NOVEMBER 1988 £1·30

ISSN 0141-0857

Practical Wireless

The Radio Magazine

REVIEWED... Yaesu FT-747GX HF transceiver

PW QRP CONTEST RESULTS

NEW SERIES... yesterday's world of technology

BUILD... a practical antenna electrometer

"They said I couldn't work DX with just 100 watts. Especially with a radio that has less than 1000 switches on the front panel.

But the truth is, I'm working lots of DX, more than some of these blockbuster types, thanks to my Yaesu FT-747GX.

You see, my no-nonsense FT-747GX was designed with me in mind, so I can hop around the band fast to nail those DX stations. While the other hams are warming up their amplifiers, I'm working the new country!

My FT-747GX has a super receiver, with a directly-driven mixer for great overload protection. And, Yaesu included the CW filter in the purchase price (I used the money I saved on postage for the QSL cards!).

And my FT-747GX is loaded with other features. The receiver works from 100kHz straight through 30MHz, and it's a fantastic shortwave broadcast receiver. I can use all twenty memories for that alone! Plus it's got dual VFOs. A noise blanker. Split frequency operation for the pile-ups. And scanning up the band helps me check out openings as they happen.

I just put in the optional crystal oven, and next month I'm going to pick up the FM board.

And with the money I saved when I bought my FT-747GX, I got a second ten-metre antenna for satellite work on the high end of the band. I use my personal computer to tell me what satellites are going by, and the computer even sets the frequencies on the radio for me.

Now my friends are getting FT-747GX rigs, too. I knew they'd figure out my secret weapon sooner or later. But now I'm setting the pace!

Thanks, Yaesu. You've made a rig that makes sense, at a price I can afford."

South Midlands Communications Ltd
S.M. House, School Close,
Chandlers Ford Industrial Estate,
Eastleigh, Hants SO5 3BY
Tel: (0703) 255111
UK Sole Distributor

YAESU

"They laughed when they saw my radio. Then they saw my logbook."

Practical Wireless
The Radio Magazine

NOVEMBER 1988 (ON SALE 13 OCTOBER 1988) VOL. 64 NO. 11 ISSUE 980

THIS MONTH

NEXT MONTH

Special 8-page feature "In the Know" Helping the radio hobbyist to find essential information and bits

Build the *PW* "Marlborough" LF/MF to HF Converter

Heinrich Hertz; Did he discover radio?

plus
All the usual features

Don't miss it—place your order with your newsagent now!

On sale November 10

Contents subject to last-minute revision

We are sorry that, due to pressure on editorial space and the effects of the postal dispute, Understanding Circuit Diagrams—9, Crops & Coils—3, and Chas E. Miller's dissertation on the DST100 receiver have had to be held over

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ARE COMMUNICATIONS

STANDARD C500 DUAL BAND HANDIE

Still continuing to be our best dual-band handheld, the STANDARD C500 offers facilities envied even by our Commercial users. 2m and 70cms, full duplex operation with receive coverage on 138 - 169.995 MHz and 420 - 469MHz.

SPECIAL LEICESTER EXHIBITION PRICE: £349

YAESU FT736R QUAD BAND MULTIMODE

The King of UHF/VHF base stations, the FT736R has all the facilities any discerning user may need, plus the two most important features: uncompromised receive performance and a clean transmitted signal.

ARE's continued policy of direct importing guarantees you an unbeatable price including excellent part-exchange deals.

SPECIAL LEICESTER EXHIBITION PRICE: ASK AT THE SHOW

YAESU FT747GX "ECONOMY" HF TRANSCEIVER

An HF transceiver with built-in general coverage receive. All mode, including FM as an option, for less than the price of a 2m multimode?

Offered without am or cw filters at a super discounted price of **£579**

YAESU FT767GX HF + 2m + 6m + 70cms

Despite being YAESU's most expensive transceiver for HF operation, it continues to outsell all other HF equipment marketed by A.R.E. All band, all mode, built-in automatic tuning unit, power supply, general coverage receiver, digital power/SWR meter, full 100w output, optional 2m/6m/70cms modules, which just plug in.

SPECIAL LEICESTER EXHIBITION PRICE: £1,369 including MH1BB scanning mic.

Also available with one or all VHF modules fitted at a discounted price.

ICOM IC32E DUAL BAND HANDIE

Direct competition to the STANDARD C500, the ICOM IC32E offers excellent facilities utilising all existing ICOM accessories. Ideal for the IC2E/O2E owner. Similar specification to the C500.

SPECIAL LEICESTER EXHIBITION PRICE: £369

ARE
Tel: 01-997 4476

KENWOOD TS790G TRIPLE BAND MULTIMODE BASE STATION

At last KENWOOD have updated the long-standing TS780S. The latest addition to the KENWOOD product range, the TS790G offers an excellent specification over the 2m/70cms/23cms amateur band. The new TS790G is simple in operation, but offers excellent performance for the VHF user. Operating on 12 volts DC, it is available with the matching PS31 power supply and SP31 speaker. Viewing for the first time can be made at the LEICESTER EXHIBITION.

SPECIAL LEICESTER EXHIBITION PRICE: WAIT AND SEE!!

KENWOOD TS680S/140S HF TRANSCEIVERS

Available with or without 6 metres, the TS680/40 is an ideal upgrade from your dusty FT101ZD!

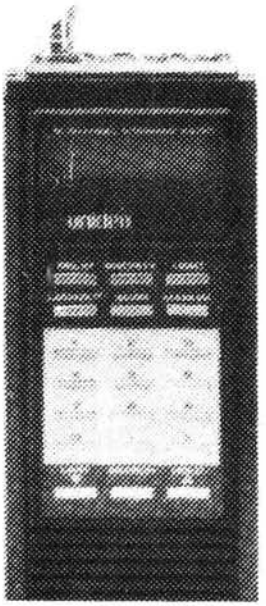
SPECIAL LEICESTER EXHIBITION PRICE: TS680S £879 - TS140S £799

KENWOOD TS440S HF TRANSCEIVER

Quickly becoming a major seller in the A.R.E. product range, the TS440S offers 100w output between top band and 10m. FM is fitted as standard. Auto tuning unit is optional extra.

SPECIAL LEICESTER EXHIBITION PRICE: £1,029 or with antenna tuning unit £1,189

UNIDEN/BEARCAT BC200XLT SCANNER



A purpose built handheld scanner, the new BEARCAT BC200XLT offers frequency coverage and specification previously unavailable. **Frequency range 66 - 88MHz: 118 - 174MHz: 406 - 512MHz: 806 - 956MHz (Cellular Band).**

200 fully programmable channels, auto am/fm selecting makes the BEARCAT 200 an instant success.

SPECIAL LEICESTER EXHIBITION PRICE: £219 including nicad pack, mains charger & free VHF/UHF Frequency Guide.

JRC JST135 HF TRANSCEIVER

The latest offering from the Japan Radio Co., the JST135 is available for the radio amateur who appreciates quality engineering. Imported direct, bypassing any European distributor, A.R.E. COMMUNICATIONS continue to offer this excellent transceiver at an unbeatable price. Visit our stand at the LEICESTER SHOW for details.

Opening hours Monday - Friday 9.30-5.30. Saturday by appointment.

A MESSAGE FROM THE GUV'NOR . . . . . .

"We are often referred to by the 'official' UK Distributors as 'Grey Importers'. Perhaps a change of colour would be appropriate - may I suggest **GOLD** - because our massive savings in purchase price, which we pass on to you, puts **GOLD** back into your pockets. We are effectively cutting out the middle-man by importing direct from our agents in Japan, **(who are usually found NIPPING AROUND TOKYO IN HONDAs, RATHER THAN SWANNING AROUND IN AEROPLANES, MERCEDES OR ROLLS ROYCES).** Both Brenda and myself spend the majority of our time contacting agents throughout the world securing supplies of Japanese products, including famous brand names such as YAESU and KENWOOD, at far better prices than those offered to you by the European distribution networks.

Our continued policy of direct importing will always guarantee you better prices. You may also have noticed that our product range is increasing - this is largely due to the tremendous support we get from our customers. Remember, the more you purchase, the more we can purchase and the better prices will be. Come along to our stand at the LEICESTER EXHIBITION where myself, Brenda, Martin and Brian will give you a warm welcome - and unbelievable discounts."

73 Bernie G4AOG

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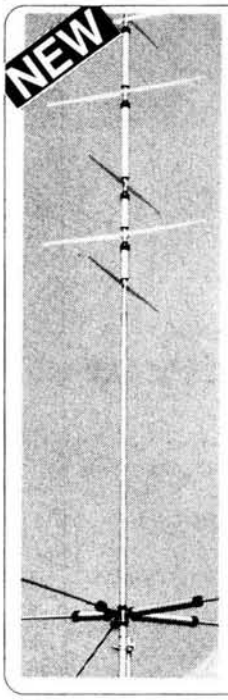

from COMET & HOKUSHIN

SMC are proud to present 1 new mobile and three new base station antennas incorporating the very latest in aerial technology to give outstanding durability whilst maintaining excellent performance characteristics.

CHA5	WX1	CA2X4 MAX	CA2X4 KG
HF Vertical	VHF/UHF Base	VHF/UHF Base	VHF/UHF Mobile
80-10m 5 band	144/432 MHz	144/432 MHz	144/432 MHz
C/W Radials	4.5/7.2dB Gain	8.5/11.9db Gain	6.0/8.4db
200W Pep	200W Max	200W Max	120W Max
£210.00	**£49.95**	**£99.95**	**£39.95**

Also still available the two best selling amateur antennas, the ubiquitous 78F 2m 7/8 wave £21.15 and the GP144W 2m base £42.00

MOBILE ANTENNAS

2QW	2m ¼ wave	£3.15
2NE	2m ⅝ wave fold over	£13.25
2SE	2m ⅝ wave fixed	£13.25
2VF	2m ½ wave fold over	£16.13
78B	2m ⅞ wave ball mount	£15.00
88F	2m ⅞ wave	£24.10
258	70cms 2 × ⅝ fold over	£29.37
268E	70cms	£32.80
358	70cms 3 × ⅝ fold over	£33.73

DUAL BAND MOBILE ANTENNAS

70N2M	2m/70cms fold over	£24.95
727VM	2m/70cms fold over	£30.88
70N2DX	2m/70cms fold over	£37.75

BASE ANTENNAS

ABC23	2m 3 × ⅝	£63.97
GP23	2m 3 × ⅝	£45.00
GPV144DX	2m 2 × ⅝ S/Steel	£53.13
GPV5S	2m 2 × ⅝ H/Duty	£45.50
GP432X	70cms 3 × ⅝	£47.50
GP714	70cms	£88.20
358FG	70cms 3 × ⅝ G/F	£57.75
HS965V	60-905MHz	£57.75

DISCONES FROM SMC

DSC770	70-700MHz c/w Stub Mast	£55.74
D130	25-1300MHz c/w coax	£75.00

SONY at SMC

SONY RECEIVERS

SMC are pleased to be able to offer the SONY range of Multiband Receivers. They feature all the latest technology allowing unequalled coverage of both broadcast and shortwave bands, yet remaining both compact and easy to use. All the models illustrated cover VHF Broadcast, SW broadcast and some SW or Air bands (only on certain models).

ICF7600DS
Compact, synthesised portable receiver covering FM Broadcast, AM Broadcast (LW & MW) and SW bands with SSB. Large LCD display. Keypad entry and memory scanning.

ICFPRO80
Compact, handheld scanning receiver covering 150 KHz to 108 MHz and 115.15 to 223 MHz. SSB, FM(W & N), AM modes. 40 memories and PRO80 8 way timing system.

ICF2001D
Compact, lightweight synthesised receiver including FM Broadcast, AM Broadcast (LW & MW) Airband and SW Band with SSB. Keypad entry, memory scanning and numerous other functions.

AIR-7
Compact, handheld scanning receiver AM/FM reception covering, VHF broadcast airband and AM Broadcast (MW). 30 channel memory and Keypad entry.

ICF7600DS	**£159**
ICF2001D	**£299**
ICFPRO80	**£299**
AIR-7	**£229**

A full range of accessories is also available.
Carriage free on all above Receivers (not accessories).

P.S.U.'s

NEW FROM SMC

A range of 12VDC power supplies to suit all needs. Specially manufactured to the highest quality using only the best in components and materials. With a choice of either 4, 8 or 25A continuous output (6, 10 & 35A surge handling) these P.S.U.'s are built to stand the rigours of everyday operation. Both the 8 and 25A units are fitted with overvoltage protection.

All the above power supplies are keenly priced and are available from all leading retail outlets.

		Carriage
4A	only **£19.95** inc VAT	£2.50
8A	only **£59.95** inc VAT	£3.50
25A	only **£175.00** inc VAT	£6.50

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MORSE KEYS			P&P
HK702	Straight Key	£42.95	A
HK703	Straight Key	£38.45	A
HK704	Straight Key	£26.35	A
HK705	Straight Key	£22.49	A
HK706	Straight Key	£21.80	A
HK707	Straight Key	£39.95	A
HK710	Straight Key	£39.95	A
HK808	Straight Key	£66.95	A
HK711	Key Mounting	£41.75	A
BK100	Mechanical Bug	£38.35	A
MK701	Single Lever Paddle	£38.35	A
MK702	Single Lever Paddle	£36.25	A
MK703	Squeeze Key	£34.50	A
MK705	Squeeze Key	£32.78	A
MK706	Squeeze Key	£30.48	A
HK802	de Luxe Brass Key	£109.00	B
HK803	de Luxe Brass Key	£104.50	B
HK804	de Luxe Brass Key	£101.99	B

MORSE EQUIPMENT			
KP100	Squeeze 230/13.8V	£109.25	B
Dewskay Std	Star Masterkey	£54.69	A
Dewskay M	Star Masterkey Memory	£94.99	A
D70	Morse Tutor (Datong)	£56.35	A
MMS1	Morse Tutor (M/M)	£129.95	B

MICROWAVE MODULES – RTTY EQUIPMENT			
MM2001	RTTY to Video	£188.83	B
MM1001KB	Morse Keyboard	£135.00	B

DATA TERMINALS			
PK232/FAX	Multimode Data Terminal CW, RTTY, AMTOR, FAX A = £1.75 B = £3.50	£269.95	FOC

ROTATORS

Superb engineering standards combined with pin sharp setting accuracy means new technology from the rotator company – SMC

"G-800SDX/G-1000SDX Shown"

ANTENNA ROTATORS		
AR200XL	Offset type Twist/Switch control	£38.50
G-250	Bell type, Twist/Switch control	£78.00
AR40	Bell type, Turn/Push control	£155.00
G-400RC	Bell type, 360 deg. meter	£169.00
CD45	Bell type, meter readout	£219.00
G-600RC	Bell type, 360 deg. meter	£219.00
HAM IV	Bell type meter readout	£327.00
T2X	Bell type, meter readout	£449.00
HDR300	Bell type, Digital readout	£699.00
G-800SDX	Bell type, 450 deg. var. spd	£325.00
G-1000SDX	Bell type, 450 deg. var. spd	£368.00
G-2000	Bell type Meter ± 90 deg.	£445.00
KR500	Elevation, Meter ± 90 deg.	£149.95
KR5400	Azimuth/Elev. Dual control	£279.00
KR5400A	Azimuth/Elev. Computer cont.	£339.00

ROTATOR HARDWARE		
9523	Support bearing Chan. Master	£19.95
9523/FU200	Support bearing FU200 etc	£21.95
9525	Rotary bearing Guy type	£19.95
KS050	Rotary bearing 1 ⅝" mast	£19.95
GS065	Rotary bearing 2" mast	£29.95
GC-038	Lower mast clamp G-400/600	£16.95

ROTARY CONTROL CABEL		
RC5W	5way for G-400RC etc. per/mtr	£0.48
RC6W	6 way for G-250/400 etc. per/mtr	£0.66
RC8W	8 way for CD45 etc per/mtr	£0.72

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On many regular priced items SMC offers.
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Details of eligible items available on request.
You pay no more than the RRP price!

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SAVES YOU MONEY & SERVES YOU WELL

★ 144-146MHz (Rx. option 140-170MHz)
★ 25 watts output. ("HE" model 45 watts)
★ 21 memories & 2 "call" channels.
★ Programmable Scanning & Priority channel
★ 12.5kHz & 25kHz steps.
★ Includes microphone & mobile mount.
★ Bright LCD display
★ Reverse repeater etc.

2m FM Mobile ALR-22E

£249

FREE 24HR DELIVERY U.K. MAINLAND

Designed for optimum performance combined with small size, the ALINCO ALR-22E reaches new heights in both technical performance and value for money. We've managed to keep the price down to a level that cannot be matched by any other manufacturer although we believe that a small increase will shortly be made to the price. What better time therefore, than now to purchase one of these super rigs. You won't see prices like this again! Technically it's superb and inside it looks very much like some of its more expensive competitors! Measuring only 5.5" × 6.5" it will fit into most places and if you ask, we will extend the frequency range to cover 140-170MHz on receive. We could bore you with the specification but frankly its just the same as all the others (apart from the price of course). We could tell you about all the various features it has, but again its not much different from the competition. Lets be honest, apart from being scome £100 cheaper than some of its competitors and having an extended receiver coverage, it really is like most other rigs. So if money is no object and you only want 144-146MHz coverage, you probably won't be interested in the ALR-22E. If on the other hand these things are important to you. why not send for the full colour brochure today.

★ 2M FM 144-146MHz
★ RX 137-170MHz!
★ 3 Watts output
★ Battery Saver
★ 10 memories
★ LCD Readout
★ S-meter
★ Tone Burst
★ Priority
★ 12.5KHz steps
★ 12v DC operation!

Another winner from ALINCO. A true handy transceiver with no extras to buy! Unlike its competitors, you get the nicad pack (500mAH) AC charger, and provisions for direct 12v DC charge. Measuring 168 × 61 × 30mm it's a beauty! Optional accessories include speaker-mic, mobile bracket and high power packs. Get the facts today!

DJ-100E 2M FM 137-170MHz!

NEW

IN STOCK

£219

ALD-24E 2m/70cm Dual Band FM

£449

★ 2m/70cm. Full duplex operation.
★ 25 watts FM on both bands.
★ Single antenna socket output.
★ 21 memories & 2 "call channels".
★ Programmable scanning and priority.
★ 12.5KHz & 25KHz steps.
★ Includes all hardware & microphone.
★ Bright LCD readout.
★ Reverse repeater operation.
★ 12 months warranty parts & labour.

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ALR22HE 50 watt	299.00
ALR72E 70cm mobile	299.00
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ALX2E 2m h'held	189.00
EBP3N Batt pack	28.95
EBP2N Batt pack	23.00
EDH10 DC to DC	16.95
ESC5 Case and clip	15.50
EDC2 Cigar charge cable	6.50
ELH230D11 30w Amp	75.00
ELH260D 50w Amp	119.00
DC1 DC leads for mobiles	5.95
DC2 DC lead for amps	4.50

NEW DUAL BAND HANDHELD!

The new ALINCO DJ-500E will shortly be available covering 2m & 70cm with full duplex. Features include 10 memories on each band and programmable offsets. Receive frequency can be extended from 130-169 & 420-469MHz approx. Measuring 58 × 176 × 30 mm it is pretty compact. As usual all the standard accessories are supplied at the basic price. Watch for our super opening price!

ALINCO DJ-500E 2M/70 cm

★ 2m/70cm Coverage
★ Full duplex
★ Extended Rx ranges
★ Programmable Memo
★ Scanning
★ Keyboard Entry
★ Compact size
★ No extras
★ Price? T.B.A.

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FM - AM - SSB 32 MEMORIES
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Sony Anti Active Antenna £49
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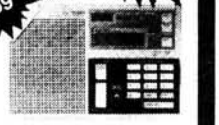
SONY ICF 7600DS
76-108MHz
NEW
£159



76-108MHz
153kHz-29.995MHz
Complete with case, mains power supply, earphone and frequency list.

KENWOOD

Kenwood RZ1 150kHz-950MHz £399
Kenwood TS140S £800
Kenwood R5000 ..... £799
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Handheld 29-54MHz, 118-174MHz, 406-470MHz, 806-956MHz inc NiCad Charger & Case.
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ACTIVE ANTENNA
50MHz to 1300MHz
Gain 17dB Typical

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Noise Figure	1dB at 50-180MHz 1.5dB below 300MHz 2.0dB below 350MHz 2.7dB below 400MHz 3.0dB below 500MHz 3.8dB below 650MHz 4-6dB below 1300MHz

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Intercept Point 3rd Order +18dbm at Input
Post £5.00 or Securicor £7.00 extra

ARA 30 ACTIVE ANTENNA
50 kHz . . . 40 MHz WITH LIMITED PERFORMANCE UP TO 100MHz

Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 1.2m long glass fibre rod. Circuit is built into waterproof 2.5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems. £129. See Review in August 1985 Issue p.35. Both antennas come complete with 7 metres of cable, interface, power supply and brackets.

£129

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ICOM R71
General Coverage Receiver
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FIRST CLASS SHORT WAVE RECEIVER. BUY THIS FOR **£825** AND RECEIVE AN ARA 30 **FREE.** WORTH **£129.**

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+ All ICOM models available. + YAESU Accessories.

YAESU

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BF480	0.85	BFW92A	1.35	MC3340P	1.85	SL6440	3.65	2N2369A	0.45
BF981	0.85	BFX89	1.15	MC3357	3.05	SL6601	2.95	2N3866	1.35
BFQ23	2.25	BFY90	1.20	MPF102	0.40	SL6700	4.45	2N4427	1.75
BFQ51	2.10	BLX65	2.50	MPS918	0.30	TDA7000	2.55	2N4921	0.70
BFR34A	1.65	BLY33	1.85	NE564	3.10	UA733	1.00	2SC1947	6.75
BFR90	1.30	J304	0.60	NE565	1.25	VN66AF	1.60	2SC2053	1.50
BFR91	1.50	J309	0.60	NE592	1.20	ZTX327	1.50	3N201	1.25
BFR94	8.75	J310	0.60	SL560	2.25	ZN414Z	1.10	3SK51	2.60
BFR96	1.75	LM3089	3.50	SL1612	4.85	ZN416E	1.65	3SK87	0.40

808 SERIES FILM TRIMMERS 1.4-5.5PF, 2-10PF, 2-22PF **25p:** 5.5-65PF **40p.**

UNITED KINGDOM TABLE OF RADIO FREQUENCY ALLOCATIONS
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An invaluable publication for all radio users. 308 pages **£12.00 (ZERO VAT)**

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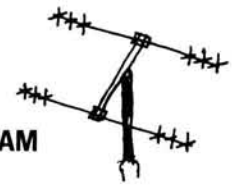

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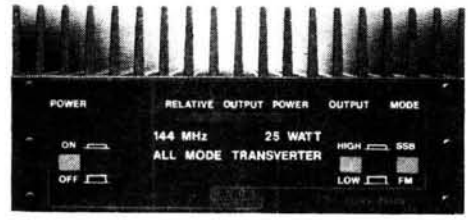

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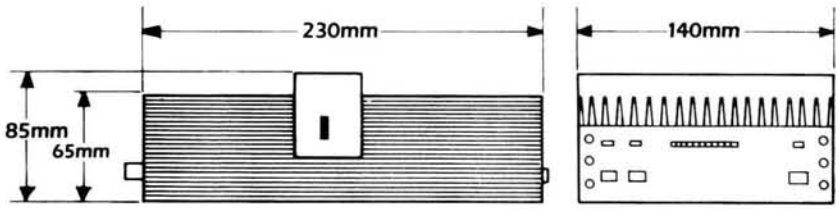

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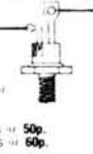

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WRITE ON... *the page where you have your say*

RSGB "YEAR"

Having read the RSGB draft proposals on the subject of "YEAR" (Youth into Electronics via Amateur Radio), I find that, interspersed between the padding and the cliches, there appear to be a few basic points the truth of which have been obvious to most amateurs for a long time. There are also several suggestions which I regard as ill-considered or impractical, or even downright dangerous.

Yes, of course we should do everything possible to introduce youngsters to our hobby **and** encourage them to stay, but I would very seriously question the necessity for any form of novice/student/easy transmitting licence. The plaintive demand for such a licence has been around, from time to time, for as long as I can remember, and has always come from those who are either bone idle and want everything handed to them on a plate or those who simply imagine that the RAE and/or Morse Test is completely beyond their abilities and should, therefore, be dispensed with. CB fulfils that requirement admirably.

I have been teaching the RAE and associated Constructional classes for many years, with considerable success as several hundred amateurs around Nottingham can testify, and feel well qualified to comment on this aspect of the discussion.

In any typical RAE class, most of the students start with no previous knowledge of the subject. Their ages range from under 14 to well past retirement and their educational backgrounds vary just as widely. They all have one thing in common — a real and determined interest in amateur radio.

Of course, as you would expect, most of those with some previous electronics training have no difficulty with the course or the exam and generally achieve very good results. The fact which the proponents of this scheme clearly do not appreciate is simply that most of those without any previous knowledge of electrical matters, never mind radio, **also** pass, first time, with many of them achieving a well-deserved reward for their hard work and keen interest in the form of a Credit or Distinction.

I see no justification for any attempt to introduce a lower standard of examination. Such easing of standards already well within reach of anyone prepared to make the effort, can only lead to the general degrading of amateur radio. Any such simplification is totally unnecessary. The further suggestion, on page 4 of the Draft, that the exam should be passable by illiterates can be regarded as horrific, incredible or hilarious depending upon one's state of mind after having read that far.

The Draft Report states that there is a "tendency to purchase and use elaborate and expensive commercial equipment." Whose fault is that? High powered (and high revenue!) advertising together with publication of mainly "high tech" articles in *Radio Communication* and other magazines must give the impression to any potential newcomer that only after having attained a degree in electronics, sold the car and taken out a second mortgage, is it possible to participate in what must appear to be a rich man's hobby. One of the more intensive advertisers has recently tried to justify the rocketing prices of his gear by comparing them

PW COMMENT

Metric vs. Imperial

LIKE MANY OF YOU, I suppose, I have mixed feelings about new technology, new laws, new customs, and so on. Whilst accepting that nothing is ever perfect, it all too often seems that things which get changed were quite all right before, whereas the things that were crying out to be torn apart, changed around and generally rehashed just get left to muddle on the way they were.

One change loathed by many people, especially among our older readers, is metrication. Years ago, the government decreed that the UK should go metric, and the changeover was begun. Then, as so often happens, our lords and masters got cold feet in the face of objections from some quarters of commerce and industry, and from some sections of the public. The result, instead of either scrapping the idea completely (difficult when large parts of the world were already using metric measure) or pressing ahead regardless, was a total mess, with some things changing and others not.

The medical profession went metric, with dosages in millilitres or grams, etc. There hasn't been a 7lb baby born in the UK for years, though there have been a good few 3175 gram ones.

The building trade went metric too, though timber suppliers seemingly thought the whole idea was just too complicated, so they invented a "metric foot" of 300mm, which they christened a Timber Unit. If you went into your local hardware store (this was in the days before d.i.y. supermarkets) and ordered a 6 foot length of timber, they would call this 6 T.U.s and saw you off a piece which was short of what you wanted by 4.8mm for every foot, in other words by 28.8mm or marginally over $1\frac{1}{8}$in on that 6ft length. Not very clever if you had wanted to use it to fix across a 6ft gap! Luckily they soon stopped this silly idea, and moved towards proper metrication, though it did take a few years more before they stopped offering you, say, 2 metres of 2 inch x 1 inch timber.

Miles of motorways and pints of beer were among those items which stayed resolutely Imperial, but lots of other industries moved part way towards metrication and then faltered for a time. Engineering was one, food another. Everyone who's studied the label on a jar of marmalade on the breakfast table will surely have it engrained in their minds that 1lb equals 454g. Knowing that, there's no excuse to get lost in conversions of small weights, provided your mental arithmetic is reasonable, or you have a calculator to hand.

When the big changeover to metric measure was first announced, we decided on *Practical Wireless* that we should go along with that change, but to make it easier for everyone to get used to the new measures, we would put the Imperial equivalent alongside each dimension. We did that for about three years, though it got pretty cumbersome in articles where there were lots of measurements quoted.

Older readers sometimes complain because we now generally used only these "new-fangled metric measurements", though we do in fact still occasionally add in Imperial equivalents where it seems to add to an understanding of the subject-matter.

The problem now is that the UK's schools went totally metric in their teaching many years ago, and anyone younger than their late twenties will probably never have been taught in feet and inches, or pounds and ounces, certainly in the senior school. I well remember my daughter, now a nurse in her mid-twenties, asking me what I meant when I said an object was about a foot long. So we can't sensibly go back to Imperial; the change has gone too far.

According to a recent newspaper report, one of the last bastions of non-metric measure, the USA, has now designated metric measurement as the official system for US trade and commerce, and all government agencies will be required to adopt it by 1992. That will leave just a few nations such as Burma and Liberia resisting metrication.

So, the days of Imperial measurements would seem to be numbered!

Geoff Arnold

with average wages today and in the 1920's. Rubbish! Try comparing the price of a TV in the 1950's, and its complexity, with today's version. In terms of the "average wage" the price has dropped very considerably. Why? Because of the general development and improvement in technology. So why is current amateur radio equipment so expensive?

Quite obviously we **must** encourage new blood into amateur radio and showing clearly that an enormous amount of inexpensive pleasure **can** be achieved from the simple, straightforward approach is an essential part of the campaign.

There are already many good and simple kits on the market. The RSGB would serve no useful purpose in getting involved in this field — if anything such involvement would probably increase the prices of the kits. Far better for the RSGB to promote **real** amateur radio through the medium of *RadCom*, and possibly by publishing a reasonably priced magazine for the down-to-earth constructor. *D-I-Y Radio* is a start, although I found the contents a bit bland and, seemingly, aimed at the 7 to 10 age group. I know this is a pilot issue but it certainly needs a bit more thought before the next one. Have a look at the G-QRP Club's *SPRAT* if you need ideas!

There is every justification in making every effort to encourage anyone (not just the youngsters) with any interest in electronics to get maximum enjoyment out of what can be a most rewarding hobby.

There is no sense, let alone justification, in degrading amateur radio by opening the doors to all and sundry. We have a reputation and a history we can be proud of. Let's keep both — not just end up as history.

Alan Lake G4DVW
Nottingham

Studying for the RAE

I read Mr Hawkings' letter (*PW* August) with interest and some sympathy, but it is up to him to take the RAE and obtain his licence.

In Clacton on Sea we suffered from a similar lack of local RAE courses. Our nearest was at Colchester, where the teaching is excellent, but the prospect of a 28 mile round trip in winter-time was not appealing.

I recommend Mr Hawkings does one of three things: 1. Join his nearest amateur radio club, often these run courses for those interested. 2. Enrol for a correspondence course, of which there are many. 3. Approach the local Evening Institute to ask if they would consider starting a course for the City and Guilds Radio Amateurs' Examination. It's a good idea to get together the names of 12 or more budding radio amateurs who wish to study for a licence, and who would be prepared to enrol on a course.

This is what we did in Claction in 1986, and I am happy to say that a 90 per cent pass rate has been achieved by candidates from the two courses run to date.

Finally, I appreciate Mr Hawkings may have considerable knowledge of wireless and radar, but does he have knowledge of the Amateur Licence regulations, bandplans, causes and cures for TVI and so on?

Sit and obtain your licence without asking for a Novice Licence; the world as a radio amateur can be yours.

T. R. Taylor G1YCT
Clacton on Sea

Morse Class

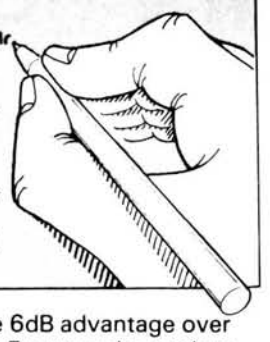
Before my husband passed his Morse test the family was subjected to Morse at every conceivable moment. It obviously rubbed off.

My 11-year-old son's headmaster was telling his class about the Morse code and wrote out the alphabet on the blackboard. When he had finished my son pointed out to him that he had put the Morse symbol for K instead of C!

L. V. Williams G1VYL
Morecambe, Lancs.

Send your letter to the Editorial Offices in Poole, the address is on our Contents page. Writer of the Star Letter each month will receive a voucher worth £10, to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.

Letters must be original, and not duplicated to other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.



In Defence of Morse

As my callsign indicates, I have been a licensed amateur operator for the last 30 years and in that time I've seen "Letters to the Editor" on most subjects. These usually serve only to allow the writer to let off steam on his own particular pet hate, whatever it may be. Until now, I have been able to resist the urge to reply to some of the more fatuous of them, since the world of the letter writers seems to bear little resemblance to the real world of amateur radio encountered on the bands. However, GM0IRZ's letter in May *PW* has finally driven me to put pen to paper in defence of c.w. operation.

We use Morse, and particularly c.w. as a means of sending it, as a means of communication because, quite simply, it is the most effective way of communicating over long distances in terms of bandwidth and power required, and of ease of communicating with operators in other, non-English speaking lands.

First, watt for watt, Eckersley, in the RSGB *Amateur Radio Operating Manual,* quotes a c.w. advantage over r.f.-clipped s.s.b. equivalent to a 20dB power gain! I leave you to figure out how big a linear amplifier has to be to give a 20dB gain on a 100W c.w. transmitter, or how many elements you need in a beam to give the same gain.

Secondly, a.m. d.s.b. speech needs a bandwidth of 6kHz for a reasonable quality transmission, whereas in 6kHz there can be, at the minimum, six c.w. contacts going on (in times of high activity, nearer sixty, I can hear the contest operators say). Incidentally, reduction in bandwidth was one of the main reasons for the change from a.m. to s.s.b. in the 'sixties, as well as the 6dB advantage over d.s.b. Everyone knew then that the d.s.b. was easy to generate, but the s.s.b. was better.

Thirdly, using c.w. and the commonly accepted abbreviations allows you to have contacts with the bloke who speaks only Serbo-Croat!

So there are three advantages to be gained from c.w. operation which surely destroy the claims that it is "antiquated, absurd, trivial, superfluous, vexatious and . . . barbaric". (And the gear is simple to build.)

Wait a minute, though. One of these might apply to some operators. Vexatious — yes, you must use skill to operate using Morse and you've got to work at it — and hereby lies the source of all the attacks on Morse operation. You've got to exert yourself to be good at it. You can't become a good Morse operator just by spending money. You've got to use your brain to learn it in the first place and to keep using your brain when you're using it. That's the bit that upsets the moaners!

Well, that's too bad. Like every other field of human activity, you get out what you put in and this is the point that should be presented to the young, impressionable newcomer to the hobby. In the particular case of Morse operation, the more you work at it, the easier it becomes and the more fun and satisfaction you get out of it.

So, there you are. I'm not knocking 'phone operation — I use it myself. All I'm saying is, c.w. operation offers tremendous returns for effort put in. So, call me if you hear me at the bottom end of 20 metres. I don't mind slowing down to 12 w.p.m. — and I do QSL! 73s.

Tom Harrison GM3NHQ
Broughty Ferry

WRITE ON

Coat-hanger Success!

I made the "Low-cost Indoor Antenna for 144MHz" (*PW* August 1988) exactly to the dimensions given and it was an immediate success. Local and semi-local stations gave reports of considerably improved signals compared with a λ/4 ground plane.

The author Fred Judd G2BCX is to be congratulated on his unique approach to development of his very successful "Slim Jim".

Roy Eldridge G3RAE
Beccles, Suffolk

Young Blood

After reading your Comment in August *PW*, it is interesting to note that Wilmslow has a decline in 10 to 14-year-old children. This is perhaps one reason why when my club, the North Cheshire Radio Club, ran one of the special 75 event calls, no younger element showed any interest.

The Club Chairman had written to 22 local schools and advertised the event in the local press, and we had one 17-year-old turn up. Not one school had the manners to reply to our Chairman. Our saving grace was a newspaper advert and CB.

The shack we put together was a late 40's Heathkit transmitter plus ancient mike and a Radiovision Commander receiver, and for more modern gear an FT-ONE, a 2m Icom, packet, RTTY and ATV. All of these were in use and plenty of middle-aged people came to see and talk, but no young ones.

We now have the nucleus of an RAE course from them; the enthusiasm shown by these people has to be seen to be believed, with all their work in copper-plate neatness!

Where did we go wrong? Do young people want ham radio or are they put off at school by all these computers?

P. W. Fryer G4SUB
Knutsford, Cheshire

Resonance

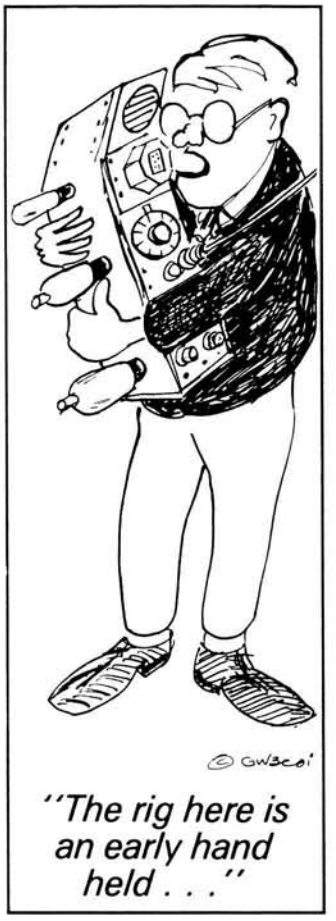
My sympathy goes out to L Hawkings ("Write On", Aug, 1988). What is the point of using that silly formula which he quotes?

All my life I have used this simple one: $f = 159/\sqrt{LC}$ where f is in MHz, L is in μH and C is in pF. These are the actual units which we use every day in our h.f. work.

The error using my formula is less than one tenth of 1 per cent—hardly significant. Remember, KISS—keep it simple, stupid!

Fred Ness GD3ESV
Douglas, IoM

Whilst I would agree that this simplified formula is great to use when you want to calculate resonant frequency, it does nothing at all to aid your understanding of what makes an LC *circuit resonate. At the stage when you are studying for the RAE, it's that understanding which is the important thing. The short cuts come later, when you're applying your knowledge to practical circuits.—Ed.*



"The rig here is an early hand held . . ."

OUR SERVICES

QUERIES

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

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
4. Write to the **Editor, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** giving a clear description of your problem.
5. Only one project per letter, please.

BACK NUMBERS AND BINDERS

Limited stocks of most issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.40 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW* are available Price £3.50 plus £1 post and packing for one binder, £2 post and packing for two or more, UK or overseas. Prices include VAT where appropriate.

CONSTRUCTION RATING

Each constructional project is given a rating, to guide readers as to its complexity:

Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

Intermediate
A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on his own.

COMPONENTS, KITS AND PCBS

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for our more recent projects are available from **CPL Electronics,** and from **FJP Kits** (see advertisements).The **printed circuit boards** are available from our **PCB SERVICE** (see page 26 of this issue).

CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** stating the county or counties you're interested in.

ORDERING

Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **PW Publishing Ltd., FREEPOST, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP,** with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders **must** be drawn on a London Clearing Bank.

Credit card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

SUBSCRIPTIONS

Subscriptions are available at £15.50 per annum to UK addresses, £18 to Europe, and £19 elsewhere (by Accelerated Surface Post). For further details, see the announcement on page 25 of this issue.

NEWS DESK ... compiled by G4LFM and G8VFH

Azden PCS-6000

The Azden PCS-6000 is a v.h.f. mobile transceiver with a difference. The basic transceiver provides 25 watts of f.m. between 144 and 146MHz, but the receive capability is 118–174MHz.

Other features include scanning modes, 20 memories, priority channel, temporary memo channel, reverse repeater, etc. Each memory channel can have a whole range of data stored in it, such as auto tone-burst, repeater shift and the like.

The transceiver should be on sale by the early autumn for something just over £300.

Waters & Stanton Electronics,
18–20 Main Road,
Hockley,
Essex SS5 4QS.
Tel: 0702 206835.

Special Event Stations

GB8AER: This station will be operational on 144MHz f.m. for the 8th Army El Alamein Reunion on October 29 from the Winter Gardens, Blackpool. The station will be situated at the top of the Opera House Stairway and they would like especially to work RSARS, RAFARS and RNARS members. ***G2DHV. QTHR.***

GB8EAR: This station will be operational on 144MHz f.m. from the Great Hall, Town Hall, Hove for the El Alamein Reunion on October 22. ***G2DHV. QTHR.***

OSCAR-13

As users of this new satellite will be aware, there is a section of the transponder which can be accessed from the 144–145MHz portion of the 2m band. This section had not been given too much publicity in the UK as AMSAT-DL (the designers) have especially requested that this section be used ONLY by Eastern bloc countries who do not have the privileges most of us in the Western world enjoy as regards the 1269MHz uplink. The 144MHz approach enables our friends in the Eastern Bloc to talk with us in the West without undue hassle, via the space bands. That in itself should be a good reason for not degrading the name of AMSAT to the rest of the amateur radio population by abusing the 144MHz section of the band which is used (in the UK at least) by mixed mode and other group operation.

There is, however, a wider issue. That of complete and future co-operation between USSR and the west in the launch of satellites for AMSAT world wide. This may not be immediate, but plans are afoot on both sides of the "curtain" to achieve this goal. Therefore we in AMSAT say, please refrain from the use of 144MHz uplink on this satellite.

Obviously there will be people who would like to put their point of view, and to this end AMSAT-UK and AMSAT-DL have been getting people to write with their views on the matter.

By this means, we hope to correct a situation to the benefit of the majority, which could have been avoided if IARU and National Radio Societies (RSGB included) had given a response to AMSAT's request for input some eighteen months ago, before the satellite was launched in June this year.

Finally, to those radio amateurs who have been the subject of QRM by the few satellite users who have used this band to date, we apologise on their behalf. However, on a check of callsigns used in the UK, from our own reports, it is certain that 90 per cent of those on this uplink are NOT AMSAT-UK members. To the others we say, please respond to the spirit of amateur radio and help us correct a situation which has arisen and which can be corrected.

Issued jointly by AMSAT-DL and AMSAT-UK.

MuTek Returns to Amateur Radio

MuTek Ltd., a highly respected name within the specialist v.h.f. community, is about to resume the manufacture of its range of amateur radio products.

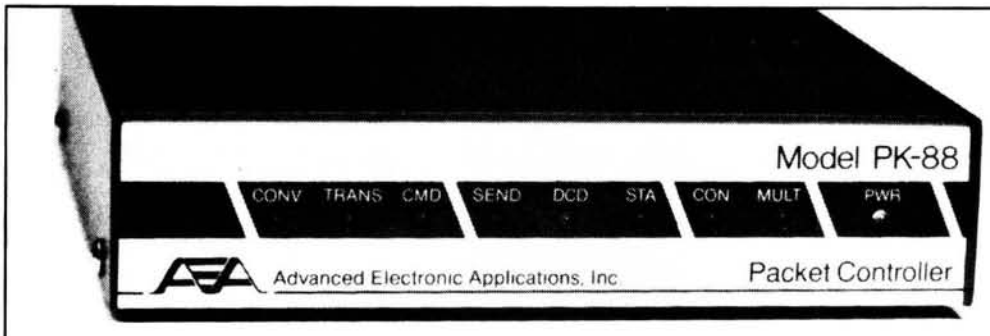
Formerly owned by Jane and Chris Bartram G4GDU, the company was founded in 1979 and grew to prominence manufacturing Chris's high performace designs. These included pre-amplifiers, transverters and filters, often employing innovative technologies.

In 1987, following the diagnosis in Jane of multiple sclerosis, Chris decided to cease manufacture and to concentrate on offering a professional radio frequency and analogue circuit design service under his own name. The designs still existed, however, and early in 1988, a keen young r.f. engineer, Mike Dorsett G6GEJ, contacted Chris with a view to resuming production.

After fairly lengthy negotiations, Mike went ahead and purchased MuTek and is engaged in putting the range back into production. As the technology has moved on over the last few years, much of the range is being up-dated by both Mike and Chris, who will also provide new designs in the future.

MuTek Ltd., will be appearing at a few rallies this year, but the major effort will be directed at re-establishing the product range.

More details about MuTek from:
Mike Dorsett G6GEJ.
Tel: 0602 729467.



Packet Radio TNC

ICS Electronics Ltd. have announced their new PK-88 packet radio controller. This is a successor to the PK-87, which is already in use at a number of UK licensed packet repeater sites.

Like its predecessor, the PK-88 permits "Host Mode" control by the driving computer. This means that the computer software can regularly poll the TNC for status information. Suitable software (also available from ICS) permits the user to see status information on the screen and enables much tigher control of the TNC by the host computer software.

Compared with the PK-87, the PK-88 is physically much smaller and is lower in cost—£109.95 inc. However, ICS says there have been no compromises made in its design. It has all the capabilities of the PK-87, as well as its own personal mailbox facility, increased RAM size and the ability to interface at either t.t.l. or RS232 voltage levels.

ICS Electronics Ltd.
PO Box 2,
Arundel,
West Sussex BN18 0NX.
Tel: 0243 65655.

Electrostatic Protection

Cirkit Distribution now market the Chiploc range of electrostatic shielding and dissipative packaging bags.

They provide protection for static sensitive semiconductor devices and assemblies. Other applications could include holders for documents in clean room areas.

There are two varieties of bags available, the ES version for electrostatic shielding and DP version for controlled static dissipation requirements. Both may be supplied in closure or non-closure formats and are fully transparent.

Both bags employ static dissipative film layers and do not require a certain minimum humidity level to provide electrostatic shielding. This means that static control is available in all seasons and in a wide range of physical environments.

Both styles of bag can be supplied in 18 sizes, with a 9mm average heat seal on the ES version and an average lip of 28mm above the zip. Further information is available from:

Cirkit Distribution Ltd.,
Park Lane,
Broxbourne,
Herts. EN10 7NQ.

Computer Club '88

Computer Club '88 on October 15 provides an opportunity for computer enthusiasts of all ages and interest to get together in Wallsall. Attractions provided will include communications, desktop publishing, computer music, computers and amateur radio, applications, games, PD software, a raffle and a bring and buy stand.

Simple refreshments will be available and there are plenty of pubs and other eating establishments within easy reach of the show.

The venue is the Blue Coat Comprehensive School, Birmingham Street, off Springhill Road, Walsall, West Midlands. Car parking is both extensive and free, the entry fee is £1 for adults, 50p for the under 16s. Doors are open from 10am to 4pm.

CALSOD

This is a software package for computer-aided loudspeaker system optimisation and design. The program runs on IBM PC/XT or compatible computers with at least 512K bytes of RAM and a graphics card.

Only a very brief description of a few features can be given here. A total of four different loudspeaker drivers can be used to simulate a loudspeaker system consisting of a maximum of seven drivers. Standard filter target functions include Butterworth, Linkwitz-Riley and constant voltage designs. It is also possible to include user defined transfer functions if required.

By using CALSOD, the speaker designer can create crossover networks in a fraction of the time it would take to go through the design and testing cycle. Also, a much more detailed analysis can be carried out at the design stage.

Audiosoft,
128 Oriel Road,
West Heidelberg 3081,
Melbourne,
Australia.

Reciprocal Licensing in NZ

The reciprocal licensing rules seem to have changed recently in New Zealand. The Reciprocal Licensing Bureau's address is:

Russ Garliek ZL3AAA,
23 Lydia Street,
Gray Mouth,
New Zealand 7801.

You may obtain an application form for the licence which is valid for 12 months; two weeks notice is needed.

A "short term" licence is also available, it's valid for 14 days and is issued without prior application, "walk in, over the counter".

The Licensing Authority is now known as the NZ Radio Frequency Service. For more details, contact the RSGB or Russ Garliek.

Six Trace 'Scope

The Hameg HM806 oscilloscope is capable of displaying signals from d.c. to 80MHz on three channels with two timebases, delay lines and trigger display.

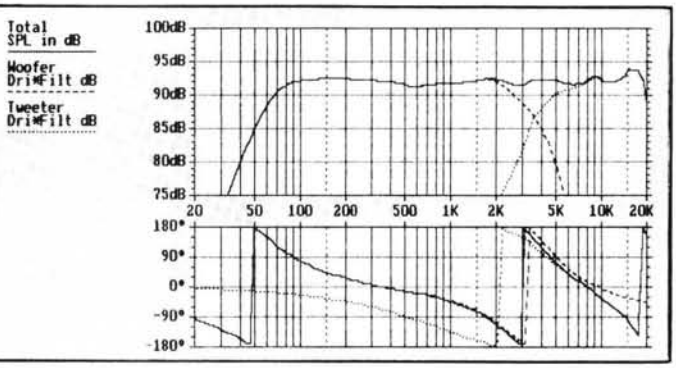
The display is an 8 x 10 division c.r.t. with internal graticule and accelerating voltage of 14kV. Maximum sensitivity is 1mV/div. Timebase A covers 2.5s–5ns/div and timebase B covers 0.2s–5ns/div, including a x10 magnification.

When operating in the alternating timebase mode, the normal signals are displayed together with expanded signals resulting in a six-trace display.

The HM806 features a separate 2nd trigger facility with independent slope and level selection. Reliable triggering of the main timebase is ensured to above 100MHz, even at small signal amplitudes of less than one division.

An active TV-sync-separator is included which substantially enhances triggering of noisy or distorted video signals. For more information, contact:

Levell Electronics Ltd.,
Moxon Street,
Barnet,
Herts. EN5 5SD.



The Mary Rose Award

The Marconi Radio & Electronics Society sponsor The Mary Rose Award, recently they have had to revise the rules:

There is no start date or termination date for this award and all bands and modes can be used. No QSLs are required but a certified check list, as per the log sheet, must be signed by two amateurs or an amateur club official.

UK and European stations must work twenty-five stations within the Hampshire and Isle of Wight boundaries. Stations outside Europe must work ten stations in the same area.

The Marconi Club HQ station is not mandatory, but extra points are available from working it. The appropriate calls are: GB2MAR and G4JMR, these count as five points if appearing once in a check list. Special event stations run by the club also count.

Should a station be fortunate enough to contact HQ under more than one call, the second HQ call will count as one point only, and a maximum of seven points can be obtained this way.

Silver endorsement stickers are available for 50 points and Gold stickers for 100 points.

The basic award costs £3.75 for European and UK stations, £5 for outside Europe. The Silver and Gold endorsements cost £1 each.

V. Scambell G3FWE
Marconi Radio &
Electronics Club
Solent View
78 Slade Road
Isle of Wight

Hand-held 1296MHz

The Icom IC-12GE is a hand-held 1296MHz f.m. transceiver. The output power of the rig is 1W, switchable to 0.1W and there is an automatic power saver which keeps the battery drain down to 20mA when no signals are received.

Even on this hand-held, there are twenty memories which not only store the frequency but the repeater information too, if any. The Programmed Scan function scans all the frequencies between two programmable edges, whereas the Memory Scan scans the memories, except the one you choose to skip.

For further details on this hand-held, contact:
Icom (UK) Ltd
Sea Street
Herne Bay
Kent CT6 8LD
Tel: 0227 363859

Radio Telex System

ICS Electronics have announced a new, low-cost error correcting radio telex system for commercial and marine applications using h.f. radio links.

The TOR-1 is built into a rugged die cast enclosure and is fully waterproof. Power consumption is less than 1 watt at 12 volts and 2 watts at 24 volts. It corresponds fully to CCIR recommendation 476-2 and operates in ARQ, FEC and SELFEC modes. Configuration information is held in non-volatile memory. The unit can also be used for AMTOR in the amateur bands.

The cost of the unit is £499.95 and for more details, contact:
ICS Electronics Ltd.
PO Box 2,
Arundel,
West Sussex BN18 0NX.
Tel: 0243 65655.

Multimeter ME4055

Solex has added the ME4055 High Performance Heavy Duty Multimeter to its range. The unit is ruggedised and sealed which makes it drop, water and grime proof. As standard the model ME4055 comes complete with a three-year warranty.

The unit incorporates many features including high accuracy d.c. voltage readings (0.1% r.d.g.), temperature testing, data hold, min/max hold, frequency testing, 40 segment bar graph display, auto or manual ranging and auto power down mode. A yellow case is provided.

Full specification and ordering details are available from:
Solex International,
95 Main Street,
Broughton Astley,
Leics. LE9 6RE.

Rally Calendar

October 18: ELHOEX 88 (Electronic Hobbies Exhibition) is being organised by The Hornsea ARC in the Floral Hall, Hornsea. There will be traders, AMTOR and Packet demos, club stands and much more there. Doors open 11am. More from: ***G4IGY. Tel: 0864 533331.***

October 23: The first privately organised Warrington Communi-Constructor Fair will be held at the Great Sankey Forum, close to junction 7 off the M62. Doors are open from 10.30am to 4pm. The event will have a strong emphasis on constructor's components, communications and computer related equipment. It's also expected that there will be a vintage radio, valve and hi-fi presence. Details from: ***Bernard. Tel: 0772 435858.***

November 5: The Eighth North Devon Radio Rally is to be held in Bradworthy Memorial Hall (near Holsworthy). Doors are open between 10.30am and 5pm. There will be the usual attractions, including a bring and buy. Talk-in will be on S22. More from: ***G8MXI. QTHR.***

November 20: The Bridgend & District ARC Rally will be held at the Bridgend Recreation Centre, Angel Street, Bridgend. Doors open 11am. There's free parking, a bring and buy, bar facilities, etc. Talk-in will be on S22. Details from: ***Mike GW6XCG. Tel: 0656 724041.***

Eureka TV

Mr Kenneth Clarke, Minister of Trade and Industry, has announced that his department will be providing £1.7 million financial support for participation by Quantel Ltd and Philips Research Laboratories in a major Eureka project to develop a high definition television system. This takes the total DTI support to UK participants in the HDTV project to £4.8 million. project to £4.8 million.

Quantel will develop a range of high definition editing and image manipulation equipment and Philips Research Laboratories will be making a major contribution to research into picture analysis and coding techniques associated with the transmission and display of high definition signals.

A major demonstration of the Eureka system will take place at the International Broadcasting Convention in Brighton in September this year. Further demonstrations will take place in 1989, with the objective of having the Eureka system adopted as a world standard by the CCIR in 1990.

Chart Recorders

Electronic Temperature Instruments Ltd. have now included Rustrak chart recorders to their range of temperature measurement instrumentation.

Rustrak strip chart recorders are available to measure both temperature and humidity. The size of the recorders make them suitable for both portable applications and control panels.

The humidity chart recorder is designed to monitor both temperature and relative humidity or air/gases. Relative humidity is defined as a percentage of water vapour present in the air/gas in relation to the saturation level that could be achieved at temperature.

The recorder samples the humidity sensor every eight seconds and prints a dot on the chart. Four seconds later, the recorder switches to the temperature channel and its sensor. The series of dots make continuous lines, the right-hand channel has a short break in its trace every 12mm of chart travelled, this provides channel identification should the traces overlap each other.

The prices for these instruments start at £199 for the basic temperature recorder. If you would like more details on the range of equipment, contact:
PO Box 81,
Worthing,
West Sussex BN13 3PW.
Tel: 0903 202151.

NEWS DESK ... compiled by G4LFM and G8VFH

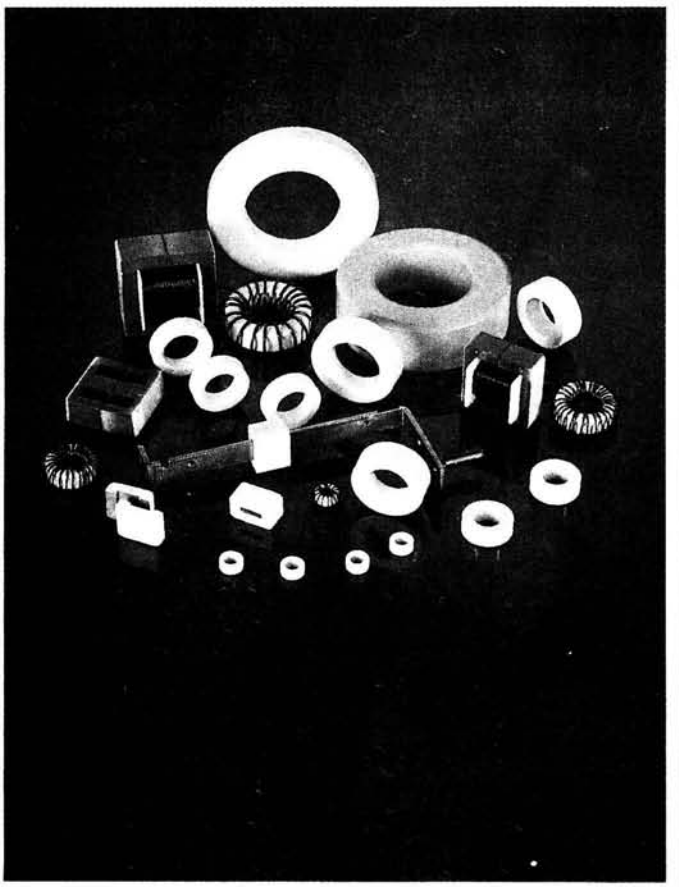
Shielded Coil Forms

Cirkit Distribution have introduced a comprehensive range of shielded coil forms manufactured by Micrometals of California. The assemblies include both an adjustable threaded core and a fixed cup to close the magnetic path.

Iron powder cores are offered as standard, with ferrite cores available for applications requiring higher inductance at lower frequencies. Winding forms may vary from series to series, with impregnated paper tube, polyester tube and nylon bobbins available. Shielding cans for electromagnetic shielding are made of copper with tin plating to ensure performance.

A thermoset plastics that will not deform at elevated temperatures is used for the plastics moulded bases and all pins are copper tin plated.

For further information, contact:
Cirkit Distribution Ltd.,
Park Lane,
Broxbourne,
Herts. EN10 7NQ.



New PK-232 Software

There are now two new software packages for the PK232 available from ICS Electronics.

Comm-Fax is a comprehensive package for the Commodore 64 computer. It allows facsimile images to be both sent and received. Received images can be shown on the screen, zoomed, justified, stored on disc or printed.

The second piece of software is a driver program for the Sinclair QL computer. Again, this is a comprehensive package, it supports all of the data modes of the PK-232. Facsimile images can be fed to a printer, but not to the screen.

ICS Electronics Ltd.
PO Box 2,
Arundel,
West Sussex BN18 0NX.
Tel: 0243 65655.

EUCW Fraternisation

The European CW Association's major event of the year takes place on November 19/20. All amateurs are welcome to join in this event, high speed/low speed, high power/low power, veteran or beginner, and there is an s.w.l. section as well.

This is not a contest in the strictest sense, although certificates are awarded to the first three stations of each class. All participants are encouraged to send in logs whether they work a few or many stations.

The idea is to encourage c.w. operators of all abilities to come on the air, to meet fellow enthusiasts in a friendly spirit, and to demonstrate that c.w. is alive and well. Out of consideration for other band users, the times and frequencies have been arranged to cause minimum interference to stations not taking part in the event.

Nov 19: 1500–1700UTC using 7.010–7.030MHz & 14.020 – 14.050MHz; 1800–2000UTC using 3.520–3.550MHz & 7.010–7.030MHz.

Nov 20: 0700–0900UTC using 3.520–3.550MHz & 7.010–7.030MHz 1000-1200UTC using 7.010–7.030MHz & 14.020–14.050MHz.

A copy of the full information sheet can be obtained by sending an s.a.e. to:
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Lincoln Century Award

This award is available to licensed amateurs and s.w.l.s. A list showing full details of the contacts made/heard should be certified by two other licensed amateurs.

All the contacts must be made from the same location, but contacts via satellites or repeaters don't count. The award can be claimed for any permitted mode and all bands may be used. Any claims for above 50MHz should be single band.

There are four classes of award E to A and contact must be made with Lincoln Cities and Counties throughout the world. Lincoln Short Wave Club stations G5FZ or G6COL count as 30 points.

Any station in the City of Lincoln, England or any other town or city in the world with the name Lincoln counts as 20 points.

Any station in the County of Lincolnshire, England or in any Lincoln County in the USA counts as 10 points.

The five stages of award require the following points value:
E = 100 points
D = 200 points
C = 300 points
B = 400 points
A = 500 points

The award costs £1.00 sterling or 5 IRCs and is available from:
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Lincoln Short Wave Club
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Yesterday's World of Technology

In this short series, F. C. Judd G2BCX takes a look back through Electricity, Magnetism and Sound in the 19th Century. In Part 1, he describes how to build your own replica Wimshurst machine.

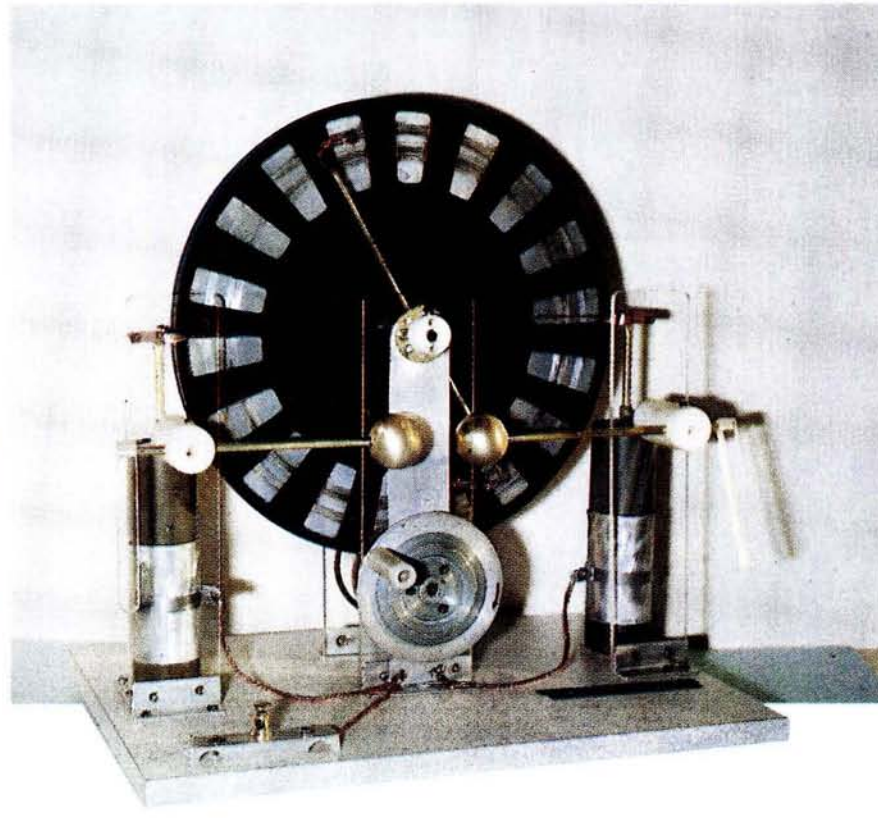
Even during the reign of Elizabeth I there was great interest in the physical properties of electricity and magnetism. In the years that followed, other physical agents (light and sound for instance) became subjects for exploration. A little before the start of the 19th Century, there began an era of experimental science resulting in an enormous number of discoveries and inventions that stemmed from the, then much wider, knowledge of physics.

Only a few of these, based on electricity, magnetism and sound can be dealt with in this short series. It can be said, however, that a great deal of modern technology in radio communication, electronics applications, sound recording and reproduction and the generation of electric power is based on that developed during the 19th century.

Long before G. Marconi designed his apparatus for "wireless" communication, systems employing electricity and magnetism were in operation for communicating over distances along wires. Examples were the electric telegraphs which included the Morse system, Wheatstone's and Cooke's single needle telegraph, numerous "dial" methods which indicated letters of the alphabet at a remote station and even one known as Cowpers Writing Telegraph—an invention that faithfully reproduced, at a distance, an exact "facsimile" of a person's handwriting.[1]

Discoveries & Inventions

As only a few of the enormous number of discoveries and inventions of this era concerned with electricity, magnetism and sound can be dealt with, numerous references are given—including the book *Ganot's Physics*. From these, the reader can obtain not only information concerned with interesting and instructive experiments, but also greater details of many other important inventions. Sufficient, in fact, for constructing working replicas of some from readily available materials and without the use of special tools. For example, the Wimshurst machine for generating static electricity as well as an Electrophorous, an Electroscope, the original Hughes microphone and Edison's first experimental phonograph have all been constructed by the author.



Electricity

Electricity is a powerful physical agent that manifests itself not only by attraction and repulsion, but also by luminous and heating effects and other phenomena. Unlike gravity, it is not inherent in bodies, but can be evoked by friction, pressure, chemical action, heat and magnetism. In the year 6BC, it was known that when amber was rubbed with silk it acquired the property of attracting materials very light in weight. This was static electricity produced by friction. It was not until nearly the end of the 16th century that a Dr Gilbert, physician to Queen Elizabeth I, showed that this phenomenon applied to other materials such as sulphur, wax, glass, etc.

The word "electric" is derived from the Greek **elektron** or Latin **electrum**, both meaning amber.

The Electrophorous

One of the most simple, but effective, producers of static electricity is the Electrophorous devised by Volta. From this device, an almost infinite number of charges could be obtained from a single initial charge. The apparatus consists of a circular brass plate attached to the under-surface of a circular piece of ebonite—this assembly being known as the "sole". Another circular brass plate, slightly smaller, has a handle of insulating material attached to its centre, see Fig. 1.1. First, a negative charge is given to the ebonite sole **and done originally by rubbing it with fur from a cat**! (Note: there's no need to skin your neighbour's cat). Nowadays, a piece of silk or better a small piece of nylon pile carpet about 50 or 75mm square can be used by anyone wishing to experiment with this device.

Static electricity charges are then collected on the free plate by placing it on the sole. This plate is then removed

and earthed to get rid of charges of negative polarity. The positive charges left on the plate are then transferred to a Leyden Jar. The process just described is repeated a number of times to increase the voltage stored by the jar. Discharging the jar results in the production of a very large spark with quite dramatic effect.

A Leyden Jar is in effect a capacitor of low value with a very high working voltage. For more details and the construction of Leyden Jars[2,3] see Figs 1.5 and 1.6. Instead of ebonite, glass or Perspex may be used for the sole and the plates made from aluminium about 1mm thick.

The Electrophorous led to the invention of numerous machines for generating static electricity by automatic repetition of this process.

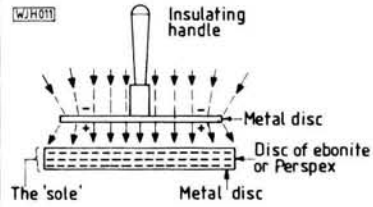


Fig. 1.1: The Electrophorous. The "sole" is about 300mm diameter and the disc with the handle slightly smaller

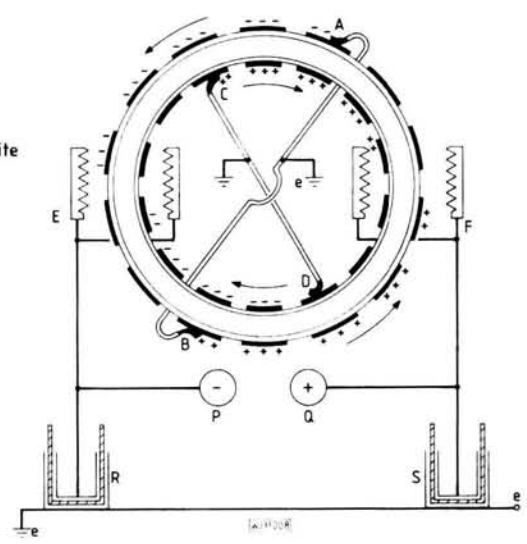


Fig. 1.2: Schematic diagram of a Wimshurst Machine, rearranged so that the rotating discs are represented as cylinders

Machines to Generate Static Electricity

Numerous machines for generating static electricity were produced from about the year 1740 onwards. The first was invented by Otto Von Guericke and most employed rotating glass discs or cylinders and friction pads. One discovery, made quite by accident, was due to a workman placing one hand in a jet of steam from a boiler whilst the other was touching an earthed metal part of the engine. In the words of Ganot, "he was astonished at receiving a smart shock". What became known as Armstrong's Hydro-electric machine was developed from this occurrence.

Holtz's electrical machine employed an induction method. Used in conjunction with two Leyden Jars, it could produce sparks 150 to 180mm long![1] A relatively modern development of static electricity generation is by means of the Van de Graaff machine that can generate extremely high voltages and discharge sparks at great length. It is also used for accelerating charged particles of atomic magnitudes, e.g. protons, to high energies.

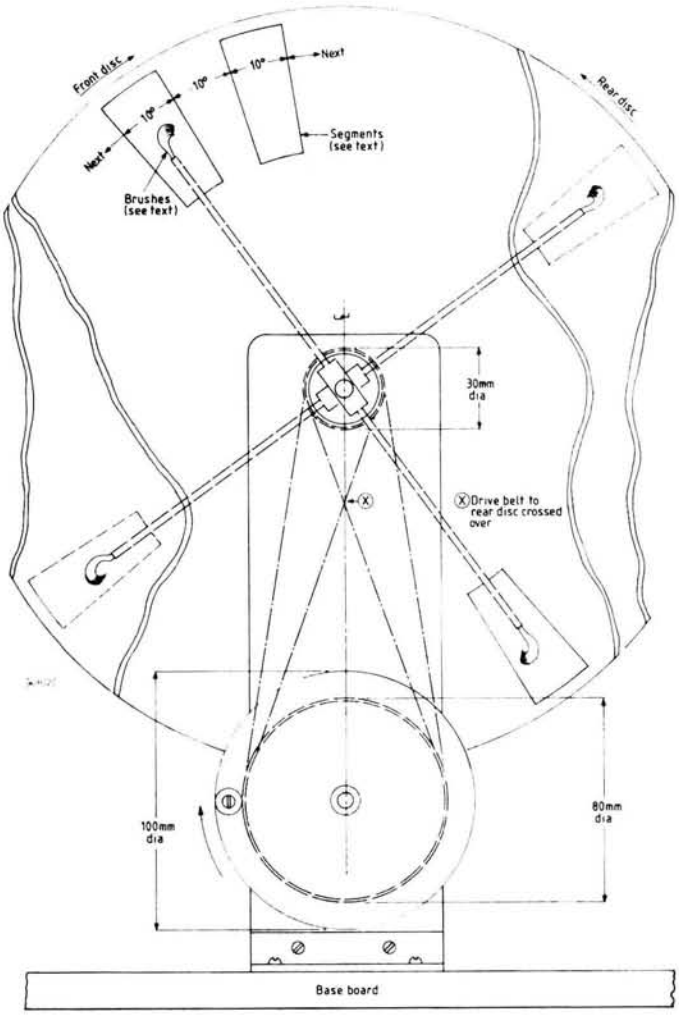


Fig. 1.3: Arrangement of the discs, segments and drive system of the Wimshurst Machine constructed by the author

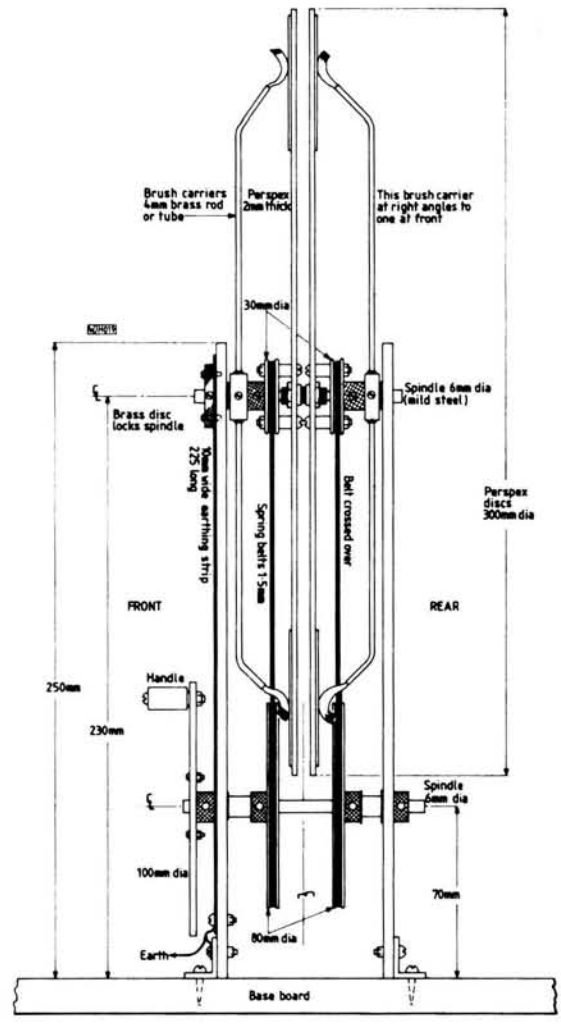


Fig. 1.4: The side view showing the assembly of the discs, supports, drive pulleys, brush supports and brushes

The Wimshurst Machine

This was probably the most popular and may be found today in university and school physics laboratories. It is also called the Wimshurst "influence" machine.[2,3] The replica constructed by the author functions very efficiently. In very dry conditions, a spark about 35mm long can be obtained between the discharge spheres. Whilst the current is low, 1 microamp or less, the voltage is very, very high! Perhaps 60000 volts, or more. **These are not "toys" to be played with carelessly.**

The following is a brief description of the construction and function of the machine invented by James Wimshurst (UK) in 1882. The main components are two circular glass discs (varnished with shellac) around which are placed eighteen or more, equally spaced, metal foil strips. The two discs are mounted close together, back to back, on a common horizontal spindle and rotated in **opposite** directions. The way in which the machine functions is best explained with the aid of Fig. 1.2. Here, the discs are shown as vertical cylinders. Like the discs, these would be rotating in opposite directions.

At "A" and "B" are wire brushes which simultaneously touch two, diametrically-opposed, segments on one disc. The brushes are connected together by an earthed conducting rod. At this moment, charges of opposite polarity on the segments of the other disc are passing so that the segment at "A" will receive a negative charge and that at "B" a positive charge. These charges are eventually given up, the negative to the collector at "E" and the positive to the collector at "F". Before arriving at the collectors, they play a similar part to the segments passing the brushes "C" and "D", giving those in contact with "C" a positive charge and those at "D" a negative charge. For more detailed information, readers should look up reference 3.

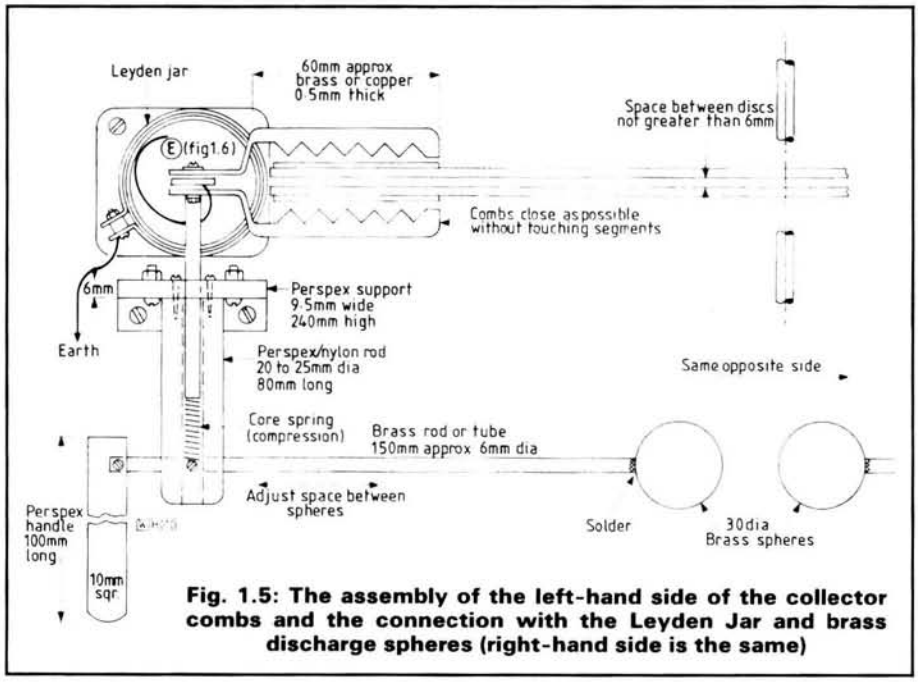


Fig. 1.5: The assembly of the left-hand side of the collector combs and the connection with the Leyden Jar and brass discharge spheres (right-hand side is the same)

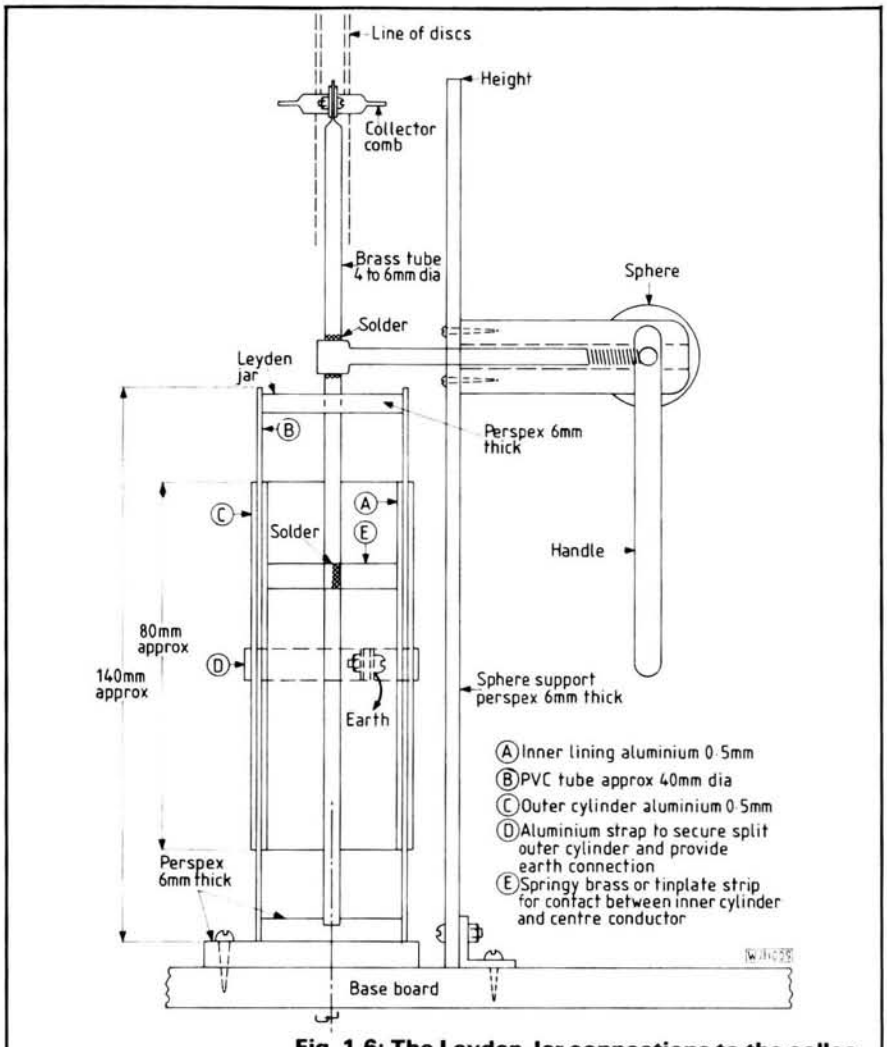


Fig. 1.6: The Leyden Jar connections to the collector comb and discharge sphere. The base of the Leyden Jar is secured to the Perspex block beneath with Araldite

The two discharge spheres "P" and "Q" are connected to the collectors. When the difference in potential between them rises sufficiently, due to the accumulation of charges of opposite polarity, a spark discharge will take place. However, most Wimshurst machines are fitted with Leyden Jars, "R" and "S", one being connected to each collector. Their function is to provide a capacitance so that a higher voltage is produced at the spheres "P" and "Q". The result is a much more violent discharge with a longer spark. That's why the distance between the spheres is made adjustable.

Working Replicas

The diagrams in Figs. 1.3 to 1.6 provide general details and dimensions of the machine the author made. The two rotating discs may be of Perspex and about 300mm diameter and 2–3mm thick. Most Perspex retailers will cut the discs for the cost of the material and an extra cutting charge.

The replica has 18 thin aluminium segments on each disc, spaced at 10 degrees and secured with Araldite. The main supports, the four pulleys and other items, as indicated on the diagrams, are made from Perspex 6mm thick. The solid brass spheres, intended for use as cupboard door knobs, can be obtained from most d.i.y. suppliers. The base board is Melamine covered chipboard about 400 × 300mm, with four rubber feet underneath. Small diameter brass tubing, 4,

5 and 6mm, can be obtained from dealers specialising in model making supplies. The brushes are short lengths of copper braiding from thin coaxial cable.

Ideally, the Leyden Jars should be small glass jars of about 40 to 50mm internal diameter and 140 to 150mm high, although these can be pvc tubes of a similar diameter and height, blocked each end with tight-fitting Perspex discs, 6mm thick. See Figs. 1.5 and 1.6 for details.

Operation

Run the machine in a warm, dry room and set the spheres about 10mm apart to start with. Check in darkness for stray leakage, e.g. sparks jumping across outside the Leyden Jars. The distance between the spheres may be gradually increased for a longer spark, but this will be limited by attainable charges in the Leyden Jars, insulation leakage and humidity of the room.

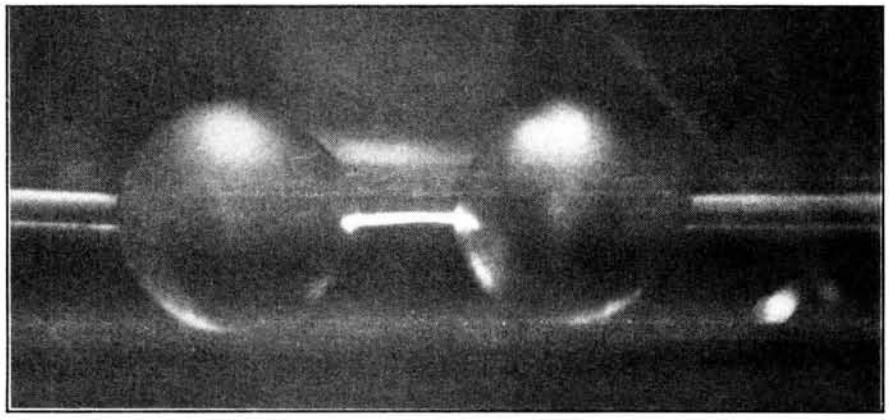


Fig. 1.7: The spark produced with the replica Wimshurst Machine. With dry conditions, discharge sparks up to 40mm long were obtained

WARNING: Always short-circuit the spheres and so discharge the Leyden Jars before touching any conducting part of the machine. A photograph of a spark from the replica machine, constructed by the author, is shown in Fig. 1.7.

Next month, we'll look at dynamic electricity, the Electroscope and sound —amongst other topics.

References

(1) *Elementary Treatise. Ganot's Physics.* 10th Edition. (Edition 15 is best.) Originally published as *Ganot's Elements de Physique.* First English edition published 1881 by Longmans, Green and Co. London. Copies can be obtained by local libraries from The British Lending Library, Boston Spa, Yorkshire.

(2) *Text Book of Physics* by J. Duncan and S. C. Starling. Part 5 Magnetism and Electricity. Published by Macmillan & Co., London. (1922).

(3) *A Texbook of Physics* by E. Grimsel. Publisher not known. Extracts on Wimshurst Machine obtained from the Institution of Electrical Engineers, London.

(4) *Electronics Inventions and Discoveries* by G. W. A. Dummer. Published by Pergamon Press, London. Available from libraries only.

(5) *A History of the Marconi Co. (Part 1)* by W. J. Baker. Published by Methuen & Co. (1970). Copies available from the Marconi Co., St Mary's House, Victoria Road, Chelmsford, Essex CM1 1NY (Price £8.75). Also available at libraries.

Feature

Haven't You Got An Ohm To Go To?

Phil Williams G3YPQ remembers something written in the pages of PW *over a year ago that sparked off this train of thought. "The unit of conductance was at one time called the MHO, although this was later renamed the SIEMENS."* Practical Wireless *March 1987.*

Now I am sure Mr Siemens deserves recognition for his contribution to the foundations of electronics, but there are those of us who absent-mindedly lapse into megacycles, or could still be heard referring to condensers, who might miss the old mho. There was something rather appropriate about the mho being an ohm backwards as the unit of conductance. Mind you, after many years in the electronics industry I can't say I have actually had occasion to use it, nevertheless its nice to know it was there. Rather like 4 metres, I suppose.

So, purely for nostalgic reasons, next time I stumble across a 2Ω resistor, I am going to stick it on a card and pin it to the shack wall with the title "Half a mho".

Let's take the argument a little further. If the mho was the ohm backwards and the reciprocal of resistance, then the unit of resistance is the reciprocal of the **siemens** or the **snemies.** You might therefore encounter a circuit having a collector resistor of 39 kilosnemies and an emitter resistor of a thousand snemies de-coupled by a capacitor of 270 microfarads—or megadarafs.

Most of us, I suspect, would be rather honoured should our names be committed to perpetuity by giving a reference to some variable or other. I mean, no doubt there are descendants of Monsieur Ampère who are reminded almost daily of their forefather, or 4000 millifathers. And I bet they are jolly grateful too, otherwise great grandchildren Evette and Gaston Ampère would have to go through life as Evette and Gaston Voltsperohm.

The same, of course, happened with the unit of inductance named after Lenny Henry's grandad Henry Henry and his wife Millie Henry. Just as well really, imagine the introduction at the London Palladium (or the London Atomic Weight 46) . . .

"Tonight, ladies and gentlemen, we present the multi-talented comedian and impressionist, star of *Three of a Kind*, Lenny Rate of Change of Current through a Conductor of One Amp per Second."

Doesn't quite have the same ring, does it—inductors do ring, of course, oscillate even.

Yes, it must be nice to have a unit named after you. The floppy disk, of course, remembers Dr Samuel Floppy, the first person to repeatedly manage to crash an abacus; all the little Algos resulting from Mr and Mrs Algo—discoverers of the Algo-Rhythm; and I expect Mrs Richter feels a bit special every time the earth moves.

Now, before this gets completely out-of-hand, consider the following . . .

The QRM on an 80m frequency after dark can be measured on an open-ended scale of **printers,** and a sked frequency automatically increases the number of printers by a factor of 3. So an evening 80m frequency can easily have a QRM value of 2 printers or in the case of a sked frequency, 6 printers. Incidentally, as we all know, attempting to reduce the value of printers by switching to upper sideband adds one to its original value. A **zero printer** frequency is, of course, one of those purely theoretical values which is only encountered in classrooms and shacks with "modified" CR100 receivers, except in the latter case where you can't hear anything else either.

The printer immortalises its founder Sir Telly Printer, half-brother to Telly Savalas who, after pioneering late night skeds on 80m, was forced to tear off his headphones in anguish so often that he too is as bald as a football.

As for myself, I should like to propose the introduction of the **phil,** or more accurately the **phil ratio.** This is defined as, "the ratio of drivel to intelligence generated by radio data". This can be applied with equal validity to VDU Scribble and the amount of time spent in achieving such scribble.

For example, you hear a RTTY station and by the time you actually tune it in, you get something like this . . .

"XY2% DR = WWWWWWWWW WWWW /??? SSS R5 %%. ZDKEUT BIBI FOR NOW KKK."

This has a phil ratio of about 4 to 1 and is actually not bad.

Packet radio is supposed to be completely error-free, so you would think it should have a phil ratio of 1:1. But, if you look at the average screenful of a busy 144.650 or 14.101MHz, there's not much that you could accurately describe as intelligence, is there?

Packet radio is in reality a system which selects random samples from the left-hand column of the callbook and tries to match the selections with other TNCs doing the same. You see the ROMs in a TNC contain a copy of the callbook and when you go "VHF OFF" it switches in an international section. The system has cloned itself from ERNIE, the premium bond machine, and the end result is a screenful of meaningless callsigns, one line of text saying, "The link is rather slow >>>>" and a phil ratio approaching infinity.

So there we are, you might say that this article has a high phil ratio, but it was meant to entertain and not inform. So if you believe any of the previous, beware of being described as "Thick as two short Quantum Theory Constants"! **PW**

ERRORS & UPDATES

A Constructor's Shack Test Gear, October 1988

Apologies to P. Newton, who wrote the article, for having wrongly credited his work to E. P. Essery on our Contents page.

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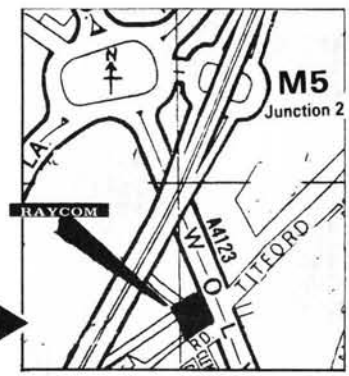

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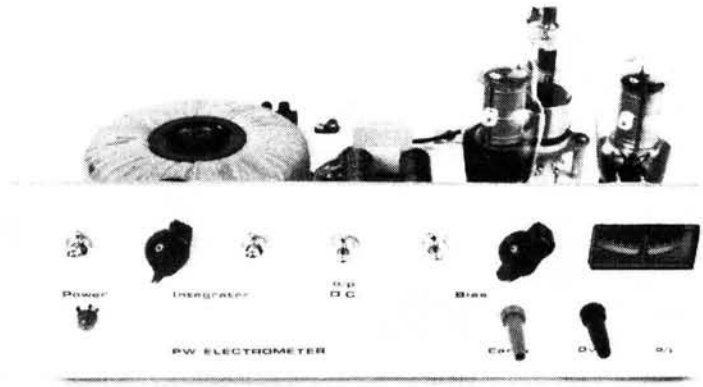
Practical Antenna Electrometer

Most people regard atmospheric static as an unavoidable nuisance, few have ever thought of this effect as a useful weather forecasting aid or even a means of monitoring ionospheric conditions. Tony Hopwood is one of these few enlightened people, and in order to monitor this natural phenomenon he has produced the instrument described here.

Static is a fact of life for radio enthusiasts. Not only does the background fizz and crackle of a storm blanket DX reception, but it can become a real hazard when an antenna takes a kilovolt charge from a passing thunderstorm, or unusual atmospheric conditions.

A well-insulated wire antenna is an efficient collector of the atmospheric electric charge, and monitoring that charge gives a fascinating and accurate insight into present and future local weather conditions.

Because the atmospheric electrical field has a fair-weather source impedance of over 10TΩ (a Teraohm is 10^{12} ohms) it can only be monitored by a high input impedance device. It is easy to build a portable and sensitive low voltage electrometer using m.o.s.f.e.t.s, but unless a stable gigohm input bias resistor is used, the instrument will only show relative field measurements, and may overload when the antenna takes a charge of more than a few volts.



Practical Design

A practical antenna electrometer must have a high input impedance and be able to follow an input that can swing hundreds of volts positive or negative with respect to earth. It must also read accurately and be immune to damaging transients from nearby lightning strikes.

A single triode valve operated in cathode-follower mode, hung between stabilised positive and negative h.t. (high tension) rails will do all this, as well as providing a self-calibrating readout of most atmospheric conditions.

The circuit as shown Fig. 1 is very simple and uses three valves, one triode and two stabiliser tubes. The author's choice of valve was a 6Q7GT type, mainly because it is still available new,

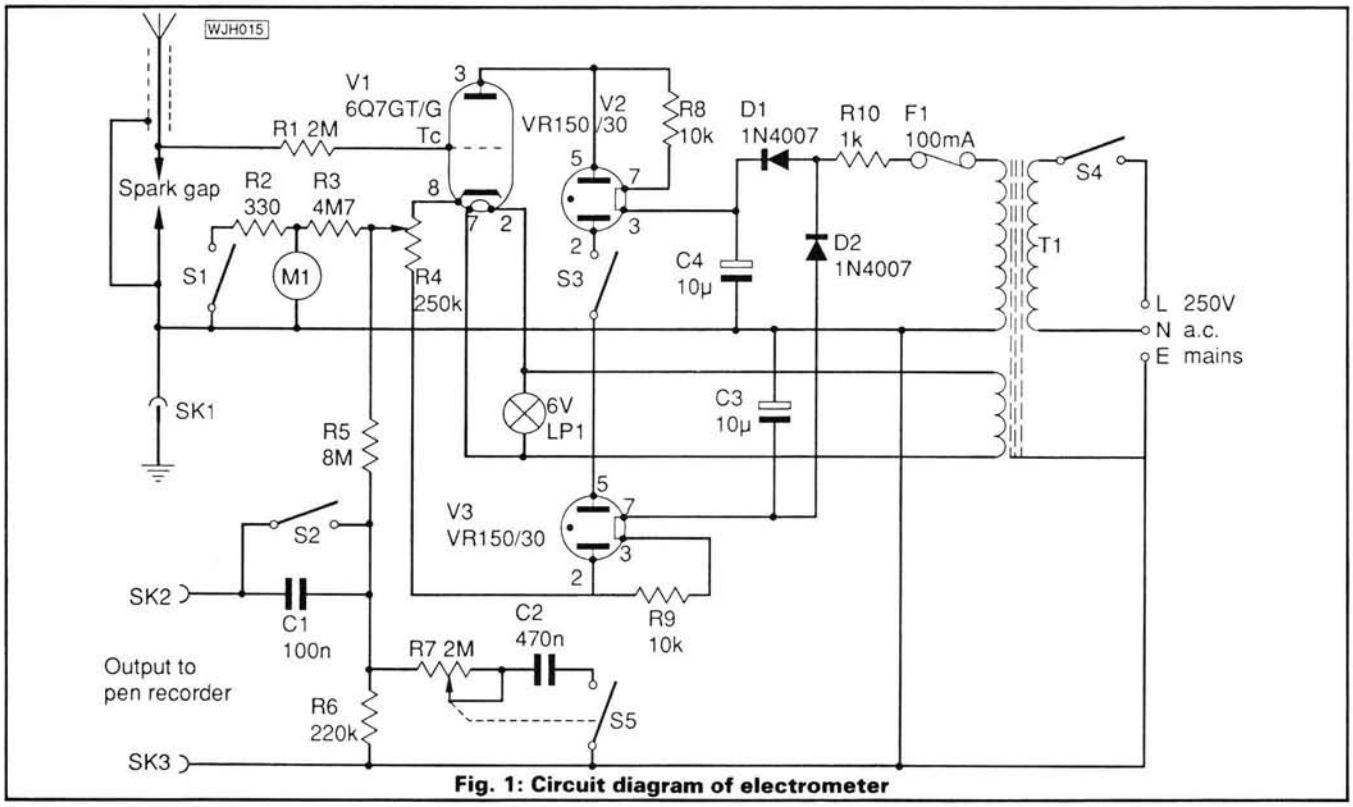


Fig. 1: Circuit diagram of electrometer

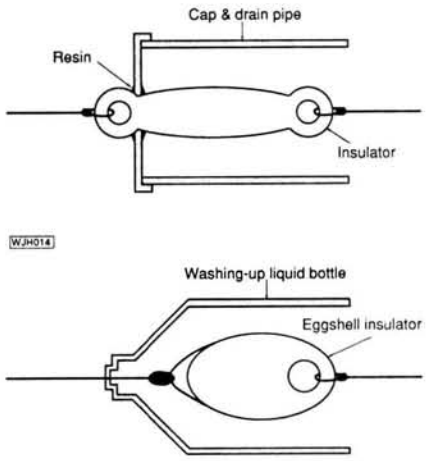
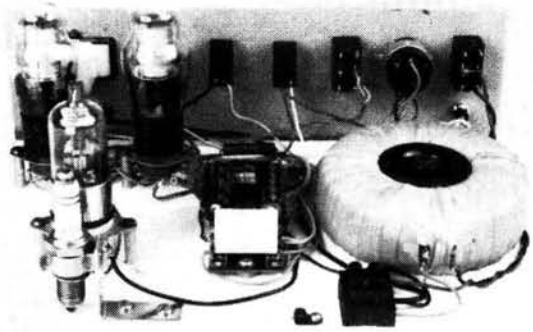


Fig. 2: Insulators with d.i.y. rain guards. Note that a higher insulation factor can be gained by adding further insulators



plus it has a top cap grid connection making it easy to maintain a high input impedance. However, any indirectly heated, top cap grid triode or triode strapped pentode would serve.

Transformer T1 has two secondary windings, a 250V which supplies the h.t. and a 6.3V used to power the heater of V1. Two silicon diodes D1 and D2 are connected as half-wave rectifiers across the h.t. winding of T1, providing both positive and negative rails. Two gas-filled stabilisers, V2 and V3 (VR150/30), are fed from the two half-wave rectifier networks, D1/C4 and D2/C3, providing 150V positive and negative supply rails. A stabilised supply is not essential, but does improve the small-signal sensitivity and accuracy.

Other power supply arrangements could be tried if a surplus transformer is to hand, such as the type that can be salvaged from an old valved radio. These generally have a 300-0-300V h.t. winding plus one or two heater windings. This higher h.t. voltage is permissible provided the heater-cathode insulation of the valve used is adequate and the heater circuit is left floating. A 300-0-300V supply is about the maximum that most ordinary valves and bases will take without the risk of insulation failure. In addition, with more than 600V across the valve, the small-signal background noise level will rise due to supply variations and the internal leakage of the valve.

The valve is wired with a cathode load resistor chosen to set the current at full positive input of 1-2mA. The cathode voltage, and hence the antenna charge, is read by a centre-zero microammeter arranged as a voltmeter, scaled to suit the power supply voltage. The author used a 250kΩ potentiometer as the cathode resistor so that zero could be set with the grid of V1 earthed. Switch S1 is used to select the 200V range resistor R3, by disconnecting the 20V range shunt resistor R2.

Switch S3 is included to give the instrument the option of an extra high voltage range. Another worthwhile refinement was to provide an output attenuator giving a 5V p/p signal for driving a pen recorder. The attenuator also includes an additional variable *CR* damping or integrating circuit for trace averaging, as well as a switched series capacitor to give an a.c. output signal for lightning transient recording.

Construction and Components

Both the instruments made by *PW*, and the author's prototype were constructed using the old bread-boarding technique. There are two good reasons for this, the first being that the design, as it stands, might be termed as a semi-experimental instrument. The shape and form of the instrument will depend on each individual's requirements and component sources. The second reason for the rather exposed layout is partly due to the sensitivity of the instrument being disturbed by earth loops. This means that the use of a metal case is rather difficult and the use of a plastics or a wooden case is not advisable due to their potential fire risk.

Good quality new components for use in valved equipment are rather difficult to come by, particularly high voltage working electrolytic capacitors. However, there is plenty of leeway, within reasonable limits, on most of the values of capacitors and even resistors, but the component working voltages must be adhered to. A good source of these components may be your local radio and TV repair shop, they do still exist! All of the valves used are still available from a number of component suppliers, a short list of which appear in the "Buying Guide".

The centre-zero meter used in the *PW* prototype is not as sensitive as that used in the author's original, the choice being limited by availability and price of components. The 50-0-50μA originally used often went full scale, so it shows there is some room for improvement. The values of resistance shown will support most moving coil meters up to 250μA f.s.d. If after a period of use with a less sensitive meter it seems the usable scale is rather small, try experimenting with the values of R3 and R4.

Installation

When the readout is by moving coil meter and a servo-pen recorder with a sharp frequency cut-off above 10Hz, the induced 50Hz mains wave riding on the antenna is integrated to zero and ignored, although it may be many volts peak to peak. This "invisible" waveform will cause problems if the output is measured by d.v.m. or any instrument using switched sampling, and will have to be removed by additional signal conditioning, particularly if the electrometer output is to be recorded on computer.

A cathode follower valve has ideal characteristics for electrical field monitoring. Although the normal "fair-weather" field potential is some +100V/m from earth, the source impedance is so high that a 15m long antenna 8m above ground gives a cathode follower d.c. output signal of less than 10V positive, from a true ionic potential of nearly 1kV. This inherent signal compression is useful, as the study of electric field is more concerned with change rather than actual potential. However, the equipment is still sensitive enough to permit the recording of small field changes as well as the more dramatic events associated with convective cloud building, thunderstorms and solar flares.

Antenna

Although an ordinary well-insulated wire antenna works well in dry weather, sensitivity falls dramatically when it gets wet. This is no bad thing in thunderstorms, but if true all-weather insulation is wanted, then additional insulators designed to preserve a dry

surface must be used. One simple method is to provide a rain hood made from either plastics drain pipe with the insulator secured with resin up inside the tube, or to use the top half of a washing-up liquid bottle to shield the insulator (Fig. 2). Lastly, experience showed that the readings were less prone to variations caused by bodily movement near the instrument, if the antenna was brought into the shack via good quality coaxial cable (UR67).

Lightning Spikes

Although the valve will tolerate high voltage lightning spikes, the antenna can still take a charge of several kV, so some precautions are advisable. It is a moot point whether it is safer to earth an antenna during a storm, or to fit a spark gap to earth it where the system enters the building. (*On the* PW *prototype a small stand-off insulator was not available to terminate the antenna to R1, so a new, but surplus, petrol engine spark plug was used. It was mounted on the base-board by a Terry clip bolted to a right-angle bracket. If the spark plug's outer metal case is earthed through the clip, it will serve not only as a cheap stand-off insulator but also double as a spark-gap.—Ed.*) Lightning tends to strike the highest earthed object, and earthing the antenna may turn it into a more attractive target than nearby trees, power lines or TV antennas.

If lightning does strike, anything connected to outdoor wiring is at risk, no matter how remotely connected, including radios, TVs and phones. Even if it appears to be a relatively poor path to earth it will be at risk. Remember the most likely outcome of a lightning strike is fire, fortunately this type of thing doesn't happen all that often, but be sure to keep clear of the antenna when the sparks start to fly!

As a point of safety it may be wise not to rely just on the mains earth to ground the 0V line of the instrument, a second local earth should be provided if possible, by some stout wire and an earthing spike driven into moist ground.

Results and Research

The fact is, if you shut down the station while the storm is overhead, you will not miss much, because the field variations will be way beyond the range of the instrument. I find the most interesting recordings come from approaching and receding storms, where the field changes are attenuated by distance and become more readable. Individual lightning strokes can be recorded up to 80km away, and changes in amplitude and frequency give excellent early warning of an approaching storm. It is also possible to detect whether an approaching squall contains lightning, and by its decreasing stroke frequency, to see when lightning activity ceases in a dying storm.

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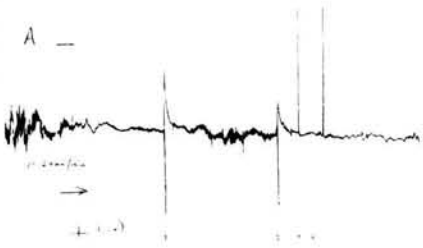

Fig. 3

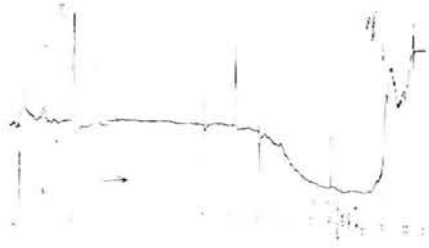

Fig. 4

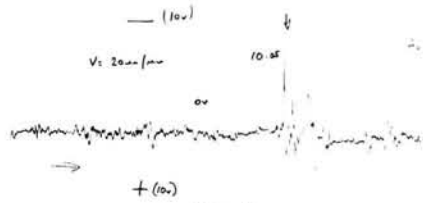

Fig. 5

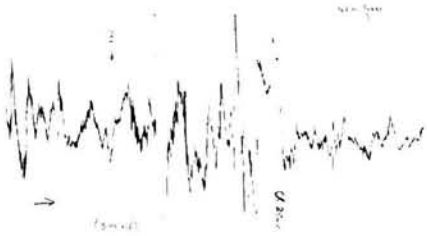

Fig. 6

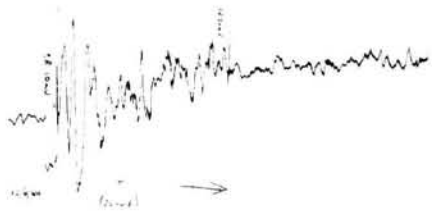

Fig. 7

Fig. 3: Trace from author's electrometer shows two thunderstorm centres. Strikes 1 and 2 are about 24/32km away and show distances affect overshoot, while 3 and 4 are about 16km away and are of an unusual negative polarity. The spikes are clipped at 25V, although they peak at well over 100V

Fig. 4: Trace shows the passing of a positive charge centre overhead accompanied by heavily attenuated lightning spikes. The trace shows the characteristic voltage swing which often accompanies the onset of rain. Again the change is unusual, being from 250V positive to 250V negative in less than a second as a cloudburst started

Fig. 5: Trace shows smoke effect on a typical summer morning trace, the background being about 4V positive

Fig. 6: Trace showing Perseid meteor shower on the morning of August 12, the f.s.d. being 250mV, and shows a nice shower around 0735 hours. Meteor contacts with the atmosphere show a very definite pos/neg pulse almost sinusoidal in nature. The very large off-scale pulses are caused by low flying aircraft, which as you can see, carry a large static potential

Fig. 7: This trace is thought to have been caused by a small earthquake in California!

Caution: This project has a mains voltage connection and every effort must be made to insulate all live joints on the mains switch and primary of the transformer by means of sleeving. It is also recommended that the mains plug be fitted with a 2A fuse. In addition to the hazard that the mains potential represents, all reasonable precautions must be taken to limit access to circuitry within the project that carries high voltage d.c. and a.c. potentials.

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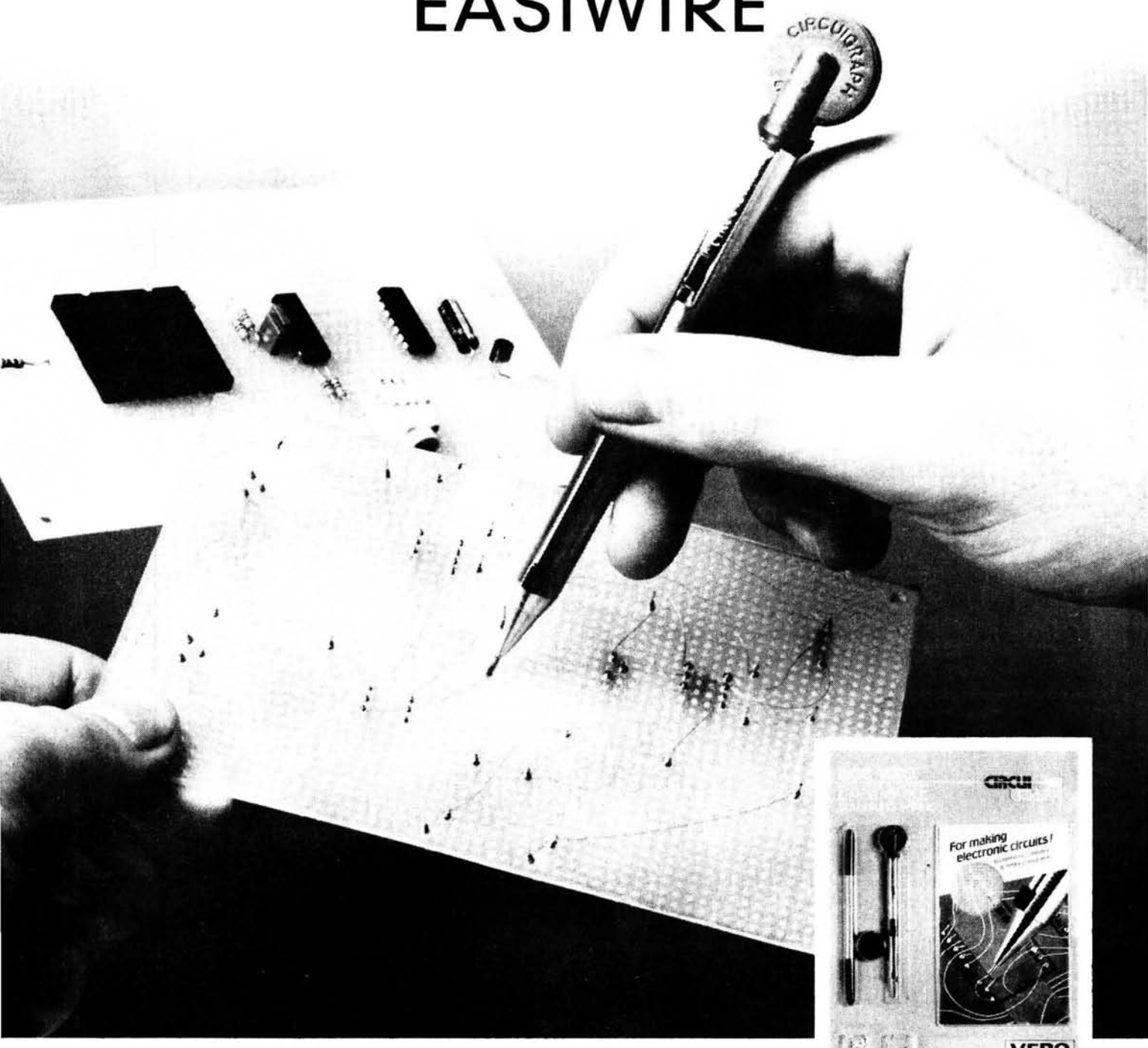

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Results

Certificate Winners

Overall Winners	The Hillbillies	GW4APA/P
Runner-up, leading single operator, leading English station and single-antenna stn.	Michael J. Ryder	G0CDA/P
3rd place	Hillingdon Amateur Radio Club	G1HIL/P
Runner-up single operator	Lee Parrott	G0AMU/P
3rd placed single op.	Chris Partington	G0CLP/P
Leading fixed station	Tony Wyn Jones & Tom Jones	GW4VEQ
Leading Scottish station	Galloway Contest Group	GM0CLN/P
Leading Irish station	Paddy Devine & others	EI9FY/P

The sixth *PW* QRP contest took place on June 12 and, as usual, attracted a high level of low power operation to the 144MHz band. Entries from 120 stations have been received, and this year there are a few changes at the top of the results table. The winners this year are **The Hillbillies,** operating under the callsign **GW4APA/P**, comprising Tony Ashcombe G4APA, Bob Harrison G4UJS, Martin Platt G4XUM and Don Stoker G1GEY. From the top of Esclusham Mountain in NE Wales, they achieved an impressive lead, aided by their remarkable 104-element antenna array; four 17-element and four 9-element Yagis.

In last year's contest, **Michael Ryder G0CDA/P** set a new record by reaching 4th place, the highest position ever achieved by a single operator. This year he has not only broken that record but really excelled himself: leading the 58 single operator entrants, he reached 2nd place overall. But that's not all—his station also becomes the leading English station, and gets the title of the leading station using a single antenna (an 11-element Yagi). A quite remarkable performance!

Another record has been broken by the leading fixed station, **GW4VEQ** operated by **Tony Wyn Jones** and **Tom Jones.** At 7th place overall, this is the highest position ever achieved by a fixed station. Tony's newly acquired site on Anglesey certainly has a good take-off, allowing him to work 35 squares despite being only 35 metres above sea level, demonstrating the fact that there's more to a good site than height.

Results of the two leading Scottish stations were very close, and only after careful checking of the logs did the **Galloway Contest Group GM0CLN/P** emerge a whisker ahead to gain the Tennamast Trophy from last year's holders, GM4CAA/P. Amongst the entries from EI/GI, the leader was **Paddy Devine EI9FY/P.**

All the leaders mentioned above are certificate winners, as are the 3rd placed group overall, **G1HIL/P,** and the 2nd and 3rd single operators, **G0AMU/P** and **G0CLP/P** (see panel). Certificates also go to the leading stations in each locator square (see list), even if there is little or no competition in the square. We all appreciate the efforts of those in the outlying areas for activating the rarer squares.

Details of the top few single and multi-operator stations are included here, and a summary of the positions of all 120 entrants. The full detailed results list will be sent to all who supplied a stamped addressed envelope with their entries; anyone else requiring a copy should send a large s.a.e. to the Poole offices. I also intend to distribute the list via the packet radio bulletin board network shortly after this issue is published. Look out on your local BBS for a bulletin from G4HLX titled "QRP Contest Results" (use the command L< G4HLX to find it).

Leading Multi-Operator Stations

Pos.	Name	Callsign	Score	QSOs	Squares	Location	Antenna	a.s.l. (m)	TX/RX
1	The Hillbillies	GW4APA/P	15428	406	38	IO83KB	4 × 17Y +4 × 9Y	450	FT-101ZD +μTek TV
3	Hillingdon Amateur Radio Club	G1IHIL/P	9139	247	37	IO91OQ	4 × 17Y	190	FT-726R
4	Mansfield ARS Club Group	G3GQC/P	6608	236	28	IO93EC	2 × 17Y	380	IC-251E
5	Worthing & District ARC	G1WOR/P	6210	230	27	IO90TV	2 × 16Y	220	FT-290R
6	Wulfrun Contest Group B	G1WPF/P	6120	204	30	IO91SW	2 × 8Y	160	IC-202S
7	Tony Wyn Jones & Tom Jones	GW4VEQ	5180	148	35	IO73SG	4 × 8Q	35	TR-751E
8	David Wright & others	G8EQD/P	5122	197	26	IO93FK	2 × 15Y	395	FT-290R
9	Neil Underwood & Martyn Wright	G4LDR/P	5100	204	25	IO80WX	14Y	275	IC-275E
10	Allstars Contest Group	G0FEH/P	5044	194	26	IO93GC	8Y	275	IC-275E
12	R. Thornley & S. Maher	G1NUS/P	4664	212	22	IO83XD	2 × 9Y	350	FT-290R

Leading Single-Operator Stations

Pos.	Name	Callsign	Score	QSOs	Squares	Location	Antenna	a.s.l. (m)	TX/RX
2	Michael J. Ryder	G0CDA/P	9664	302	32	IO93AD	11Y	465	FT-290R
11	Lee Parrott	G0AMU/P	4704	224	21	IO83WE	10Y	405	IC-290E
16	Chris Partington	G0CLP/P	4176	174	24	IO84IG	8Y	550	TR-7010
20	Peter Thompson	G8DDY/P	3432	156	22	IO90JP	2 × 19Y	240	IC-271E
21	Dave Iles	GW4XGA/P	3381	147	23	IO73XC	4Q	1000	FT-290R
30	Jean Grahame	G1VEN/P	2640	165	16	IO92AJ	16Y	255	TR-751E
31	Andy Brewer	G1GMV/P	2584	136	19	IO80SQ	8Y	170	FT-290R
33	Tim Raven	G4ARI/P	2261	133	17	IO82LB	14Y	430	IC-202S
36	Terry Bruce	G6IAT	2109	111	19	IO91TV	2 × 17Y	160	FT-767GX
38	Ron Flemming	G0BNC/P	1872	117	16	IO91EU	2/2Q	200	FT-480R
38	Tony Crake	G1GVA/P	1872	104	18	IO91GI	13Y	275	TR-751E

Activity

The number of entries was a little lower this year, reflecting less activity on the band during the event, as several entrants noted in their comments: "probably not the usual number of stations active," says G4ARI/P and some others, "at times much of the band was clear," at G4YRY. Some suggested reasons for this, the most popular being, as EI9CAB/P puts it: "the first three hours or so were OK, but maybe everyone went to see the England v. Ireland match in the afternoon". PA3EUS/P, too, notes: "very little activity this side of the channel until the football finished".

Not everyone found it this way, however, and G1OGY was one of those reporting an "apparently larger number of stations competing". Any increase in activity is welcomed in some of the more remote areas, "yes, there is life in IN69!" remarks G0AEA. "2 metres certainly benefits from the increased activity," says GI0EJN, "it is usually very empty, except during openings, in this neck of the woods".

Weather

In few areas could the weather have been an excuse for not taking to the hills, as we provided the now customary sunshine in most parts of the British Isles. "You once again picked a fantastic day" —G4YFT; "Just what the doctor ordered"—GM3PGV/P. "For the fourth year running I'm nursing a rather sore suntan"—GM0FUN/P. "Had to abandon the contest after 2 hours due to the heat"—GM3NHQ/P.

However, in many parts the sun was accompanied by high winds, which took some groups by surprise when they arrived at their elevated sites. "At about 1300ft. a.s.l. it was difficult to stand," says GW4VVX/P, "the wind noise around the car was louder than the rig". "It blew a gale all day" at G8DDY/P, while EI4FO/P had "a very slow QSO rate because I was preoccupied by the effect of the wind on the beam direction".

Leading Stations in each Locator Square

Square	Name	Callsign	No. entrants in square
IN69	Colin S. Oakley	G0AEA	1
IN89	Dave Hewitt	GJ8ZRE/M	1
IO52	Thomas J. Foley	EI6BA/P	1
IO63	Paddy Devine	EI9FY/P	2
IO70	Bideford Bay Radio Club	G0JKD	2
IO71	Paul Rees	GW0GPQ/P	1
IO72	John Murphy	EI4FO/P	1
IO73	Tony Wyn Jones	GW4VEQ	3
IO74	Glasgow VHF Contest Group	GM0GCG/P	2
IO75	Steve Hartley	GM0FUW/P	2
IO76	Ochil Hills Contest Group	GM0GDL/P	1
IO77	Sutherland & District Radio Club	GM0IYP/P	2
IO80	Neil Underwood & Martyn Wright	G4LDR/P	4
IO81	Bedwas Tip QRM Generating Team	GW4VVX/P	6
IO82	Tenbury Wells Radio Society	G1TRS/P	5
IO83	The Hillbillies	GW4APA/P	11
IO84	Chris Partington	G0CLP/P	3
IO85	Civil Aviation Authority RS	GM4CAA/P	5
IO86	George McKay	GM4YWS/P	2
IO87	Thomas Harrison	GM3NHQ/P	1
IO88	Caithness ARS Contest Group	GM0CRA/P	1
IO90	Worthing & District ARC	G1WOR/P	3
IO91	Hillingdon Amateur Radio Club	G1HIL/P	15
IO92	Atherstone Amateur Radio Club	G6ARC/P	9
IO93	Michael J. Ryder	G0CDA/P	15
IO94	M. J. B. Overton	G1JDP	1
IO95	Keith Falconer	G1BWJ/P	2
JO00	Galloway Contest Group	GM0CLN/P	2
JO01	SEARS Contest Group	G4RSE/P	13
JO02	Roy Smith	G6GAU	1
JO11	Godfrey Hands	PA3EUS/P	2
JO22	Jaap Nap	PE1JVH	1
JO32	Dragon Slayers QRP Group	PE1MHO	1

Antenna Problems

Problems with erection of antenna masts seem to have been common, in many cases, of course, caused or at least compounded by the high winds. At G1GVA/P "a huge gust actually bent the pole whilst struggling with the guy ropes". GW0GPQ/P made a classic mistake—after much frantic effort to get the mast up they discovered they'd forgotten to connect the feeder to the Yagi at the top! The antenna at PE1MHO developed a fault after only 10 minutes, but the winds prevented getting it down for repair. The beam at G1GVA/P "must have had to go up and down seven times before a galaxy of faults were cleared".

A more serious collapse at G1WPF/P, "when attempting erection, the base plate left the ground and the aerials took a nose dive". Although it may be easy to laugh at this misfortune now, experience at G6YZR/P reminds us that an untamed antenna mast can be a real hazard: "the wind got up, hindering the erection of our mast . . . just as we had it half way up, the foot of the mast slipped and hit an operator in the face", which led to an immediate visit to the hospital.

Practical Wireless 144MHz QRP Contest 1988

Pos.	Callsign	Points
1	GW4APA/P	15428
2	G0CDA/P	9664
3	G1HIL/P	9139
4	G3GQC/P	6608
5	G1WOR/P	6210
6	G1WPF/P	6120
7	GW4VEQ	5180
8	G8EQD/P	5122
9	G4LDR/P	5100
10	G0FEH/P	5044
11	G0AMU/P	4704
12	G1NUS/P	4664
13	G6ARC/P	4576
14	G3VRE/P	4512
15	G4ITR/P	4284
16	G0CLP/P	4176
17	G1ORC/P	3611
18	G1TRS/P	3540
19	G3UAX/P	3444
20	G8DDY/P	3432
21	GW4XGA/P	3381
22	GW0GPQ/P	3358
23	G0EVV/P	3336
24	G4RSE/P	3190
25	GW4VVX/P	3180
26	GM0CLN/P	3164
27	GM4CAA/P	3120
28	GM0GDL/P	2782
29	G4UHF/P	2680
30	G1VEN/P	2640
31	G1GMV/P	2584
32	GW1HGV/P	2560
33	G4ARI/P	2261
34	G4ZTR/P	2166
35	G3RR/P	2112
36	G6IAT	2109
37	G4SLH/P	1980
38	G0BNC/P	1872
39	G1GVA/P	1872
40	G4CDD/P	1824
41	G4XQW/P	1785
42	GM0IYP/P	1728
43	G4XOM/P	1665
44	GW3POM/P	1635
45	G1STH/P	1521
46	G0FHR/P	1508
47	G1BWJ/P	1470
48	G4ZUN	1458
49	GM0FUW/P	1420
50	GM0CRA/P	1407
51	G2HR	1364
52	G8DBY/P	1320
53	G4OEU/P	1280
54	EI9FY/P	1276
55	G1UXA/P	1248
56	EI04FO/P	1218
57	GW6VAT/P	1207
58	G4WIK/P	1204
59	GM0AEE/P	1188
60	G4YRY	1136
61	G4YFT	1111
62	GM4YWS/P	1102
63	G0JKD	1078
64	G1OGY	1053
65	GW0IIW/P	1044
66	G7AAB/P	994
67	G4FOX/P	936
68	GM0GCG/P	912
69	G6YZR/P	897
70	G1YIY	882
71	G1MSS	871
72	G4ZQN/A	871
73	EI6BA/P	840
74	GW1MVL	825
75	G0EWN	819
76	G4PSO/A	819
77	PA3EUS/P	817
78	G0GBI/P	793
79	G0HXO/P	780
80	G4TVK	770
81	G0BPI/P	756
82	G7BDY/P	748
83	G4BZP/P	715
84	G6JMN/P	640
85	G3BXF	605
86	G8JTD/P	594
87	G4SSD	583
88	G6UUO/P	583
89	G0EVT	572
90	G1LHO	572
91	G1NTW/P	540
92	G1PVT	528
93	G6GAU	518
94	PE1EWR	518
95	GW1ZFX	516
96	G3SVC/P	513
97	GM4PGV/P	507
98	G1EHF	468
99	G6ZIM/P	460
100	PE1MHO	420
101	G1JDP	418
102	G0ACK	410
103	G2DHV/P	352
104	EI9CAB/P	351
105	G1NMF	350
106	PE1JVH	288
107	GM4UYZ	264
108	GJ8ZRE/M	260
109	G6YLW	252
110	G0IEQ	228
111	GM3NHQ/P	209
112	GM1AYG	198
113	G1AMX	180
114	G1YCA	155
115	GI0EJN	152
116	G0AEA	133
117	G6XAL	128
118	GM1ZVJ	120
119	GM1GGP/P	119
120	G1UQW	30

Checklogs gratefully received from G2HIF and G6DZH

Conditions

Despite being the middle of the Sporadic-E season, most stations experienced nothing special in terms of propagation. Typical descriptions of conditions were "very poor, not one French station heard"—G1WPF/P, "terrible!"—GM0AEE/P.

However, most Scottish stations and some northern England stations enjoyed an opening into Scandinavia. "Only one English station was heard" at GM0CRA/P, "but many OZ, LA, and SMs were heard". "Our first contact was an LA" reports GM0IYP/P, "then we worked SMs and OZs". For some, it all happened too late: "after the contest, during the drive home to Northumberland, the band was wide open with SM, OZ, LA, all/M"—G0EVV/P.

In fact the opening lasted most of the day, and 12 of the 15 GM stations entering have an LA in their log. LA6HL was the most worked of the DX, the earliest contact being at 0905UTC, the latest at 1228. Some northern G stations (in IO85 and IO95) were still working SMs and OZs as late as 1618UTC, and as noted above, the DX was still being heard after the end of the contest.

Here and there

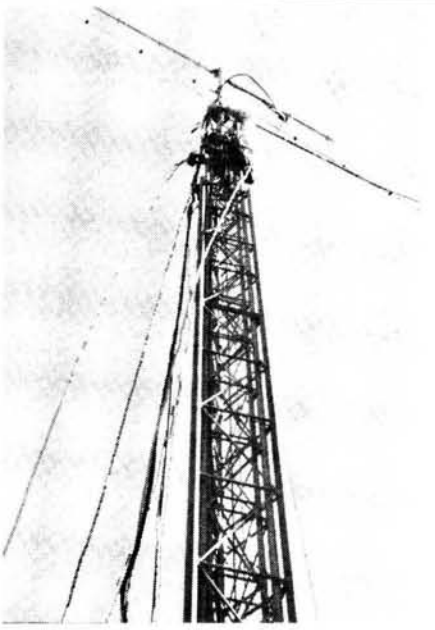
Grumbles about quality of signals or operating standards were very few this year. "Signals, without exception, seemed very clean," says G6ARC/P, a comment echoed by several others. G1TRS/P noted one GW station who didn't seem to be keeping a check log: "they called us five times after working us—is this a record?" Maybe, but in the past an entry with less than 15 contacts was submitted containing a duplicate, which also takes some beating.

Some novel station set-ups were in use; G1STH/P were using a horse-box as a mobile shack, while GM0IYP/P claim to have had "the most powerful rotator in Britain . . . a 200 h.p. four-wheel-drive tractor and high-sided dung trailer", to which the 12 metre mast was fitted (see photo). GM0IYP/P also express a common sentiment among Scottish stations: "one of our new members asked 'do they have 2m in England as I have not heard any yet?'—the answer is yes they do, but they do not have rotators and leave their antennas permanently pointing south".

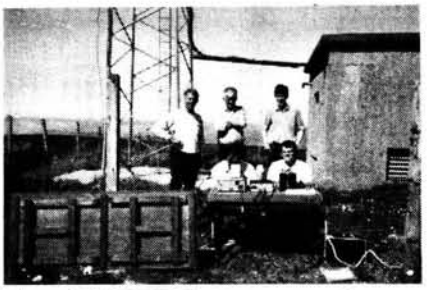
General remarks about the contest follow the themes set by GM4PGV/P: "a very fine contest, it has become the highlight of our year"; G6ARC/P: "again we were very pleased with what could be achieved with 2.5 watts"; and G3GQC/P: "we are eager for the next one". A few constructive criticisms were received, but were generally self-cancelling, e.g. one call to reduce the event to 6 hours in length, another to extend it to 24 hours.

The event continues to attract newcomers to contesting, as was originally hoped, for example G4FOX/P: "our first attempt at v.h.f. contest working and everyone had a very enjoyable day". G4YFT tried a single operator entry for the first time, but found it all rather hard going; "this is the first year I have done the contest single handed, and the last . . . next year it's back to multi-op".

Most entrants like to look forward to the next event with some improvements to their station being planned, like G1LHO, who "will be back next year with a few more frills", or at a better location, like G1YCA, "here's to next year, hopefully sat on top of the hill just behind me". Although some entrants have suggested running more than one contest in a year, or an additional event on another band, there are already a wide range of v.h.f./u.h.f. contests being organised by the RSGB, so those who have tasted contest operation for the first time, and have enjoyed the experience, should easily find something to suit them. But do come back on the air for the next *Practical Wireless* 144 MHz QRP Contest, which is planned for **Sunday 11 June 1989**.



Antenna inspection at GM4CAA/P on Lowther Hill



The GM0CRA/P team on Ben-a-Chielt

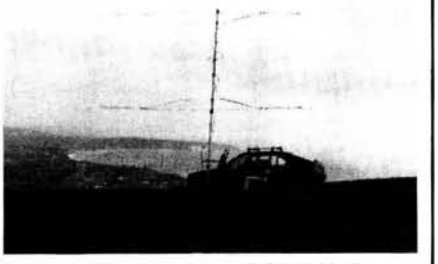
GM0GDL/P ready for the "off", on Ben Vorlich

Waiting for the G1STH/P mobile shack to arrive on Billinge Hill

GM0IYP/P and their dung-trailer on Beinn-a-Bhragaidh, Sutherland

G7BDY/P, the "Propagating Pixies", in Devon

G0FHR/P, the "Raving Mad Contest Group", on Firle Beacon in East Sussex



Peter Thompson G8DDY/P on Shanklin Down, IoW

The EEC EMC Directive on Electromagnetic Compatibility

By Nick Foot*

At long last legislation in the UK is going to seriously address the problems of TVI, BCI and all other types of interference which are felt severely by transmitting radio amateurs among others. The most significant legislation relating to radio interference ever to be invoked in the UK is being forced through at the moment by the Common Market. This legislation, the impact of which has not yet been appreciated by industry, is due to become mandatory at some stage between January 1990 and the implementation of the "Open European Market" in January 1992. This impending legislation is known as "The EEC Directive on EMC".

What is the directive? The directive, the fine detail of which is still being discussed, states simply that after the implementation date

No equipment placed on the market may cause interference or be interfered with.

This all-embracing statement is the heart of the directive and the rest of it then concentrates on the scope of the equipment covered by it and the detail of how it will be implemented.

The directive applies to all equipment using electricity to function (other than motor vehicles which are covered by separate legislation). This has been interpreted in the UK in its broadest meaning and it is intended to apply it to all electrical and electronic equipment ranging from children's toys through domestic appliances to industrial plant and mainframe computers. It applies to battery powered equipment, mains powered equipment and all engine-driven equipment other than vehicles. A comment made at a recent conference held on the directive was that "if it functioned by the movement of electrons" then the directive was applicable.

The proposed method of implementation is to allow manufacturers to satisfy themselves that their products would not cause interference or be interfered with. This could be done at the manufacturer's choice by means of testing products to interference specifications or by theoretical analysis. The DTI (and its corresponding equivalents throughout the EEC) would be free to ask manufacturers for proof that this had been done and could ask to see the test results or the analysis. If it is subsequently found that the interference from or to products is unacceptable manufacturers can be forced to **withdraw their product from the market.**

Specifications

This is where the whole issue starts to get cloudy. The stated intention is to have common standards throughout the Common Market and for equipment which is certified as acceptable in any EEC country to be freely marketable throughout the EEC.

The stated intention is for a master interference specification to be produced as an 'EN' document (an EEC Standard) and for all the member countries to produce their own specifications aligned with this. This will mean that there will be a British Standard produced which will be identical with a VDE document in Germany and the corresponding standards bodies in all the member countries will have identical documents.

This infrastructure of documents has not yet been implemented and with the speed that international and national committees work at it is unlikely to be produced quickly. This means that each country will have to work to their existing standards as an interim measure. These are reasonably similar in many cases as they are all derived from CISPR (International Special Committee on Radio Interference) standards. At the moment, however, there are significant national variations.

The current UK documents which are most relevant are BS 800, BS 6667 and BS 6527. One of the areas of concern is that some of the specifications, such as BS 6667 which applies to the susceptibility of equipment, have several sets of limits which are graded depending on the environment equipment is expected to operate in. This standard is aimed at industrial equipment and there are no guidelines provided as to which limits to use for domestic equipment. My own feeling is that it should be the most severe ones as stray r.f. from radio amateurs can be at much greater levels than interference experienced in the industrial environment. The frequency range covered by this standard is limited to 27MHz and above as it is derived from a standard produced by SAMA (the Scientific Apparatus Manufacturers Association) and was intended to protect process control equipment from radiation from walkie talkies. As radio amateurs know only too well there are plenty of breakthrough problems occurring at frequencies below 27MHz!

Implications for the Radio Amateur

There are good and bad implications for radio amateurs in this forthcoming legislation. The good news is that all electronic equipment will at last be designed to withstand some levels of ambient r.f. near it and will hopefully

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have been tested to ensure that interference does not occur. The potential problem of this aspect is whether the specification test levels will be adequate to represent the environment that exists near high power amateur installations. Measurements in properties adjacent to radio amateurs have shown that field strengths in excess of 10V/m (volts per metre) are commonly produced. Many of the specification levels that have been proposed are lower than this (the levels proposed in the CENELEC document on interference protection for domestic equipment which has been circulated in draft form are 1.8V/m).

The bad news is that all commercially manufactured amateur equipment will have to meet standards for interference emissions for the first time ever in this country. There are currently no standards proposed specially for amateur transmitters and receivers and, if this equipment is tested to the general interference specification limits (even with a dummy load fitted and a concession at the operating frequency as it is permitted to radiate there), it is anticipated that it will fail severely on things like harmonic emissions and case radiation. This could have considerable cost implications and might force some black boxes off the market completely as the unit could have to be redesigned to achieve the required limits and this may not be cost effective for the manufacturers.

Fortunately this legislation applies only to commercially produced equipment and does not apply to home construction. The increased prices may lead to a revival in home construction which may be a good thing for amateur radio.

What Must Manufacturers Do?

All electrical and electronic equipment manufacturers must start to consider emc in their product designs now as equipment that is currently on the drawing board may have to meet the legislation by the time it reaches the market. If they do not have sufficient expertise within their design teams they must seek outside help from emc test houses or consultants, as to have a product removed from the market could be very costly. Interference control needs to be designed into equipment if it is to be achieved cost effectively.

This impending legislation will affect all manufacturers of electrical and electronic equipment throughout industry, as the legislation will apply across the board to all electrical equipment

What Happens Next?

The current state of the directive is that all the European national authorities are negotiating on the final form of the directive. In the UK we are represented by the DTI and they are attempting to increase industry's awareness of the impending legislation. Various UK trade associations such as BEAMA are feeding information from their members to the DTI. The engineering institutes such as the IERE are also doing their part to increase awareness of the directive and its implications.

There is great concern being expressed about the width of the applicability of the directive in its present form and the short timescales involved. Particular concern is being expressed that the specifications and limits to be met are still not defined. Manufacturers aware of the potential effects are worried about cost implications on their products while the majority of the industries that will be affected are in blissful ignorance of the problems ahead. Test Houses involved in emc are investing heavily in new equipment to cater for the anticipated demand for interference testing, and the competition to find and employ engineers experienced in interference control is enormous.

The next step is up to the DTI and the EEC, but hopefully a lot of the grey areas will have been defined shortly and the implementation of the directive will be properly defined. In the meantime it is essential that manufacturers consider interference aspects of all new designs if they wish to remain in business after 1992. **PW**

PW REVIEW

Are you confused by the never ending stream of complicated transceivers that are appearing on the market? If so the Yaesu FT-747GX could well be a sight for sore eyes! Mike Richards G4WNC checks out the on-air performance.

The FT-747GX from Yaesu is a very compact multi-mode transceiver featuring 100 watts p.e.p. output on all the current h.f. amateur bands, plus a general coverage receiver with a wide range of 100kHz to 30MHz.

The first thing I noticed when I collected the FT-747GX was its weight, at a mere 3.3kg it's extremely light. This weight saving over previous models seems to be due to the increased used of plastics, but despite this I thought the styling of the FT-747GX was very attractive.

The Connections

The accent throughout the rig is on simplicity and the external connections are no exception. The power requirements are the normal 13.5V d.c. at a maximum of 19 amps when transmitting at full power. The p.a. module in the FT-747GX has actually been designed to cope with a continuous output of 100 watts for up to 30 minutes, ideal for the RTTY or SSTV enthusiast. You will obviously have to ensure that your power supply can take this loading. If you are buying a Yaesu power unit then the FP-757HD heavy-duty supply will be required. The power supply connection is via the supplied 3m long red and black lead which is fitted with an in-line fuse holder and 20A fuse. The connection to the rig is by a standard Yaesu 4-pin plug and socket, the other end of the cable being left for the user to terminate.

The antenna connection is also very straight forward comprising a single SO-239 socket on the rear panel. The p.a. stage of the FT-747GX includes protection against poorly matched antennas and gives about a 25 per cent power reduction with a 3:1 s.w.r. the output will of course reduce further with greater mis-matches.

As the FT-747GX features reception from 100kHz to 30kHz you may find that you need an external antenna switch so that an alternative antenna system can be selected when listening to the lower frequencies. My own antenna system comprises a nest of dipoles for 3.5, 7.0, 14, 28MHz with the combination being workable, via an a.t.u., on all the h.f. amateur bands. The only problem is that balun used precludes operation below about 1.6MHz. My answer to this situation is to use an active antenna for reception of lower frequencies, though an alternative would be to short-out the inner and outer of the feeder at the shack and use that as part of the antenna.

The rear panel connections on the FT-747GX have been well thought out and employ standard plugs and sockets. A 4 to 16Ω external speaker can be connected via the 3.5mm jack which automatically disconnects the internal speaker. For the c.w. operator there is a 6.3mm standard jack for the key, the maximum voltage and current at this point is +13V and about 1mA, which means that virtually any key or keyer can be connected without problems.

The data mode operator is well catered for on the FT-747GX with the p.t.t., audio output and switched +13V lines available on phono sockets for external use. The provision of a switched +13V is rather a novelty and means that the packet TNC or RTTY terminal unit can be powered-up with the rig. The actual current available from this socket is quoted as 200mA which should be adequate. My only grumble at this point is that the audio input, i.e., microphone socket, which is needed in order to transmit packet, RTTY, etc., is only available from the front panel which can make the connections rather untidy.

Other facilities on the rear panel include an external a.l.c. for use with linear amplifiers, and an 8-pin DIN socket carrying band data information for use with Yaesu's FC-1000 automatic a.t.u. and FL-7000 linear amplifier. The final facility on the rear is a 6-pin DIN socket market CAT which enables most of the operation of the transceiver to be controlled by a personal computer. The protocols used for this facility conform to the standard established by Yaesu.

The Controls

One of the first things that strikes you about the front panel layout is the sheer simplicity, which is quite refreshing these days. Centre position of the front panel is taken by the large (46mm dia.) rotary tuning knob and the well lit l.c.d. The tuning action is of the stepped type with 50 steps per revolu-

tion. My first thoughts were of disappointment at the poor feel of this control, probably because I was brought-up on silky smooth Eddystone dials! I must confess though, after using the FT-747GX for a while, I soon became accustomed to the feel and accepted that it wasn't really a problem.

One noteable and welcome change on the FT-747GX is that the speaker is mounted on the front panel facing forwards, rather than the more usual of on the top panel facing up! This change means that the internal speaker is really quite useful and there is no real need to use an external speaker.

As can be seen from the photographs, the front panel layout of the FT-747GX has the right-handed user very much in mind, with all the main operational controls placed to the right of the tuning dial. Being right-handed myself I found this layout to be very convenient and easy to use.

The four rotary controls have been grouped according to standard practice with the volume/squelch and mic gain/drive mounted in concentric pairs.

The various tuning and memory options are selected using eight of the nine buttons immediately to the right of the tuning knob with the remaining buttons used to select: mode, narrow c.w. filter, attenuator, noise blanker and manual transmit switching.

The only two buttons left are those just above the tuning dial, these are directly connected with frequency selection, one being to lock the dial while the other operates the clarifier.

Tuning

Despite the simple appearance of the FT-747GX, Yaesu have not compromised on the range of tuning options. The most obvious technique is to manually tune using the main tuning knob. As mentioned earlier this is a stepped control with some 50 steps per revolution, the size of these steps being dependent on which mode you are using. The actual steps are 25Hz for s.s.b./c.w. 1kHz for a.m. and 5kHz for f.m. These step sizes are fine for normal use though the RTTY/packet operators will note that the 25Hz minimum step is about the largest that can be accepted for these narrow shift modes. To aid rapid tuning across a band these tuning steps can be increased to 2.5kHz, 10kHz and 12.5kHz respectively. This change is achieved by pressing the FAST button and just to make sure you notice, the word FAST appears on the display. As with most of the push-buttons on the FT-747GX, the effect is reversed with a second press of the button.

Band selection on the FT-747GX is rather different as you don't actually step from one amateur band directly to the next, but just change to a super fast tuning mode. This change is effected by pressing the BAND button, whereupon the main tuning knob step size increases to 500kHz giving 25MHz per revolution! Although normal tuning can be restored with a second press of this button there is an internal five second timer which forces a return to normal tuning if the main control is untouched during this period. Although unusual, this technique was actually very effective and made it very easy to rapidly change frequency over a very wide range. It also meant that you could change from amateur bands to short wave listening very easily. You will no doubt be pleased to hear that the FT-747GX will only transmit within amateur bands, so there is no risk of accidentally transmitting out-of-band!

Memories

No modern microprocessor rig would be complete without a selection of memories and the FT-747GX is no exception. There are a total of twenty memories provided (twenty-two if you include the two v.f.o.s) and each of these can store not only the operating frequency, but the mode as well. Storing frequencies in memory has been made very straightforward, requiring first the selection of a memory and then a single press of a button to transfer the current v.f.o. mode and frequency to the selected memory!

As an added bonus, these memories will also store split frequency operation, if that is the current mode. The only exception is that memories 18 and 19 can only store single frequencies and modes.

In addition to the simple storing and recall of frequencies, the FT-747GX has a scanning facility which enables the memories to be automatically scanned for activity. This scan is activated by pressing the UP or DOWN buttons on the microphone whilst in memory mode. The strength of signal that will stop the scan is determined by the setting of the squelch control which gave a wide range of control. A very useful feature of the scan is that you can exclude any number of memories and so tailor the operation to, for example, just QRP frequencies.

Once a signal of sufficient strength is detected, the scan stops for approximately five seconds, if you want to stop the scan you press the UP or DOWN buttons a second time. The overall operation of the memories was very good and enabled very rapid band and mode changing which, when combined with the scanning facilities, were very useful for searching out activity on some of the more interesting bands.

Last, but not least, the FT-747GX has a priority channel facility. This particular implementation lets you automatically monitor any single memory channel for activity every four seconds whilst using either of the two v.f.o.s. This can be useful if you want to keep a check on a calling frequency whilst chatting to a friend on a different band. Once the FT-747GX has detected a signal on the priority channel that exceeds the squelch threshold, it switches to the priority channel for five seconds and then reverts to the normal operating frequency. If you want to stay on the priority channel, all you have to do is momentarily press the p.t.t. switch on the microphone during this five second period.

In these days of crowded bands and DX pile-ups, it is often necessary to use different transmit and receive frequencies (known as split frequencies). Yaesu have not forgotten this and the FT-747GX is equipped with dual v.f.o.s to handle this situation. Along with most modern rigs, it doesn't actually have two v.f.o.s, but rather two dedicated memories. This is a better system because these two memories are able to conveniently store the operating mode as well as the frequency.

The v.f.o.s are selected by pressing the left-hand side of the dual purpose VFO/MR button which alternatively selects v.f.o. A or B with each operation. As I've said, the main use for the dual v.f.o.s is for working split frequencies and this operating mode is selected very easily by setting the required two frequencies in v.f.o. A and B then pressing the SPLIT button. If you should want to reverse these frequencies, say to listen on the transmit, you select the other v.f.o. whilst in receive. I must admit I thought this was all very well laid out and simple to use.

Last but not least a lithium back-up battery is fitted internally, to preserve the memory contents when the power is disconnected. According to Yaesu, it should have a life of about five years which is quite useful.

Circuit Description

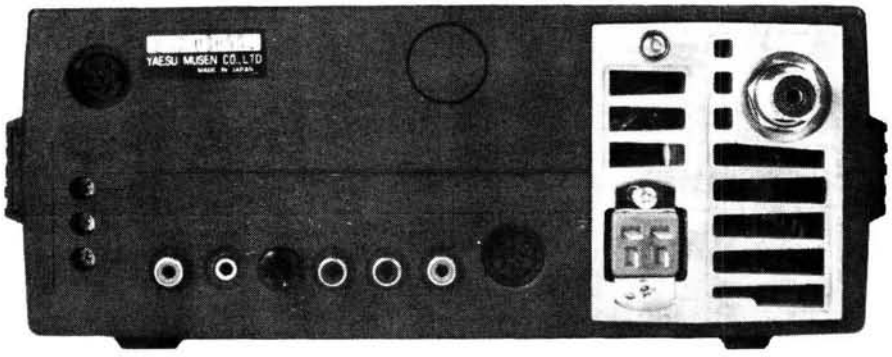
Despite the FT-747GX's position at the economy end of the market, the electronics are very well sorted. It would take far too long to give a complete circuit description, so I will just give you an outline of the important features. Starting with the receiver, the switched antenna feed is passed to the first mixer via a low-pass filter and a diode-switched set of band-pass filters. These filters split the band into six sections, i.e. 0.1–2.5, 2.5–4, 4–7.5, 7.5–14.5, 14.5–21.5 and 21.5–29.9MHz. The first mixer comprises a pair of *n*-channel f.e.t.s and produces a first i.f. of 47MHz. This signal is then amplified before passing to the second mixer which produces the second i.f. of 8.215MHz–that's where all the main filtering takes place.

The rig is well endowed with filters as there are three second i.f. crystal filters to cover s.s.b, c.w. and a.m. I must admit I was very surprised to find a narrow c.w. and an a.m. crystal filter in an economy rig, it just goes to show how much thought Yaesu have put into the rig. For the demodulation there are three separate demodulators, one for each mode. If the optional f.m. unit is fitted, then a third i.f. is used which is the standard 455kHz. The output of the demodulators is fed via an active filter to an audio pre-amplifier and then to the main amplifier via the squelch switch.

One other receiver feature worthy of note is the noise blanker. This is another place where cost cutting could so easily have been made, but instead a proper i.f. noise gate has been employed. This helps maintain the high engineering quality of the rig.

On the transmit side, the same high quality has been maintained with the same i.f.s being used, but in reverse order. The filtering is very good with the driver output using the same bank of band-pass filters as the receiver, the p.a. uses the conventional push-pull arrangement with the output fed to the antenna via a bank of relay-switched low-pass filters.

Frequency generation is all microprocessor controlled with a 5.4MHz crystal providing the reference frequency. In order to cope with the wide range of local oscillator frequencies required by the first mixer, a bank of four v.c.o.s are used.



Other on-board oscillators include a 38.84MHz second local oscillator, a switchable carrier insertion oscillator and a 4MHz clock for the microprocessor. I think Yaesu have actually managed the compromise between economy and facilities very well.

Computer Control

This seems to be a standard feature of virtually all Yaesu rigs and I must say it's good to see a manufacturer adopting a standard and sticking to it. One very attractive feature of the system is that, providing you are capable of some quite simple programming, virtually any computer with a serial interface and t.t.l. levels can be used. If, on the other hand, you prefer to leave the programming to others then there are a selection of programs available. Access to the FT-747GX's microprocessor is achieved via a 6-pin DIN type socket on the rear panel and from this point the frequency, memory and mode selections can be both read and set. In addition to the serial data lines, the p.t.t. and a.g.c. lines have been extended to this socket. This enables transmit/receive switching to be computer controlled and the a.g.c. line can be connected to an analogue to digital converter to give a computerised S-meter read-out!

The Manual

The manual follows Yaesu's normal format and comprises a 28-page A4 booklet. In addition to this, there are several loose sheets containing full circuit and block diagrams despite the obvious complexity of this type of rig, the diagrams were actually quite easy to read. The main core of the manual was split into six chapters covering: specifications, controls, installation, operations, options and computer control.

Although the manual contained all the information required, I felt that the presentation could have been improved if more diagrams had been included to help illustrate some of the features. Two other points that I would have liked to have seen were a trouble-shooting guide and a section to get you on the air quickly. Despite these criticisms, I found that once I had become familiar with the basic operation of the rig, the indexing used in the manual enabled me to quickly locate particular topics.

Finally, for those of you who are interested in the computer control facilities offered by the FT-747GX, the last section of the manual covers this in some detail—including all the instruction opcodes and the data formats used. Although I have not actually tried it, there seems to be sufficient information in this section to allow the computer-literate enthusiast to write his or her own software to control the operation of the FT-747GX.

On the Air

Having seen all the publicity given to this rig, I was really very keen to see how it actually performed. First job was to install it in the shack which was a remarkably simple task as there were very few external connections to be made, at least for phone or c.w. operation. The antenna used was my trusty nest of dipoles which covers all bands from 1.8 through to 30MHz.

Phone operation was tried first and I managed a successful contact on my first attempt, albeit only with another G station on 3.5MHz! I was given a 5/9+10dB report and told that the audio was very clear, that was at least a good start. Having established everything was basically working, I thought I would jump in with both feet and see how I fared on 14MHz where my humble nest of dipoles would be competing with high power stations using beam antennas. the results were very encouraging, as despite my lower signal strength, I was able to cut a path through the QRM and make several successful contacts.

Although it would have been helpful to have band-pass tuning and notch filters handy, the decision to omit these along with VOX has not seriously handicapped the performance. At this point I was beginning to believe Yaesu's publicity, you know the bit that goes, ". . . they all laughed at my rig until they saw my log book . . .".

The next stage was to dust off the key and try a bit of c.w. I have two keys in regular use, one is an old Admiralty up-and-downer and the other is an iambic type. The use of a standard 6.3mm jack on the FT-747GX meant that I could plug in either of these keys with no

problems. Also, the voltage and current available from the key jack means that there should be no problems connecting a wide range of keys to this rig.

One great asset to c.w. operation on the FT-747GX is the inclusion of a narrow (500Hz bandwidth) crystal filter as standard. This filter was certainly a tremendous help when operating in the crowded c.w. segments of some of the bands.

Transmit/receive switching can be accomplished in three ways: either by pressing the MOX button on the front panel, manually grounding the p.t.t. line or by using the semi-break-in facility. The semi-break-in is permanently active with the manual modes providing a means of keying the transmitter for longer than would be normal with the semi-break-in. The break-in facility was rather like VOX on phone in that as soon as the key was operated the transmitter switched to transmit and only returned to receive after waiting a pre-set length of time from the last key press. This delay time was adjustable via an internal potentiometer, though the top cover had to be removed to achieve this.

The only other adjustment I had to make was to the side-tone level, which was set rather too loud for my operating conditions. The adjustment was very easy and meant altering a small pre-set potentiometer via an access hole in the bottom cover.

Having achieved success on both phone and c.w., I thought I had better try the data modes. The first tests were with RTTY and AMTOR using my G3LIV filter terminal unit and the G3WHO software running on a BBC-B. The connections to the FT-747GX were quite simple, requiring an audio input, audio output and p.t.t. line. The provision of a fixed level audio output and the p.t.t. lines on phono jacks on the rear panel went a long way to easing the connections. It's a shame that the only available audio input was via the microphone socket on the front panel. This did mean that the connections became a little untidy.

Once all the connections had been made, the next step was to set-up the drive level which is really dependant on the power supply you are using. As the one I was using was not rated for 20A continuous, I adjusted the drive for about 50 watts output.

After the setting-up was complete, I tried a few contacts and once again achieved immediate success with several contacts on 14MHz, including an RTTY mailbox. The next mode to try was AMTOR, which places quite high demands on the transceiver as the transmit/receive switching times are critical. The G3WHO software I was using includes AMTOR, so no extra connections were required to use this mode.

My first test was to a local AMTOR mailbox on 3.5MHz and this link worked perfectly first time, which was pleasing. Having boosted my confidence, I moved to 21MHz to see if there was any DX about. While searching I heard a CE (Chile) station calling a Spanish station with no success, so I tried calling the CE. I was quite astounded when the link worked on the first call, tlhe QSO continued with a very low error rate, hence demonstrating that the FT-747GX is very well set-up for this mode.

Next on the list of data modes was packet, which is probably one of the fastest growing areas of amateur radio. For this mode I used a Siskin TNC-220 to interface between the computer and the FT-747GX. The connection problems were much the same as with RTTY with regard to the audio input. The operation was again very successful with several mailboxes successfully contacted.

The final mode tried was FAX, which was in receive only, using an ICS Electronics FAX-1 decoder. The performance of the FT-747GX was fine over a wide range of signals from amateur FAX through to weather FAX pictures. The only problem that you may have is with the 25Hz tuning steps if you try to receive l.f. FAX stations using 150Hz shift, though I would add that there were no problems with the FAX-1.

One important point to consider when using data modes is that the rig is used in close proximity to a lot of "noisy" computer equipment and the internal screening of the rig becomes significant. During my on-air testing the FT-747GX was operated within inches of a BBC-B computer, disk drives and an Epson printer. Despite the increased use of plastics in the casing of the FT-747GX, I was pleased to find that there were no signs of interference from the computer equipment.

As the review model was fitted with the optional f.m. unit, this was also tried, again with great success. The audio quality on both transmit and receive was very good.

Summary

If you've read this far, then you have probably already gathered that I liked the FT-747GX! The task of selecting the right compromise between cost and performance is never an easy one, but I think Yaesu are pretty well spot-on with the FT-747GX. The important point is that the basic performance of the transceiver is very good with only the frills omitted to produce the required economies. Despite these economies, I was very pleased to see that a narrow c.w. filter was included along with the capability for computer control. Another bonus was the ability of the p.a. to work at full power for long periods. Well done, Yaesu!

The FT-747GX is available from ***South Midlands Communications Ltd., School Close, Chandlers Ford Ind. Est., Eastleigh, Hants,*** priced £659 and £39.99 for the optional f.m. unit.

My thanks to SMC for the loan of the review model. **PW**

*MAKERS SPECIFICATIONS

TRANSMITTER

Frequency coverage	1.5–1.9999MHz (160m) 3.5–3.9999MHz (80m) 7.0–7.4999MHz (40m) 10.0–10.4999MHz (30m) 14.0–14.999MHz (20m) 18.00–18.4999MHz (17m) 21.00–21.4999MHz (15m) 24.5–24.9999MHz (12m) 28.0–29.9999MHz (10m)
RF power output:	c.w./s.s.b./f.m.*: 100W p.e.p./d.c. a.m.: 25W carrier
Carrier suppression:	More than 40dB below peak output
Unwanted sideband:	Better than −50dB with 1kHz a.f. input
Spurious emissions:	Harmonic: better than −50dB Non-harmonic: better than −40dB
Microphone:	Impedance 500–600Ω
Audio response:	Less than −6dB from 400–2600Hz
3rd Order intermodulation distortion:	Better than −25dB (@ 100W p.e.p.)
Deviation (f.m.)	±2.5kHz max.*

RECEIVER

Frequency coverage:	100kHz–29.9999MHz
Intermediate frequencies:	47.055MHz, 8.215MHz, 455kHz (f.m. only*)
Sensitivity:	Input for 10dB S+N/N (except f.m.)

	0.5–1.5MHz	>1.5MHz
s.s.b./c.w.:	0.5μV	0.25μV
a.m.:	2.0	1.0μV
f.m.*:	0.7μV for 12dB SINAD (above 28MHz)	

Squelch sensitivity:	
s.s.b./c.w./a.m.:	4.0μV within 0.5–1.5–30MHz 2.0μV above 1.5MHz
f.m.*:	0.32μV
Image rejection:	Better than 70dB within 1.5–30MHz
I.F. rejection:	Better than 60dB within 1.5MHz
Selectivity:(−6/−60dB)	
s.s.b./c.w. (W)/a.m. (N):	2.2/5kHz
c.w. (N):	500Hz/1.8kHz
a.m. (W):	6/14kHz
f.m.*:	8/19kHz (for −6/−50dB)
Clarifier range:	±9.975kHz
Max. Audio output:	At least 1.5W into 8Ω with 10% t.h.d.

GENERAL

Tuning steps (selectable):	s.s.b./c.w.: 25Hz or 2.5kHz/step a.m.: 1kHz or 10kHz/step f.m.*: 12.5kHz or 5kHz/step
Frequency stability: (0° to +40°C)	s.s.b./c.w./a.m.: ±200Hz f.m.*: ±300Hz
Frequency accuracy:	s.s.b./c.w./a.m.: ±200Hz f.m.*: ±300Hz
Antenna impedance:	50Ω unbalanced (nominal)
Power requirements:	13.5V d.c. ±10% neg. ground 19A max. at 100W output
Dimensions:	W238 × H93 × D238mm (without knobs)
Weight:	3.3kg (7.25lb) approx.

*F.M. operation requires optional unit.

Reg Ward & Co. Ltd.

1 Western Parade, West Street, Axminster, Devon, EX13 5NY.
Telephone: Axminster (0297) 34918

Yaesu

FT767	HF Transceiver	1550.00	(—)
FEX767(2)	2m Module (767)	169.00	(3.00)
FEX767(70)	70cm Module (767)	215.00	(3.00)
FEX767(6)	6m Module (767)	169.00	(3.00)
SP767	Speaker	69.95	(2.50)
FT290	Mkll New Super 290	429.00	(—)
FT690	Mkll 6m M/Mode 2·5W	399.00	(2.00)
MMB11	Mobile Bracket	SPECIAL PRICE	(2.00)
NC11C	Charger	10.50	(2.00)
CSC1A	Carrying Case	6.50	(2.00)
YHA15	2m Helical	7.50	(2.00)
YHA44D	70cm 12wave	12.50	(2.00)
YM49	Speaker Mike	23.00	(2.00)
MMB15	Mobile Bracket	14.55	(2.00)
FT23R	2m Mini H/H	223.50	(3.00)
FT33R	70cm Mini H/H	243.50	(3.00)
FNB9	Nicad Battery Pack (23/73)	27.60	(2.00)
FNB10	Nicad Battery Pack (23/73)	32.60	(2.00)
FNB11	Nicad Battery Pack (23/73)	50.60	(2.00)
NC18C	Charger (23/73)	12.35	(2.00)
SMC28	Charger (23/73) 13A Plug	15.40	(2.00)
NC28	Charger (23/73)	17.71	(2.00)
NC29	Base Charger (23/73)	57.50	(3.00)
PA6	Car Adapt/Charger (23/73)	18.40	(2.00)
MH12A2B	Speaker Mic	29.75	(2.00)
MH18A2B	Speaker Mic Miniature (23/73/727)	27.00	(2.00)
FT727R	2m/70cm H/H	425.00	(3.00)
FNB3	Spare Battery Pack	41.00	(2.00)
FNB4	Spare Battery Pack	46.00	(2.00)
FNB5	Empty Cell Case	10.00	(2.00)
FRG9600M	60-950MHz Scanning RX	509.00	(—)
PA4C	Power Supply for 9600	21.00	(2.00)
MMB10	Mobile Bracket	10.00	(2.00)
NC9C	Charger	11.50	(2.00)
PA3	Car Adaptor/Charger	21.85	(2.00)
YM24A	Speaker Mike	31.05	(2.00)
FRG8800	HF Receiver	639.00	(—)
FRV8800	Converter 118-175 for above	100.00	(2.50)
FRT7700	RX ATU	59.00	(2.50)
MH1B8	Hand 600 8pin mic	21.00	(2.00)
MD1B8	Desk 600 8pin mic	79.00	(2.00)
MF1A3B	Boom mobile mic	25.00	(2.00)
YH77	Lightweight phones	19.99	(2.00)
YH55	Padded phones	19.99	(2.00)
YH1	Lweight Mobile H/set Boom mic	19.99	(2.00)
SB1	PTT Switch Box 208/708	22.00	(2.00)
SB2	PTT Switch Box 290/790	22.00	(2.00)
SB10	PTT Switch Box 270/2700	22.00	(2.00)
FT736 **NEW**	2/70cm 25W Base Stn	1,450.00	(—)
FT747GX	160-10 All mode TX Gen. Cov.	659.00	(—)
FT2311R	23cm FM Transceiver	475.00	(—)
FT211RH	2m 45W FM Mobile	309.00	(—)
FT212RH	New 2m 45W FM Mobile	349.00	(—)

— Datong Products —

PC1	Gen. Cov. Con.	137.40	(2.50)
VLF	Very low frequency conv.	34.90	(2.50)
FL2	Multi mode audio filter	89.70	(2.50)
FL3	Audio filter for receivers	129.00	(2.50)
ASP/B	r.f. speech clipper for Trio	82.80	(2.50)
ASP/A	r.f. speech clipper for Yaesu	82.80	(2.50)
ASP	As above with 8 pin conn.	89.70	(2.50)
D75	Manual RF speech clipper	56.35	(2.50)
D70	Morse Tutor	56.35	(2.50)
RFA	RF switched pre-amp	36.00	(2.50)
AD270-MPU	Active dipole with mains p.s.u.	51.75	(2.50)
AD370-MPU	Active dipole with mains p.s.u.	69.00	(2.50)
DC144/28	2m converter	39.67	(2.50)
ANF	Automatic notch filter	67.85	(2.50)
SRB2	Auto Woodpecker blanker	86.25	(2.50)
RFA	RF switched pre-amp	36.00	(2.50)

ICOM

IC761	New Super HF Transceiver	2459.00	(—)
IC751A	HF Transceiver	1500.00	(—)
IC735	New HF Transceiver	979.00	(—)
AT100	100W ATU (751/745)	379.00	(3.50)
AT150	150W ATA (735)	329.00	(3.50)
PS55	Ext PSU (735)	192.00	(3.00)
IC505	50MHz multi-mode portable	529.00	(—)
IC290D	2m 25W M/Mode	559.00	(—)
IC28E	25W FM	359.00	(—)
IC28H	2m 45W FM	399.00	(3.00)
IC Micro	2E New Mini H/H	249.00	(3.00)
IC2E	2m The Original H/H	235.00	(3.00)
IC02E	2m H/H	279.00	(3.00)
IC275E	New 2m 25W Base Stn	1069.00	(—)
IC4E	70cm H/H	285.00	(3.00)
IC04E	70cm H/H	318.00	(3.00)
IC48E	70cm 25W FM Mobile	455.00	(3.00)
IC490	70cm 10W M/Mode	625.00	(—)
IC3200	2m/70 Dual Band FM Mobile	556.00	(—)
IC12E	23cm H/H	449.00	(3.00)
ICR71	Gen Cov RX	855.00	(—)
IC7000	VHF/UHF Scanner	989.00	(—)
AH7000	25-1300MHz Discone	82.50	(3.00)
SP3	Ext Speaker	64.00	(2.50)
CK70	DC Cable (R70/R71)	8.00	(2.00)
EX257	FM Board (R70/R71)	43.00	(2.00)
GC5	World Clock	43.00	(2.50)
AD2	Waterproof Bag all Icom H/H	14.38	(2.00)
BC35	Desk Charger	74.75	(2.50)
BP3	Battery Pack 8·4V (2/4E/02/04E)	32.20	(2.00)
BP4	Empty Battery Case (2/4E/02/04E)	9.78	(2.00)
BP5	Battery Pack 10·8V	63.25	(2.50)
BP7	Battery Pack 13·2V (02/04E only)	78.20	(2.50)
BP8	Battery Pack 8·4V	74.75	(2.50)
CP1	12V Charge Lead BP3/7/8	7.48	(2.00)
DC1	DC/DC converter operate from 12V	18.40	(2.00)
FA2	2m Helical BNC	9.75	(2.00)
FA3	70cm Flexible 14 wave Antenna (BNC)	9.75	(2.00)
HM9	Speaker/Mic	23.00	(2.50)
HS10	Head set Boom Mike	23.00	(2.00)
HS10SA	Vox Unit HS10 (02/04E only)	26.45	(2.00)
HS10SB	PTT SW Box HS10	22.00	(2.00)
LC1	Leatherette Case 2E/4E + BP5	9.20	(2.00)
LC3	Leatherette Case 2E/4E + BP3	9.20	(2.00)
LC11	Leatherette Case 02E/04E + BP3	9.20	(2.00)
LC14	Leatherette Case 02E/04E + BP5/7/8	9.20	(2.00)
SS1	Shoulder Strap	11.50	(2.00)
SM5	600ohm 8P Base Mic	48.00	(2.50)
SM8	1·2k/600ω 8P Base Mic	86.00	(2.50)
SM10	Comp/Graphic Mike	120.00	(3.00)

— CW Keyers —

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Vibrokeyer Deluxe		78.09	(3.00)
The Original Standard		73.54	(3.00)
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BENCHER			
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BY2	Squeeze Key, Chrome base	76.97	(3.00)
STARMASTER			
Dewsbury	Electronic Keyer Unit (No Paddle)	54.70	(3.00)
Dewsbury	Electronic Memory Keyer (No Paddle)	95.00	(3.00)

KENWOOD

TS940S	9 Band TX General Cov RX	1995.00	(—)
AT940	Auto/ATU	244.88	(3.00)
SP940	Ext Speaker	87.55	(3.00)
TS930S	9 Band TX General Cov RX	1695.00	(—)
AT930	Auto/ATU	206.03	(3.00)
SP930	Ext Speaker	86.23	(3.00)
TS440	9 Band TX General Cov RX	1138.81	(—)
AT440	Auto/ATU	144.82	(3.00)
PS50	H/Duty PSU	222.49	(3.00)
AT230	All Band ATU/Power Meter	208.67	(3.00)
SP230	External Speaker Unit	66.49	(3.00)
PS430	Matching Power Supply	173.78	(3.50)
SP430	Matching Speaker	40.81	(3.00)
SM220	Station Monitor	343.62	(3.50)
BS8	Band Scope Unit (830/940)	77.00	(2.50)
TL922	10/160 2kW Linear	1495.00	(7.00)
TH21	2M Mini H/H	189.00	(3.00)
TH41	70cm Mini H/H	218.00	(3.00)
TH205	2M H/H	215.26	(3.00)
TH215	2M H/H Keyboard	252.13	(3.00)
TR751	2M 25W M/M Mobile	599.00	(—)
TS711	2M 25W Base Stn **(New Low Price)**	898.00	(—)
TS811	70cm 25W Base Stn **(New Low Price)**	998.00	(—)
R2000	Gen Coverage HF/RX	599.00	(—)
VC10	118·174MHz Converter (R2000)	161.94	(2.50)
R5000	General Coverage HF/RX	875.00	(—)
VC20	118·174MHz Converter (R5000)	167.21	(2.50)
BT2	Empty Battery Case TH21/41	11.86	(2.00)
DC21	DC Power Supply TH21/41	25.00	(2.00)
EB2	Ext. Battery Case TH21/41	6.77	(2.00)
HMC1	Headset with Vox TH21/41	32.91	(2.00)
PB21	Nicad Pack TH21/41	24.36	(2.00)
BC6	Desk Charger TH21/41	99.00	(2.50)
SC8	Soft Case TH21/41	11.86	(2.00)
SMC30	Speaker/Mic TH21/41/2600	28.31	(2.00)
MC50	4P Desk Mic	46.08	(3.00)
MC60A	8P Desk Mic	88.22	(3.00)
MC80	Electric Desk Mic	53.98	(3.00)
MC85	Desk Mic Audio Level Comp	99.00	(3.00)
MC43	8P Fist Mic	22.22	(2.00)
MC35	4P Fist Mic	21.72	(2.00)
MC55	Mobile Mic (6p.o. 8p)	52.67	(3.00)
LF30	HF Low Pass Filter	32.26	(2.50)
HS6	Lightweight Hiphones	24.36	(2.50)
HS5	Deluxe Hiphones	37.54	(2.50)
TS140	HF 9 Band Gen. Cov. TX/RX	862.00	(—)
TW4100	2/70cm FM Dual band model **SPECIAL**	499.00	(5.00)
RZI	500·950MHz AM/FM Scanner	465.00	(6.00)

— SWR/PWR Meters —

HANSEN			
W720S	130/440 MHz 20/200W	52.75	(2.50)
FS5E	3·5·150MHz 20/200W	42.75	(2.50)

— Miscellaneous —

SMCS 2U	2 Way SO239 Switch	18.95	(2.50)
SMCS 2N	2 way 'n' Skts Switch	23.50	(2.50)
Kenpro KP21N	2 way Switch 'n' Socket Deluxe	27.00	(2.50)
T30	30W Dummy Load	10.29	(2.50)
T100	100W Dummy load	45.00	(3.00)
T200	200W Dummy load	65.00	(3.00)
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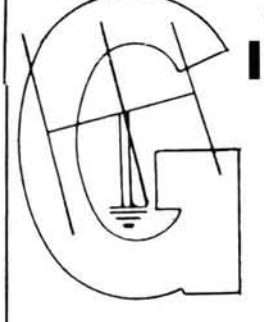

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Practically Yours

By Glen Ross G8MWR

The ubiquitous v.s.w.r. bridge does an excellent job on coaxial cable but what happens if you want to do the measurement on 300Ω flat line? Your unbalanced bridge is not much help on balanced transmission line. There are two ways around this problem, the first is close to the radio amateur dream, of getting something for nothing. All that is required is a length of 300Ω twin lead about 610mm long (or 150mm for v.h.f. use) and two 6.3V dial lamps. The two lamps are connected across the twin lead as shown in Fig. 1 and the construction is complete.

Application

To use the indicator simply tape it to the transmission feeder in such a way as to keep the two wires in the v.s.w.r. bridge line in close proximity to the wires in the TX feeder. This means the wide surfaces of the 300Ω ribbon are taped together as in a sandwich. The next step is to fire up the transmitter. If you have a well-matched line only the lamp nearest the transmitter will light, but if there is a mismatch then both lamps will light. The difference in brilliance is an indication of how high the v.s.w.r. is. Depending on the band and power in use, you may have to experiment a little with the line length and perhaps the current rating of the lamps. If all you are looking for is a minimum v.s.w.r. indicator to assist in tuning up your antenna, or to make sure the system is not misbehaving, then this is all you will need.

Table 1

SWR	Meter* reading	% Reflected power
9.0	8.0	64.00
8.0	7.7	59.29
7.0	7.5	56.25
6.0	7.1	50.41
5.0	6.6	43.56
4.0	6.0	36.00
3.0	5.0	25.00
2.5	4.2	17.64
2.0	3.3	10.89
1.9	3.1	09.61
1.8	2.8	07.84
1.7	2.5	06.25
1.6	2.3	05.29
1.5	2.0	04.00
1.4	1.6	02.56
1.3	1.3	01.69
1.2	0.9	00.81

*Meter reading assumes scale markings of 1-10

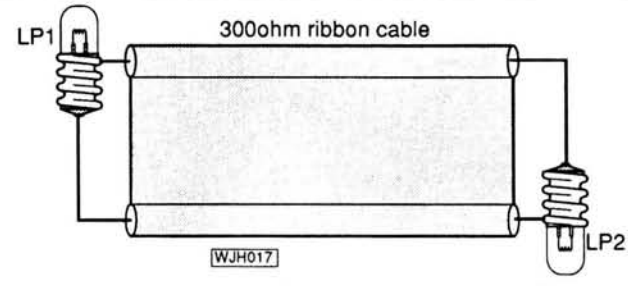

Fig. 1: Construction of twin lamp v.s.w.r. indicator (300Ω line length and LP1,2 wattage see text)

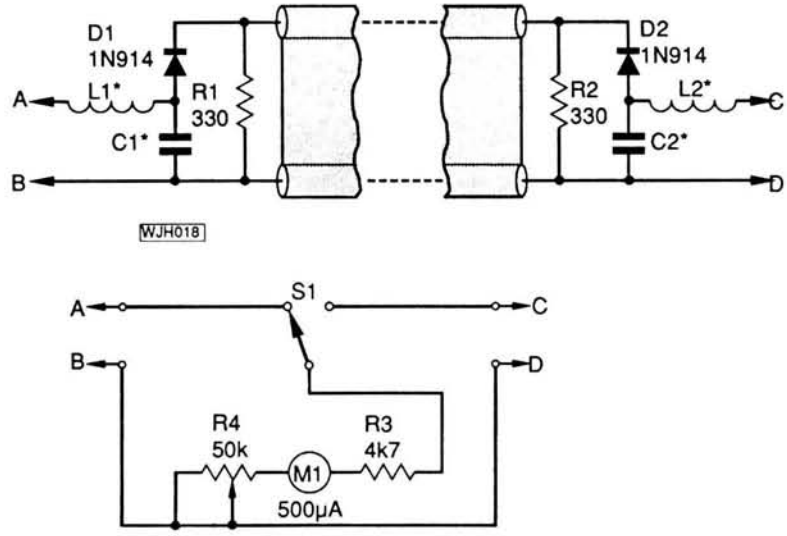

Fig. 2: Remote sensor for driving meter circuit

Turning it into Real Readings

If you want to be able to read the actual ratio of mismatch then you need something a little more complex. The lamps are removed from the line and are replaced by the small detector networks shown in Fig. 2. These are then used in conjunction with a normal metering circuit, with facilities to change from forward to reverse indication. The readings are taken in the normal way, by first setting the forward reading to full scale, then switching to reverse and noting the meter reading, which is then compared with the forward reading, to obtain a ratio of forward to reverse power present on the line. The formula to calculate s.w.r. from forward full-scale-deflection (Vo) against reflected power (V_R) is as follows:

$$\text{s.w.r.} = \frac{Vo + V_R}{Vo - V_R}$$

For example,

$$\text{f.s.d.} = \frac{1+1}{1-1} = \frac{2}{0} = \infty$$

$$\tfrac{1}{2}\ \text{f.s.d.} = \frac{1+\frac{1}{2}}{1-\frac{1}{2}} = \frac{1\frac{1}{2}}{\frac{1}{2}} = \frac{3}{1} = 3{:}1$$

$$\text{Zero} = \frac{1+0}{1-0} = \frac{1}{1} = 1 = 1{:}1$$

The reverse scale reading can be compared with the information given in Table 1, so as to obtain a quick reference of actual v.s.w.r.

The Mystery

Two lamps in what looks like a series circuit and yet, at zero v.s.w.r., one lamp lights and the other does not, how strange! So how does it work? The system works because there are in fact several currents in the loop, not one. The actual values of the inductive and capacitive currents are due to the wire making up one side of the bridge, having much tighter coupling to the adjacent wire in the feeder than it does to the wire further away.

Capacitive Inductive Effects

The current due to capacitive coupling, which is not dependent on the direction in which the wave travels, passes through the two lamps in the same direction. This current has the same value and is in the same phase at both ends of the line, for waves travelling in either direction.

The currents due to inductive coupling, which is a vector action, are of different values and phase depending on whether they are generated by forward or reverse power. Therefore, in a line with zero v.s.w.r., the various currents cancel in one lamp, which stays out, and adds in the other, which is illuminated. In fact the circuit, although appearing to be a simple series loop, is actually far more complex than it first looks.

SHOPPING LIST

Resistors

0.25W 2% Carbon film

330Ω	2	R1,2
4.7kΩ	1	R3

Potentiometer Lin.

50kΩ	1	R4

Capacitors

Disc ceramic

1nF	2	C1,2 (v.h.f.)
10nF	2	C1,2 (h.f.)

Inductors

100µH	2	L1,2 (v.h.f.)
2.5mH	2	L1,2 (h.f.)

Semiconductors

Diodes

1N914	2	D1,2

Miscellaneous

S1 s.p.d.t. toggle, M1 500µA f.s.d., connecting wire, 300Ω ribbon cable.

30 ▶

Monitoring the electric field can be both fascinating and useful. The atmospheric potential varies with humidity, temperature, solar activity and convective cloud formation.

In summer, the "fair-weather" field reaches a peak in mid afternoon unless shower clouds develop. Large cumulus clouds passing over the antenna cause fluctuations and polarity reversals, which grow as shower clouds form. Distant lightning shows as sharp spikes on the trace, with amplitude increasing as the storm approaches.

Apart from forecasting thunderstorms, variations in background field foretell the approach of rain or other changes in the weather. A steady fall in potential several hours ahead of the normal daily cycle signals rain, and on a dull day, a further sharp fall in an already low voltage warns that rain is imminent. A steady rise in potential during drizzle or fog means better weather, and in winter, erratic "noise" accompanied by heavy cloud and falling potential forecast snow.

At night the field potential falls to a low level, unless thunderstorms threaten. Under these quiet conditions a trace at high gain will show occasional disturbances caused by solar events or ionospheric ripples caused by meteors burning up overhead. Another powerful source of disturbance is smoke. A nearby bonfire, or traffic exhaust can cause large erratic swings in the 1-10V range and give the impression of local instability associated with convection cloud building.

The electrometer also seems capable of registering seismic disturbances such as earthquakes and underground nuclear tests, both of these events having been monitored at the author's QTH. The exact mechanism by which the effects can be monitored is relatively complex, however, such changes in potential can be likened to those caused by distorting a piezoelectric substance.

Once installed, an antenna electrometer will give a fascinating insight into the complex electrical interchange between the ionosphere and the surface of our planet. The major power source of this phenomenon is the avalanche of charged particles from the sun. Who knows, this may be yet another instrument by which those cherished DX windows may be forecast!

PW

SHOPPING LIST

Resistors

1W 5% Carbon film

330Ω	1	R2
10kΩ	2	R8,9
220kΩ	1	R6
2.2MΩ	1	R1
4.7MΩ	1	R3
8.2MΩ	1	R5

4W Wirewound

1kΩ	1	R10

Potentiometer Linear

250kΩ	1	R4
2.2MΩ	1	R7*

*with single pole switch

Capacitors

Polyester 400V

0.1µF	1	C1
0.47µF	1	C2

Electrolytic 500V

10µF	2	C3,4

Semiconductors

Diodes

1N4007	2	D1,2

Valves

6Q7GT/G	1	V1†
VR150/30	2	V2,3†

Miscellaneous

T1 250V 100mA, 6.3V 500mA or similar(1); 250V 1A toggle switches S1-4; International Octal valve holders (3)(2); 6V panel lamp with holder and bezel; M1 see text(3); SK1–3 4mm type with matching plugs; F1 1¼in fuse with chassis mount holder; Plywood off-cut (baseboard); Single gap spark plug (must be unused); Hook-up wire; Terry clip; Knobs; Tag strip; Assorted hardware.

(1) Suitable surplus item (Part Code X075) available from:
Greenweld Electronic Components, 443 Millbrook Road, Southampton SO1 0HX. Tel: 0703 772501.

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

(3) Meter shown in *PW* prototype is a 250–0–250µA, part code CZM250. Also available with a slightly smaller scale is a 50–0–50µA type, part code 30MP4. Both stocked by:
Electrovalue, 28 St Judes Road, Englefield Green, Egham, Surrey TW20 0HB. Tel: 0784 33603.

† RST Mail Order Co., Langrex Supplies Ltd., 1 Mayo Road, Croydon, Surrey CR0 2QP. Tel: 01-684 1166.

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Have 30 years *Practical Wireless* to date, including many enclosures (8 missing) plus 9 years of *Television* magazine. Would exchange for fair quality Morse key and oscillator plus Morse tutor tapes and information on passing RAE. Tel: 0664 840 764 *E799*

Have Yaesu FT-757GX plus matching p.s.u. and auto a.t.u., boxed as new (4 QSOs old). Would exchange for basic solid state h.f. rig plus adjustment. Garry. Tel: 0625 530200 *E803*

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Have Chinon CE3 auto/manual SLR camera with Zeiss 50mm F1.8 auto lens and 135mm manual lens plus dedicated power winder. Would exchange for terminal unit, h.f. receiver, 50MHz transverter or w.h.y? Alan G1EBH. Tel: 0268 45573 evenings *E804*

Have crystal set, 1920's Gecophone style, working with original cat's whisker, basket wound coil and period Brown's "A" headphones (plaited wires). Would exchange for good SLR camera. Mann. Tel: Cambridge 860150 *E805*

Have Tristar 777 transceiver converted to 28MHz band, has a.m., f.m., s.s.b. modes plus 100W linear amplifier. Would exchange or part exchange for 144MHz f.m. or multimode rig, communications receiver or scanner. John G4XYY. Tel: 0937 844197 *E816*

Have IC-505 50MHz multimode transceiver 0.5W-10W output in v.g.c. Would exchange for h.f. transceiver FT-101, FT-707 or similar. Tel: 0384 65614 *E820*

Have Grundig Satellit 208/6000 1.6-30MHz battery/mains receiver also army spark-gap TX and many other vintage goodies. Send stamps for full list. Would exchange for Sony ICF-7600 and variable pitch cassette deck. 25 Glenmore Road, Birkenhead. Tel: 051 652 8799 *E835*

Have lots of i.c.s, components, meters. Send for lists. Would exchange for urgently needed counter i.c. type AY-5-8100 and 1.28MHz crystal. S.K. Lai, 172, JLN Hujan Emas 4, BKT Indah, JLN Klang Lama, Kuala Lumpur, Malaysia *E840*

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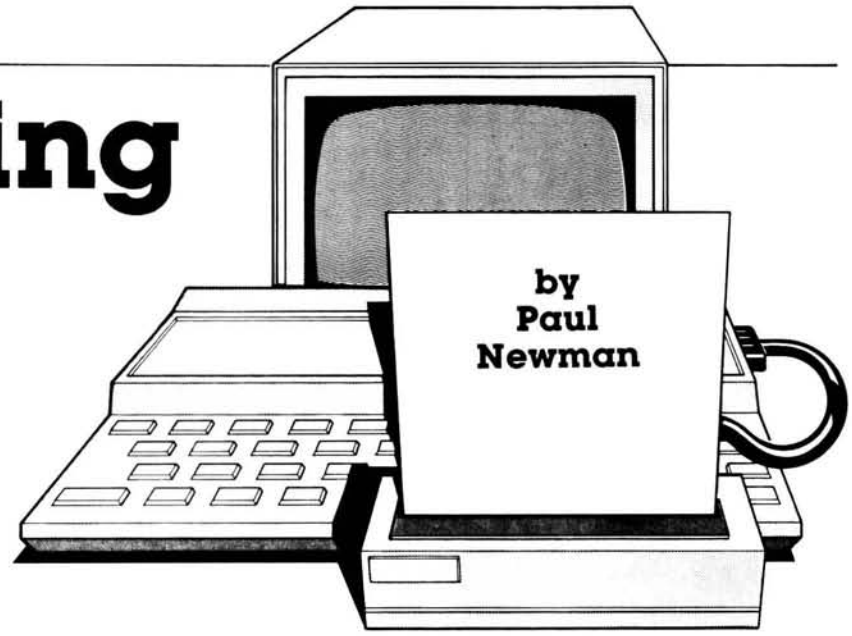


Due to an apparent lack of development concerning most micros common in Amateur Radio, this issue will have to concentrate upon one major development affecting Spectrum users. More of that in a little while.

Commodore users may be interested to know that a Commodore Radio Users Group has been formed under the guidance of Simon Lewis GM4PLM. They have a 4/year newsletter, a wide software library and intend to cater for all CBM machines from PETs to AMIGAs. For an application form or more information please write to the address given below[i]. Please remember to enclose an s.a.e. or valid IRCs.

As I indicated in several previous issues, I am hoping to review a brand-new multimode-mode intelligent terminal unit with a special eye on use with the Sinclair and Amstrad CPC machines. I'm pleased to say that thanks to AMDAT [ii], this unit is now with me and under review. More of that in the next Computing Corner.

Users of the CPC Packet-controller program featured several issues ago might like to note this little mod which should be made if the program is to be used with digipeaters having "The-Net" software rather than NETROM. This is more likely to affect continental users at present I gather. This is the change:

RUN "PTE . . when it runs, break the program with esc

POKE &41CD,&3E
POKE &42AD,&3E

SAVE "PTE.BIN", B,&4000,&550

this will then print "TheNet's" connect message instead of NETROM's message. Thanks to Saku OH1KH for this. Incidentally, Saku's program has proved very successful with the MFJ-1278 unit.

As you may be aware both from this column and elsewhere, there have been rumours of a dedicated Spectrum Packet Radio system for quite some time. Its existence has been known to me for some 4 months (at time of writing). Up 'till now, I've hesitated to report it in any detail since it may never have "hit the market" Well, now I'm sure that it will.

At the time of writing, my knowledge of the system is based solely on a lengthy correspondence although I will actually lay hands on a working version within a week or two and my intention is to produce a short review which will, I hope, also appear next time around.

The FB-AX25 Packet Radio System is believed to be the first TNC/Driver designed specifically for the Sinclair Spectrum 48K micro. It converts the micro into a complete Packet-Radio Terminal requiring NO extras other than a conventional v.h.f. or h.f. transceiver.

The software is supplied complete with a modem which is a compact unit plugging into the rear edge-connector of the Spectrum. No modifications to the Spectrum are required. A DIN connector permits connection to the p.t.t., mic and speaker lines of the transceiver. The software will be supplied on cassette. This is a "nothing else to buy" package–you don't need an additional terminal unit.

It is believed that this system will be ideal for anyone with a serious interest in Packet Radio. It is not a compromise but it will be economical enough to purchase a 48K Spectrum for the sole purpose of dedicating it to Packet Radio. (With 48K Spectrums selling second-hand at £10–£15 this has to be true!)

In RECEIVE-mode the screen is split into several windows, the top line showing the station callsign and a real-time clock. The second line shows the channel-number in use, present status and callsign of station called.

The third line is used to advise the channel numbers in use and flashes the channel-number of a message arriving on that channel. The balance of the top $\frac{2}{3}$ of the screen displays incoming text.

The bottom $\frac{1}{3}$ of the screen is used for either command lines to the program, or messages. Upper and lower screens scroll independently. The lower screen contains either the CMD: or TXT: prompts which is changed by alternate presses of CAPS and SYMBOL SHIFTS together.

Transmitted messages are displayed on the upper screen and prefixed with (S) so that there is no confusion with incoming text. CMD: must be selected before entering any command. If an invalid command is typed it simply disappears from the screen before ENTER is pressed. (I believe I'm right in saying that currently there are no split-screen terminal programs for the 48K Spectrum.)

The screen can be scrolled forward or backward with a unique scrolling facility using CAPS-SHIFT ⌃ (up arrow) or CAPS-SHIFT ⌄ (down arrow). Left arrow is used for backspace/editing and the right arrow to send » at the end of the final over to invite the station to reply. This is the usual convention in Packet Radio operating.

The ENTER key will also send the packet at any time, otherwise it will be sent automatically when the "PACKLEN" (packet length) parameter is reached.

Program parameters can be changed by the use of about 85 commands but all are set up for normal use as default settings. The program is "user friendly" in that a parameter screen can be called showing the current settings such as Baud rate, Packet length, Connect alarm, etc., and can be changed simply by typing in the new parameter i.e.:

R baud rate 1200bps YES

For 300 bauds on h.f. this would read

R Baud rate 1200bps NO

Entering RO for NO or R1 for YES immediately updates the screen. Packet length is changed by entering PO to P1, each one increases the packet length by 25 characters.

A Connect alarm sounds through the Spectrum speaker when a connect is made to the station and sounds for 5 seconds. It can be amplified by connecting an amplifier from the "ear" socket. The facility can be disabled. Word-wrapping is also provided.

Baud rates of 1200 or 300 are available and also a unique facility allowing either high (2025/2225Hz) tones or low (1070/1270Hz) tones to be selected

for h.f. operation. The standard v.h.f. settings are 1200/2200Hz, i.e. 1000Hz shift. All these are software-selectable and the modem switches automatically.

Buffers are available as follows:

Connect Message buffer can contain any message up to 90 characters. It is displayed on a separate screen and is sent whenever a connection is made to your station.

Beacon Message buffer can contain any message up to 90 characters and is also displayed on a different screen selected by command S2. This message is sent automatically every multiple of 5 minutes which may be selected by the commands B1 to B6. B0 disables the beacon message.

A type-ahead buffer allows the operator to enter a message on the lower screen which displays the last 180 characters before scrolling up. Edit facilities allow for correction of text before sending messages.

A separate buffer can be used to compose a message in advance of sending, for example, to a mailbox. Files can also be entered into this buffer either from the keyboard or cassette for later transmission.

The callsign buffer logs the last 20 stations received for viewing or sending to another station.

Both upper and lower case mode can be selected using the command L1 or L0. This changes the character-set for both send and receive. It is quite refreshing to receive a normal 128 character set after operating on baudot RTTY.

Up to 9 separate Packet Radio stations can be operated at the same QTH using different SSIDs (secondary station identifiers) . . i.e.–Z21FB-1 for the h.f. station and Z21FB-2 for the v.h.f. station. Up to 15 can be received or called.

The system also acts as a digipeater which is enabled by the command D1.

An echo allows outgoing messages to be displayed on the upper screen together with incoming messages thereby maintaining a complete record of the QSO. This can be disabled to conserve buffer-space if required.

Up to six channels may be selected to allow simultaneous connects with up to 6 stations at the same time. You therefore have a facility to carry on up to six QSOs at the same time with the relevant text being sent to the screen attached to that channel.

Sending text to a printer is at present limited to systems using the Rocky Gush DOS interface, although by the time the unit is released in UK I would expect normal RS-232 printers to be supported (G4INP). A facility also exists for sending a "busy" signal if you are not available for a connect but wish to monitor the channel. You are advised of the caller's presence.

The AX.25 protocol allows for up to 8 repeater stations to be used and this facility is also supported.

A further program will be available at a later date which will integrate with this and permit full-colour pictures to be transmitted using the AX.25 protocol. It will operate between Spectrums only.

This "press-release" is based upon detailed specifications supplied by the system's designer Howard Benjamin. At the time of writing I understand that there is a possibility of one of UK's leading radio software authors becoming involved in the marketing of this system. This would, in my view, give the system the support it deserves.

There is considerable interest amongst members of the Sinclair User Group. Further information will be released as it becomes available and I'll happily supply on receipt of a stamped addressed envelope clearly marked PACKET INFO [iii]. I look forward to bringing you hands-on experience of this exciting development next time around. 73 till then.

[i] Mr S Lewis GM4PLM, 69 Irvine Drive, North Clippens, Linwood, Paisley, Renfrewshire. (s.a.e. please).
[ii] AMDAT, "Crofters", Harry Stoke Road, Stoke Gifford, Bristol.
[iii] Paul Newman G4INP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ–no s.a.e. = no reply.

Constructional

Kitchen Konstruktion

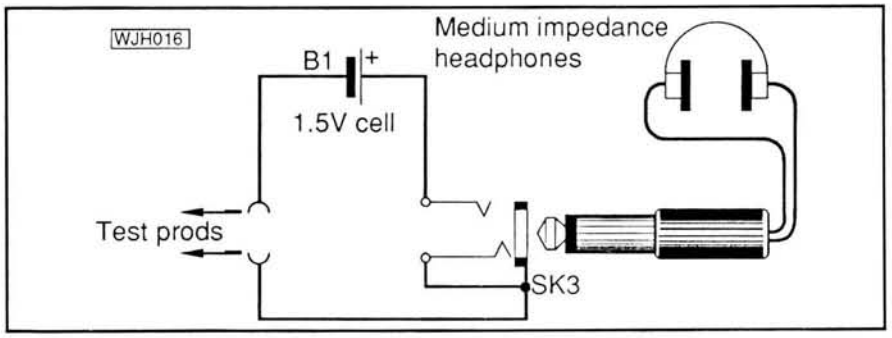
This month in No. 8 of his occasional series, Richard Q. Marris explains how to make and use a simple continuity tester.

Optical acrobatics are usually involved when testing for circuit or winding continuity, usually with the multimeter set on the ohms range. This involves looking at where the test probes are while simultaneously squinting at the meter scale. It's obvious that trying to multiplex one's visual senses between two or three tasks is slightly over-stretching the human system. What is needed is a feedback system that uses one of the other human senses, the ears in this instance.

The simple continuity tester consists of a pair of headphones, a 1.5V battery and a couple of test prods. This idea, in one form or another, has been used around the author's QTH since schoolboy days. It must date back to some of the earliest communication experiments ever done; but has not been seen around much in recent years.

Construction

The whole gadget can be built into any small enclosure, plastics or metal. Into the enclosure should be fitted a single cell battery holder, R6 (AA) or R14 (C) size and a non-shorting headphone jack socket. A couple of suitable test prod sockets are mounted at the opposite end of the enclosure to the jack socket. If you have an old set of headphones and test prods the sockets could be dispensed with, and these items may be hard wired.



As can be seen in Fig. 1 the battery, headphones and test prods are wired in series with the circuit under test. If there is continuity then a click will be heard in the headphones. With your ears checking for continuity, your eyes can pay full attention to where the test prods are going.

The device has been found useful for checking continuity in transformers and other windings; checking wiring looms for breaks and also tracing circuits on strange chassis. It is, of course, essential that all components and circuits being checked should be isolated from any source of power. This would also apply when using an ohmmeter for the same purpose. **PW**

On The Air

On The HF Bands

Reports to Paul Essery G3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1AR

Just how much of the mail has reached me, due to the postal dispute, heaven only knows. So, if you wrote and no mention appears, bear with me—your letter won't have landed.

The Bands

My own impression is that 21MHz (15m) has yielded more entertainment than 14MHz (20m), if only because the noise level drops noticably as one goes up to 21MHz. I'm quite sure that there are interesting DX signals, maybe even pile-ups, lurking beneath the barrage of noise which seems never to drop below S8 in the afternoon or evening hours. Certainly, the contrast between today and conditions at the bottom of the cycle a couple of years ago are spectacular; 21MHz open almost every evening at least until around 2100Z. I have even managed to eavesdrop on the odd 28MHz (10m) opening, which is quite unusual.

Use or Lose!

It is purely lack of use that has resulted in the Yanks losing the lower 2MHz of their 220MHz band, as reported recently in *The DX Bulletin*. A lesson which could come home to roost on our lower bands come the next WARC, which is probably as near as 1992. Make no mistake, the pressure is on; if we have under-used bands, we will see them snatched by the broadcasters and the other spectrum users. To me, it seems likely that our new bands, allocated at WARC 1979, plus the 1.8MHz (160m) band, are the most at risk. Let us see more real activity on these bands, and more reporting of that activity.

What Gives?

At the time of writing I am still hearing rumours about the Lynx DX Group operation as 4WOEA; but there is no hard information as to dates or whatever.

Again at the time of writing, there is activity from VP8 Falkland, VP8 S. Georgia and VP8 S. Orkney; at one stage all three were loading 21MHz which must have caused some people to agonise over which one to tackle first!

If you come across a 4F1 station (they are increasingly common), this is the top grade of licence in the Philippines.

There has been a report of an S6HF/MM on 21MHz, asking for QSLs to a Glasgow address. One fears this is yet another of the phoney /MM stations; it seems to be a fashion among sailing types to run amateur equipment aboard, but the information gleaned about them indicates that a very large proportion of such "amateurs" are in fact phoneys.

The Vanuatu YJ8 expedition seems to have come to naught; but a buzz is going round that it is postponed until either December, or maybe August next year. Also in the cancellations, the 9Q5HT expedition—no reason given.

Turning to Fiji, lots of 3D2s about; but, alas, AL7JG/3D2 who has been quite active from the area is operational from his boat, so won't count for anything at all.

C9MKT seems to operate like an actor using the Method . . . everything done to a list! Just why this one is considered to justify a list operation, no-one seems to know. However, TDXB states that his licence only permits operation on 2–3 days each month over the next year; furthermore his activity, I understand, is being carefully monitored by the licensing authorities, so watch what you say!

BY9GA is quite active, being heard in the mornings and around tea-time in UK, and it should be noted that this BY is in the rare CQ Zone 23.

FP, St Pierre et Miquelon, has always been a rare bit of N. America, but it is understood that F2DX (Ex-F6EYS) is there for three years and promising activity on all bands 1.8–28MHz.

Silent Keys

Quite well known in UK was Sybil Stevens ZD7SS, widow of the late ZD7SD; she is reported to have passed away on August 9 and will be much missed by many UK amateurs.

LX1BW must be one of the most well-known calls on the European continent; alas Willy also is a silent key, on July 11 at the early age of 53.

The 1.8MHz Band

No doubt at all, the main item of news is the receipt of that rather useful newsletter covering doings on this band, offered by VE3INQ. Perhaps the most interesting piece was the offering by ZY0SA and ZY0SB, covering their exercise from St Peter and St Paul Rocks. One end of the antenna was on South Eastern Rocks, the station on South Western Rocks; they were taking about $3\frac{1}{2}$ hours to get from one end of the antenna to the other thanks to the sea in between. A dipole, with its centre feedpoint wasn't possible and the antenna came down more times than enough, carried away by winds and bird strikes; it even carried away the a.t.u. on one occasion. Even the drum of fuel for the generator was under water for some of the time, which made for some stoppages while the drum was hoisted up enough for a refuelling exercise.

Another interesting little snippet was a reprint of W1BB's article of 1965 covering the apparent 169-year cycle in the sunspot routine. 3B8CF writes on his experience on the band over last winter and how he tackled the question of an antenna for the band on his small property in Mauritius.

Perhaps the most important piece of information, listen to the 4X4NJ Top Band Net, on Saturdays 1400UTC on 14.339MHz ±QRM, for the very latest news on Top Band activities.

Details of the VE3INQ Top Band Annual News Digest can be obtained from Ivan Payne VE3INQ, Box 146, Station E, Toronto, Ontario, Canada M6H 4E1. Enclose an s.a.e. for Ivan's reply. In general, Ivan keeps a stock of your s.a.e.s for each issue, and if you can't lay hands on Canadian stamps, then the way is to send an addressed ($4\frac{1}{2}$ × $9\frac{1}{2}$ inches minimum, A4 preferable) envelope and 5 IRCs for the next issue to be airmailed to you. With some 28 pages well filled, a hefty envelope goes without saying!

The only other report on Top Band this time is the one from **G2HKU** (Sheppey) who mentions s.s.b. contacts with ON4CW and ON7BW, while c.w. made it across to ON4CW.

The 3.5MHz Band

Nice to hear again from **G0HGA** (Stevenage) who offers all c.w.; AC2E, HB0/DL1GGT, DL, PA, ON, LA, SM, OK, SP, GM and northerly G stations.

Another report on this band was from G2HKU, who notes his contact with G3RJV/A using his Argonaut. This was the Rev. George Dobbs, fund-raising for the Organ Fund at St. Aidan's Church, Rochdale. In addition, 15 watts of c.w. to the first British-built Century-22 made it to G3NOZ and UA6EED in the course of some tests from home.

G3BDQ (Guestling) had his first sally on the band this season one evening and raised CX1TE, VK6LK and 5B4MF.

The 7MHz Band

Again G3RJV/A by G2HKU, on c.w., although conditions seem to have been a bit "down" this month; PY7IW, VK3MR, TV6DEB and OY/SM0FSK were also lifted while trying the new Corsair.

G0JBA (Sittingbourne) works shifts and heard a fair amount of DX around 0430Z before heading off to work; but on the other hand those worked were all of the inter-G or Western EU persuasion.

G0HGA as usual worked many G, DL, YU, PA, F, ON, LA, SM, UA, SP, I, EA and OZ stations, plus OG2C for a Finnish Radio Camp, UL8LYA, UZ9FYR, SO5ASL (G4ASL using his reciprocal SP licence: QSL to G4ASL), 4N0CW for a YU special, UA9SA, plus gotaways by way of FG8BP/FS, HB0/F6GM and TK5VN, the latter under much QRM.

G4XDJ used his delta loop to raise SM5IZ, OZ1GHQ, GM3GKJ, GM3JDR and LA9LE on c.w., plus SM6LJU on s.s.b.

WARC Bands

As usual, a dearth of reports. **G4HZ** (Altrincham) notes the DK0WCY beacon as being on 10.143MHz, first noted on August 14 at 1452Z. It sends "DK0WCY Beacon" then a long dash and repeats.

G2HKU kept, rightly, to c.w. and on 10MHz he raised ZL4HB, OH6KO, W1CFZ, LX1DA and VK3NC. There are just one QSO on 18MHz with F6FQF.

The 14MHz Band

It is often said this is the DX world's lifeline; certainly it contains most of the world's oddest electronic and natural (QRN) noises in abundance.

Most times that I cast an ear around the band, the noise was enough to put me off, but I did actually have just one QSO, with VO7AA. This was a Marconi celebration and was for me doubly interesting in that I have seen a postcard of this exact spot, as it was at the time Marconi used it, with the Marconi antenna drawn in, and signed by Capt. Round of the team . . . I wonder whether it looks like that now!

Now **G0AMO** (Andover) makes his bow; he has a Howes Transverter driven by an FT-290R; ten watts into a G5RV at 9m. During the first week on the air, the s.s.b. out of this combination raised ZL4OD, AX3ABD, CP5GC, VE3BZ, VE1CHP, KA1UGC, AB2E, W4EXT, VK5AKW, W1OBE, KD2NN, KE2CG and WB2DIN, plus lots of Europeans. Welcome aboard, Mike.

It was c.w. all the way at G2HKU, who worked W5XJ, KI6HP, VE7IQ, KB7WD, W200RR, TA3D, TR8JL, VK2QL, WB6UAG, VK5DS, UZ9SWI, PY7AHA, K2OZ, KH6IJ, K6DWO and 4N0CW.

On to G4XDJ, who offers RTTY to G0DHU, RA9YB and OH2NAF, plus c.w. to VK6ZE, JA9TSI, W2VAV, VE3GME, VK3ANJ and a two-way QRP one with VK7VV at three watts each way.

G3BDQ didn't spend a lot of time on the band, but he did talk to VK6CW, P0PJ and ZL2APW.

The 21MHz Band

An interesting band, and at present probably the most useful, G2HKU stuck to his key, and exchanged news and views with ZP5LOY, W5/DL3YBM, K5NA, LU1MQE, YB4FN, UA0KF, W4MJ, W2LZX, N4LS, W5PLH and W6DU. In fact, Ted felt that conditions might have dropped off somewhat during the month.

I spent the odd few minutes scratching around, between the chores, to raise, on s.s.b. TZ0MAR, followed immediately by GM4YBJ in Orkney, VP9LR, UI8LAD, CX6BZ, UZ9LWE and OH2RM; gotaways included VK4ANP who was testing-out a renewed antenna installation comprising a 21m tower and a log-periodic array, but was so tired he after getting it all up that he all but fell asleep at the rig! VP8BTA was doing a lot of good business, but the stalk for him was alas interrupted by the shrilling of the landline.

Three different modes were used by G4XDJ; s.s.b. gave 9V1WP, CU3GO and KA8SYW, while RTTY made it to 6W6JX, HZ1AB, LU8DHT and WE2K, leaving c.w. to deal with YD4FQB, JR2RVL, KT3X, W1EQA, AB4ID, PY2ZEB, PU2LWB, N4FYI, N3GIB, KB6NRL, W3LWN, LU5DO, N4PHH, FY5YE, VE2MDJ, KB8MN, VE3AR and JA8HNL.

Now to G0HGA who stuck to c.w. and 5 watts QRP; Angie offers WR7C, NJ1T and UV9CAI.

Turning to G3BDQ, we find on c.w. John raised HL1IFF, and 8Q7MT, while s.s.b. accounted for BY5QA, HK0HEU, VP8VK, YE7W, CN8FC, HZ1AB, UJ8JMM, UL8GWB, AX4NSB, DU1CRU, 9J2EZ, 9V1WW plus a gaggle of West Coast Ws.

On s.s.b. G0JBA has a wire dipole put up in the previous month and 50 watts which made s.s.b. contact with A92BE, EA1ETS, IK1LRY, K2DA, KF5TT, UA3AFJ, W5VX, W5ZPA, plus a QSO on the key with 4X6PO.

The 28MHz Band

Naturally enough, with the rising sunspot activity, there has been quite a lot doing and certainly there have been paths to the DX.

G4XDJ split his time between s.s.b. and c.w.; s.s.b. coped with VK6NQE, YC3FNL, G0GKO and G4IJM/A, while the c.w. was used for OH3KN, OH2BZN, LB1VD and OH8OB.

G0HGA stuck to QRP c.w.; the five watts made it out to LU3YE, EA8FO, EA1BSU, DJ2WC, YO2BON, DF3CB, DL1SN, OK1CZ (QRP both ways), DL9MDW, OZ5S, SM7RME, LB8SC, EA6EJ, HA3NI, OK3ZWX and OK2KR.

A welcome first report from **G0JFM** (Brixham). Steve doesn't get a lot of time for radio in the holiday season, but he did find time to raise TR8SA and 4N0CW on 28MHz s.s.b., plus LA0EM on f.m. That 4N0CW was a Yugoslav expedition, G0JFM believes. On a different tack, the locals have given him a phonetic rendering of "January February March"—a pity that after January 1 he won't be able to add "/April"!

Now on to G3BDQ, who used s.s.b. to raise UZ9CWW, ZS2SI, ZS4AE and turned to f.m. for a host of semi-DX stations. John has been having a change-round in the shack and has a TS-680S which is fine and easy to operate on s.s.b. and f.m., but doesn't, in his eyes, compare with the Corsair on c.w.

Now a DX report; this one comes from **ZS5DD** (Pinetown) who is ex-G3AOY. Bunny found the 28MHz band starting to open for DX contacts back in February, so he put up a half-wave sloper with the feedpoint up at 7m; the QTH is some 370m above sea level. The rigs used are a Drake TR4 and remote v.f.o., Trio TS-510 and on occasion the old FT-200 gets a warm-up too. By now, ZS5DD will have got his 28MHz beam back up. All c.w. contacts in the last couple of months, included were SV4AAQ, 5H1HK, KH6HI, KH6DQ, EA2SE, G4KLF/MM in the Gulf of Oman, VS6DT, JF3LOP, JR1AFA, FT5ZB, TA2AN, T5GG and RI8BT. However, Bunny would love to have a lot more G contacts; to that end he is on 28.015–28.020MHz, every day, at 0515 and 1400Z for about 20–30 minutes, calling CQ G de ZS5DD on the usual 3 x 3 routine. All contacts will be QSL'd, the Bureau ones via the Bureau, direct ones direct. But it is requested stations QSL-ing direct do write his name —D.C. Hilton—on the envelope, as this does speed up delivery.

G0JBA next; Phil says the contacts were mainly Europeans, with Africa heard from mid-morning and S. America from mid-afternoon, the opening to N. America having been in the evenings. Contacts using s.s.b. were booked in with CT1BHK, DH2RAM, EA4CZF, EA5/DH0HAJ, GM0JAV (Orkney), HA6VK, IK8GGQ, IS0JHJ, LA8DF, LU1BDF/P/4X, OH6NTO, PY2YP, lots of SMs, TA3F, T77F, SP2AQP, UB5, UC2, UH8, UP1, UZ6, YU7IGH, 4X4FR, 9J2AL (QSL via Box 20127, Lusaka), while the c.w. mode appealed more to OH1OU and G3AFV; locals were worked in both c.w. and s.s.b. modes; f.m. accounted for G0CEG, through a German repeater!

Contests

All the information on contests on the h.f. bands is put together by W1WY, for his Contest Calendar column in *CQ Magazine*; here I only mention the main ones. Anyone who is thinking of a contest should pass the word to W1WY, because all the avid contesters in all modes, work by Frank's column. He needs to know at least three months ahead and preferably much more . . . e.g. November 15 for the February issue, and so on.

October 15–16 covers JOTA, and the RSGB 21MHz CW contest. October 29–30 is the CQ WW DX SSB contest, November 11–13 the JA International DX Contest, the same weekend as the European RTTY contest, and the VK YL Contest by ALARA. November 26–27 is the CQ WW DX CW Contest. December 2–4 is the ARRL Top Band Contest, and December 10–11 the ARRL Ten-metre Contest, which is the same weekend as is down for the ARCI QRP CW shindig.

The next three deadlines are: Oct 26, Nov 24 and Dec 22

VHF Up

Reports to Norman Fitch G3FPK
40 Eskdale Gardens, Purley, Surrey CR2 1EZ

Significant events to be covered this month are a 50MHz opening to South Africa, reports on recent DXpeditions to St Kilda and to the Isles of Scilly and a very good Perseids meteor shower.

Awards News

Two readers have gained stickers for their 144MHz QTH Squares Century Club certificates. From Italy, **Alex Della Casa I4YNO** was awarded one for 250 squares confirmed on September 1 for award number 60. Three QSOs were on tropo, nine via Sporadic-E, twelve by m.s. and one, with YO9AZD (ME) on 26 July 1987, by f.a.i. mode. His m.s. confirmations included EI4VBG (UM) in June 1987 and EI4VCH/P (U0) and EI2VPX (VN) in August 1987, all on c.w.

Paul Pasquet G4RRA (SRY) has been sending out many QSLs direct and this has paid off. His 225 sticker was issued on August 10 for award number 86. The 18 new confirmations comprised 15 s.s.b. and three c.w. QSOs. Seven were on tropo, nine via Es and one each via Aurora and m.s. modes. The choicest cards were from SV2JL (LA) and SV4LD (LZ) both Es QSOs on 5 June 1985 and FC1DDA/P (DE) on tropo on 12 August 1987. Paul's total squares confirmed is 226.

Beacon Notes

First the 50MHz scene starting with the news that GB3NGI is now QRV on 50.0625MHz f.s.k. from locator IO65NC, the site of the GB3LY v.h.f. repeater in Limavady (LDR). It runs 25W to a halo antenna 280m a.s.l. GI8YDZ is its keeper and reception reports should be sent to him at QTHR.

Geoffrey Holland G3GHS is the Honorary Secretary of the Mid Cornwall Beacon and Repeater Group. He wrote that in June permission was received for beacons on 50.0425MHz and 1296.860MHz. The long-awaited new Gas Board mast at the Hensbarrow Down site (IO70OJ) was being erected. The 70, 144 and 432MHz beacons will be off the air while their antennas are being transferred. New brackets and shackles for all five were being made when Geoffrey wrote.

The group has applied for a change of callsign to the more appropriate GB3MCB but until this is sanctioned all five will still sign GB3CTC, the call of the original beacon at Camborne. The group is very grateful for the donations received so far but more cash is needed to complete the project. G3GHS is QTHR.

Overseas news now and **Mike Devereux G3SED** (HPH) reports that HC8SIX on 50.082MHz and LU1MA on 50.087MHz are both in operation. No other details of these Galapagos and Argentine beacons yet received.

Contest Notes

The first session of the 1.3/2.3GHz Cumulative Contest is on October 14 from 1930–2200UTC. The last four are scheduled for October 30, November 15 and December 1 and 17, all those from 2030–2300UTC. There are two sections, F for single-op fixed stations and O for all others.

The second session of the 432MHz Cumulatives is on October 22, 1930–2200UTC, the following one on November 7, 2030–2300UTC. There are F and O sections again.

50MHz addicts have the Trophy Contest on October 23, 1000 to 1700UTC, a two section affair; F for single-op fixed and O for all other stations. Radial ring scoring up to 650km but all longer DX counts 25 points. There are county/country multipliers.

For c.w. addicts the weekend November 5/6 is a "must." The Marconi Memorial Contest is from 1400UTC and lasts 24 hours. For those who cannot devote the time to that there is the RSGB CW Contest buried in it on the 6th, 0800–1400UTC. Each has two sections; S for single-op and M for multi-op stations.

DXpedition News

First the Five Bells Contest Group's trip to St Kilda which was reached after a 28 hours journey in a chartered fishing vessel. The team comprised **Keith Tatnall G4ODA**, the Group's chairman, **David Johnson G4DHF**, **John Arnold G4NPH** and **Chris Phillipson G8IJC.**

Eight other civilians were on the boat which had to anchor off shore. On a purely voluntary basis, some Army personnel in inflatable boats met the party. The "civvies" helped the Group load all their equipment into the inflatables for ferrying ashore.

The station was established at a quarry site about 120m a.s.l. They were able to use a 5 x 2.5 x 2.5m metal container as a shack, thanks to some contractor's staff who cleared it out for them.

The equipment included six 19kg gas containers for the generators. A 3kVA one powered the amplifiers and a 1kVA one the rest of the gear. There were some rusty poles on site which were of use for the antenna supports. The radio stations comprised an Icom IC-730 and home built transverter for 432MHz, the antennas being four 18-ele home-made Yagis to a W0EYE design modified by G4CYA.

For 144MHz they had an IC-202 with BF981 front end, SRA-1H ring mixer and digital readout, and a Yaesu FT-225RD with MuTek mods. The antenna array was four 9-ele Yagis from Tonna. Home-built amplifiers with 3CX800 valves were used on both bands.

There were 50MHz and h.f. bands stations too. On 50MHz the antenna was a 4-ele Yagi, with dipoles for the h.f. bands.

Nearly 500 QSOs with about 380 different stations were completed on 144MHz including 55–60 on m.s. Conditions were rather strange on this band with all long distance signals sounding garbled and distorted. This explains why the operators of GB4VR may have sounded a little abrupt and impatient at times by requesting rapid repeats of reports.

Only 20 QSOs were made on 432MHz due to severe TVI problems. This was inevitable as the local low power TV relay on the island was operating close to the band. On 50MHz some Es contacts were made.

The operators were G4DHF, G4NPH and G4ODA. G8IJC looked after the "creature comforts" aspect. They stayed under canvas at a designated camp site 25 minutes walk from the quarry.

The St Kilda islands are administered by the National Trust of Scotland. The Nature Warden and the local Army Commander were very interested in the Group's activities. The contractor's staff and other visitors gave welcome assistance, too.

G3FPK was one of the many lucky stations to have worked this rare square and, on behalf of all readers, a big "Thank you chaps" for an excellent DXpedition.

Next the Derbyshire Hills Contest Group's trip to the Isles of Scilly (WJ09e) from August 4 to 14 as reported by **Nigel Wilson G4VVZ**, the Group's Secretary.

They had equipment for the 50, 70, 144 and 432MHz bands. On the afternoon of the 5th, tropo conditions on 144MHz to D, F, ON and PA were good but the best DX were OZ1s FGP, KLU and OF in EQ square, about 1250km.

At other times QSOs were made on tropo with EA2BWA/M, F3TE and F1CCM (ZD), GM8COX/P (YP), F6BSG (CG), I2FAK (EF) and DJ9CZ (DL). Tropo to the south was excellent on their last night and 15 EAs were worked in the "D" row of squares. The most enjoyable QSO was with EB4EO/P1 on f.m. who gave an S9+60dB report from their 40W to a collinear antenna.

The main activity was on 144MHz with about 750 QSOs made including 119 completed on m.s. Best m.s. DX were OH2TI (MU) at 2260km and UP1BWR (MO) at 2192km. 115 squares in 27 countries were worked, using the call G4ZAP/P.

On 432MHz G6APZ/P worked about 50 stations the best DX being EA1BLA (VD) on 25W after two amplifiers had failed along with a GaAsf.e.t. pre-amp. DL9KR was heard off the moon but 25W was quite insufficient to attempt a QSO.

Equipment problems also curtailed 70MHz operation but G4VVZ/P did work G4SEU (ZM), G3APY (ZN), G4APA (YN) and G3EDD and G4NBS (AM).

No such problems on 50MHz though for G4VVZ/P with Es contacts to LA6QBA/P on several occasions plus LAs 1YCA, 1ZE, 8WF and 9T. OH was heard via Es. The m.s. attempt with OH1ZAA was, " . . a touch and go affair . ." on 50.200MHz but PA0RDY was easy to work with a 30 seconds S8–9 burst.

The other operators were **Martin Daft G6ABU** and **Richard Mason G6HKS.** Nigel acknowledges the prior assistance of David Hardy G8ROU and Colin Oakley G0AEA. Over the first four days Mike Coombs G4YBB gave them a lot of help, too.

Annual v.h.f./u.h.f. table
January to December 1988

Station	50MHz		70MHz		144MHz		430MHz		1296MHz		Total Points
	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	
G1KDF	38	16	—	—	83	18	57	11	25	6	254
G6HKM	30	13	—	—	76	27	47	15	25	10	243
G1SWH	43	18	—	—	95	18	53	7	—	—	234
G4XEN	43	14	9	1	66	32	48	9	—	—	222
G8LHT	8	7	6	1	65	28	40	13	6	2	176
G0IMG	37	14	28	4	43	11	23	3	—	—	163
G4DEZ	33	16	—	—	30	16	27	6	34	10	162
GW6VZW	42	16	—	—	68	16	—	—	—	—	142
G1IMM	26	8	—	—	52	11	31	2	—	—	130
GM0EWX	53	12	—	—	49	13	—	—	—	—	127
G6MXL	17	8	11	4	41	14	17	5	5	3	125
ON1CAK	—	—	—	—	70	31	9	6	—	—	116
G1EZF	—	—	18	2	67	23	—	—	—	—	110
G4VOZ	18	11	46	6	—	—	21	7	—	—	109
G4YCD	—	—	—	—	83	23	—	—	—	—	106
ON1CDQ	—	—	—	—	61	32	6	6	—	—	105
G0EHV	—	—	35	5	45	19	—	—	—	—	104
G4ZEC	—	—	—	—	75	27	—	—	—	—	102
GW4FRX	—	—	—	—	70	28	—	—	—	—	98
GJ6TMM	23	12	—	—	36	14	7	5	—	—	97
G3FPK	—	—	—	—	77	20	—	—	—	—	97
GM0HBK	26	8	—	—	46	15	—	—	—	—	95
G6MGL	19	10	—	—	49	10	—	—	4	2	94
GW4HBK	22	18	43	6	—	—	1	1	—	—	91
GI4OWA	19	14	—	—	40	14	—	—	—	—	87
G7ANV	—	—	—	—	66	21	—	—	—	—	87
G8XTJ	16	4	—	—	55	11	—	—	—	—	86
G4ARI	—	—	16	2	58	9	—	—	—	—	85
G8PYP	13	9	2	1	38	12	6	2	—	—	83
G1SMD	21	17	—	—	25	18	—	—	—	—	81
G1DOX	16	2	19	2	22	5	5	2	2	1	76
G4AGQ	—	—	13	1	35	8	12	3	—	—	72
G1CEI	—	—	—	—	59	12	—	—	—	—	71
G2DHV	5	1	12	1	28	6	7	1	—	—	61
G3EKP	12	3	16	4	7	4	5	1	—	—	52
G4WHZ	3	2	—	—	31	12	—	—	—	—	48
GM0JOL	—	—	—	—	30	10	—	—	—	—	40
G4ZVS	—	—	—	—	34	5	—	—	—	—	39
G0HGA	—	—	—	—	30	5	—	—	—	—	35
G0HDZ	—	—	—	—	30	5	—	—	—	—	35
GU4HUY	—	—	—	—	23	10	—	—	—	—	33
GM1ZVJ	4	3	—	—	14	7	—	—	—	—	28
G8PNN	—	—	20	3	—	—	—	—	—	—	23

OSCAR-13

Following the criticism of the use by some West European satellite operators of Mode JL on OSCAR-13, a letter has been issued jointly by AMSAT-UK and AMSAT-DL to magazines, groups and individuals. This requests that the

144.425 to 144.475MHz uplink sub-band only be used by Eastern Bloc countries who cannot use the Mode L 1269MHz band. See "Newsdesk" this month.

The 50MHz Band

A foretaste of things to come later in Solar Cycle 22 occurred on August 28 when South African stations worked into the British Isles. G3SED is claiming the first G/ZS QSO of this cycle. Mike's CQ call at 1640UTC on 50.110MHz was answered by ZS6XJ (KG33); Leroy was S3-7. At 1642, Hal Lund ZS6WB (KG44) was contacted at S3-9. ZS6LN (KG46) was the third ZS worked at 1734; Jack was S2-4.

Earlier at 1555, ZS6XJ had worked DL9RM cross-band 50/28MHz and at 1600 he heard part of G4IGO's callsign. At 1603 G4UPS heard the ZS6PW beacon, now on 50.009MHz, and the ZS6XJ keyer.

Between 1643 and 1741 Hal and Leroy worked G3JVL, G8HVY, G4JCC, G8VR, GJ4ICD, PA0RDY, F1DQK and F6DOK. EI2FH was heard. Between 1725 and 1740 ZS6LN contacted GJ4ICD, G3SED and G3JVL.

My Minimuf computer program suggests that for a solar flux of about 140, F2-layer propagation would have been possible at the southern end but at the higher northern latitudes the h.p.f. would only have been about 40MHz. Does anyone have any suggestions as to the likely propagation mode?

G3SED sent the following information. ZB0E is now on from Gibraltar with 15W to a dipole but soon to be using a 5-ele Yagi. FT5ZB on Amsterdam Island in the Indian Ocean is beaming towards the UK and monitors 28.885MHz all day. FH5EF in Mayotte is also active and looking to the UK, while FH5EG is building a transverter.

From Cyprus 5B4AZ has obtained a 50MHz licence and is keen to make his first G QSO. 9Q5NW in Zaire is being sent a 50MHz rig by N4EJW so hopes to be active soon.

VK6HK has built a beacon for 50.066MHz which should be on by now. Both he and VK6RO are looking for UK stations. SM6FZD told Mike that 25 special 50MHz licences will be granted in Sweden from November.

On August 10, ZS3AT (JG87) heard beacons CT0WW and 9H1SIX, 1643-1810UTC. As soon as equipment is donated to him, SU1ER in Cairo intends to operate on the band. Now to news from the British Isles.

Gerry Schoof G1SWH added five more countries in August, GU4CJG/P (GUR) being his 18th country this year. **Clive Penna G3POI** (LDN) heard beacon ZD8VHF via F2-layer on August 2, 2130-2230, also on the previous day.

G3SED also copied it on the 1st, 2102-2135 at S7. Mike worked OX3LX at 1915 on August 5 for his first OX. He lists other assorted Europeans as "heard/worked" on August 7, 8, 11, 13 and 14. (I would appreciate your indicating which were worked, Mike.)

In his August 15 letter, **Ken Osborne G4IGO** (SOM) lists several Fs worked on July 31 plus ZB0E (XW) and CT4KQ/M (VA). In the evening there was some very short skip Es to PA and Gs in the Midlands. He copied ZD8VHF on August 1, 2101-2232. The 5th brought OX3LX and OX/OZ1FDH in mid-evening and GB4VR at 1907 the next day. Ken worked OH, D and PA stations on the 8th. An m.s. QSO was completed with LA6QBA (GW) on the 13th. Other QSOs in the day included 9H1EL, EA1MO (ZD) and FC1HIU (DD). LA6QBA was worked on m.s. again on the 14th, this time from FW square.

In August **Martyn Jones G4TIF** (WKS) added his 20th country on the 3rd, GU4CJG/P. On the 7th he lists three OHs in KP20 and KP30 plus back-scatter QSOs with GI6ATZ, GI8YDZ and G0HNW at QTE 330° and on the 8th b-s contacts at 210° with G3ZYY, GW4TTU and G4IGO.

John Palfrey G4XEN (NHM) worked CT4KQ/M (IN50) and F6AJW (IN93) who was running 200mW on July 31. The GJ beacon was heard via tropo for the first time that day and G4FHO and G3ZYY (CNL) were contacted GU4CJG/P was a new county and country on the 8th.

Ela Martyr G6HKM (ESX) also worked the GU on August 3 and in a brief opening next day OH1AYQ (KP12). She contacted GB4VR in the evening of the 6th and OH1VR/2 on the 8th. At 1710 on the 28th Ela heard ZS6XJ who peaked S3 for a short while.

John Fitzgerald G8XTJ (BKS) says he now believes in m.s. having heard some long, loud reflexions. He started on the band on August 11 with 10W to a dipole his first QSO being GU8OGJ/P (ALD). OH and LA were heard via Es on the 12th and on the 14th and 17th John worked 9H1EL. Best UK QSOs were G6CZV (MCH), GW3JXN/A (DFD) and GW1PXM/P in XL square.

Gerard Elliott GI4OWA (LDR) worked via Es on August 6 OH2BUW (KP20) at 2135, LA8WF (JO59) at 1903 on the 8th and on the 11th OH2BC (KP20) at 1935. LA6QBA/P (JP61) was contacted via m.s. later at 2305.

The July report from **Geoff Brown GJ4ICD** just missed last month's deadline. He enclosed copies of six log pages for July 31 when there was a ". . massive . . G opening" 120 QSOs are recorded with stations from IO82/92 to IO97.

Geoff's August report lists LAs on the morning of the 14th but the big day was the 28th. The 9H1SIX beacon was S6 at 1630 and at 1717UTC he made the first GJ/ZS contact with ZS6XJ who was S8. At 1727 ZS6LN was S4. The signals did not sound of t.e.p. quality and, in view of the 9H1 reception, he suggests it was Es propagation to the Mediterranean latitudes then F2-layer to South Africa.

Keith Boleat GJ6TMM lists 30 G, GI and GM stations worked on July 31. He

Annual c.w. ladder

Station	Band (MHz)				Points
	50	70	144	430	
G4ZEC	—	—	521	—	521
G4OUT	—	—	191	—	191
G0HGA	—	—	176	—	176
G0HLT	13	—	161	—	174
G4AGQ	—	35	107	10	152
G4VOZ	24	79	—	17	120
G4WHZ	6	—	106	—	112
G0HEE	—	—	111	—	111
G4ARI	—	10	80	—	90
G0DJA	11	—	69	—	80
G4ZVS	—	—	80	—	80
G2DHV	10	33	24	—	67
G3FPK	—	—	63	—	63
GW4HBK	21	33	—	—	54
G0GKN	—	—	52	—	52
G1SMD	21	—	15	—	36
G6DIF	2	—	30	—	32
GU4HUY	—	—	22	—	22
G1DOX	3	5	—	—	8

Number of different stations worked since January 1.

QTH Locator Squares Table

Station	Band (MHz)			Total
	1296	430	144	
G3JXN	87	133	175	395
G3XDY	81	137	185	403
G3UVR	79	129	239	447
G6DER	78	110	183	371
G8PNN	63	98	128	289
G4FRE	63	136	84	283
GJ4ICD	59	119	253	431
G6MGL	59	89	141	289
G4NBS	59	103	102	264
HB9AOF	55	80	141	276
G4DEZ	48	37	248	333
G8GXP	45	151	331	527
G8ATK	45	91	143	279
G3COJ	44	103	186	333
G3IMV	42	122	406	570
G4RGK	38	107	262	407
G6HKM	35	101	191	327
G1KDF	35	93	163	291
G1EZF	32	93	249	374
G8HHI	31	106	148	285
G4ZTR	29	29	37	95
G4MUT	28	90	149	267
G6XVV	25	64	211	300
G6STI	22	66	128	216
G4FVK	20	46	75	141
G1EGC	14	80	198	292
G6MXL	10	36	81	127
G6AJE	5	57	95	157
G8LHT	4	71	135	210
G2DHV	2	6	31	39
G4AGQ	1	41	104	146
G4KUX	—	112	367	479
G4XEN	—	107	268	375
G0DAZ	—	114	249	363
G4SSO	—	84	227	311
G4DHF	—	—	307	307
G4TIF	—	107	198	305
G4SWX	—	—	293	293
I4YNO	—	—	270	270
G1LSB	—	126	125	251
G3NAQ	—	80	160	240
G6DZH	—	87	149	236
G3FPK	—	—	233	233
G4IGO	—	—	232	232
G1GEY	—	68	158	226
G4MJC	—	33	184	217
EI5FK	—	47	168	215
GM4CXP	—	31	184	215
G4MEJ	—	—	213	213
G0EHV	—	75	137	212
G8LFB	—	—	209	209
G4YCD	—	—	197	197
GW4FRX	—	—	193	193
G8MKD	—	49	142	191
GM0BPY	—	57	129	186
G4DOL	—	—	183	183
GI1JUS	—	—	181	181
GJ6TMM	—	40	137	177
ON1CAK	—	—	172	172
GW6VZW	—	6	115	121
G4TGK	—	—	118	118
G0FEH	—	24	88	112
G1IMM	—	13	98	111
G8XTJ	—	—	108	108
G7ANV	—	—	103	103
GI4OWA	—	—	101	101
G1SMD	—	—	93	93
GM0GDL	—	19	66	85
PA3EUS	—	18	57	75
GM0HBK	—	—	75	75
G0HEE	—	—	73	73
G8PYP	—	6	61	67
GU4HUY	—	—	67	67
G1CRH	—	—	62	62
G0HDZ	—	—	61	61
G1VTR	—	23	32	55
G1NVB	—	—	49	49
G7AHQ	—	—	34	34
GM0JOL	—	—	29	29
GM1ZVJ	—	—	21	21

Starting date 1 January 1975. No satellite or repeater QSOs. "Band of the month" 1296MHz.

got GB4VR on August 6, OH2BUW and LA9BM (JP40) on the 8th and LA6QBA/P and LA9WF on the 13th.

John Hilton GM1ZVJ (LTH) was still running 2.5W from his Yaesu FT-690R Mk 2 when he wrote but hoped to have more power and a 3-ele Yagi by now. Finally to Wales and **Paul Baker GW6VZW** (GWT) who did well on July 31, too, working some Fs, PA0RDY, CT4KQ/M in IN50 and IN51, then lots of Gs later. GU4CJG/P was new on August 3.

The 70MHz Band

Bill Somerville-Large EI9FK (Wicklow) was travelling around the Republic in August. On the 9th from Donegal (VO) he worked G3UVR, G0CZD, G4ASR, G3NAQ, G3NKS, G3UKV and G4MKF. From WP square next day G3UVR was worked in inferior tropo conditions on c.w. G8VZT and G3NKS were worked on m.s.

In the Perseids he operated from IO55TA and on the 11th completed with G0HHV and G4SEU despite considerble QRM from OK and SP broadcast stations via Es. On the morning of the 12th Bill completed with GW4HBK, G4HGT, G4MKF, G4TGB, G3APY, G3NAQ, G4ASR, G4AFJ, G3NKS, G8VZT, G0ENR, G4SEU, G3UKV, G0AUI and G6VX.

Tropo conditions were as good as he could remember from IO51FN (Cork) on the 23rd from his usual /P site. 16 stations in G, GU and GW were worked.

G4XEN got going on the band on August 19 using a transverter made and loaned by G3MJW. It gives 25W, the prime mover being a Kenwood TS-430S. So far John's antenna is an 80m dipole.

Colin Redwood G6MXL (DOR) worked GU3ZTZ/P (ALD) on August 6 for a new one, as did **Dave Lewis GW4HBK** (GWT) on the 5th. His m.s. QSO on the 12th with EI5FK/P produced some one minute bursts. GU2HML was worked on the 22nd and Colin reckons there is more regular activity now than when he started in 1981.

The 144MHz Band

The last letter from **Johan Van De Velde ON1CAK** arrived too late for last month so his news is now rather dated. However he and brother **Geert ON1CDQ** did well in this summer's Es events.

First the tropo reports, starting with **Dave Ackrill G0DJA** (WMD) who continues his c.w. activity. The FC1HPZ he heard on July 24 is not in Corsica, though. He is a class "C" licensee in France. The Corsica prefix has been TK for some years now.

Andrew Salt G0HEE (YSS) uses c.w. and his best August DX was GB4VR on the 3rd. On the 20th he managed to get through to GD4IOM on the Calf of Man with his 2.5W and appreciated the operator's great patience in completing the QSO.

G1SWH worked GB4VR (WIL), G4ZAP/P (IOS) and EI5BZB/P (Roscommon) on August 5. But Gerry's greatest delight was to contact EI5BZB/P again in Sligo to complete the entire 104 British Isles counties worked.

Pat Billingham G4AGQ (SRY) found tropo quite good on August 14 and worked F6GYH/P (DH) and HB9AOF (DG) on c.w. **Alan McMillan G4SSO** (LDN) worked four EA1s in VD, WD and XD squares on August 17 and later in the month contacted G6EBH/MM when Bernard was in AO square, a new one.

G4XEN's "lament of the month" was not working GB4VR, heard many times on tropo. However John did get G4ZAP/P on the 5th. G6HKM was luckier and worked GB4VR on her first call at 1137 on the 6th. The previous evening Ela found EI6BA and EI9DQ in Cork.

Nothing was heard of the group in XH square but Ela did find FPA3DSB/P (YG) on the 10th. On the 14th the band was open to southern DL and stations in DJ, EI, EJ and FH were worked. She was also called by HB9SLU for the first HB of 1988. EA1BLA (VD) was contacted on the 17th.

Irwin Brown GI1JUS (ATM) found tropo in August very disappointing, his only new one being GB4VR also worked by **Paul Thompson G6MEN** (SPE) and **Ian Harwood G8LHT** (YSS). Ian also added IOS and ALD and worked OK1AXH (JO70) on August 7.

GI4OWA worked GB4VR on August 2, GB2XS (XS) on the 16th and GB75ARN on the Isle of Arran on the 21st. GM1ZVJ's QSO's from home in August were all with other GMs. John operated as GJ1ZVJ/P between the 14th and 21st using only his FT-290R at 2.5W with its whip antenna. He worked just GJ, GU and F.

GW6VZW added GU4THB/P and F/HB9SAX/P (XH) on August 3, G4ZAP/P on the 5th and F1FEN/P (CE) on the 14th bringing Paul's squares total to 115.

Next probably the last Es report for 1988, that of July 31 in which at 1748 G4IGO heard EA1KV (VC) then worked EA8BEX (SN) at 1750. Between 1800 and 1825 Ken was hearing EA1BLA (VC) via Es-scatter when the EA was beaming to OZ. He worked him at 1821. G4TIF also heard EA1KV at 1749 but no QSO for Martyn.

GI1JUS started at 1756 with an EA7 in WX and an FC1 in BI was heard at very short QRB. New ones for Irwin were EA7WM (WX), I5JUX (FD), F8CS (CH), IK1GYZ (DF), IK1LUT (DE) and FC1CCC (CG). The event finished at 1839. He mentions that after the Es finished there was some f.a.i. propagation from England to HB9 with the Gs beaming due south. Nobody else mentioned this.

GI4OWA lists 19 QSOs between 1750 and 1838, which provided Gerard with nine new squares and HB9 for an all-time new country. Squares worked from WO were BC, CG, CH, DE, DF, DG, DH, EE, EF, FD, FE and FF.

Now to m.s. and majority opinion is that this year's Perseids shower was excellent. **Mark Page G1EGC** (BKS) thought operating was much better than last year. He completed on s.s.b. with UR1RWX (MT) in 20 minutes and with CT1WW (WB), SP9AMH (JK) and OY9JD.

G4SSO reckons the shower peaked between 0300 and 0500 on the 12th. In the run-up he completed skeds with UR1RWX (MT) and SP2NJI (JM) both in 40 minutes on August 9. Alan completed with OY9JD, UR1RYY, YU2CCB, YU3C, YU2QS, I2CVC/7, YT3ET/P (GG), OK3LQ, I0UZF and SM5BEI. Success rate about 40 per cent.

Mike Ray G4XBF (SRY) reckons his success rate was 50 per cent. He completed on c.w. with HG4KYB (JH) on July 29, YU7AU (KE) on August 6, YU2EZA (IG) on the 7th, UR1RWX on the 9th, YU2CCB (IF) and SM0EJY (IT) on the 10th and HG2NP/O (KH) and OE8HWQ (HG) on the 13th. Random contacts on s.s.b. completed in a single burst were SM5BEI (JU) on the 10th and HG1YA and OE3UP (IH) on the 12th.

G4XEN completed with UR1RYY on c.w. on the 6th for a new square and country, EA6FB (AY) on the 11th and OY9JD on s.s.b. on the 12th which brings John's country total to 46.

Oddly G4IGO dismisses the Perseids as ". . a non-event ." GI1JUS found it disappointing and Irwin only completed one of his four skeds; IK2DMF (EF) which was not new.

The 430MHz Band

G1SWH worked GB4VR on August 5 and G6APZ/P (IOS) on the 7th for a couple of rare ones on this band. Other new ones for Gerry were GI4FUM (ATM), G0DKM (AVN) and GM1TTY/A (DGL).

Denis Jones G3UVR (MSY) is just three cards short of the 100 for a QTHCC application out of his 129 squares worked. He worked the St Kilda station too. G4AGQ worked ON1CDQ in the contest on July 31 but Pat could not get his c.w. heard by PA0RDY on August 7.

G4XEN worked G6APZ/P (WJ) on August 7 which was John's first new square for nine months. Tropo was quite good on August 7/8 but nothing new; best DX was DG2BAW (JO43LD) at 2145 on the 7th.

G6HKM reckons the July 31 low power contest was ". . almost unmentionable." Ela only made 32 contacts including ON1CAK and ON1CDQ and six PAs. On August 7 at 0640 she worked OK1AIY/P (GK) and again at 0708 during a contest. He was only running 4W. DK6AS (FM) and Y23BD (GM) were also worked. The evening of the 8th brought QSOs with SM7ECM and SM7LAD (GP) and G6APZ/P when she had a newly licensed amateur in the shack.

G8LHT worked OK1AXH (JO70) on August 7, Ian's only long DX of the month. He worked GU4XGM/P (ALD) too as did G6MXL. Colin also found GW8LNR/P (PWS) in the contest on July 31.

Jim Rabbitts G8LFB (LDN) has recently acquired an Icom IC-402 but no antenna as yet. Even so, on August 7 he took it into the garden and with just 3W to its quarter wave whip worked OK1AIY/P. Naturally he is quite sold on the band after that.

The Microwave Bands

The MEB Radio Club's activity evening on July 26 saw G6MEB/P operating on 10GHz from Walton Hill Clent. On wideband f.m. QSOs were made with G4WAC/P on Lickey Hill, G1RLR/P on Barr Beacon at 21km and G8HMV operating from his new QTH near Titterstone Clee, 35km away. On 24GHz wideband f.m. G3AYJ/P on Barr Beacon was worked.

The foregoing news from G0DJA who was QRV from Shining Tor, near Leek, in the 10GHz Cumulatives session on Aug 7. This QTH is 559m a.s.l. with a good westerly take off. He worked GW3UYM/P on Halkyn Mountain at 80km and GD3ZME/P, the Telford Club who had travelled to Snaefell, a QRB of 196km.

Dave is scheduled to give his 10/24GHz talks to the Redditch Club on November 10, the Willenhall Club on November 16, a return engagement, and the Cannock Club on December 8.

Bryn Llewellyn G4DEZ (ESX) operated on 1.3GHz in the August 14 Trophy Contest and worked GW3JXN/A on c.w. His best DX was GI4OPH at 529km.

G6HKM found 1.3GHz open on the evening of August 6 but with sparse activity. Ela had a half hour chat with PE1EWR. DG6EAE (DL) was also worked. The next morning she contacted DK6AS (FM), DC5JM (DL), PA0QC (CM) and PE1EWR again.

On the 8th there was a small duct to OZ

and SM when SM7ECM, SM7LAD, OZ/DK2UO (EP) and OZ1KLU (EQ) were worked. The contest on the 14th brought QSOs with CBE, SPE and ALD, the GU being all-time new.

G6MEN was using the call GW1GHZ/P on Moel Sych (IO82HV) 824m a.s.l. on August 7. QSOs were made on 10GHz with G8AGN/P at 102km, G3NKL/P at 134km, G4UQI/P at 168km and GD3ZME/P at 168km. For G6MXL GU4XUM/P (ALD) was an all-time new county, country and square on August 9.

Tropo DX-Feedback

Jim Bacon G3YLA (NOR) has been studying the meteorological conditions during the GI-EA8 opening on July 15 reported last month. His research suggests there was a narrow, high level duct at the Irish end which GI4KIS found. Further south it would have been a low level sea duct.

The path down the west African continent is ideal for the formation of ducts. The hot dry air off the continent meeting the much colder moist air over the Atlantic is the mechanism. Moreover, there is usually an absence of weather fronts which could bring these ducts to an abrupt end.

Jim agrees with my feeling that such ducts could extend much further than 3000km over this path but unless there is someone on a weather ship to work we will never prove it.

More detailed research into this case would require access to radiosonde data. This is available at some cost to the researcher but Jim is undecided about proceeding further.

The next three deadlines are: Oct 26, Nov 24 and Dec 22

Gem of the Month

Overheard on 144MHz in a discussion about the new licence conditions. A G1, thinking out loud, "It's all very well this e.r.p. limitation on 50MHz, but how do you work out your e.r.p. under lift conditions?" Maybe we should suggest a handicap system as in some horse racing!

Postal Disruption

As this was being compiled, the future delivery of mail was very uncertain. Should prolonged disruption occur, readers can telephone me at any reasonable time on 01-668 5582 with news and table figures. I will endeavour to be on 144MHz s.s.b. as often as time permits in the run up to the usual deadline.

RTTY

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS

Readers' letters

I'll start this month with two pleas for help. The first comes from **Dennis Landin GW6ZHQ** who runs a BBC-B computer and would like to receive SSTV. I have already told him about the Technical Software RX4 program, but wondered were there any others? So, if you're receiving SSTV using a Beeb, what program do you use and what's it like?

The second letter came from **Bill Nottingham GM3NVZ**. He has one of the Texas TI99 computers and would like to use it for RTTY. I suspect there are quite a few TI99 users out there, as these machines have been available at reasonable prices now for some time. If you have found, or written, a program that runs with the TI99, please let me know so I can pass the information on to Bill.

Finally for this month, **Terry Robinson VK3DWZ** wrote telling me about himself and his station. Terry's interest in RTTY started about ten years ago, he was inspired by a terminal unit article in an Australian electronics magazine. Having built the terminal unit, he managed to obtain an old Post Office Teletype Model 15. Despite its age, the machine actually worked very well and was in regular use until 1983. At that point the station was upgraded with the addition of a Hal ST-6 terminal unit. This was matched with a "modern" Siemens 100 teleprinter, which is still in use today.

During Terry's time on the air, he has formed a strong opinion that phase lock loop terminal units definitely take second place to filter or discriminator types—especially on h.f. He also has a particular dislike of computer generated RTTY as many of the systems seem to fail to send out important things like a line feed (LF) when a carriage return is sent.

This results in all the text being printed on one line, making it rather difficult to read! Terry tells of one day when he worked three Europeans each with a different set-up. The first didn't send line feeds and when Terry pointed out how necessary they were replied that his computer couldn't send them! The second station was using a "proper" RTTY machine so all went well. The third station, when he asked to send line feeds, insisted on sending several every few words. This resulted in Terry's teleprinter eating miles of paper! So life is not necessarily easy with a teleprinter.

In these days of computers, newcomers to the data modes often think that teleprinters are "old hat" and "useless". I can assure you, there's great fun to be had from keeping one of these old beasts running. It would also do well for computer users to remember that these machines exist and put in line feeds at the appropriate moments.

If you've got any tales about "old-fashioned" teleprinters, why not drop me a line. I'm sure there's still plenty of them in regular use. At the BARTG rally I saw a couple of 444 teleprinters going for £35–40.

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RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRY
RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRY


..................  STATION  INFORMATION  ......................

AS AT Ø3/22/1988.

NAME.........   TERRY ROBINSON.
CALL SIGN.....  VK3DWZ   ...   VK3DWZ.
QTH...........  21 RUSSELL AVENUE, WOODEND, VICTORIA, 3442,
                AUSTRALIA.
LOCATION......  70-KM NORTH-WEST FROM MELBOURNE  ::  IN THE
                CENTRAL VICTORIAN DISTRICT.
ELEVATION.....  ABOUT 600 METRES ABOVE SEA LEVEL.
EQUIPMENT.....  E.A.C. (COLLINS) R-390A/URR, SONY ICF-2001 AND SONY
                ICF-7600D WIRELESS RECEIVERS.  YAESU FT-102 WIRE-
                LESS TRANSMITTER, SIEMENS 100 TELETYPEWRITER,
                HAL ST-6 RTTY TERMINAL UNIT.
AERIALS.......  7 AND 14 MC/S DIPOLE - 5 METRES HIGH, INVERTED-V
                FOR 3.6 MC/S.


VVV    VVV   KKK    KKK   33333333   DDDDDDD      WWW       WWW   ZZZZZZZZZ
VVV    VVV   KKK   KKK    333333333  DDD    DD    WWW       WWW       ZZZ
VVV    VVV   KKK KKK          333     DDD      D  WWW       WWW      ZZZ
VVV    VVV   KKKKKK         333333   DDD       D  WWW       WWW     ZZZ
 VVV VVV     KKKKKK         333333   DDD       D  WWW   W   WWW    ZZZ
  VVVVV      KKK KKK          333     DDD       D   WW WWW WW     ZZZ
   VVV       KKK   KKK   333333333   DDD     DD     WW W WW     ZZZ
    V        KKK    KKK  33333333    DDDDDDD         W W       ZZZZZZZZZZ

RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRY
RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRY
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Fig. 1: The station details from Terry Robinson, printed on a "proper" RTTY machine

Contests

The BARTG Autumn VHF RTTY Contest takes place between 1800UTC on Saturday October 22 and 1200UTC Sunday October 23. A four hour rest period must be taken, and declared, during this period.

The only band you can use is the 144MHz (2m) band, but contacts via repeaters or satellites aren't valid.

The contest is open to licensed amateur radio stations within Zones 14 and 15 who are permitted to use RTTY as a mode of communication. Portable operation is allowed, but must be from one location, or within 1km, for the whole of the contest. Contest logs from s.w.l.s will be very welcome. Stations cannot be contacted more than once during the period of the contest.

All messages shall consist of the following: (A) Time of start of contact in UTC, to consist of a four-figure group. This information must be passed in both directions and logged. Expressions like "same" or "same as yours" are not permitted. (B) RST reports, normal three-figure group. (C) Message number, this will consist of a three-figure number starting from 001 for the first contact made on the band and running consecutively from this number. (D) Locator, Universal (Maidenhead) is preferred, or QTH given as a town or a bearing and distance in km from a town (max 25km). The town must be identifiable on a 1:500 000 tourist or route map.

The log must contain, date, time of start of contact, RST report and message number sent, locator received, estimated distance and points claimed. It is helpful to include your own locator at the top of every log sheet. Copies of forms and log sheets are available from the Contest Manager.

The scoring is as follows:
0–50km = 1 point; 50–100km = 3 points; 100-150km = 5 points; 150–200km = 7 points; 200–250km = 9 points; 250–300km = 11 points; 300–350km = 13 points; 350–400km = 15 points; 400–450km = 17 points; 450–500km = 19 points and pro rata on 50km radial increments.

Certificates will be awarded on the top scores and runners-up in each section: (1) single operator or stations UK and Europe. (2) multiple operator stations UK and Europe. (3) short wave listeners UK and Europe.

Logs must be postmarked no later than November 19 to qualify and they must be sent to: BARTG Contest Manager, Peter Adams G6LZB, 464 Whippendell Road, Watford, Herts WD1 7PT.

I hope to have my new mast and 144MHz antennas installed before this contest, so hopefully some of you will hear me and give away a few points! For those who haven't tried RTTY on v.h.f. and are thinking about having a go, RTTY will be found on 145.3MHz for a.f.s.k. signals (that's F2B) though most activity will be found around 144.6MHz F1B or J2B plus or minus. It does get rather congested, so be patient. Don't get confused by packet activity on 144.65MHz.

Computing News

The Public Domain Software Library has completely re-organised the cataloguing of the library. So much so that it is unrecognisable from the previously much-criticised document—at least as far as MS-DOS is concerned. For those who may not have heard of the PDSL, it is exactly as the title suggests, a library of public domain (free) software. The only charges made to customers cover copying and administration. This can make for very reasonably priced software.

The main changes that have been made are to list all the MS-DOS programs in subject order, rather than catalogue number. So, if you're interested in communications—look under communications, etc. There's even a section on amateur radio, unfortunately it's filed under "ham radio".

To give you an idea of approximate cost, from one to four disks (each one containing several programs) will cost you £4.50 for each disk. This includes the cost of the disk (you don't have to send one of your own) and all the postage charges and VAT, etc. If you join the library, the cost goes down to £3.50. Also if you're a member you can send in your own disk and the copying and admin charge drops to £2.30 each disk for up to nine disks.

For details of the service and a catalogue, send a large s.a.e. (enough to take an unfolded A5 booklet) to: PD Software Library, Winscombe House, Beacon Road, Crowborough, Sussex TN6 1UL.

I recently made it to the BARTG rally at Sandown Park and used the visit to check up on current computer prices. I found the exercise quite interesting as the spread of prices and value for money was amazing. These are the sort of prices I found:
Atari 800XL – £30*
BBC-B – £195**
BBC Electron – £35*
Commodore +4 – £20
Commodore C16 – £30*
Commodore Vic-20 – £25*
Mitac IBM compatible – £410**
Sinclair Spectrum – £70**
Sinclair Spectrum+ – £80*

If there is a single star, that means I only know of limited amounts of software available for that machine, two stars is plenty available, but those with no stars have very little available. That's unless you know different.

Help for Newcomers

Ian Brothwell, the Secretary and Publicity Officer for BARTG, has recently sent me a copy of a new booklet called *Amateur Radio Data Comms & BARTG*. The booklet is available free-of-charge, provided you enclose an A5 or larger s.a.e., from: BARTG, Mrs Pat Beedie GW6MOJ, Ffynnonlas, Salem, Llandeilo, Dyfed SA19 7NP.

The object of the publication is to provide some basic information for newcomers to the data modes. It starts with some quite interesting historical facts covering the origins of RTTY. This is followed by a brief description of TOR, packet and FAX. The next section gives some background behind the actual operating techniques in use today, including taking the reader through a typical RTTY and AMTOR QSO. They've even provided a subs form on the back page!

BARTG AGM

Contrary to popular belief, this isn't a BARTG take-over bid, but their AGM deserves a mention (anyway next month will be too late!).

The AGM will be held on November 5 (so you'll miss bonfire night unless you live close by) at the Churchill Room, London-House, Mecklenburgh Square, London WC1. Everything kicks off at 2pm. Apparently, London House is close to the junction of Grays Inn Road and Guilford Street, just a few minutes walk from Kings Cross and St Pancras.

One of the issues to be discussed is a proposed change of the group's name by replacing the word "teleprinter" with "teledata". That's because BARTG is no longer solely concerned with mechanical RTTY, but also now encompasses computer RTTY, packet radio, AMTOR and FAX.

Now the other important bit, refreshments will be provided.

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD.

Unlucky 13? Mode "B"

Large numbers of reports have been coming in on the status and operational characteristics of our new Phase IIIc satellite. It is now in its final orbit, and said to be at the correct attitude for the optimum compromise of earth pointing and solar-cell efficiency. **G4JY** reports working WB5HRD, VK5ZJ and VK5ED using 40 watts of uplink r.f. power to a 16dB-gain helix. **G3ABU** has worked into VK and has had eight W QSOs using just 8 watts of power, whilst **G0DLC** reports working many W and European stations.

Some users claim that OSCAR-13 is superior in performance to its predecessor, OSCAR-10, during the post-launch phase of that satellite, but the majority complain of poor sensitivity, a weak downlink and bad spin modulation. Most certainly, my attempts to use the satellite have resulted in findings common to the majority, with the powers claimed to be needed published in the earlier articles on this topic being insufficient to give an adequate downlink for reliable QSOs on Mode "B". **Vern Riportella WA2LQQ**, AMSAT President, believes the performance to be superior to that of OSCAR-10, and that degradation of Mode "B' users' feeders and antennas from weathering over the years could be responsible for the findings of inferiority stated. He recommends that full attention should be given to the station receive capability, and aim it so that the beacon on 145.812MHz, allowing for the 1.6dB sky noise, should give a level of 12dB over noise for an effective system.

Ron Broadbent G3AAJ, Secretary of AMSAT-UK, feels that the results discovered are very similar to the older satellite. At G3IOR, the average signal only barely moves the S-meter, and an uplink of 50W of r.f. to a –2dB feedline and a 16dB-gain, right-hand-circular crossed G3HUL Yagi resulted in a RS 3 & 0 signal return using a crossed right-hand circular 10-element Jaybeam Yagi of some 13dB gain feeding a MuTek front ended IC-521. This calculates to a 1.25kW e.r.p. uplink, and should have given a solid 5 and 2 downlink to the receive system in use if we relate this level to the required specifications involved. This was found to be true for OSCAR-10, but lacking for OSCAR-13.

It has to be admitted that the satellite a.l.c. system was probably activated by some of the persistent "alligators" present, but the fact remains that they were the only ones who seemed to be giving adequate signals over the noise. At the same time, the noise floor of the transponder could clearly be heard varying with the rotation, which would not formally be expected under such circumstances. It therefore appears that the sensitivity is not lacking, but it is just possible that high solar noise from our now activated sun is responsible, or it may indicate noise from an internal source, as this symptom is absent on the earlier satellite.

The spin-modulation which was brought about by the damaged antenna on the

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Yaesu	FT767GX	1550.00	(—)
Yaesu	FT747GX	659.00	(—)
Icom	IC735	978.00	( )
Icom	IC751A	1500.00	( )

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Signal	R535 "Airband"	249.00	(—)
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Sony	PRO 80 New Sony Receiver	349.00	(—)
WIN 108	Airband Receiver	175.00	(2.00)

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Icom	AH7000 Antenna 25-1300MHz	82.50	(3.00)

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Kenwood	AT230	208.67	(2.50)
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Icom	IC2GE Handheld	265.00	(—)
Icom	IC02E Handheld	279.00	(—)
Icom	IC228E 25W mobile	365.00	(—)
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earlier OSCAR-10, was not expected on OSCAR-13, but the spinning fade pattern is very marked indeed when the satellite is not pointing within some ten degrees to the user.

The AMSAT-DL design team believe that this problem was brought about by the last minute fitting of the Mode "S" antenna to one of the arms, which, combined with a resonant spacecraft structure, has produced a marked change of lobe patterning on the 145MHz Mode "B" downlink. It is also possible that the attitude of the antenna itself to earth may be "skewed" due to this problem, as although the positioning was shown to be A.LONG 180 and A.LAT 0, a marked difference in the sensitivity and the downlink performance was noticeable according to the position of the spacecraft to the user station. When the satellite was in the west, the American stations seemed to be getting good signals from the Europeans, but the users on the eastern side of the Atlantic were having great difficulty. When OSCAR-13 was to the east of the user, then things seemed far better, with less spin modulation and a stronger downlink too, but stations one was in contact with who were west beaming to the satellite were reporting similar problems to that earlier suffered by the Europeans attempting to work Ws. Most certainly when the satellite was at a high angle of elevation between 180 and 90 degrees azimuth, it performed better than at other times. By the time this column is with you for reading, the orientation will have changed to A.LONG 210 and A.LAT 5, and it will be interesting to compare the effect of this manoeuvre.

The mean anomaly times for the commencement and termination of the different modes of operation are slowly changing according to sun angle and optimum earth pointing, the latter being very important for "L" mode.

Two states of Mode "B" exist at this time, that with the beam antennas switched on when the mean anomaly shows that the spacecraft is at either side of apogee (at optimum pointing close to apogee Mode "L" or "JL" is placed on) and another "B" mode using the omnidirectional antenna when the satellite is inverted and closest to earth near to perigee. This latter "QRP" mode seems to perform very well indeed, with very good downlinks despite the lack of antenna gain, so indicating further that it is mainly a matter of whether the antennas are "looking at you" or otherwise.

We also have to remember that the optimum satellite position for the northern hemisphere has yet to be reached, as the apogee is currently far less than the inclination, currently occurring at 7.5 degrees north. As can be seen by Fig. 1, a computer print out from the "sopp4" program for the end of 1991, we are then looking at some 16 hours of continuous communication daily, as by that time the high apogee point will be occurring much further north. To evidence this point, compare the computer Mercator maps made by WA2LQQ from AMSAT's Amateur Satellite Report. The map in Fig. 2 shows the ground track as in mid-August 1988, with the four circles denoting where the successive apogees occurs. The map in Fig. 3 shows it five years hence, Fig. 4 ten years hence and Fig. 5 in February 2003. It can be confidently expected that as this apogee sub-satellite point moves north, far better results for the majority users in the northern hemisphere will come about. After

```
AMSAT AMS-81 TRACKING SYSTEM
ACCESS SKED FROM  30DEC91 000000
   >>G3IOR          VIA OSCAR 13 <<
DAY    AOS   LOS   MAX  DX/EL   AZ
30DEC 0102  1118  0558 12335   286
30DEC 1549  2119  1725 17195   021
30DEC 2353  1010  0451 11152   280
31DEC 1454  2007  1618 17424   012
31DEC 2245  0901  0345  9910   272
01JAN 1354  1903  1511 17518   002
01JAN 2140  0751  0238  9478   091
```

Fig. 1

reaching 57 degrees north in February 1993 the apogee will slowly move back south again, so we have much good communication to look forwards to in the years to come.

Mode "L"

The results on Mode "L", 1269MHz up 435MHz down, are not near the high sensitivity expected. Current reports indicate that whilst levels of 29dBW, or 800W e.r.p., will work under the ideal conditions, powers of 38dBW, 5kW e.r.p., such as provided by 50W of r.f. to a 20dBi antenna, or 100W to a 17dBi antenna, are more normally needed for reasonable communications. Under most active conditions, 6.5kW e.r.p. have been shown to be required. When the pointing angle of the 1269MHz helix satellite uplink antenna is bad no amount of logical level of amateur possible power seems to work! Apart from the beamwidth limitations, the reason is thought to be either terrestrial military spread spectrum transmissions or radar attenuating the transponder, as when the spacecraft's receiver antenna is beamed to earth, some 10 to 14dB of attenuation is shown by the telemetry even when the passband is devoid of amateur signals. When it is beaming away from earth to space, 0dB is shown.

By virtue of optimum pointing, high power and high-gain antennas, a number of good signals are to be clearly heard on the passband, but there would now seem to be little hope for the mobile and low power possibilities earlier thought to be possible with the 1269/436MHz transponder. Mode "L" on OSCAR-13 is however far superior to its predecessor OSCAR-10.

Mode "J"

By far the best mode of the new satellite appears to be the 145MHz uplink 435MHz downlink, as 10W to a 13dB gain right-hand circularly polarised Yagi gives a good downlink signal when using a 13-element right-hand circularly polarised 435MHz receiving Yagi, e.g. an uplink of 200W e.r.p. is enough even at Apogee. Many stations using less than this can be heard and the passband is full of signals from all over the world. Indeed, this very success is in itself a disadvantage, as will be foretold.

The uplink running from 144.425 to 144.475MHz was primarily intended, as explained in our last column, for the use of stations in countries where by reason of cost, availability or licence restrictions, access to the Mode "L" downlink passband was not possible. To quote Dr. Karl Meinzer DJ4ZC, "the originally planned frequency of 145.925 to 145.975MHz became impossible to use due to the many f.m. stations which do not observe the bandplan and thereby interfere with satellite communications worldwide.". The projected use of the new uplink band was notified to all IARU Radio Societies some two years ago, but not a single adverse comment, criticism or objection of any kind was received. Although the uplink used is not currently part of the IARU Region 1 band plan, it may, of course, be used by amateurs within the terms of their licence subject to the usual non-interference clause, which means fundamentally that one does not commence transmitting on a frequency already obviously in use, which in turns means monitoring first. The story heard is that some forty stations centred around the DARC HQ contacted the said society in protest at the use of the new uplink resulting in demands that the Mode "J" transponder should be closed down! As this seems centred in that area where the IARU agreement on the non-use by terrestrial stations and f.m. repeaters of the 145.800 to 146.000MHz spaceband has not been applied, we have a paradoxical situation!

It really comes down to the situation where in some densely populated areas, spectrum space is short, collisions between different mode users are apt to occur when sharing a common band, but, if one obeys the conditions of the licence and the amateur code of conduct, they should be infrequent. For most of the time satellite users will be beaming skywards with narrow band transmissions and modest powers, and are hence unlikely to cause much of a problem. In the vast majority of areas, such as East Anglia, Scotland, or indeed the majority of Europe other than the really big densely populated towns, this section of the 144MHz is

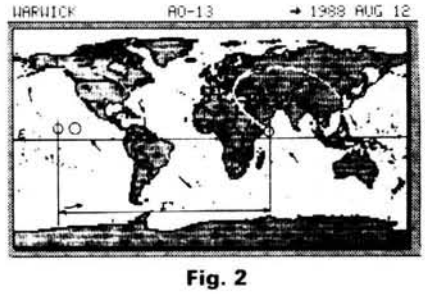


Fig. 2

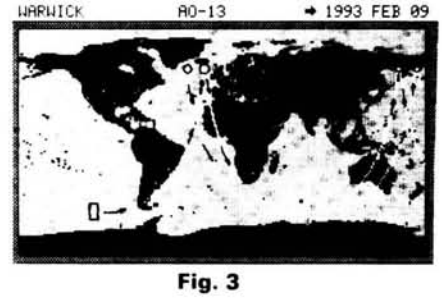


Fig. 3

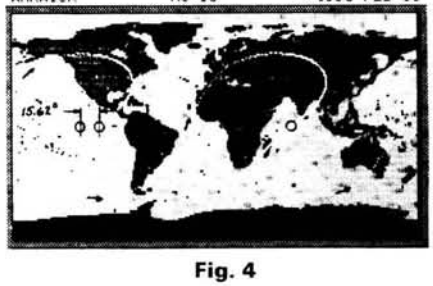


Fig. 4

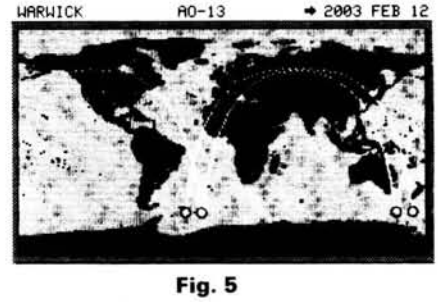


Fig. 5

rarely, if ever, used, and no problem exists. The high cost of equipping for Mode "B" and "L" at the power levels now known to be necessary deny the use of these modes to the majority of radio amateurs, whilst most have a station receiver and a 144MHz transmitter available, only needing to add a modestly priced 430MHz receive converter.

"Magic" Numbers

The problem of determining your uplink frequency required for a given downlink, or vice versa, can become rather tedious, especially when using an inverting transponder. The task is simplified, and undesirable QRM and v.f.o. swishing can be avoided by merely using the following numbers, which are found by adding the zero Doppler shifted uplink to the resulting downlink. Thus, by subtracting the uplink from the figure, we get the downlink, and by subtracting the downlink from it, we obtain the uplink required.

For Mode "B", the number is 581.398MHz. As an example, near mid-band, if we subtract the 145.890MHz downlink from 581.398MHz, we get 435.508MHz, the uplink frequency needed to place us on 145.890MHz plus or minus a little Doppler shift correction.

For Mode "J" it is 580.413MHz, thus subtracting say our downlink of 435.965MHz, we get our uplink of 145.448MHz, or, by taking away our 145,448MHz uplink, we get the 435.965MHz downlink where our signal appears.

With Mode "L", it is 1705.356MHz. Thus, our downlink of 435.860MHz requires a signal sent up on 1269.496MHz to be present on that given downlink, and vice versa. Readers will note that this is a considerable departure from the previously published transponder relationships of some 21kHz. All frequency relationships supplied are within 1kHz of product.

Mode "S", at the time of writing, was awaiting a good earth pointing of the antenna, which up to that time had not resulted. Thus, it will not be until after the first tests due just before you are reading this that we shall know the exact uplink and downlink relationships.

The RUDAK

Despite the fact that the RUDAK system was tested exhaustively on a water tower near Munich for two years without any sign of a problem, now it is in orbit and out of reach to the engineers (but not the commanders) critical problems are evidenced. The problem manifested is that when attempts are made to bootload the PROM of the packet digipeater, the RUDAK CPU runs for a short time, and then hangs up, and the 10 byte loader does not permit the special program to be loaded into RAM. It is possible that a malfunction due to low temperature may be the cause, so plans to activate the adjacent Liquid Ignition Unit and so heat the RUDAK may yet prove effective. Valiant efforts are being made to try to sort out the problem by the AMSAT-DL team, who have wreaked miracles before now when they wrestled with the memory problems of OSCAR-10.

RS-Satellites

According to recent information from **Andy Mironov RS3A**, it would appear that we may well have heard the last of the two remaining members of the mass COSMOS RS3 to 8 inclusive launch. Whilst attempts to command them on will still be attempted from time to time, there appears to be little hope of success.

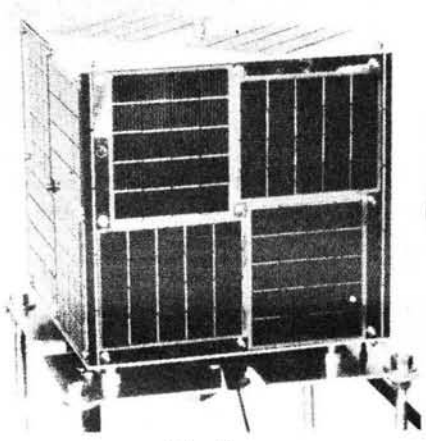


Fig. 6

RS-10/11 is still on continuously and providing lots of DX. **Hank Hincks G3ASM** of Harburn near Stockton on Tees sends his impressive list of contacts made since starting off in mid-May this year, with many of the stations worked frequently. In the first fortnight, he had QSOs with UV1AS, I5YT, DL1NN, HG5N, UA3GCD, F6DJW, UA1DRQ, YO3RG, SM5GLC, SM0KV/0, PA2GER, VE2QO, F9EA, UB4UMY, 4K0DR, UA1AJA, UV1AP, UA1JR, UA3DH, NG1I, W1JSM, R4GR, and VE1BB. In June his log shows VE8RCS, DJ5XO, UA1QAW, G3IOR, UL7TCB, UA3JD, UC2OX, IN3YNBZ, W1NU, UR2NR, Y26IL/A, UA4FBI, UA9FIZ, SM7BYU, UA1NA, UA9CF, RB5IRF, UT5IT, UA1QEK, UR2FL, KC5CC, RS3A, then UL7MU, UT5IT, UL7CR and OZ1US by the beginning of July. Hank uses a single vertical attached to the rear of his house for his 25W '9130 144MHz transmitter and listens on a '930 using his 3-element tri-bander beam. Naturally, he has a strong preference for c.w., by far the best mode for good satellite DX QSOs.

FO-12

Still we have no long term schedule for 'Fuji", and either have to take pot luck or try to update the activity times and modes by information on the AMSAT nets. The frequency of 145.885MHz is being used extensively for packet radio in Japan, and high levels of use of the digital "JD" mode are in evidence. Some good news for 430MHz users (especially e.m.e. enthusiasts) is that the dreaded Syledis QRM is being asked to move. The bad news is that the wide band Syledis system may now move 2MHz up into the satellite space band!

Fig. 7

UoSAT

Suddenly, without any apparent reason, signals are being heard from the 14.0014MHz OSCAR-9 alias UoSAT-1 h.f. beacon. The 21.0014 beacon is on regularly, but the reason for the non-appearance of the lower frequency beacons has long been understood to be the snagging by wiring of the gravity gradient boom, which the h.f. beacons use for an antenna. Whilst it is just possible that the boom may have deployed, it is felt doubtful, especially as the signals are quite weak, some 2dB below the 21MHz companion, which does not exactly bend the S-meter! If one listens carefully between the low end c.w. earth signals, one may hear the new arrival sending carrier, followed by ten channels of telemetry, followed by the call "AMSAT". It is a valuable propagation indicator and may well be heard both sub-horizon and antipodal, especially in late October, through November and early December. The UoSAT team at the University of Surrey would appreciate reports on both beacons, especially unusual and relative hearings.

New Sats

A place has been booked by the University of Surrey and AMSAT on the "SPOT-II" imaging satellite *V-34 ARIANE-4* launch due in June 1989. Six AMSAT satellites are due to fly in all, four being a new class of ultra-compact "microsatellites" of similar design but different purpose. One will be the BRAMSAT Peacemaker voice synthesiser, also called DOVE for Digital Orbiting Voice Encoder, one a CAST (Center for Aerospace Technology) earth-looking low resolution c.c.c.d. camera, and the others PACSAT packet radio transponders from AMSAT-NA and AMSAT-LU. As can be seen in Fig. 6, they are very small and light, being only 230mm each side, and weighing less than 10kg. They will be placed into an 822km sun-synchronous circular orbit at 98.7° inclination, and will thus provide world wide coverage. More details on these will follow in our future columns.

The UoSAT-C NASA Delta-C launch earlier announced is now postponed, so the UoS will now split the original large UoSAT-C load and have a common launch of UoSAT-D and UoSAT-E as separate spacecraft with the microsats into a similar orbit. The primary payload on UoSAT-D will be the Packet Radio Communications experiment, with 4 megabytes of memory available to all radio amateurs worldwide with AX.25 compatibility. It will use 9600 baud f.s.k. on both uplinks and downlinks using Mode "J", e.g. 144MHz up and 435MHz down, and will function without the need for high gain antennas. One mode included will be a special high power form that will permit access and adequate reception to very small ground stations, such as those in use on the recent SKI-TREK trans-Arctic expedition.

Keplerian Elements

These are supplied for us again by **Birger Lindholm** of Dalsbruk, Finland. Prior to taking up satellites, upon which he is a world renowned expert, Birger (Fig. 7) and his father used to be keen on short wave radio and DX television, for which they developed and built many antennas. He was captured by satellites from the moment he first heard OSCAR-5, and now closely follows all the AMSAT nets, the amateur satellites, the weather satellites

Satellite Name	OSCAR-9	OSCAR-10	OSCAR-11	MIR	OSCAR-12	OSCAR-13	RS10/11	SALJUT 7	OKEAN-1
Int. Designation	81-100B	83-058B	84-021B	86-017A	86-061B	88-051B	87-054A	82-033A	88-056A
Object No.	12888	14129	14781	16609	16909	19216	18129	13138	
Element Set	262	345	332	335	103		460	179	
Epoch Year	1988	1988	1988	1988	1988	1988	1988	1988	1988
Epoch Day	214.03512140	208.70664142	205.17630120	214.28363816	191.56475721	193.90000000	215.10465066	214.68963211	188.4144758
Inclination	97.6182	27.2519	98.0535	51.6188	50.0161	57.6540	82.9277	51.6102	82.5177
RAAN	248.3247	312.4328	267.0040	195.5433	271.5005	247.5380	113.8512	69.8797	95.7684
Eccentricity	0.0001935	0.6028873	0.0012361	0.0004591	0.0011213	0.6538919	0.0010779	0.0000403	0.00212
Arg of Perigee	171.6238	323.5201	280.8965	185.3874	193.4780	187.2210	212.0744	11.3201	275.4378
Mean Anomaly	188.5229	7.7041	79.0846	174.6662	166.5756	357.2170	147.9718	348.6965	84.4325
Mean Motion	15.33998942	2.05876723	14.62355959	15.74956346	12.44395077	2.09697960	13.71900618	15.33138656	14.73248494
Decay/Drag Fact.	$8.624e^{-05}$	$3.7e^{-07}$	$3.14e^{-06}$	$3.4313e^{-04}$	$-2.5e^{-07}$	0	$8.6e^{-07}$	$2.616e^{-05}$	$6.0e^{-06}$
Rev No./Orbit	37961	3851	23444	14093	8674	57	5564	35906	??
Nodal Period	93.932683	699.2007	98.530002	91.369155	115.653147	686.65	105.022824	93.863523	97 802968
Long. Increment	23.480147	175.3553	24.633197	23.231397	29.239320	172.19	26.381466	23.845246	24.580347
Beacon Freq (MHz)	21.002/14.001	145.810	145.826	143.625=voice	435.797	145.812	29.357/.403	19.953	137.4??=APT
	145.825	145.987	435.025	166.125=data	435.913	435.651	145.857/.903		
	435.025		2401.5	(a.m.)			29.407/.453		
	2401.0						145.907/.953		
Reference EQX	7 Aug 88	3 Aug 88	6 Aug 88	4 Aug 88	5 Aug 88		5 Aug 88	6 Aug 88	
Orbit No.	38053	3867	23647	14136	9004		5604	35973	
Time (HHMM.MM)	0052.09	1127.92	0135.41	0017.09	0138.77		0031.62	0212.91	
Longitude West	74.27	173.02	58.12	135.56	148.50		209.99	286.51	

Satellite Name	NOAA 9	NOAA 10	METEOR 3-2	METEOR 2-16	METEOR 2-17	COSMOS 1602	COSMOS 1766
Int. Designation	84-123A	86-073A	88-????	87-068A	88-005A	84-105A	86-055A
Object No.	15427	16969		18312	18820	15331	16881
Element Set	270	153		121	46	900	323
Epoch Year	1988	1988	1988	1988	1988	1988	1988
Epoch Day	207.77327930	208.40891463	208.65080731	211.18734539	211.83114260	213.13266339	220.71572946
Inclination	99.1038	98.6757	82.5430	82.5575	82.5417	82.5364	82.5264
RAAN	183.0984	238.5691	45.9236	115.4485	176.6847	274.3252	327.2978
Eccentricity	0.0015321	0.0014377	0.00148	0.0012856	0.0018432	0.0026794	0.0025116
Arg of Perigee	145.9864	110.9407	276.3084	27.5399	90.5168	50.6082	42.3559
Mean Anomaly	214.2291	249.3320	83.6276	332.6471	269.8125	309.7528	317.9498
Mean Motion	14.11613297	14.22601414	13.16761278	13.83353746	13.84031582	14.73919082	14.73789537
Decay/Drag Fact.	$1.56e^{-06}$	$1.85e^{-06}$	$3.0e^{-06}$	$1.8e^{-07}$	$4.1e^{-07}$	$5.43e^{-06}$	$5.81e^{-06}$
Rev No./Orbit	18639	9635	5?	4785	2509	20690	10910
Nodal Period	102.067277	101.280231	109.416728	104.153448	104.102454	97.758535	97.767106
Long. Increment	25.514768	25.320111	27.482842	26.166963	26.154339	24.569090	24.571315
Beacon Freq	137.620=APT	137.500=APT	??	137.400=APT	137.300=APT	137.330=APT	137.380
	137.770=DSB	136.770=DSB					
Reference EQX	6 Aug 88	3 Aug 88		4 Aug 88	2 Aug 88	6 Aug 88	10 Aug 88
Orbit No.	18798	9743		4866	2553	20777	10944
Time (HHMM.MM)	0102.22	0007.10		0106.20	0017.35	0055.99	0034.72
Longitude West	135.82	67.52		218.56	141.00	59.90	2.22

and a whole lot more. Birger also is a keen MIR follower, and he has been responsible for "discovering" many of the frequencies used for this space station and the associated Soyuz, Progress and attached modules by employing his AOR-2002 scanner and tracking passes calculated on his Spectrum 48K computer from the Keplerian elements he shares with us. He asks us to note that the NASA two line sets produced are not precision enough for exact scientific purposes, and that the orbital period and increment given is true for the epoch of the reference date given against them.

Our new ones this month are OKEAN-1, a Russian Oceanographic satellite giving good radar pictures around 137.4MHz, and METEOR-3/2, the latest Soviet Weathersat. These have been supplied by **Les Currington**.

Eclipses

For the remainder of this year, the following amateur satellites will experience eclipse for the periods shown or over the mean anomaly periods given for the first days of the month.

Date	OSCAR-10		Uo-2	FO-12	RS-10/11
1988	Min.	MA	Min.	Min.	Min
Nov. 1	39	019-034	31	29	33
Dec. 1	76	033-061	31	0	29

The start time for the above is 0000. Fuji-OSCAR-12 will be in full sunlight from November 30 until December 17 so a more reliable schedule is probable.

Satellite News

In addition to the h.f. AMSAT nets earlier advertised, OSCAR-13 is now giving this service. The AMSAT International net and news broadcast, which is on 14.282MHz and 21.280MHz each Sunday at 1900UTC, with an information exchange commencing both one hour before the broadcast and following it also, is now being placed on OSCAR-13 by WA2LQQ when the spacecraft is within range of North America. When the satellite schedule is Mode "B", it will come down on 145.957MHz, and when in Mode "L" on 435.888MHz, plus or minus a slight Doppler differential. The source is usually strong enough to overcome the worst of the spin modulation, fully readable and pleasantly devoid of the strong European QRM that often wipes out large parts of the h.f. news information content. The very latest Keplerian elements are always available, an AMSAT "whats on", plus coming events and happenings in the amateur, manned, research and commercial satellite programmes.

The next three deadlines are: Oct 26, Nov 24 and Dec 22

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex RH20 4HE

According to my readings about solar radio astronomy in the late 1960s, the active sun's output at metre-wavelengths varied with frequency. So, with this in mind, I added a second receiver to my solar telescope. This receiver, electrically similar to the first, observed the sun on a clear spot around 95MHz (you could then, hi!). Its antenna, Fig. 1, was a 6-element Band II Yagi mounted on a wooden frame, 2m square. The frame, covered in wire mesh, replaced the Yagi's own reflector and a metal pipe, slightly longer than the woodwork and secured to the rear of the frame, enabled the antenna to be centre-slung between two 50 mm diameter supports. These were standing on foot-plates buried in the ground. The horizontal pipe was attached each end to the uprights with strong mast clamps which allowed for periodic vertical adjustment.

By mid-1970, the second instrument was running concurrently with the 136MHz system. The output of both receivers was fed to an Evershed and Vignoles twin-track chart recorder, Fig. 2, so that direct comparison between the solar activity on each frequency was easily made. The telescope and its work received a lot of publicity. On 5 November 1971, it was featured in the BBC television programme, *Tomorrow's World*. The presenter, James Burke, is seen talking to

camera, Fig. 3, from a position between the two antennas with the microphone held above him out of shot.

Apart from the high number of daily bursts recorded throughout 1971, continuous noise storms occurred from January 7-14, 19-22 and 28 to February 3, April 9-17, May 6-12, June 28 to July 2, July 14-19 and 24-28, August 18-27, October 3-5, 23-25 and 30 to November 1, November 16-19 and December 4-9 (all dates inclusive). The following year, 1972, was unforgettable for me with major noise storms occurring from February 12-19, March 3-13, May 29 to June 2, June 18-21, August 1-9 and 11-14, September 8-11 and October 24 to November 1.

The aurora which manifested from 1300 to 1700 on June 18 and the h.f. blackout on November 1 were each associated with noise storms. The real "winner" for me was the massive solar storm during the first week of August. Let me explain; apart from a few small individual bursts, the sun was relatively quiet from July 7 to 31. But at 1146 on August 1, I recorded a hefty burst of noise which lasted for 8 minutes on both 95 and 136MHz, Fig. 4 and was strong enough to blot out the static crashes from a local thunder storm that was in progress at the time. Thunder storms are a pest during any solar observation because every crash of static draws an unwanted spike on the recording chart. On this occasion, it was scientifically valuable and became an excellent guide to the power of a solar burst. These static crashes were being generated only a few kilometres from my solar antennas but the radio waves that "crushed" them originated 150 million kilometres away and had travelled for 8.3 minutes before entering my receiver.

It was obvious that something big had started on the sun's surface and very soon astronomers were telling me about the appearance of a very large sunspot group which remained visible until the 9th. The daily increase in radio noise reached its peak on the 4th and then declined as the group crossed the centre of the sun's disc, Fig.5. From sunrise on the 4th, the solar radio noise was so strong that my meteor counting system, working with a horizontal antenna on 70.31MHz, could not be used for several hours until the sun was much higher in the sky. When the telescope switched on at midday, both recording pens were banging the upper stops.

Like any other day the instrument switched off automatically at 1430 and, apart from a few updating phone calls, I closed my mind to radio astronomy and by 1500, I was helping fellow members of Storrington's Horticultural Society to prepare for their annual flower show on the 5th. Our venue was a large marquee on the

Fig. 1▲

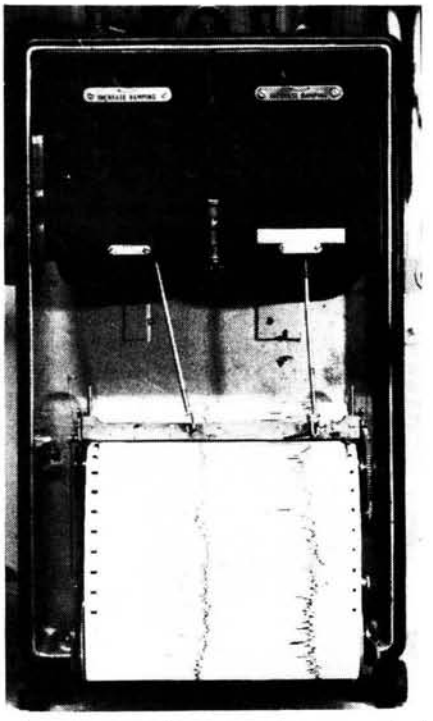


Fig. 2▶

recreation ground and moving and installing tables and exhibits in the pouring rain was no joke. However, around 2200 the rain stopped leaving the sky clear. The seeing was extra good because there were no street lamps on, or near, the ground to hinder our view of the night sky, in fact, it was an ideal astronomical situation.

Around 2330, my attention was drawn to an arc of white light on the northern horizon about 20 degrees wide and 5 degrees high in the centre, From this arc came several searchlight type beams, a few degrees apart and reaching over my zenith. As these giant beams moved across the sky from west to east, their delicate shading changed from red to green to light blue. It is very rare for an aurora borealis to be seen in Sussex and I lapped up every second of it because this was the first time I had ever seen the northern lights. Nature's fantastic display lasted almost 3 hours and its climax came about 0200 when the bright stars of Ursa Major (The Plough) were shining through a pink auroral glow which, by that time, had become the backdrop behind the beams and periodic blotches of bright light.

I heard later that this aurora had an umbrella effect on v.h.f. radio signals, I was not at all surprised, but nothing would have dragged me home to find out. Had the sky remained overcast no one, apart from v.h.f. enthusiasts, would have known that an aurora was present. The sun was still active on the 5th and another aurora manifested at 1500 hours, but this time it was broad daylight and its existence was only known about because of the effect it has on the tone of terrestrial radio signals. Before the advent of radio, untold numbers of aurorae must have gone by unrecorded because their light was hidden by overcast skies or because they manifested during the hours of daylight. More events next time but now back to the happenings in 1988.

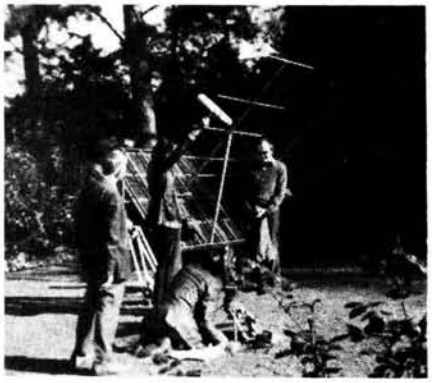


Fig. 3

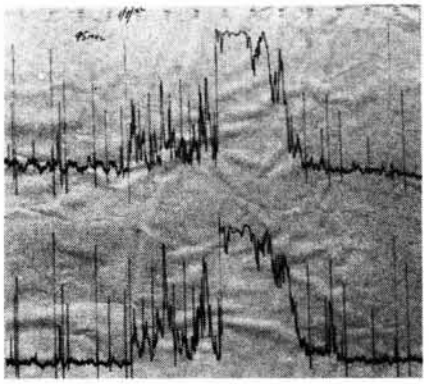


Fig. 4

Solar

That giant sunspot group at the end of June will be a talking point for some time and **Cmdr Henry Hatfield** (Sevenoaks), using his 8in Meade Schmidt-Cassegrain telescope, photographed its position at 1014 on June 30. See Fig. 6.

"The monthly mean sunspot number for July was 112.6," wrote **Neil Clarke G0CAS** (Ferrybridge). The daily solar flux for July showing extremes of 133 and 193 s.f.u. can be seen in Neil's computer printout, Fig. 7. The mean average for July was 153 s.f.u.

Patrick Moore (Selsey) sent drawings showing the sunspots that he observed on July 26 and August 9, Figs. 8 and 9. In Bristol, **Ted Waring** counted 47, 57, 48 and 10 sunspots on July 29, August 2, 9 and 17 respectively.

Dave Coggins (Knutsford) heard bursts of solar noise at 24, 28 and 50MHz around 0655 on July 24 and another at 50MHz, while beaming west, at 1840 on August 4.

Magnetic

"July was generally unsettled with stormy periods," said Neil Clarke. He explained, "on the 1st, the Ap index was 31 and then fell to 14 on the 5th before climbing again to 36 on the 11th. The next stormy day was the 16th with an Ap index of 42, but the most stormy period was the 21st, 22nd and 23rd with the Ap index at 65, 48 and 32 respectively."

In Saltash, **Karl Lewis** found the most unsettled conditions occurred on July 1, 11, 12, 21, 22, 26 and 27. At the other end of the UK in Strathclyde, **Doug Smillie GM4DJS** reports that his home-brew magnetometer, using Hall-effect devices, was unsettled on days 3, 4, 5, 7, 10, 11, 16, 30 and 31.

Aurora

Ron Livesey (Edinburgh) is the auroral co-ordinator for the British Astronomical

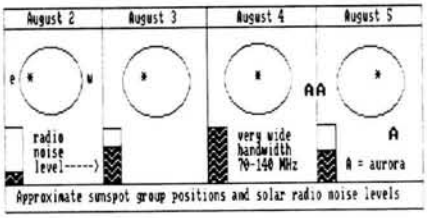


Fig. 5

WRM969

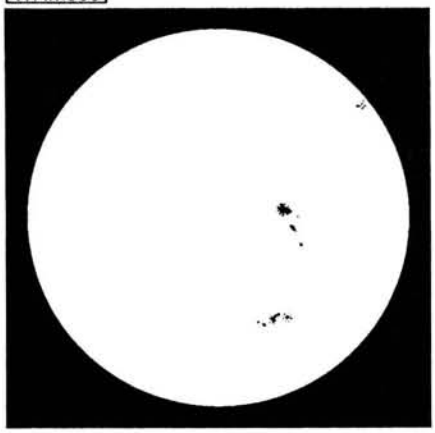


Fig. 8

Association. He received reports of "active fragmentary homogeneous arc" (11.6 degrees above the horizon) at 0626UTC on July 8, "quiet glow" (19°) at 0837 on the 12th and "pulsating striated rayed arc" (40.9°), "flaming striated rayed arc" (15.8°) and "active homogeneous glow" (87.0°) between 0638 and 0702 on the 15th, from Winnipeg.

Dave Coggins heard vision pulses with "ghostly" signals on Ch. R1 (49.75MHz) at 2140 and 2120 on August 7 and 8.

Sporadic-E

At 1815 on July 29 and at 1900 on the 31st, I counted at least 15 f.m. signals

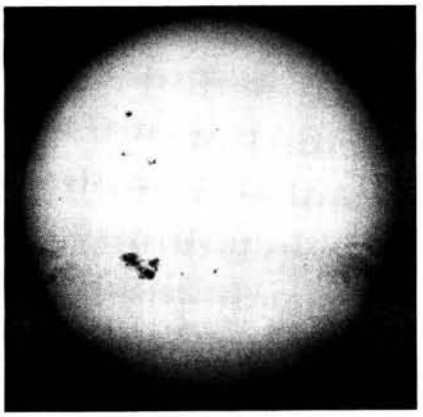


Fig. 6

from east European broadcast stations who normally operate between 66 and 73MHz. It is likely that the service area of these transmitters is limited to a diameter of about 80km. However, when Sporadic-E is present their signals can be heard hundreds of kilometres away and often at fantastic strengths. The scanner used by **Stephen Moore G0GTV** (Newquay) indicated some Sporadic-E during the morning of August 14 when he received strong signals from Gdansk on 70.31MHz.

The 50MHz Band

I regret to say that **Norman Hyde G2AIH** (Epsom Downs) passed away in May. For many years Norman was a regular contributor to the 50MHz and the beacon sections of this column. In fact his interest in propagation ranged from 28 to 1296MHz and possibly more. We extend our deepest sympathy to his wife and family and to his many friends at this sad time.

"I have been granted an experimental licence by the Department of Communications to transmit on 2 spot frequencies of 35.810MHz and 41.75MHz to carry out

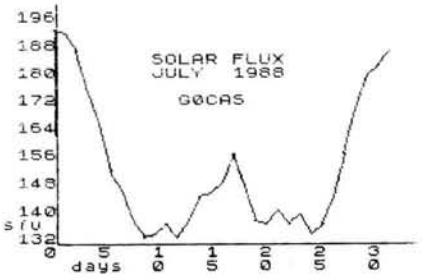


Fig. 7

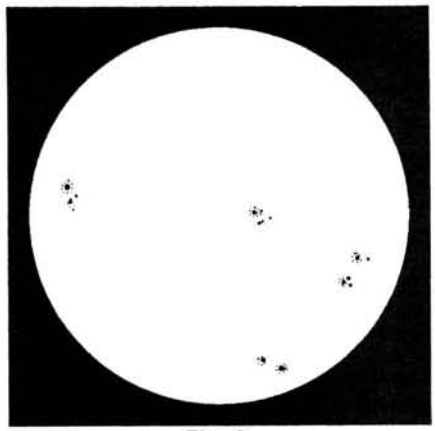


Fig. 9

propagation tests on paths with a view to ascertain the m.u.f. between 30 and 50MHz, looking for 6m openings," wrote **Graham Rogers VK6RO** (Ferndale, WA). Graham is well known for his efforts on the 50 MHz band and for these experiments he has the callsign VK6R. He will be using f.m. and probably a 6-element log-periodic Yagi covering 30 to 54MHz. Graham plans to use liaison frequencies of 28.385 and 28.885MHz to arrange for stations to listen for his signals on the two spot frequencies. Good luck Graham and let us know the results.

Propagation Beacons

First my thanks to Dave Coggins, **John Coulter** (Winchester), **Don Hodgkinson G0EZL** (Hanworth), **Ken Lander** (Harlow), **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), **Chris van den Berg** (The Hague), Henry Hatfield and Ted Waring, for their 28MHz beacon logs.

In addition to the the beacons listed, Ken Lander received signals from EA1AW, W3VD and WA4DJS/BCN on August 3, 5 and 9, respectively. "WA4DJS says 'Fort Lauderdale, Florida, 20 watts, antenna 250ft loop'," wrote John Coulter who logged it around 2025 on August 9 and 23.

On the 5th, Don Hodgkinson added KJ4X/BCN (28.206MHz), N4JHX/BCN (28.226MHz) and W3VD/BCN (28.295MHz) to his first-timers list. This was updated on the 7th and 13th when he logged 5Z4ERR (28.240MHz) and EA1AW (28.248MHz) respectively. Don had a 28MHz QSO with 5Z4RT, the beacon keeper, on the 12th and learnt that he does not operate 5Z4ERR when he is on the air himself.

Dave Coggins noted strong signals from ZS6PW and Z21ANB at 1100 on August 14. He also heard IK6BAK and PY2AMI, about S1, on 24MHz almost daily during the month prior to August 23. Ted Owen logged IK6BAK (24.91MHz) at 1230 on August 17 and Greg Lovelock heard KE2DI/B (28.286MHz) on August 9 and PY2AMI (24.90MHz) on July 30 and August 17/18.

June 88 / July 88

Beacon	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
QF0AAB			X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X						
QL0IGI	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EA3JA					X	X																									
HG2BHA	X	X	X	X	X	X	X	X																							
IY4M	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X			X	X	X	X	
KD4EC											X				X																
LA5TEN	X	X	X	X	X	X					X	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X
LU1UG	X		X			X		X	X	X	X	X	X	X	X			X		X			X	X	X		X		X	X	X
OH2TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X
PT7ETE			X			X														X											
PY2AMI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VE3TEN											X				X																X
VP8ADE																								X							
VP9BA																													X	X	
ZS1LA			X		X	X	X	X		X	X		X	X	X		X	X	X	X	X	X	X	X	X		X	X	X	X	X
ZS5VHF	X					X	X		X		X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X			
ZS6PW	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Z21ANB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5B4CY			X			X	X	X		X	X			X	X				X	X	X		X	X	X				X		X

Fig. 10

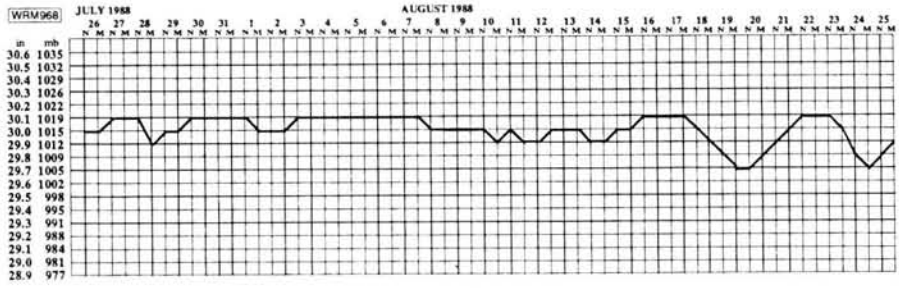


Fig. 11

My thanks to **Ken Rawlings** (Zimbabwe) for the gen that their beacon Z21ANB has been moved to a new site in Bulawayo. Following an overhaul this year, by the Zimbabwe Amateur Radio Society, its power has been increased from 8 to 20W. The present Beacon Keeper is Eric Cohen Z21BC/R, PO Box 1372, Bulawayo, Zimbabwe.

934MHz

The slightly rounded variation in atmospheric pressure for noon and midnight, recorded by me from July 26 to August 25 can be seen in Fig. 11. Pressure changes are important to anyone who uses the v.h.f. or u.h.f. bands for static or mobile communications.

While in Dorset on August 14, 934MHz enthusiast **Terry Wyatt UK-845** (Walton-on-Thames), using a mobile collinear antenna, worked UK-176 in Gurensey and heard a station in Cherbourg. He also made contacts with stations in Exeter (UK-796), Hengistbury Head (UK-862) and Ringwood (FW-31) and visitors UK-210 and UK-933 situated on the Purbeck Hills above Poole.

Don't forget the next three deadlines are: Oct 26, Nov 24 and Dec 22

Broadcast Round-up

Peter Shore

The Pacific region continues to be of potential interest to the short wave listener, with news that the New Zealand government is now re-evaluating the role of Radio New Zealand, that Cinderella of international broadcasting. It seems that the value of international short wave radio has been recognised. Radio New Zealand's antiquated 7.5kW transmitters could be replaced before too long by more powerful senders, beaming programmes in English and probably some Pacific vernacular languages, throughout Australasia. I reported some time ago that the BBC and the New Zealand authorities were exploring the possibility of setting up a joint transmitting facility in New Zealand, in order to improve the BBC's audibility in the Pacific region. Clearly an upgrading of the Radio New Zealand External Service would enable such an arrangement to be set up.

Meanwhile, talking of the BBC; on September 1 the BBC External Service disappeared, to be replaced by the BBC World Service. All the BBC's language services are now called BBC World Service instead of External. This was apparently to fit in with the public perception of the organisation who had never fully grasped the name External Service.

Relay agreements continue to feature in the media news, with reports that Austria and Canada are considering such a move. Under the agreement, Radio Austria International would broadcast around two hours a day via the Sackville site of Radio Canada International to North America. A similar amount of RCI programmes would be broadcast by ORF's Moosbrunn transmitters to the MIddle East. Austria is reported to also be considering offers from other stations for relay facilities.

It is remarkable how these exchanges have burgeoned in the last couple of years. Ten years ago, it would have been almost unthinkable for broadcasters in the East and West to contemplate such arrangements. Where will it all end?

Radio Finland has re-introduced daily French language broadcasts to supplement the weekend broadcasts which started 18 months ago. Radio Finland ceased daily French language programmes in 1958. It is the English service that has suffered as a result of the increase in other language broadcasts. Since 1984, almost half of the station's English language service has been cut. With a massive investment in new transmitters for both h.f. and m.f. services, Radio Finland is clearly aiming to be one of the world's most audible small international broadcasters.

At the Commonwealth Foreign Ministers Conference in Toronto, Canada during August, the Canadian hosts tabled a proposal that a short wave service targeted on South Africa should be established. The proposal for "Radio Free Africa" would entail a station being set up, similar in concept to Radio Free Europe established after World War Two by the Americans, to provide uncensored news to blacks and whites in South Africa. The news would be provided by Canadian journalists and perhaps Australians and British too. At present, no specific details on budgets, technical facilities and so forth have emerged, but it seems that the idea will come to fruition before too long.

In Sweden, the Community Radio station City 103 in Gothenburg has been told to stop relaying VoA Europe during the night when it does not broadcast its own programmes. The Swedish Community Radio Board says that continuous relays of foreign stations are not permitted under the community radio regulations in Sweden. City 103 takes two BBC World Service news bulletins during the day time, but these have not been cited as a breach of the regulations.

Radio Moscow broadcast its first programme in the Basque language directed towards Spain in August. Whilst claiming that this was the first ever programme in Basque on short wave, in fact Radio Exterior de Espana has been broadcasting in Basque since 1985.

Europe

All times are UTC (=GMT).

Radio Austria International broadcasts from September 4 to Europe:

0400–2300 on 6.155MHz
0700–1700 on 13.73MHz
1300–1500 on 21.49MHz
1700–2200 on 5.945MHz
2000–2300 on 9.87MHz

The use of the new 13MHz channel was predicted in this column last month!

Radio Finland has been conducting single sideband tests in Finnish on 15.325MHz at 1000–1100. The new daily French language programmes can be heard:

0115–0130 on 15.40 & 11.755MHz
1030–1045 on 15.325 & 15.115MHz
1845–1900 on 15.185, 11.755, 9.53, 6.12MHz & 963kHz.

Radio Finland is also heard at 1100 on 15.40 and 11.945MHz.

A new station opened in Malta during late August—Radio Voice of the Mediterranean. It is heard on 9.765MHz from 0600 in English with Arabic on the same frequency at 0700. Up to Moscow's first frequency change on September 4, the 0600 portion was subject to severe QRM from Moscow World Service. It is believed that this new Maltese station is controlled by Libyan interests.

Radio Netherlands introduced some frequency changes on September 25 and the complete English transmission schedule became:

0400 on 9.895 & 7.21MHz
0630 on 11.93 & 9.895MHz
0730 on 9.715 & 9.63MHz
0830 on 21.485, 17.575 (to SE Asia) & 9.63MHz (New Zealand)
1030 on 9.505 & 6.02MHz
1130 on 21.48, 17.575, 15.56 (Mid East & Asia), 17.605, 9.715 & 5.955MHz (Europe)
1430 on 17.575, 15.56, 13.77, 11.735 & 5.955MHz
1630 on 15.57 & 6.02MHz
1830 on 21.685, 17.605, 9.54 & 6.02MHz
2030 on 15.56, 11.74, 9.54 & 9.895MHz
0230 on 9.895, 9.59, 6.165 & 6.02MHz
0530 on 9.715 & 6.165MHz

Some programmes to be heard in Radio Netherlands' English Service during the coming weeks are:

Monday October 31: "The Research File" looking at the science behind weather forecasting. What is being done to improve the global weather prediction service.

Starting on Wednesday October 5, an eight-part documentary series produced in co-operation with the Australian Broadcasting Corporation will examine the Dutch influence on the development of Australia in bicentennial year.

Thursday means *Media Network* and on October 13, the programme will look at the many clandestine stations which operated during World War II. On October 27, the programme puts religious short wave broadcasters under the spotlight.

Radio Norway International has new frequencies, they are:

0600 on 15.165, 11.865 & 9.59MHz
0700 on 21.73, 15.165 & 9.59MHz
1000 on 21.705, 21.565 & 15.235MHz
1100 on 21.705, 17.78 & 15.18MHz
1200 on 25.73, 21.705, 15.325 & 15.165MHz
1300 on 21.705, 15.31, 9.59 & 6.035MHz
1400 on 21.7, 15.31, 15.28 & 15.19MHz
1500 on 17.84 & 15.31MHz
1600 on 21.7, 15.31, 9.59 & 1.314MHz
1700 on 21.7, 15.31, & 9.655MHz
1800 on 21.7, 15.31, 15.22 & 9.655MHz
1900 on 15.31, 15.22 & 9.59MHz
2000 on 15.31, 9.59 & 6.01MHz
2100 on 15.265 & 15.165MHz
2200 on 15.18 & 11.85MHz
2300 on 11.85 & 9.605MHz
0000 on 11.85 & 9.62MHz
0100 on 9.615MHz
0200 on 9.56MHz

0300 on 9.65 & 7.215MHz
0400 on 11.76MHz
0500 on 15.165 & 11.735MHz

English is heard on Sundays at 1000, 1300, 1400, 1600, 1700, 1900, 2000, 2200, and 0000. Mondays at 0400, 0500 and on medium wave at 1600.

Turkey is heard between 1000 and 1500 on 11.96 and 9.46MHz.

Africa

The Voice of Ethiopia has moved frequency for its programme at 1830. It is now heard with good reception on 9.662MHz (announced as 9.66MHz).

Malawi has been heard during the evenings from around 2130 on 3.381MHz.

Radio RSA has introduced a Danish language programme on Wednesdays only at 1600 until 1615 on 21.535MHz. English can be heard at:

1100–1200 on 21.59, 17.745 & 11.9MHz
1400–1600 on 21.59, 17.745 & 11.925MHz
1800–1900 on 21.535 & 17.765MHz
1900–2100 on 15.365, 15.32 & 7.295MHz.

Middle East

Iraq's English Service at 2000 is now on 9.77 and 15.23MHz. The Qatar Broadcasting Service is heard from 0800 on 11.795MHz.

UAE Radio Dubai in English can be heard at:

0330 on 21.7, 17.89, 15.435 & 11.94MHz
0530 on 21.7, 17.83, 17.775 & 15.435MHz
1030 & 1330 on 21.605, 17.865, 15.435 & 11.955MHz
1500 on 15.30, 11.955, 11.73 & 9.55MHz.

Asia and The Pacific

English language programmes from Radio Bangladesh are now heard at 1230 on 17.71 and 15.25MHz.

Radio Exterior de Espana's relays via China are heard now at:

1000 on 9.62MHz
1100 on 11.915MHz
1200 on 9.62MHz
1300 on 11.915MHz

Radio Japan's General Service schedule for English is:

0100 on 17.845, 17.81, 15.195 & 5.96MHz (Canada)
0300 on 17.81, 15.195, 11.84 & 7.125 (Gabon to 0330)
0500 on 17.81, 15.235, 11.87, 11.84 & 9.505MHz
0700 on 21.695 (Gabon), 17.81, 15.235 & 11.955MHz
0900 on 17.81 & 11.84MHz
1100 on 11.815 & 6.12 (Canada)
1400 on 11.815, 11.78 & 9.695MHz
1500 on 21.70 (Gabon), 15.23, 11.815, 9.695 & 9.505MHz
1700 on 11.815, 11.705 & 9.505MHz
1900 on 11.705, 9.64 & 9.505MHz
2100 on 11.85, 11.815, 9.695 & 9.64MHz
2300 on 17.81, 15.23, 15.195, 11.815 & 11.80MHz (Gabon)

Any reports for Broadcast Round-up should be sent to the PW offices

Some frequency changes were due to come into effect in Papua New Guinea on September 5 with the installation of new 10kW transmitters from Japan. Provincial stations move as per:

Kimbe	2.435MHz
Kundiawa	2.490MHz
Mount Hagen	2.450MHz
Kieta	3.320MHz
Rabaual	3.380MHz
Lorengau	2.465MHz

The Americas

RAE Buenos Aires current schedule for English programmes is:

0200 and 0400 on 11.71MHz
1700 and 2200 on 15.345MHz

Radio Havana Cuba is now broadcasting English as per:

0600–0800 on 11.76MHz (to America)
1700–1800 on 15.295MHz
2200–2300 on 7.15MHz

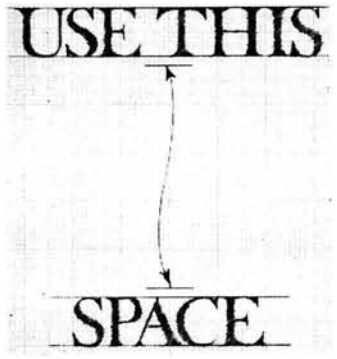
KNLS in Alaska has English at:

0800–0900 on 11.715MHz
1500–1700 on 9.75MHz
1800–1900 on 11.65MHz

Radio Mexico International has announced the following schedule for its programmes in English and Spanish:

1300–1700 on 11.77 & 5.985MHz
2000–2300 on 17.765MHz
2000–0500 on 15.43 & 9.705MHz
0300–0500 on 17.765MHz

Some low powered South American news: In Bolivia, Radio Centinario La Nueva in Santa Cruz is now back on 4.855MHz at 0000–0200. Radio Cortech, Sucre is heard on 4.935MHz. In Venezuela, Radio Rumbos in Caracas is on 9.66 and 4.97MHz during the evening period.



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