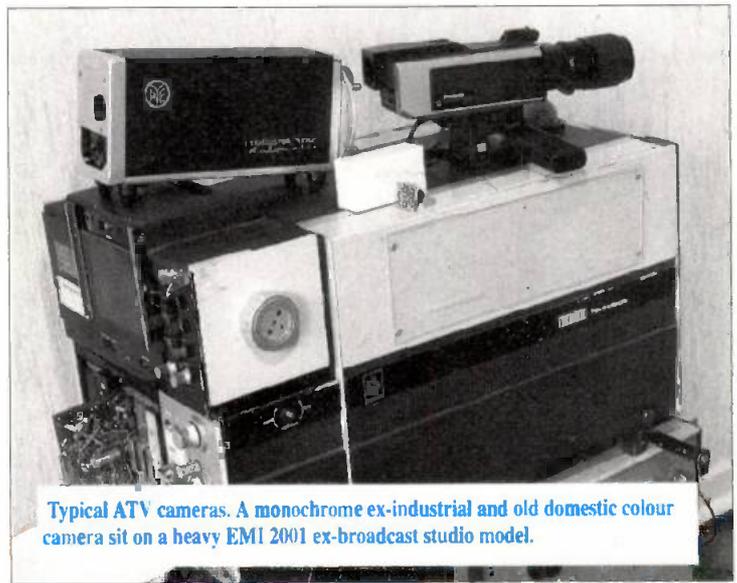
At 10.15am the 10GHz links will be broken, then each repeater will independently carry a quarter-hour of local news, presented by members of the British Amateur Television Club (BATC) who are switching between live colour cameras, video tape and computer-generated graphics.

My futuristic 'vision' could and may all happen. Thanks to the extension of the regular on-air activity, pioneering developments and vast possibilities offered by amateur fast-scan TV (FSTV), the transmitting and receiving of standard television pictures on the amateur radio bands.

Fast-scan amateur television adopts the same video system as terrestrial broadcast i.e. 625 lines top to bottom, 25 complete pictures (frames) every

second. A broadcast-quality signal will contain video frequencies from d.c. up to 5.5MHz, line rate synchronising (sync.) pulses at 15625Hz, frame sync. pulses at 50Hz, and colour signals on a 4.43361875MHz sub-carrier.

Amateur TV can and does nearly achieve broadcast quality, depending



Typical ATV cameras. A monochrome ex-industrial and old domestic colour camera sit on a heavy EMI 2001 ex-broadcast studio model.

on equipment and frequency band being used. A received ATV picture is reported by 'P' numbers, with a 'P5' picture achieving near broadcast clarity i.e. noise free, good definition, solid locking.

Progressively lower picture quality gives P4 down to a P1. This rating represents a very noisy image, just discernable with difficulty.

Generating and transmitting pictures is a specialist branch within the broad hobby of amateur radio, so dedicated ready-built ATV equipment is scarce. This means that there is plenty of scope for the most diverse and inventive analogue and digital circuitry, so home-construction still plays a big part. If you have so far only used speech and are keen to begin seeing other amateurs in vision, here's how.

## Before Camcorders

Before the development of camcorders and security systems, video cameras were only found in broadcast TV studios. The early ATV operator built their own, even colour!

Now, video cameras come in all sorts of sizes and weights! Consumer camcorders produce good definition colour pictures, are lightweight but not particularly cheap if you're only going to use them for ATV.

You may happen to have one

already. If not, perhaps borrow one from a friend or neighbour, they may even become interested in ATV themselves!

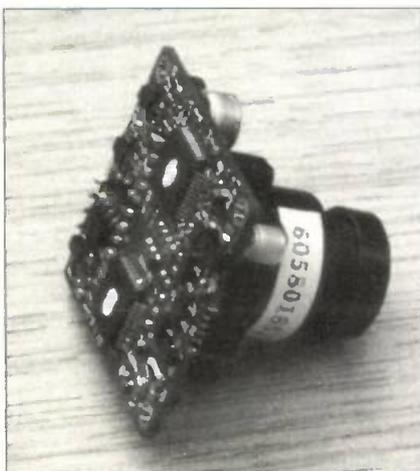
An amateur radio rally is the best place to find a used camera. There are plenty of small ex-surveillance units to be found, but the picture definition may be poor, or more likely the pick-up tube (if it uses one) may have a faint burnt-on image due to long periods focussed on a single scene. Good enough for ATV, but try to choose the best, or least worse, example!

Still smaller are the micro-video cameras now available from a number of dealers. Measuring only slightly larger than a 50p coin, these solid-state devices could even be put in a model boat or aircraft to send pictures from otherwise inaccessible angles. To the truly besotted ATVer, though, the larger the camera the better. So the 'holy grail' is broadcast-quality video from a camera that needs two to lift it!

Whatever camera you eventually settle on, it should have a 'video out' socket, ideally BNC but phono will do. We don't want modulated r.f. - yet. And if it is or can be powered from 12V, so much the better this means you can take it portable!

You may show your own production of received images, provided its content conforms to the restrictions of the amateur radio licence. However, you

Charge-Coupled Device (CCD) micro-camera with sound is only 3cm square.



# An Introduction



should not show feature films or other entertainment material.

## Computers

Computers can be very flexible for test-cards, captions and large text but remember you need a 625 line 50Hz video signal, which is not normally available from the PC. Machines most commonly used for ATV are the BBC Model B and the Sinclair Spectrum. Both types can still be found at rallies, computer fairs or from classified advertisements.

## Dedicated Video

A dedicated video card is where home-construction comes into its own. Many keen ATV'ers design and build their own particular video generating or processing card, but provided you can use or are willing to try wielding a low-power (eg. 25W) soldering iron, then p.c.b.s are available and only need populating with components.

For just putting on-air your own callsign within a test pattern, for station identification, the dedicated circuit board on a single p.c.b. is small and quick. Usually ROM-based, a stack of EPROMs can be manually switched (to give for instance your callsign /P when operating away from home) or automatically cycled with repeater news and information. Video switching or processing boards are as boundless in design and function as the needs of their users require.

Whatever picture sources you have, they should all produce a standard TV peak-to-peak composite video waveform (see Fig. 1). Amateur TV is permitted on all the UK u.h.f. and microwave amateur bands.

However, the most activity is presently to be found around 436MHz (70cm - ATV is not available to Novices), 1.3GHz (24cm) and 10GHz (3cm), see the various band plans for more detail. So, now let's see what's needed to get 'in vision'.

## Transmitting ATV

Amateur TV on 436MHz uses

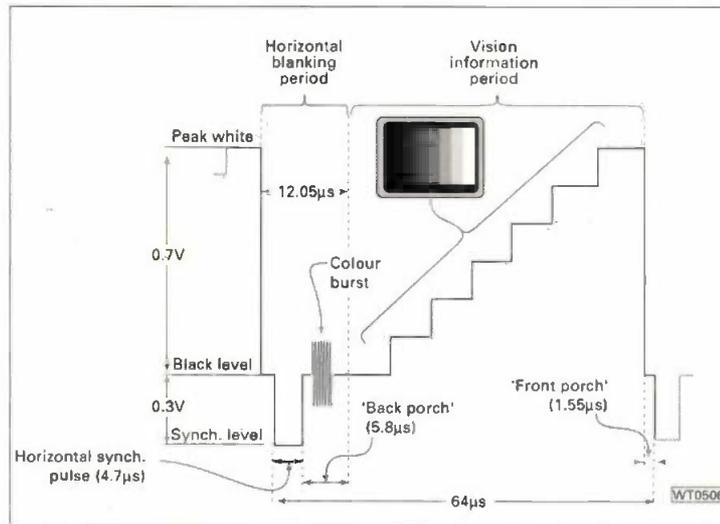


Fig. 1: Composite of grey test scale video waveform.

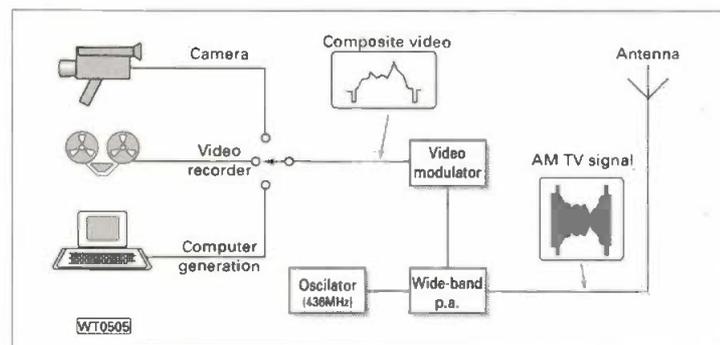


Fig. 2: Possible video sources into 430MHz transmitter.

amplitude modulation (a.m.) and the picture frequencies should be limited, with a filter, to 3MHz and no colour. You may already have nearly enough kit to transmit and receive an ATV picture on the u.h.f. band.

First take a normal 430MHz 'phone transmitter, 'black box' or home-brew, with its frequency modulation reduced to zero or disabled. Feed the 436MHz output into a wide-bandwidth (ie. 6MHz - 2 x 3MHz) power amplifier fed by a video modulator and you will be transmitting ATV! (see Fig. 2).

Note that after modulation the waveform is inverted, sync. pulses giving maximum carrier, peak white minimum carrier. This is called 'negative' modulation. And it's the system used by terrestrial broadcast TV so 430MHz ATV is easily receivable with any domestic set.

## Receiving ATV

An up-converter connected to the antenna socket of your TV is the easy way to receive ATV on the 430MHz band. An incoming ATV picture at around 436MHz is mixed with the converter's local oscillator (l.o) to produce a signal at around u.h.f. Channel 36. Tune your TV to low in the broadcast band and you should find that ATV station.

An up-converter p.c.b. may be available from the BATC and back numbers of the club magazine *CQ-TV* carry simple home-brew designs.

There are some limitations with 430MHz ATV. It's vision only (voice talkback has to be on another band, usually 144MHz), this band is not available to Novice licences and there is considerable other traffic now on

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Yaesu's new super dual bander is available from Martin Lynch & Son at a fantastic discount!

- Full remote head
- 50 Watts on 2M
- 35 Watts on 70cm
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- Built in CTCSS Encode
- Personal Computer Control
- Massive Omni-Glow Display
- 110 memories with Alpha display

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SAVING £254!!



## Yaesu FT-990

SAVE OVER £600!!



The Yaesu FT-990 has been a world best seller since its introduction a few years ago. Thousands world wide are used daily by Radio Amateurs who want a simple to use, beautifully built HF Transceiver. No other is built using plug-in boards for example, allowing servicing to be quick and easy. The FT-990 was the first to offer Digital Filters allowing high and low cut to the received signal.

- 100 watts on all HF bands
- General Coverage RX
- High Speed internal Auto ATU
- Available with or without internal PSU
- Digital hi/lo cut filter as standard
- Twin VFO's
- Fly wheel tuning
- Brilliant RF Speech Processor
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AC Version: RRP £2199 ML Price £1549!  
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SAVE  
£800!!



Icom's Flagship machine offering a massive 200 watts of power and DSP. Despite its size, the IC-775DSP is relatively light thanks to a high power switch mode supply fuelling the transceiver and huge brightly lit display.

- 200 Watts output
- Massive display
- Twin PBT on each I.F.
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- DSP also available for TX
- Auto Notch
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- Contest Keyer
- Fly Wheel Tuning
- Twin VFO's

Now just take a look at the price!

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## NEW! Icom IC-821H

Icom brings you the latest in all mode dualband technology. The new IC-821H is an "enhanced" version of the IC-820H, sporting some very important features. If you are serious on VHF/UHF then join the queue for the best of the best.

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- 45W on 2M FM
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- 40W on 70CM FM
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INCLUDING 5 YEAR WARRANTY & ACCIDENTAL DAMAGE

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- 5 - 1300MHz NO GAPS
- Tuneable bandpass filters for excellent image & intermod rejection
- 1000 memory channels with Alpha tag upto 8 characters
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- All mode as standard
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- Optional 500Hz CW/Data Filter
- Built in RS-232C interface
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- Digital AFC function
- Multiple tuning steps
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New boxed ICR-8500, FL52 500Hz CW/Data Filter (worth £129), Mains PSU (Worth £20), FIVE YEARS Breakdown & Accidental damage cover (worth £126)

ALL FOR £1699.00 SAVE £275!!

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The new IC-756 was rather like the new Jaguar XK-8 coupe at the Motor Show. You couldn't get near it! Like the new Jaguar the IC-756 is bursting with innovative features and (as long has been Jaguar tradition), offered at a very competitive price.

- Integrated 4.9" Data Display
- Band Scope
- Full DSP at 15kHz
- Visible TX Message on memory keyer
- Dual Watch as standard
- 160m - 6m ALL MODE
- 100W output ALL Bands
- APF, Twin PBT, Auto Notch



### SPECIAL PACKAGE OFFER:

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FL-222 1.8kHz SSBN.....£129

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## NEW! Standard C-156

The latest addition to the STANDARD CORP family, the C-156 will become the real "standard" in 2m handies. Typical Standard engineering with features that price for pound are unheard of in today's market. Take a look:

- Coverage 100-200MHz RX
- DOT Matrix LCD & Menu Display
- Message delivery, 10 fixed, 9 customised by user
- 39 tone encoder + 1750Hz tones built in
- 100 Capable memory channels, incl. Alpha tag, Repeater/simplex, offset, Tone Squelch frequency (option), + more
- Upto 5 Watts output with optional CNB 157 or 13.8V input.
- Lightweight & very compact, only 290g with batteries!



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## Yaesu FT-900AT

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RRP £1195 ML PRICE: £989

## Canon Power Shot 600

For those looking at a more professional approach to digital photography, take a closer look at the new Canon Power Shot 600.

- Stores images on optional PCMCIA internal Hard

- Drive or Flash card
- Captures 832x608 pixel images
- Maximum of 2500 images stored (stores 15 on internal memory)
- Sound recording facility with each image
- Industry standard file formats: JPEG & WAV
- Free Image Editing software
- Auto exposure, auto focus & auto flash
- High quality lenses
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- Parallel interface for downloading images direct to a PC
- Twain driver
- Massive 570k CCD
- Size 159Wx92Hx57Dmm
- Weight 380g (exc. battery)

PRICE: £899

or £199 deposit + 12 payments of £64.28  
Cost of loan: £71.36  
Internal PCMCIA card available at £399.

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Not only has JVC invented the worlds smallest lightest hand held CamCorder, they've produced it in the new "Mini DV" digital video format.

Offering quality of picture and audio that can only be described as breathtaking, the versatility offered by a unit so small, (it really can fit in your jacket pocket), is yet to be matched by any of the competition.

- Up to 60 mins recording with M-DV60ME tape
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- Lens F1.6, f=4.5-45mm
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- Colour View finder
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- Wide Band RX, 110-550 / 750-1300MHz.
- Smart Search sweeps a band and loads active frequencies in dedicated frequency banks.
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# Amateur Television - an Introduction

Continued from page 19

An Up-converter (left) and a 100mW transmitter constructed from BATC designs for 436MHz.

John Roberts G6DFH, a newcomer to the delights of ATV, receives his first P5 pictures on 70cm.

430MHz. So, keep the video filtered off at about 3MHz to give a 'black and white' but still perfectly viewable picture.

Even with the constraints mentioned, 430MHz is in regular use by many devotees. But to transmit a colour picture with sound, just like domestic TV, ATVers need to go up to 1.3GHz.

## Low Microwave Bands

The very mention of operating or building kit for the low microwave bands used to send a cold shiver into many a radio amateurs' heart! Critical circuit layouts, prohibitively expensive power devices and very few other stations around even if you did become operational.

Three major factors changed the face of microwaves for ATV. These were the affordability of medium power s.h.f. semiconductors, the improved performance of passive components at GHz frequencies and maybe the most significant, the almost universal adoption of frequency modulation for both vision signal and the sound.

The 24cm (1.3GHz) amateur band is 85MHz wide. This gives enough room in any one area for the input and output channels of an ATV repeater plus two other stations in direct contact.

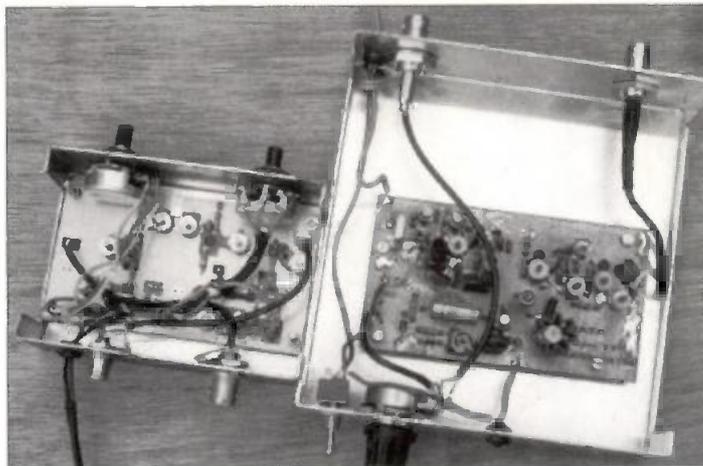
All the video sources used with 430MHz can be fed into a 1.3GHz system. If you have successfully and neatly built a p.c.b. generator card, try a 1W 1.3GHz ATV transmitter kit.

No searching for components, these come with everything other than signal connectors and a potentiometer! A power of 1W of r.f. is good enough for a local contact and will probably get you into your local repeater. Ready-built transmitters are available too, but if you are watching cost, the kit is the one to go for.

## Easiest To Receive

Using a satellite TV tuner is the easiest way to receive ATV pictures on the 1.3GHz band and if you can find a manually tuneable one at a rally, better still. Feed the tuner into the antenna socket of your TV, same as you did with 430MHz, and if an ATV transmission is available, a picture should be seen.

Again there are snags with trying to adapt domestic TV equipment for the amateur bands. Satellite tuners are expecting a high r.f. signal strength with wide f.m. deviation. Our ATV signals have much lower carrier deviation and certainly give a weaker incoming r.f. level, unless the ATV



station is very close by!

So, a pre-amplifier is often needed. These can be built or bought as a first step to improving your 1.3GHz receive set-up.

Then, maybe the tuner's f.m. demodulator can be modified for the lower amateur deviation. This will improve the picture contrast.

The ideal, though, is to use a dedicated 1.3GHz ATV receiver which will deliver composite video and sound into your monitor.

The 1.3GHz band brings not only colour and sound, it's also the first band where ATV repeaters are licenced to operate. Unlike voice repeaters, which do not transmit until accessed, ATV repeaters can be continuously radiating.

Most ATV repeaters put out a cycle of test cards and news pages, unless accessed by detecting incoming sync. pulses from an ATV station. Then, a repeater automatically switches to re-radiate the received sound and vision.

Amateur TV repeaters are managed and developed by a local Repeater Group, which may vary in size from just a handful of keen individuals to something along the lines of the huge Severnside ATV Group in Bristol. A pro-active Group will encourage useage of their repeater, improve its performance and facilities and may even publish a members' newsletter.

Here is a list of ATV repeaters, all are 1.3GHz f.m. unless other stated.

GB3UT	Bath (a.m.)
GB3TG	Bletchley (10GHz)
GB3VR	Brighton
GB3ZZ	Bristol
GB3XG	Bristol (10GHz)
GB3PV	Cambridge
GB3TT	Chesterfield
GB3RT	Coventry
GB3CT	Crawley
GB3TV	Dunstable
GB3EY	East Yorkshire
GB3VI	Hastings (a.m.)
GB3HV	High Wycombe
GB3GV	Leicestershire
GB3LO	Lowestoft
GB3TN	Norfolk
GB3MV	Northampton
GB3TM	North Wales
GB3NV	Nottingham
GB3UD	Stoke-on-Trent
GB3ET	West Yorkshire

When you have used 1.3GHz for a while you'll discover that microwaves are really quite friendly. You will no doubt then be eager to take the next step onwards and upwards to 10GHz (3cm).

## Onwards And Upwards

So, onwards and upwards! The 10GHz band is not really an ATV beginners' band, but there is a rapidly growing availability of easy kits or ready-to-use 10GHz transmitters and receivers, particularly from BATC members.



Gunn diodes make very simple and cost effective power sources for 3cm. Feed a 10mW Gunn diode into a small ex-satellite dish with a typical gain of 24dB and you achieve an effective radiated power of about 4W!

A Low Noise Block (LNB) converting the frequency range 10-10.5GHz down to 1-1.5GHz and fed into a satellite receiver is the almost exclusive way of receiving 10GHz ATV. The satellite output is then fed into the TV set r.f. input, or demodulated video and audio connected via the SCART socket.

The radio amateurs' pioneering spirit is very much alive on 10GHz. Over-the-horizon propagation modes and paths are being explored that seems to exist only for 10GHz signals.

Just a few mW of power into a small dish has enabled good ATV pictures to

be sent across the sea from the UK to the Dutch coast. Evidence suggests a surface-ducting effect is responsible and this could eventually lead to the formation of UK to Europe ATV links! Another propagation effect at microwave frequencies appears to be scatter from rain clouds and links in excess of 100km have also been established.

### Quite Tolerant

Radio amateurs enjoying a voice-only QSO are quite tolerant of received signal strength. The ear is a very selective organ so, provided the other station can be heard and is intelligible, noise and interference caused by a weak r.f. signal is often ignored.

Eyes and television systems are far more critical. Even slight noise on a picture is quickly and obviously apparent, as signal strength reduces, loss of colour occurs.

At still lower r.f. carriers, line and frame synchronisation become weaker, giving the familiar 'roll' or 'line tearing' effect on screen. During contest exchanges this may not be of much concern, other than affecting the score, but for normal ATV contacts you are after as much received signal strength as you can get.

For 436MHz and 1.3GHz, installing good low-loss coaxial cable is probably the first step to take. Maybe you could also add a low-noise pre-amplifier, ideally close to the antenna. The conventional Yagi is still used up to 1.3GHz, with the loop-Yagi a common variation on the familiar design.

By mutual agreement, ATV uses horizontal polarisation. This reduces interference (by 30dB ie. 1/1000) to the vertically-polarised modes; voice, data et al, and ensures your antenna is sitting the same as the other fella (or lady!).

Achieving the horizontally-polarised circular pattern needed by most repeaters is a bit more tricky. So, many of the 1.3GHz units use the Alford Slot antenna design.

A horizontal field pattern is put out by 10GHz but into very different antennas. Horn reflectors are effective for local working, while greater distances need perhaps an ex-satellite dish and waveguide feeder.

### First Contact

To make your first contact on 430MHz and 1.3GHz, start with the 144MHz ATV calling frequency of 144.750MHz. But please move off this channel after contact has been made. If you access the packet network as well, and why not, see if the times of any ATV 'Nets' are on your local Bulletin Board.

For ATV stations lucky enough to live within the coverage of an ATV

repeater, there are three ways to try for a contact. The repeater could be monitored to watch for usage, but this may take time.

A better method would be to access the logic with a 'CQ + Callsign' picture for several minutes, then see if anyone responds. Alternatively, some of the repeaters have provided 'Usage Bargraphs' within their information pages (clever yes?) which indicate busy and quiet periods.

Your first ATV contact will probably not be on 10GHz. Even experienced users of this band still make direct contacts by arrangement, not by calling 'CQ'. There are three 10GHz repeaters operational, so if you live in the Burton, Dunstable or Bristol area, look for GB3XT, GB3TV or GB3XG.

So, there you are, that's what the many ATVers get up to! We all love it, think it's great so why don't you join us?

Perhaps you may like a few practical circuits to start you off? An ATV up-converter or 430MHz transmitter modulator for example - please let the PW Editorial office know and I may be able to arrange something.

If you have any specific questions or would appreciate more details, write to me at 11 Cottesbrook Road, Acocks Green, Birmingham B27 6LE, mentioning *Practical Wireless*. Or send a packet enquiry to G8EMX @ GB7SOL.#29.GBRE.EU. You might get an individual reply but any messages I receive will be answered via my 'Focal Point' bi-monthly column.

PW



Repeater test cards and beacon pages from the UK. These are usually 24 hour and each repeater awaits an incoming video and sync. pulse train.

A 10GHz dish sending ATV across the sea.

(photo courtesy of Bob Platts G8OZP)

### The British Amateur Television Club

The BATC represents the activities of amateur television enthusiasts in the UK and abroad. Amateur TV circuits, p.c.b.s, components, kits and news are published in their quarterly magazine *CQ-TV*, which is sent to the almost 2000 members.

The BATC club offers assistance to the many affiliated Repeater Groups, organises two specialist ATV rallies each year and represents ATV interests to the RSGB and Radio Authority. Membership to the BATC is open to anyone who has a keen interest in hobby television, whether they are licenced or not.

Belonging to the BATC could be regarded as almost essential for anyone active with ATV or considering becoming so. The annual subscription is only £12, but many members decide to join or renew for more than a single year and enjoy a discount scheme, £22 for two years or £32 for three years membership.

If you have a computer and modem (and who doesn't!) the BATC operates a telephone Bulletin Board System on (01633) 614765, and, yes, (of course!) the BATC Internet address is <http://ourworld.compuserve.com/homepages/ipawson/>

But if you want to actually write to someone, you still can. The BATC membership secretary is Dave Lawton, 'Grenehurst', Pinewood Road, High Wycombe, Bucks HP12 4DD.

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Address: .....

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..... Postcode: .....

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**73 from Dave G4KQH, Technical Manager.**

# Computing & Radio

## Do They Mix?

By Mike Richards G4WNC

*Our resident computer expert Mike Richards G4WNC gives you a few reasons to justify buying that computer so that you can use it in conjunction with your amateur radio set-up - read on to find out more.*

So, you've got your amateur radio licence, bought your rig and are now wondering if you should buy a new computer or maybe put your existing computer into action in conjunction with your radio set-up.

Listening around the bands you can hear that lots of people do use a computer, but why bother? What can you do better and is it all worth the effort? These are a few of the questions asked by both new and experienced amateurs when it comes to deciding whether or not to use a computer in the shack. In this article, I'll attempt to throw some light on the subject and give you a few clues as to where to start.

### *A Few Tips*

Let's start with a few tips on what to buy for those of you who are thinking of buying. And firstly, if your budget can stand it I would recommend going for a new IBM-PC - but which one?

A look through the adverts of the major PC magazines will probably confuse more than help, as there are

very good service, but still offer very competitive prices. From my own personal experience, DAN Computers fall into this category and provide a very good range of PCs with good prices and excellent back-up.

### *The Pitfalls*

Now, before you get too carried away with the huge potential offer by a computer in the shack, I think it's only fair to point out the pitfalls. First and foremost, all computers create r.f. noise.

I doubt there's a station out there that can say, hand-on-heart, there is no increase in noise 'floor' when the computer's switched-on! However, the interference can be reduced to extremely low levels and most modern PCs are very well screened - but there will always be some noise.

Secondly, computers are undoubtedly anti-social beasts that cause you to spend inordinate periods of time staring at the screen trying to get the latest time saving program set-up just the way you like it! Computers can also be the cause of countless family arguments as spouse and off-spring fight to play the latest game and end-up crashing the whole system!

Despite all this, many radio amateurs believe the benefits outweigh the problems. So, if you're still with me, let's take a look at just what can be done.

### *Radio Related Programs*

Radio related computer programs can be divided into three main groups. These groups are Transmission systems, Utilities and Log Books.

So, let's start with a look at a few of the transmission systems that are available. You will find that the addition of a computer to the shack opens-up a whole new world of digital communications from Morse

code through to FAX and Slow Scan TV (SSTV).

If you're not sure where your interests lie and just want to try out a few different systems, the best way is to get hold of some free software. Although not really free, amateur radio shareware is available in abundance for PCs.

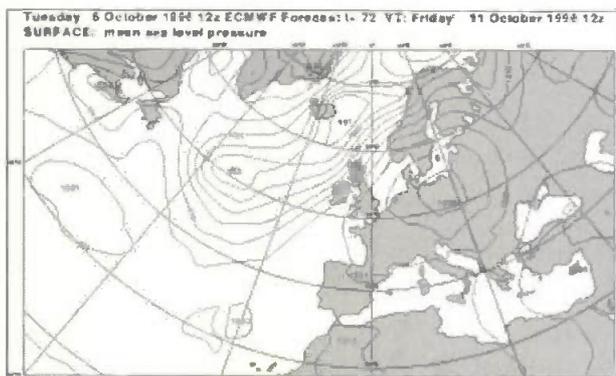
The most popular transmission mode packages are Hamcomm, JVFAX, EZSSTV, DL4SAW and MSCAN. In addition to being available at very low cost, an additional attraction of these programs is their use of a common interface to make the connection between the computer and the transceiver.

Whilst each of those I've mentioned can be enhanced with a more sophisticated interface, the basic unit provides surprisingly good results. The interface simply comprises a comparator integrated circuit that turns the incoming audio signal into a square-wave that swings between voltages representing logic one and zero.

The squared-up signal is then applied to the PC's serial port. In each program analysis of the audio signal is carried-out by measuring the time between each zero crossing of the squared-up signal.

For the transmit signal, the PC generates the necessary tones using one of its programmable timers, this is also available via the serial port. This signal is rather crude and needs some basic filtering before being connected to the microphone socket of your transceiver.

These simple interfaces are dead easy to build yourself and may be



You can use your computer to receive weather forecasts which can then be used to help the avid DXer predict good times to go DXing.

just so many different suppliers. Many of these are also just 'box shifters' i.e. they don't have a showroom and survive by making a modest profit per item, but shift huge volumes of stock.

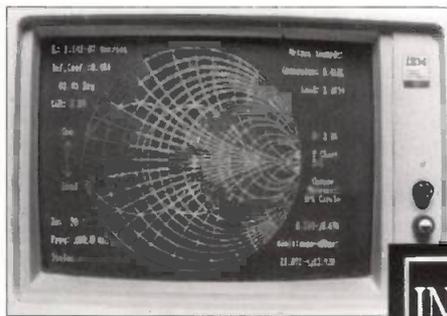
Don't expect wonderful pre or after sales service from these 'box shifters' suppliers, just a good price. There are a number of suppliers that provide a half-way house and offer

bought in kit form from a number of suppliers. If you just want to get down to business you can also get ready-built units from the same sources.

Let's now take a look at what the programs can do for you. Firstly, Hamcomm gives access to RadioTeLeTYpe (RTTY) based systems including the more sophisticated AMTOR error correcting mode. The program also features Morse transceiver and can resolve/translate the coded weather transmissions that abound on h.f.

Secondly, there's JVFAX which is the next most popular program, as it provides facilities to send and receive both FAX and SSTV signals. Although FAX is still used by some amateurs, SSTV is generally much easier to use and provides surprisingly good colour pictures.

If you want to take a look, tune-in to 14.23MHz on any Sunday morning. While FAX is less popular, the ability to receive FAX weather charts can be extremely useful if you're into v.h.f./u.h.f. DXing. Regular examination of this weather information can provide early warning of potential 'lifts'.



### Log Keeping

There's a lot of debate surrounding computer based log keeping and those with a good index card system will claim that they can beat any computer system hands down when it comes to matching a name to a call. But for many, this is the prime reason for using a computer based log.

Where a computer based log book really scores is if you want to search for something other than just the name or call. Most of the ever changing range of log book programs have the facility to search on any part on the entry.

So you could, for example, search for any previous contacts that used a particular rig or maybe lived in a particular area. It's these extra facilities that can give computer based logs the edge over manual systems.

Computer based logs can also be a great boon to the contest operator.

Some of the best systems will automatically increment the serial number and print-out the contest entry sheets for you. A classic example of this is popular Super-Duper logger (dreadful name, but neat program!).

### Utilities

The utilities group is a pretty general term that covers just about everything else! Once you have some computing power in the shack, it can be really useful to simplify many of the number crunching operations that the keen amateur encounters.

For example, if you like building your own antennas there are programs around that will help with the dimensions and even plot a theoretical radiation pattern! A look through the software catalogue of a shareware supplier will reveal a host of these utility programs.

Another rapidly growing area for computer utilities is in the control of suitably equipped transceivers. Most modern transceivers have a built-in control port and these useful utilities allow you to control many of the transceiver's functions directly from the computer keyboard. This has many advantages, not the least of which, is to add a wide range of custom memories.

There are even a few programs that combine rig control with the log book to make for really slick operation. You will also find several propagation utilities that will help



select the best time of day and frequency to reach a particular part of the world. You can even design and print your own QSL cards by using one of the many desktop publishing packages that are available.

### Get The Software

Now I've whetted your appetite, you're probably wondering how on earth you can get at all this software! There are two basic routes: (A) purchase the software on disk from a shareware supplier or (B) download software from bulletin board systems or the Internet.

Starting with option (A), probably the best place to begin is to

visit one of the larger radio rallies. You will usually find several shareware firms that specialise in radio related software and make them available at very reasonable prices.

If visiting rallies isn't convenient, a good bet is the Public Domain and Shareware Library (PDSL) in Crowborough (Tel: (01892) 663298). They have a very comprehensive range of software available and all the programs are very well catalogued.

If you have a CD-ROM, I can thoroughly recommend the QRZ HAM RADIO CD-ROM. Although it has a strong American bias, it's packed with amateur radio data including the full FCC Call Book and thousands of radio related programs.

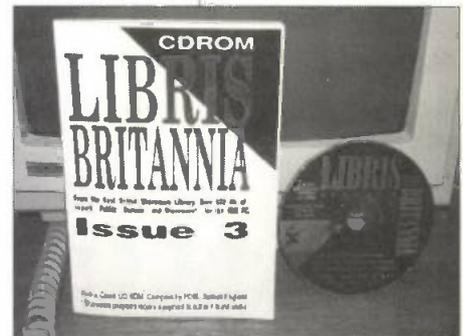
If you're keen to get on-line and download your own software, you will need to get yourself a decent modem. With most modern programs getting ever larger, it's important to buy the fastest modem you can afford.

You should consider a minimum of 14.4kb/s with 28.8k being the preferred option. Once you have the modem, you can dial-up a number of BBS such as PDSL on (01892) 661149.

If you choose to use the Internet you will need to join-up with an Internet Service Provider (ISP) to provide the necessary access. Once you have this you can scan the world for the latest software!

However, if you want a few pointers to set you off in the right direction, you could start with my Web page:

<http://dialspace.pipex.com/mike.riehards/> Here you'll find links to most of the more popular radio related sites, plus direct links to many of the common programs. **PW**



The Public Domain and Shareware Library (PDSL) in Crowborough have a very comprehensive range of software available and all their programs are very well catalogued.

Computer programs (left) are available for everything from creating antenna charts to learning Morse.

*I hope this has given you a taster as to how you can hook-up your computer with your amateur radio station and make the two work together. Of course there are other ways you can use your computer in the radio shack. Don't forget if you want to know more make sure you read 'Bits & Bytes' every month here in Practical Wireless for the latest computing in radio news.*

# Bits & Bytes - The Computer In Your Shack

By Mike Richards G4WNC

*Mike Richards G4WNC has news of a new teaching system from Texas Instruments, an introduction to RTTY and details of how to get caught in his 'Web'.*

I've finally taken advantage of the free Web space offered by my Internet supplier, Pipex. Much promised and now finally here, my new Web pages are now on-line and ready for action.

I've put the pages together as a way of ensuring that those with Internet access can easily get the very latest software and news. Rather than having to search around for useful sites, a visit to my Web page should take you straight to the prime sources of radio information and software.

I've put the pages together as a way of ensuring that those with Internet access can easily get the very latest software and news. Rather than having to search around for useful sites, a visit to my Web page should take you straight to the prime sources of radio information and software.

## Texas Teaching

Now for some news of an interesting winter project for any radio club that's technically inclined. Texas Instruments have been at the forefront of DSP technology for many years and have just launched a brand new teaching system.

The new Texas package is based on the TMS320C50 DSP chip which features a 40MHz clock rate and 10k words of on-chip RAM. The DSP chip is

Powers of two	2 <sup>6</sup>	2 <sup>5</sup>	2 <sup>4</sup>	2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>	
decimal value	64	32	16	8	4	2	1	
Decimal	65	1	0	0	0	0	1	= 64+1
	82	1	0	1	0	0	1	0
	22							= 16+4+2
	36							
	29							

Fig. 1: Decimal-Binary Look-up Table

simple plug-top power unit (supplied) and features two phono jacks for audio input and output plus a 9-way D-connector for the link to a PC. This is basically an updated version of the older TMS320C20 DSP starter kit that has been used for a number of amateur related applications.

The important difference with the new Texas teaching kit is the reference and educational information that comes bundled with the package. The teaching material has been produced as a joint venture between Texas and the University of Hertfordshire and the material has been tested out at several

demonstration - just right for a club night! The lectures appear to start at a suitably basic level with an introduction to DSP followed by a study of sampling and conversion techniques and then moving-on to filtering, Fourier Transforms and finally speech and image processing.

The starter kit itself is well worth further mention as it comes complete with an assembler/debugger and all the necessary connecting leads. Just to wrap-up the whole package there's a CD-ROM Multimedia Reference Guide that contains a huge database of DSP products and useful programs.

The price of the complete teaching package is extremely attractive at around £130. For UK distributors try Arrow-Jermyn on (01234) 270027 or Macro Marketing on (01628) 606000. For Internet based information try the Texas Instruments home site at [www.ti.com](http://www.ti.com)

## Great Circle Maps

A few readers have contacted me to say that they've been unable to locate the Great Circle Maps program from the address I featured a couple of issues ago. Just to clear-up any confusion, here's a location I've double checked.

<ftp://funet.fi/pub/ham/arrl/bbs/programs/gcmwin21.zip>

## Digital Modes

And now for something completely different! As I think it's about time I put together a few tutorials on the various amateur digital modes. Although not the most common mode, the technology behind RadioTeLeTYpe (RTTY) forms a good

supplied ready-assembled on a custom starter kit p.c.b. with all the ancillary electronics to enable it to be used for a wide range of applications.

The starter kit is powered by a

universities across Europe.

In addition to the starter kit, there's a comprehensive instructors guide and a full set of overhead transparencies. This is supported by a

number of software packages that provide practical demonstrations to back-up the lectures.

Each of the five lecture sessions is designed to last around 50 minutes with another 30 minutes of practical



Computer interfaces and terminal units are used to enable the user to send and receive RTTY.

learning foundation for all the other text based modes, so this is where I'll start.

Let's start at the very beginning with the press of a key on the computer keyboard. Although early RTTY used the electromechanical teleprinter, they're few and far between today. So, I won't look at these unless you write and ask!

Anyway let's look at how pressing a key on one keyboard results in the appropriate letter appearing on the screen of a computer many miles away. As you've probably already gathered, computers can only handle numbers.

So, the first task is to convert the keypress into a number that's exclusive to that particular key. In order to ensure some form of standardisation, most computers use the American Standard Code for Information Interchange or ASCII code for this translation and has been around in the computer world for a very long time.

If you now return to your keyboard, press the letter A and it will be converted to the number 65 by the computer, B is 66 and so on. The other important point about the way in which computers work is their use of the binary numbering system.

If you haven't encountered binary numbering before it can seem rather confusing, but it's really very simple. The binary system is so well matched to computing because it only has two states, on or off which equates to on and off in an electrical circuit.

So how do you convert from decimal to binary? It's extremely simple if you use a simple look-up table. I've show a simple table in Fig. 1.

In Fig. 1 you will see the decimal number to be converted down the left-hand side and what's known as the weighting along the top. The weighting is the value assigned to each Binary digit (known as a bit).

Using the keypress I described earlier as an example, you will see that the decimal number 65 can be broken-down to  $1 \times 64$  plus  $1 \times 1$ , the final binary number being 1000001. As a simple exercise try filling-in the missing binary numbers in Fig. 1.

Another important point to note about the ASCII code is that it always contains seven digits or bits which gives a maximum of 127 combinations. This is plenty to cover the upper/lower case alphabet plus numbers and punctuation.

However, if we want to send an amateur RTTY signal we need to use, not the ASCII code, but what's known as the International Telegraph Alphabet No 2 (ITA2) This is an older and, more limited code, that uses just 5 bits to represent the required letters, numbers and

punctuation.

One of the prime functions of the RTTY software that you run on the computer is to convert the computer's internal ASCII code into ITA2. Inside the computer this 5 or 7 bit binary number is generated by voltages representing logic 1 or 0 using a separate wire for each bit - this format is known as parallel data.

If you now want to send this number to another computer, you need to find a way to get it out of the computer. The answer is to use what's known as a serial port. This takes the parallel data and concentrates it into one wire by sending one bit at a time.

In order to make some sense of this serial data information, the serial to parallel conversion has to take place at some predetermined rate. You also need to know when one character finishes and the next begins.

This is done by adding an extra, start bit, at the beginning of each character and a stop bit at the end, so wrapping-up each character. So here we are with a nice neat string of data emerging from the computer's serial port, but how can this be transmitted over the ether?

The answer is to convert the digital 1s and 0s into audio tones. These can then be connected to the microphone socket of the transceiver and broadcast in the same way as speech.

The conversion can either be done using what's known as a terminal unit or within the computer itself. This latter option is usually done by programming a timer within the computer to generate the required audio tone.

Terminal units come in various forms, but the conversion from data to tone is usually done by using some form of voltage controlled oscillator. Now that you have your audio signal winging it's way through the ether, the conversion into a stream of text on a computer screen is the exact reverse of what I've just described.

### To Recap

Just to recap, the tones are first converted into voltages representing logic 1 and 0. This is then applied to the serial port where it's assembled into parallel data, converted into ASCII and then converted into the appropriate screen character for display. I hope this has helped with a very simplified introduction to RTTY transmission.



### Special Offers

Those of you who've ordered recently may well have suffered rather long delays - I'm sorry for that, but recent demand has outstripped my ability to supply. I've therefore been trying to find a better way to handle the reader's offers.

As a result I've managed to secure a very special offer with the **Public Domain and Shareware Library (PDSL)**. They have put together a library set of all five disks for just **£12** all inclusive.

Using PDSL also makes ordering simpler as they accept all the usual credit cards, so you can order by 'phone and don't even have to write a letter. So in future, please direct all requests for this disk set to **PDSL Winscombe House, Beacon Road, Crowborough, Sussex TN6 1UL. Tel: (01892) 663298** and request library volume: **H008739abcde**.

The disk set consists of: **Disk A** - JVFX 7.0, HAMCOMM 3.1 and WXFAX 3.2; **Disk B** - DSP Starter plus Texas device selection software; **Disk C** - NuMorse 1.3; **Disk D** - UltraPak 4.0; **Disk E** - Mscan 1.3 and 2.0.

I'm still supplying my FactPacks, but am looking at better ways to do this, so watch this space!

### Printed Literature:

- Beginners Utility Frequency List (Order Code **BL**)
- Complex Signals Utility Frequency List (Order Code **AL**)
- Decode Utility Frequency List (Order Code **DL**)
- FactPack 1 Solving Computer Interference Problems (Order Code **FP1**)
- FactPack 2 Decoding Accessories (Order Code **FP2**)
- FactPack 3 Starting Utility Decoding (Order Code **FP3**)
- FactPack 4 JVFX and HAMCOMM Primer (Order Code **FP4**)
- FactPack 5 On the Air with JVFX and HAMCOMM (Order Code **FP5**)
- FactPack 6 Internet Starter (Order Code **FP6**).

For the printed literature just send a self addressed sticky label plus 50p per item (£1.50 for four, £2.50 for seven and £3.00 for nine).

*That's all the computing news I've got for you this month so, until next time 'happy computing' and don't forget to keep your news and views coming to me Mike Richards G4WNC, 'Bits & Bytes', PO Box 1863, Ringwood, Hants BN24 3ZD. Internet: mike.richards@dial.pipex.com*

# Computing Technically

By Gerald Stancey G3MCK

**Gerald Stancey  
G3MCK gives you  
some good advice  
about using your  
computer to help with  
the amateur radio  
hobby.**

The advent of personal computers has given the average amateur the opportunity to undertake calculations that hitherto would have been beyond his means. It has also meant that the scope for getting things wrong has increased by the same magnitude!

I've written this article to show some of the areas where errors can occur and suggest techniques which will reduce the chance of errors in your computer calculations. The first thing to appreciate is the term GIGO.

The term GIGO is an old computer acronym that means 'Garbage In

Garbage Out'.

In other words, if you put rubbish into a computer you will get rubbish out. It might seem obvious, but errors can occur and they may not be so simple to find.

The following list shows a few of the

areas where things can, and often do, go wrong:

- errors in your program
- input data which is incorrect
- input data which has been incorrectly entered
- errors in someone else's program
- errors in the compiler
- errors in the utilities
- errors in the operating system
- hardware errors
- mains supply errors

The only areas over which you have complete control are the first three items so, we will consider these in some detail.

## Failure To Obey

Programming errors mainly occur through: failure to obey the rules of the programming language; simple keyboard errors when entering your program into your computer; or faulty logic in the design of your program.

Failure to obey the rules of the language should be detected by the compiler but this cannot be guaranteed. Faulty logic errors are probably going to be un-detectable provided the rules of the language are obeyed.

Input keying errors should be detected by carefully reading the program listing which should always be printed out. However most people are poor proof readers and even getting someone to check it for you is no guarantee that all the errors will be detected.

A good example of an error that can easily escape detection is to enter a statement such as 'A=B+C' instead of the correct statement 'A=B-C'. In this case the rules of the language are met, but the program is wrong. The symbols '+' and '-' are also very easily mistaken.

The last six items in the list are areas over which you have very little control. In fact all most people can do is to use hardware and software that is supplied by a reliable manufacturer and hope for the best!

## Error Detection

Fortunately there is one technique that will identify most of the errors that may occur irrespective of their source. This technique is called 'testing'. In testing you input data which will give you known answers and check what the computer says against what you know to be correct.

When you have done enough trials and got agreement every time you may then be reasonably confident that your program is doing what you want it to do. Simple and easy isn't it? However, this begs the questions of how do you know the correct answer in the first place and how many tests do you have to do.

Regrettably the only way you can find the correct answer is by hand calculating it. This means using such aids as: mental arithmetic, pencil and paper, tables, slide-rule, pocket calculator, etc. The wise amateur will use the aid which is most appropriate for the job in hand and not be misled by the dictates of fashion.

The amount of testing you need to do depends on the complexity of the calculations which you are computing. It is rare that one hand cranked calculation will be sufficient. This being the case you should really consider whether you should even be using a computer to solve a one-off problem.

However, back to testing, and let's assume that you are going to calculate the results of many variations in input to one formula (this is just the area where the computer is ideal). For simplicity let us now assume you are calculating the effect of varying two quantities and expressing the results in a table.

Your output could look something like Fig. 1. This shows the total attenuation of different lengths of coaxial cable which have different attenuations per unit length and has

been chosen solely to illustrate the point in a simple fashion.

In this simple case the minimum hand checks would be to calculate the results for the following cells: middle of bottom row, middle of right hand column, bottom right hand corner, and a cell near the centre of the table.

If after you've calculated the various cells out, you get agreement between your hand calculated results and what the computer says you can be reasonably confident that the computer has got it right.

There is however, still one more test to carry out. And that is to simply look at the results table created. Does the table make sense? Consider Fig. 1 again. Common sense tells you that the cell values should show general increase as you go along a row from left to right or down a column.

It is also reasonable in this demonstration to expect the cell in the bottom right corner to hold the largest value. All these things occur so the table 'looks' correct.

If, on 'looking' at the flow of values in the table, you find unexpected variations in the figures, it's essential that you check by hand the suspect cells and the neighbouring cells.

## Other Programs

Now let's consider when you are using a program which has been written by someone else. If the program has been supplied by a reputable source it is not unreasonable to expect that it has been professionally written and tested. It may also be completely beyond your ability to do other than take it at face value.

However, it is essential that you thoroughly understand the documentation and know that you are using the program correctly. In other words:

- are you supplying the data it wants
- is the data supplied by you within the range that the computer and program can handle
- have you correctly keyed in the input data

If the program comes from an unknown source it should definitely be treated with caution until you have validated it to your own satisfaction by subjecting it to a comprehensive testing schedule.

PW

Fig. 1:

Length (m)	Attenuation (dB/30m)				
	0.70	1.50	2.00	2.40	3.10
10	0.23	0.50	0.67	0.80	1.03
20	0.47	1.00	1.33	1.60	2.07
30	0.70	1.50	2.00	2.40	3.10
50	1.17	2.50	3.33	4.00	5.17
70	1.63	3.50	4.67	5.60	7.23
90	2.10	4.50	6.00	7.20	9.30

Fig. 1: A simple table used as an example by Gerald.

## Laborious

All the above steps may appear very laborious but they really are necessary if you are to have any confidence in the results which are calculated by your computer. You may believe you are so good that you do not need to waste your time with such trivia.

Your track record may support this approach but have no doubt Murphy will get you in the end and it will be at the most embarrassing time. The adoption of program testing techniques such as those described in this article will reduce the risk of getting egg on your face.



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# The **MyDEL** Multi-Trap

By Eric Gray G3CPS

*Keen h.f. operator Eric Gray G3CPS reviews an interesting antenna. Eric says that the Mydel "will fit in most suburban gardens. It can give good results when up at low heights".*

I live on an estate at the foot of the South Downs in East Sussex and my back garden is 21m long and 20m wide. My main interests include h.f. DXing and experimenting with antennas. The local authority has allowed me to retain my 6.5m scaffold tubes without any planning permission.

I have a 2-element beam for 14, 21 and 28MHz, a rotary dipole for 18 and 24MHz. Also available are end-fed for 1.8MHz and a 41m long doublet. The MyDEL Multi-Trap antenna was used at 6.5m in the centre of my back gardens.

## Two Dipoles

The MyDel Multi-Trap antenna consists of two separate dipoles, fed from a common 52Ω coaxial feeder. The shorter dipole, which covers 14, 21 and 28MHz is just over 6m long and the longer dipole for 3.5 and 7MHz is 20m long.

I found that the antenna is well constructed. The wire used is a thick multi-stranded copper type covered with a transparent plastic insulation.

There are two traps encased in aluminium tubing in the h.f. dipole, and two loading coils covered with black plastic in the l.f. dipole. The centrepiece has an integral balun and an SO239 socket for the feeder.

The centrepiece and the antenna's four insulators are made from a blue, high impact plastic. A bracket is supplied for fixing the centrepiece to a 40mm outside diameter mast.

The 3.5 and 7MHz dipole has loops of extra wire on each side of the loading coil. These are for adjustment and small metal clamps for securing them.

On the 14, 21 and 28MHz dipole there's a loop on the far side of each trap, and again, small metal clamps



The MyDel antenna (centre) on test. The low visual impact of the antenna is clearly demonstrated by the photograph itself, when compared to the support mast (see text).

for securing them. The photograph, shows the antenna and the parts described before I installed it.

## Instructions & Installation

The instruction leaflet supplied with the antenna states that during installation the two longest elements (3.5 and 7MHz) should be deployed in an inverted 'Vee' configuration, at an inclination of about 35°

The two shorter elements (14, 21 and 28MHz) should be, if possible, positioned at 90° relative to the longer elements. The tips of the elements must be supported at least two metres above the ground.

The MyDel Multi-Trap antenna on review was positioned in the centre of my back garden, almost exactly as recommend by the makers. The 3.5 and 7MHz elements were in a straight line from SW to NE and the 14, 21 and 28MHz elements in a straight line from SE to NW.

The centrepiece of the antenna was attached to an insulator and hauled up to 6.5m through a plastic ring attached to an aluminium scaffold tube. It was connected to 34m of 50Ω RG58 cable.

## Manufacturer's Specification

The manufacturer's specification sheet claims a maximum v.s.w.r. of 1.4:1. Personally, I think that they

should have added 'at resonance' for this condition was not possible on 3.5MHz because of the shortness of the antenna.

After adjustment, better s.w.r.s were obtained at the h.f. 'DX' end of the band. My results are tabulated below and are samples of the many readings I took using the station s.w.r. meter.

## Adjusted Antenna

Wishing to work some DX on 3.5MHz, I adjusted the antenna and shortened the length of the wires. I achieved this by turning back and taping the loops at the far ends of the 3.5/7MHz elements next to the insulators.

The adjustments gave me resonance at 3.800MHz. As it happened, it also gave me better results over the whole band - (see Table 6). Note: that to maintain balance, equal adjustments should be made to each side of the antenna.

From the tables, you'll see that on 3.5MHz, without any adjustment, resonance is about the centre of the band. And for an s.w.r. of 2 or less, a bandwidth of about 40kHz is possible.

By shortening the antenna as I did, the top 60kHz had an s.w.r. of 2 or less. I'm also sure that by lengthening the antenna by the required amount, a similar result

## Manufacturer's Specifications

Impedance	52Ω
Power rating	1kW
Weight	2.5kg
Trap type	Multi-band
Overall length	20m
Slope of elements v.s.w.r. (max)	35°
Adjustments	1.4:1
	3 bands only

# p Antenna

would be possible for the c.w. end of the band.

## Without Adjustment

Without adjustment I found that from 28.20 to 29.00MHz, the s.w.r. is 2:1 or better. But unfortunately, it is higher on the c.w. portion of the band and no adjustment is possible for this band.

On 7, 14 and 21MHz I the whole of each band has an s.w.r. better than 2:1

I found that on the WARC Bands - the s.w.r. on 10 and 24MHz exceeded 10:1. But it fell to only 5:1 on 18MHz. I was able to match the antenna on all the WARC bands using my Yaesu FC-102 a.t.u. I also used the antenna quite satisfactorily on 1.8MHz with the feeders strapped.

## On The Air

I was pleasantly surprised with the results on the air, the exception being the 3.5MHz band. During the tests I used power levels of 30, 100 and 200W using a TS-830S, an IC-725 and sometimes a TL922 linear.

Brief tests were made with an output power of 400W and the traps and coils were well able to handle this power. No TVI was experienced on any band.

The antenna was used exclusively for five weeks during July and early August, but only during the afternoons and evenings until 2300UTC. Comparisons were made with my other antennas, ie. a Mosley 2-element beam for 14, 21 and 28MHz, a rotary dipole for 18 and 24MHz, a 41 metre long doublet and a 54m long end-fed.

were at the same height as the MyDEL Multi Trap).

Many Europeans were worked on all bands from 1.8 through to 28MHz and the following DX was worked: 3.5MHz VK2XN, 7MHz PY2OU, KIJKS, 4Z4TA, RA9CHL (Asia) and VK5KJC. On 14MHz I worked HL1CG, 7J6AA (Japan) and KH0ES N. Marianas, who came back to my CQ call. On 21MHz I worked CE3LZR and on 10MHz I logged UA9WGU and ZS6QU.

## Comparison Reports

I've compiled a comparison of reports received using other antennas: On 1.8MHz the MyDel was two S points down on my 54m long end-fed antenna. And on 3.5MHz it was one or two S points down on my 41m long doublet

On 7MHz the MyDel was better than with my 41 metre long doublet and my 54m long end fed antenna. On 14, 21 and 28MHz the MyDel was usually one, but sometimes two S points down on my 2-element tri-band beam.

Reports on the WARC Bands for 18 and 24MHz were similar to those received with my rotary dipole. And on 10MHz reports were similar to those received with my 54 metre long end fed antenna.

## Most Gardens

The MyDEL Multi-Trap dipole is a small antenna which will fit into most suburban gardens. It can give good results on all bands 1.8 to 28MHz including the WARC band when up at low heights.

On 7 and 14MHz, even during



Table 4 -  
21MHz Band

21.00	1.4:1
21.05	1.2:1
21.20	1.1:1
21.25	0.5:1
21.30	1.1:1
21.35	1.2:1
21.40	1.3:1

Table 1 -  
The 3.5MHz Band

3.500	5:1
3.570	4.2:1
3.590	3:1
3.600	2:1
3.610	1.7:1
3.620	Unity
3.630	1.3:1
3.640	1.8:1
3.650	2.4:1
3.680	4.5:1
3.750	6.8:1
3.760	8:1
3.770 to 3.800MHz in excess of 10:1	

Table 2 -  
The 7MHz Band

7.000	Unity
7.020	1:1
7.050	1.2:1
7.100	1.3:1

Table 3 -  
14MHz Band

14.00	1.2:1
14.10	1.3:1
14.15	1.4:1
14.18	1.5:1
14.20	1.6:1
14.30	2.2:1

Table 5 -  
The 28MHz Band

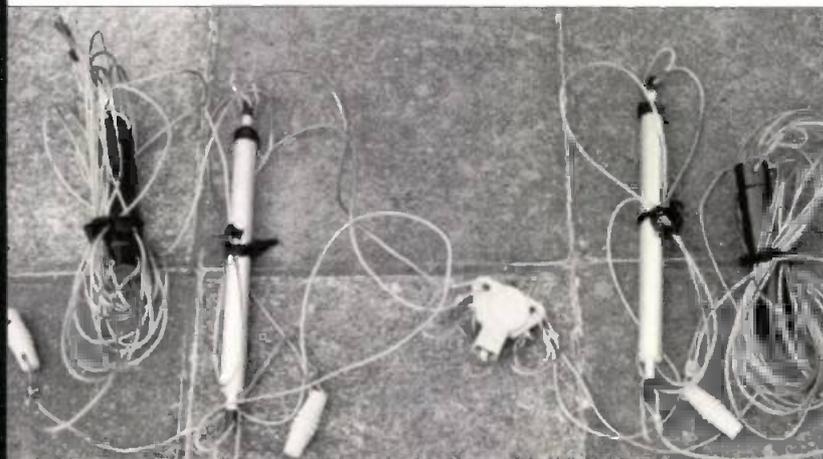
28.00	2.75:1
28.10	2.5:1
28.20	2:1
28.30	1.8:1
28.60	1.1:1
28.70	Unity
28.80	1.2:1
28.90	1.5:1
29.00	1.7:1
29.20	2:1
29.50	3:1
29.70	2.6:1

Table 6 -  
The 3.5MHz Band (with adjustment)

3.500	5:1
3.730	2.8:1
3.740	2:1
3.750	1.8:1
3.760	1.6:1
3.770	1.4:1
3.780	1.3:1
3.800	1.2:1

the present sunspot minima, the antenna will provide an occasional DX contact. For local 'natters' on 1.8, 3.5 and 7MHz it's quite adequate. I'm sure too, that when 21 and 28MHz are open again and the sunspots are to our advantage, it could provide many DX contacts on these bands.

Bearing in mind that my MyDEL Multi-Trap Antenna was only at 6.5m, much better results would be possible if it was higher and in the clear. I am indebted to my friends Bill Staples G0AKY (who took the photographs) and to John Heys G3BDQ for their valuable help.



The MyDel antenna ready for installation. (See text for comments).

*The MyDEL Multi-Trap Antenna is available from Martin Lynch & Son of 140-142 Northfield Avenue, Ealing, London W13 9SB. Tel: 0181-566 1120 who kindly supplied the antenna for my review. The cost is £69.95 plus £7.50 postage and packing, and in my opinion, represents good value for money.*

# Tips & Tools Workshop Practices

By Clive Hardy G4SLU

*Clive Hardy G4SLU, a busy 'home-brew' enthusiast provides tips and hints based on the workshop practices and techniques he uses when building projects on behalf of PW.*



A small number of good quality tools, perhaps in a purpose built case, as in this 'Student' Tool Kit' from Maplin Electronics, can provide most of your needs.

As a radio amateur I would put myself in the 'licensed listener' class. I've never had that overwhelming urge to work every country and prefix ever invented, but I do like tinkering about on the bench.

More 'midnight oil' has been burned by me when trying to make some circuit or other work, than when chasing DX. Having the licence gives me the option of trying out the bits and pieces I've built on the air.

Amateur radio is pure hobby to me, so what I've learnt about the workshop is pure trial and error. I hope that what I can pass on from my experience will be useful.

For those who haven't ventured into home-brew yet, you've nothing to loose but sleep, patience, and sanity! But, the satisfaction derived from completing any project, however simple, is immense. It's the same whether that really simple bit of building is your first, or one hundredth and first.

No one turns into an expert constructor overnight. I'd like to think that I'm reasonably competent now, but some of my early efforts were, to put it mildly, less than mediocre! Many mistakes were due to

lack of knowledge. Doing is learning.

## *In The Beginning*

In the beginning you may ask how do I start? What do I need? Well, my first answer is what you do need is a bit of space to work in. Not a great deal, but don't consider the dining room table if you value domestic harmony!

Most home-brewers work in a space on the workbench that is slightly smaller than whatever the item is they're working on. This is an unwritten rule of technology. I try to break it, but often fail. My own work

area is just about a metre square, on the end of the shack bench.

## *Good Lighting*

Good lighting is essential. Even eyes in perfect working order don't like being used to look at poorly illuminated small components close up.

When it comes to close work, I haven't tried any of those magnifying spectacles or similar attachments, but I have found that a X2 (times two magnification) jeweller's eyeglass is more than adequate for checking small components and soldered joints.

My wife has one of those magnifying lights for her craft work. It's a bit bulky to work around when looking through the glass, but the close-in light is wonderful.

Ventilation is also important. Soldering is an integral part of construction, but the fumes are best avoided. I'm moving rapidly to the idea that my next soldering related purchase will concern fume extraction.

My present soldering iron is a 25W type with a 2.5mm or 3mm bit. It's big enough and hot enough for most tasks. Components today seem pretty robust, and rarely fail due to the thermal abuse they can receive when being soldered.

A solder sucker is useful, as is a set of three popular solder tools. I find the tool with a hook on one end for lifting components, and a point on the other for clearing holes in p.c.b.s to be especially helpful.

## *Essential Tools*

Talking of soldering irons and other hot bits brings me to the subject of the essential tools. Every workbench needs them, and although you won't require a vast number what **you do need** are tools of the best quality you can afford.

Ideally you should have two of everything. And this is because tools hide!

So, what's in my tool box? Let's take a look and see: In the ordinary tool line I have several small screwdrivers. A flat blade type,

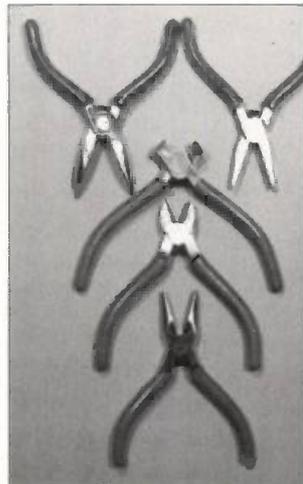
another which is a mains tester, and some cross head drivers. (There are also couple of varieties of cross head screws, and the drivers from hardware stores sometimes need a little filing to re-shape the blade to fit the screws commonly found in radio equipment).

Returning to files, my pack of 6 small files is of the budget-priced local shop variety. They have lasted well. (Very useful for tidying up soldering, especially the centre pin of a PL259).

For pliers I have a box jointed snipe nose pair for most work. I also have a nondescript pair of the electrician's variety for brutal jobs.

Incidentally, 'Box joints' remain stable under

Sets of high-quality pliers, end and side cutters are available from many outlets.



pressure much more so than lap joints, and that keeps the jaws properly positioned in relation to each other. This is even more important with wire cutters. Chopping through coaxial cable doesn't require the best cutters, but for board work I have cutters with small pointed jaws.

The small pliers could double as a heat sink when soldering. Fortunately though most components are pretty robust and can take a fair amount of thermal abuse.

Of the slightly more specialised tools, trimmers are important. Take my advice, it will cost far more in aggravation alone to repair the damage done to coil cores with screwdrivers, than the cost of these



A good soldering iron and stand, such as this Antex 25W model, is a good investment.

tools. Non metallic ones are essential for adjusting variable inductors.

In the non essential category (but still very useful) is a 'pearl catcher for fishing' (forgive the deliberate pun!) out dropped components from the depths of equipment.

Searching through the tool box I find that there's a reamer, a short imperial or metric steel rule and a small craft knife. There's also a 'Junior' hacksaw blade, the odd Allen key, and a set of BNC spanners completes my tool collection.

It may seem a small quantity of tools, but I've found that's about all I need. However, with so few tools it's worth spending the money for good quality. (All the tools I use are available mail order from the usual suppliers).

### The Multimeter

It's perhaps restating the obvious, but if ever one item of equipment is essential, it's the multimeter. And both analogue and digital have their uses!

When making adjustments changing voltages are easier to see with the moving needle of an analogue meter. On the other hand digital meters have a much higher input impedance, so they don't affect the circuit under test as much as analogue meters.

Digital meters also have extra functions, depending on the price of course! But my advice is that you avoid those really cheap small analogue meters with an input resistance of  $1k\Omega/volt$ .

A dummy load is useful, and was one of the first items from a *PW* design that I built. Combined with a 1N1418 diode and a multimeter and 'hey presto' you have an r.f. power meter.

An s.w.r. bridge is a standard item of test gear. It's also basic enough to attempt as a first kit if you're looking for something to build.

Once I had started to build radios using free running oscillators a frequency counter became necessary. Although a general coverage receiver can be used to monitor a signal, provided you've got a good idea where to listen in the first place. For a more detailed look at test equipment try my article 'From Multimeter to Oscilloscope', *PW* October 1994.

### Trying A Kit

For anyone with an inkling of a leaning towards a bit of construction I would suggest trying a kit first. And although some are definitely for the experienced builder. There are plenty of easier ones to choose from.

Kanga Kits produce quite a few simple kits, many being QRP

'classics' (see their advert on the 'Your Local Dealers' page at the back of this issue). However, QRP does mean an emphasis on c.w.

For someone like me who only took the Morse test to gain access to all the amateur bands, voice communication is to be preferred. With that in mind, the developing range of 'Somerset' kits by **Walford Electronics** (address at end of article) is very welcome, particularly the recent ones which appear to be aimed at the novice end of the kit market.

**Howes Communication** kits are known for good instructions, and nice boxes. (See the Howes Communications Advert in this issue).

But for a bit of freelance building I have to recommend joining the **G-QRP club** for its quarterly magazine, *Sprat*. This (subscription only) magazine has lots of circuit ideas.

### Printed Circuit Boards

For one-off home-brew projects and experimenting, the island technique for making printed circuit boards (p.c.b.s) is good. Strips of p.c.b. material about 3mm wide are cut into short lengths to make the islands. The hardest part is cutting the strips!

Your planned layout can follow the circuit diagram to a greater or lesser extent. Because all the connections are on the same side of the board as the components, testing and checking is a lot easier.

The islands can be soldered to the board or stuck with 'super glue'. Glueing may seem easier, but be careful if using 'Super glue' to attach the islands. When soldering to the islands the fumes given off by hot super glue are pretty unpleasant.

Etching your own p.c.b.s brings its own satisfaction, and the results are very neat, but scope for subsequent modification is limited. Also, ferric chloride, used for the etching, is not indoor friendly.

**Editorial note:** *Ferric chloride is a dangerous chemical. You should follow the instructions carefully, protecting eyes and hands when using it. Take care and be safe!*

On a few occasions I have cut the copper from between the tracks with the tip of a small drill bit, using a 12V drill. It works, but the bits don't last long!

Finally, I should mention 'stripboard'. I have never got on well with this (Veroboard), and I think it's best avoided for r.f. work anyway as it has too much stray capacitance between the tracks.

### Helping Hands

For small p.c.b.s a 'helping hands' device will hold the job steady. When

writing this I was in the throes of building a 50MHz transceiver on a single 150 x 150mm board. I was greatly helped by a 'third hand' in the form of a proper p.c.b. holder.

The third hand was a gift from **Ted G3BKN**. Like many tools, I can't work out how I managed without one before. Thank you Ted! Still in the holding department, on my bench I have fitted one of those little blue vices that are available at every market and cost about £1.50. Bought as a novelty, it is actually very good.

### Organise Yourself

When the enthusiasm to solder a few bits together begins to stir, it helps to organise yourself and place the required components readily to hand. Otherwise the enthusiasm might wane before the soldering iron gets plugged in!

Some people suggest, to save money, using bits removed from old equipment. This needs time to sort them out, and somehow they are never the types you subsequently want. (So much better to know for certain you have the necessary components).

I think the best way to start a serious component collection is to buy those bargain packs containing hundreds of resistors or capacitors. At the same time I suggest you get some multi strand hook up wire in four or five colours.

For the rest of the shopping get some ideas by doing some armchair construction. Look at construction articles in books or magazines. See what components are commonly used.

It is likely to be small signal transistors, diodes, and trimmer capacitors. Light emitting diodes have high play value!

Nowadays I tend to buy twice the components I need for a project. Firstly because I'm sure that I'll break some of them during construction. Buying the extra of course ensures that nothing gets broken. Secondly it means my junk box continues to be replenished.



'Helping Hand' units such as this are extremely useful.

PW

*I hope my thoughts have been of some help. Now that the long evenings are here it's time to warm up the soldering iron and get busy!*

# Soldering Success Isn't a Secret!

By Paul Essery GW3KFE

*Paul Essery GW3KFE casts his very experienced eye and years of practical work onto soldering techniques. And as we all know...you either get it right or very wrong!*

Soldering success is not a secret...and by the time you've read this article I hope you'll agree! And if you start by looking at Fig. 1, you'll see that you can weld, as in Fig. 1a, and 1b., or glue, as in Fig. 1c, or solder as in Fig. 1d, two pieces of metal together.

Welding joins by melting some of the 'parent' metal. With glue, it's smeared on the surfaces, brought together and left for 'setting'. (Glue 'grips' the surfaces, so these are 'roughed up').

With soldering (or brazing which is the same in effect), the workpiece is heated together with an alloy (solder). At the right temperature the solder then runs and can fill a gap of between two to six thousandth of an inch by capillary action. It can also 'wick' upwards for as much as 50mm.

In each of the cases I've mentioned you should notice that a good joint pre-supposes **chemical cleanliness**. (Very important!).

## Solder Mixture

Solder is an alloy made up of a mixture of tin and lead. Lead melts at 327°C, tin at 232°C. The mixture (in all but one of the possible proportions between 18 and 98% tin), the alloy begins to melt at 183°C.

Between 183° and the temperature of complete melting, a 'pasty' phase called 'liquation' is seen. The

temperature at which melting starts is called the 'solidus', and melting is complete at the 'liquidus'. (Liquation is a damned nuisance to us, but it helps the plumber or car body repairer!).

The one proportion that shows no liquation is 61.9% tin 38.1% lead. Its melting point is at precisely 183°C. - the 'eutectic' alloy.

## Liquation Nuisance?

So, why is 'liquation a nuisance? To discover the answer, start by considering Fig. 2 and imagine the iron is controlled at 250°C and a chemically 'clean' workpiece is used.

The temperature gradient is as illustrated in Fig. 2. I've applied the solder in the proper place as shown. Only the 'eutectic' mixture has penetrated, leaving the rest in the 'fillet' the joint is mostly lead, and weaker than it should be. Hence: for a good joint **everything must be heated above the liquidus**.

Now let's look at a nicely tinned soldering iron in Fig. 3. At the top there's solder, at bottom the copper of the iron. Between, there are two layers of copper/tin alloy, tin-rich at the top, copper-rich below. (The copper comes from the slow erosion of your iron's bit so you must file it back to shape occasionally).

The bond between top and bottom layers in Fig. 3 is metallurgical and quite strong. Incidentally, the hollow in an unfilmed iron can have edges sharp enough to cut the tracks in printed circuit boards (p.c.b.s).

The effect shown in Fig. 3 will also occur to a degree with a copper wire wrapped round a tag. If the wire is properly wrapped round the tag, capillary action occurs and fills the tiny gap.

## Slag Result

Now it's time to look at slag, the result of heat, decomposing flux, dirt or impurities. Begin by imagining a bead of slag in Fig. 2.

The capillary action **must be strong enough** to drive the slag right through the joint and out. Slag **must also escape**; if it's trapped in the joint it prevents adhesion there and is probably also corrosive.

Flux is used to ensure chemically

clean surfaces so the alloying actions of Fig. 3 can take place. It also enables capillary action to occur, filling the joint with solder and driving out slag. (In doing its job, flux turns into slag). Note: anything trapped in the joint is invisible and unreachable; hence the need for solder flow to force flux and slag out.

At room temperature soft solder strength is about a tenth that of hard ('silver') solder. At 100°C soft solder is a quarter of its room-temperature strength. At 170°C it's a mere tenth. (Not very strong!). High Melting Point (HMP) solder is stronger at higher temperatures.

## Honest Joint

Let's be honest...**everyone** makes the odd bad joint! See Fig. 4a. And to help you remember here's a little mnemonic: **Beady Joints are Bad**.

To help you recognise a good joint: see Fig. 4b. Here the solder has 'melted' in to the copper at the edges. Any joint deviating from the Fig. 4b standard towards Fig. 4a is to be regarded as suspect.

To achieve a good joint cleanliness, flux, solder and heat are needed. Remember Fig. 2! It argues a need for a temperature controlled 'watty' (powerful) iron.

I use a 60W Weller soldering iron for most work and change the bit to change the temperature. The 15W jobs cause more dry joints than you need!

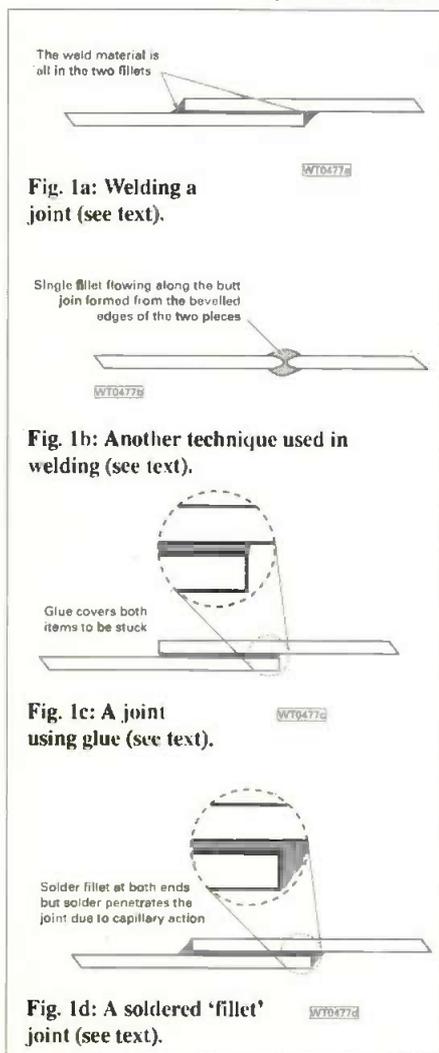
Additionally, the work heats slowly and p.c.b. tracks are liable to lift, so I prefer a tiny bit in the Weller iron. Don't forget also, that heat transfer from iron to work is maximised if your iron has liquid solder floating on it.

Occasionally you'll form a 'solder bridge'. When this happens I use a solder-sucker for preference. A few strands of tinned wire can also be used as a wick to mop up (using capillary action).

## Some Pitfalls

Now I'll move on to discuss some of the pitfalls. And to start off...that bit of emery cloth on your work-bench is surely oily!

The emery cloth may also leave particles of abrasive embedded in the job to cause a total refusal to 'take'. If



you **must abrade** use pumice powder in water, or 'wet-and-dry' cloth **used wet**.

Some solder tags look mucky but 'take' easily. Take note of what you see, so you recognise next time! If it plays up, give it a good clean and try again. With both wire and tag pre-tinned, the iron's heat will make the solder flash round and almost guarantee a good joint.

### Flux-Cored Solder

If possible used a flux-cored solder, 60/40 tin/lead to British Standard (BS). I like to use solder about 20s.w.g.

My advice is that you buy a reel of solder. Those little cards in d.i.y. shops are very expensive.

After tinning, put a drop of solder on the iron, then take it to the job: placing the iron one side and cored solder on the other. (This bit of hot solder increases the heating effect and puts flux in the right place).

The flux in the grades I've specified can actually protect the joint. Similar fluxes in paste form are to DTD 599A or BS. If all else fails, you might try tallow, or go into the woods and get some resin in a tin.

### Active Fluxes

Active fluxes contain water and are corrosive. The iron boils the water, they spatter, and you get holes in your shirt. If you get a drop in your eye, wash out with lots of water, and straight to the 'casualty' hospital. (I've not needed to use 'killed spirits' active flux since 1943).

To clean, after using an active flux, first try warm turpentine. If that fails, warm vinegar followed by a good scrub in hot water with some Stergene or similar. The vinegar makes the slaggy residues water-soluble. However, with **adequate** pre-cleaning you don't need active flux.

### Static Precautions

There are still a few CMOS devices that require static precautions. First, check the continuity from earth from mains plug to tip of bit. rectify as necessary. Repeat at every switch-on.

Secondly, work on an earthed brass sheet and keep a part of your hands touching the sheet. Thirdly sit still...wriggling on your chair charges you up!

*I've tried to explain the mechanics of soldering and how we make 'cold' or 'dry' joints. I hope you find it a help, because making a good solder joint needn't be a secret!*

### Third Hand

A 'Third Hand' is useful. My cheap version is shown in Fig. 5. I clamp the thing in the vice, then grip wire in one peg, small connector in the other. It leaves two hands for the soldering operation. The same device will hold complete p.c.b.s for soldering or inspection.

If you try to hold a wire on to a tag with one hand and the iron with the other, your hand will shake and you will produce 100% 'cold' joints. It's best to use some form of clamp.

### Special Solders

Special solder, such as HMP, to 95A in the British Standard is far stronger than ordinary stuff at 100°C. But not much better at room temperature.

The HMP can be used to avoid the job coming apart if you start with it and then use 60/40 for the final work. On the low temperature side, 'Woods Metal' melts at 71°C. (Most low temperature formulas use Cadmium).

'Silver Solder' is much stronger but needs far more heat. Some formulas contain Cadmium and require special fluxes. You can soft solder over silver solder, but you can't silver solder over soft. There are several grades with different melting temperatures.

### Health & Safety

A soldering Iron is hot and I'm offering a little health and safety advice. 'Park' it in a suitable stand that won't tip over.

Keep wires away from the hot tip of a parked iron. If you use a handy gas-fired iron (for example on National Field Day), you also need to be sure where the flame is going when you put it down.

Cadmium (already mentioned) is a known hazard and recent research indicates there may be respiratory problems even from resin core or paste fumes. For both, the answer is ventilation improvement. I have a 'Muffin' fan from a club junk sale sucking the fumes away.

Finally, when you finished the job, inspect every soldered joint. You might even find a wrong component! Any deviation from Fig. 4b in the direction of Fig. 4a or even any doubt, then remake (re-flow) the offending joint

PW

Fig. 2: Looking at 'liquation' (see text).

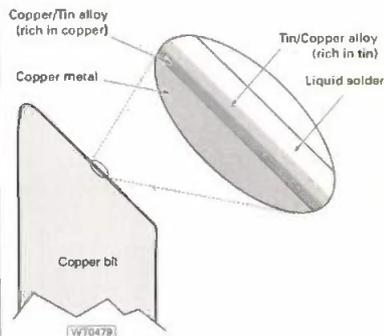
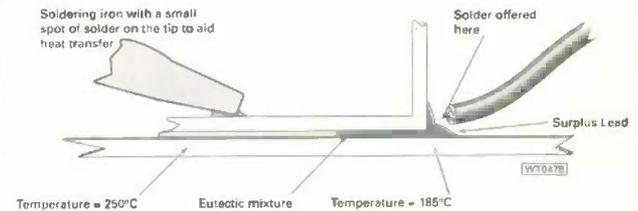


Fig. 3: A correctly tinned soldering iron (see text).

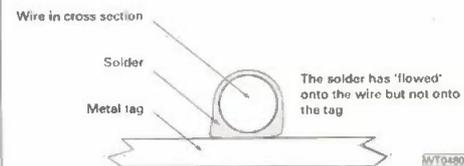


Fig. 4a: Problems soldering a wire to a tag (see text).

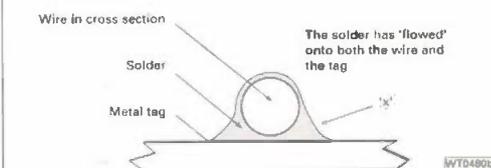


Fig. 4b: A good joint (see text).

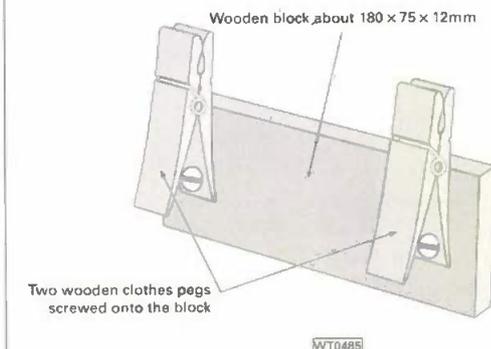


Fig. 5: Robbed from the washing line...Paul GW3KFE's 'third hand' (see text).

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# Plugging Coils



By Ray Loveland G2ARU

*Ray Loveland G2ARU offers some advice on making plug-in coils. He also describes how to measure their coverage before fitting them in place.*

I needed some plug-in coils for a piece of test gear, and a search of various catalogues failed to produce anything suitable. So, I decided to make them up and this is how they were constructed.

I began looking for a suitable base and experimented with the solid plastic pin protectors found on ex-government valves. They're moulded in plastic and available in both B7G and B9A sizes.

The pin holes are already drilled in

should be stretched by pulling until the wire is felt to 'give' slightly. This straightens the wire perfectly. Next, cut the wire into suitable lengths and insert them in the base.

Heat each 'pin' with the soldering iron and allow solder to run into the recesses on both sides of the base. This locks the pins in position. Once the coil and its supporting rod are fitted to the base, connect the wire ends to the pins. A coil at various stages of construction may be seen in Fig. 1.

You can either wind the coil before, or after fitting the rod to the base. After sealing the winding as a protective cover for the coil I used the plastic sleeve from a discarded fluorescent lamp starter. The cover may be wrenched 'carefully' from its base and then a hole drilled top centre.

In order to give a close fit for the cover, a plastic sleeve may be needed between the base and the cover itself. I found a piece of neoprene tubing just the right size in the junk box.

At higher h.f. and lower v.h.f. ranges when smaller inductances are needed a support rod may not be needed. And for the lower h.f. ranges, when inductance values need to be greater, the coil can be wound on the outside of the cover.

An alternative base can be made using B7G or B9A plugs often to be found at rallies. These plugs can be fitted with the coil former as described above as they already have a central hole.

## Party Popper

Not being a party person I wasn't familiar with 'Party Poppers'. But when introduced to them recently, I immediately saw their potential as plug-in coil formers.

I used them in a similar way as already described. But as the base of the party popper has a rather large diameter the pin protectors base cannot be used in the same way.

You'll need a base plate, about 23mm diameter, cut from some insulating material to fix the pin protector to. The top section of the popper has an internal diameter to provide excellent anchorage for the coil support rod.

To strengthen the body of the popper I used a starter lamp cover pushed into it. You may need a couple of turns of tape to give a tight fit in the popper.

My plug-in coils, made in the way described, have proved to be excellent in use. They are robust and will easily withstand the handling that inevitably occurs with plug-in coils.

## Repeatable Coils

Making repeatable coils for a project is often very much of a hit-or-miss affair. Making it, putting it into the circuit and subsequently trying to remove or add turns is a process familiar to us all.

What is needed is to be able to check the coil before it's fitted and fixed on the former. And in the dim and distant past I'd seen a circuit, using a signal generator, a diode, a calibrated capacitor and a meter for checking coils.

I tried several arrangements and finally settled on the circuit shown in Fig. 2. For some signal generators a 1mA meter will be adequate but a 250 or 100µA unit may be better.

A unit I made up for the higher h.f. and low v.h.f. ranges has a 50pF variable capacitor and a 100µA meter, but a more general unit has a 500pF capacitor.

If a separate panel meter isn't available, leads can be brought for a multi-range test meter to be used. Any signal diode is suitable.

The signal generator should be set for maximum output. As the circuit is brought into resonance it presents a much higher impedance and the current reading will drop with a sharp dip.

I have made many coils using this device and generally they prove to be correctly wound. It's much easier to alter the turns at this stage.

## Tuning Range

The device described doesn't of course measure the inductance of the coil directly but can show the tuning range of the coil (this is after all you really needs to know). You could readily calculate the actual inductance from the resonant frequency using the normal formula or from data charts.

To calculate the inductance the variable capacitor needs to be calibrated (this should be done with a bridge if one is available). You could also use the substitution method using close tolerance silver mica capacitors.

I have found this device of great help in making my coils. I wonder how I ever managed without it!

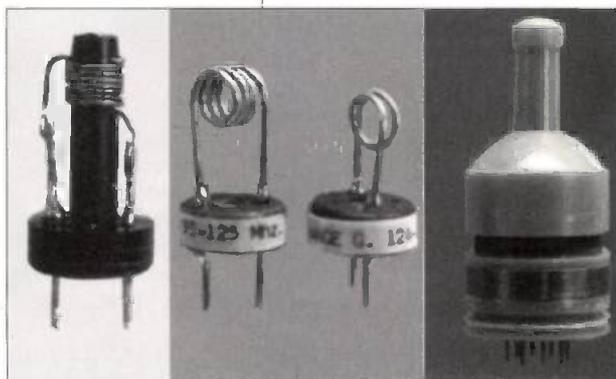


Fig. 1: Coils in various stages of construction.

the base but to hold the coil support rod a 6mm hole should be drilled in the base. The support rod can be of almost any plastic material, but I've found that Perspex rod isn't suitable.

Whichever type of rod you use, it should be cut to length, drilled and tapped at both ends. Alternatively, self-tapping screws can be used, but you need to drill exactly the right sized hole, otherwise the rod will split when the screw is tightened.

## Suitable Former

By fitting a piece of 6mm plastic rod vertically at the centre of the base and using short pieces of tinned copper wire for the pins, a suitable former

can be made.

For the pins, I used lengths of tinned copper wire. I've found that 1mm (about 20s.w.g.) wire is a loose push fit into the holes in the base, but I prefer to use 18s.w.g. wire. The wire

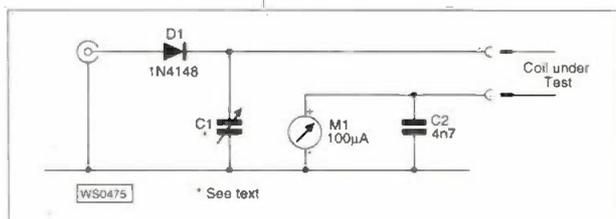


Fig. 2: A simply made checking meter allows coils to be checked and calibrated before fitting and fixing the cover in place (see text).

Gerald Stancey G3MCK shows how easy it is to use the fearsome looking Smith Chart. He says that anyone with an interest in antennas should have one in their tool-kit.

# Antenn

I suspect that the majority of radio amateurs on coming across the Smith Chart have hurriedly turned the page and found something else to read. This is a pity because the Smith Chart is very easy to use and is a powerful tool for solving transmission line problems.

In this article I'll explain the basic use of the chart. For simplicity I'll assume that the transmission lines are loss-less, a reasonable assumption which makes the introduction to the Smith Chart much easier.

Later you can expand your knowledge of the Smith Chart to use it in more complex situations, including when it's essential to allow for line losses.

The prime use of the Smith Chart is to estimate the input impedance at the end of a mis-matched transmission line. However, to do this accurately you need other information. You need to know the characteristic impedance of the line, its length, its velocity factor and the impedance of the load with which it's terminated, see Fig. 1.

You could ask "why not use an impedance bridge and measure it"? Firstly, not everyone

## Impedance Variation

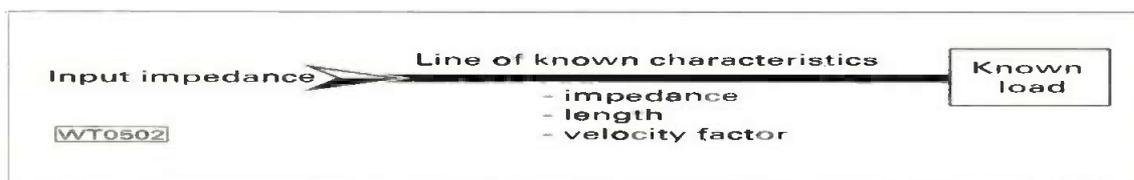
Let's have a look at the variation of impedance on a mis-matched line. If a 50Ω line is terminated with a 17Ω resistance the line will operate at an s.w.r. of 3:1 (well nearly 3:1 as  $50/17 = 2.94$ ). The graphs of Fig. 2 show how the resistive (R) and reactive ( $\pm jX$ ) components of the impedance vary along the length of the line.

This pattern of the variation of impedance

line of 1Ω characteristic impedance. Then all we have to do is use the line's actual impedance as a multiplier (or divider) to get the real values. So 50Ω equates to 1.0 and 17Ω becomes  $17/50 = 0.34\Omega$ , and so on.

The technique is known as normalising and is often used in engineering to make sets of tables and graphs of universal applicability. The right hand scale of Fig. 2 is normalised in this way.

Unfortunately if you want to work with a



repeats itself every half wavelength along the line. So, if you are dealing with a 50Ω line operating at an s.w.r. of 3:1 this chart is most helpful.

Let's look at how we can use the chart by considering a line  $0.4\lambda$  long terminated in a resistive load of 17Ω. The impedance at the input end of the line, is shown by the graph to be 24Ω resistive in series with 30Ω capacitive reactance, or  $(24-j30)\Omega$ .

Similarly if the line was  $0.8\lambda$  long you would take the values given at  $(0.8-0.5)\lambda$  or  $0.3\lambda$  from the load, which gives the figure of  $(85+j67.5)\Omega$ . These figures are read off the left hand vertical scale.

For non-resistive loads the measurements from the point on the chart that corresponds to the reactance of the load (instead of the origin). If you go off the right hand side of the chart, then wrap round as before.

The simple chart can also be used for a line of any characteristic

impedance that is operating at an s.w.r. of 3:1. This 'trick' is done by proportioning all the values. For example if the impedance of the line is 600Ω, then all you need to do is recalculate the chart by multiplying all the left hand scale values by 12 (ie.  $600/50$ ).

In fact if we calculate (and calibrate) the resistance and reactance scales in terms of a

**Fig. 1: The basic problem is to calculate the s.w.r. on the line, the impedance seen at the input when the line is terminated with other than the characteristic impedance.**

line operating at any other s.w.r. you will need another chart. The graph of Fig. 2 is specially calculated and drawn for an s.w.r. of 3:1. for another s.w.r. value another chart would have to be generated.

## Problems Solved

Happily with the Smith Chart your problems. (of creating a new graph for each vs.w.r. value) are solved. This drawback of multiple charts was solved by using some clever maths, about which we need to know nothing.

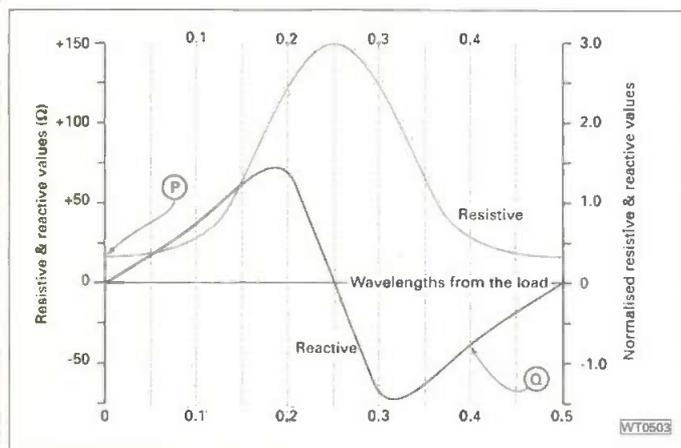
Because the Smith chart is circular, it makes going off the scale at the right-hand end much easier to handle. And it's usually normalised to a line impedance of 1Ω.

A simplified diagram of the Smith Chart is shown Fig. 3. Round the perimeter is a scale calibrated in wavelengths; this is just the same as the x-axis in Fig. 2. The circles (tangential at B to the line F-G) carry the resistive values and the curves marked 'L' and 'C' carry the reactive values. The lines labelled L represent inductive reactance and the C lines being capacitive reactance.

Purely resistive impedances lie on the line BOA. Any impedance which is represented by a point to the right of the line BOA contains inductive reactance. Similarly, any impedance which is represented to the left of the line BOA contains capacitive reactance.

For example, point P on Fig. 3 shows where a normalised impedance of  $(1+j0.5)\Omega$  appears on the chart. Of course in a 50Ω system this would represent an impedance of  $(50+j25)\Omega$ .

Now we know the basic chart scales let's see how an s.w.r. of 3:1 is portrayed. It's too simple

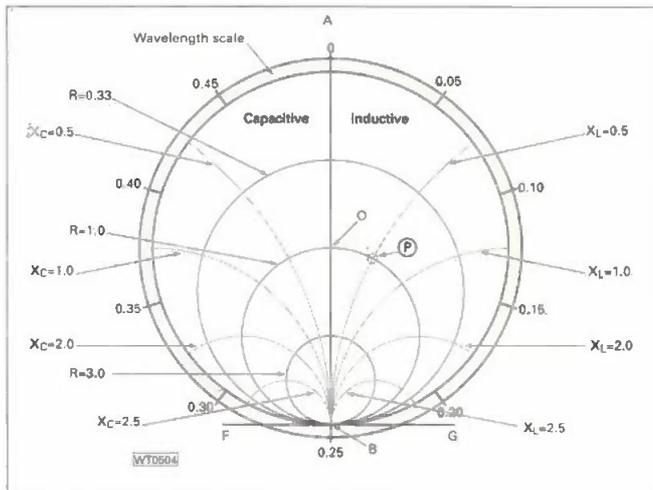


**Fig. 2: The graph of the impedance variations along a line for an s.w.r. of 3:1. When no line loss is assumed, the pattern is repeated every half wavelength.**

has an impedance bridge. And secondly even if you have a bridge, there are few bridges that work effectively on open wire lines.

And thirdly not only does the Smith Chart allow you to calculate the feedpoint input impedance. It also gives you a visual representation of how the impedance varies along the line.

# a Workshop

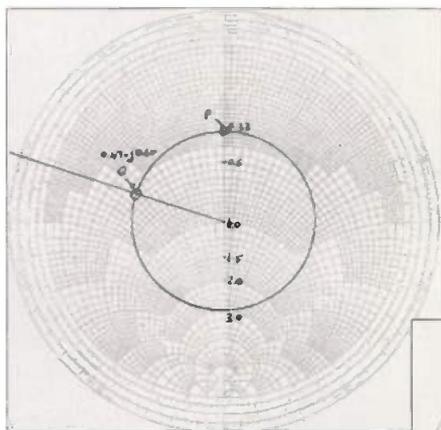


**Fig. 3: The basic, simplified curves of the Smith Chart. See the text for an explanation.**

to be true! You just draw a circle, centred on O, that passes through the value 3 on OB, see Fig. 4. This chart is now the direct equivalent to the graph Fig. 2.

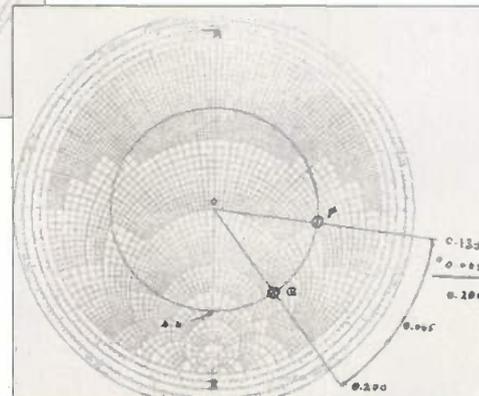
Let's now transfer some values to the chart. Point P is the load which has a normalised value of 0.33 (17Ω) and is purely resistive. The point Q represents (23-j30)Ω normalised to (0.47-j0.6).

Extend the line OP to the outer (wavelength)



**Fig. 4: A 'real' Smith Chart with the s.w.r. circle of 3:1 drawn on it.**

**Fig. 5: See the text for the explanation of this Smith Chart solution.**



scale and step round from this point, in a clockwise direction 0.4λ. The line from this new point to the centre of the chart (O) passes through Q on the s.w.r. circle. This point Q on the s.w.r. circle is the equivalent of Q on Fig. 2.

## A Worked Example

Let's do a worked example that brings all these ideas together. Consider a 60m long,

50Ω line that has a velocity factor of 0.66, being used at 3.515MHz feeding a load which is 25Ω resistive in series with 50Ω inductive. What is the s.w.r. on the line, and the line input impedance?

### Step 1

Normalise the load by dividing by 50, so the load becomes 0.5+j1.0. Plot this point on the Smith Chart as point P in Fig. 5.

### Step 2

Draw a circle centred on O which passes through point P. This circle passes through the line OB at 4.4. So the s.w.r. is 4.4.

### Step 3

Find the electrical length of the line. At 3.515MHz one wavelength is 300/3.5 = 85.35m. Therefore 60m is 60/85.35 = 0.703 wavelengths. Allowing for the velocity factor: 0.703/0.66 = 1.065 wavelengths.

### Step 4

Extend the line OP to the wavelength scale. Then and move round in a clockwise direction 0.065 wavelengths. This brings us to 0.20 which we join to the centre (O) by a straight line. In fact we go round the chart two and bit times as the line is 1.065 wavelengths long. Where this line intersects the s.w.r. circle (Q) read the normalised

impedance (1.65+j1.9)Ω. Multiplying this value by 50 gives the actual impedance (82.5+j95)Ω. The input impedance of the line is therefore 82.5Ω resistive in series with 95Ω inductive reactance.

Easy isn't it? Try it yourself but change the operating frequency to 3.8MHz. You will see that the s.w.r. remains unchanged but you get a different value for the input impedance. That's all there is to using the Smith Chart in its basic mode and for many amateurs this is all you will ever need to know.

Next time I'm in the 'Antenna Workshop' I'll show how the Smith Chart can be used to help you to design an antenna tuning unit.

PW

Smith Chart paper can still be bought from good stationers or artist's suppliers but they may have to order it specially. It is not in the general catalogue of the Chartwell range of graph papers so you will have to quote reference number C7510.

It's also available from the ARRL and the RSGB are considering stocking it. Finally it is permissible to photocopy a blank chart from a suitable text book for your own use.

## Reactance

An impedance consists of a resistive component and a reactive component. The reactive component may be either inductive or capacitive. The term j is a short hand way of referring to a reactive component.

If the reactance is inductive the term is shown as +j and if it is capacitive it is shown as -j. The term j has a mathematical significance but it is not necessary to know what it is to use the Smith Chart.

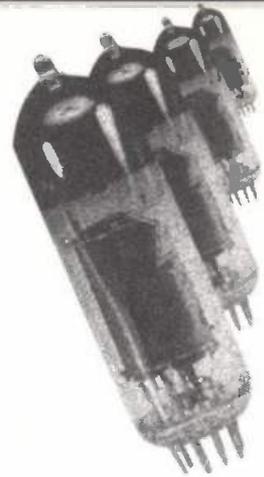
## Velocity Factor

A radio wave travels more slowly down a transmission line than it does in free space. The ratio of the velocity of the wave in the line to the free space velocity is called the line's velocity factor.

The effect of this velocity factor is to make the line wavelength physically shorter for a given free space wavelength. Solid polythene dielectric coaxial cable has a velocity factor of about 0.66.

So, for example a quarter wavelength at 7.0MHz is 300/(4x7) = 11.2m long. However, in a coaxial transmission line the length of a quarter-wave is 11.2 x 0.66 = 6.93m long.

# Valve & Vintage



By Phil Cadman G4JCP

*It's Phil Cadman G4JCP's turn to look after the vintage 'wireless shop' this month and he continues his look at regenerative detectors and discusses the techniques used in valve h.t. power supplies.*

**G**reetings, 'vintage types'! Did anyone watch the film on BBC 2 a while back that told the story of the beginnings of radio broadcasting in the USA? Entitled 'Empire of the Air - The Men Who Made Radio', it told the story of Lee De Forest, Edwin Howard Armstrong and David Sarnoff and was fascinating!

The names De Forest and Armstrong should be familiar to you but I expect Sarnoff will be a bit of a mystery. He began life in the USA as a poor Russian immigrant and went on to become the head of RCA, the giant Radio Corporation of America. That's what's called success!

## Modification Time

Now, it's modification time and I'm looking back to the 'r.f.' circuit featured in my June column. Then I told you how I found it difficult to find a tapping point on the coil that gave both good audio and adequate sensitivity.

To improve matters I've modified the original circuit along somewhat more traditional lines. The new circuit is shown in Fig. 1.

The difference between the two circuits is in how the regeneration is obtained. The cathode tap has gone and a new feedback winding, L2, has appeared.

Here's what to do if you've already built the original detector and want to try the new arrangement. First, disconnect the cathode of V1 from the tap on L1 and take it straight to the h.t. negative (h.t. -) rail. Next, put a radio frequency choke (r.f.c.) of about 1mH inductance in series with the anode of V1.

Then, from the anode of V1 take a length of wire and wrap it around the earthy-end of L1 about ten times. Take the other end of the wire to the fixed vanes of a 150pF variable capacitor. The moving vanes should be connected to h.t. negative as usual.

Try to keep the additional wiring as short as possible and clear of the grid circuit of V1, including components R3 and C3. The value of capacitor C8 is not critical, you can use higher capacities but try not to exceed 350pF.

## How It Works

Let's take a look at how it works. And (fortunately!) the operation of this circuit is a little easier to visualise than that of the original. For example, it's quite obvious that the incoming signal will be amplified by V1.

A proportion of the amplified r.f. signal is fed back into the grid circuit by means of the coupling between L1 and L2. The amount of feedback (regeneration) is then controlled by

adjusting the value of capacitor C8.

If you set C8 to minimum there's almost no feedback. The very high reactance of C8 effectively blocks any r.f. signal current flowing through L2.

As the capacitance of C8 is increased the amount of feedback will also increase. (The lower reactance of C8 allowing more current to flow in L2).

Eventually, the amount of feedback will be great enough to cause the circuit to oscillate. It's then time to back off a little. The most sensitive and selective point is just before the detector begins to oscillate.

In case you're wondering, the 1mH choke in the anode circuit of V1 is there to stop the amplified r.f. signal being shorted to h.t. negative via C6. The choke has no real effect on the demodulated audio present at the anode of V1, passing it with little attenuation although this 'pathway' is seen as a high impedance to r.f. signals. Any r.f. signal that does get through RFC1 is removed by capacitor C6.

## Best Results

To adjust the new circuit for best results, you should first attach an aerial several metres long to C1. Then set C8 to minimum and find a reasonably strong station. Next, adjust R1 to give the best demodulated audio quality. Once set you won't need to touch R1 again in a hurry.

Remove the long aerial and replace it with just couple of metres of wire and re-tune C2. Now, as you gradually increase C8 the signal should get progressively louder until the inevitable howling starts. Back C8 off a little and that's it. (Except that it might not be so easy!).

There is a right and a wrong way for the direction of the winding sense of L2. This is because clearly, the feedback provided by L2 should be positive.

If the direction of L2 is wrong then the feedback will be negative and you won't get the smooth increase in volume as C8 is rotated. Although the detector may eventually oscillate it will be difficult to tune and the demodulated audio will sound poor.

Even if the circuit works wonderfully first time around do take the trouble to take off L2 and try it the other way round, i.e. clockwise instead of anti-clockwise or

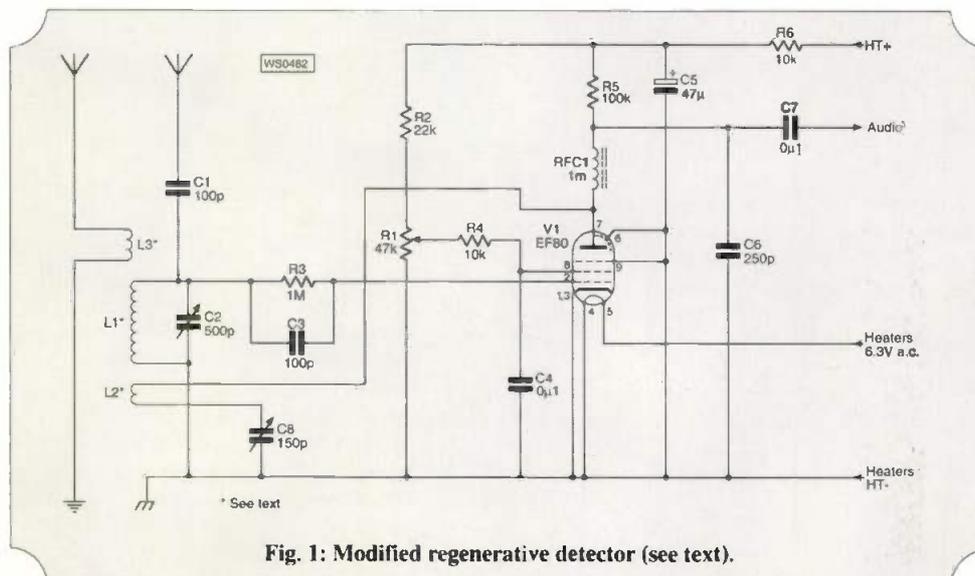


Fig. 1: Modified regenerative detector (see text).

vice-versa. There should be a marked difference.

Choose the direction that sounds the best. As I didn't give you precise details of how to wind L1 in the original circuit I can't tell you the direction in which to wind L2. It's a case of try it and see!

Should the detector oscillate with C8 only slightly meshed, try removing some turns from L2 or sliding L2 away from L1. If the detector won't oscillate at any setting of C8 (most unlikely) then add a few more turns to L2.

Don't be afraid to experiment. You can't damage anything; resistors R2 and R5 see to that. And don't forget to try other coils. You should find the new circuit's Medium wave performance is improved too.

By the way, you can just as easily use a triode rather than a pentode in this circuit. Simply ignore all the components associated with the screen grid of V1, i.e. resistors R1, R2 and R4, and capacitor C4.

## Heard All Continents Again

Only two days after I sent my September offering into the PW office I found a short article about the Heard All Continents (HAC) Company in *Radio Bygones*. It was written by Mr C. M. Lindars who used to work for the company.

On reading the article, I was surprised to learn that the company began way back in 1935 and closed as recently as 1983. And at least some HAC sets used Denco coils, which is appropriate considering Denco coils are available once again.

I was reminded by reader Mr. J. Dickinson of Tamworth, that last time I didn't give Denco's address, so to make good the omission here it is: **DENCO (Clacton) Ltd., 259/265 Old Road, Clacton-on-Sea, Essex CO15 3LU. Tel: (01255) 422213.**

(Please include a stamped self-addressed envelope when writing, postage costs can be rather prohibitive for small companies these days).

## High Tension Supplies

So far, the circuits I've described have operated from a high-tension (h.t.) supplies of around 100V. This has been for reasons of safety and because new h.t. transformers are expensive.

However, sooner or later you're going to get the urge to try more ambitious projects or maybe repair valve equipment. Then you'll have to cope with h.t. supplies of several hundred volts.

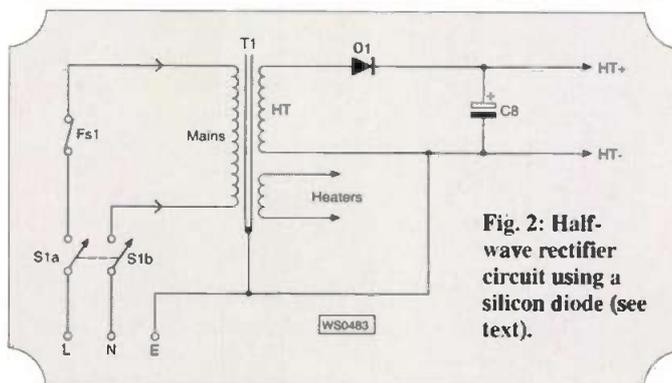
Such high voltages bring danger...and not just of getting electrocuted (Heaven forbid) but

because of the amount of energy that high-voltage capacitors can store. So, whether you're designing a p.s.u. for a new project or tracing supply problems in faulty equipment, understanding how valve power supplies work is **nigh on essential**.

The simplest power supply circuit is the half-wave arrangement illustrated in Fig. 2. (You'll invariably find half-wave circuits like this in transformerless (a.c./d.c.) equipment like TV sets and low-cost domestic radios).

However, it's unusual to find a valve half-wave rectifier used with a transformer. Instead, it's most likely you'll find a selenium (or metal) rectifier.

More modern contact-cooled selenium rectifiers look like small metal boxes and are found bolted to the chassis. Older types are air-cooled, easily identifiable by their large cooling fins.



**Fig. 2: Half-wave rectifier circuit using a silicon diode (see text).**

A faulty selenium rectifier is rather easy to detect as the smell is not easily forgotten! Nowadays though, silicon diodes are the preferred alternative.

## Not Kind

Unfortunately, half-wave rectification circuits are not kind to transformers for reasons which I won't go into now. Suffice it to say that the a.c. current rating of the h.t. secondary winding should be at least three times the expected d.c. output current.

Remember too that during the first few seconds after switching on the valves won't be drawing any h.t. current (their cathodes will still be cold). Under this, albeit brief, no-load condition capacitor C1 will charge up to the peak a.c. voltage of the h.t. winding.

For example, I'll consider a h.t. secondary of 250V a common value. The peak a.c. voltage will be 250 times 1.414 (the square root of two, remembering your a.c. theory. That's over 350V).

To make matters worse the off-load h.t. secondary voltage will be

higher than the on-load voltage by some amount and 10 to 15% is not unusual. As a result the voltage which will build up across C1 during those first few seconds after switch-on will be close to 400V.

By the way, the capacitor that follows the rectifier in power supply circuits is called the reservoir capacitor. That's C1, in Fig. 2.

The description is apt in that the capacitor provides a reservoir of electric charge. In turn this supplies power to the load while the h.t. secondary voltage is too low for the rectifier to conduct.

Suitable capacitors for use in power supplies may have a surge rating marked on them. This can be up to 25% higher than their normal working voltage.

It's important to realise that the surge rating only applies for the first few seconds after switch-on. After that the h.t. voltage should fall to (or

below) the normal working voltage of the capacitor. The reason why such a short-term higher voltage rating is useful should be clear from what I've already said.

## Peak Inverse Voltage

Another important consideration is the peak inverse voltage (p.i.v.) the rectifier will be subjected to. Theory would suggest twice the peak a.c. voltage of the transformer secondary but that's neglecting the rise in voltage under no-load conditions and the occasional mains surge.

For safety, I always choose a p.i.v. rating about 50% greater than the theoretical figure. Just to give you an idea of the numbers involved, I'll provide an example, using the 250V a.c. transformer secondary already mentioned.

The peak voltage will be 353.5V. Doubling that gives 707V. Why double?

Remember, the cathode of the rectifier is held 353.5V positive by the

capacitor, the anode then swings up to 353.5V negative as the mains waveform completes the next half-cycle.

Adding my 50% safety factor gives a total of 1,060.5V. So, that's why I think it's best use a rectifier diode with a p.i.v. rating of 1000V or more.

Half-wave rectification is not used for high current power supplies (unless there's no financially viable alternative) so current is not a problem if a silicon rectifier is used. A 1N4007 or BY127 rectifier diode would be fine. (This example does go to show how easily 250V can become 1000V and why extreme care is needed when working on valve equipment while it's switched on.)

One final point; the ripple voltage across C1 will be quite large (too large for feeding small-signal circuitry). Consequently, the reservoir capacitor will be followed by at least one resistor-capacitor smoothing filter.

Resistor R6, and capacitor C5, in the detector circuit shown in Fig. 1, form just such a filter. Smoothing filters not only reduce the ripple voltage on the h.t. rail but also serve to isolate one stage from another thus preventing unwanted interactions.

## Next Time

Next time around I'll cover full-wave rectifier circuits and say more about smoothing capacitors. I'll also mention some of the companies I know that sell new h.t. transformers.

In the meantime, take note of what's available whenever you visit a radio rally or show. And don't forget radio club junk sales. If you're lucky they can produce some bargain priced transformers.

Oh well, the Editor is looking at his watch so it must be time for me to put the 'shutters up'. So, until it's my turn 'in the shop' again I'll say cheerio and, as you won't be hearing from me again 'till next year, may I wish you all a very merry Christmas and a happy and prosperous New Year. Remember, send your letters and E-mails to me either via the PW offices, via E-mail to [phil@oldpark.demon.co.uk](mailto:phil@oldpark.demon.co.uk) or direct to me, Phil Cadman G4JCP 21 Scotts Green Close, Scotts Green, Dudley, West Midlands DY1 2DX.

**Shopping List** (additional components)

Capacitors		
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150pF		
Radio frequency choke	1	RFC1
1mH		
Miscellaneous		
Thin interconnecting wire for L2		

Cheerio from Phil, see you in March.

# Carrying On -

# The Practical Way



By Rev. George Dobbs G3RJV

*The Rev. George Dobbs G3RJV describes a practical idea, an old favourite - a regenerative short wave receiver - that can provide a lot of fun and good results.*

*"You see, wire telegraph is a kind of a very, very, long cat. You pull his tail in New York and his head is meowing in Los Angeles. Do you understand this?"*

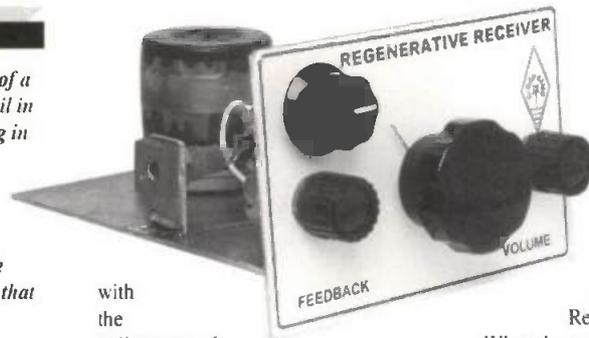
*And radio operates exactly the same way: you send signals here, they receive them there. The only difference is that there is no cat."*

Albert Einstein

Without doubt the thing that brought me into amateur radio was building simple receivers as a schoolboy. I guess that applied to many people who entered the hobby in my era.

I've been surprised to meet lots of radio amateurs who have never had the thrill of hearing the first signals on a receiver they had actually built themselves.

However, in more recent times amateur radio receiver building has had somewhat of a renaissance. This came



## Principle Simple

The principle of regeneration is simple. (Although the full explanation of what happens is somewhat more difficult!).

Regeneration works like this:

When the output of a radio frequency amplifier is fed back into its input, in phase (so that the signals add) the signal will be re-amplified many times.

The technique can provide a thousand (or more) times increase in gain from the amplifier. It can also turn the amplifier into an oscillator.

The power gain of an amplifying device is fixed, but the voltage gain of a regenerative circuit can get near to infinity as it comes to the point of oscillation. The result is an amazing amount of gain in a single amplifier stage.

## Another Advantage

There's yet another advantage but this is where matters become a little more complex! Regeneration introduces 'negative resistance' into the circuit.

Assuming the amplifier to be tuned, negative resistance results in a vastly increased selectivity in the tuned circuit. The circuit's selectivity, or 'Q', is equal to its net reactance divided by its net resistance.

The negative resistance effect

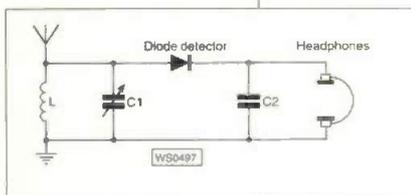


Fig. 1: Circuit of the basic 'crystal set'.

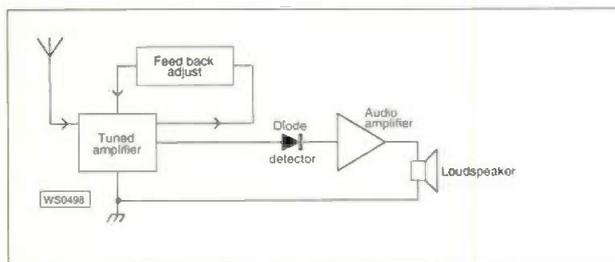


Fig. 2: Adding a tuned regenerative r.f. amplifier and an audio amplifier all increase the signal to more audible levels.

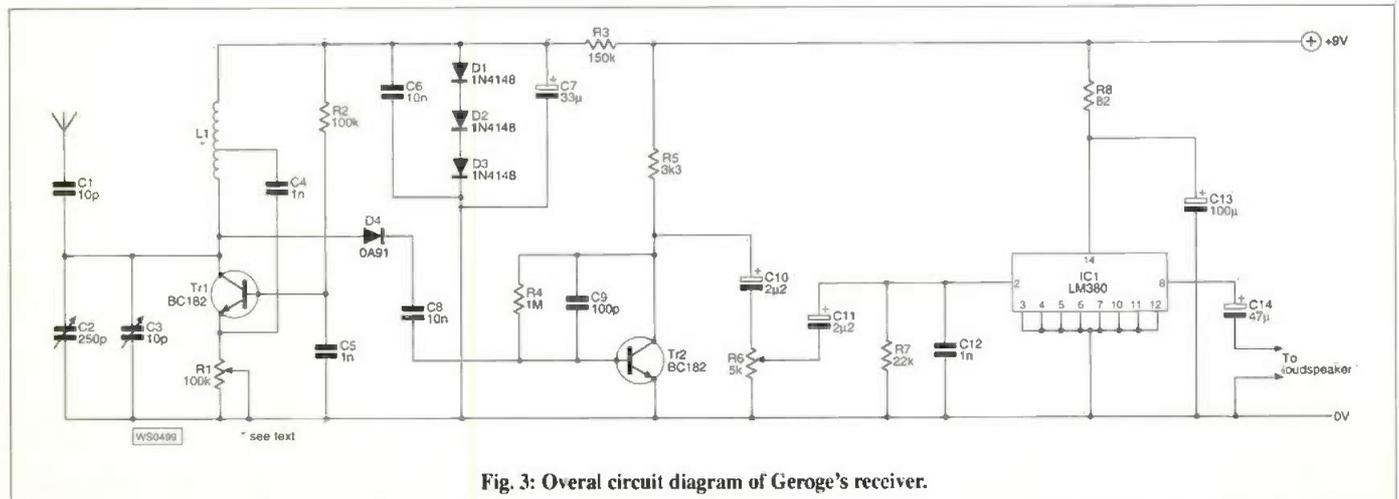


Fig. 3: Overall circuit diagram of George's receiver.

Continued on page 47

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produced by regeneration is less than its fixed positive resistance when the circuit is just below self oscillation. When held in this state, a regenerative stage provides an amazing increase in gain and selectivity. What a useful technique!

But like most simple things, there are problems! There is a critical point at the threshold of oscillation when the circuit's positive and negative resistances are equal.

The 'threshold' point, at which the net circuit resistance is zero, is very difficult to maintain. The smallest change in the signal (anything from random noise to the hand capacitance of the operator adjusting the knob) will push the circuit into oscillation.

Once above the oscillation threshold, a whole new set of characteristics appear. Strange secondary oscillations are introduced, and they can turn off (quench) the main oscillations under certain conditions producing circuit gains of up to a million times. (This effect was also discovered by Armstrong and called 'Super Regeneration', and was a technique used to build the very first v.h.f. receivers. But that's another story!)

### Amplification & Sensitivity

Regeneration could be summed up as a technique which allows one stage to produce a lot of amplification and good selectivity. But it is difficult to control.

Most practical regenerative receiver circuits use a regenerative detector stage. A very economical approach as the one stage selects the signal, detects it and amplifies it.

In the recent revival of interest in simple regenerative receivers, several radio amateurs have used circuits which have a regenerative r.f. amplifier ahead of a simple detector. One of them is Chris Garland G3RJT, who hails from Holmfirth in Yorkshire, the site

of the famous BBC 1 TV series 'Last of the Summer Wine'.

Chris used an i.f.f.e.t. as an infinite impedance detector (another good old technique) fed with radio signals via a regenerative amplifier. The idea was further developed by Colin Davis G3VMU, as the 'Nicky TRF' and appeared in *Sprat*, the journal of the G-QRP Club. I built the Nicky and rate it as about the best regenerative receiver I've used.

More recently in the *Communications Quarterly* (Fall - Autumn - 1995 issue), Charles Kitchen N1TEV, in a very extensive article on regenerative receivers, used a regenerative amplifier to feed a crystal detector. And the receiver I'm describing is based upon the ideas in that article.

### Classic Set

The diagram, Fig. 1 shows a classic Crystal Set. If you have never built one, you should be ashamed of yourself!

The circuit in Fig. 1 is that brought radio from the laboratory into the home. In reality it's just a tuned circuit, to select the desired signals and a diode to detect the r.f. signals feeding headphones. Very simple, but the received signals are weak (no amplification) and the selectivity is so poor that often several stations can be heard at the same time.

The diagram Fig. 2 shows one way of improving the basic crystal set. The simple detector remains but ahead of it is a regenerative r.f. amplifier.

Addition of the amplifier will provide a high degree of selectivity together with a lot of r.f. amplification of the radio signals. The detector is followed by an audio amplifier which is capable of driving a small loudspeaker.

A further advantage is that the regenerative stage can be operated just below the point of oscillation for a.m. signals. It's operated just above the point of oscillation to provide a heterodyne for c.w. and s.s.b. signals (it's a multimode receiver!).

The full circuit for a regenerative crystal receiver is shown in Fig. 3. The

transistor Tr1 is a Hartley Oscillator where C4 is the feedback capacitor to a tapped coil L1.

The requirement is to operate Tr1 at the point of oscillation. To this end the voltage supply to Tr1 is very small. Three diodes, D1, 2, 3, act as a voltage regulator supplying 1.8V.

The current through Tr1 is controlled by R1. Setting R1 for maximum gain without inducing oscillation is critical but once the setting is achieved the amount of gain is quite amazing.

### From The Antenna

The signal from the antenna is coupled via a low value capacitor, C1, to the tuned circuit C2/L1. The small value of C1 helps to reduce antenna loading of the tuned circuit.

In my prototype I used both the 'a.m.' (medium wave) gangs of a polyvaricon variable capacitor of the type used in miniature medium wave/f.m. radios. Using both 'a.m.' sections gives a maximum capacitance of some 220 to 300pF as shown in Fig. 4.

The 220/300pF results in a rather rapid tuning rate. So I added a smaller variable capacitor, C3, of about 10pF, in parallel to provide bandspread tuning to fine tune individual stations.

The amplified r.f. signal is detected by D4 and the resultant audio signal passes to an audio pre-amplifier, Tr2. The output from Tr2 is coupled via a volume control, R6, to an LM380 audio chip.

You should take note of the high degree of decoupling, C6, C7 and C13, which was essential in the prototype. The whole receiver is powered from a PP3 9V battery.

Inductor L1 is wound on a plastic 35mm film canister with 15 turns for the main winding and 5 turns for the feedback winding, see Fig. 5. This seems to tune from about 2 to 5MHz but will vary with individual coils and capacitors for C2.

Having two gangs available for use on C2 a switch may be added to use one or both of these gangs, providing a 'pauper's two-bander'. This took my receiver to beyond the 7MHz amateur band.

Values for L1/C2 and the tuning ranges are all very subjective and the individual constructor may like to experiment with different windings for L1. It would be possible to contrive plug-in coils for L1 to allow a wide frequency coverage by the receiver.

The actual number of turns used for

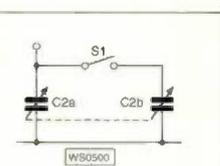


Fig. 4: The 'Paupers Receiver', dual-band option (see text).

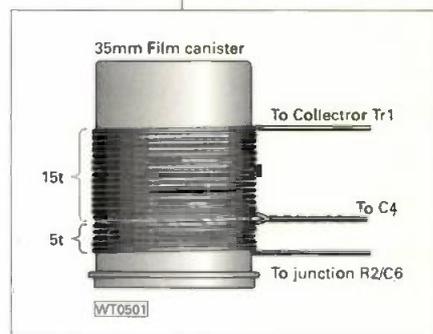


Fig. 5: Coil winding details of L1 (see text for other winding details).

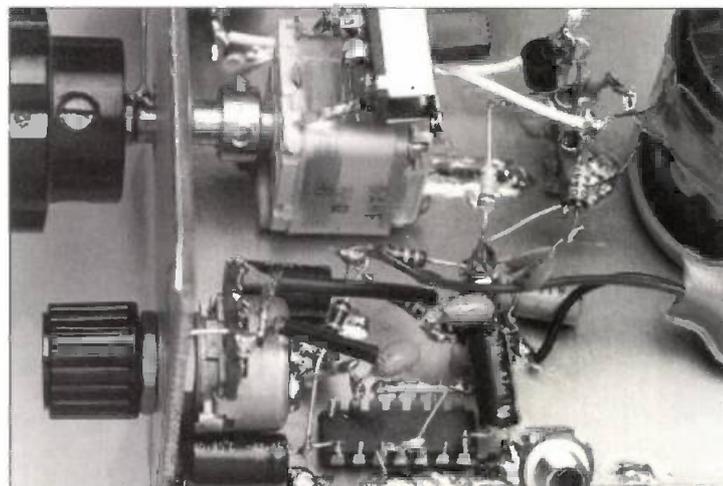


Fig. 6: Illustrating the 'Ugly Bug' style construction.

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# Basic Radio & Electronic Calculations (Using The Casio Scientific Calculator)

By Ray Petri G0OAT

By Rob Mannion G3XFD

*Are you scared of sums, mesmerised by maths or petrified by plots? Well...there's no need to be now that Ray Petri G0OAT has finally (after a truly marathon solo effort) published his new book. It's aimed at leading the reader through mathematical operations and indicates the key strokes needed (hence the fact its dedicated to the Casio calculator) to achieve mathematical success.*

I can honestly say that Ray Petri deserves success with this book. If it had been available when I was at school, I could have achieved more. The purist may claim that by using a calculator the student is cheating. They may even state that the book will encourage the reader to cheat. But I say that nobody should criticise the author, book or calculator because they encourage exploration with mathematics. After all, mathematics are the essential tool for the experimenter and scientist alike. Aimed at the radio enthusiast heading for the RAE and various trade examination courses, this book will certainly encourage anyone to have a go and understand. Ray's book takes the fear out of mathematics and will find use in RAE courses, colleges and in schools. I'm sure it will become a classic and it's something I'm going to have

on my bookshelf...because it's never too late to learn. But first I'll have to buy a new Casio Calculator...it'll be worth it!

Rob Mannion G3XFD.



**Basic Radio & Electronic Calculations (Using The Casio Scientific Calculator)** is available from the PW Book Store at £13.95 with FREE P&P (UK, overseas readers please add £2 P&P) until 13 December 1996. To order your copy please use the Order Form on page 62 of this issue or telephone the Credit Card Hotline on (01202) 659930.

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# HF FAR & WIDE

*Leighton Smart provides his monthly report on what YOU have been up to on the h.f. bands.*

**Charlie Blake MOIAJ** would perhaps rather fancy an antenna like this, but living in a 'New town' he is taking the sensible approach and negotiating with the planning authorities first (see text).



I'll start this month with a request for help from **Henry (Hank) Borawski** of New York, USA. He is seeking the QSL addresses of **GB5F**, and the rather unusual single letter suffix callsign **G6M**.

Henry has had some difficulty obtaining their addresses, (although the RSGB should be able to help you out Hank) but I'm sure that our readers may have the relevant information. Henry can be reached via: <75564.1612@CompuServe.COM>

## Scottish Awards

From the GMDX group of Scotland, I've received news of two new Scottish awards. They will no doubt appeal to award-chasers.

The first is 'The Islands Of Scotland Award', aimed at encouraging operators to work the Scottish Islands, (the 'Chaser' section). There's a separate section which also encourages the more adventurous amongst us to actually get out there and to activate the islands (the 'Activator' section!).

The second award relates to the reintroduced 'Scottish Activity Weekend'. This is intended to encourage activity by all Scottish amateur stations, and to promote world-wide interest in working Scottish stations.

There's also a short wave listener category for both awards. Details of both can be obtained from: **Robert W. Ferguson GM3YTS**, at 24 Braemar Avenue, Dunblane, Perthshire FK15 9ED, Scotland.

## News Snippets

News 'snippets' from the RSGB's *DX Newsheet* now. **Ray**, (formerly 7P8SR) is now active from the Malagasy Republic, as **5R8FK**, along with his wife **Donie**, who is also known as **5R8FJ**. Both are active on 7MHz c.w.

On Macquarie Island, **Graham VK5WG** will be active as **VK0WG** from the 15th of November, and in Senegal, **Rick K3IPK** will be operating under the callsign **6V6U**, with QSLs to his home call.

## Your Reports

I'm starting your reports with 7MHz and the higher bands. This is because it seems that is where most of our reporters' activity has been concentrated.

Although many reporters mention that conditions have ranged from 'patchy' to 'poor', it seems that they have nevertheless managed to work all parts of the globe! Just goes to show what skill and operating experience can do under rough conditions eh?

For my part, however, I've just been 'ragchewing' around 1.8MHz s.s.b. when my work schedule and family commitments allow. And unfortunately I must add, this isn't very often of late.

## The 7MHz Band

First with his 7MHz band report comes **Charlie Blake MOIAJ** of Milton Keynes. He's currently in negotiation with the local authority over the erection of an antenna (best of luck, Charlie!).

However, while still in the 's.w.l. mode' Charlie reports s.s.b. reception on 7MHz of 8R1Z (Guyana) in contact with **IK6SNR** (Italy) at 0548, **TG9AOP** (Guatemala) working **SP4LVH** in Poland at 0556, **YV3FNI** (Venezuela) and **XE1GTL** (Mexico) working **S58D** in Slovenia at 0526, **VK3AJJ** (Australia) in contact with **SM3NRW** (Sweden) at 0656UTC.

Charlie also picked up the special call **UR100HA** chatting to **S51ST** at 0601 (QSL via **UT7DX**). He also logged **9A2FV/MM** located at 44N 15E working **Tony G0EKD** in Bedford at 0617UTC.

A fellow 'early bird' is **Ted Trowell G2HKU** on the Isle of Sheppey, who has also been up at the crack of dawn on 7MHz. Using up to 70W of c.w. Ted lists contacts with **KP4XX** (Puerto Rico), **SV9/SV1AVD** (Crete) **9H3LID** (Malta), **CM2PD/7** (Cuba) and **9H3RJ** (Gozo Island), all at around 0500UTC.

## The 14MHz Band

As usual, the 14MHz band still carries the bulk of h.f. DX traffic.

However, reporters indicate that 18 and 21MHz are offering reasonable DX opportunities at times.

Listener **Derek Blunden BRS 171057** in Westlea, Swindon, reckons that 14MHz was the best band for him this last month. Derek reports 16 new DXCC countries this time. His s.w.l. log includes s.s.b. reception of **TY1IJ** (Benin) and **5V1MD** (Togo) at 0700, and **Z22JE** (Zimbabwe) at 0800UTC.

Afternoon DXing sessions for Derek produced **5B4AB** (Cyprus) at 1347, **JG0KGU** (Japan) at 1400, **9Q5TR** (Zaire) at 15.00. While 1700 produced **AP2KSD** (Pakistan), **TT8PG** (Chad), **V01FG** (Newfoundland), and **JH3BHL** (Japan).

Meanwhile, **Ted G2HKU** found time from his gardening to work c.w. with **ZD8DEZ** (Ascension Island), **9V1ZB** (Singapore). He also worked **JH7WKQ** (Japan), and **IH9/IK8BIZ** (Pantelleria Island, off North Africa), all at around 1500UTC.

Down to Skewen in West Glamorgan now, and **Carl Mason GW0VSW**, who has been 'bashing the key' quite a lot of late. Using 90 watts of c.w. into a **G5RV** dipole, Carl has logged **2LQ** (USA) at 1215, **CN8MC** (Morocco) at 1007, **CO2BM** (Cuba) at 2217, and **OH3GZ/OHO** (Aland Island) at 0800UTC.

A quick 'phone call from **Eric Masters G0KRT** of Worcester Park brought me the news that he's been extremely busy with his studies of late. As a consequence, the radio has taken a very firm back seat! However, Eric reports just one contact on 14MHz in the form of a 5W c.w. contact with **EA8QJ/QRP** for his first QRP/QRP contact with the Canary Islands, at 2128UTC.

## The 18MHz Band

The regular monthly report from **Don Mclean G3NOF** from Yeovil indicated that the 18MHz band has opened for a few days on the short path to Asia at around 1200UTC. He says it's mostly Japanese stations being heard.

Don also noted that African

stations have been coming in during the late afternoons. On the other hand, north America has been prominent both around 1300 and from 2100UTC onwards.

The **G3NOF** 18MHz log includes s.s.b. DX contacts with **AP2JZB** (Pakistan) at 1620, **D2FIB** (Angola) at 1841, **HL3VQ** (Korea) at 1344UTC. There's a string of Japanese stations between 1200 and 1400, **JY5HF** (Jordan) at 1348, **TT8SP** (Chad) at 1601, QSL via **F50IJ**, **Z21CS** (Zimbabwe) at 1739, **5N9NJM** (Nigeria) at 1544, and **5X1ID** (Uganda) at 1727UTC (QSL to **SM0BFJ**).

## Signing-Off

Well, that's just about all the space I have this month folks and it's signing-off time! My grateful thanks to all reporters for their information and support.

I'm only sorry that I'm not able to squeeze it all in! all the best for now, and keep up the good work! Good DXing!

As usual, reports, information, and photographs to me by the 15th of each month) **Leighton Smart GWOLBI**, 33 Nant Gwyn, Trelewis, Taff Bargoed CF46 6DB Wales. Tel: (01443) 411457

**END**

## VHF REPORT

This month David Butler G4ASR has news of Trans-Equatorial Propagation to Africa and an offer of some free software.

Keep a look out for 7Q7RM during the 50MHz t.e.p. season.

Don Kirby GW0PLP (I072) has written in for the first time to inform other readers what can be achieved on the 50MHz band with a modest station. Although his QTH in west Wales is located at 200M a.s.l. and overlooks the Irish Sea, the take-off to the east is poor with hills blocking many DX paths. Indeed Don has given up on the 144 and 430MHz bands for this very reason.

However, at the comparatively low frequency of 50MHz results have been very much better. Don's station runs 100W from an Icom IC-706 and because of space limitations the antenna is a vertical whip at 10M above ground. In this, his first year of operation on the 50MHz band, he has worked some 40 countries and a total of 144 locator squares.

Don comments that he heard 65 countries but many got away due to limitations of the small antenna. (Apart from unity gain a vertical antenna suffers greatly from being in the opposite polarisation plane to that normally used on the band. This can lose you up to 5 or 6 S-points, about 30-36dB, in signal strength.) Despite these limitations some of his contacts have been very good and have included DX QSO's with V47KV, VE and W.

On August 10, at 1826UTC, Don worked LY/DJ1OJ/P (K005) for a new DXCC country. Following this contact he called CQ on 50.110MHz and was rewarded with a reply from OX3LX (HP15) located in Greenland.

Reports of 55 were quickly exchanged before other European stations told Don to QSY off the calling frequency. This is one of the penalties of 'daring' to make a QSO on this exalted frequency!

A little later in the evening contacts were made with CT3HJ (IM12) at 55 bothways and OY6FRA (IP62), signals peaking 59. Conditions on the following day, August 11, were equally good.

At 1041UTC a contact was made with JX7DFA (IQ500V) on Jan Mayen Island, at 59 bothways, followed by a QSO with HA6ZB (JN97). Don was then fortunate to experience a pile up lasting some hours.

Propagation was really good and the Sporadic-E (Sp-E) skip seemed to be circulating all around Europe. One moment contacts would be

made with stations in Scandinavia, OY9JD, LA, OZ, SM etc. and then he would be called by stations in DL, I, OK, PA and SP.

During the event Don also worked CT3HJ in the Azores, TF3T (HP93) in Iceland and called again by JX7DFA for a rag chew! All these contacts show one advantage of using a vertical antenna.

Although the cross polarisation losses are substantial the vertical antenna has an omni-directional beam pattern. In other words, you don't need to rotate it.

If you want to eliminate the cross polarisation losses and retain the advantage of an omni-directional pattern you could construct a Halo, Big Wheel, Cloverleaf or similar variant. Stacking two similar types together will give a useful amount of horizontal gain without being unduly large.

(Surprisingly most 'modern' v.h.f. manuals don't provide details of these types of antennas. Try finding an older edition circa 1970-1980.)

### Trans-Equatorial Propagation

Propagation on the 50MHz band during September was generally very poor. This is normally expected at that time of the year.

There were a few Sp-E events enabling contacts to be made with stations in LA, OH, OZ and SM on September 8 and to CT and EH on September 27. Other openings occurred at other times during the month but were so brief as to be insignificant.

It was pleasing to note a number of small auroral openings. These were observed on September 19, 22, 23, 26 and 27.

According to my records the last aurora heard at my QTH was on May 27. Last time I mentioned that the station of JA1VOK had heard signals from Taiwan and Malaysia making him wonder whether the autumn trans-equatorial propagation (t.e.p.) paths had started to open up.

Well I can tell you that t.e.p. has definitely returned to the 50MHz band. On September 28 the 50MHz band was open to southern Africa between 1600-1800UTC.

The first 'sighting' in the UK was probably when Ken Osborne

G4IGO (I080) heard the Namibian beacon V51VHF (JG87) at 1608UTC. Initially it was very weak but slowly built up to peak at 579. For much of the time however it averaged 559 with little fading and a clear tone.

Ken remarks that he was alerted to the rise in southerly propagation by the reception, at 1525UTC, of west african television on 48.250MHz. These TV signals, which he has received many times in the past, faded out at 1740UTC just before the loss of the beacon V51VHF some six minutes later.

Ken also heard 7Q7RM in Malawi between 1740-1745UTC but no two-way contact was established. At my QTH I heard the V51VHF beacon (50.017MHz) between 1725-1755UTC peaking 539 with slow QSB. The distance from my QTH to V51 incidentally is something in the order of 8500 km.

The opening to V51 was also observed by Neil Carr GQJHC in I083. Unfortunately it appears that no other activity was heard in the UK.

However, F1MXE (JN05) heard the 7Q7SIX beacon (50.002MHz) peaking 529 at 1800UTC. He then went on to work the two resident 50MHz operators in Malawi 7Q7JL and 7Q7RM. Both stations by the way are located in KH74.

Another brief opening was spotted on the following day, September 29. At 1526UTC, Keith G4FUF (JO01) heard the V51VHF beacon peaking 539. No other activity was noted apart from the station of V51DM who was working a number of stations located in France and Italy.

### Ionospheric Characteristics

Trans-equatorial propagation involving reflection from the ionospheric F-layer has a number of worth noting. The ionisation occurs in two belts located north and south of the geomagnetic equator.

Although the position of the ionised belts are independent of the

time of year they become unbalanced in intensity as the sun favours either one or other region. However, during the period of the equinoxes (September 23 and March 21) when the sun crosses the equator the intensity of the two regions are at their greatest. This is because the length of day and night everywhere are of equal duration and therefore the ionisation effects are similarly balanced.

Although I've been very specific about the date when the sun crosses the equator, in radio terms the t.e.p. season is generally accepted to be between September/November and February/April. Propagation is confined to paths at ninety degrees to the geomagnetic equator (not the geographical one!) and extend to approximately 4000km north and south of it.

In this part of the world the northern limit is generally accepted to be in the Mediterranean area. The UK is situated much too far to the north for most (if not all) t.e.p. events and access to the ionised zones will normally be made via the help of another propagation mode.

It's interesting to note that both before and during the t.e.p. opening on September 28 there was Sp-E propagation between the UK (and other parts of Europe) to southern Spain. It is very likely therefore that the opening to V51/7Q7 was a combination of Sp-E + t.e.p. This is not unusual and has occurred many times in the past.

Of course by the time you read this column these t.e.p. openings may well have disappeared. If you want to catch these type of events (or other propagation modes) it's no good reading about them two months after the opening!

You need to subscribe to one of the v.h.f. discussion groups on the Internet ([majordomo@blacksheep.org](mailto:majordomo@blacksheep.org)) or make use of the DX Cluster (via packet radio). Apart from actually listening to your radio 24-hours a day these two are probably the most practical methods of ensuring that nothing is missed.

TO: G4ASR		CONFIRMING QSO WITH:		LOCATOR: KH74MG	
<b>MALAWI</b>					
LAND OF THE LAKE — THE WARM HEART OF AFRICA					
<b>7Q7RM</b>					
DATE	TIME	RST	FREQ	MODE	REMARKS
19.6.92	1707	59	50.1	J3E	73 <sup>15</sup> Rom
TEL: 0861 632908 FROM MACFARLANE B.E.M., P.O. BOX #72, BLANTYRE, MALAWI EX: GMJENK					

## Packet Software

Regarding packet radio, I'm now using ClusterMaster (Ver4.2) software written by Tony 10JX (a well known 50MHz operator). The freeware (it doesn't cost anything) consists of a suite of programs allowing DX Cluster operation and control of Icom and Kenwood computer aided transceivers (c.a.t.) via an RS232 interface.

Some of the main features include voice spelling of incoming DX spots (it's amazing, just turn the volume up and it tells you that the 50MHz band is open!) and separate PacketCluster windows for your own traffic and general traffic in monitor mode.

There's also full two way integration between PacketCluster and rig control. No need to tune your radio to the wanted DX frequency. The RigMaster/RigMate software does it all for you.

Another feature (for Kenwood rigs only) is an automatic antenna s.w.r. graphic plot based upon the internal s.w.r. meter readings. There's also a facility to produce antenna gain polar plots based upon the S-meter readings obtained whilst the antenna is rotated on a steady beacon signal.

I run the 10JX software on a Pentium 120 but any reasonably equipped PC (with soundcard) should be sufficient. Two serial ports are required if you wish to enjoy all the program features.

One port is connected to the packet radio terminal node controller (t.n.c.) and the other to the RS232 link to provide automatic rig control. If you have trouble obtaining the software (it's on the Internet and other sources) you can obtain a copy by sending me a formatted 1.4Mb 3.5in disk (with return postage). I would however appreciate a few lines for the column in return.

## Activity In Tunisia

Frank DL8YHR has sent a report about his recent activity with DJ2QV and DK3DM from the 3V8BB Club station in Tunisia. Permission to operate on the 144MHz band from this country had only recently been granted and therefore many v.h.f. DXers were queuing up to make skeds with the club station.

Initially the group used a single 10-element Yagi which was changed to a 17-element F9FT Yagi after three days of operation. By the end of their first week the group had succeeded in building a 4 x 17-element Yagi array capable of receiving echoes from the moon.

Using a p.a. consisting of 2 x 8874 triodes 3V8BB made QSOs on the 144MHz band with stations in 95 locator squares. A total of 5 contacts were made via ionosscatter, 10 via earth-moon-earth (e.m.e.) communication, 12 via field aligned irregularities (f.a.i.) and 131 via meteor scatter (m.s.). Stations in the UK known to have made an m.s. contact with 3V8BB include G0CUZ, G0FIG, G0GMS, G0KAS, G1HWY, G3IMV, G3WZT, G4AEP, G4FUF, G4PIQ, G4RKY and G4YTL.

## Beacon Operational

The beacon GB3REB is now operational again on 70.010MHz following a move of QTH to its new site near Camberley, Surrey. The beacon is running 28W e.r.p. from a 2-element Yagi beaming at 330°. Reception reports should be sent to the beacon keeper D. Ferigan G3ZYV.

Changes have recently been made to two of the three beacons operational from the GB3LER beacon site situated in the Shetland Isles. The 6m (50MHz) unit is again radiating on 50.064MHz after successful installation of a new antenna.

## Deadlines

That's enough for this time. If you have any news, comments, photographs for your column or entries for the all-band tables please send them to me by the end of the month to Yew Tree Cottage, Lower Maescoed, Herefordshire HR2 0HP.

You can also contact me via packet radio @ GB7MAD, the DX Cluster @ GB7DXC or E-Mail via davebu@mdlhr1.igw.bt.co.uk Alternatively you can telephone me on (01873) 860679.

The power output for GB3LER is 45W into a folded dipole aligned for maximum north-south radiation. The antenna was designed and built by Dee-Com at the request of an anonymous supporter of the beacon project.

The beacon keeper, Andy Steven GM4IPK, passes on his thanks to both Dee-Com and the very kind person who arranged the procurement of the antenna. Without that support it would have been many more months before the 50MHz beacon had returned to service.

The 2m unit (144MHz) operating on 144.965MHz uses two 6-element Yagis, one beaming at 45° and the other beaming at 135°. This beacon has been running on reduced redundancy for some time with full power (150W) in the north-east feed and low power (10W) in the south-east feed. (Normally both antennas are fed with 150W each.)

During September the situation was reversed with full power being connected to the south-east antenna to cover any possible tropo openings experienced during the autumn months. The low power in the north-east direction will still provide adequate auroral indication.

Andy reports that he took the decision to leave high power in the north-east feed during the summer to provide indication of ionospheric scatter modes in northern latitudes during this period. During 1995 the

GB3LER beacon was heard on many occasions in northern Scandinavia via this propagation mode.

MuTek are expected in Shetland later this year to resolve some outstanding issues with the high power installation. It's expected that both p.a. stages will be returned to operational service at that time.

Allan Duncan GM4ZUK is now the beacon keeper for the GB3ANG series of beacons currently operating on 70.020, 144.975 and 432.980MHz. Allan is considering building a beacon for the 1.3GHz band if there is sufficient interest. Please contact him if you support this proposal.

## Tables Return

I haven't run v.h.f. tables for a number of years but now intend to return them for the 1997 period. Hopefully it will stimulate some more activity on the various bands above 30MHz.

Entries can be for any band, any mode. You only need to include details of the number of counties, locators and countries worked on each band. And of course your callsign.

**END**

## Carrying on the Practical Way - Continued from page 47

L1 is open to experimentation. The tapping ratio of L1 seems to work well at about 3:1.

When experimenting with turns for L1, the main requirement is to be able to use R1 to induce (and stop) oscillation across the whole tuning range. Try it and see!

The breadboard technique would probably be the best approach for the receiver. However, I built mine 'ugly' fashion on a piece of printed circuit board (p.c.b.) material.

The front panel does need to be metal to prevent hand capacitance disturbing the regeneration point. And again I used a piece of p.c.b. material.

Rigid mounting of C2 and L1 is essential. I mounted the bottom of the varicon capacitor to the base board using a hot glue gun. This capacitor is fitted with a 8:1 in-line epicyclic slow motion drive.

The 35mm canister was cut down in size and also mounted to the base board with hot glue. The controls Tune, Bandspeed and Volume are front panel mounted.

The audio amplifier chip is wired 'dead bug'

fashion on the base board with the pins pointing upwards. Remember to count the pin numbers as inverted!

Transistor Tr2 is mounted leads upwards held in place by bending over and soldering the emitter lead to ground. A three tag group board is used to mount Tr1 above the base board and the other components are point to point wired around Tr1.

I think it's best to build the receiver 'back-to-front'. Build the audio amplifier first and test it, add the audio pre-amplifier and test it. Then complete the rest of the receiver.

## Real Radios

Regenerative receivers are real radios...the user has to operate them! For a.m. stations the feedback control is set just below the point of oscillation and for c.w. and s.s.b. signals just above the point of oscillation.

The correct point is usually marked by a rushing sound in the output. The tuning is by means of C2

with use of the bandspeed, if fitted, to allow fine tuning.

The main problem is that these controls interact with each other. The feedback control will require readjustment as the receiver is tuned and further readjustment according to the strength of the received signal. So it's a real 'hands-on radio' receiver.

My approach is to roughly set the feedback control according to the tuning point, find that station and then re-adjust the feedback. The bandspeed control, if fitted, is set at midway and then adjust to fine tune required signals. But the process is soon learned by using the receiver.

There's enough audio output to drive a small loudspeaker but walkman type phones work well. I did not bother to fit an on/off switch but used the snap on connector for the PP3 battery.

My advice is to just build the receiver. It can be done in an evening at low cost and will give a lot of enjoyment and a real insight into the earlier days of radio reception. Go on...have a go and rediscover 'real radio'!

PW

Due to the fast turn-round of popular secondhand items, readers should check on availability of advertised stock. In other words...if you spot something you fancy...don't delay or you could miss it!

# Traders

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**TH-77E** As new 2/70 £219.95  
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**Icom IC726 HF** Transceiver and 6m £625  
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**Kenwood TS440S HF** Transceiver / General coverage RX £650  
**Kenwood TSS30SP HF** Transceiver valve PA £499  
**Kenwood TS830S HF** Transceiver £595  
**Kenwood TS850SAT HF** Transceiver with auto ATU £1250  
**Kenwood TS950SD Top Range HF** Transceiver £2200  
**Yaesu FT774GX HF** Transceiver £495  
**Datacomms**  
**Kantronics KAM Multimode TNC** £185  
**Kantronics KAM PLUS Multimode TNC V7.1** £299

**VHF/UHF TRANSCEIVERS**  
**Alinco DJ160E 2m handheld** £160  
**Alinco DJ180E 2m Handheld** £160  
**Alinco DRM06SX 6m FM Mobile** Transceiver £215  
**Icom IC24ET Dual band handheld** transceiver £269  
**Icom IC2SE 2m Handheld** £150  
**Kenwood TH205E 2m Handheld** £150  
**Kenwood TH28E 2m Handheld** with 70cms RX £225  
**Kenwood TH47E 70cm Handheld** £175  
**Kenwood TH75E Dual band handheld** with speaker mic £245  
**Kenwood TH78E Dual band handheld** £298  
**Kenwood TM231E 2m Mobile** £195  
**Kenwood TM451E 70cms Mobile** with 2m RX £330  
**Kenwood TM7733E Dual band Mobile** £495  
**Yaesu FT11R 2m Handheld** £195  
**Yaesu FT203R 2m Handheld** £149  
**Yaesu FT2200 2m FM mobile** transceiver £289  
**Yaesu FT290R 2m Multimode base/mobile/portable** £225  
**HF RECEIVERS**  
**AOR3030 HF Receiver** £499  
**Icom ICR71E HF Receiver** with FM and SSB Filter £600  
**JRC NRD535 Top class receiver** £1000  
**Kenwood R2000 HF Receiver** with VHF Converter fitted £475  
**Love HF225 HF Receiver** £350

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**Kenwood TM255E Latest 45w remote head 2m multimode** £595  
**Kenwood TS140S HF transceiver** £595  
**Kenwood TS50S Latest 100w HF mobile all mode transceiver** £649  
**Kenwood TS50S Latest 100w HF mobile all mode transceiver** £699  
**Kenwood TS50S Latest 100w HF mobile all mode transceiver** £725  
**Kenwood TS830S Amateur band coverage transceiver** £450  
**Kenwood TS850S HF general coverage transceiver, 100w, ATU optional** £1095  
**Kenwood TS930S HF transceiver** with gen coverage £650  
**Icom IC Micro 3 70cms FM handheld** £119  
**Icom IC12E 23cm 1watt handheld** £175  
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**Icom IC725 HF all band transceiver** with FM board £550  
**Icom IC728 Latest 100w HF transceiver** with PBT & speech proc. & FM board £629  
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**Icom IC735 HF transceiver** with general coverage £695  
**Icom IC735 HF transceiver** with general coverage £725  
**Icom IC737 Latest HF transceiver** with auto ATU £995  
**Icom IC737 Latest HF transceiver** with auto ATU £995  
**Icom IC751 General coverage HF transceiver** £695  
**Icom IC901E Dual band remote head 2/70 FM transceiver** £379  
**Icom ICPS15 Power supply unit** £99  
**Icom ICPS15 Power supply unit** £125  
**Icom ICPS30 Good Quality 30 amp PSU, matches top end Icom gear** £149  
**Icom ICR7000 25MHz-1000MHz +025MHz-2000MHz receiver** £595  
**Yaesu FT1012D Mk1 HF Communications receiver** £295  
**Yaesu FT1012D Mk3 HF general coverage transceiver** £450  
**Yaesu FT227R 2m 10W FM synthesized transceiver - the original!** £125  
**Yaesu FT23R 2mtr h/h +MH132 FNB10 chgr PA6 head-set 2 window ants m/mount** £110  
**Yaesu FT290R 2m multimode transceiver** £269  
**Yaesu FT290R MKII 2m 2.5W multimode portable** £349

### NEVADA 01705 662145

**USED EQUIPMENT**  
**ALINCO DJ-100** £99  
**ALINCO DJ-180** £150  
**ALINCO DJ-F1** £185  
**ALINCO DJX-1** £225  
**FDK MULTI C5000** £199  
**FDK-700E** £159  
**ICOM IC-725** £595  
**ICOM IC-W2E** £275  
**KENWOOD TH-28E** £199  
**KENWOOD TH-41E** £159  
**KENWOOD TH-45E** £145  
**KENWOOD TH-79E+SM33** £375  
**KENWOOD TM-221M** £199  
**STANDARD C5000** £345  
**TRIO TR-2200** £99  
**TRIO TR-2300** £99  
**YAESU 790R 1** £325  
**YAESU FT-207R** £110  
**YAESU FT-211RH** £225  
**YAESU FT-290 II** £375  
**YAESU FT-480R** £299  
**AOR AR-800E** £125  
**AOR AR900** £140  
**BEARCAT 3350A** £99  
**BLK JAG 200 MKIII** £125  
**ICOM IC-R1 WIDE RX** £279  
**REALISTIC 2036** £179  
**REALISTIC PRO-50** £69  
**ALINCO DJ-X1** £195  
**ICOM R-72** £675  
**KENWOOD R-2000** £395  
**KENWOOD R-5000** £699  
**LOWE HF-225** £375  
**SONY SW-1E** £95  
**YAESU FRG-7** £175  
**YAESU FRG-7700+MEM** £285  
**YAESU FRG-8800** £499  
**YAESU FRG-9600** £299  
**DAIWA 2002A** £260  
**DRAKE TR4/AC4** £345  
**ICOM IC-728** £795  
**ICOM PS-15** £149  
**JST - 100** £395  
**JST NA-88** £45  
**JST NBD-500 PSU** £95  
**KENWOOD AT-50** £225  
**KENWOOD TS-120V + 100W amp** £399  
**KENWOOD TS-180S** £345  
**KENWOOD TS-440S** £745  
**YAESU FL-2500** £79  
**YAESU FT-101** £225  
**YAESU FT-707** £400  
**YAESU FT-726R** £825  
**YAESU FT-747** £495  
**YAESU FT-980 HF** £699  
**YAESU FT-ONE** £699  
**POWER MAX CEPT** £89  
**SATCOM SCAN 40** £75  
**TEAM 3004UK** £125  
**TEAM 3100 UK** £95  
**NEC SPEAKER/CLOCK** £69  
**OUTBACKER** £115

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# Traders' Table

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### ARC EARLESTOWN 01925 229881

#### HF TRANSCEIVERS

Yaesu FT-990 VGC £1000  
Icom IC-765 plus matching speaker £1650  
Kenwood TS-850SAT plus DSP-100 as new with all accessories £1599  
Kenwood TS-140S c/w AT-230 boxed £TEL  
Yaesu FT-102 £475  
Yaesu FT-102 + FC-102/FV-102DM £799  
JRC JST-135HP deluxe c/w matching NBD-520 PSU (opt units fitted) £TEL  
Yaesu FT-757 boxed £550  
Kenwood TS-140S + AT-230 £650  
Yaesu FT-747GX + FM £499  
Icom IC-706 £TEL

#### MOBILE/BASE VHF/UHF TRANSCEIVERS

Yaesu FT-726R +2m/HF £699  
Yaesu FT-726R +2/6/70/SAT £899  
Kenwood TS-700 boxed £450  
Kenwood TS-700S £TEL  
Kenwood TR-9000 £300  
Yaesu FT-790 boxed £250  
2 x Yaesu FT-290R Mk 1 plus accessories from £225  
2 x Navico AMR-1000S from £140  
Kenwood TR-751E mint condition £TEL  
Kenwood TM-742 + 10m module as new £625

#### RECEIVERS

2 x Yaesu FRG-8800 + extras from £425  
Yaesu FRG-7700 plus FRT-7700/FRV-7700 £375  
Icom IC-R7000 + remote control £650  
Kenwood R-5000 boxed £699  
Yaesu FRG-100 VGC £375  
AR-3000 boxed £550  
AR-2001 £175  
AR-3000A VGC £675  
Sony SW-77 immaculate condition £TEL  
2 x ICOM IC-R71E boxed from £599

### PHOTO ACOUSTICS 01908 610625

Icom IC-728 100W HF General Coverage Transceiver. (Mint Condition) £699.00  
Icom IC-290E 10W 2M Multimode (Very good cond.) £269.00  
Yaesu FT-707 100W 80 - 10M Amateur Band Transceiver c/w matching ATU, memory unit and Heavy Duty power supply £475.00  
Kenwood TM-701E 2M/70cms Mobile Transceiver (VGC) £329.00  
Yaesu FT-470 2M/70cms Dual Band Handheld £249.00  
Icom IC-735 100W HF General Coverage Transceiver c/w AT100 Auto ATU and Shure Desk mic £699.00  
Kenwood TS-50S 100W HF Mobile General Coverage Transceiver (Demo) £829.00  
Yaesu FT-290R1 2M Multimode 2.5W output £249.00  
Kenwood TH-75E 2M/70cms Handheld c/w speaker mic £249.00  
Tokyo HX-240 2M to HF Transverter, covers 80 - 10M Amateur Bands £189.00  
Trio TM-201A 25W 2M Mobile. £179.00  
Kenwood TH-22E 2M Handheld, battery box, no charger £139.00  
Yaesu FT-76R 70cms Handheld £159.00  
Alinco DJ-F1E 2M handheld £159.00

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AOR 3000 £499  
AOR 3000A £599  
AOR 3030 £499  
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Grundig Yacht Boy 400 £90  
Grundig Yacht Boy 700 £250  
Hoka Code 3 V5 £325  
Icom IC761 £950  
Icom ICW-21E £249  
Icom IC2 PET £165  
Icom IC901E £325  
Icom ICR7100 £899  
Icom AT100 £179  
Icom IC706 £875  
Icom SP3 £59  
Icom IC32E £189  
Icom ICR100 £299  
JRC NRD525 £469  
JRC NRD535 £995  
Kenwood TH28E £179  
Kenwood TS140 £575  
Kenwood R1000 £289  
Kenwood R5000 £599  
Kenwood TS850SAT £1159  
Trio TM-201A 25W 2M Mobile. £179.00  
Trio TS820 £359  
Signal R532 £165  
Universal M-8000 £599  
Yaesu FT101 £299  
Yaesu FRDX400/FLDX400 £299  
Yaesu FT900CAT £999  
Yaesu FT50R £225  
Yaesu FT5100 £335  
Yaesu FT290 £225  
Yaesu FT290II £299  
Yaesu FT690 £299  
Yaesu FT790 £279  
Yaesu FT890 £755  
Yaesu FT77/FP700 £459  
Yaesu FT480 £249  
Yupiter MVT8000 £225  
Yupiter MVT7100EX £175  
Yaesu FR50B £75  
Nevada MS1000 £175

### SHORTWAVE SHOP 01202 490099

#### HF EQUIPMENT

Yaesu FT90 2DM c/w FTV902R Tvt. (2Mtr)  
Yaesu 708R 70cm. H/H. £95-00 and SP902 Spkr. £495.00  
Philips MX290 PMR. 2Mtr.  
Yaesu FT707 c/w FC700 ATU £395.00  
Mic and Data inputs. £69.00  
Yaesu FT102. VGC. FM.Fitted £395.00

#### MISCELLANEOUS.

MFJ249 Antenna Analyser £179.00  
Yaesu FT101E Mint c/w Frequency counter £275.00  
Datong D70 Morse Tutor £50.00  
Yaesu FT101EE VGC. £250.00  
MFJ 901B ATU £55.00  
Yaesu FT1 c/w filters and Kenwood Yaesu FC301 ATU £135.00  
MC50 Mic £395.00  
Kenwood VC10 VHF converter for Yaesu FT101Z. as new £275.00  
R2000 £125.00  
Icom AT180 Auto ATU £145.00  
Yaesu FRV VHF Converter for 7700 or 8800 £45.00  
Lowe HF150 c/w Keypad and Portable option £325.00  
Call for the latest update on used DX300. Gen Coverage Receiver. £135.00

#### EQUIPMENT AVAILABLE

Kenwood R5000. Receiver. £550.00  
Yaesu FR101 HF Receiver £165.00  
Grundig Satellit 00 as new £265.00  
Philips 2924 FM/SW Broadcast Band Receiver. Mains/Battery £69.00  
Sony ICF2001D Mint. FM/HF+AIR c/w PSU and Antennas. £175.00  
Datong UC/1 HF to VHF Receive Converter. £125.00  
Tokyo HX240 2Mtr to HF Transverter 3.5/7/14/21/28.MHz. £165.00

#### VHF/UHF

Icom IC 281H 2Mtr. Mobile. 70cm Rx.  
Ex. Demo. Unmarked. 12mth. Guarantee. £345.00  
Yaesu FT290R Mk1. c/w MMD11 Mobile Mount. VGC. £235.00  
Icom IC32 Dual Band H/H. £195.00

### SMC GROUP 01703 251549

#### HF TRANSCEIVERS

PX FT757GX Yaesu HF 100W £525  
PX FT747G Yaesu HF 100W £449  
PX FC700 Yaesu Man ATU £169  
PX FT777 Yaesu HF 100W £349  
PX FP707 Yaesu PSU 12v £119  
PX FTV107 Yaesu Trans. 2+70 £179  
PX IC729 Icom HF +6mtr £1060  
LX FTONE Yaesu HF 100W £675  
LX FT890AT Yaesu HF 100W £1250  
LX TS520SE Kenwood HF Valve £335  
AX FT767GX Yaesu HF 100W £1450  
AX FT990 Yaesu HF 100W £1650  
AX IC765 Icom HF 100W £1699  
RX JST10 JRC HF 100W £395  
RX FT101 Yaesu HF Valve £260  
RX FT102 Yaesu HF Valve £450  
RX FT747 Yaesu HF Mobile £450  
RX FT7 Yaesu HF Mobile £240  
RX TS690 Kenwood HF/6m £1175  
RX TS440 Kenwood HF 100W £750  
RX IC726 Icom HF 100W £1850  
RX 2KL Icom HF L/Amp £1595

#### VHF/UHF TRANSCEIVERS

PX FT736R Yaesu 2mtr/70cm £1195  
PX FT290R1I Yaesu 2mtr port £375  
PX FT690R1I Yaesu 6mtr port £375  
PX IC900E Icom 2mtr/70cm £475  
PX C500 Standard VHF/UHF £219  
LX FT290R1I Yaesu 2mtr port £400  
LX TH21E Kenwood 2mtr port £100  
AX FT790R Yaesu UHF port £310  
AX TM-732E Kenwood 2mtr/70cm £525  
AX IC2GE Icom 2m trans £179  
RX DJ160 Alinco 2mtr/70cm £155  
RX DJ560 Alinco 2mtr/70cm £335  
RX FT76 Yaesu 70cm port £155  
RX FT212RH Yaesu 2mtr FM £175

#### RECEIVERS

PX R5000 Kenwood HF RX £649  
PX AR2800 AOR RX M/base £359  
PX AR3000 AOR 1kHz - 2ghz £599  
PX AR1500 AOR Scanner. £225  
PX AR3030 AOR HF RX £475  
PX HF225 Lowe HF Gen RX. £445  
PX FR101 Yaesu HF Ham £175  
PX FRG9600 Yaesu VHF/UHF £389  
PX SW-7600 Sony Portable RX. £139  
PX PRO2006 Realistic B/Scanner £249

!PX = Chandlers Ford  
HQ 01703 - 251549  
RX = Reg Wards 01297 - 34918  
LX = SMC Leeds 01132 - 350606  
AX = ARE London 0181 - 9974476

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## EQUIPMENT

## SPECIFICATIONS

*Ian Poole G3YW X brings this series to a close with a look at power supplies and the essential role they play in amateur stations.*

Many amateur radio stations possess a separate power supply. They are almost essential in today's stations, to power anything from a small piece of ancillary equipment up to the main rig. However, when looking at power supplies there are a host of specifications used to describe what they are capable of producing and how well they perform.

### Voltage And Current

Obviously the most important parameters for power supplies are the voltage and current. Most supplies used for amateur purposes operate at around 12V, although many give the nominal 13.8V to enable them to equate to a fully charged automotive battery. In fact on most there is an adjustment to allow the final voltage to be altered to give the correct value, although this may be inside the equipment.

Even though most power supplies have a fixed voltage, some are fully variable. These types are more expensive and usually used for experimentation and prototyping. Their voltage may be capable of being adjusted up to as much as 25 or 30V and even more in some cases.

Be very careful if the supply is to be used for a 12V transceiver, even if only as a temporary measure. The full voltage could easily wreck the set. Better still do not use them on the main rig.

Current capability is another important factor. This is obviously rated in the number of amps (A) or milliamps (mA) the supply can give.

When choosing a power supply it's wise to ensure that it's not operating right up to the limit. Make sure there is some margin, otherwise the output

voltage may drop or there may be a rise in the level of 'hum' under peak loads.

Choosing the right current for an f.m. transceiver is fairly easy because the current drawn is constant during transmit. For a sideband transceiver it's more difficult to judge because it varies, rising under speech peaks. Here it's usually necessary to consult the handbook to see how large a supply is needed.

### Ripple And Regulation

After the basic voltage and current requirements, it's obviously wise to know how well the power supply performs its functions including of course 'ripple' and regulation. Most supplies today are fully regulated.

Many power supplies use a linear regulator where the output voltage is maintained by varying the resistance of the series transistor or field effect transistor (f.e.t.). Nowadays switching regulators are becoming more popular.

Here a series element, normally a f.e.t., is switched on momentarily to charge up a large reservoir capacitor to the required output voltage. As it discharges the series switch turns on to give another pulse to maintain the output at the right voltage. In both of these types of regulator, the ripple and output stability when the load is changed are the two major factors.

The ripple is the amount of cyclic variation, normally measured as an r.m.s. or peak-to-peak value. For a linear regulator the ripple will be 100Hz - twice the mains frequency. For a switching regulator the frequency will be much higher. Usually between 50 and 200kHz.

Also beware the ripple for switching regulators is normally measured as an r.m.s. value, but there are usually sharp 'spikes' which can cause havoc with some circuits. As the spikes are very sharp and short they do not affect the r.m.s. value significantly, but they can be quite large as shown in Fig. 1b. The other aspect is load regulation. When a large load is applied to the output, the voltage will change by a small amount. This is what is called the load regulation and it's a



Fig. 1a: Typical ripple as seen on a linear regulator.

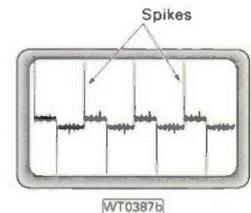


Fig. 1b: Typical ripple as seen on a switching regulator.

measure of how well the supply can maintain its output voltage as the current changes. For example the output may change by 10mV for a load change from 0 to 100% (i.e. no load to full load), See Fig. 2.

Line regulation is also given. This indicates how much the output voltage changes for a change in mains input voltage. Typically this might be a few millivolts for  $\pm 10\%$  input voltage change.

above the danger level the zener diode starts to conduct. This fires the thyristor which forms a virtual short circuit.

The short circuit then blows the fuse, removing the supply from the regulator and hence the set. Simple but effective!

In view of the damage which can be caused by the unlikely event of a regulator failure, it is well worth having over voltage protection. It may cost a bit more money or effort to include it in a design, but it may save its cost many times over if the power supply fails.

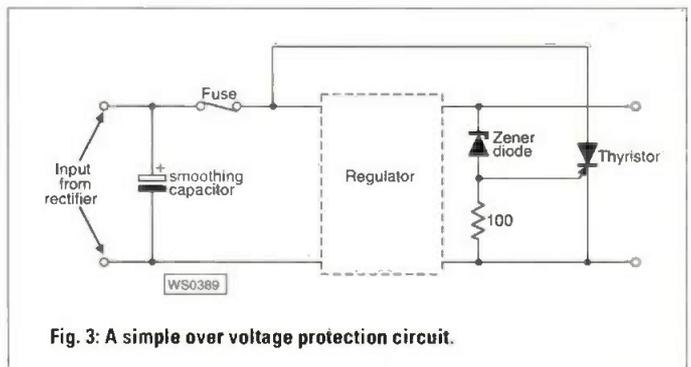


Fig. 3: A simple over voltage protection circuit.

### Circuit Protection Required

Protection is required because most power supplies use some form of series transistor or f.e.t. to act as either a linear regulator or as a switch in a switching regulator. In either case if this series element fails and becomes a short circuit, it can mean that a large voltage can appear at the output.

In some cases it may be twice or even more than the required output. Naturally this could have a disastrous effect. To overcome this an 'over voltage' protection circuit is often included.

Over voltage protection circuits can operate in a number of ways, but the one shown in Fig. 3 is one of the simplest and most effective I've come across. It operates very simply.

When the output voltage rises

### Sign-Off

This is the last in the series of 'Specifications'. I feel that most of the important topics have now been covered, and I hope that I've been able to shed some light on some of the more confusing aspects of equipment specifications.

Thank you all for your letters, comments and questions. It has been a pleasure to receive them and to write the series.

Ian G3YW X

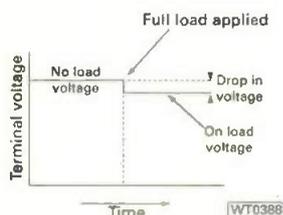


Fig. 2: Load regulation of a supply.

END

## BROADCAST

## ROUND-UP

*Peter Shore takes his monthly look at the broadcast bands after starting off with an idea for a listener's ideal Christmas present.*

If you are searching for a Christmas present for a fellow radio enthusiast (or if you're the wife/girlfriend/husband/boyfriend of an enthusiast and have sneaked a look at this edition of *Practical Wireless* in the hope of some Yuletide inspiration), you could do worse than get him or her a copy of the 1997 edition of *Passport to World Band Radio*. It has been described by the *New York Times* as 'the closest thing to a TV guide for world band radios', and the publishers claim it's the world's largest selling short wave guide.

*Passport to World Band Radio* is cleverly aimed both at complete Novices, and people with an intimate knowledge of international radio listening. For people who have never switched on a radio set to listen to stations abroad before, there are simple, straightforward explanations of how to operate a short wave radio, and how to improve reception.

Then there are profiles of the principal international stations, from the **Voice of Russia** (VoR) to **Radio France International** (RFI), and a comprehensive section about what programme is on the air at what time. New for 1997 is a country-by-country listing of times and frequencies of broadcasts in English followed by a similar section covering the national languages of each broadcaster, from Arabic out of Saudi Arabia to French, German and Italian from Switzerland's SRI.

And to conclude *Passport to World Band Radio* - well, actually it's the last third of the publication - are the fabled 'Blue Pages'. These comprise a frequency-by-frequency table of all the short wave frequencies used by the world's global broadcasters.

The blue pages are relatively simple to use,

particularly if you are an experienced listener, but may be a little daunting for newcomers. They are right up-to-date, with information for the winter period that started on 27 October.

In fact, the blue pages are more current than the white pages, as in all the white page entries the BBC is shown as using 15.07MHz, which it stopped using at the end of October, but the blue pages show the replacement channel of 15.575MHz! All in all, the book represents good value at £15.50 in the UK - and of course it is available by mail order through the *PW* Book Store!

### Developments

Look out for developments at **Voice of America** (VoA). The station VoA Europe, broadcast on satellite and medium wave across the continent (and to other parts of the world too) may change its name.

Voice of America is negotiating with other US broadcasters on the formation of a consortium which would take over VoA Europe and run it as a private station. More news on this as it develops.

Also from VoA comes news that it is to build a short wave relay station on the Mariana Islands in the Pacific. The new station, which will cost around US\$21 million, will broadcast VoA and Asia-Pacific Network programmes. Transmitters from the former Radio Free Europe/Radio Liberty relay station in Portugal will be used, giving the station three 500kW transmitters.

Radio France International's (RFI) 24 hour-a-day French service has been relaunched as an all-news station. The change, which took place on 16 September, is in response to a change in the way people in Francophone countries have been 'using' the station. It seems that they want

more news, so RFI

is now providing ten minutes of news every half-hour.

**Radio Denmark's** English programme has funding only until the end of this year, so if you want to be certain of hearing it before it could, theoretically, be cut, tune in at 0938UTC on the first and third Sunday of the month on 13.80 or 15.22MHz. Contact the station at **PO Box 666, DK-1506 Copenhagen, Denmark**, or via E-mail through the English service producer, **Julian Isherwood** at [jui@dr.dk](mailto:jui@dr.dk).

### Further Afield

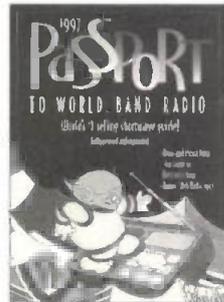
**Harold Buggins** has been listening to stations further afield. He reports that at his home in Witney, Oxfordshire, he has managed to log on to **Radio Melopia** in Arequipa, Peru on 5.995MHz; **Radio Victoria** in Lima, Peru, on 6.018MHz; **Radio Union**, also in Lima, on 6.115MHz and **Radio Educacion** in Mexico City on 6.185MHz. Harold has heard all of these from around 0600 until fade out (although he has not specified what time that is). If anyone else has some interesting logs, please let me know via the *PW* offices.

One other Mexican station that can sometimes be heard in Europe is **Radio Mexico International** (RMI), although its target is the Americas. The station has Spanish and English language programmes on either 9.705 or 5.985MHz between 2300 and 0500, 1200 and 1600 and 1800 and 2300UTC. The station's address is **RMI, Apartado 21-300, 04021 Mexico City**.

### European News

Back in Europe, the Maltese **Voice of the Mediterranean** (VoM) is back on the air, this time from Russia. Tune in to

**Passport To World Band Radio** has been described by the *New York Times* as 'the closest thing to a TV guide for world band radios'. Buy yours now from the *PW* Book Store.



English at 1900-2100 on 9.765MHz which should be easy to hear as the transmitter is 500kW!

South Africa's **Channel Africa** will be funded by the South African Government up to next March. The government commission looking into the future of external radio from South Africa was swayed, according to Broadcasting Minister, **Jay Naidoo**, by the support Channel Africa received from major international organisations, other broadcasters, African states and human rights bodies.

Meanwhile in Britain, BBC World Service announced a plan to reduce its costs by more than £6 million, against a potential short fall in the 1997-98 budget of £12 million. Output of some language services would be cut, including Czech to Europe, and Cantonese.

More use would be made of the Internet to deliver Cantonese language programmes into Hong Kong. And 90 jobs would go, with volunteers sought for redundancy instead of compulsory redundancies.

All this happened just a few weeks before the opening of the BBC's new Thailand transmitting station on 31 October. The station has two 250kW transmitters, with two more to follow by next Spring.

The transmitters will come from the Hong Kong relay station which has now closed. (If you want to hear BBC World Service from Thailand, try 9.58, 6.065 and 5.99MHz for English).

**That's all from me this month. Have a good few weeks listening to the short wave bands until we meet in print again next month.**

**END**

# Practical Wireless Index Volume 72 January to December 1996

## Constructional

	Part	Pg/Mth
A Junk Box PSU by Ken Lee-Rand G3UXA		30 Jan
A Potent Cubical Quad for 144MHz by Kevin James G6VNT		36 Apr
A Quart In A Pint Pot by Bryan Wells G3MND		40 Sept
A Superbeam Experience on 24MHz by Vic Westmoreland G3HKQ		41 Oct
Are You Ready For CTCSS? by Mike Rowe G8JVE		24 Feb
Budget Battery Power by Ben Nock G4BXD		22 Jan
Locking The Robin To Droitwich by Mike Rowe G8JVE	Part 2	32 Jan
Low Cost Bi-directional Wattmeter by Ken Fisher G0LXX		39 May
Mobile Control Box by Fred Oliver G3LVJ		32 May
New Lamp For Old by Richard Q. Marris G2BZQ		23 Aug
One Chip - One Receiver by Steve Oltmayer G4RAW		51 Mar
Plugging Coils by Ray Loveland G2ARU		39 Dec
Power From The Sun by Ben Nock G4BXD		23 Mar
PW 'Side-By-Side' by Chris Williams G7NBP		26 Apr
PW Brassica Vertical h.f. Antenna by Maurice Schofield G4WUP		36 June
PW Changer by Kevin Walker G4AES		54 Mar
PW Codecard by Terry Grice G4PSL		32 July
PW Easy 144MHz Amplifier by Ben Nock G4BXD		24 June
PW Helix - An Experimental Loop Antenna by Richard Q. Marris G2BZQ		39 Feb
PW Remote Antenna Position Indicator Device by Peter Laitt G0IFQ		38 Apr
PW Rugby 7MHz SSB & CW Transmitter by Dave Howes G4KQH	Part 1	20 Sept
PW Rugby 7MHz SSB & CW Transmitter by Dave Howes G4KQH	Part 2	26 Oct
Shack Intruder Alarm by Jack McKinney G13TZB		26 Aug
Short Twenty by Frank Lee G3YCC		27 Mar
Simple Transistor Checker by John Thornton Lawrence GW3JGA		28 Feb
Six-Whip by Kevin James G6VNT		24 Jan
Sprat Transceiver by George Dobbs G3RJV	Part 1	38 July
Sprat Transceiver by George Dobbs G3RJV	Part 2	38 Aug
Suspend-A-Loop by Kevin James G6VNT		36 Sept
The Dipole Antenna - Our Flexible Friend by Matt Probert		28 June
The Hairpin Match Revisited by Roy Quantick G3UGL		28 Aug
The Handy From Tandy - Revisited by Mike Hadley G4JXX		26 May
Turn & Tune - A Variometer Tuner by Anthony Langton G04HTU		58 Nov
Up The Pole - The PW Trolley Mast by Jack Frizzell G0LEO		42 Aug
Wooden Wonder For Two by Maurice Schofield G4WUP		32 Mar

## Errors & Updates

Harding's Home-brew Pgs 36 - 38 Dec '95		24 Mar
PW Helix - An Experimental Loop Antenna Pgs 39 - 41 Feb '96		24 Mar

## Features

Amateur Radio In The Maldives by Nick Plumb G0PBV		43 May
Amateur Television - An Introduction by Graham Hankins G8EMX		18 Dec
An Effective Earth System by Roy Ratcliffe GW3KZW		40 Apr
Broadcasting On A Shoestring by Jim Lee G4AEH		25 Nov
Carry On Cruising With Kenwood by Bryan Coleman G0ICN		25 Oct
Computing & Radio - Do They Mix? by Mike Richards G4WNC		26 Dec
Computing Technically by Gerald Stancey G3MCK		30 Dec
Dayton HamVention '96 Holiday Report by Rob Mannion G3XFD		18 Oct
Electronics Servicing For The Radio Amateur by John Beaumont G3NGD		48 May
Farewell To Ferranti by Ian Poole G3YWX		31 Feb
Five And Nine By Force Four by Ron Wilson G3DSV		42 Apr
Hebridean Holiday by Peter Walker G4HHH		42 Feb
Holly's Hobby - Building The Pitney by Holly Sibley		13 Dec
Invisible Power by Gordon King G4VJV		30 Aug
Key Tips by Peter Barville G3XJS		30 July
London Show Report by Rob Mannion G3XFD		40 May
Lucky Lutterot by Jan Lutterot G0LUT		31 Mar
Meters Made - Taiwanese Style by Mike Haydon G1KVO		42 July
Morse Methods by John Goodall G0SKR		26 July
My Kind of Holiday - The Island Of Mykonos by Phil Whitchurch G3SWH		41 May
Practical Wireless 144MHz QRP Contest Results by Neill Taylor G4HLX		34 Nov
Practice Makes Perfect by Roy Clayton G4SSH		33 July
Rounding-Up To The RAE		19 Sept
Satellite Radio - An Introduction by Simon Spanswick		22 Oct
Soldering Success Isn't A Secret! by Paul Essery GW3KFE		36 Dec
The 14th Annual Practical Wireless 144MHz QRP Contest Rules by Neill Taylor G4HLX		26 June
The First 100 CW QSOs by Richard Lau G0TBX		40 July
The Good Old Days by Jack Belcher		36 May

	Part	Pg/Mth
The Kenwood Story by Richard McLachlan G3OQT		20 Aug
The Low Down On 73 by David Butler G4ASR		24 Sept
Those Amazing Auroras by Ian Poole G3YWX		38 June
Three Legged Winners by Ron Ham		44 Feb
Tips & Tools - Workshop Practices by Clive Hardy G4SLU		34 Dec
Trapezoids Triangles & Squares by Patrick Allely GW3KJW		42 June
Trials & Tribulations Of The RAE by Patricia McVey GOPXJ		31 Sept
Would You Be Eligible? by John Worthington GW3COI		61 Mar

## Theory

Antenna Workshop - Delta Yagis by Ray Fautley G3ASG		58 Mar
Antenna Workshop - Planning Permission by Gerald Stancey G3MCK		48 June
Antenna Workshop - SWR Fact or Fiction? by Dick Pascoe G0BPS		44 Oct
Antenna Workshop - Tee Tuner & Skelton Cone by George Dobbs G3RJV		30 Apr
Antenna Workshop - Three-Band Indoor Pi-Match Antenna by John Heys G3BDQ		60 Nov
Antenna Workshop - Trapped Dipoles by Ray Fautley G3ASG		44 Sept
Antenna Workshop - Vertically Polarised 50/70MHz Antennas by David Butler G4ASR		42 Jan
Antenna Workshop - VHF Discone & Skeleton Discone by John Heys G3BDQ		44 May
Antenna Workshop - VHF/UHF Antenna Questions by David Butler G4ASR		44 Aug
Antenna Workshop - Voltage Standing Wave Ratio by Gerald Stancey G3MCK		37 Feb
Antenna Workshop - The Smith Chart by Gerald Stancey G3MCK		40 Dec
Crystal Clear Future by Ian Poole G3YWX		20 Jan
Looping Over The Lawn by Ben Nock G4BXD		37 July
Make One Or Buy One? by Denis Payne G3KCR		22 Apr
RAE Casebook by Murray Ward G3KZB		38 Sept
Your Coaxial Cable - Any Good? by Don Johnson K7UGQ		38 Jan

## Book Reviews

<i>Basic Radio &amp; Electronic Calculations (Using The Casio Scientific Calculator)</i>		48 Dec
<i>Electronics Service Manual</i>		46 Aug
<i>More Out Of Thin Air</i>		18 Jan

## Reviews

ADI - AR-146 Mobile Transceiver by John Goodall G0SKR		20 Apr
AKD Target HF-3 Communications Receiver by Rob Mannion G3XFD		21 Nov
Alinco DJ-190 VHF FM Transceiver by Elaine Richards G4LFM		28 May
Alinco DJ-S41 430MHz Transceiver by Ken Smith G3JIX		53 Nov
Alinco DR-605 VHF/UHF FM Transceiver by Leighton Smart GW0LBI		38 Oct
Cobwebb Antenna by John Heys G3BDQ		32 Apr
Cushcraft R7000 Vertical Antenna by Steve Locke GW0SGL		28 Sept
Garmin GPS 45 Personal Navigator by Peter Barville G3XJS		18 Mar
Icom IC-706 HF & VHF Mobile Transceiver by Richard Newton G0RSN		20 Feb
Icom IC-T7E Dual-Band FM Transceiver by 'Tex' Swann G1TEX		32 June
Kenwood TRC-80 Professional HF Transceiver by Mike Devereux G3SED		23 May
MFJ-9406 50MHz Transceiver by David Butler G4ASR		22 July
Quickroute 3.5 by Tex Swann G1TEX		44 July
Revox W200 SWR & Power Meter by Leighton Smart GW0LBI		19 Aug
SWR-50RM Antenna Tuning Unit by 'Tex' Swann G1TEX		28 Apr
The Chelcom 3-Band Windom Antenna by John Heys G3BDQ		30 Oct
The MyDel Multi-Trap Antenna by Eric Gray G3CPS		32 Dec
Watson 2090H Add-On Linear Amplifier by 'Tex' Swann G1TEX		36 Jan
Yaesu FT-3000M 144MHz Mobile Transceiver by John Goodall G0SKR		21 June
Yaesu FT-50R Dual-Band Hand-Held Transceiver by Clive Hardy G4SLU		36 Aug

## Show Guides

### The Essential Guide To The London Show

Picketts Lock - The Beginning		37 Mar
Editor's Corner		38 Mar
News		39 Mar
Floor Plan		41 Mar
Questionnaire		42 Mar
Vintage Fair		48 Mar

### The Leicester Show

25 Years and Counting		40 Nov
Floor Plan		42 Nov
Show News		44 Nov
Editor's Corner		52 Nov

# Practical Wireless Index Volume 72 January to December 1996

## Regulars

### Bargain Basement

59 Jan, 59 Feb, 75 Mar, 59 Apr, 58 May, 59 June, 58 July, 58 Aug, 58 Sept, 58 Oct, 72 Nov, 58 Dec.

### Bits & Bytes - The Computer In Your Shack by Mike Richards G4WNC

51 Jan, 54 Feb, 66 Mar, 50 Apr, 55 May, 52 June, 55 July, 54 Aug, 54 Sept, 48 Oct, 66 Nov, 28 Dec.

### Book Profiles

64 Oct, 48 Nov, 64 Dec.

### Broadcast Round-Up by Peter Shore

53 Jan, 57 Feb, 73 Mar, 57 Apr, 56 May, 57 June, 56 July, 56 Aug, 55 Sept, 55 Oct, 71 Nov, 55 Dec.

### Buyers Guide

80 Nov.

### Carrying On The Practical Way by George Dobbs G3RJV

24 Aug, 32 Sept, 36 Oct, 30 Nov, 44 Dec.

### Club Spotlight

16 Jan, 16 Feb, 16 Mar, 16 Apr, 20 May, 18 June, 18 July, 16 Aug, 16 Sept, 16 Oct, 16 Nov, 16 Dec.

### Competitions

Wordsearch 9 Feb.

Spot The Difference 9 Mar.

### Dayton '96 Promo

18 Jan, 33 Feb, 49 Mar.

### Editor's Keylines by Rob Mannion G3XFD

9 Jan, 9 Feb, 9 Mar, 9 Apr, 9 May, 8 June, 9 July, 9 Aug, 9 Sept, 9 Oct, 9 Nov, 9 Dec.

### Endnotes 67 Jan, 67 Feb.

### Equipment Specifications - The Mysteries Explained by Ian Poole G3YWY

46 Jan, 51 Feb, 64 Mar, 49 May, 55 June, 47 Aug, 53 Sept, 54 Dec.

### Focal Point - The World of ATV by Graham Hankins G8EMX

58 Feb, 58 Apr, 58 June, 57 Aug, 57 Oct.

### HF Far & Wide by Leighton Smart GW0LBI

56 Jan, 56 Feb, 70 Mar, 56 Apr, 52 May, 56 June, 50 July, 52 Aug, 50 Sept, 54 Oct, 68 Nov, 49 Dec.

### News '96

26 Jan, 26 Feb, 12 Apr, 12 May, 12 June, 12 July, 12 Aug, 12 Sept, 12 Oct, 12 Nov, 12 Dec.

### Novice Natter by Elaine Richards G4LFM

12 Jan, 12 Feb, 12 Mar, 14 Apr, 18 May, 16 June, 16 July, 14 Aug, 14 Sept, 14 Oct, 14 Nov.

### Packet Panorama by Roger Cooke

58 Jan, 74 Mar, 57 May, 57 July, 56 Sept, 74 Nov.

### PW Book Store

63 Jan, 63 Feb, 79 Mar, 63 Apr, 63 May, 63 June, 63 July, 63 Aug, 63 Sept, 63 Oct, 46 Nov, 63 Dec.

### Radio Diary

31 Jan, 30 Feb, 28 Mar, 18 Apr, 16 May, 20 June, 20 July, 18 Aug, 42 Sept, 21 Oct, 13 Nov, 9 Dec.

### Receiving You

10 Jan, 10 Feb, 10 Mar, 12 Apr, 10 May, 10 June, 10 July, 10 Aug, 10 Sept, 10 Oct, 10 Nov, 10 Dec.

### Scene USA by Ed Taylor WT3U

49 Jan, 48 Mar, 48 July, 52 Oct.

### Valve & Vintage by Ben Nock G4BXD

49 Feb, 48 Mar, 48 Aug, 62 Nov.

### Valve & Vintage by Charles Miller

40 Jan, 44 Apr, 46 July, 46 Oct.

### Valve & Vintage by Phil Cadman G4JCP

62 Mar, 46 June, 46 Sept, 42 Dec.

### VHF Report by David Butler G4ASR

54 Jan, 52 Feb, 68 Mar, 54 Apr, 50 May, 50 June, 52 July, 50 Aug, 48 Sept, 50 Oct, 64 Nov, 50 Dec.

## Special Offers

Cushcraft R7000 Multi-Band Vertical Antenna 37 Sept

More Out Of Thin Air 18 Apr

Practical Wireless Subscriptions - Free Binder 19 June

Practical Wireless Subscriptions - Free Book 16 May

Practical Wireless Subscriptions - £50 for 3 years 18 Sept

Practical Wireless Subscriptions - Free Reference Chart, 2m & 70cm Databards 20 July

UK Scanning Directory 29 Aug

Practical Wireless Free For 1 Year 21 Oct

Practical Wireless Christmas Subscription Offer - Free Earpiece, Speaker or Clip 24 Dec

## Special Prize Competitions

CobWebb Antenna & Mosley Antenna 25 Apr

ADI AR-146 Mobile Transceiver 17 May

IC-706 HF & VHF Mobile Transceiver Part 1 30 May

IC-706 HF & VHF Mobile Transceiver Part 2 9 June

IC-706 HF & VHF Mobile Transceiver Part 3 21 July

Air Tattoo Tickets 20 & 21st July 31 June

## Star Buy

The ARRL Handbook for Radio Amateurs 1996 62 July

Passport To World Band Radio 1996 62 Aug

Practical Wireless Binders 62 Sept

Radio Amateurs Examination Manual & How To Pass the RAE 62 Oct

Guide To FAX Stations 1995/1996 62 Nov

Radio Amateurs Map Of The World & QTH Locator Map Of Europe 62 May

More Out Of Thin Air 62 Dec

## Subs Club Special Offers

The Radio Amateurs' Question & Answer Reference Manual 17 Feb

## Free Gifts

The Practical Wireless Handy Reference Data Chart Jan

PW Pull-Out Wall Planner Feb

The Practical Wireless Antenna Data Reference Chart May

The Practical Wireless Morse Data Chart Aug

1997 MFJ Radio Products Catalogue Dec

Don't forget we have still available *PW* back issues for 1996 as well as 1991, 1992, 1993, 1994 and 1995. But hurry as stocks are limited. To order back issues either use the Order Form on page 62 of this issue or telephone the Credit Card Hotline on (01202) 659930. Back issues for 1991 and 1992 are available for just £1 including P&P, all others are £2.30 including P&P.

Advertisements from traders or for equipment that is illegal to possess, use or which cannot be licensed in the UK, will not be accepted. No responsibility will be taken for errors.

You should state clearly in your advert whether the equipment is professionally built, home-brewed or modified.

The Publishers of *Practical Wireless* also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

# BARGAIN

b a r g a i n

Compiled by Zoë Crabb



Adverts are published on a first come, first served basis. All queries to Zoë on (01202) 659910.

All adverts should be sent to: Zoë Crabb, Bargain Basement Free Ads, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW.

## For Sale

**386SX 33MHz motherboard** with cpu, 4 x 1Mb simms, Conner 85Mb HD, Trident 9000 VGA board with manual, drive/its disk at 1/10 plus IDE, FD controller board, cables, £85. Michael Watkins GONBB, Kent. Tel: (01227) 266460.

**80W petrol gen.** also R107, R206, S36, S37, AR88 and teleprinters No 7, etc., best offer secures. Also a.m. 50W amp and p.s.u. WW2, both huge, very heavy. Offers. Also H40, etc. Anthony, Milton Keynes. Tel: (01908) 373114 after 8pm.

**Air operated antenna mast.** 85 feet extended, 12 feet lowered, works from tyre pump, ideal for field days or small gardens, offers, evenings or weekends. Roger GOTES, Northants. Tel: (01933) 650729.

**Alineo DJ-162E 144MHz f.m. hand-held** transceiver with six AA Nicads £1250.00. Evershed Megger, 500V battery operated £25.00. Both items in v.g.c. G3MA, 40 Carlton Road, Gloucester GL1 5DY. (no Telephone) (01933) 650729.

**Alineo DR-590 dual-band 2m/70cm** (144/430MHz), manuals. Revet D24 duplexer. Diamond 770R dual-band mobile antenna. ZL special 7-element 70cm beam. £350 o.n.o. Looking for FT-690R 50MHz m/mode or similar. Chris G7NR0, QTHR. Tel: (01642) 553345.

**Amiga 500, 1Mb upgrade,** loads of software, mouse, joystick, £100 o.n.o. Wanted KW2000B h.f. transceiver and p.s.u., not too expensive. Lee, G4RKY (not QTHR). Tel: (01227) 742109.

**AOR 3000A,** mint condition, 100kHz - 2036MHz plus CLP5130 MKII log periodic beam antenna, both boxed with manuals, £650 o.n.o. P-ex considered for TS-50 h.f. radio, must be mint plus cash. Tel: Cleveland (01642) 883718 evening or (01642) 883365 daytime.

**Astron RS-50A 13.8V/50A power supply,** good condition, £100. Professionally built, unmodified p.s.u. Tel: (01827) 59155.

**AVO multimeter - meter leads,** £5 pair. Also leather case, 50MHz oscilloscope, model 0755 (twin beam) counter, Eddystone 840 receiver, would exchange for valued wireless sets. Tel: (01812) 862291.

**BC348-0 1940 aircraft receiver,** perfect working order, 240V a.c. 19246 radio receiver with BTH LS speaker, horn type. Tel: Devon (01395) 445392.

**Bush stereo radiogram SRG110,** manufactured 1964, 1.5m w.f.m., Garrard autochanger, 16/33/45/78, valved, full working order, floor standing, wooden cabinet, Mahogany finish, slightly scratched, 33W x 15D x 29H (inches), £20. Delivery extra. Walter, Pontefract. Tel: (01977) 611229.

**C12 + R Box,** cables, headset, £79. 38 Set, £35. C42 + p.s.u., R Box, headset, cables, £175. RT77/GRC9 transceiver, £55. Morse signal lamp with key, £10. Class 'D' wavemeter, £10. Tel: Yorkshire area (01274) 824816.

**CapCo magnetic loop antenna,** 80m (3.5MHz), less control box, good working order, £79.99. TAR Communications 144MHz 7-element ZL special antenna, boxed, £34.99. Tel: Oxon (01869) 244166.

**Citizen 120+ dot matrix printer,** as new, boxed, 200 sheets, continuous paper, 11m x 240mm, £85. Global CX401 antenna switch, new/boxed, £30. GPV-7 3-element collinear, stainless steel, £20, as new, RadCom 1980-1995 complete, pristine condition, £30. No offers please, carriage extra. G2FZU, Notts. Tel: (01636) 813847.

**Commodore 128C computer,** two drives, 157-81, REU 1MHz colour monitor 1901, Star 200 colour printer, TNC for packet, loads of software, manuals, p.s.u.s, cables, £450. Perfect working order. G1FEI, QTHR. Tel: Devon (01271) 870024.

**Crossed field loop antenna (h.f.)** indoor/mobile use, includes phasing unit and cables, £100. Tel: Isle of Lewis (01851) 706099.

**Datong v.l.f. converter,** brand new, but

unwanted, receipts verify, cost, £39, will sell for, £25 plus postage. B. Williams GW0GHF, QTHR. Tel: Cardiff (01222) 703429.

**Dentron 1Kw a.t.u.** (superb tuner + c/w h/book, £99 inc. P&P. Also wanted 'Top band' hand spread coil for HRO. Peter, Cleveland. Tel: (01287) 634397 9-5pm.

**Drake items,** all pristine, TR-4310, R4245, RR2, RR1, DSR1 with spares, manuals and extras. Serious offers only. Thanks. G3YFK, Nr. Shrewsbury. Tel: (01743) 884858.

**Eddystone 770U v.h.f./u.h.f. a.m./f.m. receiver,** 150 to 500MHz, fair to good condition, £85. BBC Master computer, disk drive, colour monitor, printer, £125. Tel: Birmingham 0121-475 8647.

**Eddystone receivers,** 770R x 2 and one 770U, all three in mint condition mechanically, but in need of circuit renovation to make them work. Open to offers. Buyer(s) to collect. John, London. Tel: 0181-362 5220 (work) or 0181-807 3859 (home).

**FT-101E h/book, mic., v.g.c.,** £150 o.n.o. Also original metal Morris 1000 sun visor 1956, £30 o.n.o. Tony, Colchester. Tel: (01206) 575035.

**FT-290R Mk1 2m (144MHz) multi-mode,** good condition, £175. FRG-7700 comms RX plus FRV-7700 v.h.f. converter, £200. FRDX500 amateur bands receiver, 160 (1.8MHz) to 2m (144MHz), £75. Can be air tested at this QTH. John G6HKQ, Norfolk/Suffolk borders. Tel: (01842) 878703. Free delivery to handicapped persons 50 miles.

**FT-301S h.f. transceiver,** no WARC, 10W solid state output, mic., manuals, £235 o.n.o. Good working order, ideal first rig or portable. Mike G4GER, Wiltshire. Tel: (01793) 539640.

**FT-747 all-band general coverage, c.w. filter** fitted, manual, £425. GW3COL, Abersoch. Tel: (01758) 712675.

**FT-747 general coverage h.f. 100W rig, c.w. c.w. filter, manual, £425.** GW3COL, Abersoch. Tel: (01748) 712675.

**FT-76 70cm (430MHz) hand-held transceiver,** spare NiCad and charger, £150 o.n.o. Icom IC-1016T, 100 channels, 70cm (430MHz) hand-held transceiver, 2 cell cases and p.s.u. lead, £120 o.n.o. Ideal Novice rigs. Tel: Sussex (01444) 441460 after 8pm please.

**Grundig Yacht Boy 500 with RDS and s.s.b.,** new, boxed with warranty, £135. Tel: London 0181-785 7314.

**Headkit SB301 and SB401** Shure 444 mic., Datong r.f. clipper, complete working h.f. station in clean condition, offers, circa. £175. Tel: Birmingham 0121-430 2929 evenings.

**IC-740 100W rig with RTTY/f.m. and a.c./d.c. option,** £425. Lowe HF-225 with f.m./synchronous a.m. detector, keypad and internal batteries, £325 o.n.o. John McCormick GM42NA, Fife. Tel: (01383) 412613.

**Icom IC-575H 100W dual-band multi-mode** 6/10m speech reloader. Trio 4000 25W dual-band f.m. 2/70cm, 10A p.s.u. triplexer, full packet equipment for white stick users, all-mode TNC, £1550 or split. Bill GW0PQL, Gwynedd. Tel: (01492) 623672.

**Icom IC-740 h.f. transceiver,** Curtis keyer, 250W, c.w. filter, WARC bands, f.m., c.w., RTTY, s.s.b., int. p.s.u., mics x 2, manuals and Icahi a.t.u., f.b. condition, £450 inc. del or offers to G3VGH, FT708 + splr. mic., p.s.u., 70cm, £85 o.n.o. Tel: York (01904) 769245.

**Icom IC-7TE with speaker mic. and dual-band** mobile whip, £250. PRO3036 base scanner, £140. Sony ICF-SW1E, £80. Buyer must collect. Tel: Rentrow 0141-885 2022.

**Icom IC2000H 2m (144MHz), 50W,** boxed, manual, three months old, 2m mobile whip, £210. Andy, Wigan. Tel: (01744) 895390.

**Index QRP Plus,** £400. Ten-Tec Century 22 c.w., £200. Trio JR599SC h.f. 2m (144MHz) and 6m (50MHz) receiver, £150. CapCo 10-20m loop, £100. MOAJL, Essex. Tel: (01708) 250578 evenings or weekends.

**Jaybeam 3-element tri-band antenna,** type TB3 MKII, 14-21-28MHz, complete with Ily-Gain BR-86 balun, also assembly and installation, instruction manuals, can deliver

locally, £95. Mick GONBB, Kent. Tel: (01227) 266460.

**JSI 125 h.f. TX** with matching power supply and speaker, mint, boxed, plus latest spec., smart tuner SO 230T, a gift at, £850 for JRC quality and rapid tuning. Dave GW0DXO, Gwynedd. Tel: (01248) 353619 or (01248) 372200.

**Kent Morse trainer,** £35, perfect condition. Yaeu FT-101E h.f. transceiver with manual, mic., good condition, £150. Tel: North Wales (01745) 852691.

**Kenwood R2000 receiver v.g.c.,** 150kHz - 30MHz, plus v.h.f. 118-174MHz, boxed with manual £375.00. Tel: Wokingham (01903) 262591.

**Kenwood R5000 + VC20 + s.s.b. filter,** £795. NRJ JRC525, £595. Both mint. Makers boxes with manual, circuit, etc. Tel: Beccles (01502) 711880.

**Kenwood Station monitor SM220 with Pan-**adapter fitted, as new £200.00. GMDWO QTHR.

**Kenwood TM-251E 2m (144MHz) f.m.** transceiver, 50W, Heathlite mic., boxed, as new, never used mobile, £275 inc. delivery. Barry GURZI, Cumbria. Tel: (01946) 812092.

**Kenwood TR-751A 144MHz all-mode,** 25W output £425. KW202 & KW204 good condition £50 the pair. Heathkit SB220 2Kw linear amplifier with new Eimac valves (tubes) £500. Home-brew antenna tuner £100. Tel: (01925) 225067.

**Kenwood TS-120V h.f.,** PS20, SP120, £350. Yaeu FT-902DM, £350. FT-101E, £200. FL227Z, TS-770, £400. Drake R4B, £150. Icom 260 2m (144MHz), £175. Wanted Navico AMR1000 E7J June 1982, Kenwood SA220. Dave, Norwich. Tel: (01603) 745512.

**Kenwood TS-140S h.f. RX/TX,** excellent condition, boxed with manual, £450. Also D/II R210 h.f. TX/RX with manuals and complete spares kit, buyer collects, £650. W. Powell, Herts. Tel: (01763) 245887.

**Kenwood TS-42E,** one month old with case, cost, £303, sell for, £250 or swap for Yaeu FT-101ZD/II or 707 with cash difference. Also for sale, Adams AM303 desk mic., £45. Mike, 18a High Street, Hoyland, nr. Barnsley, S. Yorks S74 9AB. Tel: (01226) 742971.

**Kenwood TS-440S with Kenwood PS-50** matching power supply, auto a.t.u., c.w. and s.s.b. filters fitted, this unit has had little use and is in excellent condition, price, £800, may split. Barry, Ayrshire. Tel: (01475) 672040.

**Kenwood TS-830S** mint condition used 30 minutes only, with headset boom-microphone. All supplied boxed with manual £550. Explorer 1.5Kw linear amplifier unused, mint condition £750. Buyer pays carriage. Mike Dunning GD0HYM, Tel: Isle-of-Man (01624) 833037 (Daytime only)

**Kenwood TS-830S,** c.w. filter, workshop manual, £425. DFC230 remote v.h.f., mobile bracket, mic., £55. Both v.g.c., buyer collect/pay carriage. Duncan, Milton Keynes. Tel: (01908) 562009.

**Kenwood TS-870 d.s.p. transceiver,** mint, used mainly QRP. £1650 inc. carriage. AMT3 RTTY/AMTOR, £65. MC85 desk mic., £65. G3YCC, Hull. Tel: (01482) 650410.

**KW2000E h.f. transceiver, p.s.u.,** manual, mint, £185. Eddystone 770R v.h.f. receiver, 19.165MHz, as new, with original documents, £155. Rascal 1217 h.f. receiver (solid state), superb, £220. RCA. AR88, cabinet, manual, £140. Tel: Yorks (01482) 869682.

**KW2000E** with matching Q-multiplier and instruction manual, £200. Tel: S. Glamorgan (01446) 750748.

**Marine band transmitter,** valve, would convert to top band (1.8MHz), no p.s.u., also have vintage 'scope, mod 13A, offers or swap for r.f. signal generator in good working order. R. Burrell, 2 Clachamish, Berinsdale, Isle of Skye IV51 9NY.

**MCL data decoder, RTTY, c.w., FEC, ARG** with TV monitor, all manuals, books with Star LC100 colour printer, the lot. £175 o.n.o. Tel: 0181-658 2440.

**Navico AMR1000S 144MHz f.m. mobile** transceiver, very good condition, boxed with manual, 25W output, £100. Tel: W. Yorkshire (01924) 440748.

**Navtex professional receiver,** never used afloat, mint, £145 o.n.o. Signal R535 v.h.f./u.h.f. airband receiver, power supply, excellent, £260. NRDS35 Low mod. filters, matching speaker NVA319 with filters, excellent condition, £975 o.n.o. Tel: Warwick (01926) 854556.

**NRD525,** like new, boxed, £550. Icom R7000, 25-3000MHz, v.g.c., boxed, £550. Kenwood R5000 h.f. + v.h.f. conv., v.g.c., manual, £600. Panasonic DR29 s.w.r. digital f.m./m.w./l.w., 1.6 to 30MHz, £150. Pye Cambridge valves radio, nine bands, excellent condition, sound, £50. Wanted 30-S-1 KWS-1 75A3 75A1. Tel: London 0181-813 9193.

**PRO44 hand-held scanner** in mint condition, covers 68-88, 108-136.975, 137-174, 380-512MHz, not even one year old, £90 o.n.o. Tel: Essex (01255) 679521 after 5.30pm or (01255) 673607 weekdays 9am to 5pm.

**Pye MX294 Ili hand TX/RX 2m (144MHz) 16** channel ex-pm, £55 o.n.o. + P&P. Also Rascal RA17 short wave RX, 0-30MHz, v.g.c., 230V a.c., £140 o.n.o. + carriage (heavy). Prefers buyer collects. Mr Pavey, Hants. Tel: (01730) 263104 after 6pm.

**QRP MFJ-9420 s.s.b. and c.w.,** as new, £159. Sudden 30m (10MHz) OXO TX, £29. 80m (3.5MHz) TX/RX OXO, £39. Howes metal chassis, all 80m (3.5MHz) functions installed, lovely c.w. rig, £109. John GOFJN, 12 Gilpin Road, Oulton Broad, Suffolk NR32 3NS. Tel: (01502) 518745.

**R-1000 RX, g.c., c/w handbook,** 30 bands, £199 to include P&P. Dentron 11k w.a.t.u., £99 inc. P&P. Peter, Cleveland. Tel: (01287) 634397 9-5pm, work QTH.

**Rascal 117E, GCHQ RX,** excellent condition, very stable, fully filtered, S meter, etc., boxed, manual, spare valves, view and collect, £185. Bill, N. Kent. Tel: (01634) 573471 anytime.

**Scanmaster wide band scanner antenna,** also TX/RX 2 + 70 amateur bands, as new, £22.50 p/paid. Two Amstrad PC1640DD PCs mono monitors, l/board, Morse printer, g.w.o., £55 - collected. John, Hants. Tel: (01256) 465126.

**SEM Z match a.t.u., £45. RAF Type 'D'** Morse key, unused from new, £30. Buyer collects or pays carriage. Tel: Cornwall (01326) 313688.

**Signal R532 airband receiver** with battery pack, charger, case and antenna, in mint condition, £80 o.v.n.o. plus postage. Russell, Watford. Tel: (01923) 680732.

**Sony ANI antenna,** 150kHz to 30MHz with r.f. amp, low noise, wide dynamic range (i.e.), compact size, d.c. operation, cost, £70, £45 o.n.o. Used once. Tel: London 0181-529 3392 after 6pm.

**Tektronix 465 oscilloscope** (100MHz dual-beam, delayed timebase, etc., reasonable offers, also assorted power supplies, bench, metered, modular, state your requirements! Call anytime. David, Kent. Tel: (01634) 220749.

**Tektronix 7603 oscilloscope** units 7B53A, 7A13, 7A26, six manuals, £100. KW500 linear, 2 x 813, £100. Tequipment D43 dual-beam scope, £40. AR3000A, as new, c/w handbook and accessories, £500. Earl, Daventry. Tel: (01327) 802665.

**Tonna 6m 5-element beam,** used three months, v.g.c., boxed with manual, £35. Andy G0XBA, Hants. Tel: (01256) 411207 after 6pm weekends.

**Tower P60,** £275, reduced to £200. If buyer digs out ground post. G3MEA, Durham. Tel: 0191-373 4560.

**Trio TR2500 hand-held 2m (144MHz) original** box and manual, little used, £85. Swing arm magnifying lamp, £17. Tel: Birmingham 0121-427 1788.

**Trio TS-520** boxed with manual, MC50 mic. and spare TX valves, c.w. filter, d.c.-a.c. converter TV502 2m (144MHz) transverter, £250 the lot o.n.o. Excellent condition for former set, one owner. Paul, Merseyside. Tel:

0151-924 9711 anytime of the day/evening. TS-530SP, excellent condition with manuals, £350 o.n.o. G6DFH, QTHR. Tel: 0121-706 0231.

**TS-700G 2m (144MHz) all-mode,** 10W, mains or 12V, mic., manual, mint, £210. TR220GX 2m mic., £55. Wanted TR2300, SD1-452 transistor. GAILA, Stockport. Tel: 0161-477 6702.

**TS-830S c/w f.m. and narrow c.w. filter,** VFO230, AT230, SP230, original service manual, handbook, two spare sets matched 6146Bs and 12BY7A drivers (originals still in), Shure 527B mic., £675. Vic, Berkshire. Tel: (01344) 485635.

**Two x RN6 50MHz transverters,** 2.5W 144MHz in, 2.5W 50MHz out, £155 o.n.o. 2.5W 144MHz in, 2.5W 50MHz out, £60 o.n.o. ideal for Novice. Maxon 4 channel 70cm x p.m.r., 3 repeater fitted, UB 433.100 SD433.350 TC 433.025 (Wincanton) maybe, one simplex, ideal south west mobile? £70 o.n.o. Martin, Dorset. Tel: (01747) 826078.

**Valves,** various, have few to sell, 'U' series, 'E' series, 7 & 9 pin ECC83s, EL84, 6J7, KT61, 6K8, EF39, EBC33, KT33C, EL35, EL38, etc., list available. Rank aldas 16mm sound projector, £60. GB8SK, 290 Priory Road, Southampton. Tel: (01703) 552247.

**Wek SP15 s.w.a. power meter,** 200W c.w., likewise matching Wek AC38M a.t.u., £75, pair, £40 each. Boxed, mint, instructions, also Reace transceiver monitor s.w.r. power mod., 1kV, £40. All plus P&P. Barry GORZI, Cumbria. Tel: (01946) 812092.

**Yaeu antenna rotator G400RC** including bottom mast clamp and fifty feet control cable, boxed with instructions, £150 o.n.o. Tom, Derby. Tel: (01332) 767960.

**Yaeu automatic a.t.u. FC757,** good condition, with manual, £200. Cushcraft R5 vertical aerial, £150 (with instructions and box), Pete, Bristol. Tel: (01454) 887461 or 887872.

**Yaeu FRG7000,** £190. FDK750 2m (144MHz) multi-mode, £175. Standard CR900 2m mobile, £110. PRO57 scanner, £60. Massive junk box sale, valves, transformers, components, etc., s.a.s.e. lists or collect or carriage extra. Ken G0WBM, 2 Bexley Close, Glossop, Derbyshire SK13 9BG. Tel: (01457) 855468.

**Yaeu FRG7700** with memories board, power lead, manual, mint, sell for, £300 o.n.o. or swap FT-7B or FT-77 or any old h.f. transceiver, taking c.w. soon, want to see to get on h.f. 2E1FCG, S. Yorks. Tel: (01226) 742970.

**Yaeu FT-101E transceiver,** microphone, manual, circuit details, perfect, £250. Ted, London. Tel: 0181-488 9629.

**Yaeu FT-101E, v.g.c.,** plus matching monitor scope YO-100, also v.g.c., all for, £225 o.n.o. Patrick G7FJA, Dartford. Tel: (01322) 273451 evenings or (0468) 201834 days.

**Yaeu FT-101ZD,** g.w.o., service manual, £360. Headphones by Yaeu, £10. Keyer ETM3 electronic, jap. semi-automatic bug, £10. BC221 freq. meter, £20. Yaeu speaker, £15, misc. bits. Tel: Scotland (01292) 479217.

**Yaeu FT-102** fitted with f.m. and narrow c.w. filter with SP102 speaker, £375. Marchwood p.s.u., £80. Yaeu FT-102 with SP102, £350. PC 386/33 5m RAM 120Mb hard disk, mono, £150. Clive, London. Tel: 0181-963 4262 work or 0171-732 8319.

**Yaeu FT-200 & FP-200** combination with TX fault plus FRG-7 with minor dial light fault, otherwise good condition! £50 the pair, Will not split, must see and collect. Bill Symes G8AIV, 135 Moreton Road, Upton, Wirral, Merseyside L49 4NT

**Yaeu FT-221R 144MHz multi-mode (a.m., f.m., u.s.b. and l.s.b.) transceiver.** Excellent condition, with high performance MuTek front-end, and complete with original manual and documentation £295 o.n.o. Dave G4JRQ, Tel: Milton Keynes (01908) 691887.

**Yaeu FT-227 2m (144MHz) mobile 10W** synthesised 10kHz steps (+5kHz), superb condition in full working order, inc. manual, £120 or swap for 25kHz channelled rig. Bob Ralph, W.Mids. Tel: 0121-356 6001 ext. 215.

**Yaesu FT-2400H** 50W 2m (144MHz) f.m. transceiver, mint condition with Leson desk mic, £225. Kenwood mobile s.w.r. meter SW100A 1.8-150MHz, 150W, £25. Tom G7LNG, S. Devon. Tel: (01752) 892175.

**Yaesu FT-480R** multi-mode transceiver 2m (144MHz), 1W low power, 10W high power, good condition. Also left antenna and Ken key, £230 o.n.o. Steve. Bognor Regis. Tel: (01243) 824034 evenings.

**Yaesu FT-707** h.f. transceiver £275, FP-707 p.s.u. £85, no modifications. Cusbcraft vertical h.f. R5 antenna £90. Datong automatic r.f. speech processor £50, R.N. Electronics LNA/Q 70MHz r.f. switched pre-amplifier £15. Geoff. Tel: Weaybridge, Surrey (01932) 845719.

**Yaesu FT-726R** including 50MHz, 144MHz, 432MHz, satellite modules, YM-48 d.l.m.f. microphone, £725. Yaesu FT-530 dual-band 144-432 hand-held, 12V NiCad, SMC-18 NiCad charger, two battery cases, soft case, £325, see other ad. Mick G4ITF, Portsmouth. Tel: (01705) 386184.

**Yaesu FT-747** h.f. transceiver, boxed with manual, fitted f.m. boards, £485 o.v.n.o. Kenwood TS-8305 transceiver, extra s.s.b. filter, £475 o.v.n.o. Both excellent condition. GW3YAF, Carmarthenshire. Tel: (01269) 870076.

**Yaesu FT-747GX** with f.m. board, LAR-a.t.u., cross pointer s.w.r. meter, Siskin Electronics computer interface and software for the IBM PC, £550 or offers, for carriage can be arranged. Chris, Cambs. Tel: (01480) 466410 (home) or (01223) 250437 (work).

**Yaesu FT-76** 70cm (430MHz) hand-held, NiCad charger, soft case, £175. Netset PRO44 v.h.f. u.h.f. scanner, NiCads and charger, p.s.u., £100 plus free RX mag mount aerial! All as new and boxed. Tel: Staffs (01827) 58004.

**Yaesu FT-747GX** h.f./2m (144MHz), SP767 filtered speaker, MH-1B8 microphone, £880. **Yaesu FT-470** v.h.f. u.h.f. hand-held, two NiCads, d.e. adapter, speaker-mic, NC-29 base charger, soft case, mobile bracket, £260. AEA AT-300 a.t.u., £110. Brian G4ITG, Hanis. Tel: (01329) 310364.

**Yaesu FT-747GX** h.f./2m (144MHz) 2m/70cm (144/430MHz), MH-1B8 mic., £1200. **Yaesu FT-470** dual-band 144/432 hand-held, d.e. adapter, battery cases, soft case, £240. **Yaesu** speaker microphones MH12A2B, £15. MH18A2B, £10. MH29 l.c.d. remote FT530/51, £60. Mick G4ITF, Portsmouth. Tel: (01705) 386184.

**Yaesu FT-901DM**, sell, £250 or exchange for decent Clarke mast or similar, may accept R1000 receiver in exchange if in mint condition. Telephone me if you have either of the items, I will do a deal! Callers after 6pm please. Tel: S. Wales (01443) 41954.

**Yaesu FT-ONE** general coverage all-mode transceiver, c/w mic., owners and service manuals, excellent condition, £625 o.n.o. CapCo SPC300 a.t.u., £100. Simpson frequency counter, 10Hz to 60MHz, £75. Tel: N.W. London 0181-455 8831 anytime.

**Yaesu FT7B** h.f. TX/RX, plus YC7B digital read-out unit, complete, mic., mobile mount, handbook, also ancient Vibroplex standard bug key, will accept reasonable offer or exchange, w.h.y.? Peerless, 157 Fairmead Crescent, Edgware, Middlesex HA8 8YS or 0181-958 6887.

**ZX Spectrum** + with RX4 decode software, c.w., RTTY, SSVT, AMTOR, £30. Tel: Derbyshire (01298) 78268.

### Exchange

1920s radio with original lit. battery, very old crystal set, numerous valves, one new PM12M,

Ultra Valiant base station, three mobiles for any h.f. or 2m (144MHz) transceiver, could deliver. Keith GOXKT, Paddock Wood, Kent. Tel: (01892) 836308 anytime.

**Atari NSX-380** midi hi-fi system, immaculate, manual, original packing, CD, twin cassette, remote, full logic, Karaoke feature, swap for R1000 or Sony 20001D radio, will deliver. Borthwick, 42 Eldon Road, Hawick, Scottish Borders TD9 8ES.

**Atari 1040STE** 40Mb hard drive, 4Mb RAM, colour monitor 50+ boxed games and many hundreds of PD disks and games, exchange for weather FAX decode set-up or w.h.y.? Tel: Middlesex 0181-384 9199 after 6pm.

**Datong ASP r.f. speech processor** + Icom connecting lead, microwave modules, 2m pre-amp, r.f. switched. Wanted h.f. vertical port or mobile h.f. port. G3NQX, Preston. Tel: (01772) 703957.

**Delta One 934**, v.g.c., c/w beam antenna, swap superb Star 3900, ranger 28.30, Belcom LS102 L, LINCION 28.30. Answer machine, please leave message, all calls returned. Andy GUAD, Derbyshire. Tel: 0115-930 8096.

**Diawa Search 9 marine RX + 5CX5 power pack**, v.g.c., exchange for good h.f. RX 50kHz - 30MHz Eddystone RX or w.h.y.? Fred, Darlington. Tel: (01325) 365010.

**Does anyone have spare matching power supply** for my KW2000B, also any other KW items, would exchange for 19 Set power supply, also have 19 Set items, buy, exchange or sell. Pete G4LQZ, QTHR. Tel: (01993) 845270 anytime.

**Exchange Short Wave Magazine** (50-60) and Greenkai Spotter Scope (30-60x) with tripod, for good quality air-band radio or w.h.y. Tel: (01782) 833469

**Nikon FG SLR** camera with 50mm Nikor 135mm Nikor and 35-70 zoom, all mint condition and boxed for AOR SDU5000 in same condition. Len G4HME, QTHR. Tel: Northants (01933) 227505.

PC, complete with SVGA monitor, sound card, CDROM, modem, twin speakers, Epson printer, Win95, etc., etc., swap for good receiver. Wanted Mini Beam for 10-12m (24-28MHz), reasonable price paid. Tel: Northants (01536) 522007.

**Yaesu FT-747** with f.m. board, well used but good reliable rig, exchange for 486 computer, pref. with tower case, but any considered. Dave. Tyneside. Tel: (01207) 543776 evenings or weekends.

### Wanted

**144MHz mobile rig** with 25kHz channels (ritals or synth) inc. tone burst and manual, £100 for rig in very good condition. Bob Ralph, W/Mids. Tel: 0121-356 6001 ext. 215.

A mini beam that covers the 24 and 28MHz bands, two or three element, but please no fancy prices, also exchange 386DX40 PC multi-media PC for good receiver. Tel: Northants (01536) 522007.

A school club needs NiCads in good condition for Pye PF2UB transceivers. Noel G17CMC, QTHR. Tel: (01232) 452202 (evenings) or E-mail to: bfsra@mpic.co.uk

**Aerial AV5** Cushcraft or similar. Also mobile antenna, details please. Tel: Derbyshire (01283) 221878.

**Any information on ratemeter type 136A**, cat no: 368A/A2, serial no: L65, by Ericson Telephones, Nottingham. Any costs will be reimbursed. K. H. Snell, 13 Green Bank Avenue, Maghull, Merseyside L31 2FG.

**Any RAF comms Radar equipment WWII**, any state. J. Burton, 48 Bron-y-Graig.

Llangefni, Anglesey. Tel: (01248) 722636.

**Base/mobile scanning ant. magnetic loop**, any make? h.f. vertical. Mr Howlett, Herts. Tel: (01438) 750450 anytime.

**HC348 in good working order**. Tom Jones, Macclesfield. Tel: (01625) 573543.

**Circuit board** with a.g.c., b.f.o.s.s.b., r.f. sens. supply for Eddystone 1837/15, also 2182 board, i.e.d. front panel black plastic surround, exchange 5/4 2 filters for HRO 5060, w.h.y.? NC 4007 Brian Pollard. Tel: 0171-736 6581 after 6pm.

**Circuit diagram**, alignment details for Tandberg receiver Huldra 8-55 or 8-56, will photocopy and return or pay for photocopy. Tel: Mid-Glamorgan (01443) 204180.

**Dish, 18in, parabolic reflector for 10GHz**, feed horn and flange. FDK 70cm transverter model EXpander 430, g.w.o. with instruction manual, John Piggott, Mid-Glamorgan. Tel: (01443) 834055.

**Drake SL-6000 a.m. filter**, 6.0kHz model 7024, to fit Drake TR7 model 1336, also Drake MS7 matching speaker and Drake watt meter. Jack G4NMZ, QTHR. Tel: (01504) 883390.

**Eddystone 960**, EB35 MkIII, other 'slide rule dial' models considered. Aldis sale for working, wooden case, £30. Anthony. Tel: (01686) 630255.

**Eddystone items**, 870A, EB35, EC10, 890, 930, 688, 621, speakers, in fact anything inc. scrap sets, for spare parts. Help please if you can. Peter Lepino, Surrey. Tel: (01372) 454381 or (0374) 128170 anytime.

**Fairmate AS3230** civil airband marine, 2m (144MHz), fair price given, thanks. F. Steele, Warwick. Tel: (01295) 670749.

**Ferrite rod aerials**, must be half inch in diameter, no more or less, must be six inches long or more. Peter Tankard, Sheffield. Tel: 0114-266 5253 anytime.

**Front flap cassette holder for GEC Stardeck** radio cassette, model R9002H or info where obtainable. T. A. Carrick, Lydney, St Aubyn Crescent, Newquay, Cornwall TR7 2RQ.

**GDHM-32 24GHz doppler module**, WG20 waveguide, IN26 diode, HP K486A sensor, hopefully QRV on 24GHz in 1997! Please 'phone if you have any of the above surplus. Bob G8VOI, Hampshire. Tel: (01705) 250830 after 6pm.

**Goodmans tuner amplifier**, 1.20 model T. Yehon, Barb. Tel: (01788) 890831.

**Headkit catalogues from 1970s**, any condition. Chris Murphy, 61 Portland St., Derby DE23 8QD. Tel: (01332) 730085.

**Help!** Has anyone constructed the Cirkit 2m (144MHz) f.m. 'Talkbox' transmitter, mine won't give any power output. Is there a modification I should know about? Yes, I have built it correctly. Peter Tasker, Shropshire. Tel: (01384) 480480 day. FAX: (01384) 480654.

**HRO type communications receiver**, no exuberant offers please. Brian. Croydon. Tel: 0181-651 5345.

**IC-SM5**, IC-SP2 speaker in clean working order, also IC-EX1/2 terminal with full details, realistic prices please. Chris. Wilts. Tel: (01672) 810677 after 1900 hrs.

**Information please** on any p.s.u. transistor regulator i.e. combination for 150V 150mA adjustable current limit. Differential 130V application notes or development circuits, etc., to power valve test equipment. Fred Meier, 3 Duckmaster Avenue, Clayton, Staffs ST5 3AJ. Tel: (01782) 614132 after 8pm.

**Mains frequency meter**, in working order. John, Middlesex. Tel: 0181-868 7684.

**Manual and/or circuit diagram for FDK**

multi-700EX 2m (144MHz) f.m. p.1.1. transceiver, photocopy will suffice, all expenses refunded. Mike M1AFC, Morecambe, Lancs. Tel: (01524) 416702.

**Manual for Trio 'scope**, type CS1560A to buy or loan for copying. Dan. Merthyr Tydfil. Tel: (01685) 375294.

**Manual/circuit diagram** for Lafayette HA-600 8W receiver, 6 bands, would photocopy manual or return or pay costs of owner doing this. Craig, Lanarkshire. Tel: (01555) 892399.

**Marconi Atlanta marine receiver**, John, W. Sussex. Tel: (01903) 241810 after 8pm and at weekends.

**Muirhead M100M** receiver. Desperate for any information by manufacturer's staff, user, etc., circuit diagrams, handbook, or history. Your cost price paid for any information. C. Hentall, 11 Union Street, Barne EN5 4HY. Tel: 0181-440 3534

**Operating Instructions** or manual for Trio TR-2600E hand-held 144MHz f.m. transceiver. Could copy and return. Geoff Stocks, Tel: Plymouth (01752) 668015.

**Power unit 1154/1155** also for RX216. 'Q-Max' chassis punches, FLDX 400 transmitter. Oceanspan Marconi transmitter, 5 'ton' emergency transmitter power pack NCX5, 816 valves, top class straight key preferred, RAF (pre-war) with rolling brass contacts. Tel: Powys (01597) 811159.

**QRO a.t.u.** with s.w.r. meter for h.f. Write with details to: Geoff Barnes G3AOS, QTHR. Tel: (01260) 252287.

**Racal I.f. units urgently wanted**, your price, will collect any-where, also wanted large cabinet to fit RA17 and LF137 into, have other Racal units to swap. John. Staffs. Tel: (01538) 385735.

**Racal RA17 100kHz** i.f. strip, back copies *RadCom*, SWM, circuit Icom ICM-12 Dymar 820 base station, have several working v.c.r.s, sell, swap, w.h.y.? E. Edwards, Wirral. Tel: 0151-632 0614.

**Racal RA217 or RA329B**, also I.f. adapter if you have one. All in v.g.c., complete with all original parts, knobs, paint work, etc., no modifications of any kind. Write to: Barker, 29 St. Andrews Court, Benton, Newcastle/Tyne NE7 7UT.

**Radio software TX/RX** for Apple II ex. Tom Staiker, 73 New Edinburgh Road, Uddington G71 6AB. Tel: (01698) 816793.

**Radiovision Leicester 'Hamhander' receiver** and construction book. Tel: Bridgwater (01278) 722792.

**Restoring 1954 Pye 'Cambridge International'** (PE80) 11 wave band receiver, require: information, control knobs, circuit diagram, other vintage radio enthusiasm in my own area? Nigel Norris, 9 Buckingham Drive, Read, Burnley, Lancs BB12 7QE. Tel: (01282) 774699.

**RTTY program** for Apple II computer on diskette and any necessary TNC. Will G4EQG, Walsall. Tel: (01922) 682689.

**Service manual and operator instructions** for Tektronix scope, model 546. John Edwards, Gwent. Tel: (01495) 245825.

**Service manual for Telequipment D52** Serviscope. A photocopy will do. Chris Murphy, 61 Portland Street, Derby. Tel: (01332) 730085.

**Shure 444 magnetic mic.**, or just the insert cartridge or will swap for Shure EH28A table mic. Adrian, Herts. Tel: (01582) 833451 anytime.

**Signal civil air band base station receiver** for disabled listener, must be in good working order and reasonable price as my income is

limited. Please write to: Mr Round, 3 The Redhouse, Priorslee Village, Telford TF2 9NW.

**Single band c.w. TX/RX**, any age, condition, considered. QRP or QRO, H/B, I don't mind as long as g.w.o., I will pay carriage. Jo GMOWPQ, Moray. Tel: (01542) 833883 after 6pm or leave message.

**Small hand-held for 2 (144MHz) or 70cm (430MHz)** for packet use only. Also selling FT-221R 2m (144MHz) multi-mode, £300 o.n.o. G3GRX, Penrith. Tel: (01768) 864890.

**Solartron Vari-pack** type SRS153S variable voltage power unit: manual or circuit diagram only required. Photo copies welcome, all costs paid. Duncan G4DFV Tel: Mansfield (01623) 651954

**Solartron power unit 952.2**, circuit or firm's address. Thermo couple for 0-10/15 amps @ 1.8MHz, expenses gladly reimbursed, thank you. Colin Sumner, 7 Barncroft Drive, Hempstead, Gillingham, Kent ME7 3JT.

**Sony AN1 active a.w. antenna**, reasonable price please. Tel: S. Yorks (01909) 563911.

**Ten Tec model 243 remote v.f.o.**, fair price paid for unit in g.w.o. and condition, also require model 217 500Hz crystal filter. Peter, Suffolk. Tel: (01728) 748056.

**Trio TK350E a.m. f.m. tuner circuit/set-up** details, can you help, all expenses paid. John G8BHH, Gloucester. Tel: (01452) 830018 anytime.

**Yaesu FT-221R** multi-mode transceiver, also owner's handbook/circuits for Yaesu FRDX400 receiver or photocopy. Tel: Leamington Spa (01926) 427172.

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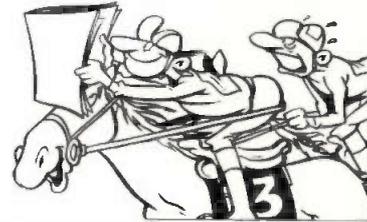
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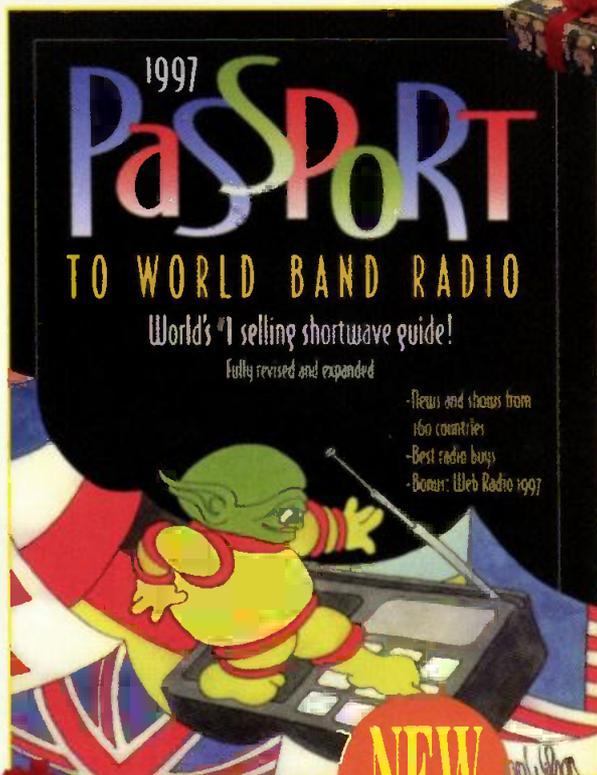
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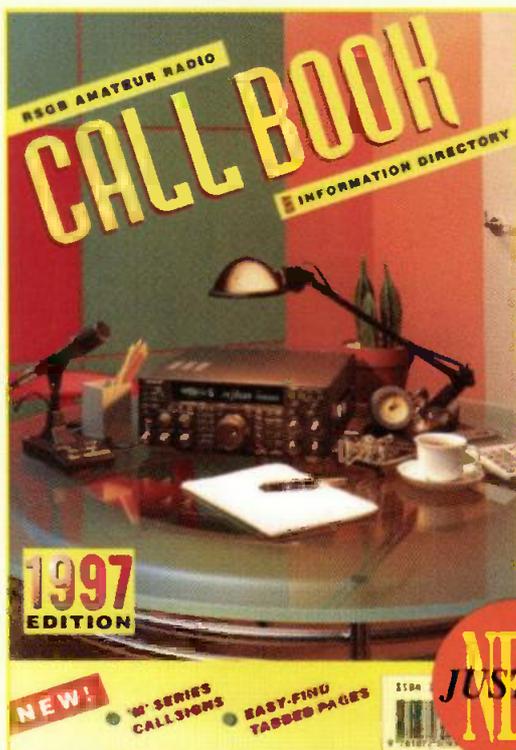
In keeping with previous editions there's also the usual authoritative articles and reviews designed to keep you fully up-to-date with the latest in short wave equipment. So, if you are partial to listening to short wave broadcasts from around the world or are just entering the fascinating world of listening then this is the book for you. At only £15.50 for over 500 informative pages it surely deserves a place on your bookshelf.



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Profiles



## The RSGB Amateur Radio Call Book And Information Directory 1997

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As in previous editions the directory continues to carry a Surname and Town index designed to aid in the looking-up of callsigns, together with the WAB square and IARU locator listing for most entires. The IARU locator information has been expanded to include amateurs listed in Northern Ireland. A new innovation for 1997 is the introduction of 'tabs' down the side of the pages (very like that used in address books) to make callsign finding easier.

As well as all this information on Band Plans, Clubs, Beacons, Contests, Licensing, Special Event Stations and much more is included within the Call Book's 480 pages.

The Amateur Radio Call Book And Information Directory really is the radio amateur's 'Bible' and is truly an invaluable reference book containing much more than just names, addresses and callsigns. So, go on what are you waiting for? - At only £13.50 it's well worth it.



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## The Klingenfuss Selection

In the world of data communications the name of Joerg Klingenfuss reigns supreme when it comes to information. The fifteenth edition of the *Klingenfuss Radio Data Code Manual* has almost 600 pages of information.

Broken down into 23 sections the thick book covers the weather organisations, types of code, civil aviation organisations, air traffic messages and how to decode them and the aircraft designators.

There is also many sections covering the method of transmission, modulation methods, and RTTY codes. You can identify the meteorological observation stations throughout the world from their index numbers given in the book.

There's over a hundred pages covering the non-standard teleprinter systems, before dealing with radiotelegraphy terms and definitions, non-standard Morse alphabets cryptography and abbreviations.

If you have any interest in the textual data transmission modes this book is a 'must' for you. Price £28.

Check out the weather throughout the world. See storms as they develop around the world with help from the *1996/1997 Guide To Weatherfax Services* from Klingenfuss.

Sections cover equipment, techniques standards and meteorological satellites, amateur stations, radiofax stations (organised in three different ways for clarity).

The final three sections cover schedules,

abbreviations and sample charts. Many of the charts are now available over the internet, those that are have the 'homepage' address shown.

There is an offer of 'perfectly modulated transmissions' available on CDs to check out your system. These audio recordings allow you to set up your system without the vagaries of propagation. *1996/1997 Guide To Weatherfax Services* is available for £25.

The *Klingenfuss 1996 Guide To Utility Stations (Edition 14)* incorporating Edition 22 of *The Guide To Radioteletype Stations* has 24 sections in some 600 pages.

These 24 sections cover topics such as how to monitor the transmissions, how to identify the station you're hearing and the table of international call signs. If you want to find one particular station, you can search by both frequency or name to winkle it out.

To catch the news before the radio and television transmit it listen to the news services. A list of press service stations is available in both alphabetical and chronological sequence. A short section about NAVTEX transmissions on 518kHz precedes a reference sections with areas such as the 'Z' and 'Q' codes, SINPO and SINPFEMO codes, types and modes of transmissions. Price £35.

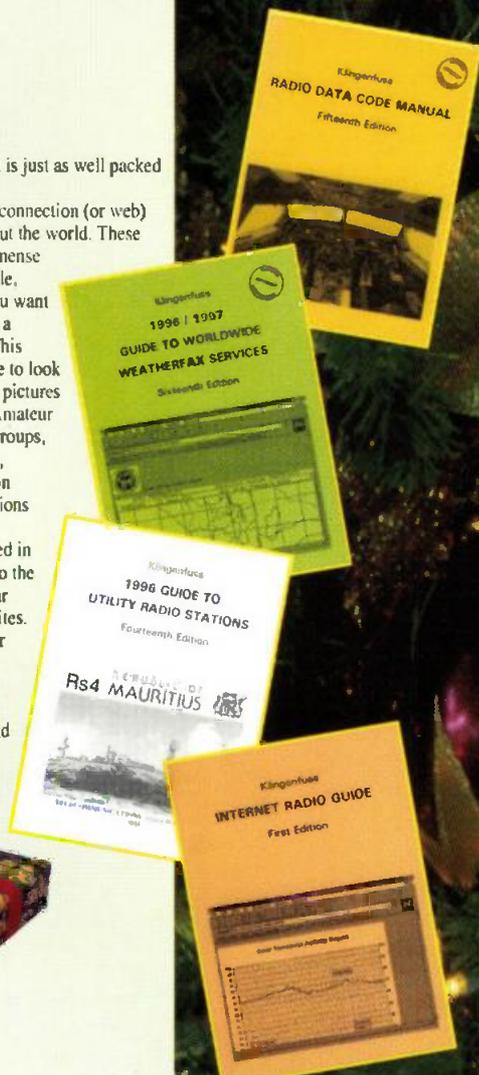
A newcomer to the Klingenfuss stable of reference guides is the *Internet Radio Guide Edition 1*. This new guide is only marginally slimmer than the more well established

Klingenfuss guides but is just as well packed with information.

The internet is vast connection (or web) of computers throughout the world. These computers have an immense amount of data available, but finding the 'bit' you want can be like looking for a needle in a haystack. This guide shows you where to look for 'pages' of data and pictures about topics such as: Amateur radio, clubs and newsgroups, geography intelligence, meteorology, navigation publications, radio stations and satellites.

For anyone interested in propagation there's also the page addresses for solar and geophysical data sites.

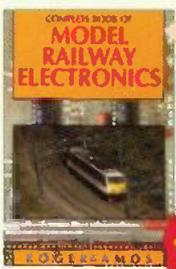
If you're looking for the radio information needle in a haystack - this book is just the magnet you need to find it and at £21 is well worth it.



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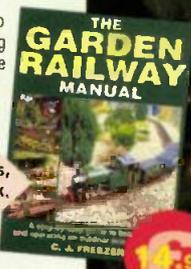
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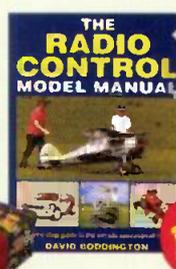
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Also, don't miss out on *Passport To World Band Radio 1997* edition at £15.50 and of course the new 1997 *Amateur Radio Call Book and Information Directory* at £13.50.

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## Index to Advertisers

A H Supplies .....	61	J Birkett .....	38	PCB Service.....	38
Aerial Techniques.....	67	Kenwood Electronics UK.....	5	RAS Notts.....	67
AKD .....	25	Klingenfuss Publications.....	4	RSGB.....	6
ARC .....	48	Lake Electronics.....	67	SMC.....	2/3
Circuit Distribution .....	6	Langrex Supplies.....	45	Spectrum Communications .....	67
Colomor Electronics.....	38	Linear Amp UK.....	45	SRP Trading .....	31
Cricklewood Electronics.....	45	Martin Lynch & Son.....	20/21	Sunrise Electronics.....	7
Datong Electronics .....	45	Mauritron Technical Services.....	67	Verulam Rally.....	38
Fairhaven Electronics .....	67	Modular Security Systems.....	61	Vintage Audio Co.....	67
Haydon Communications.....	14/15	Monitoring Times .....	31	Waters & Stanton.....	8
Howes, C M .....	25	Multicomm 2000 .....	46	Yaesu UK .....	OBC
Icom UK.....	IFC	muTek .....	61		

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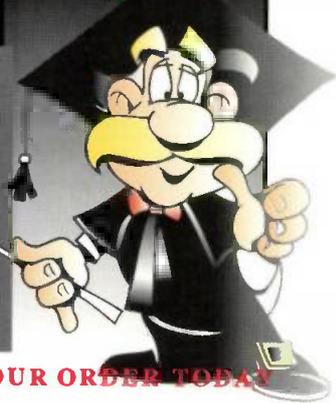
**ANTENNAS IN ACTION**

The First of a Bi-monthly 8 page special devoted to antennas and associated products - **don't miss it!**

**FREE!**  
 Office, Shack or Home -  
**DON'T RUSH OUT AND  
 BUY A YEAR PLANNER  
 FOR 1997!** There's one  
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**EXCLUSIVE! - REVIEW**  
 The New Kenwood TS-570D HF Transceiver  
 Plus all your regular favourites

Rob Mannion  
 G3XFD helps  
 and welcomes  
 newcomers to  
 amateur radio  
 through his new  
 Beginners' column



\*Contents subject to change

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short wave magazine

....**BOLDLY GOING**.....

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- ★ **60 Years of BBC TV** - ¶ Keith Hamer & Garry Smith
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# One tough little dual bander!

## Features

- Frequency Coverage  
Wide Band Receive  
RX: 76-200 MHz, 300-540 MHz, 590-999 MHz\*  
TX: 144-146 MHz, 430-450 MHz
- AM Aircraft Receive
- MIL-STD 810 Rating
- Digital Coded Squelch (DCS)
- 112 Memory Channels
- 12V DC Direct Input
- High Speed Scanning
- Alphanumeric Display
- CTCSS Encode (Decode w/FTT-12)
- Auto Range Transpond System™ (ARTS™)
- Dual Watch
- Direct FM
- High Audio Output
- ADMS-1C Windows™ Programmable
- Four Battery Savers:  
Automatic Power-Off (APO)  
Receive Battery Saver (RBS)  
Selectable Power Output (SPO)  
Transmit Battery Saver (TBS)
- Time Out Timer (TOT)
- 2.5 and 5 Watt Versions Available
- Optional Digital Voice Recording System (DVRS)
- Full line of accessories



"You notice how loud this HT's audio is?"

"Yeah, it's Mil Spec tough like a commercial HT."



"Easy to operate, small, great price!"

"Yaesu did it again!"



For the foremost in top-performing, durable, dual band handhelds there is one choice. The FT-50R. Manufactured to rigid commercial grade standards, the FT-50R is the only amateur dual band HT to achieve a MIL-STD 810 rating. Water-resistant construction uses weather-proof gaskets to seal major internal components against the corrosive action of dust and moisture. And, the rugged FT-50R withstands shock and vibration, so throw it in with your gear!

Dynamic and exclusive features set the FT-50R apart, too. Wide Band Receive includes 76-200 MHz (VHF), 300-540 (UHF), and 590-999 MHz\*. Dual Watch checks sub-band activity while receiving on another frequency, then when a signal is detected, shifts operation to that frequency. Digital

Battery Voltage displays current operating battery voltage. Digital Coded Squelch (DCS) silently monitors busy channels. Auto Range Transpond System™ (ARTS™) uses DCS to allow two radios to track one another. And, the FT-50R is ADMS-1C Windows™ PC programming compatible, too. To round out the FT-50R, it has four battery savers, and super loud audio—remarkable in an HT this size.

A reliable companion where ever you go, the FT-50R is one tough little dual bander with all the features you want!

**YAESU**  
...leading the way.™

For the latest Yaesu news, hottest products, visit us on the Internet! <http://www.yaesu.com>



**FT-10/40R**  
Ultra Compact Handhelds  
VHF or UHF. Similar to FT-50R including MIL-STD 810, and other exclusive features.

*Waters and Stanton Electronics present the*  
**1997 MFJ**  
**Radio products catalogue**

*Americas largest communications accessory manufacturer present their 1997 product lineup for the radio enthusiast and electronics hobbyist direct from their sole U.K distributor - Waters and Stanton Electronics.*



*MFJ hotline order number: 01702 203353*

*Quote "P.W. order" to ensure free delivery  
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**AMERITRON**

**MIRAGE**

Over 500 lines - Antenna tuners - Antenna analysers - Data products - Transceivers - Receivers

# MFJ 3 KW Roller Inductor Tuner

... Gives you absolute minimum SWR ... Simple 2-knob tuning ... Lighted Cross-needle SWR/Wattmeter ... 6-position antenna switch ... Balun for balanced lines ... 1.8-30 MHz coverage ...

**NEW**  
MFJ AirCore™  
Roller Inductor!

MFJ-986



- Easy-to-use 2-knob tuning
- Covers 1.8-30 MHz
- Peak and average Cross-needle meter
- Differential capacitor
- Roller inductor with 3-digits turns counter
- TrueCurrentBalun™
- Antenna Switch

MFJ's innovative *Differential-T™* Tuner uses a differential capacitor that makes tuning easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only *one* setting.

The MFJ-986 is a rugged 3 KW PEP SSB roller inductor antenna tuner that covers 1.8-30 MHz continuously, including 160 Meters, MARS and all the WARC bands.

MFJ's exclusive *AirCore™* Roller Inductor gives you *absolute minimum SWR*—something a tapped inductor just can't do.

A 3-digits turns counter plus a spinner knob gives you precise inductance control — so you can quickly retune to your frequency.

A *lighted* peak and average reading cross-needle meter shows you SWR, forward and reflected power at a single glance!

You get a 6-position antenna switch that lets you select two coax lines and/or random wires (direct or through tuner), balanced line and external dummy load.

The *MFJ TrueCurrentBalun™* for balanced lines minimizes feedline radiation that causes field pattern distortion, TVI and RF in your shack. Ceramic feedthru insulators for balanced lines withstand high voltages and temperatures.

## New Antenna Tuner Technology

MFJ brings you three innovations in antenna tuner technology: a *Differential-T™* circuit simplifies tuning; a directional coupler gives you more accurate SWR, forward and reflected power readings; and the *MFJ TrueCurrentBalun™* reduces feedline radiation.

## Differential-T Tuner™ ...

A New Twist on a Proven Technology

Replacing the two variable capacitors with a *single* differential capacitor gives you a wide range T-network tuner with only two controls — the differential capacitor and a roller inductor.

Simple 2-knob tuning makes tuning easier than ever, gives you minimum SWR at only *one* setting and has a broadband response that ends

The wide-spaced air gap differential transmitting capacitor lets you run 3 KW PEP SSB.

## Accurate SWR and Power Reading

MFJ's Cross-Needle SWR/Wattmeter gives you accurate SWR and power readings over its entire frequency range.

You can read forward/reflected power in 2 ranges: 200/50 and 2000/500 watts. The meter lamp is front panel switched and uses 12 VDC or 110 VAC with MFJ-1312.

## MFJ TrueCurrentBalun™ ... Reduces Feedline Radiation

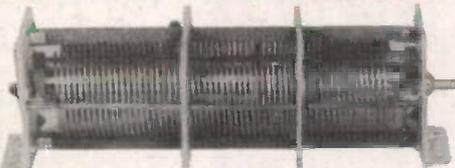
Nearly all commercially built tuners use a "voltage" balun. A "voltage" balun forces the voltages to be equal on the two antenna halves. It minimizes unbalanced currents only if the antenna is perfectly balanced—not the case with practical antennas.

The MFJ-986 uses a *true* current balun to force *equal* currents into the two antenna halves. Even if your antenna is not perfectly balanced, you get minimum unbalanced currents.

The *MFJ TrueCurrentBalun™* gives superior balance over voltage baluns.

The *MFJ TrueCurrentBalun™* minimizes unbalanced current which reduces field pattern distortion. This concentrates your power for a stronger signal — plus it reduces TVI and RF in your shack caused by feedline radiation.

## MFJ AirCore™ Roller Inductor



MFJ's exclusive *super heavy duty AirCore™* Roller Inductor has an air core that *can't* burn up! You get ultra high-Q, the lowest loss, highest efficiency and highest power handling of any roller inductor in ham radio.

MFJ's exclusive *Self-Resonance Killer™* keeps potentially damaging self-resonances away from your operating frequency.

Large, self-cleaning wiping contact gives excellent low-resistance connection without contact arcing or burning.

A solid 1/4 inch brass shaft with self-align bearings gives smooth non-binding rotation.

constant re-tuning. You'll spend your time QSOing instead of fooling with your tuner.

The compact 10 3/4 x 4 1/2 x 15 inch cabinet has plenty of room to mount the roller inductor away from metal surfaces for highest Q — you get high efficiency and more power into your antenna.

Call your Dealer for your Best Price and get absolute minimum SWR  
In stock at ham dealers everywhere!

Order today or pick one up at your favorite dealer or hamfest — no shipping, no waiting.

# MFJ 1.5 KW Versa Tuner III

... lets you use your barefoot rig now and add up to a 1.5 KW linear amplifier later



Why settle for a 300 watt tuner when a few extra dollars lets you step up to the more powerful 1500 watt MFJ-962C?

Two continuously variable capacitors give you the precise control you need to get your SWR down to a minimum. Plenty of inductance gives

you the widest matching range possible.

A *lighted* peak and average reading

Cross-Needle SWR/Wattmeter makes tuning quick and easy. At one glance you can read SWR, forward and reflected power. Handles 1500 watt PEPSSB. Meter light uses 12 VDC or 110 VAC with MFJ-1312.

A 6-position *ceramic* antenna switch lets you select 2 coax lines (direct or through tuner), random wire and balanced lines.

You get a heavy duty *MFJ TrueCurrentBalun™* for balanced lines. High-voltage *ceramic* feedthru insulators let you operate high power into balanced feedlines. For highest Q and the most compact size, the wide range switched airwound inductor is mounted horizontally away from metal surfaces for efficiency and maximum power into your antenna. Measures 10 3/4 x 4 1/2 x 15 inches.

**MFJ ... the world's most trusted name in antenna tuners!**

# MFJ-989C 3 KW Antenna Tuner

More hams use MFJ-989s than any other 3KW tuner in the world! Why? ... Because MFJ uses super heavy duty components to make the world's finest 3 KW antenna tuner ...

In Stock at ham dealers everywhere!  
Call your dealer for your best price

MFJ-989C



- New for 1996 -- MFJ AirCore™ Roller Inductor
- Super Heavy Duty Components • Made in U.S.A.
- Handles 3000W PEP SSB
- peak/average Cross-Needle SWR/Wattmeter
- Antenna Selector • Balun • Built-in Dummy Load

## More hams use MFJ-989s than any other 3 KW tuner!

MFJ uses super heavy duty roller inductor, variable capacitors, antenna switch and balun to build the world's most popular 3 KW antenna tuner.

The rugged MFJ-989C handles 3 KW PEP SSB and covers 1.8 to 30 MHz, including all MARS and WARC bands.

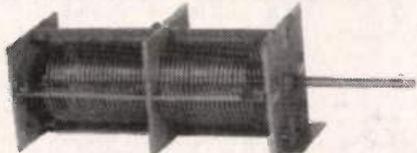
MFJ's new 1996 AirCore™ Roller Inductor, three-digit turns counter and spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax or balanced lines.

You get everything you've ever wanted in a high power, full featured, antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, antenna switch, built-in dummy load, balun, convenient flip-stand -- all in a sleek, compact cabinet.

MFJ builds the world's most popular 3 KW antenna tuner using these super heavy duty components ...

### MFJ AirCore™ Roller Inductor



MFJ's exclusive super heavy duty AirCore™ Roller Inductor has an air core that can't burn up! You get ultra high-Q, the lowest loss, highest efficiency and highest power handling of any roller inductor in ham radio.

MFJ's exclusive Self-Resonance Killer™ keeps potentially damaging self-resonances away from your operating frequency.

Large, self-cleaning wiping contact gives excellent low-resistance connection without contact arcing or burning.

A solid 1/4 inch brass shaft with self-align bearings gives smooth non-binding rotation.

Some competing "legal limit" tuners use a lousy, low Q, solid core with erratic electrical

contacts and have potentially damaging self-resonant frequencies. This can cause excessive heating and can destroy the core.

### Massive Transmitting Capacitors

Look inside ... you'll see two super heavy duty transmitting variable capacitors that can handle 6000 volts. Extra wide (0.27 inch) stator plate spacing gives you arc-free operation.

Specially shaped plates give low minimum capacitance when unmeshed. This and a hefty 250 pf maximum give you an extremely wide matching range -- even on 160 and 10 Meters.

The nearest competing "legal limit" tuner has variable capacitors physically much smaller than the MFJ-989C's. Theirs is rated at 4500 volts -- a full 25% less than the MFJ-989C.

Theirs is more likely to arc -- not what you want in a "legal limit" tuner!

### Super Antenna Switch

The MFJ-989C super heavy duty antenna switch is made of two individual ceramic wafers wired in parallel. Extra wide spaced, heavy duty contacts handle extreme voltages and currents. We've never burned one up!

You can select two coax antennas (directly or through tuner), balanced line/random wire, or built-in dummy load.

### 3 KW Current Balun

MFJ's super heavy duty 3 KW true current balun for balanced lines uses two giant 2 1/2 inch toroid cores. It's wound with Teflon® wire connected to high-voltage glazed ceramic feedthrough insulators.

The MFJ-989C lets you safely operate high power into balanced feedlines without core saturation or voltage breakdown.

Some "legal limit" tuners have inferior voltage baluns with smaller diameter toroid cores and use soft plastic feedthrough insulators that can arc and melt.

More reasons why the MFJ-989C is the world's finest 3 KW tuner ...

### Built-in Dummy Load

A full-size 300 watt non-inductive 50 ohm dummy load is built into the MFJ-989C.

You'll find it handy for transmitter tuning, testing and repairing your rig, setting power level, adjusting your mic gain and more.

Some "legal limit" tuners don't have a built-in dummy load. They want you to pay for an external dummy load that just gets in your way.

### Lighted Cross-Needle Meter

MFJ's lighted Cross-Needle SWR/Wattmeter lets you monitor SWR, forward and reflected power simultaneously. Read both peak and average power in two power ranges

### Sleek and Compact

The compact MFJ-989C slides right into your operating position -- you'll hardly know it's there. It's just 10 3/4 x 4 1/2 x 1 1/2 inches. Do you really want a bulky "legal limit" tuner that's bigger than your amplifier?

### Superior Cabinet

The MFJ-989C's premium, low-profile all-aluminum cabinet has a sub-chassis that adds strength and RFI protection.

Every cabinet is chemically treated and has a tough, scratch-proof vinyl cladding -- not paint that can scratch or chip off. You won't find a tougher, longer-lasting finish anywhere.

Detailed logging scales and legends are permanently silk screened on real aluminum front and back panels -- they aren't decals or glued-on paper strips that can peel off.

### Superior Construction

Every MFJ-989C uses PEM nuts (not self-tapping screws), wing-nut for ground post (not a cheap nut), fire-retardant epoxy glass PC board (not canvas based), heavy gauge wire throughout (not small gauge), locking compound on nuts/bolts (not loose hardware).

### No Matter What™ Warranty

Every MFJ-989C is protected by MFJ's famous one year No Matter What™ unconditional warranty. We will repair or replace your MFJ-989C (at our option) no matter what for a full year.

Others may give you a limited warranty on defects in material and workmanship.

But what do you do if your "legal limit" tuner burns up and they say, "Sorry, your limited warranty does not cover that?"

### Outstanding Customer Service

We're here to help keep your MFJ-989C performing flawlessly -- no matter how long you own it.

# MFJ Cross-Needle Super Value Tuner

Now with Lighted Cross-Needle Meter plus . . . Antenna switch balun . . .

MFJ-941E



The new MFJ-941E gives you a 300 Watt antenna tuner that covers everything from 1.8-30 MHz--plus you get a lighted Cross-Needle meter with on/off switch (Light uses 12 VDC or 110 VAC with MFJ-1312B), antenna switch and 4:1 balun . . . for an *incredibly low price*.

The new Cross-Needle meter shows SWR, forward and reflected power--all at a glance. It reads forward/reflected power in 300/50 and 30/5 watt ranges.

8-position antenna switch that lets you select 2 coax lines, random wire/balanced line or dummy load (direct or through). Efficient 12 position airwound inductor gives lower losses and more power out. Has 4:1 balun, 1000 volt capacitors. A beautiful black aluminum cabinet with black brushed aluminum front panel matches your rig perfectly and fits right into your station. It measures just 10<sup>5</sup>/<sub>8</sub>"x2<sup>7</sup>/<sub>8</sub>"x7".

## Compact Mobile HF Antenna Tuner

New! Covers 6-Meter Band and has antenna bypass switch! MFJ-945E



Don't leave home without this *mobile* tuner! Have an uninterrupted trip as the MFJ-945E extends your antenna bandwidth and eliminates the need to

stop, go outside and readjust your mobile whip. Handles 300 watts.

Small 8x2x6 inch black aluminum cabinet uses little room. The new Cross-Needle meter shows SWR, forward and reflected power--at a glance. It reads forward/reflected power in 300/50 and 30/5 watt ranges. Has on/off lamp switch. Requires 12 Volts for lamp. Convenient placement of controls makes tuning fast and easy while in motion. Antenna switch lets you bypass tuner and still use the SWR/Wattmeter.

Back panel has SO-239 connectors for transmitter and coax and a wing nut post for your ground. Efficient airwound inductor gives you lower losses and more watts out. 1000 volt capacitors. Covers 1.8-60 MHz. Use it at home in your base station when you're not in your RV, boat or car. Mobile mount, MFJ-20. Add shipping for bracket if ordered separately.

## MFJ's smallest Versa Tuner

The MFJ-901B is



our smallest--5x2<sup>1</sup>/<sub>2</sub>x6 in.--(and most affordable) 200 watt PEP versa tuner--when both your space and your budget are limited. You can operate anywhere in a

band and get low SWR. You'll get maximum power out of your rig and it'll run cooler and last longer.

It matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced and coax lines continuously from 1.8 to 30 MHz. Excellent for matching solid state rigs to linears. Efficient airwound inductor gives you lower losses and more power.

You get SO-239 connectors for transmitter and coax, binding posts for random wire or balanced lines and a wing-nut ground connection. A 4:1 balun for balanced lines is also built into this sturdy, compact tuner. Works with solid state and tube rigs. Fits into your station and your car.

## MFJ Antenna Tuner/Artificial Ground

Turns random wire into effective antenna

MFJ-934



Throw up a random wire anywhere and work the world!

Sounds great -- but that *don't* work -- never has, never will. Why? Because a random wire or longwire antenna *requires a ground* to work. Many of you found that out the hard way -- with hours of calling CQ and no QSO. No ground, *don't* work.

But a random wire *can* be an effective antenna -- you have to do two things.

1. Match the random wire impedance to your transmitter.
2. Provide an adequate ground for the random wire to work against.

The new MFJ-934 Antenna Tuner/Artificial Ground combines a versatile antenna tuner with an artificial ground. It turns a random wire into an effective antenna that works. It's great for traveling, emergency or as a makeshift antenna.

You get the best features of the MFJ-941E Cross-Needle Antenna Tuner and the MFJ-931 Artificial RF Ground in a *single* compact 10<sup>5</sup>/<sub>8</sub>x3<sup>1</sup>/<sub>2</sub>x7 inch cabinet -- and the MFJ-934 cost less.

You get a 300 watt full featured, general purpose antenna tuner that covers 1.8-30 MHz. It has a two range, lighted Cross-Needle Meter that lets you read SWR, forward and reflected power all in a glance and a 4:1 balun for balanced lines. Plus, you get an efficient airwound inductor, special high current/voltage 12 position inductor switch and two 1000 volt air-variable capacitors. It tunes all types of antennas and feedlines including random wire, coax and balanced lines.

The MFJ-934 is unique because it has a built-in artificial ground. A *Ground Matching* knob lets you switch in inductance to bring an attached wire to a low impedance current point to form an artificial ground. A push button switch lets you use the Cross-Needle Meter to monitor for maximum ground current.

With an adequate artificial ground to work against, you'll be surprised to see how well a random wire can work. Don't be surprised if you can work the world *without* hours of calling CQ.

The MFJ-934 with an artificial ground wire and a random antenna wire makes a *complete, effective antenna for use anywhere* -- during emergencies, camping, RV parks, hotels, on vacations, nearly anywhere.

When you don't need the artificial ground feature, you can use the MFJ-934 as a full featured general purpose antenna tuner.

## MFJ-931 Artificial RF Ground

Create an artificial RF ground with the new MFJ-931! It effectively places your rig near actual earth ground potential even if your rig is on the second floor or higher with no earth ground possible! Also, it electrically places a far away RF ground at your rig.

MFJ-931



How's your RF ground? Do you have RF "hot spots" that "bite" you when you transmit? Do you have RF feedback that causes your rig to quit working on some bands? Do you have TVI/RFI that makes your neighbors hard to live with? Do you get weak signal reports

because of extreme ground losses or radiation pattern distortion?

These problems could be caused by poor RF grounding, especially if your rig is on a second floor with no ground at all. Even if you have a good ground, a long connection wire can ruin its effectiveness by isolating true RF ground from your rig.

The new MFJ-931 creates an artificial RF ground! It resonates a random length of wire thrown along the floor and produces a tuned counterpoise. This artificial ground effectively places your rig near actual earth ground potential even if your rig is on the second floor or higher with no earth ground possible.

Also, the MFJ-931 electrically places a far away RF ground directly at your rig--no matter how far away it is. The MFJ-931 reduces the electrical length of the ground connection wire to virtually zero by tuning out its reactance.

The MFJ-931 connects between your rig and a random length of wire or a connecting ground wire. It's tuned for maximum ground current using the built-in RF ammeter. It covers 1.8 to 30 MHz and measures 7<sup>1</sup>/<sub>2</sub>x3<sup>1</sup>/<sub>2</sub>x7 inches.

# MFJ-949E Deluxe 300 Watt Tuner

More hams use MFJ-949's than any other tuner in the world!  
Why settle for an imitation when you can have the real thing?

Pick one up at your favorite dealer --  
no shipping, no waiting, no hassles

MFJ-949E

Includes **FREE AC adapter**  
for meter light

**More hams use MFJ-949's than any  
other antenna tuner in the world!**

Why? Because the world's leading tuner has earned a worldwide reputation for being able to match just about anything.

MFJ-949's have been highly refined and have years of proven reliability.

Every MFJ-949E comes with . . . MFJ's famous one year *No Matter What™* unconditional guarantee . . . first-rate performance . . . unbeatable quality . . . the best tuner value in ham radio -- all from the world's most trusted name in antenna tuners.

Now the latest MFJ-949E gives you even more features and more value than ever at a new lower price

Why take chances with an imitation when you can have the *real thing* from the world's most trusted name in antenna tuners.

**More reasons why more hams  
use MFJ-949's than any other  
antenna tuner in the world . . .**

### Full 1.8-30 MHz Operation

1000 volt tuning capacitors, extra heavy duty inductor switch, Teflon® insulating washers and proper L/C ratio gives you arc-free no worries operation with up to 300 watts from 1.8 to 30 MHz.

### Lighted Cross-Needle Meter

MFJ's lighted Cross-Needle Meter shows you SWR, forward and reflected power *simultaneously*. It reads both *peak* and average power on 300 or 30 watt ranges.

The meter is illuminated for easy reading in dim light and has an ON/OFF lamp switch. The meter lamp uses 12 VDC or 110 VAC. A *free* AC adapter is included at no extra cost.

### Tunes any Antenna

The MFJ-949E tunes out SWR on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . nearly anything!

Use coax feed, random wire or balanced lines. Has oversized heavy duty 4:1 balun.

### Super Antenna Switch

MFJ's 8 position *super* antenna switch lets you select two coax fed antennas, random wire/balanced line or built-in dummy load for use through your MFJ-949E or direct to your transceiver.

MFJ's Cross-Needle SWR/Wattmeter is always active for monitoring forward and reflected power and SWR.



### QRM-Free PreTune™

MFJ's *QRM-Free PreTune™* lets you pre-tune your MFJ-949E off-the-air into a built-in dummy load without causing QRM. Pre-tuning into a dummy load makes tuning your actual antenna faster and easier.

### Superior Materials . . . Superior Construction

Every MFJ-949E use Teflon® insulating washers, countersunk screws for meter bracket, wing-nut for ground post, fire-retardant epoxy glass PC board (not canvas based), heavy .063 inch thick aluminum chassis (not flimsy .050 inch), heavy gauge wire used throughout (not small gauge), custom cabinet (not multi-purpose with unused holes and internal protruding screws). It measures 10<sup>3</sup>/<sub>8</sub>" x 3<sup>1</sup>/<sub>2</sub>" x 7".

### No Matter What™ Warranty

Every MFJ-949E is backed by MFJ's famous one year *No Matter What™* unconditional warranty. That means we will repair or replace your MFJ-949E (at our option) *no matter what* for a full year.

Others may give you a *limited* warranty on defects in material and workmanship.

But what do you do if it burns up and they say, "Sorry, your *limited* warranty does not cover that?"

### Continuing Service

Only MFJ gives you a *direct* toll-free technical help line answered by *electronic technicians* who are experts in antenna tuners. We're here to help keep your MFJ product performing flawlessly -- no matter how long you own it.

### Call your dealer for your best price

In stock at ham dealers everywhere!  
Order your MFJ-949E today or simply pick one up at your favorite dealer or hamfest -- no shipping, no waiting, no hassles.

## Why take chances?

Why take chances with an imitation  
when you can have the real thing from  
the most trusted name in antenna tuners?

### Full Size Dummy Load

The MFJ-949E has a *full size* non-inductive 50 ohm dummy load measuring 3/4 inch diameter by 5 inches. It *easily* handles 300 watts of abusive tune-up power.

You'll find it handy for tuning, testing and repairing your rig, setting power level, adjusting your mic gain and more.

*Watchout* for cheap midget size dummy loads that changes resistance as it heats up -- marginal ones could burn up your transceiver.

### Custom Inductor Switch

The inductor switch is the most likely component to burn up in *any* antenna tuner.

The inductor switch in the MFJ-949E was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner -- it's not a flimsy *plastic* switch made for small signals and wired with *tiny* gauge wire.

### Superior Cabinet

Each MFJ-949E cabinet is chemically treated and has a new tough scratch-proof *vinyl* cladding -- not paint that can scratch or chip off. You won't find a tougher, longer lasting finish anywhere.

Detailed logging scales and legends are *permanently* silk screened on a *real* aluminum front panel and back panel -- it's not merely a plastic decal or glued-on paper strip that can peel off.

## New MFJ Deluxe 300 Watt Tuner

MFJ-948



If you don't need a dummy load but want all the other features of the MFJ-949E choose the new MFJ-948.

The MFJ-948 features a peak reading lighted meter with a built-in lamp switch, 1-year unconditional guarantee and made in the U.S.A.

Remember, with MFJ you're getting proven performance and reliability from the most trusted name in antenna tuners.

AC adapter not included. MFJ-1312C.

# Tune any antenna with your Automatic Tuner!

MFJ greatly extends matching range of your Automatic Antenna Tuner -- you can match ANY antenna automatically! No pre-tuning, no manual tuner needed . . .



MFJ-914



Does your HF rig's automatic antenna tuner have limited matching range?  
 Can't auto-tune your antenna on all bands?  
 Have to pre-tune your antenna with a manual tuner before your automatic tuner will work?  
 MFJ's latest innovation greatly extends the matching range of your automatic antenna tuner -- you can match nearly any antenna automatically!  
 MFJ's new AutoTuner Extender™ transforms your antenna

impedance -- up or down by as much as 10 times!  
 Puts nearly any antenna into the matching range of your automatic tuner.

It's easy to use. Just bypass your auto-tuner and turn the MFJ-914 knob for minimum SWR. That's it -- you're ready to auto-tune. Never manually pre-tune with an external tuner again!

By transforming your antenna impedance so your tuner can be used in a low Q mode, you can handle more power without arcing your tuning capacitors.

It also extends the range of manual antenna tuners.

You can use any transceiver from 160 through 10 Meters with up to 300 watts.

An OFF position grounds your antenna to bleed off static and protect your receiver. OFF also connects your transceiver to an external dummy load for safety. The MFJ-914 also has a bypass position.

The MFJ-914 is a heavy duty, wide band, wide range, impedance transforming device. It has been very carefully designed for flattest frequency response and lowest loss.

## NEW Tune up your antenna without transmitting!

MFJ-212



This new MFJ-212 MatchMaker™ lets you tune up your antenna tuner without transmitting a single milliwatt!

You can't cause QRM -- there's no radiated power.  
 You can precisely tune your antenna tuner for a 1:1 SWR -- no additional "tweaking" needed.  
 Protect your transceiver and antenna tuner. Avoid dangerous overheating and arcing caused by high SWR and long tune-ups.

It's easy to use. Plugs between your transceiver and antenna tuner. Adjust your tuner for a null in receiver noise by ear or S-meter and you have 1:1 SWR!

Tuning noise is modulated to make it easy to recognize. What if you accidentally transmit? Will you burn up your MFJ-212? No!

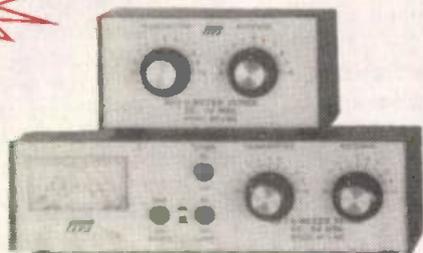
MFJ's exclusive RF\*Guard™ automatically bypasses your MFJ-212 to prevent damage.

Works with all transceivers from 160 through 6 Meters. Measures 3 1/2 x 1 1/4 x 4 inches. Uses 9-12 VDC, 9 volt battery or 110 VAC with MFJ-1312B.



MFJ-903

MFJ-906



## MFJ 6 Meter Antenna Tuner

MFJ's new 6 Meter antenna tuner for the Magic Band gives you low SWR with practically any coax fed antenna -- mobile whips, dipoles, verticals, vees, random wires, verticals, beams.  
 With low SWR, you'll get more power out of your 6 Meter transceiver

and into your antenna for more DX.

With low SWR, your rig will be more efficient. It'll run cooler and last longer. You'll protect your expensive transceiver from overheating due to high SWR.

A lighted Cross-Needle SWR/Wattmeter shows SWR, forward and reflected power simultaneously in 300/60 and 30/6 Watt ranges and has an ON/OFF lamp switch.

With MFJ's built-in bypass switch, you can bypass your tuner and connect your transceiver directly to your antenna.

The MFJ-906 handles 100 Watts FM and 200 Watts SSB PEP. Works with all solid state and tube rigs and is perfect for home and mobile stations. Covers 50-60MHz. Measures 8" x 2 1/2" x 3".

Measures 8 x 2 1/2 x 3 inches. Lamp uses 12 VDC.

MFJ-903, Same as MFJ-906 but less SWR/Wattmeter and bypass switch. Measures 5 x 2 1/2 x 3 inches.

## Random Wire Tuner    Mobile Antenna Matcher    Choose 144/220 MHz or 440MHz Tuner



Operate all bands 1.8-30 MHz -- anywhere with any transceiver -- using a random wire and this MFJ antenna tuner that's small enough to carry in your hip pocket -- 2x3x2 inches.

Handles up to 200 watts output. Match high and low impedances by interchanging input and output. Has SO-239 connectors.

MFJ-16010



Use this MFJ compact Mobile Antenna Matcher at the base of your mobile whip to lower your SWR and to provide more power into your antenna. Your solid state rig runs more efficiently, puts out more power with less heat. Matches mobile antennas 10 through 80 meters. Easy plug-in installation. 2 1/2 x 2 1/4 x 1 1/2 inches.

MFJ-910

MFJ-921  
OR  
MFJ-924



This new MFJ-921 Dual Band VHF tuner covers both 2 Meters and the 220 MHz band. Has a built-in SWR/Wattmeter. It handles 200 watts, matches a wide range of impedances, and is excellent for mobile and base operation. SO-239 input/output connectors. Wing nut post for ground. Eggshell white and black aluminum cabinet. Measures a compact 8x2 1/2x3 inches. It comes with MFJ's famous No Matter What™ full one year unconditional guarantee.

MFJ-924. Similar to MFJ-921 but covers only 440 MHz band.

# MFJs Cross-Needle 1.8-60 MHz SWR/Wattmeter



**Large 3 inch meter**

MFJ-815B

- Read *Peak* /Average Power
- Built-in Meter Lamp

This MFJ-815B Cross-Needle SWR/Wattmeter features a large 3 inch lighted meter. It gives you accurate SWR and power readings over a wide frequency range.

Reads SWR and *peak* or average for forward and reflected power simultaneously-- all at a glance.

Power ranges: 200/2000 watts *forward* and 50/500 watts *reflected*. Reads SWR from 1:1 to 8:1. Covers 1.8 to 60 MHz. Has mechanical adjustment to accurately zero meter.

Push button selects range, meter lamp on/off and *peak*/average power. SO-239 connectors. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312. Black aluminum cabinet measures 7 1/4 x 4 1/2 x 3 1/2 inches. Made in USA.

Why buy a copy-cat? This MFJ original gives you the most for your money and you get MFJ's famous *No Matter What™* one year unconditional guarantee.

## Dual Band SWR/Wattmeter



**Large 3 inch meter**

MFJ-817 This lighted MFJ-817 144 and 440 VHF/ UHF Cross-needle SWR/ wattmeter features large 3 inch meter. Reads SWR and *peak* or average for forward and reflected power simultaneously-- all at a glance. Power ranges: 200/20 *forward* and 50/5 watts *reflected*. Push button selects range, meter lamp on/off and *peak*/average power. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312. 7 1/4 x 4 1/2 x 3 1/2 inches.

## VHF SWR/Wattmeter



MFJ-812B MFJ-812B is the world's most popular -- and most affordable -- VHF SWR/Wattmeter. Has built-in Field Strength meter. Covers 2 Meters and 220 MHz. Reads forward and reflected power in 2 ranges -- 30 or 300 watts. Reads SWR from 14 MHz thru 220 MHz. Also reads relative field strength from 1 to 220 MHz. Has binding post for field strength antenna. Two color meter. 4 1/2 x 2 1/4 x 3 inches.

## HF SWR/Wattmeter

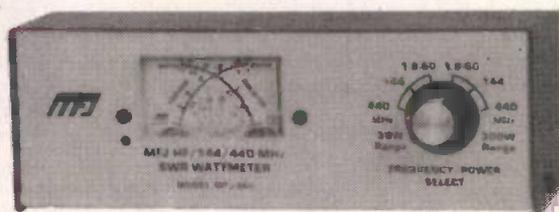


MFJ-816 MFJ-816 HF wattmeter lets you read forward and reflected power on 2 scales -- 30 and 300 watts -- and SWR from 1.8 to 30 MHz. Toroid current pickup gives uniform sensitivity. Easy push-button operation. Sturdy eggshell white and black aluminum cabinet. SO-239 connectors. 2-color meter scale. Compact size -- 4 1/2 x 2 1/4 x 3 inches -- makes it ideal for portable use.

- Cross-Needle Meter

# MFJ Cross-Needle HF, VHF, UHF SWR/Wattmeters

**Covers HF thru VHF ... 1.8-60MHz, 144 MHz, 440 MHz**



MFJ-864

- Cross-Needle Meter
- Covers HF/VHF/UHF
- Dual Sensors for HF and VHF/UHF
- Schottky diodes for best accuracy

This new MFJ Cross-Needle SWR/Wattmeter covers HF thru VHF -- 1.8 to 60 MHz, 144 MHz, 440 MHz Bands -- for an incredibly low price!

You can read forward and reflected power and SWR

simultaneously at a single glance.

It features separate HF and VHF/UHF directional couplers, each with its own set of SO-239 coax connectors.

This lets you connect your HF and VHF/ UHF transceivers at the same time. You can then monitor SWR and power of either

transceiver at the flick of a switch. Others have a single set of connectors -- you have to plug and unplug to use separate HF or VHF/UHF rigs.

Power ranges -- 30/300 watts forward and 6/60 watts reflected. Each power range for each band is *individually* calibrated. Schottky diodes are used for best accuracy.

Single knob operation makes it easy to use and the meter is lighted for easy reading.

The attractive all metal black cabinet has a tough vinyl cladding that won't scratch or chip off. You won't find a tougher, longer lasting finish anywhere. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312B. Measures 7 1/4 x 2 1/2 x 2 1/4 inches.

## MFJ-862 covers 144/220/440 MHz

MFJ-862



Similar to MFJ-864 but covers 144 MHz, 220 MHz, 440 MHz. 30/300 watts forward, 6/60 watts reflected ranges. 5 3/4 x 2 1/2 x 2 1/4 inches. Has one sensor for all three bands.

## MFJ-860 covers 1.8 to 60 MHz

MFJ-860



Similar to MFJ-864, but for 1.8-60 MHz. Push button selects 30/ 300 watts forward, 6/60 watts reflected ranges. 4 1/2 x 2 1/4 x 3 inches.

# MFJ SWR Analyzers™

## MFJ 440 MHz UHF SWR Analyzer™

New MFJ UHF SWR Analyzer™ lets you read the SWR of any antenna from 420 MHz to 450 MHz... MFJ-219/N

The New MFJ-219 UHF SWR Analyzer™ lets you read the SWR of any antenna from 420 MHz to 450 MHz -- just plug in the coax of your antenna, set the frequency and read the SWR on the MFJ-219.

This fully portable MFJ-219 lets you read SWR where it really counts -- directly at the antenna's base or feedpoint. Even small changes are critical at UHF, and can make a big difference in the way your antenna system performs. Now you have the perfect tool to do the job right.

The MFJ-219 uses the latest high-tech microwave integrated circuits and microstrip technology to produce an affordable UHF SWR Analyzer™ for only MFJ-219/N, with "N" connector.

Has jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312B. 7 1/2x2 1/2x2 1/4 inches.



## MFJ Bandswitched Dip Meter™

The MFJ-203 is a sensitive Bandswitched Dip Meter™ that covers all ham bands from 160-10 Meters. There are no plug-in tuning coils to keep up with or break. MFJ-203

It's the easiest dip meter you'll ever use -- just tune for a dip. There's no sensitivity control to constantly adjust.

Saves time and takes guesswork out of winding coils, measuring inductance and capacitance, measuring velocity factor and electrical lengths of coax. Determine resonant frequency of tuned circuits. Measure Q of coils. Also use as signal generator.

Has detachable coupling coil, dual FET oscillator, op-amp meter amplifier and jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312B. 7 1/2x2 1/2x2 1/4 inches.



## MFJ 10-160 Meter HF SWR Analyzer™

If you're an HF man, this compact MFJ-207 HF SWR Analyzer™ will help you build antennas that'll make working DX almost routine. MFJ-207

Just plug in your coax to find the SWR of any HF antenna on any ham band 10-160 Meters. Has jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312B. 7 1/2x2 1/2x2 1/4 inches.



## MFJ 1.8-170 MHz SWR Analyzer™

If you don't need a built-in frequency counter but want 1.8-170 MHz continuous coverage and smooth vernier tuning, choose the MFJ-209. MFJ-209

It'll help get your antennas in tip-top shape.

Same as MFJ-249 without LCD frequency counter. Has jack for external frequency counter. Use 8 AA cells or 110 VAC with MFJ-1312B. 4x2 1/2x6 3/4 inches.



## MFJ 2 Meter VHF SWR Analyzer™

MFJ-208 2 Meter VHF SWR Analyzer™ finds the SWR of any antenna from 138-156 MHz. MFJ-208

Jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312 B. 7 1/2x2 1/2x2 1/4 inches.

### For Commercial VHF Radio

Same as MFJ-208 but for commercial VHF. MFJ-217, covers 30-50 MHz and MFJ-21, covers 150-170 MHz.

Just plug in your coax to find the SWR of any HF antenna on any ham band 10-160 Meters. Has jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312B. 7 1/2x2 1/2x2 1/4 in.



## MFJ Antenna Bridge

Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge. Your antenna coax lead connects directly to this unique Antenna Bridge. MFJ-204B

No other equipment needed. Take it to your antenna site. Determine if your antenna is too long or too short, measure its resonate frequency and antenna resistance to 500 ohms. It's the easiest, most convenient way to determine antenna performance. Built-in resistance bridge, null meter, tunable oscillator-driver (1.8-30 MHz). Use 9 volt battery or 110 VAC with optional AC adapter, MFJ-1312. 4x2x2 inches.



## MFJ RX Noise Bridge

MFJ-202B



Let's you quickly adjust your dipole, inverted vee, beam, vertical, mobile whip or random wire for maximum performance. Tells whether to shorten or lengthen your antenna for minimum SWR. Measure resonant frequency, feedpoint resistance and reactance. Works with any receiver or transceiver.

Individually hand-calibrated resistance scale, expanded capacitance range ( $\pm 150$  pf) and exclusive built-in range extender.

## MFJ Antenna Current Probe

This MFJ Antenna Current Probe lets you monitor RF antenna currents--no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures. MFJ-206

Indicate transmission line radiation due to high SWR, poor shielding or antenna unbalance. Detect re-radiation. Pinpoint RF leakage in shielded enclosures. Locate the best place for your mobile antenna. Use as field strength meter. 4x2x2 inches. Use 9V battery (not included).



## 600 MHz 10 Digit LCD Counter

Add this handy MFJ-346 frequency counter to your station and get high accuracy frequency measurements to 600 MHz with 10 digit precision. MFJ-346

Compatible with MFJ SWR Analyzers™, Dip Meter™, Antenna Resistance Meter™ and Antenna Bridge™.

Four gate times, .1 Hz resolution, high accuracy 1 ppm 10 MHz crystal time base. Use 9 volt battery or 110 VAC with MFJ-1312B. 4x1 1/2x5 1/4 inches.



# MFJ HF/VHF SWR Analyzer™ with RF Resistance Meter

Read your antenna SWR from 1.8-170 MHz... 10-digit LCD frequency counter... RF Resistance Meter™... smooth reduction-drive tuning... simple-to-use...



MFJ-259

If you work with antennas, MFJ's revolutionary new SWR Analyzer™ is the best investment you'll ever make! Now you can diagnose a wide range of antenna problems instantly with one easy-to-use instrument.

## What the MFJ-259 Does

The MFJ-259 gives you a complete picture of your antenna's performance anywhere between 1.8 and 170 MHz -- you can even check SWR outside the ham bands without violating FCC rules. Set the bandswitch and tune the dial--just like your transceiver. SWR is displayed instantly!

## RF Resistance Meter™

Does 2:1 SWR mean 25 ohms or 100 ohms? The new MFJ-259 tells you at a glance!

Now you can measure RF resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's exclusive side-by-side RF Resistance and SWR Meters!

Take the guesswork out of building matching networks and baluns for your antennas.

Watch the effects of spacing on radiation resistance as you adjust your antenna.

## Here's What You Can Do...

Find your antenna's true resonant frequency from the shack.  
Tune the antennas on your

tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from 1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss. Test RF chokes, transformers, baluns.

Adjust your tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259 is really four test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter, RF Resistance Meter™ and an SWR Analyzer™.

## Free Manual

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand!

For free manual write or call MFJ.

## Take It Anywhere

The MFJ-259 is fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-1312B. It's in a rugged all metal cabinet that's a compact 4x2 1/2x6 3/4 inches. Take it to remote sites, up towers, on DX-peditions -- any- where your antennas are located.

For rough service, pick up a convenient MFJ-29, or MFJ-29B, padded carrying pouch to keep your MFJ-259 close at hand and looking like new.

## How Good is the MFJ-259?

MFJ SWR Analyzers™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Professional installer and technicians use them worldwide.

## Get More by Paying Less

With the MFJ-259, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, a high accuracy frequency counter and MFJ's exclusive RF Resistance Meter™.

## 1.8-170 MHz SWR Analyzer™

MFJ-249

MFJ-249 HF/VHF SWR Analyzer™ has

all the features of MFJ-259 but less RF resistance meter. Includes 1.8-170 MHz continuous coverage, 10-digit LCD frequency counter and smooth vernier tuning.

It's fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-131. Take it to remote sites,

up towers, on DX-peditions -- anywhere your antennas are located.

MFJ-66



Q of coils. Set of two coils cover 1.8-170 MHz depending on your MFJ SWR Analyzer™.

## Dip Meter Adapter

Plug a dip meter coupling coil into your MFJ SWR Analyzer™ and turn it into a sensitive and accurate bandswitched dip meter.

With a dip meter you'll save time and take the guesswork out of winding coils, measuring inductance and capacitance. Determine resonant frequency of tuned circuits and measure

## Carrying Pouch

MFJ-29B

Tote your MFJ-259, MFJ-249, or MFJ-209

SWR Analyzer™ anywhere with the MFJ-29B custom Carrying Pouch.

Made with a special foam-filled fabric, the MFJ-29B cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work--the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

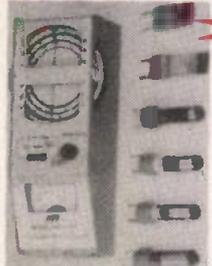
Has clear protective window for frequency display and cutouts for knobs so you can use your MFJ SWR Analyzer™ without taking it out of your pouch.

MFJ-29, less protective window and cutouts for knobs. Must remove MFJ SWR Analyzer™ from pouch to use.

Protect your investment and keep your analyzer safe and looking like new!

(continued from MFJ-201)

# MFJ 1.5 to 250 MHz Dip Meter



MFJ-201

Originally developed during the 1920's using vacuum tubes, the grid dip meter

quickly became the most widely used piece of test equipment in radio because of its versatility.

Now MFJ brings you a modern day solid state version that covers a frequency range of 1.5 to 250 MHz in 6 bands,

As a Dip Meter you can determine resonant frequencies of tuned circuits and antennas or use it as a variable RF signal source.

As an Absorption Wavemeter, you can locate sources and frequencies of RF energy, parasitic

oscillations and harmonics.

You'll save a lot of time and take the guesswork out of pruning antennas, winding coils, tracking down parasites and measuring inductance and capacitance.

An easy-to-use thumb wheel tuning knob and a frequency readout dial that's color coded to the plug-in tuning coils make measurements quick and accurate.

You can use its built-in sine wave audio generator as an audio source or to AM modulate the dip oscillator.

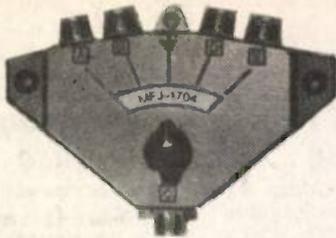
There's an earphone jack for monitoring AM signals, sensitivity adjustment and battery check function. Uses 9 volt battery. Measures 2 x 2 1/2 x 7 inches.

Here are some of its many uses... determine resonant frequency of tuned circuits and adjust antennas for optimum performance... determine electrical quarter and half wave lengths of transmission lines... measure the velocity factor

of transmission lines... measure capacitance and inductance... measure mutual inductance or coefficient of coupling of coupled coils... measure the Q of a coil... use it as a signal generator to align receivers and for supplying RF for antenna measurements... use it as a field strength meter... use it as a crystal oscillator... use it as a neutralization indicator for transmitters and linear amplifiers... turning on your transmitter... find the frequency of parasitic oscillations in tube and solid state transmitters and linear amplifiers... you can even use it to locate metal and trace hidden wiring or metal pipe.

# MFJ's Heavy Duty Coax Antenna Switches . . .

give you a center ground position, automatic grounding of unused positions, handles 2.5 KW PEP and works to over 500 MHz

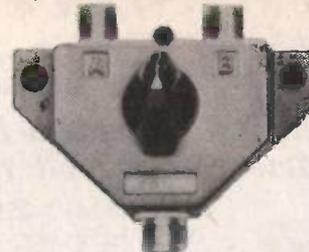


MFJ-1704

MFJ-1704N

Mount this 4-position SO-239 switch on your operating desk and you'll have more than the convenience of being able to instantly select any of 4 antennas or the center ground position--you'll also get the replaceable lightning surge protection device that helps protect against distant lightning induced surges and static. It handles a full 2.5 KW PEP. Extremely low SWR. Isolation is rated from better than 60 dB at 30 MHz to better than 50 dB isolation at 500 MHz. Negligible insertion loss. 50 ohm.

MFJ-1704N. Like MFJ-1704 with "N" type connectors.



MFJ-1702B

MFJ-1702BN

The MFJ-1702B 2-position Coax Switch has a new Center Ground Position! It handles 2.5KW PEP, 1 KW CW. It has better than 60 dB isolation at 300 MHz and better than 50 dB at 450 MHz. 50 ohm.

The unused terminal is automatically grounded for static and RF protection. It has less than 0.2 dB insertion loss and SWR below 1.2:1. The MFJ-1702B has heavy cavity type construction and uses SO-239 connectors. Mounting holes. 3x2x2 inches.

MFJ-1702BN. "N" connectors, covers DC-1.1 GHz.

## 1 KW Dummy Load

MFJ-250X **VERSALOAD** KW dummy load lets you tune up fast! Extends life of finals! Run 1-KW CW or 2 KW PEP for 10 minutes. 1/2 KW CW or 1 KW PEP for 20 Minutes. Continuous duty with 200 watts CW or 400 watts PEP. Complete with derating curve. Quality 50 ohm non-inductive resistor. Use transformer oil (not included). Low VSWR to 400 MHz. Under 1.2:1 to 30 MHz 1.5:1 30-300 MHz., 2:1 300-400 MHz. Ideal for testing both HF and VHF rigs. SO-239 connector. Vented for safety. Removable vent cap. Carrying handle. 7 1/2 inches high by 6 5/8 diameter.

MFJ-250, includes transformer oil (no PCB).

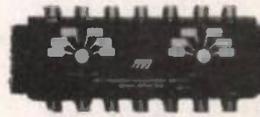
MFJ-250X



## MFJ HF Antenna/Transceiver Switches

MFJ-1700B

MFJ-1701



This MFJ-1700B has two ceramic rotary switches that let you select 1 of 6 antennas and 1 of 6 transceivers in any combination. You can also plug in an antenna tuner, wattmeter, linear, etc. so it is always connected to the antenna and transceiver selected. Handles 2KW PEP for 50-75 ohm loads. Unused terminals automatically grounded. SO-239 connectors. 1.8-30 MHz. 10x3x1 1/2 inches.

MFJ-1701. Six position switch. 1.8-30 MHz. Unused terminals grounded. SO-239. Handles 2 KW PEP, 1 KW CW. 50-75 ohm loads.

## 1.5 KW UHF/VHF/HF Dry Dummy Load

Ham radio's most versatile 50 ohm dummy load does it all--works with all radios from 160 meters thru 650 MHz and from QRP to full 1500 watt legal limit.

SWR below 1.3 to 650 MHz and below 1.1 at 30 MHz. Handles 100 watts for 10 minutes, 1500 watts for 10 seconds. Strong lightweight aluminum construction. 3x3x9 inches. Comes with MFJ's famous *No Matter What*™ one year unconditional guarantee. Made in USA. MFJ-264N. With "N" connector.

MFJ-264



## Dry 300W VHF/HF Dummy Load

Air cooled, non-inductive resistor in perforated metal housing with SO-239 connectors. Full load for 30 seconds, derating curve to 5 minutes.

MFJ-260C (300 W). SWR: 1.1:1 to 30 MHz, 1.5:1 30-650 MHz. 2 1/4 x 2 1/4 x 7 in.

MFJ-260CN. With "N" connector. MFJ-5803. 3 foot coax with connectors.

MFJ-260C



## New MFJ Low Pass Filter

If your harmonics are causing TVI problems, an MFJ-704 could keep your neighbors happy while you have fun hamming. The MFJ-704 Super Lowpass Filter simply plugs between your rig and antenna. It suppresses TVI, RFI, telephone and other interference by reducing unwanted harmonics going to your antenna. At the same time your HF signal passes on through with low loss so you can

MFJ-704



snag rare DX. Nine Chebyshev poles, MFJ's exclusive Teflon Dielectric Technology™ capacitors, Hi-Q inductors, ground plane shielding, an RF tight cabinet give you excellent TVI and RFI protection. These Exclusive Teflon Dielectric Technology™ capacitors give you extremely low loss and eliminate voltage breakdown and capacitor heating--even at full legal power with a 2:1 SWR load!

The result? You get lowest possible RF loss, excellent harmonic attenuation and years of trouble-free and TVI-free service. Handles full legal power from 1.8-30 MHz. SWR below 1.3 to 30 MHz into 50 ohms. Attenuates above 40 MHz. 3x3x9 inches. Handy mounting tabs. MFJ's *No Matter What*™ one year unconditional guarantee. Made in USA.

## MFJ RFI Free Choke Eliminates RFI

MFJ-701

Package of 4



MFJ-701 RFI-Free Choke Kit makes it easy to eliminate common RFI problems. You simply wind the offending cable around MFJ's RFI suppressing toroid to get rid of RFI.

You get four square ferrite toroids that's formulated especially for eliminating RFI from .5 to 200 MHz. Each toroid separates into halves to make it easy to wind on all kinds of cable--including computer ribbon, TV coax, power cord, telephone wire, VCR video cables and stereo audio cables. Then the halves mounts in a tough snap-together plastic frame to form a first rate RFI suppressor.

For severe RFI problems and to accommodate large diameter cables, individual toroids snap together into a stack. Includes helpful *"How to Eliminate RFI"* guide to aid you in getting rid of difficult RFI.

## MFJ W9INN Balun Box

MFJ-912



Let's you use coax from your antenna tuner to the MFJ-912 mounted outside the building. The MFJ-912 then converts the unbalanced coax to the balanced transmission line (ladder line). Provides the same function as an internal balun except it is located away from tuner. Giant 2 core balun wound with teflon wire connected to high voltage ceramic feedthru insulators handles full legal power with ease. 3 1/4 x 2 1/4 x 7 inches.

# New MFJ CW Transceivers

New improved ultra-hot receiver... enjoy DXing or Ragchewing wherever you go... brush up on CW and upgrade... no-compromise performance... rediscover the thrill of ham radio... great radio... terrific price...

MFJ-9040, MFJ-9030, MFJ-9020,  
MFJ-9017, MFJ-9015

- NEW! 5 Bands... Models for 40, 30, 20, 17, 15 Meters
- Write for Free manual

Hams everywhere are getting into QRP! Why not join the fun? You'll be amazed at how easy it is to work the world running only 5 watts! Countries you've worked in the past become fair game once again as you go for QRP-DXCC. And, you're not limited to the home QTH! QRP stations are so light and compact, you can take them anywhere -- on trips, vacations, backpacking, even biking!

### Best QRP Radio Ever

Read what Radio Journals around the world are saying about these exceptional rigs:

"All the right stuff... The MFJ-9020 QRP transceiver is a great rig and destined to become a classic." Bob Gobrick, VE2DRB/WA6ERB, for *QRP Quarterly*.

"A good dollar value... This is a well-designed, well-built radio... Getting the MFJ-9017 on the air is a breeze... if you're looking for a rig to take on your next vacation, think about one of the MFJ series." Bruce S. Hale, KB1MW, for *QST*.

"Particularly pleasant... I enjoyed this little rig... I consistently received very pleasing comments on the quality of the signal -- and the receiver coped very well with heavy QRM on 14 MHz." Rob Mannion, G3FXD, for *Practical Wireless*.

"I'm impressed... The MFJ-9020 puts back into Ham Radio something long ago lost -- FUN! The MFJ-9020 may be the best value going in a ready-to-play ham transceiver." Michael Bryce, WB8VGE, for *3 Amateur Radio Today*.

"Compact and very sturdy... I really enjoyed using the MFJ-9020... It is a real radio." George Dobbs, G3RJV, for *Radio Communications*.

In fact, the MFJ CW rig is a real radio -- with all the high-performance features you expect from expensive multi-band transceivers costing hundreds of dollars more! This means you can operate for hours on end without fatigue.

### Here's What You Get...

**Easy Operation:** The most user-friendly



signals on the band come through loud and clear.

**Rugged Transmitter:** Motorola power amplifier transistor delivers full QRP output, tolerates opens and accidental shorts without damage.

**Sinewave Sidetone:** Pure 700 Hz CW sidetone makes sending as much fun as receiving!

**Semi-QSK:** Set adjustable hold transmit/receive switching to suit your normal sending speed or set it for full QSK during contests!

**Easy to Power:** MFJ transceivers use very little power -- only 50 milliamps average on receive and 1.2 amp peak on transmit. Perfect for battery operation in remote locations!

**Great Options:** Add the MFJ-726 narrow audio filter, and you can switch in four-poles of active audio filtering for true single-reception.

Add the MFJ-412 Curtis chip iambic keyer module, and plug in your favorite set of paddles! Both modules install in seconds -- without soldering or modifications.

**Rugged Construction:** MFJ CW radios are built on G-10 double-sided plate-through board in our plant. It's rugged, and it's made right here in the USA!

**Fully Guaranteed:** Each transceiver is fully backed by our one year unconditional *No Matter What*™ guarantee. If anything goes wrong with your radio during the first year, we'll repair or replace it (at our option) -- no matter what!

### Frequency Coverage

Choose your favorite band! The 40 and 15 Meter models cover Novice and Tech Plus bands segments, making them perfect "first radios" for the new ham.

MFJ-9040 covers 40 Meters: 7.000-7.150 MHz; MFJ-9030 covers 30 Meters: 10.100-10.150 MHz; MFJ-9020 covers 20 Meters: 14.000-14.075 MHz; MFJ-9017 covers 17 Meters: 18.068-18.110 MHz; MFJ-9015 covers 15 Meters: 21.000-21.200 MHz

### Get a Free Manual

Want to know more? Write or call MFJ for a free transceiver manual (please specify band). This comprehensive booklet has operating instructions, advice on setting up your station, DX-hunting tips, antenna suggestions, theory of operation, diagrams, parts lists, alignment procedures and more!

**Call Your Favorite Dealer Today** Better yet, call your dealer today for his best deal. Then, get ready to have some fun!

radio you'll ever own! Sets up in seconds -- no micro-processor mumbo-jumbo.

**Great Sensitivity:** New hotter-than-ever superhet receiver brings even the weakest signals in at full volume (we've added a super-quiet FET post-amp stage to the IF filter making this the best CW receiver going).

**Excellent Selectivity:** Tight CW bandwidth crystal ladder filter fights unwanted

## MFJ Integrated CW Station

Transceiver, tuner, power pack fastens together to form tiny 6x6 1/2 x 8 1/2 inch integrated CW station.

Save! Buys complete MFJ CW Station. Includes MFJ CW Transceiver, MFJ-971 tuner, MFJ-4114 power pack, portable antenna... order MFJ-9140B, 40M; MFJ-9130B, 30M; MFJ-9120B, 20M; MFJ-9117B, 17M; MFJ-9115B, 15M.



QRM and noise to the max.

**Smooth and Stable VFO:** Wide-spaced reduction drive VFO capacitor glides slowly across the easy-to-read dial.

**RIT:** True RIT tuning control with center-detent makes listening or calling off-frequency a snap.

**Easy on your Ears:** Smooth AGC tracks only the signals you want to hear -- it never locks onto strong signals outside the audio bandpass. MFJ's *Instant Recovery AGC*™ snaps the receiver back at full gain after transmitting.

**Built-in Speaker:** High-efficiency 3 inch speaker driven by 100 milliwatts of audio pumps out plenty of volume. Even the weakest

## New MFJ High Current Multiple DC Outlet

MFJ-1118



The MFJ-1118, is MFJ's most versatile and highest current Deluxe Multiple DC Power Outlet. It lets you power two HF and/or VHF transceivers and six or more accessories from your transceiver's main 12 VDC power supply. You get two pairs of *super* heavy duty 30 amp 5-way binding posts for powering your transceivers. Each pair is individually fused and RF bypassed. They handle a total of 35 amps. An LED indicates power "ON". Six pairs of heavy duty, RF bypassed 5-way binding posts lets you power your accessories. They handle a total of 15 amps and are protected by a master fuse, have an ON/OFF power switch and an LED power indicator. You get 6 feet super heavy eight gauge color-coded cable with ring tongue terminals. Built-in 0-25 VDC monitor meter, binding posts space for standard dual banana jack. Heavy duty aluminum construction. 12 1/2 x 2 3/4 x 2 1/2 in. 1 year unconditional warranty. Made in USA.

## MFJ Multiple DC Power Outlets

MFJ-1112



MFJ-1116

This new MFJ-1116 Deluxe Multiple DC Power Outlet gives you 8 DC outlets for powering your accessories. Hooks to your rig's main 12VDC power supply. You can monitor DC Voltage on its built-in voltmeter. Has power switch and 15 amp fuse. Outlets are 8 pairs of heavy duty 5-way binding posts with standard spacing for dual banana jacks. DC outlet are RF by passed. 13 1/2 x 2 3/4 x 2 1/2 inches. Made in USA.

MFJ-1112, like MFJ-1116 but without ON/OFF switch, voltmeter and fuse. It has 6 pair outlets.

# MFJ 20 Meter SSB Travel Radio™

... the most powerful 12 watt radio you'll ever own ... hot receiver ... potent speech processing!

MFJ-9420



**New Bands:  
40 Meter and 75 Meter  
Available!**

Turn on the MFJ-9420, and you'll marvel at how well it performs.

Weak stations roll in with surprising clarity, faithfully reproduced by the MFJ-9420's single-conversion receiver.

On transmit, MFJ's exclusive *Constant Current™* speech processor cuts through noise and QRM like a far more powerful radio.

Now you can take *world-class DX* performance along on your next vacation or business trip; the MFJ-9420, microphone, power supply, and antenna easily fit into your brief case or carry-on luggage.

At home, in the car, or on the road, you'll be amazed at what the MFJ-9420 can do!

**Here's what you get ...**

**Simple Operation:** There's no "microprocessor mumbo-jumbo" with the MFJ-9420 -- you'll have it set up and operating in minutes!

**Truly Portable:** It's the smallest rig of its kind! The MFJ-9420 - plus microphone, power supply, AND antenna -- easily fit into a small brief case or gym bag!

**Great Sensitivity:** The MFJ-9420 features a quiet double balanced mixer front-end, single-conversion clarity, and plenty of gain with a powerful audio amplifier. If a signal is there, you'll pull it in loud and clear!

**Analog S-Meter:** You get a *real* calibrated S-meter -- not a useless LED bargraph -- that makes peaking a tuner or finding the best beam heading clear-cut. The meter also monitors speech processing levels during transmit.

**Excellent Selectivity:** Eight poles of tight IF filtering cuts adjacent chatter and focuses transmitter power where you need it most.

**Smooth VFO:** No annoying "synthesizer jump" or obscure keypad commands to deal

with. Enjoy effortless tuning with a custom-built reduction-drive ball-bearing VFO capacitor.

**Powerful Audio:** You get big audio -- even in noisy locations -- from a special Signetics audio chip and a rugged 3 inch speaker.

**RF Speech Processing:** MFJ's exclusive *Constant Current™* RF speech processing

## DESIGNER'S COMMENTS

Most SSB radios are designed for a specific power level ... 100 Watts for example. The MFJ-9420 is different. We identified several popular lightweight power sources that are especially easy to pack up and carry -- like D-Cell NiCaAd packs or the MFJ-4110 wall adapter. We then set out to build a transmitter from the ground up that would wring every last possible ounce of intelligibility and talk-power from those sources. It's a different approach, but it really worked! The MFJ-9420 literally "roars" for its size, blowing away radios running a lot more power. Add an ultra-clean single-conversion receiver with a powerful audio amplifier, and the result is *pretty amazing!*

... Rick Littlefield, K1BQT

slashes through noise and QRM like a full-sized radio running many times more power. Every milliwatt of available power is focused into clear ultra-intelligible speech.

**Low Current Requirements:** You'll never have to lug around a heavy bulky power supply to run your radio. The MFJ-9420 transmitter was especially designed from the ground up to deliver maximum talk power from popular easy-to-carry power sources such as NiCaAd D cells or the special MFJ-4110 wall adapter supply.

**Rugged Transmitter:** The bullet-proof PA transistor runs cool and easily tolerates 3:1 VSWR and accidental feedline shorts or opens.

**Proven On-Air Design:** You may have already worked a MFJ-9420 without knowing it. Designer Rick Littlefield, K1BQT, literally developed the MFJ-9420 on-air, under the same real-world operating

conditions you'll experience every day!

**Built To Last:** Conservative design, premium plate-through PC board, quality components, handsome brushed-aluminum panel and a tough vinyl-clad case ensure years of dependable service.

MFJ-9420 covers 14.150 - 14.350 MHz, MFJ-9440 covers 7.150 - 7.300 MHz, MFJ-9475 covers 3.750 - 4.000 MHz. 12 watts PEP output. One watt audio output at 10% THD. Draws 50-100 ma on receive and 2.2 amp peak on transmit at 13.8 VDC. 2 1/2x6 1/2x6 inches.

## MFJ No Matter What™ Guarantee

MFJ will repair or replace (at our option) your MFJ-9420 *no matter what* for a full year. **Free MFJ SSB Travel Radio™ Manual**

Manual includes operating instructions, setting up your station, DX techniques, antenna suggestions, trouble shooting guide, theory of operation, alignment procedures, parts placement, schematic, parts list and more.

For a free manual write or call MFJ.  
**CW Adapter**

Install the optional plug-in MFJ-415, for MFJ-9420/MFJ-9420X, Shipping Code A, CW adapter, and jump to the low end of 20 Meters for some CW action! Module includes semi-break-in/T/R switching, sidetone generator, key jack and CW/SSB switch.

## Dynamic SSB Microphone

Serious DXers know not all microphones sound alike. The MFJ-290 was selected

because its on-air characteristics especially complement the superb speech processing system. You'll like the way it sounds -- and love the way it cuts thru noise and QRM. A winning combination!

**Special offer MFJ-9420X/ MFJ-9440X/MFJ-9475X**

--both microphone and SSB Travel Radio™. Microphone only. MFJ-290, add \$/h available separately.

## Get Yours Today

Order your SSB Travel Radio today. At home or on the go, you'll enjoy countless hours of operating pleasure.

## MFJ SSB and CW Transceivers Operating Accessories

### MFJ Portable Antenna Tuner



MFJ-971 Tunes coax, balanced lines, random wire 1.8-30 MHz.

Cross-Needle SWR/Wattmeter has two switchable ranges: 30, 300 or user selectable 6 watt ranges. Tiny 6 x 6 1/2 x 2 1/2 inches matches MFJ SSB and CW Transceivers. Fastens to MFJ SSB and CW Transceivers and/or MFJ-4114 Power Pack to form single unit. MFJ-27 handle for MFJ SSB and CW Transceiver stations available separately.

### MFJ Portable Power Pack

MFJ-4114

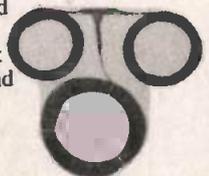


MFJ-4110

Matching portable Battery/AC Power Pack for MFJ CW and SSB Transceivers or other low power rigs. Provides power from Ni-cad D cells, regular or alkaline D cells or 110 VAC. Has charging circuit for Ni-cads D cells. 6 x 6 1/2 x 3 1/2 inches. For A/C operation only, order MFJ-4110.

### MFJ Portable Antennas

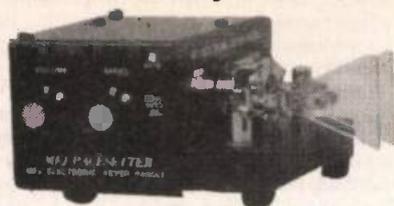
Efficient low SWR folded dipole. Lightweight, easy to carry, easy to put up. Perfect for MFJ CW Transceivers and SSB Travel Radio™. Order MFJ-1774, 40-Meter; MFJ-1773, 30-Meter; MFJ-1772, 20-Meter; MFJ-1771, 17-Meter; MFJ-1770, 15-Meter; MFJ-1776, 6-Meter.



Power Packs fasten to MFJ CW Transceivers and/or MFJ-971 to form single unit. Batteries not included.

# MFJ Keyer/Bencher Paddle Combo

MFJ and Bencher team up to bring you America's most popular keyer in a compact package for smooth easy CW...



MFJ-422C



MFJ-422CX

The best of all CW worlds—a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! You can buy the combination or just the keyer for your Bencher.

MFJ Keyer is small in size, big in features. It gives you adjustable weight and tone and has front panel volume and speed controls (8-50 WPM). You also get built-in dot-dash memories, speaker, sidetone and push button selection of semi-automatic/tune or automatic modes. Ultra-reliable solid state keying: grid-block, cathode and solid state transmitter (-300V, 10 mA max, +300V, 100 mA max.). Fully shielded. Use 9 volt battery (not included) or 110

VAC with MFJ-1312B.

Beautiful functional engineering. The keyer mounts on the paddle base to form a small (4 1/8 x 2 5/8 x 5 1/4 inches) attractive combination that is a pleasure to look at and use. You can buy the combo or just the MFJ Keyer (MFJ-422CX) to fit on your Bencher or MFJ-564 iambic paddle.

Paddles have fully adjustable contacts, lucite paddles, heavy steel base with non-skid feet. Select MFJ-564 (chrome base); Bencher BY-1 (black base); Bencher BY-2 (chrome base).

## MFJ Deluxe Electronic Keyer

MFJ-407C

You get everything you need to send beautiful CW from



this Deluxe MFJ Keyer — easy access front panel controls, all keyer modes, dot-dash memories, jam-proof spacing, weight control, sidetone, built-in speaker and more.

You get speed, weight, tone and volume controls and tune, semi-auto and on/off switches all on the front panel for easy access.

By plugging in a dual paddle squeeze key such as the MFJ-564, you can use the fully automatic iambic mode. In this mode, dot-dash memory makes keying extremely easy. It lets you insert a dot before a dash finishes or insert a dash before a dot finishes.

Also, squeezing both paddles generate alternating dots and dashes.

This lets you send characters such as C, K, and R with a single squeeze. It turns an inexperienced fist into a professional sounding CW operator.

You can use the automatic mode with a single or dual paddle. You automatically generate dots and dashes by pressing the paddle.

You can switch into a semi-automatic "bug" mode to generate dots automatically and dashes manually.

Or you can use a "straight key" mode and manually generate your own dots and dashes.

The MFJ-407C gives you dot-dash memory, self-completing dots and dashes, jam-proof spacing and instant start keying. You can select type A or type B keying to match your sending style.

The weight control lets you adjust your dot-dash-space ratio to make your signal distinctive to bust through pile ups. It also lets you compensate for the turn-on delay of your transmitter.

Has tune switch for tuning your transmitter or antenna tuner.

RF proof. Built-in speaker for sidetone. Keys solid state and tube transmitters. Uses 9 volt battery or 110 VAC with MFJ-1312B. Attractive black cabinet measures 7x2x6 inches.

## MFJ Econo Electronic Keyer II

The MFJ-401C

Econo Keyer II lets you send iambic,

automatic, semi-automatic or manual with your squeeze, single lever or straight key.

You get iambic operation with squeeze key. Dot-dash insertion. Semi-automatic "bug" operation provides automatic dots and manual dashes.

Econo MFJ keyer also features dot-dash memories, self-completing dots and dashes, jam-proof spacing. Instant start. RF proof.

Front panel controls. Smooth linear speed control selects from 8 to 50 WPM. Volume control gives you a wide range. A tune switch lets you key your transmitter for tuning.

Internal controls: Weight control adjusts dot-dash ratio, makes your

MFJ-401C



## New MFJ's Deluxe Iambic Paddles

Ideal for all MFJ Keyers and Memory Keyers

MFJ Deluxe MFJ-564

Iambic Paddles feature a full range of adjustments in tension and contact spacing, self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. MFJ-422CX keyer and MFJ-490X memory keyer designed to be mounted on these paddles.



Continued from MFJ-401C

signal distinctive to penetrate QRM. Tone control for desired side tone pitch.

Ultra-reliable solid state keying: grid-block, cathode, solid state transmitters (-300V, 10 mA max, +300V, 100 mA max.).

Use 9 volt battery (not included) or 110 VAC with MFJ-1312B. Measures a compact 4x2x3 1/2 inches.

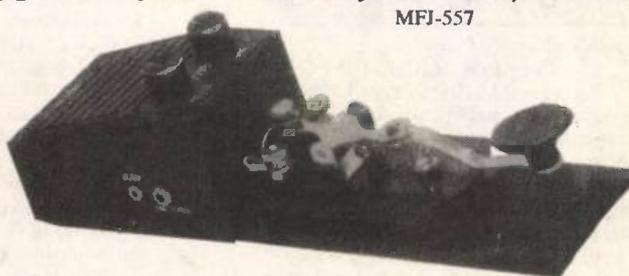
## MFJ-557 Deluxe Code Practice Oscillator

Deluxe Morse straight key for code and sending practice features a heavy steel base, tone and volume controls and an earphone jack...

MFJ-557

The MFJ-557 Deluxe Code Practice Oscillator features a Morse straight key on a non-skid heavy steel base that stays put on your table. The MFJ-557 lets you practice sending code at home, work, riding in your car —practically anywhere — because it's so easy to take it along wherever you go. A volume control lets you adjust it from barely audible to blaring full sound. You can practice without bothering anyone. A tone control gives you a wide adjustment, from high "squeaky" to low "booming" tones. You even get an earphone jack for private listening. Plug in an external speaker (like MFJ-280) for extra volume in the classroom.

It runs on a 9 volt battery (not included) or 110 VAC with MFJ-1305 that plugs into a jack on the side. When you're finished cleaning up your sloppy fists with the MFJ-557 Deluxe Code Practice Oscillator, hook the straight key to your transmitter and go on the air



sounding just like you were born working QSOs.

Don't pass up this super buy. Built-in speaker. Adjustable contacts. Solid. 8 1/2 x 2 1/4 x 3 3/4 inches. Black. It comes with MFJ's one year unconditional guarantee.

# MFJ Menu Driven Memory Keyer™



MFJ-492 \*Patent Pending

MFJ's new *Menu Driven Memory Keyer™* lets you immediately enjoy your MFJ-492 without reading an instruction manual -- there's no keypad, no complex sequences, nothing to remember.

You simply select a menu by pressing a button. An LED lights to show you which menu is active. You select a feature by pressing a feature button. It's as easy as using a computer touch screen! Each menu is clearly printed on the front panel -- there's no confusion.

From the menu you can save and play messages . . . decrement serial numbers . . . set speed, weight, sidetone . . . enter iambic, semi-auto, handkey, message queue, paddle command modes . . . turn on/off sidetone, transmitter tune, keying output on/off . . . select iambic A or B, reverse paddle, Morse trainer and store starting serial number.

You can bypass the menu by keying in simple two letter commands. When you select a feature the keyer tells you its status in CW.

## Memory expandable to over 8000 characters

You can expand the MFJ-492 standard 192 characters in four soft sectored message memories to over 8000 characters in eight message memories by simply plugging in the MFJ-80, Memory Expansion Kit. Memories backed-up by lithium battery.

## Smooth Speed Control

Matching your CW speed to a QSO is best done by ear. The MFJ-492 lets you match speed by turning a knob or by using MFJ's Analog Set™. In this mode, pressing the dot or dash paddle smoothly increases or decreases speed from 5 to 100 WPM. You can also customize the range of the speed knob for precise control.

## Powerful Morse Code Trainer

A powerful Morse code trainer lets you practice or teach code in Farnsworth or normal mode.

You can select letters, numbers, punctuation marks or prosigns or any combination for practice. You can use standard 5 character groups, more realistic random 1 to 8 character groups or select specific six character sets to work on.

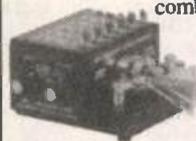
You can instant-replay a random session to check your copy.

You can store custom code practice sessions in memory for later replay.

## Here's what you can do with Message Memories . . .

### Menu Driven Memory Keyer/Bencher Paddle Combo

MFJ-490



\*Patent Pending

The best of all CW worlds -- nearly all the features of the MFJ-492 *Menu Driven Memory Keyer* in a compact configuration that fits right on the Bencher iambic paddle! You can buy the combination or just the keyer for your Bencher.

You get message memories, Morse trainer, sidetone, automatic serial numbering -- plus more. 5x3x5½ in. Uses 9 volt battery, 12 VDC or 110 VAC with MFJ-1312B. MFJ-490, Keyer/Bencher Combo. MFJ-490X, Keyer only. Memory expansion kit not available.

**Message Repeat™** lets you repeat messages continuously. You can also insert pauses within a message. This lets you call CQ, listen for an answer and then resume calling CQ by pressing a single button. Each pause can be up to an hour -- It makes a perfect Automatic Beacon.

**Message Call™** calls other messages and Message Queue plays messages in sequence. You can store QTH, rig, weather and other information in separate message memories and play these in any sequence you want!

**Message Edit™** lets you correct mistakes while recording a message -- you don't have to start all over if you make a mistake.

While you're playing a memory message you can break-in at any time and insert comments from your paddle and then resume playing your message.

You can insert commands within a stored message. As you play it back, these commands will execute. For example, you can insert

automatically incrementing serial numbers, replay messages continuously, call and play other messages, insert pauses or combine all these in one message!

When you play your messages back, automatic word and character spacing make your CW sound like perfect code. Or you can adjust the spacing for a more distinctive individual sound that DX stations will notice.

## Plus more . . .

You get contest serial numbering (0-9999) with auto-increment. You can send an N for 9 and a T for 0 to save time.

MFJ's *Analog Set™* lets you adjust speed, weight and sidetone just as smoothly as a knob -- dot/dash paddles are used as an up/down control.

You get built-in sidetone, speaker, front panel volume control knob and adjustable 300-3000 Hz tone.

You can use automatic, semi-automatic bug or handkey modes, reverse dot/dash paddles, select iambic A or B or non-iambic modes.

You can adjust weight from 5 to 95% and compensate for transmitter distortion with a special transmitter compensation feature.

A tune feature lets you key your transmitter for tuning.

You can turn off the keying output so you can practice without keying your transmitter or unplugging your keyer.

You get direct and grid block keying. Keys solid state and tube rigs.

Special MARS characters are recognized and can be used in messages.

Uses 9 volt battery, 12 VDC or 110 VAC with MFJ-1312B. 6½x2½x6¾ in.

**MFJ-80, Memory Expansion Kit.** Expands your MFJ-492 to 8000 characters and adds four additional message.

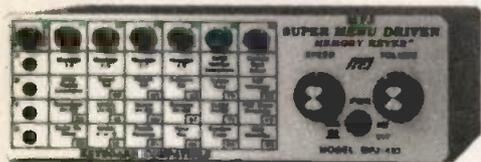
**MFJ-492X.** MFJ-492 with MFJ-80 Memory Expansion Kit installed.

**MFJ-78. Full function Remote Control** puts message memories and menu control at your finger tips for real convenience.

You get all the features of the MFJ-492 plus these . . .

You get 32,000 characters of memory.

# MFJ Super Menu Driven Memory Keyer™/Keyboard



\*Patent Pending

**MFJ-493** Plug-in a standard IBM compatible 101 AT type keyboard and you have an extremely powerful full featured standalone keyboard keyer. All commands, functions and memories can be done through the keyboard. Plus you get additional message memories and features.

**Built-in serial port** lets you combine the power of your computer with the MFJ-493. Use your computer to compose, build and store a complete library of often used messages, generate custom code practice sessions and exams and download to MFJ-493, control your keyer, automatically set up keyer for different operators during contest, display, edit and save

message memories and keyer settings.

As you key in CW, ASCII is also being sent to the serial port. You can use your computer to record an entire transmission.

In addition to the powerful Morse Code Trainer, in the MFJ-492 you get . . .

. . . an FCC Exam Simulator that sends random QSOs exactly like the FCC exams. When you can copy these random QSOs, you're ready to pass your exam and upgrade!

. . . MFJ's QSO Simulator makes learning Morse code really fun. It's like making real on-the-air contacts. You can answer a CQ or call a station and enjoy a nice a QSO. You'll get operating experience while boosting your code speed.

. . . a new Word Recognition Mode gives you hundreds of commonly used words in amateur radio for you to practice recognizing entire words instead of individual letters. With practice you can learn to copy words in your head without writing it down and carry on an entire CW conversation without paper -- just like the

pros.

**Compact 7½x2½x6¾ inches.** Use 12 VDC or 110 VAC with MFJ-1315.

**MFJ-79, full function Remote Control.**

**Optional keyboard, MFJ-551, MFJ RFI suppressed keyboard to match your MFJ-493.**

**Optional serial cable: MFJ-5409, for 9-pin serial port. MFJ-5425, for 25-pin serial port.**

MFJ-551



# MFJ Super CW Keyboard

... two line LCD display ... includes RFI suppressed keyboard ... eight 250 character nonvolatile message memories ... 150 character type-ahead buffer ... iambic keyer ... powerful Morse Code Trainer ...

Send effortless CW as soon as you turn on this MFJ Super CW Keyboard -- there's no computer to boot up, no program to load -- just start typing.

You get a standalone MFJ Keyboard that includes an RFI suppressed keyboard, a two line 16 character LCD display, eight 250 character nonvolatile message memories, a 150 character type-ahead buffer, iambic keyer, plus a powerful Morse Code Trainer and much more for an incredibly low price! Paddle not included.

**Big 200 Character type-ahead Buffer**  
Even "hunt and peck" typists can send perfect sounding CW because a large 150 character type-ahead buffer smoothes out your typing and gives you time to compose.

**MFJ Perpetual Memory™**  
Eight 250 character message memories let you store often used messages.

MFJ's unique nonvolatile Perpetual Memory™ saves your messages and settings up to 20 years without power or batteries.

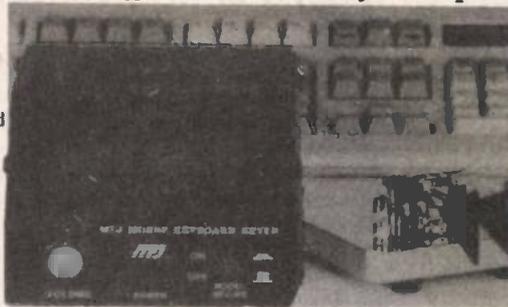
Unlike short term memory, you won't lose your messages and settings every time you turn power off.

## LCD Display

Only MFJ gives you an easy-to-read LCD display that simultaneously shows what

MFJ-452X

MFJ-452 with keyboard



you're typing in on one line and what you're sending out on another line.

You can review stored messages, keyboard settings and spot typing errors that you can quickly correct by backspacing.

LCD display is mounted on a sloped front panel and has a contrast control.

## MFJ AutoCommand™

MFJ AutoCommand™ lets you execute commands stored within a message.

For example, you can insert pauses and incrementing serial numbers, play messages continuously or call other messages.

## Includes RFI Suppressed Keyboard

Keyboard included -- you won't have to supply your own keyboard.

It has excellent RFI suppression -- it won't lockup or send characters you don't want because of RF and you won't hear digital hash in your receiver.

## SingleTouch™ Function Keys

No complex keystrokes! MFJ's SingleTouch™ function keys make it simple to

store and recall messages, set speed, weight and tone, setup serial numbering, turn on/off transmitter tune, keying and handkey mode.

## Prosigns

Commonly used prosigns are assigned keys for easy use. You can also create any prosign by pressing Alt and any characters.

## Full Featured Iambic Keyer

For fast break-in, plug in an iambic paddle and use it as a full featured keyer.

You can pause your playing buffer or message, insert your comments with your paddle and then resume playing.

## Powerful Morse Code Trainer

You can practice or teach Morse code in Farnsworth or normal mode.

Select letters, numbers, punctuations or prosigns or any combination for practice. Use standard 5, random 1 to 8 character groups or select specific six character sets.

## Plus much more

Has speaker, sidetone, volume control and jack for external speaker or earphones.

You can vary speed from 5 to 100 WPM, weight from 5 to 95%, sidetone from 300 to 3300 Hz and serial number from 0 to 9999.

Has buffer and memory full audible indicators. Keys solid state and tube rigs.

AT101 compatible keyboard plugs into compact 3 1/2 x 2 1/2 x 3 1/2 inch interface. Use 12 VDC or 110 VAC with MFJ-1312B.

MFJ-452X, not including keyboard.

MFJ-452, including keyboard. Paddle not included for MFJ-452/452X

## MFJ Dedicated CW Keyboard

MFJ-451X

MFJ-451 with keyboard



For an incredibly low price, you get a dedicated CW Keyboard that includes an IBM-AT compatible keyboard, a 200 character type-ahead buffer and two 100 character nonvolatile message memories plus much, much more.

You can send effortless CW as soon as you turn it on -- there's no computer to boot up, no program to load -- just start typing. If you make a mistake simply backspace to correct it.

Even "hunt and peck" typist can send perfect sounding CW because its huge type-ahead buffer smoothes out uneven typing and gives you plenty of time to compose your thoughts.

You can repeat stored messages and insert automatic serial numbers and pauses (up to 99 minutes and 99 seconds) into stored messages.

There's no complex keystroke sequences to remember -- OneTouch™ function keys make it simple to store and recall messages, set speed,

weight and tone, setup automatic serial numbering, turn on/off transmitter tune, transmitter keying and handkey mode.

**Hi-tech nonvolatile** memory saves messages and settings for up to 20 years without power or batteries.

Commonly used prosigns are assigned to character keys. You can also create any prosigns by pressing Alt and any characters.

For fast break-in operation, you can plug in an iambic paddle and use it as a full featured keyer complete with dot-dash memories.

You can pause while your buffer or stored message is playing, insert your comments and then resume playing.

A built-in speaker with sidetone and front panel volume control lets you monitor your sending. You can also plug in an external speaker for room filling volume.

You can key nearly any modern solid state or older tube type transmitters with the MFJ-451.

You can vary speed from 5 to 100 WPM, weight from 5 to 95%, sidetone from 300 to 3300 Hz and serial number from 0 to 9999. It has buffer and memory full audible indicators.

The IBM-AT compatible keyboard plugs into a compact 3 1/2 x 1 1/4 x 3 1/2 inch cabinet that contains the electronics. Keyboard supplied may vary from the one shown here. Use 12 VDC or 110 VAC with MFJ-1312B. MFJ-451 CW Keyboard include keyboard. MFJ-451X CW interface only without keyboard.

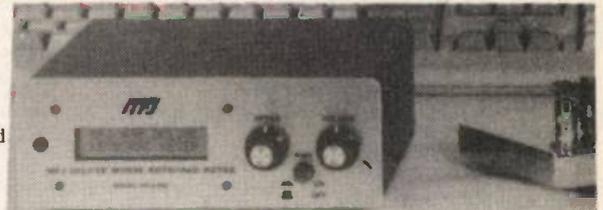
## CW Keyboard with LCD Display, QSO Simulation and 32K RAM

Want the world's most powerful CW keyboard with all the features of the MFJ-452 Super CW Keyboard, 32K of lithium battery backed up message memory, plus much, much more?

Choose the MFJ-498 and you'll also get ... an FCC Exam Simulator™ that sends random QSOs exactly like FCC exams -- when you can copy these random QSOs, you're ready to pass your exam and upgrade ... MFJ's QSO Simulator™ simulates on-the-air contacts -- answer a CQ, call a station, enjoy a QSO and get operating experience while boosting your code speed ... MFJ's new Word Recognition™ mode gives you hundreds of commonly used words -- learn to copy entire words in your head without writing it down, just like the pros. 6 1/2 x 2 1/2 x 6 3/4. Use 12 VDC or 110 VAC with MFJ-1315.

MFJ-498X

MFJ-498 with keyboard

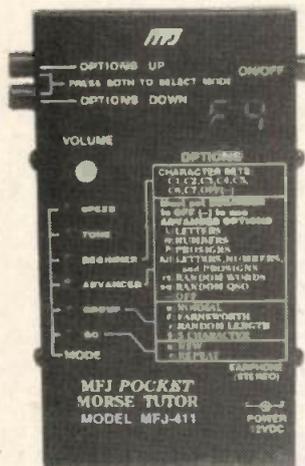


MFJ's exclusive AnalogSet™ speed control lets you customize your speed range.

MFJ-498X, without keyboard. MFJ-498, including keyboard. Paddle not included for MFJ-498/498X

# MFJ Personal Morse Code Tutor™

Learn Morse code anywhere with personal pocket size Morse Code Tutor™



MFJ-411

on the easy-to-learn *EISH-TMO Method* as described in *American Radio Relay League* publications. It's a powerful learning tool that teaches you letters and numbers by association and relation -- you'll be copying code in no time.

carry on an entire CW conversation without paper -- just like the pros on 40 Meters.

## Easy-to-Use Menu

It's so easy-to-use you won't need to read your instruction manual!

You simply select a menu and then activate a feature within that menu using just two pushbuttons. There's no keypad, no complex sequences, nothing to remember.

## Pocket Size

You can take it anywhere because it's only 3x1 1/2x5 1/2 inches. It easily fits in your briefcase, travel bag or pocket. It uses a 9 volt battery (not included) or 110 VAC with optional MFJ-1312. You can use earphones for private practice without disturbing anyone or you can use its built-in speaker for group practice.

## Tapes Can't Compare

Unlike tapes, you'll never memorize these computer generated code practice sessions.

You can select the character sets you need the most practice on and set the speed and tone for each session.

Tapes just plays the same recorded sessions over and over. You'll pay as much for a few sets of tapes as you would for a MFJ-411 *Personal Morse Code Tutor*™. In the long run, it's less expensive and more effective to own a MFJ-411.

## Get Yours Today

No matter where you are, use your spare moments to learn code and upgrade so you can enjoy more ham band privileges.

Call now and order your MFJ-411 *MFJ Personal Morse Code Tutor*™ code tutor today.

Learn Morse code anywhere with this pocket size *MFJ Personal Morse Code Tutor*™!

When you have a spare moment, no matter where you are, you can enjoy a code practice session . . . at home, going to work, in a hotel, on vacation, on a plane, car, train, bus or just waiting.

This pocket size tutor takes you from zero code speed with a beginner's course to Extra Class with customized code practice.

A *Random QSO Mode* lets you practice copying plain English QSOs to get you ready for your FCC code exam.

You also get a *Word Recognition Mode* that lets you practice copying entire words -- just like the pros on 40 Meters.

## Beginner's Course

There's a special beginner's course based

## Customized Practice

You can customized random practice sessions by selecting letters, numbers, punctuations or prosigns or in any combination.

You can select standard 5 character groups or more realistic random 1 to 8 character groups with normal spacing or Farnsworth spacing.

You can vary speed from 5 to 60 words per minute and set volume and sidetone from 300 to 3300 Hz so it's just right for you.

## Realistic Plain English QSOs

You can practice copying realistic on-the-air style plain English QSOs.

They'll help get you ready for your FCC code exam. When you're comfortable copying these, you're ready to pass your exam and upgrade!

Copying these on-the-air QSOs will also give you plenty of confidence before you make your first contact.

## MFJ Word Recognition Mode™

You can select MFJ's *Word Recognition Mode*™. It gives you hundreds of commonly used words in amateur radio for you to practice recognizing entire words instead of individual letters.

With practice you can learn to copy words in your head without writing it down and

## MFJ Voice Keyer unfair During Contest

Gain an unfair advantage during a contest by cloning your voice Has pre-wired microphone connector, programmable for most radios . . . Kenwood, Icom, Yaesu, Alinco



MFJ-432

Store frequently used phrases like "CQ Contest this is AA5MT" . . . "You're 59" . . . "QTH is Mississippi."

Let this new *MFJ Voice Memory Keyer*™ call CQ, send your call and do contest exchanges for you

in your own natural voice!

Operate most of a contest by pressing a few buttons and still have your voice after the contest.

You can store four natural sounding messages in a total of 20 seconds. EEPROM technology keeps messages stored for up to 10 years -- no backup battery needed.

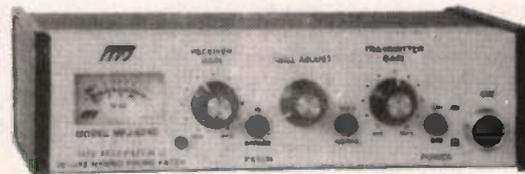
You can also repeat a message continuously. It makes it soooo easy to call long CQs during poor band conditions.

It's easy to use -- just plug your 8 pin microphone cable into the MFJ-432 and plug its cable into your transceiver's 8 pin mic connector. Internal jumpers let you customize it to your rig.

Built-in speaker lets you monitor stored messages. Has jack for remote control operation. Uses 9 volt battery (not included) or 110 VAC with MFJ-1312B. 6 1/2x2 1/2x6 1/2 inches.

## MFJ Deluxe Hybrid Phone Patch

Has pre-wired microphone connector, programmable for most radios . . . Kenwood, Icom, Yaesu, Alinco



MFJ-624D

MFJ-624D Deluxe Hybrid Phone Patch gives you crisp, clear, hum-free audio, and that's what phone patching is all about. It's jumper selectable for Kenwood, Icom, Yaesu and Alinco rigs with 8 pin mic connectors.

You can use either VOX or push-to-talk. RF pi-filters and PC board construction eliminates RF feedback. Use with virtually any rig.

Built-in VU meter monitors phone line levels to prevent crosstalk. Adjust null depth for maximum isolation between receiver and transmitter. Separate transmitter and receiver gain controls eliminate the need to readjust your rig after patching. Null control. Standard phone Connection, RJ-11. Jacks for speaker, audio in and audio out. 8 x 2 x 6 inches. Use 12 VDC, 9 volt battery or 110 VAC with MFJ-1312B.

This USA made MFJ-624D gives you more quality and more features than competing phone patches that cost much more. MFJ-624D is FCC approved. Get yours today!

# MFJ tunable DSP filter

Only MFJ gives you tunable and programmable "brick wall" DSP filters

**MFJ's tunable super DSP filter** automatically eliminates heterodynes, reduces noise and interference simultaneously on SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX, weak signal VHF, EME, satellite -- nearly any mode.

Patent pending  
MFJ-784B



You get MFJ's *tunable* FIR linear phase filters that minimize ringing, prevent data errors and have "brick wall" filter response with up to 57dB attenuation 75 Hz away.

Only MFJ gives you 5 tunable DSP filters. You can tune each lowpass, highpass, notch, and bandpass filter including optimized SSB and CW filters. You can vary the bandwidth to pinpoint and eliminate interference.

Only MFJ gives you 5 factory pre-set filters and 10 programmable pre-set filters that you can customize. Instantly remove QRM with the turn of a switch!

You get MFJ's automatic notch filter that searches for and eliminates multiple heterodynes.

You also get MFJ's advanced adaptive noise reduction. It silences background noise and QRN so much that SSB signals sound like local FM.

The automatic notch and adaptive noise reduction can be used with all relevant tunable pre-set filters.

Automatic gain control (AGC) keeps audio level constant during signal fade.

## Automatic notch filter

MFJ's automatic notch filter searches for and eliminates multiple heterodynes in milli-seconds. It's so fast, that even interfering CW and RTTY signals can also be eliminated.

With up to 50 dB attenuation, you'll copy stations otherwise masked by heterodynes.

Voice signals aren't degraded because the notch is extremely narrow.

Turn on automatic notch and you'll never hear unwanted heterodynes of tuner-uppers.

You can selectively remove unwanted tones using the two manually tunable notch filters -- an MFJ exclusive. Knock out unwanted CW stations while you're on CW.

## Adaptive Noise Reduction

Turning on noise reduction silences background noise. It reduces fatigue and makes noisy signals readable.

Noise reduction works in all filter modes and on all random noise -- white noise, static,

impulse, ignition noise, power line noise, hiss.

The LMS algorithm gives you up to 20 dB of noise reduction. Noise reduction is adjustable to prevent signal distortion.

## Tunable highpass/lowpass filters

For Voice and Data, nothing beats MFJ's exclusive tunable highpass/lowpass FIR linear

You can tune the center frequency from 300 to 3400 Hz, and vary the bandwidth from 30 Hz to 2100 Hz -- from super-tight CW filters to wide razor-sharp Data filters.

As you narrow the bandwidth, interfering signals drop out, because, just 60 Hz away, they're down by over 47 dB.

You can use narrower band-widths to fight tough QRM because these linear phase filters don't distort signals with unequal time delays.

Even with the narrowest 30 Hz bandwidth, you'll never have a problem with ringing.

One position gives you two tunable filters you can use together. For example, tune one to mark, one to space and set the bandwidth tight for an incredibly sharp RTTY filter.

## 15 pre-set filters -- factory set or you program

You can select from 15 pre-set filters. Use for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any mode.

If you don't like our pre-set filters, you can program your own -- an MFJ exclusive! Save center frequency/bandwidth, lowpass/highpass cutoffs, auto/manual notch, noise reduction -- all filter settings -- in 10 programmable filters.

Only MFJ gives you both tunable filters to eliminate nearly any QRM and convenient pre-set filters customized for any mode.

## Plus more . . .

A push-button bypasses your filter -- lets you hear the entire unfiltered signal.

2 1/2 watt amplifier, volume control, input level control, speaker jack, PTT sense line, line level output. 9 1/2 x 2 1/2 x 6 inches.

Plugs between your transceiver or receiver and external speaker or headphones. Use 12 VDC or 110 VAC with MFJ-1315. Cable Pack, MFJ-5184, includes receiver cable, DC cable, and 2 open-end TNC cables.

## Firmware Upgrade

For MFJ-784, order MFJ-55. Gives you most features of the MFJ-784B.

## NEW MFJ-784B Features

- Tunable Spotting Tone™ -- an MFJ invention -- accurately tunes even the narrowest CW filter
- MFJ's exclusive Adaptive Tuning™ -- Center frequency tuning automatically becomes finer as you narrow bandwidth -- makes extremely narrow filters easy-to-use
- Improved automatic notch with variable aggressiveness
- New quieter audio amplifier gives you full 2 1/2 Watts output
- Speaker ON/OFF button, phones always active
- Accurate easy-to-use input level Indicator
- Filter Talk™ function sends precise filter settings in Morse code
- Filter automatically bypasses during transmit for monitoring CW sidetone, voice or data by sensing PTT line
- Improved manual notch in the CW mode
- Manual notch and automatic notch can be used simultaneously
- Noise reduction, automatic notch and tunable manual notch can be used in Memory mode
- Adjustable line level output
- More Mark-Space frequencies and baud rates for data filters

phase "brick wall" filters.

You can tune the lower cutoff frequency 200 to 2200 Hz and the upper cutoff frequency 1400 to 3400 Hz. This lets you create custom filters for Voice, Data and other modes.

Signals just 75 Hz away literally disappear -- they are reduced 57 dB!

Unlike other filters, speech is not distorted by unequal time delay.

When signals are weak, you can improve copy by removing noisy high and low speech frequencies that contain little information.

On crowded HF bands, you can "slice-off" overlapping SSB signals to improve copy.

You can highpass filter out hum, pulses, rasp and other irritating low frequency noise.

## Tunable bandpass filters

Narrow band signals like CW and RTTY jump out of QRM when you switch in MFJ's exclusive tunable FIR bandpass filters.

## Add DSP to any Multimode

panel switch for easy turn-the-knob selection.

You can choose from . . .

. . . from 64 data filters with 16 Mark/Space pairs, 4 shifts, 4 baud rates. Interference is 40 dB down 60 Hz outside passband.

. . . from 32 CW filters with 8 CW tones (300-1000 Hz) and 4 bandwidths (50-500 Hz). 50 dB down 50 Hz outside passband.

. . . filters optimized for these specialized modes VHF Packet, Clover, WeFAX and SSTV. 45 dB down 75 Hz outside passband.

Plugs between transceiver and multimode. Input and output level controls. Accurate easy-to-use input level indicator.

Automatic gain control (AGC) keeps audio level constant during signal fade.

ON/OFF/Bypass switch provides true bypass. MFJ-1312B.

NEW

MFJ-781



Add "brick wall" DSP filtering to any TNC or multimode data controller. Copy signals buried in noise and QRM -- signals you can't even hear!

Under severe QRM, DSP greatly improves copy of Packet, AMTOR, PACTOR, GTOR, Clover, RTTY, SSTV, WeFAX, FAX, CW -- nearly any digital mode.

The MFJ-781 DSP Multimode Data Filter™ offers you an arsenal of 100 incredibly sharp No\*Ring™ linear phase FIR filters.

You can choose 20 filters to include on the front

## DSP for your MFJ-1278/B

MFJ-780



Plug a MFJ-780 "brick wall" DSP filter into your MFJ-1278/B multimode and you won't believe your eyes when you see solid copy from signals completely buried in QRM! The MFJ-1278/B automatically selects the correct DSP filter for Packet, AMTOR, PACTOR, RTTY, ASCII, FAX, Color SSTV, Navtex or CW. Get the MFJ-780 now and watch your MFJ-1278/B copy signals that other multimodes can't.

Has built-in automatic self-test for all digital circuitry and controls. 4 1/2 x 2 1/2 x 5 inches.

Uses 10-16 VDC or 110 VAC with

# Tap into Secret Shortwave Signals

Turn mysterious signals into exciting text messages with this new MFJ Multi Reader™

MFJ-462B



Ever wonder what those mysterious chirps, whistles and buzzing sounds are on the shortwave bands?

Much of it is RTTY, ASCII, CW and AMTOR(FEC) signals passing commercial, military, diplomatic, weather, aeronautical, maritime, amateur and other traffic.

### Tap into these "secret" Signals

Plug this self-contained MFJ MultiReader™ into your shortwave receiver's earphone jack. Then watch these mysterious signals turn into exciting text messages as they scroll across an easy-to-read LCD display. You don't need a computer, interface, program, special cables or any other equipment.

### Eavesdrop on the World

Eavesdrop on the latest breaking news as press agencies from all over the world relay them on RTTY -- it's like having a private wire service in your home.

You'll hear the world's commercial and government press agencies transmitting *unedited* news in English -- *China News Agency* in Taiwan, *Telan Press* in Argentina, *Iraqi News Agency* in Iraq, *TANJUG Press* in Serbia plus many others.

Copy RTTY weather stations from Antarctica, Mali, Congo and many others. Listen to military stations passing traffic from Panama, Cyprus, Peru, Capetown, London and others. Listen to hams as they chat to their friends, listen in on diplomatic, research, commercial and maritime traffic.

Listen to maritime users, diplomats and amateurs send and receive error free messages using various forms of TOR (Telex-Over-Radio).

Monitor Morse code communications from hams, military, commercial,

aeronautical, diplomatic and maritime coastal stations from all over the world -- Australia, Russia, Hong Kong, Japan, Egypt, Norway, Israel, Africa, Portugal, USA, Spain and others.

There's plenty of *exciting* non-voice traffic on shortwave that'll keep you fascinated . . . traffic your friends can't read -- unless they have a decoder.

All you need is your receiver and the MFJ-462B MultiReader™.

### Printer Monitors 24 Hours a Day

The MFJ's exclusive *TelePrinterPort™* lets you monitor any station 24 hours a day by printing their transmissions -- even if you're not there or you're fast asleep. Only the MFJ-462B gives you this wonderful feature without costing you an arm and a leg.

Simply plug your computer's Epson compatible printer into the MFJ-462B *TelePrinterPort™* and you're ready to print.

### MFJ MessageSaver™

You can save several pages of text in 8K of memory for re-reading or later review using MFJ's exclusive *MessageSaver™*.

### High Performance Modem

You'll consistently get solid copy from MFJ's *high performance* PLL phaselock loop modem technology.

It really digs out weak signals buried in noise and even tracks slightly drifting signals. Both mark and space tones are copied to give you greatly improved decoding under adverse conditions.

### Easy to use, tune and read

It's easy to use -- just push a button to select modes and features from a menu.

It's easy to tune -- a precision tuning indicator makes tuning your receiver for best

copy on all modes quick and easy.

It's easy to read -- the 2 line 16 character LCD display has contrast adjustment for easy reading.

### Copies Standard Shifts and Speeds

You can copy most standard shifts and speeds in all modes and you get MFJ *AutoTrak™* automatic Morse code speed tracking. Even with sloppy fists you'll be surprised at the copy you'll get with its powerful built-in software.

Use 12 VDC or use 110 VAC with MFJ-1312B AC adapter, 6 1/4 x 2 1/2 x 6 1/4 in.

Receiver cable, MFJ-5162. Cable connects MFJ-Multi-Reader to your radio's external speaker (3.5mm jack).

Printer cable, MFJ-5412.

### Toll-free Help Line

If you even need help using your new MFJ MultiReader, you can call MFJ's exclusive toll-free technical help line 800-647-TECH(8324) and talk to a friendly MFJ Customer Service Technician.

### No Matter What™ Guarantee

You get MFJ's famous one year *No Matter What™* unconditional guarantee. That means we will repair or replace your MFJ MultiReader™ (at our option) no matter what for a full year.

### Try it for 30 Days

You're not taking a chance when you buy from MFJ Enterprises, Inc. Order an MFJ-462B MultiReader™ from MFJ and try it in your own setup -- compare it to any other product on the market regardless of price. Then if you are not completely satisfied, simply return it within 30 days for a prompt and courteous refund (less shipping). So order today and try it -- you'll be glad you did.

## MFJ SSB/CW Audio Filters



MFJ-752C

MFJ-722

This MFJ-752C all mode dual tunable filter lets you zero in and pull out your favorite stations and notch out interference at the same time. Two independently tunable filters let you peak, notch, low or high pass signals to eliminate heterodynes and interference--even on the most crowded bands. Tune both filters from 300 to 3000 Hz. Vary bandwidth from 40 Hz to almost flat. Notch depth to 70 dB. Works with any rig. 2 watts for speaker. Inputs for 2 rigs. Switch selectable. Switchable noise limiter for impulse noise through clipper removes background noise. OFF bypasses filter. Use 9-18 VDC or 110 VAC with MFJ-1312B. 10 x 2 x 6 in.

MFJ-722. The MFJ-722 "Optimizer" switch selectable SSB/CW filter offers razor sharp filtering with switch-selectable bandwidths (80, 110,

## MFJ All Band Transceiver/Preselector

MFJ-1045C

MFJ-1040B



Lets you copy weak signals. Rejects out-of-band signals, images. 1.8 to 54 MHz. Up to 20 dB gain. Gain control. Dual gate MOSFET, bipolar transistors for low noise, high gain. 20 dB attenuator. Connect 2 antennas, 2 receivers. Coax and phone jacks. Automatic bypass when transmitting to 350 watts. Delay. Jack for PTT. 9-18 VDC or MFJ-1312, \$12.95.

MFJ-1045C. No attenuator, xcvr auto bypass, delay or PTT.

(continued from MFJ-722)

50, 180 Hz centered on 750 Hz), steep-skirted SSB filtering. 300-3000 Hz tunable 70 dB notch filter. Plug into phone jack. Speaker. Built-in 2 watt amp. Headphone jack. Use 9-18 VDC or 110 VAC with MFJ-1312B.

# MFJ World Band Explorer™ Mobile Shortwave Converter

Enjoy World Band shortwave listening from all over the world as you drive . . .



Enjoy World Band shortwave radio listening from all over the world as you drive.

This MFJ World Band Explorer™ converts your AM/FM car radio into a World Band shortwave receiver at a push of a button.

You'll hear late breaking news as it happens from all over the world, listen to a soccer game from Germany, enjoy a concert from Vienna and learn about the culture of other nations.

These and many interesting, informative programs on the shortwave World Bands are there waiting for you to tune in and enjoy.

Unlike local FM and AM radio stations that fade out after a few miles and broadcast the same monotonous programming, you can enjoy thrilling World Band shortwave stations throughout an entire trip, day or

night. Enjoy programming not found on AM, FM or tapes.

The MFJ-306 World Band Explorer™ covers the entire 19, 25, 31 and 49 Meter international shortwave broadcast bands.

On these World Bands, you'll hear stations from all over the world at various times of the day and year -- including: Europe, Africa, Middle East, Asia, Australia, North and South America.

The World Band Explorer™ is easy to install. Just unplug your car radio antenna and plug it into the MFJ-306. Then insert the MFJ-306 cable into your radio antenna jack and connect 12 VDC.

It's easy to use. Push a button to choose a band and tune in exciting World Band stations on your car radio.

It works with all automotive radios including the newer digital tuning radios and older radios with tuning dials.

A built-in clarifier knob lets you tune in World Band stations lodged between standard AM stations on newer digital radios.

It measures just 5x1½x3½ inches -- small enough to fit anywhere in your vehicle and it has a push button to select World Band reception or your AM/FM radio. It gives you excellent sensitivity and selectivity when used with your automotive receiver. Has standard Motorola antenna plug and jack.

Order your MFJ-306 World Band Explorer™ today and enjoy exciting programs from all over the world.

## MFJ-956 LM/MW/SW Preselector/Tuner

MFJ-956

This MFJ-956 shortwave/medium wave/long wave Pre-selector/Tuner lets you boost your favorite stations while

rejecting images, intermod and other phantom signals. It greatly improves reception of signals from .15 to 30 MHz, especially below 2 MHz.

Connects between receiver and antenna. Has tuner bypass and ground receiver positions. Measures a compact 2" x 3" x 4".



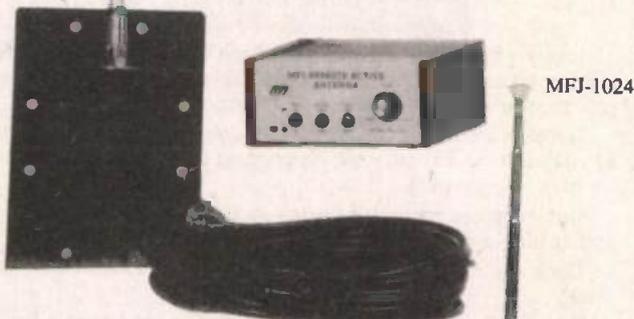
## MFJ Receiver Antenna Tuner/Preamplifier



MFJ-959B

Don't miss rare DX due to signal power loss between your receiver and antenna. The MFJ-959B provides proper impedance matching so you transfer maximum signal from antenna to receiver. Covers 1.6 to 30 MHz. 20 dB preamp with gain control boosts weak stations. 20 dB attenuator prevents overload. Select from 2 antennas, 2 receivers. 9 x 2 x 6 inches. Use 9-18 VDC or 110 VAC with MFJ-1312.

## 54" Outdoor Active Antenna



MFJ-1024

"World Radio TV Handbook" says MFJ-1024 is a "quiet rate easy-to-operate active antenna . . . quiet . . . excellent dynamic range . . . good gain . . . very low noise factor . . . broad frequency coverage . . . excellent choice." Mount it outdoors away from electrical noise for maximum signal, minimum noise. MFJ-1024 covers 50 KHz to 30 MHz.

Receives strong, clear signals. 20 dB attenuator, gain control, ON LED. Switch selects two receivers and auxiliary or active antenna. Control unit is 6x3x5 inches. Remote unit has 54 inch whip, 50 feet of coax and connector. 3 x 2 x 4 inches. 12 VDC or 110 VAC with MFJ-1312.

## Indoor tuned Active SWL Antenna

NEW



MFJ-1020B

With this new MFJ-1020B tuned indoor active antenna you'll rival reception of outside wire antennas

hundreds of feet long and pick up signals loud and clear from all over the world.

The prestigious World Radio TV Handbook says MFJ-1020 is a "fine value . . . fair price . . . best offering to date . . . performs very well indeed."

MFJ's unique tuned circuitry minimizes intermod, improves selectivity and reduces noise outside the tuned band.

You can also use it as a tuned preselector with an external antenna.

It covers 0.3 to 30 MHz including VLF, AM broadcast, all shortwave and all amateur radio bands. It has Tune, Band, Gain, On-Off/Bypass controls and SO-239 coax connectors. Use 9 volt battery, 9-18 VDC or 110 VAC with MFJ-1312B. 5x2x6 inches. Includes telescoping whip.

### MFJ invented the untunable active antenna!

Numerous copies have been made without success -- including the most recent ones. Why? Because MFJ has made continuous improvements where others have not. This new MFJ-1020B has been completely redesigned with new technology. It uses a dual gate MOSFET and a gigahertz bandwidth buffer. It improves gain and selectivity, reduces noise and intermod, and is NOT prone to self-oscillations that can severely damage your receiver.

## 300KHz-200MHz Active Antenna

Wish you could hear everything your expensive general coverage transceiver or receiver is capable of receiving?

Your ham band only antenna does great in the ham bands . . . but plug this new MFJ all band active antenna into your general coverage transceiver or receiver and you'll hear strong clear signal from all over the world from 300 KHz to 200 MHz -- including low, medium, shortwave and VHF bands.

MFJ-1022



You'll enjoy up-to-the-minute international shortwave newscast, ship-to-shore, airline, commercial RTTY and even military traffic. Use your data controller to receive FAX new photos, weather maps, Navtex and much more.

Take this tiny all band antenna with you wherever you go. Use it with your rig to listen on the ham bands or to enjoy some shortwave listening.

Also improves weak noisy scanner radio reception from low band to high band VHF -- hear signals you couldn't hear before.

A J-310 FET handles strong signals and a new noiseless feedback circuit gives you excellent low noise reception. A 4.5 GHz MRF-901 transistor lets you receive really weak signals well into VHF.

Has ON/OFF switch, power on LED, SO-239 coax connector and detachable 20 inch telescoping antenna. Uses 9 volt battery or 110 VAC with MFJ-1312B. 3½x1½x4 inches.

# MFJ Shortwave Regenerative Receiver Kit



- Covers all or part 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15, 13 meter bands
- Listen to AM, SSB, CW, WWV, RTTY and packet
- Smooth vernier reduction drive
- Smooth regeneration control, RF Stage

MFJ-8100K

Remember hunching over your regenerative receiver for hours with a pair of phones pressing uncomfortably against your ears?

You could hear just about anything that fancy superhets could hear. Sure, you had to play around with the regeneration control just right and have a steady hand to tune but you could hear'em.

Don't you wish you could relive some of this fun and excitement of your youth -- share some of it with your kids and grandkids?

Well, you can -- with the MFJ-8100 World Band Shortwave Radio Kit.

Spend a fun evening with your child or grandchild and help him put this simple kit together. When you two finish, watch him glow with excitement as he tunes the world bands -- just like you did -- and remember for life. It might even inspire him into a career in electronics.

This baby performs. It has an RF stage to really pick up the

weak ones and it goes into regeneration smoothly without pops or dead spots. Stations all over the world will come in loud and clear with just a 10 foot wire antenna.

With a 10 foot wire antenna, you'll be amazed at what you can hear -- stations all over the world will come in loud and clear.

Listen to international shortwave broadcasts, hams on SSB and CW, WWV, RTTY, packet and much more. Covers all or part of 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15, 13 Meters in five bands.

It has vernier reduction drive, bandswitch, volume and RF gain controls, uses a 9 volt battery and is built into a rugged aluminum cabinet.

Two earphone jacks let you and your child or grandchild listen together with your Walkman style earphones or plug-in speakers. 7x6x2 1/2 inches.

Order one as a special gift for your child or grandchild . . . or for yourself.

MFJ-8100K, kit; MFJ-8100W, wired and tested.

## MFJ Super Sensitive Scanner Antenna



MFJ-1864

Your scanner will come alive with signals you never knew existed when you use this new super sensitive antenna.

You'll hear distant mobiles -- even handhelds -- as they talk to base stations.

You'll pull in weak ground signals from distant control towers and air-traffic centers -- even hear both sides of conversations!

The MFJ-1864 combines new weak-signal technology -- an extremely low noise amplifier -- with a resonant high gain omni-directional antenna.

You get 20 dB of extremely low noise amplification that'll let you hear signals down to the noise level.

The sensitive high gain antenna operates as two collinear 5/8 wave elements fed in phase on the 108-174 MHz aircraft/VHF high bands and as resonant halfwave elements on 30-50 MHz VHF low band.

For really long range reception, you can mount your antenna up extra high outdoor in the clear and feed it with long runs of inexpensive coax.

Coax loss won't degrade your signal. That's because weak signals are amplified at the antenna before going into your coax.

Sidemounts to your existing tower, TV mast or any 1 to 1 1/2 inch pole with one U-bolt (supplied). 8' high, 2' boom.

### For Mobile Scanners

Maximum Gain 5/8 Wave

Gives maximum gain of any single element mobile antenna on 108-174 MHz. Resonant 1/4 wave on 30-50 MHz. 48", magnet mount. MFJ-1828B, BNC; MFJ-1828M, Motorola.

All Band Mobile. Cellular look-a-like. 25-1300 MHz highest gain 406-512, 108-174 MHz, 19". Magnet mount. MFJ-1824BB, BNC; MFJ-1824BM, Motorola.

MFJ-1828



MFJ-1824



## 2 Meter Repeater Monitor Receiver Kit

MFJ-8400K



Enjoy a fun evening building this high quality tunable 2 Meter receiver kit and you'll have a super sensitive repeater monitor that'll rival receivers costing hundreds of dollars more.

It makes an ideal second receiver for your kitchen or bedroom so you can keep up with what's happening on 2 Meters. It's perfect for monitoring packet.

Loan one to a prospective ham -- you'll whet his appetite by getting him involved.

Look at these impressive features you get for an incredibly low price . . .

A low noise, high gain RF preamp gives you excellent 0.1 microvolt sensitivity -- lets you hear weak signals loud and clear.

An air variable tuning capacitor with a velvet smooth 8:1 reduction drive makes tuning easy and comfortable with no noticeable drift.

Dual conversion superhet receiver with sharp ceramic filters and crystal controlled second oscillator gives you excellent selectivity and stability.

MFJ's exclusive TailFree™ squelch eliminates annoying squelch tails. A shaped audio response reduces background noise on weak signals.

A 19-inch 1/4 wave whip antenna is included. A 50 ohm antenna input lets you plug in an external groundplane or Yagi so you can reach out and pull in outlying repeaters.

Has tune, squelch and volume controls. Built-in speaker. High quality components with glass epoxy PC board and attractive all metal cabinet. Excellent step-by-step instructions including directions for aligning your receiver without instruments. Uses 9 volt battery, 9-12 VDC or 110 VAC with optional MFJ-1312B.

MFJ-8400K, kit; MFJK-8400W, wired and tested.

FREE instruction manual available for more details.

# MFJ FAX, WeFAX, RTTY, CW, ASCII Interface

This new MFJ-1214 Multimode Computer Interface lets you use your computer and radio to receive, display and transmit brilliant full color news photos and incredible WeFAX weather maps with all 16 gray levels. It also receives and transmits RTTY, ASCII and CW . . .  
 . . . Complete with software, power supply and computer cables for an incredible . . .



**MFJ-1214PC** This new MFJ Multimode lets you join the exciting new world of digital hamming for an incredibly low price.

You'll enjoy RTTY, ASCII and CW, as well as WeFAX and Color FAX.

Is it going to rain? The WeFAX mode lets you see for yourself when you receive highly detailed weather maps that even show you cloud densities in all 16 gray levels.

You can transmit and receive brilliant full color FAX photos and exchange them with your ham buddies around the world.

Full featured RTTY Baudot and ASCII modes are perfect for ragchewing and contesting. You can even read tomorrow morning's newspaper copy as it is transmitted to newspapers by shortwave RTTY.

Turn yourself into a CW powerhouse with the easy to use and versatile CW mode. It's perfect for contesting and DXing.

What do you need to transmit and receive these exciting digital modes? Your radio, computer and the MFJ-1214 package. That's all.

Everything is included. All you do is plug it all in, run the friendly software, and tune in a station. Then sit back and enjoy the wonderful world of digital communications as digital transmissions come to life on your computer screen.

### Everything you need is included

You get the MFJ-1214 multimode, software, computer and radio interface cables (you have to add a connector for your particular radio) and AC power supply.

You also get MFJ's unmatched full one year *No Matter What*™ Guarantee.

### 16 Gray Level Weather FAX

The MFJ-1214 lets you receive and transmit WeFAX weather maps and wire photos with all 16 gray levels. You'll be thrilled when the cloud mass over your house appears on your computer screen with cloud densities displayed.



16 gray scale weather map received off HF with the MFJ-1214, radio and computer. FAX picture can be zoomed, reversed, colorized or retransmitted.

A timer function lets you begin automatic reception of weather maps at any time of your choice. They can then be automatically saved to disk, printed out on your printer, or both.

### Full Color FAX Photos

You'll can transmit and receive brilliant full color FAX photos and exchange them with your ham buddies around the world. The MFJ-1214 supports the display of up to 32,000 colors, depending on your computer graphics.

The timer function lets you set your MFJ-1214 to automatically receive pictures at any time. They can then be automatically saved to disk, printed out on your printer, or both.

### Versatile Zoom function--gives you incredible details of pictures and maps

A zoom function lets you isolate and enlarge and display any part of a picture or map.

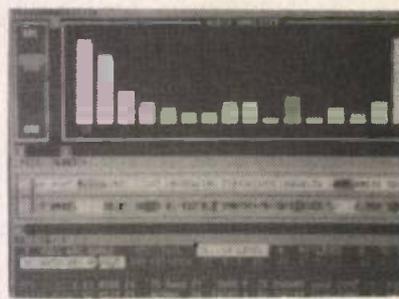
### Radioteletype (RTTY)

You'll enjoy the versatile RTTY mode. MFJ-1214 gives you all standard shifts and speeds. "Sync" and "QRM" features give you greatly improved copy under poor conditions.

A superb on-screen tuning indicator makes it super easy to lock stations in perfectly.

You also get a full fledged text editor that lets you enter, save and transmit text files.

"Shorty" messages let you create and transmit short messages during receive. These messages can be instantly saved to disk for later use.



Tuning indicator for RTTY makes tuning easy. No more guessing--RTTY Automatic Signal Analyzer™ lets you simply tune and enjoy.

### ASCII

You can transmit and receive all 7 bit ASCII using the same features as are in the RTTY mode. This gives you ARRL bulletins and other ASCII transmissions.

### CW

The MFJ-1214 makes working CW a breeze--even if you're rusty.

Automatic speed tracking locks onto received CW. CW regeneration gives you a nice clean tone with no QRM--sounds like a code practice oscillator.

Tuning is easy with on-screen tuning that tells you when you're locked in. Also a unique Tune-by-Ear™ feature lets you smoothly tune in CW by matching received tone with regenerated tone.

The CW Keyboard mode lets you send perfect CW effortlessly. You get type ahead, adjustable sidetone, transmitter tune and you can transmit message files conveniently stored on disk.

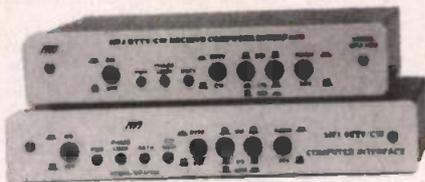
### Optional Pre-wired Radio Cable

Solves your wiring headache with the MFJ pre-wired MFJ-1214-to-radio cables. See page 36 for details. TNC/Mic switch allows you to switch between Microphone and MFJ-1214 without disconnecting cables. MFJ-1272B.

### Order Yours Now

MFJ-1214PC works with IBM and compatible computers. FAX operation requires system with 512K RAM and 10 MHz or faster and VGA graphic system. Order your MFJ-1214PC today.

## RTTY/ASCII/CW Computer Interfaces



MFJ-1225

MFJ-1224

The MFJ-1224 computer interface lets you use your IBM compatible or Commodore 64/128 computer as a full featured RTTY, ASCII, CW station for transmitting and receiving with your HF or VHF rig.

Copies all RTTY shifts and speeds. Copies on both mark and space. Sharp 8 pole active filter for 170 Hz shift and CW. Built-in tuning indicator for all modes. Normal/Reverse switch eliminates retuning for inverted RTTY. Plugs between your rig and computer. 8x1 1/4x6 inches. Use 12-15 VDC or 110 VAC with MFJ-1312.

MFJ-1225. Receive only RTTY/ASCII/CW Computer Interface. Same as MFJ-1224 but for receive only. 4 1/2x1 1/4x4 1/2 inches.

Following software includes cable to computer.

For MFJ-1224, order MFJ-1285 for IBM compatible or MFJ-1265 for Commodore 64/128/VIC 20 disk.

For MFJ-1225, order MFJ-1285B for IBM compatible or MFJ-1265B for Commodore 64/128/VIC 20 disk.

## RTTY Cross-Pattern Tuning Scope Adapter

MFJ-44X



A simple properly tuned RTTY receiving demodulator can outperform a more expensive unit that's tuned off frequency, especially under noisy conditions.

Serious RTTY operators use cross-pattern tuning on an oscilloscope display. They simply tune for maximum cross-pattern size and they're precisely tuned in for best copy.

With MFJ's new RTTY Cross-Pattern Scope Adapter you can have the same precision tuning indicator at very low cost.

It plugs between your received audio and any oscilloscope with separate X and Y inputs to display a cross-pattern on your scope.

### Analyze your Signal at a Glance

The cross-pattern tells you when there is no RTTY signal -- only noise and speech, when you are receiving wide or narrow shift, when you are properly tuned or when you have a weak noisy RTTY signal that's not limiting.

Has audio in, filter out, mark and space scope out jacks. Audio in and filter out level controls. On/Off/bypass switch.

"ON" LED. Use 9 volt battery or 110 VAC with AC adapter MFJ-1312B. 3x4x1 inch cabinet.

Order MFJ-44X, (pictured) for MFJ-1278s and other RTTY demodulators or order MFJ-44, plug-in Scope Adapter module for MFJ-1278B, installs internally.



Product	Price £	Product	Price £	Product	Price £
BY-I	84.95	MFJ-1284	34.95	MFJ-1716	21.95
BY-II	99.95	MFJ-1284D	19.95	MFJ-1717	24.95
MFJ-10	5.95	MFJ-1284M	34.95	MFJ-1718	17.95
MFJ-1020B	89.95	MFJ-1284MD	19.95	MFJ-1724B	19.95
MFJ-1022	44.95	MFJ-1284W	39.95	MFJ-1724BB	19.95
MFJ-1024	139.95	MFJ-1284WD	24.95	MFJ-1728B	29.95
MFJ-1040B	109.95	MFJ-1285	22.95	MFJ-1729	36.95
MFJ-1045C	79.95	MFJ-1285B	22.95	MFJ-1730	18.95
MFJ-105B	24.95	MFJ-1285M	22.95	MFJ-1734	46.95
MFJ-107B	12.95	MFJ-1286	34.95	MFJ-1738	36.95
MFJ-108B	24.95	MFJ-1287	34.95	MFJ-1740	19.95
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MFJ-1116	44.95	MFJ-1287BD	49.95	MFJ-1752	29.95
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MFJ-1265	19.95	MFJ-1315X	17.95	MFJ-1774	44.95
MFJ-1265B	19.95	MFJ-16010	49.95	MFJ-1776	44.95
MFJ-1266	19.95	MFJ-1610	34.95	MFJ-1778	34.95
MFJ-1267	36.95	MFJ-1610M	34.95	MFJ-1780	259.95
MFJ-1268	59.95	MFJ-1611	34.95	MFJ-1782	299.95
MFJ-1268M	59.95	MFJ-1611M	34.95	MFJ-1786	319.95
MFJ-1269	22.95	MFJ-1612	34.95	MFJ-1792	179.95
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MFJ-1272MYV	49.95	MFJ-1634	34.95	MFJ-204B	89.95
MFJ-1272MZ	49.95	MFJ-1635	55.95	MFJ-205	79.95
MFJ-1276TX	279.95	MFJ-1680I	119.95	MFJ-206	89.95
MFJ-1276X	189.95	MFJ-1680K	119.95	MFJ-207	89.95
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MFJ-1282	29.95	MFJ-1683K	34.95	MFJ-218	89.95
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				MFJ-3211	10.95
				MFJ-3212	18.95
				MFJ-3213	10.95
				MFJ-3214	10.95
				MFJ-3215	10.95
				MFJ-323	69.95
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MP-2	249.95
MP-3	289.95
MP-4	299.95

All prices include 17.5% VAT. Photocopies of order form and vouchers are acceptable.

## MFJ HT Compact Speaker/Mics

Here's a Compact Speaker/Mic that fits comfortably in your hand and has a full size speaker for crystal clear audio.

No need to remove your handheld from your belt to talk or monitor calls. Clip it near your ears so you can easily hear every call with the volume turned down.

First-rate electret mic element and full size speaker gives superb audio transmit and receive. Plus . . . earphone jack, PTT, lightweight retractable cord. Gray. 1 1/4 x 2 x 3 in.

MFJ-284 fits Icom, Yaesu, Radio Shack, Alinco, and Standard. MFJ-286 fits Kenwood.



MFJ-284 or MFJ-286

## MFJ HT Mini Speaker/Mics

These tiny MFJ Speaker/Mic are so small and so lightweight you'll forget they're there--until you get a call.

Excellent audio from electret mic element and speaker. Has swiveling lapel/pocket clip, PTT button with transmit LED, earphone jack, lightweight retractable cord. Available with L or regular connector. Tiny 2 x 1 1/4 x 1/4 inch.

Order MFJ-285/ MFJ-285L for ICOM, Yaesu, Alinco, and Radio Shack, and Standard; MFJ-287/ MFJ-287L for Kenwood; MFJ-283 for split plugs Alinco; MFJ-285W for IC-W2A.



L connector also available - order "L" model!

MFJ-283, MFJ-285, MFJ-285L, MFJ-285W, MFJ-287, or MFJ-287L

## HT Range Extenders

Telescoping antennas for handhelds



A B C  
Shipping Code A

A. The Long Ranger™ 2 Meter Halfwave, MFJ-1714. For really long range this MFJ ended halfwave is hard to beat. It outperforms a 5/8 wave on a handheld because the 5/8 wave needs a ground plane. The MFJ halfwave doesn't. It's shorter, lighter, has more gain and places less stress on your antenna connector than a 5/8 wave antenna. When collapsed, it performs like a rubber duck. 40" extended, 10 1/2" collapsed.

B. The Dual Bander™ for 2 Meters and 440 MHz, MFJ-1712. Got a new dual band handheld or separate units? One antenna fits all. It's a 1/4 wave for 2 Meters and a 5/8 wave with gain for 440 MHz. 7 1/4" collapsed, 19" extended.

C. The Pocket Linear™ 3/8 Wave, 2 Meters, MFJ-1710. Carry this pen size antenna in your pocket like a ballpoint pen. When you're using your rubber duck, on the fringe and noisy, put on The Pocket Linear™, extend it to 24 1/2" and carry on your QSO. Has pocket clip. 5 1/4" collapsed.

## Dual Band HT "Flexible" Ducks™

A. MFJ-1717. High Gain Dual Band 144/440 MHz "Flexible" Duck Antenna for Handhelds. When other rubber ducks just give you noise, you'll enjoy dependable QSOs with the MFJ-1717. Only 15 3/4 inches in length, it's a halfwave on 440 MHz that gives you a hearty 2.15 dBi gain.

On 2 Meters you get an efficient full size 1/4 wave antenna for full size performance. MFJ-1717 is precisely-tuned at the factory for low SWR. High-Q, low loss construction gives you maximum radiated power and a BNC connector. It's rugged! It'll take all the bending, twisting, flexing and tugging you can dish out, and just pop right back up. The radiator is protected by a durable synthetic rubber compound and has a hard protective safety tip. A strong rigid base protects the matching network from flexing and changing frequency.

B. MFJ-1716, MFJ Dual Band 144/440 MHz "Flexible" Duck HT Antenna. Similar to MFJ-1717. 8 3/4 inch length. 1/4 wave on 440 and efficient loaded 1/4 wave on 2 Meters.

C. MFJ-1718. Add this strong, flexible "Shorty" 4 1/4 inch rubber duck to your 2 Meters handheld and enjoy outstanding signals! Its super efficient, high-Q helical wound radiator specially impedance-matched to handhelds for maximum gain.



A B C  
Shipping Code A

## MFJ 2-Meter Pocket Roll-Up Halfwave J Antenna

MFJ-1730



Roll up this halfwave 2 Meter J-antenna and stick it in your pocket! This new MFJ Pocket Roll-Up™ is the perfect gain antenna for traveling.

Get home station performance on the go. Just hang your Pocket Roll-Up in the clear, plug the handy BNC connector into your handheld and enjoy some great QSOs.

It's omni directional and has significant gain over a 1/4 wave. It doesn't need a cumbersome ground plane so it's convenient for indoors and works great with handhelds.

## MFJ 144/440 Mhz Duplexer

MFJ-916

This MFJ-916 duplexer lets you use a dual band 2 Meter/440 MHz antenna with separate 2 Meter and 440 MHz transceiver without a built-in duplexer.

You can also use separate 2 Meter and 440 MHz antenna with a dual band 2 Meter/440 MHz transceiver that has only one RF output.

A heavy duty die cast enclosure houses the low pass networks that separate or combine the 144 MHz and 440 MHz signals.

It has a low loss SO-239 connector for the combined signal and PL-259 connectors for separate 144 MHz and 440 MHz connectors.

All ports are 50 ohms and it can handle 200 watts PEP combined.



## AC Line Monitor

MFJ-850



Guard against low voltage "brown out" conditions and surges that can damage your expensive electrical equipment. Just plug in this MFJ-850 and it shows you your line voltage. Leave it plugged in for constant monitoring. It comes with a one year guarantee. Color coded scale reads voltage from 95-135 volts. 2% accuracy. 2 1/4 x 2 1/4 x 1 1/2 in.

## Compact Speaker

MFJ-280



Enjoy superb audio and convenience with this economical mobile speaker. Just set the magnetic base on a surface, plug in the 3.5 mm phone plug and enjoy. Mounting plates with 2-sided tape allow mounting on non-metal surface. Screws included. Matches 8 and 4 ohm impedances. Handles 3 watts. 30 inch cord. 2 1/2 x 2 x 3 in.

## 2 Meter Handheld Power Meter

MFJ-840 MFJ-840



lets you accurately check the power output of your 2 meter handheld into a 50 ohm dummy load. Lets you check your battery charge so you can estimate how much longer you can use your handheld on batteries. 5 watts full scale. BNC connector. Compact 2" x 2 1/4" x 1 1/2" makes it easy to take along. Attractive black color.

## 2 Meter Handheld SWR/Wattmeter

MFJ-841



MFJ-841 connects directly in line between your hand-held and antenna. Read SWR up to 6:1 and power output to 5 watts. 2" x 2 1/4" x 1 1/2" Black. Three position switch selects SWR, SWR set or forward power, SWR set pot.

# MIRAGE... 35 Watts for handhelds!

Add this Mirage amp to your 2 Meter handheld and get 35 watts output... Talk further, longer, clearer... 18 dB GaAsFET preamp... All modes: FM, SSB, CW... Mobile bracket... Reverse polarity protection... Works with all handhelds...



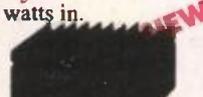
**MIRAGE RUGGED!**

## Here's why the Mirage B-34-G is MIRAGE RUGGED!

- ... First-class strip-line techniques and modular construction -- gives you superb RF performance and unsurpassed reliability.
- ... Custom wrap around heatsink -- runs cool for extra long life
- ... Reverse Polarity Protection -- this Mirage feature can save your amp -- and your pride -- if you connect power backwards.
- ... Low input SWR -- keeps your handheld safe from overheating
- ... Positive-action RF sense transmit/receive switch -- ensures precision transceiving.
- ... LED indicators -- On-Air, receive preamp and power -- gives you confidence
- ... Pushbuttons -- select FM/SSB, receive preamp on/off and power on/off
- ... Free mobile mounting bracket
- ... Full one year MIRAGE warranty
- ... Legendary MIRAGE ruggedness

### 35 watts, FM only...

**B-34.** 35 watts out for 2 watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3 1/8 x 1 3/4 x 4 1/4 inches.



## MIRAGE Dual Band 144/440 MHz Amp

**MIRAGE RUGGED!**

BD-35



Power Curve -- typical Mirage BD-35 output power

Watts Out (2Meters)	30	40	45	45+	45+	45+	45+
Watts Out (440 MHz)	16	26	32	35+	35+	35+	35+
Watts In	1	2	3	4	5	6	7

- 45 Watts on 2 Meter/35 W on 440 MHz
- Automatic Band Selection
- Single Connector for dual band radios and antennas
- Full Duplex Operation • 5x1 3/4 x 5 inches
- Reverse polarity protection
- Includes mobile bracket • "On-Air" LEDs
- Works with all FM handhelds up to 7 watts
- One year Mirage Warranty

Add this Mirage dual band amp and boost your handheld to a powerful mobile or base -- 45 watts on 2 Meters or 35 watts on 440 MHz!

Mirage's exclusive FullDuplex™ lets you talk on one band and listen on the other band at the same time -- just like a telephone conversation! (Requires compatible HT)

time delay gives you smooth transmit/receive switching. Also has remote external keying.

Place your B-5016-G out of the way. Remote Control turns Power On/Off, pre-amp On/Off, selects SSB/FM. RC-1, with 18-foot cable.

Extra heavy-duty heatsink spans entire length of cabinet. Draws 17 to 22 amps from 13.8 VDC. 12x3x5 1/2 inches.

### More 160 Watt, 2 Meter Amplifiers...

**B-2516-G.** For 10 to 35 watt mobile or base stations. 160 watts out for 25 watts in.

**B-1016-G** MIRAGE's most popular dual purpose HT or mobile/base amplifier. 160 watts out/10 W in. For 0.2-15 watt transceivers.

**B-215-G.** MIRAGE's most popular handheld amp. 150 watts out/2 watts in; 160 watts out/3.5 W in. For 0.25 to 5 watt handhelds.

## Amateur TV Amps

Industry standard ATV amps --  
 D-1010-ATVN, 82 watts PEP out / 10 in.  
 D-100-ATVN, 82 watts PEP out / 2 in. (without sync compression)

### Call your dealer for your best price!

MIRAGE has the world's most rugged VHF/UHF amplifiers -- and the largest line -- 51 models... 6 Meters through 70 cm, all modes FM/SSB/CW, continuous duty repeater, Amateur TV, even commercial.

Technical: 601-323-8287 Fax: 601-323-6551

**MIRAGE**  
 COMMUNICATIONS EQUIPMENT  
 300 Industrial Park Road  
 Starkville, MS 39759, USA

## B-34-G

Power Curve -- typical Mirage B-34-G output power

Watts Out	18	30	33	35+	35+	35+	35+
Watts In	1	2	3	4	5	6	7

For an incredibly low price, you can boost your 2 Meter handheld to 35 watts -- the power of an expensive mobile!

Your handheld becomes a powerful mobile or base when you need it -- for a lot less money.

The Mirage B-34-G is perfect for both HTs and all mode SSB/CW/FM 2 Meter rigs.

A built-in low noise GaAsFET receive preamp gives you 18 dB gain for weak signals.

Works with HTs up to 8 watts. Power Curve gives typical output power. 5 1/4 x 1 3/4 x 4 3/4 inches.

B-5016-G

# 160 Watts on 2 Meters!



**MIRAGE RUGGED!**

Power Curve -- typical Mirage B-5016-G output power

Watts Out	130	135	140	145	150	155	160	165	170
Watts In	20	25	30	35	40	45	50	55	60

MIRAGE's most popular amplifier gives you 160 watts of brute power for 50 watts input!

The B-5016-G is ideal for your 20 to 60 watt 2 Meter mobile or base station. Power Curve chart shows typical output power for your input.

## 6 Meter Amplifiers (50-54 MHz)

Bust through 6 Meters with 150 watts of brute power and work exotic DX! The A-1015-G is the world's most popular all mode FM/SSB/CW 6 Meter amplifier. For 1 to 15 watt transceivers. 150 watts out for 10 in. A-1035-G, 350 watts out for 10 in. Both 12x3x5 1/2 inches.

## 70 cm Amplifiers (420-450 MHz)

MIRAGE's most popular 70 cm amp -- the D-3010N -- gives 100 watts out for 30 in. For 5 to 45 watt mobile/base. D-1010-N 100 watts out for 10 in. Dual purpose -- for handhelds or mobile/base. D-26-N, 60 watts out for 2 in, for handhelds.

Prices and specifications subject to change. © 1996 Mirage Communications

## Low noise GaAsFET Preamps

High gain ultra low noise GaAsFET preamps for receiving weak signals. Selectable gain prevents receiver intermod. 15 to 22 dB gain. Less than 0.8 dB noise figure. Automatic RF switching up to 160 watts.

Choose In-Shack model or Mast-Mount (includes remote control) model to reduce loss. Rugged die-cast enclosure.

Frequency (MHz)	In Shack	Mast Mount
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

**MIRAGE... the world's most rugged VHF/UHF amplifiers**

# 600 WATTS OUT . . .

## Ameritron's new . . .

AL-811 linear amplifier gives you plenty of power to bust thru QRM.

You get a quiet desktop linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet -- no special wiring needed.

You get three tough 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC and much more . . . for an incredibly low price. . .

### The first 600 watts makes the most difference

The AL-811 gives you 600 watts PEP output -- that's nearly 2 full S-units over your barefoot rig.

That could mean the difference between hearing, "You're Q-5 armchair copy" and, "Sorry can't copy you, too much QRM."

Now you won't have to stand aside while the "big guns" steal your DX. You'll be able to log some of those stations first.

Going from 600 watts to the full legal limit gives you less than one S-unit increase. But is that fraction of an S-unit worth the 3 to 4 times more money it'll cost you?

The AL-811 gives you a powerful punch at a price that's easy on your wallet.

### All band, all mode coverage

The AL-811 covers all HF bands (10/12 meters with easy user mod). There's no compromise on WARC and most MARS bands -- you get a 100% rated output.

You can operate the AL-811 on all modes. You get 600 watts output PEP SSB and 500 watts output CW. You even get 400 watts on demanding continuous carrier modes like RTTY, SSTV, FM and AM.

**How the low cost 811A tube resists premature failure - even when your amplifier is mistuned**  
811A tubes resist premature failure in two ways.

First, they're constructed with widely spaced elements that minimize the chance of elements touching and causing a short -- even if the plate gets hot enough to melt.

Second, they use a directly heated thoriated tungsten filament cathode that prevents the electron emitting layer from instantly stripping off -- even if mistuning causes a sudden, severe current overload.

The Ameritron AL-811 is excellent for the newcomer because it's tough enough to withstand momentary mistuning. And the tubes are so inexpensive that you can replace one for mere pocket change.

**The Ameritron advantage: extra heavy duty power supply that gives you peak performance year after year**

The heart of the AL-811 power supply is its heavy duty power transformer with a high silicon steel core weighing a hefty 17 pounds.

A full wave bridge using 52.5 ufd of total capacitance (four 210 ufd, 470 volt capacitors) produces 1500 volts under full load and 1700 volts no load. That's excellent high voltage regulation!

Full height computer grade filter capacitors with screw terminals are used -- not short stubby, light duty soldered-in "high technology" capacitors that can't dissipate the heat generated by high current.

The rectifier diodes are rated for a massive surge current of 200 amps. They won't blow even if you accidentally short the high voltage supply.

Wire wound, 7 watt, 50 K ohm equalizing resistors safely protect each filter capacitor -- not 2



watt, 100 K ohm carbon composition resistors that can open and cause your filter capacitors to explode or fail.

The Ameritron AL-811 power supply is built tough so you get peak performance year after year.

### Tuned input provides excellent load for any rig

A Pi-Network tuned input provides a 50 ohm load for your rig. Even fussy solid state rigs can deliver their full drive to AL-811.

Low loss slug tuned coils -- tunable from the rear panel -- let you optimize performance. High quality low drift silver mica capacitors maintain proper tuning.

## 800 WATTS OUT . . .

from **FOUR** fully neutralized 811A tubes.

Only the Ameritron AL-811H gives you four fully neutralized 811A transmitting tubes. You get absolute stability and superb performance on higher bands that can't be matched by un-neutralized tubes.

Ameritron mounts the 811A tubes vertically -- not horizontally -- to prevent hot tube elements from sagging and shorting out. Others, using potentially damaging horizontal mounting, require special 811A tubes to retard sagging and shorting.

A powerful 20 CFM computer grade blower -- not an open frame phonograph motor -- draws in cool air to pressurize the cabinet and efficiently cool your 811A tubes for extra long life.

You also get efficient full size heavy duty tank coils, full height computer grade capacitors, heavy duty high silicon core power transformer, slug tuned input coils, operate/standby switch, transmit LED, ALC, dual meters, QSK compatibility with QSK-5 plus much more.



### Output tank: optimum Q on each band

The low loss pi-network output tank of the AL-811 has been carefully designed for optimum Q on each band and built with quality RF components.

The result is peak performance over each band, wide impedance matching range and exceptionally smooth tuning with efficiencies close to 70%. Even a 3:1 SWR load won't damage the tubes or tank components.

A ball bearing vemier reduction drive makes plate tuning precise and easy.

### Quiet pressurized ventilation keeps your tubes safely cooled

A quiet fan pressurizes the cabinet with over 20 cubic feet per minute of cool air.

This large volume of air flow keeps the 811A tube temperature safely below the tube manufacturer's rating -- even with a key down carrier at 500 watts output.

### Two illuminated meters

Two illuminated meters give you a clear picture of your AL-811 operating conditions so you can tell right away if something is wrong.

The Grid Current meter continuously checks for improper loading. The other meter switches between high voltage and plate current to warn of abnormal conditions.

### Ameritron exclusive

#### Adapt-A-Volt™ power transformer

Too high line voltage stresses components and causes them to wear out and fail. Too low line voltage causes a "soft-tube" effect -- low output and signal distortion.

Ameritron's exclusive Adapt-A-Volt™ power transformer has a special buck-boost winding that lets you compensate for stressful high line voltage and performance robbing low line voltage.

This makes your components last longer and gives you peak performance -- regardless of your line voltage.

### Plus more . . .

An Operate/Standby switch lets you run barefoot, but you can instantly switch to full power if you need it.

A transmit LED tells you when your rig is keying your AL-811.

A 12 VDC keying relay makes it compatible with all solid state and tube rigs. A built-in back-pulse cancelling diode protects your rig's keying circuit.

Shielded RF compartment. One year limited warranty. Compact 16" D x 13 3/4" W X 8" H. 30 pounds. UPS shippable. Shipped with transformer installed and wired for 120 VAC. Draws 8 amps at 120 VAC. Export model AL-811X wired for 240 VAC and includes 10 and 12 meters.

### Made in USA

Made in USA. You're keeping your money here at home and helping fellow Americans. If you buy a foreign made product, how do you get service? Are you willing to pay expensive freight and duties to a foreign country for service?

### Call your dealer for your best price

Get 600 watts of real power and the most for your money. Call your favorite dealer for your best price and order your AL-811 today.

**AMERITRON®**  
... the high power specialists

116 Willow Road • Starkville, MS 39759  
(601) 323-8211 • FAX: (601) 323-6551  
Free Catalog/Nearest Dealer: 800-647-1800  
8 a.m. - 4:30 p.m. CST, Monday - Friday

Prices and specifications subject to change © 1995 Ameritron

# Ameritron doubles average SSB power . . .

**AL-80B kilowatt output desktop linear can double your average SSB power output with high-level RF processing . . . runs cooler because its Eimac 3-500Z tube completely turns off between words . . .**

Ameritron's AL-80B kilowatt output desktop linear can double your average SSB power output with high-level RF processing using Ameritron's exclusive *Dynamic ALC™*.

You get cooler operation because the AL-80B's exclusive *Instantaneous RF Bias™* completely turns off the Eimac 3-500Z tube between words. It saves hundreds of watts wasted as heat.

You get a full kilowatt PEP output from a whisper quiet desktop linear. It's a compact 8 1/2" H x 14" D x 15 1/2" W and plugs into your nearest 120 VAC outlet. Covers all bands 160-15 Meters, including WARC and MARS (user modified for 10/12 Meters with license).

You get 850 watts output on CW, 500 watts output on RTTY, an extra heavy duty power supply, genuine Eimac 3-500Z tube, nearly 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, multi-voltage transformer, dual Cross-Needle meters, QSK compatibility, Two-Year Warranty, Made in USA, plus much more.

## Dynamic ALC™ doubles average SSB power

The AL-80B's exclusive *Dynamic ALC™* gives you high-level low-distortion RF processing. When activated, it can more than double your average SSB power and produce up to 6 dB improvement in intelligibility. It maximizes your talk power without distortion and splatter.

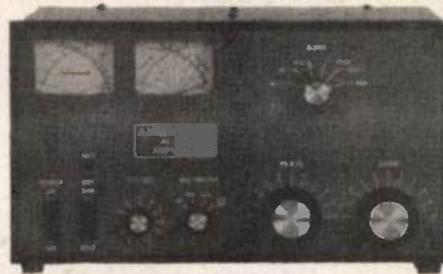
A convenient front panel control lets you adjust your output power level.

## Instantaneous RF Bias™ eliminates heat

The AL-80B's exclusive *Instantaneous RF Bias™* completely turns off the Eimac 3-500Z tube (except filaments) between words and dots and dashes. It eliminates hundreds of watts wasted as heat to give you cooler operation and longer component life.

## Gutsy Heavy-Duty Power Supply

The guts of the AL-80B is its heavy heavy duty power supply. A 26 pound transformer using a high silicone steel core, computer grade capacitors, heavy duty bleeders and ten 3 amp, 1000 V power rectifiers give you a stiff 2700 volts fully loaded. Many amplifiers using two 3-500Zs use such small power supplies they don't deliver much more power output than the AL-80B.



AL-80B

## Genuine Eimac® 3-500Z Tube

The AL-80B uses a genuine Eimac® 3-500Z tube warranted by Eimac® — not cheaper, less reliable 3-500Zs used by some competitors.

## 70% efficiency

The AL-80B is built on a rugged steel chassis. It has a separate RF compartment that's fully shielded to keep RF from leaking out. This keeps RFI and TVI to a minimum.

Superb RF design and layout, Hi-Q tank circuit and commercially rated RF power components give you nearly 70% plate efficiency over the entire operating range. Your power goes into your antenna instead of heating up your amplifier.

A whisper quiet internal fan draws in cool air over power supply components and pressurizes the 3-500Z tube compartment to remove heat for longest life.

## Tuned Input lets your rig deliver full output

A 50 ohm broadband Pi-Network tuned input is used. Even the fussiest solid state transmitter will deliver full power to your AL-80B.

## Pi/Pi-L Output Network

A carefully designed Pi/Pi-L output network using the optimum Q for each band gives you exceptionally smooth tuning, extremely wide matching range, full band coverage and peak performance at all power levels.

Ball bearing vernier reduction drives with logging scales on both the plate and load controls make tuning

precise and easy. It also lets you rapidly return to your favorite frequency.

## Step-Start Inrush Protection™

*Step-Start Inrush Protection™* stops damaging inrush current with a start up sequence that's easy on your tube and power supply components.

## Multi-Voltage Power Transformer

Excessive line voltage stresses components and causes them to wear out. Low line voltage causes a "soft-tube" effect — low output and signal distortion.

Ameritron's exclusive *Multi-Voltage Power Transformer* lets you optimize for different line voltage. Select from 14 different primary voltages from 90-140 VAC and 205-250 VAC.

The high voltage secondary can be wired to reduce plate voltage for efficient operation below 400 watts for use outside the USA.

## Dual Illuminated Cross-Needle Meters

Ameritron's dual illuminated cross-needle meters give you four separate meters to monitor your operating conditions — you can tell right away if something is wrong.

Grid current, plate current and forward PEP output power are continuously monitored to tell you of improper loading and abnormal conditions.

The fourth meter can be switched to monitor your 3-500Z tube DC plate voltage, reflected PEP power and the SWR of your antenna. ALC voltage to your rig and the grid current that starts ALC action — you get a clear operating picture of your AL-80B.

## QSK Compatible

The fast open frame T/R (transmit/receive) relay in the AL-80B switches nearly as fast as some vacuum relay QSK T/R switches.

For lightning fast QSK operation use the optional external electronic PIN diode QSK-5 T/R switch or the internal QSK-5PC.

## Plus more . . .

Operate/Standby switch lets you run barefoot, but can instantly switch to full power if you need it.

Has transmit LED; 12 VDC, 200 mA accessory jack; 12 VDC keying relay for solid state and tube rigs; tough, nearly indestructible Lexan-over-aluminum front panel. Two year limited warranty.

## Ameritron HF Linear Amplifiers with Eimac™ 3CX800A7

NEW	AL-800H	AL-800
	Two tubes 1500 Watts plus	Single tube 1250 Watts



**Output power:** 1250 watts PEP single 3CX800A7 1500 watts plus, two 3CX800A7s  
**All band operation:** 160-15 meters including WARC bands. User modifiable for 12 and 10 meters.

**Genuine Eimac tube(s):** Model AL-800 has single Eimac 3CX800A7; Model AL-800H has two Eimac 3CX800A7s

**Tuned input circuit:** Adjustable slug tuned input circuit.

**Output network:** Pi/Pi-L gives you smooth tuning and wide matching range.

**Tube protection:** Grid current limiting circuit protects your tubes.

**ALC control:** Front panel adjustable, true ALC control.

**Vernier Reduction drives:** Tuning and loading reduction drives make adjustments smooth and easy.

**Heavy-duty power supply:** User 32 lb., grain orientated, silicone steel core transformer, and high capacitance computer grade filter capacitors.

**Multi-voltage operation:** 14 user selectable AC line voltage from 90-140 Vac; 200-250 Vac.

**Air cooled:** Quiet pressurized ventilation keeps tubes safely cooled.

**Dual illuminated cross-needle meters:** Two cross-needle meters that read peak forward power, reflected power, SWR, high voltage, grid current and plate current.

**Step-Start Inrush Protection™:** Stops damage to your amplifier from inrush current.

**Attractive Lexan front panel decal**

**Compact desktop size:** 8.5" H x 16.5" D x 14.25" W

**One year warranty**

## AMERITRON offers the best selection of legal limit linears!

**These 3 rugged linears all use a super heavy duty Hypersil® power supply capable of 2500 watts!**

### Ameritron's most powerful amplifier

AL-1500



Ameritron's super power amplifier uses the herculean Eimac® 8877 ceramic tube.

It's so powerful that 65 watts drive gives you full legal output — and it's just loafing because the power supply is capable of 2500 watts PEP.

### Ameritron's Dual 3-500Z linear

AL-82



This linear gives you full legal output using a pair of Eimac® 3-500Zs. Some competing linears using dual 3-500Zs don't give you 1500 watts because their lightweight power supplies can't use the tubes to their full potential.

### Ameritron's 3CX1200A7 linear

AL-1200



Get ham radio's toughest tube with the Ameritron AL-1200—the Eimac 3CX1200A7. It has a 50 watt control grid dissipation. What makes the Ameritron AL-1200 stand out from other legal limit amplifiers? The answer: a super heavy duty power supply that loafs at full legal power — it can deliver power of more than 2500 watts PEP two tone output for a half hour.

# Ameritron *no tune* Solid State FET Amplifier

*No tuning, no fuss, no worries -- just turn on and operate . . . Incredibly low includes AC power supply, 600 Watts output, continuous 1.5-22 MHz coverage, instant bandswitching, no warm up, no tubes to baby, fully SWR protected, extremely quiet, very compact*

- Ameritron's revolutionary ALS-600 is amateur radio's only linear amplifier that uses four rugged TMOS RF power FETs -- gives unequalled *no tune* solid state performance
- includes Ameritron's *no tune* FET Amplifier and a 120 ALS-600 220 Vac, 50/60 Hz AC power supply for home operation (Includes AC Power Supply)
- Instant bandswitching, no tuning, no warm up -- just turn on and operate
- Output Power -- 600 Watts PEP, 400 Watts CW
- Continuous Coverage -- 1.5 to 22 MHz; 10/12 Meters with easy-to-install optional kit.
- SWR Protection -- prevents amplifier damage if you switch to wrong band, use wrong antenna or have high SWR
- Over Power Protection -- if output forward power or reflected power exceeds safe level, output power is automatically reduced to prevent amplifier damage by controlling ALC to exciter
- Extremely quiet -- low speed, low volume fan is so quiet you'll hardly know it's there, unlike noisy blowers used in other amps
- Very Compact -- 6 x 9 1/2 x 12 inch amplifier takes up less desktop space than your transceiver and weighs about the same -- only 12 1/2 pounds
- Illuminated Cross-Needle SWR/Wattmeter -- lets you read SWR, forward and reflected *peak* power simultaneously
- Operate/Standby Switch -- lets you run "barefoot", but you can instantly switch to full power if you need it
- Front Panel ALC Control -- exclusive Ameritron feature -- convenient front panel control lets you adjust your output power
- Transmit, ALC, SWR LED indicators -- keeps you informed
- 12 Vdc output jack -- lets you power low current accessories
- Separate ALS-600PS power supply (included) can be placed conveniently out of the way and plugged into your nearest 120 Vac outlet -- no special wiring needed
- Made in USA
- Enjoy 600 Watts of *no tune* solid state power. Call your favorite dealer for your best price and order your ALS-600 with power supply today



## ALS-600PS Heavy Duty Power Supply

*ALS-600PS power supply included with ALS-600 amplifier*



- Massive choke input filter greatly improves voltage regulation and reduces pe AC line current
- Ameritron's exclusive Multi-Voltage Power Transformer lets you compensate for stressful high line voltage at performance robbing low line voltage
- Step-Start Inrush Protection™ stops damaging inrush currents and extends life of power supply components
- Illuminated Cross-Needle Meter monitors voltage and current of 50 Vdc line
- Extremely quiet fan
- Very compact 6 x 9 1/2 x 12 inches -- can be placed conveniently out-of-way
- Wired for 120 Vac, supplies 50 Vdc at 25 amps to ALS-600 amplifier
- Also use on 100-130 Vac and 220-250 Vac, 50/60 Hz
- Draws less than 12 amp at 100 Vac and less than 6 amps at 230 Vac
- Includes prewired cable to plug into ALS-600 amplifier
- Made in USA

# Ameritron Mobile *no tune* Solid State Amplifier

*Ideal mobile amplifier -- uses 13.8 Vdc mobile electrical system, very compact 3 1/2 x 9 x 15 inches, extremely quiet, 500 Watts output, continuous 1.5-22 MHz coverage, instant bandswitching, no tuning, no warm up, SWR protected*

ALS-500M



- Mobile *no tune* Solid State Amplifier -- uses four rugged 2SC2879 high power linear RF power transistors
- Instant bandswitching, no tuning, no warm up -- just turn on and operate -- makes mobile QSOs safer
- Very Compact -- just 3 1/2 x 9 x 15 inches -- fits in nearly any mobile installation; weighs only 7 pounds, that's less than some mobile HF transceivers
- Extremely quiet -- quiet low speed, low volume fan stays off and silent until temperature rises
- Output Power -- 500 Watts PEP, 400 Watts CW
- Continuous Coverage -- 1.5 to 22 MHz; 10/12 Meters with easy-to-install optional kit.
- Load Fault Protection -- disables and bypasses amplifier if antenna has excessively high reflected power or if bandswitch is set lower than exciter frequency -- virtually eliminates damage because of operating error; has Load Fault LED indicator
- Thermal Overload Protection -- disables and bypasses amplifier if temperature is excessively high; automatically

resets when temperature drops to safe level; has Thermal Overload LED indicator

- Excellent harmonic suppression -- multiple section output network and push-pull output circuit gives excellent harmonic suppression
- DC current meter lets you monitor collector current
- ON/OFF Switch -- bypasses amplifier for "barefoot" operation without having to disconnect high current power supply cables
- Remote ON/OFF Control -- lets you remotely control ON/OFF function for out-of-the-way mounting of amplifier
- Exciter Drive -- less than 100 watts input gives full output
- Power Supply Requirements -- requires 14 Vdc at 80 amperes peak current for PA transistors and separate line for 14-16 Vdc at 4 amperes for control and bias circuits
- Made in USA
- Call your favorite dealer for your best price and order your ALS-500M today

**Free Catalog!**

**AMERITRON®**

*... the high power specialist*

116 Willow Road • Starkville, MS 39759  
(601) 323-8211 FAX: (601) 323-6551

8 a.m. - 4:30 p.m. CST, Monday-Friday

Prices and specifications subject to change © 1995 Ameritron

# AMERITRON RCS-8V Remote Coax Switch



Replace 5 coax feedlines with one!  
Ameritron's Remote Coax Switch lets your remotely switch up to five separate

RCS-8V antennas -- so you can replace five coax feedlines with a single coax.

Eliminate a tangle of troublesome coax and have a simple and neat installation -- with just a single coax feedline.

The RCS-8V consists of two units -- the weatherproof switching box that mounts on your tower or mast and the control unit that's placed at your operating station.

VSWR is less than 1.2 from DC to 250 MHz and slightly higher at 450 MHz with less than 0.1 dB loss at 150 MHz -- if you operate HF to VHF/UHF. This RCS-8V is for you.

It handles 5 KW below 30 MHz and 1 KW at 150 MHz. You can ground unused positions or leave them open.

The indoor control unit is all metal to prevent RFI and TVI. It also has LEDs to indicate the antenna you've selected.

A Lexan scratch proof front panel has a markable surface for labeling your antennas.

The RCS-8V operates from 120 Vac power source or RCS-8X for 220/240 Vac. Uses any 6 conductor control line (not supplied) and allows safe operation with 14 volts control voltage.

RCS-8VN, same as RCS-8V but with N-type connectors in place of SO-239 coax connectors.

## SPECIFICATIONS:

Number of antennas positions: 5

Loss at 150 MHz: less than .05 dB.

VSWR: under 1.2 to 1 from DC to 250 MHz.

Impedance: 50 ohms.

Power Capability: 5 KW below 30 MHz, 1 KW at 150 MHz.

Power requirements: 120 Vac 50/60 Hz at five watts.

Connectors: SO-239 for RCS-8V; "N" for RCS-8VN.

# AMERITRON RCS-4 Remote Coax Switch



RCS-4

The Ameritron RCS-4 is a remote controlled coax switch that selects one of four outputs by supplying all control voltages through the coax. The elimination of control cables gives your a fast, neat and inexpensive installation with only one coaxial line for four antennas.

You get two units -- the switching box that can be tower, mast or wall mounted and the control console that is located at your operating station.

The attractive indoor console has bright LED antenna selector indicators. A steel enclosure provides 100% shielding to prevent RFI and TVI. Switching time is 50 ms. SO-239 connectors provide reliable connections.

The weatherproof switching box uses three heavy duty 10 ampere contact relays on a rugged G-10 fiberglass circuit board.

Quality components are used throughout the entire unit to ensure maximum life for the sometimes difficult-to-reach switching box.

The RCS-4 operates from 120 Vac or RCS-4VX for 220/240 Vac power sources and allows safe operation with 14 volts control voltage. Frequencies from 1.8 through 30 MHz are covered by this excellent station accessory. Handles 1500 watts continuous.

## SPECIFICATIONS:

Number of antenna positions: 4

Loss at 30 MHz: less than .05 dB

VSWR: 1.1:1 from 1.8-30 MHz

Impedance: 50 ohms

Power Capability: 1500 Watts

average continuous

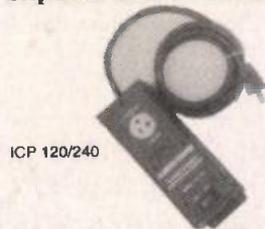
Antenna select time: 50 ms.

Power requirements: 120 Vac 50/60 Hz at 5 watts.

Connectors: SO-239.

## AMERITRON brings you the finest high power accessories!

Step-Start Inrush Current



ICP 120/240

Stops power up inrush current and absorbs momentary high voltage spikes to your amplifier. ICP-120 for 110-120V or ICP-240 for 220-240 VAC.

Legal Limit Dummy Load



ADL-1500X

Oil cooled 50 ohm dummy load. Handles 1500W for 5 min. SWR under 1.2 up to 30 MHz. Low SWR to 400 MHz. 7.5"H x 6.63" D. ADL-1500X without oil ADL-1500 with oil

QSK-5 Pin Diode T/R Switch



QSK-5

Self-contained, connects externally to most HF amplifiers. Handles 2.5 KW PEP, 2 KW CW. Six times faster than vacuum relay. 6 x 4 x 9.5 inches.

Legal limit antenna tuner



Ameritron, the high-power specialist, brings you the ATR-15 antenna tuner that's designed for legal-limit amplifiers. Heavy duty silver-plated bandswitch virtually eliminates switch failure. High power transmitting capacitors. 1.8-30 MHz. Peak reading SWR/wattmeter. Six position antenna switch. Selectable 1:1 or 4:1 balun. 5.25 x 13.25 x 13.5 Inches. Meter uses 12 VDC.

**Ameritron sells Eimac® tubes at low, low prices . . .**

# MFJ Super Hi-Q Loop™ Antenna

... 36 inch diameter -- it's the smallest, high efficiency 10-30 MHz continuous coverage antenna ever made for ham radio ...

- Tiny 36" diameter, covers 10-30 MHz continuously
- Automatic Band Selection™, SWR/Wattmeter
- Round conductor more efficient than flat strip
- Welded butterfly capacitor, no rotating contacts
- All welded construction
- No control cable needed

MFJ-1786

Only 36 inches in diameter, the MFJ Super Hi-Q Loop™ is the smallest high efficiency 10 to 30 MHz continuous coverage antenna ever manufactured for ham radio.

Its rugged all welded aluminum construction is ideal for home installations where space is limited -- apartments, small lots, mobile homes, attics, closets.

You can take it with you and have it up and operating in minutes from nearly anywhere -- on trips, vacations, from hotels, DX-peditions, camping, motorhomes.

Vertical mounting gives you both low angle radiation for excellent DX and high angle radiation for close-in local contacts -- it's like having a vertical and dipole combined into one. You can also mount it horizontally for omnidirectional coverage.

The MFJ Super Hi-Q Loop™ is a remotely tuned high-Q antenna with a narrow bandwidth that reduces transmitter harmonics, receiver overloading and interference.

It does not need a ground, radials, counterpoise or antenna tuner. It covers 10-30 MHz continuously including the WARC bands with low SWR and handles 150 watts.

## More Radiated Power

You radiate more power because the MFJ Super Hi-Q Loop™ has a more efficient radiator. Its large 1.050 inch diameter round radiator has less RF loss resistance than a thin flat-strip radiator.

## Built like a Tank

It's built like a tank with extra thick wall aluminum tubing, all welded construction, no mechanical joints, welded butterfly capacitor with no rotating contacts.

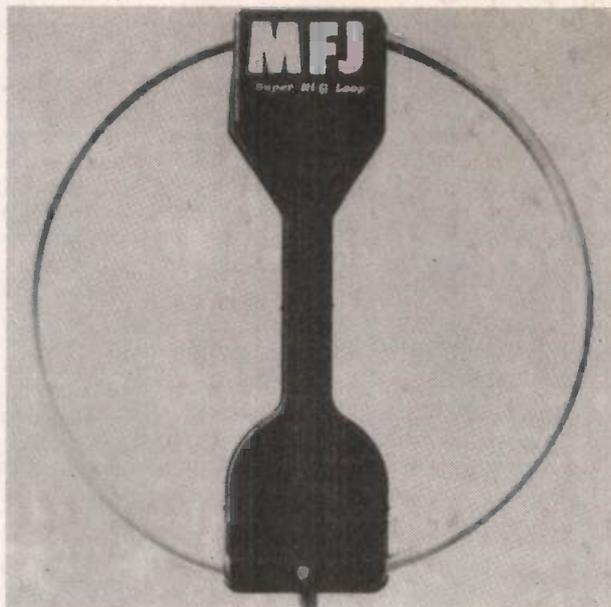
## No Control Cable Needed

You don't need a separate control cable -- the coax feedline carries both RF power and tuning control signals.

## Superb Tuning Capacitor

Each plate in MFJ's superb tuning capacitor is welded for low loss and polished to prevent high voltage arcing -- you get a smaller, lighter more refined tuning capacitor with a wider tuning range.

Tuning capacitors with unpolished plates and sharp edges require much greater spacing between plates to prevent arcing.



## Super Remote Control (included) makes MFJ Super Hi-Q Loop™ extra easy-to-tune

MFJ's exclusive Automatic Band Selection™ auto-tunes the MFJ-1786 to your desired band and lets you know with a beep. Dual Fast and Slow tune push buttons make it easy to tune.



Super Loop™ Remote Control

## Built-in SWR/Wattmeter

A two range Cross-Needle SWR/Wattmeter is built-in so you won't need a separate SWR meter.

## No Control Cable Needed

You don't need a bulky control cable because the coax feedline carries both RF power and tuning control signals.

## No Power Cord Needed

You don't need a separate power cord because it uses AA batteries (not included). You can also use an isolated power supply included with your MFJ-1786. 6x6x3 inches.

The consequences? The capacitor is larger, bulkier, heavier and has more stray capacitance to limit tuning range.

MFJ's superb tuning capacitor is welded to the radiator for super high efficiency, has nylon bearing, anti-backlash mechanism, limit switches and a continuous no-step DC motor for smooth precision tuning.

It's a nightmare tuning a loop antenna that

uses a stepper motor and is plagued with backlash -- especially, if your desired frequency is between motor steps.

A heavy duty 1/8 inch thick ABS plastic housing with ultraviolet inhibitors protects the tuning unit from the weather.

## MFJ-1782 Super Hi-Q Loop™

Same as MFJ-1786 Super Hi-Q Loop™ but has remote control with fast tune and slow tune buttons. Separate control cable is not required. Does not have SWR/Wattmeter or Auto Band Selection™. MFJ-1782.

## No Matter What™ Guarantee

You're protected by MFJ's famous one year No Matter What™ unconditional guarantee. That means we will repair or replace your MFJ Super Hi-Q Loop™ (at our option) no matter what for a full year.

## Call Your Dealer for Your Best Price

Enjoy ham radio no matter how little space you have. Call your dealer for your best price and get your MFJ Super Hi-Q Loop™ today.

## MFJ Box Fan Portable Loop

No, it's not a fan -- MFJ-1780 it's a high efficiency portable loop antenna that's about the same size and shape as a 2x2 foot box fan, complete with carrying handle.

Carry it like a suitcase, tuck it in a corner of your car or check it as baggage on a plane.

When you get there, set it on a table or desk and enjoy ragchewing or DXing.

All welded construction, covers 14-30 MHz continuously including WARC bands, handles 150 watts. Remote control has fast/slow tune buttons. Separate control cable not needed. Power supply included with your MFJ-780.



## MFJ Portable Antenna DXCC, WAZ, WAC, WAS have been won with MFJ's portable antenna!

MFJ-1621



50 feet of RG-58 coax cable. Handles 200 watts.

The MFJ-1621 is a complete portable multi-band antenna system. It can be used in practically any location. Just place in any electrically clear location, set the bandswitch, tune the capacitor for maximum field strength and operate!

The MFJ-1621 lets you operate in almost any area electrically free area--apartment, campsite, resort hotel, even at the beach. It lets you work 40, 30, 20, 17, 15, 12 and 10 meters by using a telescoping whip antenna that extends to 54 inches. The antenna is mounted on a self-standing 6x3x6 inch cabinet. It also features a built-in antenna tuner, field strength meter and

# MFJ halfwave vertical Antenna

**6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed!**

Operate 40, 20, 15, 10, 6, 2 Meters with this MFJ-1796 ground independent halfwave vertical antenna -- no radials or ground ever needed!

It's only 12 feet high and has a tiny 24 inch footprint! You can mount it anywhere from ground level to the top of a tower -- on apartments, condos, small lots, even on a motorhome. You can take it anywhere -- vacations, field day, DX-pedition, camping, nearly anywhere you go.

Frequency selection is fully automatic -- there are no moving parts, nothing to adjust -- all you do is transmit. It handles up to 1500 watts PEP. You'll work your share of DX because its low angle of radiation really reaches out and brings in DX.

During a contest, you'll love being able to quickly work one station after another from all directions because of its omni directional pattern.

It's so easy to put together that you can have it on the air in an afternoon.

## How does MFJ achieve maximum efficiency in such a compact multiband antenna?

The key is end loading -- the most efficient form of loading known. The entire length of the antenna is always radiating power. There are no lossy traps to reduce effective length.

End loading provides multiband and full electrical half wavelength on each HF band. An optimum combination of capacitive hat and inductive end loading delivers a close 50 ohm match without a lossy impedance matching network.

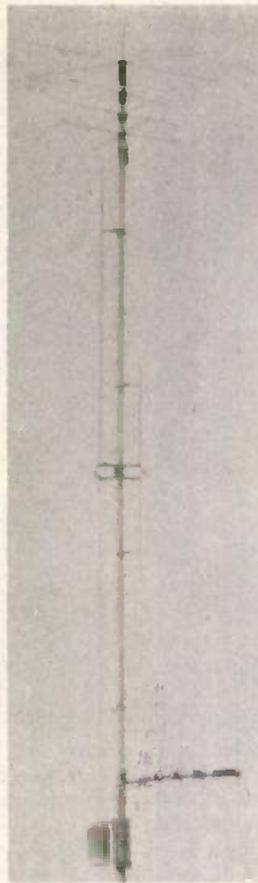
Efficient high-Q loading coils are wound on low loss fiberglass forms. Large 1/8-inch diameter aluminum radiators are used to keep losses to a minimum.

## No Radials or Ground ever Needed!

The MFJ-1796 is balanced and center fed to totally eliminate the need for radials, counterpoises or a groundplane -- you don't have the kind of ground losses that's common with a quarter wave vertical.

## No Feedline Radiation

There is no feedline radiation that causes pattern distortion and wastes power. The bottom loading unit is mounted at right angle to the radiator. This provides a low impedance point to decouple the 50 ohm Teflon® coax feedline.



MFJ-1796

The feedline is further decoupled and isolated from the antenna with a highly efficient air-wound choke balun. This attenuates RF on the outside of the coax and minimizes feedline radiation that waste power.

## Easy to Adjust

It's very easy to optimize the MFJ-1796 for your favorite part of the band. Frequency adjustments are nearly independent -- adjusting one band has minimum effect on the resonant frequency of the other bands -- unlike most other multiband antennas.

## Built to Last

The coils are wound on tough low loss fiberglass forms using highly weather resistant Teflon® covered wire.

## Full halfwave on 2 and 6 Meters

On 2 Meters and 6 Meters, MFJ's unique stub decoupling and efficient full size halfwave elements really get you out with low angle radiation for lots of DX.

## The most for your Money

The MFJ-1796 gives you the most for your money--no other multiband, automatic bandswitching, ground independent DX antenna even comes close.

## No Matter What™ Guarantee

You get MFJ's famous one year No Matter What™ unconditional guarantee. That means we will repair or replace (at our option) your MFJ-1796 halfwave vertical antenna no matter what for a full year.

## Continuing Service

MFJ Customer Service Technicians will help you keep your MFJ halfwave vertical performing flawlessly -- no matter how long you own it. Just call our toll-free help line 800-647-TECH (8324) -- an MFJ exclusive.

## Made in USA

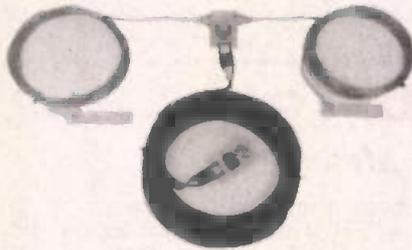
MFJ halfwave verticals are made in the USA. Help our fellow Americans by keeping our money here -- buy Made in USA.

## Call Your Dealer for Your Best Price Today

Enjoy DXing and ragchewing on six bands from your apartment, condo or anywhere. Call your favorite dealer for your best price and order your MFJ halfwave vertical today!

## MFJ's G5RV Antenna

Operate all bands through 10 Meters, even 160 Meters, with a single wire antenna!



MFJ-1778

The famous G5RV antenna has got to be the most popular wire antenna in ham radio! You hear G5RVs putting out good, strong signals from all over the world.

And it's no wonder . . . it's an efficient, all band antenna that's only 102 feet long -- shorter than a full size 80 Meter dipole.

Use it as an Inverted Vee or Sloper, and it's even more compact.

With an antenna tuner, you can operate all bands 80 through 10 Meters and even use it on 160 Meters as a Marconi with a tuner and ground.

MFJ's fully assembled, full legal limit G5RV.

Just add some coax feedline and some rope or other nonconductor, and you're on the air.

## Super 80/40 Meter Vertical Antenna

Designed as a high performance antenna for MFJ-1792 80 and 40 Meters, the MFJ-1792 features a full size quarter wave radiator for 40 Meters -- that's a full 33 feet of ruthless radiating power -- no other quarter wave vertical radiates better.

End loading -- the most efficient form of loading -- is used for 80 Meters. It's accomplished by a virtually lossless 4 1/2 foot capacitance hat and a high-Q coil wound with Teflon® covered wire on a low loss fiberglass form.

The entire length of the antenna is always radiating power.

It has a unique built-in L-network for lowest SWR, is made of high strength 6061-T6 aluminum tubing, super strong solid fiberglass insulating rod and stainless steel hardware. Handles 1500 watts PEPSSB. Includes heavy duty mount. Requires guying.

For maximum performance on these low bands, you need to use radials, counterpoises or a ground screen.

## 80/40/20 Meter Vertical Antenna

Same as MFJ-1792 but includes full size 20 Meter quarter wave radiator. MFJ-1793.

Teflon® is a registered trademark of Dupont.

# 10 Bands -- 1 MFJ Antenna!

*Full size performance . . . No ground or radials*

*Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna  
Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .*

MFJ-1798 Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters -- with this MFJ-1798 vertical antenna and get full size performance with no ground or radials!

Full size performance gives you high efficiency for more power radiated. The result? Stronger signals and more Q-5 QSOs.

Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

You get very low radiation angle for exciting DX, fully automatic bandswitching, omni-directional coverage, low SWR and full 1500 watts PEP SSB power handling.

Full size performance is achieved by using separate full size radiators for 2 through 20 Meters and highly efficient end loading for 30, 40 and 75/80 Meters. You get highest possible efficiency and exceptionally wide bandwidths.

MFJ's unique *Elevated Top Feed™* puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

Self supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- on small lots, backyards, apartments, condos, roof tops, tower mounts.

## Separate Full Size Radiators

Separate full size quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave gain radiator.

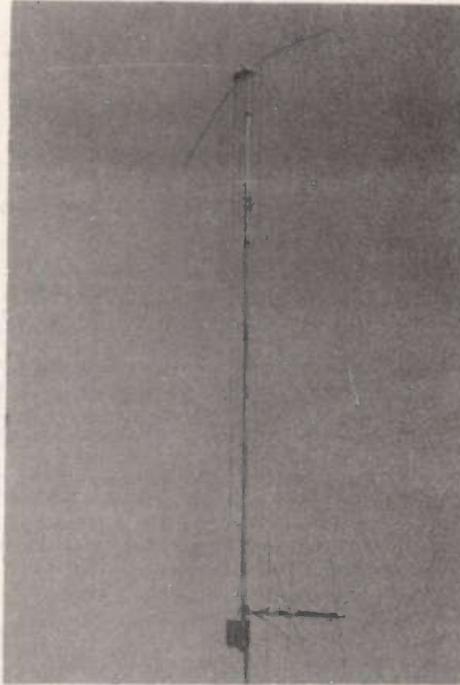
The active radiator works as a stub to decouple everything beyond it. In phase antenna current flows in all parallel radiators.

This forms a very large equivalent radiator and gives you incredibly wide bandwidths.

These radiator stubs provide automatic bandswitching -- there is absolutely no loss due to loading coils or traps.

## End Loading

End loading -- the most efficient form of



loading -- provides highly efficient performance on 30, 40, 75/80 Meters with excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network™* provides automatic impedance matching for lowest SWR on these bands.

Tuning to your favorite part of these bands is simple and is done at the bottom of the antenna.

## MFJ Elevated Top Feed™

The feedpoint is elevated all the way to the top of the antenna.

MFJ's *Elevated Top Feed™* places the maximum current point high up in the clear where maximum radiation takes place -- a big plus, especially, if your antenna is mounted low to the ground.

## Low Angle of Radiation

MFJ's *Elevated Top Feed™* gives you a very low angle of radiation -- even if you ground mount it. Don't be surprised if you routinely work scarce DX.

## No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you excellent ground isolation.

You can mount it from ground level to roof top and get awesome performance.

## No Feedline Radiation

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore™* high power current balun. This highly efficient balun is wound with Teflon® coax. It can't saturate, no matter how high your power.

This important decoupling attenuates RF on the outside of your coax and minimizes feedline radiation that wastes useful power and distorts your pattern.

## Easy to Tune

Frequency adjustments are nearly independent and very simple -- adjusting one band has minimum effect on the resonant frequency of other bands.

## Built to Last

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is used in the main structure. It's self-supporting -- no guy wires needed.

Efficient high-Q coils are wound on tough low loss fiberglass forms using highly weather resistant Teflon® covered wire.

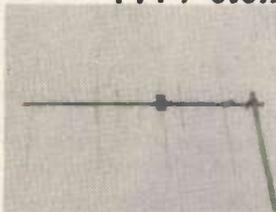
The MFJ-1798 is built to last. You'll enjoy many years of trouble free DXing and ragchewing with yours.

One year *No Matter What™* guarantee. Made in U.S.A.

© Teflon is a registered trademark of Dupont.

## MFJ dual band 144/440 MHz Yagi

*. . . 7 elements on 440 MHz . . . 4 elements on 2 Meters*



Get two Yagis for the price of one . . . put two Yagis in the space of one with single coax feed! Get 7 elements on 440 MHz and 4 elements on 2 Meters.

MFJ's exclusive dual band balanced feed with *Ferrite Choke™* decoupling prevents pattern skewing and gives you low SWR. 1/4 inch diameter driver

MFJ-1768 elements give wide bandwidth.

This *National Bureau of Standards* design is optimized for maximum gain, high front-to-back ratio and clean symmetrical pattern.

Mounts vertically for FM/Packet or horizontally for SSB with single included U-bolt on 1 to 1 1/2 inch mast or tower leg.

High strength 6061-T6 aluminum 5 foot, 1 1/8 inch diameter boom. 2 pounds. Elements are electrically isolated from boom. Made in USA.

High strength 6061-T6 aluminum tubing is used for the compact 5 foot long, 1 1/8 inch diameter boom -- it won't come down in windy areas and during ice storms.

You can mount it vertically for FM or horizontally for SSB with a single included U-bolt on any 1 to 1 1/2 inch mast or tower leg.

It weighs just 2 pounds and is made in USA.

It goes together easily. You'll have it up and on-the-air working DX in less time than it takes to go to the store and bring home a six-pack.

Get extra "oomph" and get through. Order yours today. Get two Yagis for the price of one and enjoy the convenience of two Yagis-in-one and single coax feed!

# MFJ 5/8 Wave Ground Plane

You get a 300 watt 5/8 wave ground plane 2 Meter home station antenna. Other 5/8 wave ground planes can't work any better -- no matter how much they cost . . .

Look at all you get for an incredibly low price!  
You get a 300 watt 5/8 wave ground plane base antenna for 2 Meters that gives you the maximum possible calculated gain of any single element antenna. MFJ-1750

Other 5/8 wave ground planes can't work any better -- no matter how much they cost.

You get a shunt fed matching network for the lowest possible SWR over the entire 2 Meter band. Plus, it bleeds off unwanted static.

You get MFJ's *Rapid-Tune-Radiator™* for quick accurate tuning.

You get a ceramic antenna insulator for low RF loss. The result? Maximum radiated power.

You get super easy installation to any 1" to 1 1/2" inch mast with single U-bolt (included). Made in USA. Mast

## Improved 1/4 wave ground plane

You get an improved 300 watt 1/4 wave ground plane for 2 Meters that'll bring up repeaters as well as or better than any 1/4 wave ground plane -- even if it cost twice as much. MFJ-1740

The improved MFJ 1/4 wave ground plane minimizes feedline radiation for more useful radiated power, reduced TVI and noise pickup by the coax shield.

Here's how:

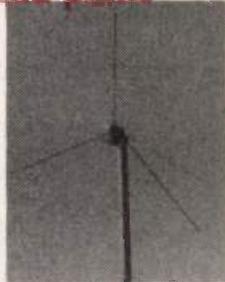
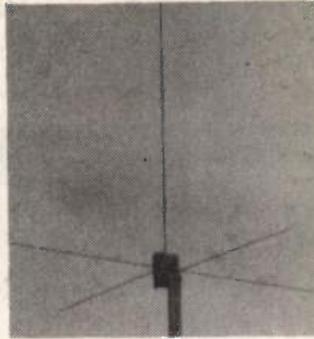
The radial angle is raised from the conventional 45 degrees to 28 degrees to reduce inductive coupling. Then, the radiator is shortened and the radials are lengthened to move the feedpoint from the voltage node so capacitive coupling cancels the remaining inductive coupling. This minimizes feedline radiation.

You'll get years of dependable QSOs because its strong lightweight aluminum parts are protected from corrosion by MFJ's *Permanent Molecular Bonding Technology™* -- this protective coating is so durable it may outlast you!

You get MFJ's *Fast-Tune-Radiator™* that makes tuning to your favorite part of the band a snap. You get MFJ's low loss ceramic antenna insulator for maximum radiated power. You get single U-bolt mounting that makes it sooooo easy to install on any 1" to 1 1/2" mast. Made in USA.

You get MFJ's *No Matter What™* one year unconditional guarantee.

The improved MFJ 1/4 wave ground plane is your very best buy. It's the most inexpensive way to put out a potent FM signal on 2 Meters. Can be cut for 220 or 440 MHz. Cutting Chart included. Get yours today.



not supplied.  
You get strong lightweight aluminum construction that's protected by MFJ's *Permanent Molecular Bonding Technology™*.

This super durable finish actually bonds itself to aluminum molecules -- it won't come off unless metal comes off!

You get MFJ's famous *No Matter What™* one year unconditional guarantee. That means we will repair or replace your MFJ-1750 (at our option) no matter what happens for a year.

Get you the most incredible value in a 5/8 wave base station ground plane. Remember, other competitive 5/8 wave ground planes can't work any better.

Also available for 220 MHz, MFJ-1752.

## Portable 3 element beam for 2 Meters

Check out MFJ's new portable 3 element beam for 2 Meters. Its unique design lets you set it up or take it down in seconds! MFJ-1763

Elements simply screw into the boom. It's easy to store and sturdy enough to use as your base station antenna.

The extra gain and directivity from this 3 element beam could get you through when a vertical can't. It'll make the difference between "you're breaking up . . . can't copy you" and "OK, go ahead with your traffic. Solid copy."

You can center mount it and use it vertically on FM or horizontally for SSB. By rotating it you can minimize QRM. Unique design also lets you end mount it vertically or horizontally on the leg of a tower . . . great for packet and *Packet Cluster™*.

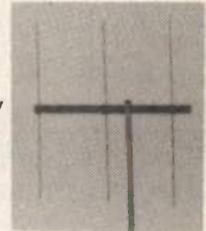
It's compact 2 3/4 foot boom gives you a calculated gain within 1 dB of a four element Yagi with a boom nearly twice as long.

Extra thick elements maintain high gain and directivity over virtually the whole 2 Meter band. A ferrite choke balun gives you excellent feedline decoupling. Coax coupling is further reduced by mounting the SO-239 connector behind the reflector.

Elements and boom are made from strong lightweight aluminum. They're protected by MFJ's *Permanent Molecular Bonding Technology™* -- MFJ's exclusive new coating that's so tough it won't come off unless metal comes off.

Weights just 2 pounds. Boom is 30 1/2" x 1 3/4" x 1 1/4". Mounts easily to mast or leg of a tower with single included U-bolt. Mast not included. Made in USA.

You can take the MFJ-1763 2 Meter portable Yagi with you wherever you go and have the "oomph" and directivity of a beam.



## Stacked 5/8 Wave for 2 Meters

gives twice the omni-directional gain of a single 5/8 wave

MFJ-1764  
MFJ's stacked 5/8 wave radiators give you more than twice the omni-directional gain of a single 5/8 wave radiator!

Wide 10 MHz 2:1 SWR bandwidth . . . excellent ferrite choke balun feedline decoupling . . . shunt choke for bleeding off unwanted static . . . strong lightweight aluminum.

Fully assembled -- simply attach radiators -- no tuning required. Mounts vertically for FM/Packet or horizontally for SSB. Installs with single U-Bolt on 1 to 1 1/2 inch mast or tower leg. 1 1/2 lbs., two 47 inch radiators, 23 inch boom. Made in USA.

Also works as excellent 6 Meter full halfwave centered antenna.

MFJ-1766 gives you four times the gain of a single 5/8 wave. Includes 2 MFJ-1764, phasing cables. Doubles gain on 6 Meters MFJ-1765 phasing cables for 2 MFJ-1764s, other 2M ant.



## Dual Band 144/440 Ground Plane

MFJ's dual band 144/440 ground plane antenna is small, lightweight and super easy to mount to any 1 to 1 1/2 inch mast with a single included U-bolt -- you'll have it up and operating anywhere in just minutes. You can even mount it inside to get on the air quickly.

You get extra long range on 440 MHz with a high gain halfwave over quarter wave antenna and solid quarter wave performance on 2 Meters.

The ground plane is sloped to give you low SWR across both bands and to minimize feedline radiation. This gives you more useful radiated power, reduced TVI and noise pickup by the coax shield.

The MFJ-1754 is made of strong lightweight aluminum parts protected from corrosion by MFJ's exclusive *Permanent Molecular Bonding Technology™*. Its stainless steel *Easy-Tune™* radiator is 19 inches long and has a built-in integral phasing coil for 440 MHz.

MFJ-1754



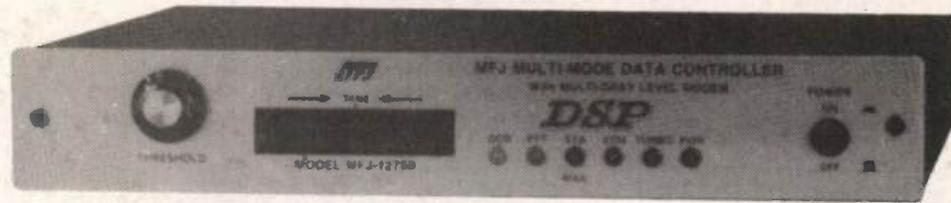
# MFJ-1278B with DSP

## multi-mode data controller

Only MFJ gives you DSP and 10 digital modes -- Packet, PACTOR, AMTOR, RTTY, Color SSTV, 16 Gray Level FAX/ Weather FAX, ASCII, Navtex, CW, and Memory Keyer . . .

**Now with DSP!**  
**GPS Compatible**

MFJ-1278B/DSP with DSP



MFJ-1278B less DSP

Combining "brick wall" DSP filters with the *world class* MFJ-1278B gives you ham radio's most powerful multi-mode data controller -- the *new* MFJ-1278B/DSP -- for an incredibly low price.

You won't believe your eyes when you see *solid* copy from signals completely buried in QRM!

This MFJ-1278B/DSP, your transceiver and computer are all you need for exciting digital QSOs!

You'll discover a whole new world of ham radio. You'll communicate in ways you never knew existed.

The MFJ-1278B/DSP and MFJ-1289 *MultiCom*™ software are packed with features available only from MFJ.

You get 10 digital modes . . . Packet, PACTOR, AMTOR, RTTY, color SSTV, 16 Gray Level FAX/Weather FAX, CW, ASCII, Navtex and Memory Keyer . . . plus an enhanced 32K mailbox that's expandable to 512K.

You'll have fun joining worldwide packet networks and exchanging color SSTV pictures with your buddies.

You'll marvel at *full color* FAX news photos as they come to life on your screen, and you'll see weather changes on highly detailed weather maps in all 16 gray levels.

You'll eavesdrop on late breaking news as it happens on RTTY.

You'll enjoy error-free HF QSOs on

PACTOR and AMTOR and enjoy receiving packet mail in your mailbox.

Wanna copy some CW? Just relax and read your screen.

MFJ-1278B, no DSP.

MFJ-1278BT, built-in 2400 baud modem, no DSP.

**Only MFJ gives you all these features . . .**

- Exclusive MFJ-1278B Features**
- Sharp "brick wall" DSP filters (MFJ-1278/DSP)
  - Color SSTV, transmits and receives . . .
    - Robot Color: 36, 72 seconds
    - Robot B/W: 8, 12, 24, 36 seconds
    - Scotty Color: 1 and 2
    - Martin Color: 1 and 2
  - 16 Gray Levels FAX/SSTV Modem . . .
    - receive all 16 gray levels of weather FAX, color AP wire photos, color SSTV
  - Real-time Packet pictures . . .
    - SVGA, VGA, EGA, CGA high resolution full color packet pictures
  - Exclusive MFJ hardware features . . .
    - 20 LED precision tuning indicator
    - Built-in parallel printer port
    - Individual radio port output level controls
    - TAPR internal modem header for high speed modem -- 2400 or 9600 baud
    - Monitor amplifier, volume control, speaker jack for monitoring receive/transmit data
    - 10 user programmable message memories
    - CW iambic paddle input
    - IC sockets used throughout
    - Free 110 VAC power supply
  - Exclusive MFJ software features . . .
    - *Automatic Digipeater*™ routing
    - Built-in packet connect bell
    - *Call Alert Beeper*™
    - *AutoMonitor alarm*™ detects incoming character strings
    - Simultaneous QSOing and file transferring
    - *Automatic Signal Analysis*™ for packet, AMTOR, RTTY, ASCII
    - Stored parameters for each mode
    - Dedicated MARS mode

MFJ-780, "brick wall" DSP data filter. Plugs inside MFJ-1278B or MFJ-1278.

MFJ-1289, *MultiCom*™ PC software brings out the full power of MFJ-1278B series. Includes PC cable.

- New Features**
- PACTOR mode with mailbox
  - 32K Packet mailbox expandable to 512K -- allows separate callsign, auto mail forwarding and reverse mail forwarding, Remote Sysop access, Sysop paging, chat mode, mailbox C-text
  - *Mail-Waiting*™ LED indicator
  - 64K battery backed up RAM
  - 1 Megabit system EPROM
  - External accessible reset
  - Up to 19.2K baud terminal operation
  - Color SSTV with VIS tones for picture autostart
  - Selectable European RTTY tones
  - Optional plug-in *crosspattern* scope tuning adapter

- Standard MFJ Features**
- Standard MFJ hardware features . . .
    - Built-in 300 and 1200 baud packet modem
    - Two software selectable radio ports
    - Noise threshold control improves HF operation
    - True DCD for excellent HF operation
    - RS-232 and TTL serial ports
    - *Fast-Start*™ Manual
  - Standard MFJ software features . . .
    - *Anti-Collision*™ gets packets through faster
    - Auto terminal baud rate: 300, 1200, 2400, 9.6K, 19.2K
    - KISS interface for TCP/IP, NetRom, MSYS
    - Host mode
    - Normal or reverse FSK output

**MFJ No Matter What Guarantee™**

- One year unconditional guarantee . . .
  - MFJ will repair or replace your MFJ-1278B (at our option) *no matter what* for a full year

**MFJ-1278BT Turbo with fast 2400 baud modem**

MFJ-1278BT



Only the MFJ-1278BT, gives you a built-in 2400 baud modem. Runs high speed packet without modifying your radio. Get the MFJ-1278BT and operate 300, 1200 and 2400 baud packet. The 2400 baud modem is also available separately. Order MFJ-2400,, for any MFJ TNCs and MFJ multi-modes.

### Exclusive Optional Items

- Real-time clock, MFJ-43
- Plug-in Scope tuning adapter, MFJ-44
- 2400 baud internal modem, MFJ-2400
- 9600 baud internal modem MFJ-9600B

### Optional Pre-wired Radio Cables

Solves your wiring headache with the MFJ pre-wired MFJ-1278B-to-radio cables. See page 36 for details. TNC/Mic switch allows you to switch between Microphone and MFJ-1278B or without disconnecting cables. MFJ-1272B.

### MFJ-1278 and Multicom Upgrade\*

Upgrade your MFJ-1278 to include PACTOR and the enhance mailbox -- MFJ-56A (32K); MFJ-56B (128K); MFJ-56C (512K).

*New MultiCom*™ upgrade release 3.2. New features: Hi-Color SSTV Simultaneous dual multi-mode or TNC operation for DOS. New FAX module with auto receive, color FAX, BMP format compatible. YAPP binary file compatible. Order MFJ-49B for *MultiCom*™ 3.2 upgrade. \*Upgrade available for current MFJ-1278 and *MultiCom* user with proof of purchase.

# MFJ Packet Only™ Transceiver

Enjoy high performance packet from 1200 to 9600 baud on 2 Meters, 24 hours/day, for an incredibly low price . . .

MFJ-8621

Runs all data rates from 1200 to 9600 baud



### Why tie up your expensive 2 Meter rig on a single packet channel?

For an incredibly low price, you can dedicate MFJ's Packet Only™ transceiver to your favorite packet channel for continuous 24 hour/day duty.

MFJ's new Packet Only™ radio is a 2 Meter FM data transceiver built exclusively for high performance packet.

You can run all data rates from 1200 to 9600 baud right out of the box!

MFJ-8621 is compatible with all TNCs having hardware DCDs. Also compatible with most TNCs having software DCDs.

Getting started couldn't be easier -- just plug in an appropriate TNC cable (also available), your antenna, 12 VDC and you're ready to enjoy error-free packet.

You get up to 5 watts output -- ideal for packet. It's plenty to cover your operating area without disrupting distant nodes.

It's ready to operate on 145.01 MHz with pre-installed crystals. For other packet channels, order plug-in crystals from MFJ -- for each packet frequency.

### MFJ's exclusive packet only design gives you outstanding performance!

Here's why . . .

. . . Direct modulation lets you use all data rates from 1200 to 9600 baud without modification.

. . . Ultra-fast PIN diode switching gives you near instantaneous changeover between transmit and receive.

. . . Dual conversion receiver, 0.25 uV low noise preamp, double-tuned front end -- gives you excellent weak signal reception and freedom from intermod.

. . . Narrow 10.7 MHz IF filter and special full data-bandwidth 455 KHZ IF filter -- gives you optimum passband and steep skirts for error-free data reception.

. . . Unsquelled audio feeds directly to your TNC for lightning-fast DCD response.

. . . The receiver local oscillator is crystal-controlled. It runs full-time -- no start-up drift or synthesizer lock-up delay.

. . . Once you're set-up, there's nothing to adjust. Just turn it on and off.

. . . You'll get dependable performance 24 hours /day. The MFJ-8621 never gets tired!

It's great for portable packet. It's a tiny 5x5x1 1/2 inches, draws just 15 ma on receive and less than 1 amp on transmit on 12 VDC.

Don't waste hundreds of dollars on an expensive 2 Meter radio just to get on packet. Order MFJ-8621 for your dedicated packet station.

### Accessories

Pre-wired cables for MFJ-8621 to TNC. Order MFJ-5100 for all MFJ TNCs/PK12/PK96/PK900/PacComm/other TAPR TNC-2 compatibles. Order MFJ-5100X for PK-232; Order MFJ-5100Z for PK-88; Order MFJ-5100YV for KAM/KPC3/KP9612. Order MFJ-5100YH for KPC9612 9600 baud port.

MFJ-4110. 110 VAC Power Supply for MFJ-8621.

### APRS ready MFJ-8621

APRS MFJ-8621 is ready-to-use as a dedicated Automatic Packet Reporting System transceiver. We've done all the work! Transmit/Receive crystals pre-installed for 145.79 MHz. Transmitter and Receiver have been precisely aligned. Order MFJ-8621X1.

## MFJ 12/24 Hour LCD Clocks

MFJ-107B

MFJ-108B



Read both UTC and local time at a glance with the MFJ-108B dual clock that displays 24 and 12 hour time simultaneously. Or choose the MFJ-107B single clock that shows you 24 hour UTC time.

Mounted in a brushed aluminum frame, they feature huge, easy-to-see 5/8 inch LCD numerals and a sloped face that makes it easy-to-read across the room.

You can synchronize them to WWV for split-second timing. Both are quartz controlled for excellent accuracy.

Long life battery included. MFJ-108B measures 4 1/2"x1"x2". MFJ-107B measures 2 1/4"x1"x2".

## MFJ World MapClock

MFJ-112



**A.** This new MFJ-112 DXers' World Map Clock not only shows you the time at any QTH throughout the world--it also gives you an attractive world map so you can see the place where your contact is! Also shows day of week, month, date and year. Time displays hour/minute/second. User selectable for 12 or 24 hour display format. Also has day-light-saving-time feature.

Easy push-buttons let you move east and west on the map display to a QTH in every time zone. The flashing map segment instantly designates the selected time zone. Attractive gold color with brown trims. Great for gift or use as logging clock. Measures 4 1/2"W x 3 3/8"H x 2 1/4"D.

**B.** The MFJ-105B is a true 24 hour quartz wall clock. The huge 10 inch diameter face gives excellent visibility across a computer or radio room. A single "AA" battery (not included) provides over one year operation.

## MFJ 24 Hour Wall Clock

MFJ-105B



## 12/24 Hour Clock has giant 2.3 inch red LED digits!



You can see this clock across the street! Giant 2.3 inch red LED digits -- nearly the width of a 2 Meter handheld -- are the

MFJ-114 largest and brightest we've seen anywhere.

Select 12 hour or 24 hour UTC time. An adjustable base lets you customize your viewing angle.

Built-in mounting holes let you hang your clock on any wall in your room.

Separate hour set and minute set buttons make setting time quick and easy.

## 12/24 Hour Clock has 10 minute ID Timer!



MFJ-116



You can get an ID buzz every 10 minutes. It keeps you legal, and you won't miss that extra-important QSO you need to make.

Big 5/8 inch LED digits can be seen across the room and even in the dark, and can show either 12 or 24-hour time.

Two Alarm Settings -- volume can be either high or low. The high volume setting is extremely loud!

Battery Backup -- You won't lose a second, even if you lose power

Compact Size -- case is only 4 1/2 x 2 x 4 inches

# MFJ's new TNC/Mic Switch

## Switch between your TNC or Mic by pushing a button!

MFJ-1272B

MFJ-1272M



Switch between your microphone and TNC by pushing a button! You won't have to unplug your microphone and plug in your TNC everytime you want to work packet or other digital modes.

Just plug these pre-wired cables into your rig's microphone connector and into your TNC and you're ready to go -- no more hunting for hard-to-find connectors and wiring up complicated cables.

Works with HF, VHF and UHF radios with 8 pin mic connectors -- including Kenwood, ICOM, Yaesu, Alinco, Radio Shack and others. For radios with 8-pin RJ-45 modular telephone jack, select the new "M" models.

Plug-in jumpers let you quickly set-up for virtually any radio. Factory set for Kenwood and Alinco. Includes easy-to-follow instructions. Has audio-in and speaker jacks. 3 1/4 x 1 1/4 x 4 inches.

Select your switch from the chart below:

TNC Type	All MFJ TNCs/ PK900/PK12/ Pk96/PacComm/ other TNC-2 compatibles	KAM VHF <sup>1</sup> / KAM HF <sup>1</sup> / KPC3 <sup>1</sup> / KPC9612 <sup>1</sup>	PK-232	PK-88
Radio Mic Conn				
8-pin round mic plug	MFJ-1272B	MFJ-1272BYV MFJ-1272BYH	MFJ-1272BX	MFJ-1272BZ
8-pin modular mic plug	MFJ-1272M	MFJ-1272MYV MFJ-1272MYH	MFJ-1272MX	MFJ-1272MZ

1. YV for KAM VHF port. YH for KAM HF port. Other Kantronics use YV models

## Pre-wired Radio-to-TNC cables

These new MFJ cables are pre-wired for most 8 pin rigs and HTs. You won't have to wait to get your cable wired because MFJ solves that little problem . . .

TNC Cables



Radio	TNC Type	All MFJ TNCs and multimodes	KAM VHF <sup>5</sup> / KAM HF <sup>5</sup> / KPC3 <sup>5</sup> / KPC9612 <sup>5</sup>	PK-232	PK900/PK96/ PK12/DSP232 /PacComm/ other TNC-2 compatibles
Alinco <sup>6</sup> / Standard HTs		MFJ-5022	MFJ-5022YV	MFJ-5022X	MFJ-5022
Icom <sup>1</sup> /Yaesu/ Radio Shack HTs		MFJ-5024	MFJ-5024YV	MFJ-5024X	MFJ-5024B
Kenwood <sup>2</sup> HTs		MFJ-5026	MFJ-5026YV	MFJ-5026X	MFJ-5026
Yaesu 8-pin		MFJ-5080	MFJ-5080YV MFJ-5080YH	MFJ-5080X	MFJ-5080
Icom <sup>3</sup> 8-pin		MFJ-5084	MFJ-5084YV MFJ-5084YH	MFJ-5084X	MFJ-5084
Kenwood/Alinco 8-pin		MFJ-5086	MFJ-5086YV MFJ-5086YH	MFJ-5086X	MFJ-5086
Yaesu 8-pin modular		MFJ-5080M	MFJ-5080MYV	MFJ-5080MX	MFJ-5080M
Icom <sup>4</sup> 8-pin modular		MFJ-5084M	MFJ-5084MYV	MFJ-5084MX	MFJ-5084M
Kenwood 8-pin modular		MFJ-5086M	MFJ-5086MYV	MFJ-5086MX	MFJ-5086M
Radio Shack 8-pin modular		MFJ-5088M	MFJ-5088MYV	MFJ-5088MX	MFJ-5088M
MFJ-8621 Data Radio 5-pin DIN		MFJ-5100	MFJ-5100YV <sup>6</sup> MFJ-5100YH <sup>7</sup>	MFJ-5100X	MFJ-5100

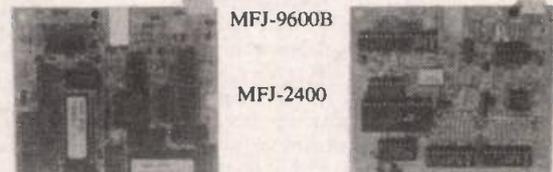
1. does not include IC-W2A 4. does not include IC-100H, IC-2700H 6. YV for KP9612 1200 baud port  
2. does not include 2500 5. YV for KAM VHF port. YH for KAM HF 7. YH models for KPC9612 9600 baud  
3. does not include 25A, 255A port. Other Kantronics use YV models 8. Excludes DJ-100, 120T, 200, 500

## Open End Cables with Radio Connectors

- MFJ-5082, open end cable with 8-pin mic connector
- MFJ-5224, open end cable for Icom / Yaesu / Alinco / Radio Shack handhelds
- MFJ-5226, open end cable for Kenwood handhelds
- MFJ-5268, open end cable with 8-pin modular mic plug for Yaesu, Kenwood, Icom, and Radio Shack
- MFJ-5222, open end cable with split connectors for Alinco and other handhelds
- MFJ-5205, general purpose open end with 5-pin DIN connector

## MFJ's High Speed Packet Modems

MFJ-2400 or MFJ-9600B High Speed modem is designed to plug inside all MFJ TNCs or multi-modes. Easy to install. NO modification is needed to your controller.



G3RUH compatible 9600 baud modem. Specially designed for the MFJ-1278/1278B and other MFJ TNCs. Plugs right into MFJ-1278/1278B for very easy installation. Screws, cable and LED included. Not all radios compatible with 9600 baud.

The MFJ-2400 modem gives you 2400 baud packet. By communicating faster you lessen congestion on crowded frequencies, reduce the chance for errors and more efficiently utilize our ham frequencies. Once installed in your TNC you'll still get 300 and 1200 baud for full compatibility with other TNCs.

## MFJ-1271 turns your Commodore 64/128 into a packet TNC!

MFJ-1271

Turn your Commodore 64/128 into a full feature TNC!



Just plug in this MFJ-1271 modem and boot up the Digicom/64 software (not included) to enjoy VHF or HF packet at 1200 and 300 bauds.

You get a high performance modem featuring a true DCD circuit with adjustable threshold control. It reduces sensitivity to noise and dramatically increases completed QSOs especially on HF. A DCD detect LED tells you when you're receiving a good signal. Plugs into cassette port and uses 12 VDC or 110 VAC with optional MFJ-1312.

The MFJ-1271 uses Digicom/64 software available from shareware/freeware/public domain suppliers.

## MFJ Computer Interface lets you use JV FAX or HamComm software

This MFJ-1213 computer interface lets you use JV FAX or HamComm software to receive and decode all kinds of digital data communications with your transceiver.

Excellent JV FAX software lets you see fabulous full-color FAX and SSTV pictures on your PC. View, edit, store FAX/SSTV images. Has "on-the-fly" skew correction, Auto-Receive, Auto-Save, Automatic Tuning Control and Auto-Sync. MovieMode creates slideshow movies using pictures you have received.

Use powerful HamComm software to receive Baudot, ASCII, AMTOR, ARQ/FEC, SITOR A/B, NAVTEX, SHIP and SYNOP. Has spectrum and scope functions.

JV FAX and HamComm software (not included) are widely available from BBSs or shareware/freeware/public domain suppliers.

# MFJ TNCs for VHF/HF Packet

MFJ-1270C super TAPR TNC clone has a world wide reputation as the most reliable packet TNC in the world! Thousands used as digipeaters, nodes, BBS and in all kinds of commercial applications working 24 hours a day -- many work for years without a single failure . . .

## Now GPS Compatible

- ROM expands to 512K
- External accessible reset
- Built-in monitor amplifier
- Front panel ON/OFF switch
- Enhanced DCD circuit for HF
- Supports 19,200 baud terminals
- 64K RAM expands to 128K or 512K



MFJ-1270C

The MFJ-1270C super TAPR TNC clone has a world wide reputation as the most reliable TNC in the world!

Thousands are dedicated as digipeaters, nodes, BBS and used in all kinds of commercial applications working 24 hours a day -- many work for years without a single failure.

### The Most for Your Money

The most reliable TNC in the world gives you the most for your money. See for yourself . . .

### Fully TAPR TNC-2 Compatible

You get full TAPR TNC-2 compatibility -- all software and hardware designed for the TAPR TNC-2 standard works without modification. You get X1J, NETROM, theNET and Rose Switch compatibility that turns your MFJ-1270C into a Layer Three and Four networking node.

### VHF and HF operation.

You get high performance VHF and HF modems as standard equipment -- for double fun.

You get a true DCD circuit that dramatically reduces sensitivity to noise and dramatically increases completed QSOs.

### FREE AC Power Supply

You get a free 110 VAC power supply at no extra cost. With other brands, the AC power supply could cost you extra.

### New enhanced Personal Mailbox

The enhanced Easy Mail™ personal mailbox lets you use a dedicated call-sign for your mailbox. Your mailbox can stay on while you operate packet. It will also auto forward or reverse forward mail to and from other BBSs. A check mail LED blinks when you have mail. More features: remote sysop access, sysop paging, mailbox C-text, chat mode and many other features not available in other TNCs. The mailbox memory is expandable to 128K or 512K.

### WeFAX gives you Weather Maps

You get a WeFAX mode that lets you print full fledged weather maps from your HF radio to screen or printer or save to disk using an MFJ Starter Pack.

### Plug-in Modem -- 2400 or 9600 Baud

You can add MFJ's optional internal 2400 baud or 9600 baud modem just by plugging it in and making a few simple connections.

### KISS interface and MFJ Host Mode

You get a KISS interface that lets you run TCP/IP and MYSYS and MFJ's Host Mode that makes it easy to write efficient application programs.

### MFJ Anti-Collision™ Technology

You get MFJ's Anti-Collision™ technology that prevents packet collisions and improves performance on busy channels.

### Plus more . . .

You also get 32K RAM, IC sockets for easy service, 256K ROM, speaker jack, lithium battery backup, RS-232 and TTL serial ports, radio cable (you have to add a connector for your radio), Fast-Start™ Manual plus much more. Use 12 VDC or 110 VAC. 9 1/2 x 1 1/2 x 7 1/2 in.

### One Year Unconditional Guarantee

You get MFJ's famous No Matter What™ one year unconditional guarantee.

### Enjoy Packet for a long, long time

If you want a TNC that'll work 24 hours a day without failure -- one that has more features than any other -- get the ultra reliable MFJ-1270C today and enjoy packet for a long, long time.

### 2400 Baud Turbo™ TNC

MFJ-1270CT. Has all the features of the MFJ-1270C plus built-in fast 2400 baud modem. Operate 300, 1200 and 2400 baud packet with the MFJ-1270CT. Radio modification is not necessary when operating 2400 baud packet.

## MFJ 9600 Baud TurboPlus™ TNC

MFJ-1270CQ



Has all the features of the MFJ-1270C, the most reliable TNC in the world, plus built-in 9600 baud G3RUH compatible modem. Operate 300, 1200 and 9600 baud.

## TNC ACCESSORIES

### MFJ Starter Packs

An MFJ Starter Pack, gets you on the air instantly. You get interface cable, software on disk and instructions -- just plug it all in and start enjoying packet. Order MFJ-1284 for IBM or compatibles, MFJ-1282 for Commodore 64/128, MFJ-1287 for Macintosh or MFJ-1290 for Amiga. **NEW!** MFJ-1284W, MFJCOM for Windows.

### 2400 and 9600 Baud Modems

MFJ-2400, operates 300, 1200 and 2400 baud packet and works with any radio. MFJ-9600B, \$109.95, G3RUH compatible 9600 baud modem. Not all radios compatible with 9600 baud. Both plug into MFJ TNCs for easy installation.

### Mailbox Memory

For MFJ-1270C/1276. Plugs into RAM socket for extra mailbox memory. MFJ-45A (32K), MFJ-45B (128K), MFJ-45C (512K).

### Real Time Clock

MFJ-43, ends re-setting TNC clock everytime you turn it on. Maintains correct time even when TNC is off. Plugs into RAM socket. Works with MFJ TNCs and TAPR TNC clones.

### FM Deviation/Temperature/Volt Meter

MFJ-52B, plug this board into your TNC configured as TheNet X-1J Node and users can check their transceiver packet FM deviation. Checks temperature and voltage. Requires X-1J or later nodeware. See *CQ Magazine*, Nov. 1993.

### Firmware Upgrade

For older MFJ TNCs. MFJ-40C, \$19.95, gives you enhanced mailbox and supports mailbox up to 512K.

### Mailbox Memory Expansion Board

For older MFJ TNCs. MFJ-47A, 32K RAM; MFJ-47B, 128K RAM; MFJ-47C, 512K RAM. Complete with firmware.

# PACKET *plus* PACTOR TNC

all the features of the MFJ-1270C HF/VHF TNC plus . . . PACTOR . . . precision tuning indicator . . .

MFJ-1276



Now you can have all the features of the MFJ-1270C, the most reliable packet TNC in the world, plus PACTOR, precision tuning indicator for HF.

PACTOR is an exciting new HF mode. PACTOR combines the best of Packet and AMTOR plus more. It's impressive under weak signals. You get error correction, faster baud

rate, data compression and full 8-bit word transmissions. The results? Faster throughput than either Packet or AMTOR and excellent weak signal operation.

A high resolution 20 LED bargraph tuning indicator lets you tune in HF signals fast. Just tune your radio to center a single LED and you're precisely tuned in to within 10 Hz -- and it show you which way to tune!

You also get an extra 32K of memory for your enhanced Easy Mail™ personal packet mailbox. Your buddies can leave you more and longer messages -- you'll never have to worry about running out of memory.

MFJ-1276T, same as MFJ-1276 but has built-in fast 2400 baud modem. Lets you operate 300, 1200, and 2400 baud packet.

# Software That Brings the MFJ-1278B to Life!

MFJ Multicom requires no set-up -- just load and use this new MFJ-1278B software -- you get multi-gray level FAX, Hi-resolution SSTV, dual port operation, and tons more . . .



16 Gray Levels WeFax map received on 16.410 MHz MFJ-1278B & Multicom™ transmit and receive 16 Gray Levels FAX.



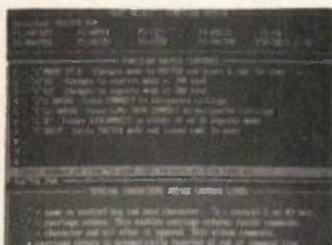
16 Gray Levels AP Wire PhotoFAX received on 20.738 MHz. See tomorrow's news today.



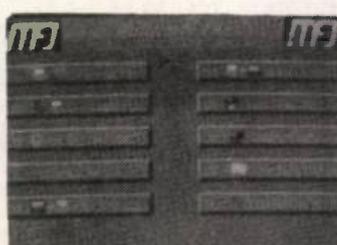
Hi resolution Color SSTV pictures received on 14.230 MHz. Robot 72S. MultiCom supports most common SSTV formats



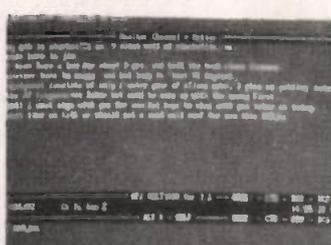
256 Color VGA Packet Picture received in real-time packet. Only MFJ-1278B and MultiCom™ has this feature.



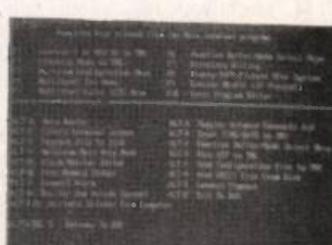
Easy and simple . . . Multicom™ Operating menu -- each mode gives you 10 programmable function buffers.



Dedicated Multicom™ FAX menu. Getting on FAX and SSTV is as simple as pressing one or two keys.



MultiCom™ lets you carry on two digital QSOs simultaneously using two multi-modes or TNCs and two comm ports.



Need help? *Alt-H* brings up the on-line Help Menu that makes the MFJ-1278B very easy to use.

MFJ-1289

**New Features for MultiCom 3.2**  
 •Hi resolution color SSTV  
 •Receives AVT color SSTV in 90 and 94 seconds format

MFJ-1289 MultiCom™ multi-mode control software gives you super easy-to-use menu operation of all 10 digital modes: Packet, Pactor, Amtor, 16 gray levels FAX, Hi resolution SSTV, RTTY, ASCII, CW, Navtex and full featured Contest Memory Keyer.

### Receive exciting up to date weather FAX right in your shack!

See high resolution weather FAX and AP and UPI news photos on your screen -- digest the latest breaking news or check the up to date weather condition -- right in your ham shack using your HF rig.

The MFJ-1278B with gray-level modem using MFJ-1289 MultiCom™ program let you see -- and transmit -- multiple gray weather FAX and photo FAX with 16 gray levels. Your MultiCom™ manual shows you exactly where to tune to see these fantastic pictures.

You can transmit and receive 16-gray level weather FAX map that shows you actual cloud density with gray levels -- not just two level representations. The new MultiCom FAX module is loaded with features like ... ten auto timers to start reception FAX picture at any time of the day. Multicom's FAX format is PCX compatible. FAX pictures you received can be exported to most paint programs for titling or coloring. Your favorite GIF or TIF picture can be converted and transmitted with MultiCom; MultiCom's auto-start will auto start and sync to FAX pictures everytime. Slanted FAX received can be straighten up with MultiCom's "Fix-slant" feature. MultiCom™ even let you color your own weather map.

### MultiCom™ is all you need to operate color SSTV with the MFJ-1278B

You no longer have to spend an outrageous amount on SSTV equipment. MFJ-1278B and MultiCom™ offer you Hi resolution color SSTV. MultiCom™ transmits and receives Hi resolution Color SSTV like Robot Color, 72S, 36S, Robot B/W 24S,

12S, 8S, Scotty Color 1, 2; Martin Color 1, 2. It also receives color AVT 90 and 94 seconds formats.

MultiCom™ SSTV features auto start, auto format detection and automatic sequential picture capturing. VIS tones allows receiving station to auto start the SSTV you sent. The auto-view automatically determine the SSTV picture format for viewing on your computer screen.

### Create Your Own Picture for Transmitting with Multicom . . .

Create your favorite pictures with your video camera and a digitizer or with a graphics program. Save them to disk on PCX or BMP format. Multicom and MFJ-1278B can transmit your picture in SSTV, FAX or packet picture mode.

### Packet Picture Transfer

Join the fun of packet picture passing. See brilliant full color pictures paint across your screen as they are being received. MultiCom™ supports 256 color SVGA, VGA pictures.

### Want dual port operation? MultiCom™ can do it . . .

Connect the MFJ-1278B to one comm port and another TNC to another comm port on your computer, MultiCom™ will operate both TNCs and two radios simultaneously. You can monitor VHF packet on the top screen and operate any other text modes on the bottom screen.

### MFJ Call-Alert™: Sounds an alarm when characters you specify are received

Only MultiCom™ gives you the new MFJ Call-Alert™ that sounds an alarm through your computer speaker if a character sequence you specify is received by your MFJ-1278B.

Now you can monitor any channel for DX reports on a certain call, a favorite packet buddy or a ragchew on a specific subject.

MFJ Auto-Set™ let you instantly switch modes without tediously retyping command parameters one at a time.

You can use Auto-Set™ to set up a second MFJ TNC for a function like Easy-Mail™.

MFJ Auto-Router™ lets you store digipeater node routes for instant digipeating MFJ's exclusive Packet Multi-Plex™ lets you send and receive packet messages during binary file transfer.

Now you can exchange programs by packet without having your QSO cut off completely. YAPP protocol is supported with MultiCom's binary file transfer.

MFJ MultiCom's built-in Multi-Word™ word processor is the only word processor specifically designed for multi-mode communications.

### Plus more . . .

You also gets disk utilities for graphics screen capture and conversion to packet picture format, sample pictures, effective packet through-put readout, screen colors set, sound on/off switch, DOS gateway, RS-232 cable, complete instructions and much more.

MFJ-1289 MultiCom™ requires an MFJ-1278B or other MFJ TNC (features limited by TNC) and an IBM or compatible computer with 512K RAM. Color SSTV and multi-gray level FAX require VGA graphic system. Hi resolution SSTV requires Hi-color card.

Order MFJ-1289 for 5 1/4" HD disk or MFJ-1289M for 3 1/2" HD disk.

MacMulticom, MultiCom64™ and MultiComAm . . . new MultiCom packages give most of the capabilities of the IBM compatible MultiCom™ for your Macintosh, C64/128 or Amiga computer.

They come complete with interface cable and friendly instructions -- everything you need. Here are the models available: Macintosh: MFJ-1287B MacMulticom™; C64/128 or Amiga computer: MFJ-1282B MultiCom64™.

**Multicom 3.2 Upgrade**  
 MFJ-49B, available to current users with proof of purchase.

# MFJ 6 Meter SSB Adventure Radio™

... MFJ breaks the six-meter SSB price barrier with the MFJ-9406 Adventure Radio. Compare with transceivers costing far more, and you'll quickly discover the MFJ-9406 is all business!



**MFJ-9406**

Turn it on. Distant stations roll in loud and clear, thanks to the MFJ-9406's quiet crystal-mixed single-conversion receiver.

Pick up the mic and transmit. MFJ's *Constant Current™* speech processing raises 10 Watts PEP to new heights -- delivering the punch of a much more powerful radio.

Explore exotic 50 MHz band openings -- Tropo, Sporadic E, F2, TE, Aurora, Meteor Scatter, and more.

Ragchew with the locals, or hunt down new grid squares from far-away places. From home, car, or, mountain top, the MFJ-9406 is built to perform! Best of all, it won't cost you an arm and a leg to get started!

**Here's what you get**

**Full CW/SSB coverage:** VFO tunes 50.0 - 50.3MHz, covers CW, propagation beacons, SSB.

**Potent signal:** 10 Watts PEP output. MFJ's exclusive *Constant-Current™* syllabic speech processing gives you up to 6 dB more punch to cut through noise, fading and QRM.

**Hot receiver:** Crystal-mixed single-conversion superhet with low-noise preamp digs deep into the noise floor to capture weak signals! If a station is there, you'll hear it!

**Easy to operate:** No microprocessor mumbo-jumbo . . . just turn on and tune in.

**Low power drain:** Mountain-top all day on a light weight NiCd pack or operate from home with the compact MFJ-4110 wall adapter supply.

**Excellent selectivity:** A sharp HF proven

SSB ladder filter reduces QRM and passband noise -- unlike some "all-mode" radios.

**TVI protection:** Built-in 7-element 50 MHz low-pass filter knocks down TVI -- lets you operate when YOU want to!

**Real S-meter:** Full-sized analog S-meter helps you steer your beam with pin-point accuracy and give meaningful signal reports. Meter also monitors speech processing.

**Smooth tuning:** Reduction-drive analog VFO gives you full control. Spot signals quickly and zero in smoothly without annoying tuning rate shifts or stair-stepping.

**Optional adapter:** Install this module, and switch to Semi-QSK CW instantly without changing modes or fiddling with the RIT. Just plug in a key and start sending!

**External amplifier:** Jack provides a key-line for activating 6 Meter SSB amplifiers such as the Mirage A1015-G/ A1035-G.

**Built to last:** Conservative design, premium G-10 plate-through pc board, quality components, handsome brushed-aluminum panel, tough vinyl-clad case gives years of service.

**Compact:** At only 2 1/2 x 6 1/2 x 6 inches, the MFJ-9406 fits in just about anywhere.

**Fully guaranteed:** Your MFJ-9406 is fully backed by MFJ's exclusive one-year *No Matter What™* guarantee. This means we will repair or replace (at our option) your MFJ-9406, no matter what happens, for one full year.

**Get yours today:** 6 Meter SSB is growing in popularity like never before. Join

the fun. Order your MFJ-9406 or MFJ-9406X today!

**Free 6 Meter Adventure Radio™ manual** Take a closer look before you buy! Manual includes hook-up and operating instructions, antenna tips, troubleshooting guide, circuit description, schematic, alignment information. For a free copy, just write or call MFJ.

**ACCESSORIES**

**CW adapter: MFJ-416.** Operate CW -- a must for DXers. Plugs-in, no soldering. Provides semi-QSK break-in and sidetone.

**Handheld dynamic SSB microphone: MFJ-290,** (3s/h) is especially matched to compliment the *Constant Current™* speech processor used in the MFJ-9406.

**Special Offer!! MFJ-9406X!!** Includes MFJ-9406 and MFJ-290 mic.

**AC portable power supply: MFJ-4110,** is a rugged wall adapter transformer and voltage regulator module that delivers 13.8 volts to power the MFJ-9406. Powerful, yet small. Fits in your coat pocket!

**MFJ portable power pack:** Built for the MFJ Adventure Radio™, the MFJ-4114, provides AC power from 10 NiCd D-cells and NiCd re-charging. Fastens to MFJ-9406 cabinet. Batteries not included.

**MFJ 6 Meter Antennas:** MFJ-1776, lightweight folded dipole. MFJ-1728B, mobile magnet mount, full 1/4 wave on 6 Meters, also 3/8 wave on 2M.

**MFJ 6 Meter Antenna Tuner: MFJ-906,** Lighted 2 Range Cross-Needle SWR/Wattmeter bypass switch, 100 Watts FM, 200 Watts SSB, 8 x 2 1/2 x 3 inches. MFJ-903. Same as MFJ-906 less SWR/Wattmeter bypass switch. Measures 5 x 2 1/2 x 3 inches. See page 4 for more details.



Above accessories are shipping code A.

## Quick Index

Amplifiers.....1, 25-29  
 Antennas.....1, 20, 30-33  
 Antenna Accessories.....6, 8-10  
 Antenna Tuners.....2-6  
 Books.....24  
 Cables.....23, 36  
 Clocks.....35  
 Code Practice Products...13-16, 22

Computer Interfaces.....21  
 Dummy Loads.....10  
 Filters.....17-18  
 HT Accessories.....25, 34  
 Keyers/Keyboards/Keys.....13-15  
 Licensing Products.....16, 22  
 Packet Radio.....35-39  
 Receiver Kits.....20

SWL Products.....18-21  
 SWR/ WattMeters.....7, 9  
 Switches.....10, 29, 36  
 Software.....22-23  
 Transceivers / Receivers...11-12, 40  
 Miscellaneous.....4, 8, 11, 16, 29, 34  
 Ordering Information.....2

