The SHORT WAVE Magazine

55p

VOL. XL DECEMBER 1982 NUMBER 10

TR3500

COMPACT SIZE AND LIGHT WEIGHT
Measures only 66W x 168H x 40D mm with a weight of 540grams including Ni-Cd battery pack.

LCD DIGITAL FREQUENCY READOUT
Easy to read in direct sunlight, or in the dark. Vitually no current drain (much less than LED's). Displays transmit and receive frequencies and memory channels. Display includes four "1Arrow" indicators: "F. LOCK" (Frequency Lock), "REV" (Repeater Reverse), "PROG. S" (Programmed Scan), "MS" (Memory Scan).

TEN CHANNEL MEMORY
Nine memories may be operated in simplex mode, or with transmit frequency offset permitting access to repeaters.

LITHIUM BATTERY MEMORY BACK-UP
No loss of memory in case of complete discharge (or removal of the Ni-Cd batteries. Current (approximately 1 microampere) to maintain memory supplied by built-in separate lithium battery, with estimated life of more than 5 years.

MEMORY SCAN
Scans only those channels (maximum 10) in which frequency data is stored. Stops on "Busy" channel, resumes scan automatically approximately 2 seconds after signal goes off, or when "MS" key is pressed. The "STOP" key or the PTT switch may be used to cancel the scan function. LCD displays memory channel number and "MS" arrow while memory scan in use.

PROGRAMMABLE BAND SCAN
Scan bandwidth (lower and upper frequency limits) and scan steps of 5kHz and larger (5, 10, 15, 20, 25 kHz, etc.) may be programmed. Scan automatically locks up on busy channel and resumes approximately 2 seconds after signal goes off or when "PROG. S" key is pressed. "STOP" key or PTT switch cancels scan function.

UP/DOWN MANUAL SCAN
UP/DOWN manual scan in 5 kHz steps.

FREQUENCY COVERAGE
Covers 430.00 — 439.995 MHz in 5 kHz steps.

TONE BURST SWITCH
The TONE BURST switch activates the 1,750 Hz repeater access tone oscillator.

TX OFFSET SWITCH
Selects simplex or repeater operation (operator pre-programmes repeater OFFSET MAX ±9.995 MHz).

HI/LOW POWER SELECTION
HI/LOW power output switch allows operation at 1.5W or, for extended battery life, 300 mW.

REVERSE OPERATION
"REV" switch shifts the receiver to the transmit frequency, and the tranmitter to the receive frequency. Useful for checking signals on the input of a repeater, to determine if you are within simplex range.

AUTO/MANUAL SQUELCH
Selector switch on threshold control allows selection of automatic or manual squelch operation.

BATTERY INDICATOR
LED battery condition indicator flashes when battery charge level approaches nominal discharged battery potential.

TWO "LOCK" SWITCHES
"F. LOCK" switch prevents accidental loss of chosen frequency when in "LOCK" position. "TX. STOP" switch prevents accidental transmission if PTT switch is accidentally pressed in handling.

BNC ANTENNA TERMINAL
Allows antenna changeover to be quick and easy.

ACCESSORIES INCLUDED
- Flexible rubberised antenna with BNC connector.
- 400 mAH Ni-Cd battery pack.
- AC charger.
- Plug for external microphone and speaker.
- Hand strap.

"compatible"

the two metre & seventy centimetre handhelds from Trio.

TR2500 £207.00 inc. VAT, carr. £5.00
TR3500 £220.00 inc. VAT, carr. £5.00

PRICES AND SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE.

LOWE ELECTRONICS
Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.

EAST LONDON HAM STORE

H. LEXTON LIMITED

191 FRANCIS ROAD LEYTON E.10
TEL 01-558 0854 TELEX 8953609 LEXTON G

DRESSLER AMPLIFIERS

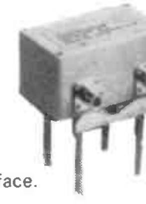
These are high power 240V linears using 4C x 150 or 4C x 250 or 4C x 350 Eimac Tubes NOT using the grounded Grid system.
Fully protected, no thermal damage to PA finals possible.

DRESSLER AMPLIFIERS

D70 70cm 200wfm 400 PEP	£495.00
D200c 2mtr 125wfm 200w PEP	£285.00
D200 2mtr 300wfm 600w PEP	£495.00
D200S 2mtr 400wfm 1KW PEP	£600.00

GASFET DRESSLER PRE—AMPS

VV2	
VV2GAAS 150W	£40.00
VV200GAAS 750W	£69.00
VV2000GAAS 1KW	£79.00
VV2RPS S0259	Non switching £22.00
VV2RPS N Type	£24.00
VV7RPS S0259	£22.00
VV7RPS N Type	£24.00



Powered by the linear or with separate interface.
0.7 - 0.9dB signal to noise
0.2dB insertion loss

3SK97 GASFET Available separately £4.50

GASFET MASTHEAD PREAMPS

WE WOULD LIKE TO WISH A MERRY CHRISTMAS
AND A PROSPEROUS NEW YEAR TO ALL OUR CUSTOMERS

ICOM

IC740 HF 100W	£699
IC720RHF 100W G/C	£899
IC730 HF 100W	£586.00
IC2KL Linear	£829.00
IC2KLPS P.S.U	£211.00
PS15 P.S.U.	£ 99.00
PS20 P.S.U	£130.00
AT500 A.T.U	£299.00
RX70 Receiver	£469.00
PS15 P.S.U	£99.00

ICOM

IC2E 2mtr fm portable	£159.00
IC4E 70cm fm portable	£ 99.00
IC25G 2mtr 25w fm	£235.00
IC290 2mtr 10w fm/ssb	£366.00
IC251 2mtr 10w fmkw/ssb/base	£495.00
IC451 70cm 10w fmkw/ssb/base	£630.00
IC490 70cm fm/ssb mobile	£445.00
ICSP3 Speaker	£ 29.00
ICSM5 Mic	£ 29.00

ICOM

Accessories

ICLC/1/2/3 case	£ 4.25
ICWM9 SP/Mic	£ 12.00
ICBP2 6V pack	£ 29.50
ICBP3 9V pack	£ 20.00
ICBP4 empty pack	£ 6.95
ICBP5 12V pack	£ 39.50
ICCP1 charging lead	£ 3.75
ICDC1 12V car pack	£ 9.75
LC8 leather case	£ 18.98
BC30 Base Charger	£ 45.00

TRIO/KENWOOD

TS930 General Coverage RX/TX	£995.00
TS830 100W HF	£650.00
TS530 100W HF	£475.00
TS130 100W HF	£495.00
TS130 25W 2mtr FM/SSB	£390.00
TS7850 40W 2mtr FM	£300.00
TS7800 25W 2mtr FM	£245.60
TR2500 2mtr Portable	£200.00
TR7730 2mtr FM	£245.00
AT230	£110.00
SP230	£ 34.00
DM801 GDO	£ 60.00
R600 Receiver AM/SSB	£190.00

YAESU

FT-one gen. coverage TX/RX	£1295.00
FT102 150W 10mtr-160mtr	£690.00
FT707 100W 5-10mtr	P.O.A.
FP707 20A P.S.U.	P.O.A.
FC707 A.T.V.	P.O.A.
FT107M 9 band 100W	P.O.A.
FP107 P.S.U.	P.O.A.
FT101ZD 160-10mtr	
FT9020M 160-10mtr AM/FM	P.O.A.
SP901 Speaker	£ 30.00
FC902 A.T.U	£135.00
FL2100Z 1.2KW PEP linear	£425.00
FC102 Speaker	P.O.A.
FC102 A.T.U	P.O.A.
FV102 V.F.O.	P.O.A.

Morse Readers

MBA electronic morse/RTTY reader	£170.00
Microdot/morse/RTTY printer/ VDU/Key Board all one peice	£650.00

YAESU

FT290R with mods	FM/SSB	£245.00
FT480R 2mtr mobile	FM/SSB	£365.00
FT780R 70cm 7.6swift	Shift	£400.00
FT780R 70cm 1.6 swift	Shift	£440.00
FT208 2mtr portable	FM	£195.00
FT708 70cm portable	FM	£205.00
FT230 2mtr FM mobile		£220.00
FRG7700 receiver	AM/FM/SSB	£295.00
FRG7700 memory		£ 80.00

FRV7700A 118-150	£ 60.00
FRV7700B 50-60/118-150	£ 75.00
FRV7700C 140-170	£ 65.00
FRV7700D 70-80/118-150	£ 72.00
FRT7700 Aerial Tuner	£ 37.00
FRA7700 Active Antenna	£ 36.00
FF5 Filter	£ 9.95
MMB11 FT290 Car Mount	£ 22.00
NC11C Charger	£ 8.00
NC8 Base Charger	
FT208/208 108	£ 44.00

MORSE READERS

+ Tasco Telereader CW/RTTY	£250

DIAWA

RM940 Mic	Infrared	£ 45.00
CN620A	1KW SWR	£ 52.81
CN1001	Auto A.T.U.	£156.00
CN2002	2KW Auto A.T.U.	£228.00
CN518	2.5KW A.T.U.	£175.00
AF406 Active Filter		
AF606 P.L.L. Active Filter		£ 56.00
SR1000Receiver		£70.00
DR7500X		£95.00
DR7500R		£100.00
DR7600X		£135.00
DR7500R		£145.00

DATONG

D70 Morse Tutor	£ 56.35
PC1 Gen. cov converter	£137.00
FL1 Agile filter	£ 79.35
FL2 Active filter	£ 89.70
FL3 Agile filter & notch	£129.37
ASP Auto clipper	£ 82.80
D75 Manual clipper	£ 56.35
RFC Speach clipper	£ 29.90
AD270 Indoor active ant	£ 47.15
AD370 Outdoor active ant	£ 64.40
RFA Wide band AMP	£ 33.92

WELTZ

SP200 1.8-160MMZ 20-200-1KW	£ 59.00
SP300 1.8-500MMZ 20-200-1KW	£ 79.00
SP400 130-500MMZ 5-20-150	£ 59.00
SP250 1.6-60MMZ 20-200-2K	£ 43.00
SP15 1.08-160MMZ 5-20-200	£ 29.95
CT150 150/400W Dummy Load	£ 31.00
AC38 3.5 30MMZ A.T.U	£ 59.00
SP10X 108-150MMZ 20-20n	£ 19.95

DURING DECEMBER OUR PREMISES WILL BE OPEN SUNDAY FROM 10-3

MORSE KEYS

Morse keys Swedish brass key	£49.00
Himound HK706	£ 11.00
Himound MK706	£ 20.00
Himound HK7022	£ 22.50
Kenpro squeeze key 100 electronic key	£ 57.00
Dawa DK210 Electronic keyer	£41.00

POWER SUPPLIES

The Lexton

7amp Max 12amp	£ 49.95
20ampMax 22amp	£ 79.95

Fully protected against overvolts, over current S/C protected & RF protected

Trade enquiries invited and own name can be provided

SONY

ICF2001 receiver	£140.00

Microwave modules

MML 144/30 1-3w drive	£ 9.95
MML 144/100 L.S. 1-3w drive	£159.95
MML 144/100 S 10Wdrive	£139.95
MMC 435/600 ATV converter	£ 27.90
MM2001 RTTY receiver	£189.00
MM4000 RTTY tranceiver	£269.00
MM1000KB key board + transceiver	£299.00
MMT28/144	£109.95
MMD050 frequency counter	£ 75.00

+ ALL MODELS STOCKED

TONO

2M - 50W Linear amp. 1-3Win	£ 62
2M - 70W Linear amp. 10Win	£ 90
2M - 100W Linear amp. 10Win	£115
θ 500 - CW/RTTY Terminal	£299.00

SCANNING RECEIVER

Scanning Receiver SX200N	£249.00

ROTATORS

Kenpro KR 250	£ 44.95
Hirshmann HR 250	£ 50.00
Kenpro KR400RC	£100.00
Kenpro elevation rotator	£85.00

TONNA

144 4ELE £12.00 432/440 21 ELE	£19.00
144 9ELE £16.00 432/435 21 ELE A.T.V.	£27.00
144 9ELE crossed 30.0 144/435 9 19ELE	£31.00
144 9ELE portable 30.0144 19ELEX	£30.00
144 16ELE £33.00 1296 23ELE	£27.00
144 13ELE portable £29.00 Phasing Harnes	
430/440 19ELE crossed telescopic masts 435 19ELE	£19.00

TET

HB33T	£189.00	HB35C	P.O.A.
HB34T	£202.00	SQ22144	£ 55.00
HB35T	P.O.A.	SQ22OX144X4	£ 90.00
		SQ007 70cm	P.O.A.

See the new standard C5800 Multimode 25W SSB/FM/CW 2Mtr £359.00

JAYBEAM

TB3 HF 3 band	£181.70	5XY2M	£24.70
VR3 band vertical	£ 46.00	8XY2M	£31.00
C52M colinear	£ 47.72	10XY2M	£40.80
5Y2M 5ELEYAGI	£ 12.00	Q4/2M	£25.80
8Y2M 8ELEYAGI	£ 15.50	Q6/2M	£33.90
10Y2M10ELEYAGI	£ 33.00	Q8/2M	£39.00
PBM1010EPARABEAM	£39.50	MBM548/70cm	£31.00
PBM1414EPARABEAM	£48.00	MBM88/70cm	£42.50
		8XY 70cm	£36.80
		12XY 70cm	£46.00

HOXIN

GP5 2mtr colinear 6.4DB	£33.00	DX1 discone TX-TX	£34.00
		HF5DX 80-40-20-15-10 mtr Vertical	£84.00

ALL ACCESSORIES AVAILABLE – PLUGS SKTS CO-AX 2MTR COLINEAR £31.50, 70CM COLINEAR £31.50

Access

PRICES INCLUDE VAT AT THE PRESENT RATE OF 15%
OPEN MON—FRIDAY 9:00–5.30. SATURDAY 10:00–3:00. INSTANT HP FACILITY AVAILABLE
EASY ACCESS M2–M11–M1 NORTH CIRCULAR ROAD–EASY PARKING

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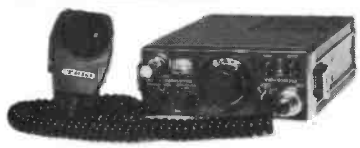
BARCLAYCARD

Wishing you a Very Merry Christmas & Peaceful New Year

THE ONLY APPROVED TRIO DEALER FOR NORTH WEST ENGLAND

TR7730 the new compact 2m Transceiver **£247.94**



TR2300

TR2300 2m Synthesised Portable Transceiver. We have lost count of the number of this model we have sold over the last 12 months. Hikers, campers, climbers, you can hear them all over the country and reliability which is the essence of TRIO equipment. £135.00

JAYBEAM

5Y/2M 5 element yagi	£12.08
8Y/2M element yagi	£15.53
10Y/2M 10 element	£33.35
PBM/14/2m. 14 element Parabeam	£48.30
5XY/2m. 5 element crossed yagi	£24.73
8XY/2m. 8 element crossed yagi	£31.05
10XY/2m. 10 element crossed yagi	£40.83
Q4/2m. 4 element Quad	£25.88
Q6/2m. 4 element Quad	£33.93
D5/2m. 5 over 5 slot fed yagi	£21.85
D8/2m. 8 over 8 slot fed yagi	£29.33
UGP/2m. ground plane	£10.12
MBM48/70cms. Multibeam	£31.05
MBM88/70cms. Multibeam	£42.55
TAS ⅝" 2m. Whip mobile	£15.30
C5/m. Colinear	£47.73
C8/70cm. Colinear	£54.05
D15/1296 23cm. Antenna	£36.80

Carriage on Antennas £4.50.

J.R.C. NRD515D

General coverage receiver 100 KHz to 30 MHz fully synthesised. Digital readout PLL synthesiser with rotary type encoder pass band tuning — modular construction. £985.00

NEW 24 CHANNEL MEMORY UNIT.

From J.R.C. the new JST100 digitally-synthesised HF transceiver. 11 channel memory — two VFO's — microcomputer based control — 100 watts.

NSD515 TRANSMITTER
+ NBD515 power supply

100 Watts output. USB/LSB-CW-RTTY. Mic impedence 600 ohm — Antenna impedence 50 ohm.
From the same Company, Japan Radio Company, comes the new JST-100 Digitally-synthesised HF Transceiver. All amateur Bands 160 through to 10M. 100 watts output AM-USB/LSB-CW-RTTY. Three phase locked loop circuits including BFO circuit are phase locked with stable 10MHz standard crystal oscillator, ensuring superior frequency stability and accuracy.

The TS930S latest transceiver from Trio **Price: £1078.00 inc. VAT.**

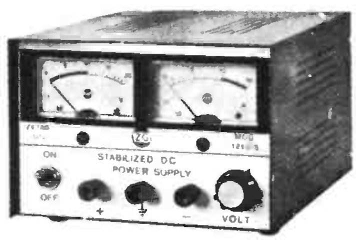
TRIO

TS830S HF Transceiver	£632.00
AT230 All band Antenna Tuner/SWR	£119.83
SP230 Speaker	£34.96
DFC230 Digital remote control	£179.86
TS130S Solid State HF Transceiver	£000.00
TS130V Solid State HF Transceiver	£000.00
PS20 Power supply	£49.45
PS30 Power supply	£88.55
AT130 Antenna Tuner	£79.12
TL922 2 KW Linear Amplifier	£624.91
TR2300 Portable 2m Transceiver	£135.00
TR2500 Hand Held 2m Transceiver	£207.00
TR7730ne compact 2m Transceiver	£247.94
TRIO TR9130 2m Transceiver	£395.00
TR9500 70cm Multimode Transceiver	£449.88
TS930S HF Transceiver	£000.00
R600 Solid State Receiver	£235.00
R2000 Solid State Receiver	£000.00
TR3500 70cm Handheld Transceiver	£000.00

Full range of TRIO Accessories stocked.

DATONG PRODUCTS

PCI General Coverage Converter	£137.42
Low Frequency Converter	£29.90
FL1 Frequency Audio Filter	£79.35
FL2 Multi-Mode Audio Filter	£89.70
Automatic RF Speech Clipper	£82.80
RF Speech Clipper	£29.90
D70 Morse Tutor	£56.35
AD370 Active Antenna (outdoor)	£64.40
AD270 Active Antenna (indoor)	£47.15
2M Converter	£39.67
Keyboard Morse Sender	£137.42



MOD. 1210 S

SOLID STATE STABILISED POWER SUPPLIES

Maximum ratings quoted. Prices include postage.

Model 125 10-15V 5 amp	£29.50
Model 156S 4-15V 5 amp Twin Meter	£40.00
Model 1210S 4-20V 10 amp Twin Meter	£75.00

RECEIVERS AND TRANSCEIVERS

SR9 Tunable 144-146MHz Receiver	£46.00
R512 Aircraft Band Scanning Receiver	£135.00
Regency Digital Flight Scan Synthesised Aircraft Band Receiver	£215.00
Yaesu FRG7 Receiver	£199.00
'Sky ACE' Hand Held Aircraft Band Receiver	£49.50
AR22 2m Hand Hold Receiver	£83.00
R528 Hand Held Aircraft Receiver	£68.50
FXI Station Wavemeter	£34.00
2-way Antenna Switch 3-30MHz	£5.00
3-way Antenna Switch 3-30MHz	£10.00
FDK 700EX Transceiver	£199.00
FDK 750E Transceiver	£299.00
DL50 50 watt 5 ohm Dummy Load	£6.50
DL500 Dummy Load/Wattmeter 1 Kw. 3-400MHz-50 ohms	£38.00
WH.2. VHF Wavemeter	£22.30

ANTENNAS

HYGAIN

12AVQ Vertical	
14AVT Vertical	
18AVT Vertical	
TH3JNR Tribander Beam	
TH2MKS 2 element Tribander	
TH3MK3 3 element Tribander	
TH6DXX Tribander	

TET

HB33SP 3 element Tribander	£189.23
HB34D 4 element Tribander	£202.69
MV3BH Vertical	£40.25
MV4BH Vertical	£49.50
MV5BH Vertical	£71.25
SQ22 2 element Quad 2M	£55.67
TE214 14 element Yagi 2M	£67.00

MINIPRODUCTS

HQ1 Minibeam	£119.00
C4 Vertical	£56.00
G9MH Minibeam	£82.50

ACCESS & BARCLAYCARD facilities. *Instant HP service. Licensed Credit Broker — quotations upon request.*

Try our new "Overnite" service for £6.00. Guaranteed 24 hour service if order placed before 11 a.m. (except North GM).
Part exchange always welcome. Spot cash paid for good clean equipment. If you have equipment surplus to your requirement we would be pleased to sell this on commission for you.

Shop Hours: 9.30 to 5.30 Monday to Friday. 4.30 p.m. Saturday.

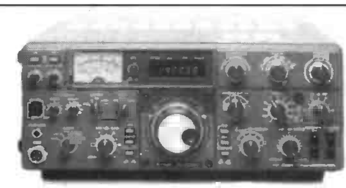
No parking problems. Turn at the Greyhound Motel on the A580 (East Lancs.) Road. S.A.E. with all enquiries. 25p will bring you latest information and prices. Postage carriage extra.

ALL OUR PRICES INCLUDE VAT
SEND S.A.E. FOR OUR UP-TO-DATE SECONDHAND LIST.

FULL RANGE OF DIAWA ANTENNA ROTATORS, SWR METERS, AUTOMATIC ANTENNA TUNERS, WELLZ SWR METERS AND ATU'S IN STDCK.

DRAKE

MN7 ATU/RF Meter 250 Watts	£124.20
MN2700 ATU 2 KW	£253.00
DL 300 Dummy Load 300 Watts	£20.70
DL 1000 Dummy Load 1 KW	£37.95
TV 3300 Low Pass Filter	£18.40
AK75, Doublett Antenna 132' top with 470 ohm Feeder	£29.90



TS830S
HF SSB TRANSCEIVER
£632.00

The new TS830S, the latest from TRIO. A high performance, very affordable HF SSB/CW transceiver with every conceivable operating feature built in for 160 through 10 metres (including the new three bands). The TS830S combines a high dynamic range with variable bandwidth tuning (VBT), IF shift and an IF notch filter, as well as very sharp filters in the 455 KHz second IF. Together with the optional VFO230 (remote digital display VFO) which provides split frequency operation and 5 memories for frequency hold, the amateur has available today's advanced technology linked to the proven reliability and exceptional linearity of a valve PA.

★ **VBT variable bandwidth tuning**
★ **IF notch filter**
★ **IF Shift**
★ **Various filter options**
★ **Built in digital display**
★ **6146B final with RF negative feed-back**
★ **Optional Digital VFO for increased flexibility**
★ **Innovative PLL system of frequency generation**
★ **RF speech processor**
★ **Adjustable noise blanker level**
★ **Adjustable audio tone**
★ **RF attenuator**
★ **RIT/XIT**
★ **SSB monitor circuit**
★ **Expanded frequency coverage**

The Amcomm Hotline.
Call FREEFONE 2705 now for fast delivery!
Prices & Orders Only.
BARCLAYCARD VISA
JUST ARRIVED! YAESU FT 980 H.F. Tcvr. SEND FOR DETAILS.
ICOM 290E 2 mtr. all mode tcvr. Check Freefone Price.
YAESU FT1 Gen. Cov. Tcvr. Call now for ex stock fast delivery.
YAESU FT102 9 Band Tcvr. Call before 2pm for price and you'll have it next day.
YAESU FT290R/FT790R. Waiting for you with free Nicads and Charger CALL FREEFONE NOW.
ICOM 720A Gen. Cov. Tcvr. Call Freefone and we'll put a smile on your face.
ICOM IC-R70 RECEIVER
Here's a Receiver that's going to be around a long time. Yes, it is up-market a bit but then so is the performance! ICOM have really produced a right gem, and we'll tell you now, it's real value for money. We expect to have plenty of stock as you read this, so call Freefone to place your order for next day delivery. If you want details of the R70, write or call us on our general enquiry number 01-864 1166. We'll send you a leaflet on this or any other product that may interest you. Remember – most items advertised are available on our super No Interest HP.
ICOM 730 8 Band Tcvr. Guaranteed (like everything on the page) for two years.
YAESU FT707 Tcvr. Call Freefone now for price and fast delivery.
YAESU FRG7700. Still with free antenna tuner – call fast – we'll deliver fast.
YAESU FT480R All mode 2m tcvr. YAESU's big success. Call Freefone now to make it yours.
ICOM 251E 2 mtr all mode base. We can't get enough – call now and try us for price and delivery.
ICOM 740 WARC Tcvr. A host of features at a real competitive price – call now.
TONO 7000E/9000E. We just need your call and it's on the way. FREEFONE 2705.
ICOM Twins IC4E/1C2E Both ex stock. Call Freefone now.
YAESU's Handheld Twin FT708 and FT208 Try Freefone now.
BARCLAYCARD VISA
AMCOMM
Amcomm Services, 194, Northolt Road, South Harrow, Middlesex HA0 2EN. Telephone: 01-864 1166, Telex: 24263.
OPPOSITE SOUTH HARROW TUBE STATION ON THE PICCADILLY LINE
SHOWROOM OPENING HOURS TUE-FRI 10.00am–6.00pm CONTINUOUS SAT. 9.00am–5.00pm CONTINUOUS
ASK FOR DETAILS OF OUR INTEREST FREE AND LOW DEPOSIT H.P.
Amcomm Services would like to wish all Amateur Radio Enthusiasts a Very Merry Christmas and a Peaceful New Year.

CONNECTORS COAXIAL

BNC-N-UHF INTERSERIES ADAPTORS

UG255	UHF socket – BNC plug	£1.76	0.50
UG273	UHF plug – BNC socket	£1.76	0.50
SO/25	UHF socket – 2.5mm jack	£0.79	0.50
SO/35	UHF socket – 3.5mm jack	£0.79	0.50
SO/NF	UHF socket – N socket	£1.96	0.50
UG146	UHF socket – N plug	£2.25	0.50
UG83	UHF plug – N socket	£1.96	0.50
UG201	N plug – BNC socket	£3.28	0.50
UG349	N socket – BNC plug	£3.16	0.50
UG606	N socket – BNC socket	£2.59	0.50

BNC PLUG 50 ohms

UG88	Standard type 5.5mm	£0.78	0.50
UG959	Large type 11.2mm	£3.22	0.50

BNC SOCKET 50 OHMS

UG290	Standard, 4 hole type	£0.78	0.50
UG1094	Nut fixing type	£0.76	0.50
UG89	Free, cable-end, 5.5mm	£0.94	0.50

BNC COUPLER 50 OHMS

UG914	Back to back female	£1.07	0.50
UG491	Back to back male	£1.66	0.50
UG274	'T' 2 female 1 male	£2.23	0.50
SMC3FBNC	'T' 3 female	£2.02	0.50
UG306	Elbow. Male – Female	£1.86	0.50

BNC CABLES 50 OHMS

BNC18BNC	1.5' RG58, BNC ends	£2.55	0.50
BNC36BNC	3.0' RG58, BNC ends	£2.65	0.50
BNC36RDC	3.0' RG58, BNC/clips	£2.50	0.50

UHF PLUG

PL259	Standard type 11.2mm	£0.55	0.50
PL259P	Push on type 11.2mm	£0.79	0.50
UG175	Reducer 5.0mm	£0.14	0.50
UG176	Reducer 5.6mm	£0.14	0.50
PL259R	Reduced type 5.0mm	£0.67	0.50
PL259A	De-luxe type 11.2mm	£1.50	0.50
PL259B	De-luxe type 5.0mm	£1.13	0.50
PL259SL	'Solderless' 11.2mm	£0.63	0.50
PL259SS	'Solderless' 5.0mm	£0.83	0.50
PL259E	Angle type 5.0mm	£0.95	0.50
PL259M	Metric type standard 11.2mm	£0.75	0.50
PL259PM	Panel mount 4 hole	£1.07	0.50

UHF SOCKET

SO239F	Standard 4 hole fix	£0.48	0.50
SO239F3100	4 hole PTFE Au plate	£0.97	0.50
SO239T	2 hole fixing type	£0.48	0.50
SO239NI	Nut fixing inside type	£0.59	0.50
SO239NO	Nut fixing outside type	£0.59	0.50
SO239E	Free angle type 5.0mm	£1.01	0.50
	Free cable end 5.0mm	£2.22	0.50
MX913/C	Dust Cap c/w chain	£0.46	0.50
MX913/M	Dust Cap metric type	£0.46	0.50

UHF COUPLER

PL258	Back to back female	£0.91	0.50
PL274	Back to back chassis	£1.07	0.50
SMCPL/PL	Back to back male	£1.38	0.50
M359	Elbow male – female	£1.07	0.50
M358	'T' 2 female 1 male	£1.38	0.50
M358AF	'T' 3 female	£1.70	0.50
M458	'X' 3 female 1 male	£2.13	0.50

UHF CABLES

PL36PL	3.0' RG58, PL259 ends	£1.85	0.50

N PLUG 50 OHMS

UG536	Small type 5.5mm	£2.82	0.50
UG21	Standard type 11.2mm	£1.55	0.50

N SOCKET 50 OHMS

UG58	Standard 4 hole fix	£0.94	0.50
UG1052	Free cable end 5.5mm	£2.86	0.50
UG23	Free cable end 11mm	£1.70	0.50
MX913/C	Dust cap c/w chain	£0.46	0.50

N COUPLER 50 OHMS

UG107	'T' 2 female 1 male	£3.74	0.50
UG28	'T' 3 female	£3.16	0.50
UG57	Double male adaptor	£2.70	0.50
UG29	Double female adaptor	£2.13	0.50
UG27	Elbow male – female	£2.24	0.50

CABLES, RADIO FREQUENCY

COAXIAL 50 OHM CABLE

URM95	Solid centre 2.2mm	p/m	£0.23	
UR43	Solid centre 5.0mm	p/m	£0.25	
UR43/100	Drum 100m UR43	100m	£24.15	2.20
UR76	Stranded core 5.0mm	p/m	£0.28	
UR76/100	Drum 100m UR76	100m	£28.45	2.20
RG58U	Stranded core 5.0mm	p/m	£0.29	
RG58U/100	Drum 100m RG58U	100m	£27.60	2.20
RG213	Low loss 10.2mm	p/m	£0.62	
RG213/100	Drum 100m RG213	100m	£57.50	4.50
UR67	Low loss 10.2mm	p/m	£0.67	
UR67/100	Drum 100m UR67	100m	£62.10	4.50

COAXIAL 75 OHM CABLE

307EP	Economy 4.3mm	p/m	£0.21	
307EP/100	Drum 100m 307EP	100m	£18.40	2.20
UR70	Stranded light	p/m	£0.30	
UR70/100	Drum 100m UR70	100m	£27.60	2.20
UR39	Medium duty 7.8mm	p/m	£0.44	
UR39/100	Drum 100m UR39	100m	£41.40	3.40
UR57	Low loss 10.2mm	p/m	£0.69	
UR57/100	Drum 100m UR57	100m	£65.55	4.50

BALANCED TWIN CABLE

302	75 ohms light duty	p/m	£0.17	
302/100	Drum 100m 302 (75)	100m	£14.95	2.20
306	300 Ohms Ribbon	p/m	£0.20	
306/100	Drum 100m 306 (300)	100m	£17.25	2.20

ANTENNA/MAST FITTINGS/PARTS

ANTENNA WIRE

CU14SWG	Hard Drawn Copper	p/m	£0.20	
CU7/029H	Hard Drawn Stranded	p/m	£0.22	
CU7/036	CAO Copper Stranded	p/m	£0.32	
CU/TER	CU/Terylene Braid About 3mmD	p/m	£0.20	
CU/029S	Soft Copper Stranded (Radials)	p/m	£0.19	

BALUN TRANSFORMERS

BN86	Hy-Gain 1:1 3-30MHz	Ferrite	£15.58	0.90
H101	Van Gorden 1:1 3-30MHz	Air	£10.00	Free

DIPOLE CENTRE PIECE

CCJ2BNC	Standard c/w fittings UG88 etc	£5.69	0.65
CCJ2UHF	Standard c/w fittings PL259 etc	£5.69	0.65
CCJ1UHF	HD type c/w fitting PL259 etc	£7.99	0.80
AJU	Polyprop. clamp and lug type	£1.09	0.55

INSULATORS END STRAIN

SMCP2	Polypropylene 3 inch	£0.55	0.45
PDRC3	Porcelain 3 inch	£0.67	0.45
SMCP1	Polypropylene 8.5 inch	£2.24	0.45
EG38	Porcelain Egg 1.5 ins	£0.44	0.45

LIGHTNING ARRESTORS

SMC566	Spark SO239/PL259 in line	£2.99	0.55
SMC567	Spark SO239/SO239 in line	£2.99	0.55
LA1	Gas Discharge Bulkhead	£48.19	0.90

CABLE GRIPS

CG5	Bulldog Grip 5mmD (0.1875") Galy	£0.17	0.55
CG6	Bulldog Grip 6mmD (0.125") Galy	£0.18	0.55
HD9	Brass Line Clamp for copper wire	£0.55	0.55

WALL BRACKETS (STAND OFF'S)

W12	12" c/w 2" U Bolts T Section	Pr	T.O.S	2.60
W18	18" c/w 2" U Bolts T Section	Pr	£10.06	2.60
W21	21" c/w 2" U Bolts T Section	Pr	£10.92	2.60
W21HD	21" HD c/w 2" U Bolts D with Brace	Pr	£12.92	2.10
W24	23" c/w 2" U Bolts T Section	Pr	£13.23	2.80
W24HD	24" HD c/w 2" U Bolts with Brace	Pr	£15.48	2.80

D SHACKLE (PIN SIZE)

DS6	6mm (1/4 ins)	£0.32	0.55
DS8	8mm (5/16 ins)	£0.37	0.55
DS10	10mm (3/8 ins)	£0.47	0.55
DS11	11mm (7/16 ins)	£0.75	0.55

GUY ROPES

HTS3	HT Steel 3mmD 1 x 19 BS720Kg	p/m	£0.20	
HTS4	HT Steel 4mmD 1 x 19 BS1258Kg	p/m	£0.32	
HTS5	HT Steel 5mmD 1 x 19 BS2000Kg	p/m	£0.25	
HTS6	HT Steel 6mmD 1 x 19 BS2875Kg	p/m	£0.48	
X150	Rustproof 3mmD Multistrand	150m	£20.59	2.60
FE7X18G100	Galvanised 7 by 18 Gauge	100'	£6.90	2.80
FE7X18G300	Galvanised 7 by 18 Gauge	300'	£20.13	4.20
TPS3	Terylene 3mmD BS70Kg	p/m	£0.10	
TPS4	Terylene 4mmD BS295Kg	p/m	£0.15	
TPS6	Terylene 6mmD BS570Kg	p/m	£0.22	
TPS8	Terylene 8mmD BS1110Kg	p/m	£0.37	

GUY STAKES

GS18	18" 'T' section 38x38x5mm Galv.	£4.08	2.10
GS27	27" 'T' section 38x38x5mm Galv.	£5.64	2.50
GS36	36" 'T' section 51x51x6mm Galv.	£10.64	3.70

GUY TENSIONERS

TPR933	Turnbuckle 115x8mm, 4.5"	£2.70	0.90
RS150X10	Turnbuckle 150x10mm, 6"	£5.12	1.30

MAST FITTINGS (12" MASTS)

SMCMP3	Guy Plate 3 hole	£1.38	0.75
SMCMP4	Guy Plate 4 hole	£2.19	0.75
SMCMB3	Guy Band 3 hook	£1.61	0.85
SMCMB4	Guy Band 4 hook	£2.24	1.05
SMCMC1	Cap. Cast Alloy	£3.74	0.80
SMCMBP1	Base Plate Alloy Shoe	£5.58	0.95

THIMBLES

THIM30	Galv. 30mm OA (1.25") for Wire	£0.18	0.50
THIM38	Galv. 38mm OA (1.5") for Wire	£0.21	0.50
THIM44	Galv. 44mm OA (1.75") for Wire	£0.23	0.50
THIM51	Galv. 51mm OA (2.0") for Wire	£0.28	0.50
F1235	Nylon 30mm OA (1.25") for Terylene	£0.20	0.50
F985	Nylon 38mm OA (1.5") for Terylene	£0.24	0.50

MASTING

AL32X16G	Aluminium 1.25" 16 Gauge	p/m	£1.83
AL38X16G	Aluminium 1.50" 16 Gauge	p/m	£2.21
AL49X7G	Aluminium Nom 2" 7 Gauge	p/m	£4.54

MISCELLANEOUS HARDWARE

RBD20	Rawlbolt 8mm Bolt	£0.51	0.50
RBE19	Rawlbolt 10mm Bolt	£0.61	0.60
PSS25	Pulley 25mm winch	£0.76	0.50
PSS38	Pulley 38mm winch	£0.94	0.50
SMC53	Mast to boom clamp 1.2" to 1"	£1.73	1.40
SMC63	Mast to boom clamp 1.2" to 1.25"	£2.19	2.10
SMC73	Mast to boom clamp 1.2" to 1" H.D.	£2.82	2.10
SMC59/15	Mast sleeve 15" for 2"	£6.61	2.10
SH63	Snap hook 63mm O/A	£0.99	0.50
UBOLT2	'U' Bolt 2" Centre 9mm Galv.	£0.46	0.60
ER4	Earth rod copperweld 4', c/w Clamp	£6.15	2.10
SMC2LK	Double lashing kit	£13.80	2.50
SMCCP1	Cross over plate 5"x5"x1/4"	£4.77	1.90

CARRIAGE

Carriage charges (shown after the item price) are for the mainland only (excluding post) and the rates shown are for one off of the item. Where more than one article is odered, total freight charge is likely to be much lower than the sum of the individual charges.

Cables, ropes and masting are normally despatched by Roadline. Carriage is £2.00 to 7Kg thereafter add an extra £0.15 per Kg. (Mainland).

Where Securicor delivery on an item, or any number of items combined, is possible, (i.e., less than 25Kg/55lbs and 5'6" long) it is charged at £4.49 per lot.

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ANTENNA ROTATORS

KR500	Kenpro elevation Meter calb ± 90°		£86.25	Free
KR400	Kenpro bell, box as KR500		£86.25	Free
RLD3	SMC, Bell Auto control		£38.53	Free
AR30	CDE, Offset Turn and Push		£51.75	Free
9508	Channel Master, Offset		£74.75	Free
9502B	Channel Master, offset		£54.63	Free
KR250	Kenpro, Bell Twist Switch		£44.85	Free
AR40	CDE	Turn and Push	£65.55	Free
KR400RC	Kenpro	Round meter 360°	£90.85	Free
AR68	CDE	5 position pre-selector	£113.85	Free
CD45	CDE	8 x 4cm meter readout	£113.85	Free
KR600RC	Kenpro	Round meter 360°	£132.25	Free
Ham 4	CDE	8 x 4 cm meter readout	£189.75	Free
KR2000RC	Kenpro	Heavy Duty 360° meter	£241.50	Free
T2X	CDE	8 x 4cm meter readout	£270.25	Free
H300	Hy Gain	Digital readout	£451.95	Free

ROTOR ACCESSORIES

CD562	Bearing CDE AR30 etc.		£7.76	1.25
AK 121	Adaptor Kit, CDE Bell to plate		£4.60	0.90
50425	Clamps/U Bolts ST CDE AR40 etc.		£4.95	1.25
50463	Clamps/U Bolts HD CDE CD45 Ham 4		£7.36	1.85
51472	Mast Mount Kit ST CDE HAM4 etc.		£12.08	2.10
51467	Mast Mount Kit HD CDE T2X etc.		£24.15	2.10
9523	Support Bearing Channel Master		£14.38	1.70
9525	Rotary Bearing Channel Master		£14.38	1.20
KS050	Rotary Bearing 1 3/4" Kenpro		£12.25	1.40
KS065	Rotary Bearing 2" Kenpro		£17.65	1.85
KC038	Lower Mast Clamp KR400, KR600		£9.95	1.70
RC5W	5 Way AR30 AR40 KR400RC	p/m	£0.35	
RC6W	6 Way KR250/400/500/600RC	p/m	£0.48	
RC8W	8 Way CD45 Ham 4 T2X KR2000RC	p/m	£0.52	

ANTENNAS VHF/UHF MOBILE

ASCOT Full range. SAE List

BANTEX Full range. SAE List

SMC-HS

SMC118M	Colinear 2M 11/8	7dB 1/4	9.7'	£28.35	2.20
SMC6P2T/PL	Telescopic 2M PL259	0dB 1/4		£3.45	0.50
SMC6P2T/BNC	Telescopic 2M BNC	0dB 1/4		£3.97	0.50
SMC2H/PL	Helical 2M PL259			£3.45	0.50
SMC2H/BNC	Helical 2M BNC			£4.43	0.50
SMCHS430	1/2λ 432MHz "Handie" 2.5dB 1/4			£5.75	0.60
SMC4	Ele 70MHz 1/4λ	0dB 1/4	3.4'	£7.65	1.80
SMC2QW	Ele 144MHz 1/4λ	0dB 1/4	1.6'	£2.30	1.30
SMC2NE	Ele 144MHz 1/2λ	3.0dB 1/4	4.3'	£8.90	1.80
SMC2VF	Ele 144MHz 1/2λ	3.0dB 1/4	3.5'	£8.63	1.80
SMC79F	Ele 144MHz 5/8λ	4.5dB 1/4	5.7'	£12.25	1.80
SMC78B	Ele 144MHz 5/8λ ball		5.6'	£12.65	1.80
SMC78SF	Ele 144MHz 5/8λ short		4.7'	£12.25	1.80
SMC86F	Ele 144MHz 7/8λ	5.2dB 1/4	6.5'	£16.10	1.80
SMC258	Ele 432MHz 2x5/8λ	5.5dB 1/4	3.1'	£11.50	1.80
SMC358	Ele 432MHz 3x5/8λ	6.3dB 1/4	4.7'	£14.95	1.80
SMC70N2M	144 and 432MHz	2.7dB 1/4 – 5.1dB 1/4		£14.20	1.80
SMCHS770	144/432 duplexer, 50W, 30dB, 0.5db			£13.40	1.30
SMCSDMM	Magnetic base c/w 4M cable			£8.45	1.20
SMCSOWM	Wing mount base			£3.45	0.72
SMCGCCA	Gutter clip, c/w 4M RG58, PL259			£8.80	1.20
SMCTMCAS	Trunk mount c/w 6M cable			£7.30	0.95
SMCSOCAL	Cable assembly 239M, 6M cable			£4.20	0.50
SMCBSD	Bumper strap stainless			£7.71	1.00
HS88BK	Bumper mount 144MHz extension tube			£16.50	1.50
MX913/M	Dust cover fits SMCOCA			£0.46	0.50
YCGA	Cable grip adhesvie (5 off)			£0.45	0.50

ANTENNAS HF FIXED

HY GAIN

12AVQ	Vertical 10-15-20M	14.0'H		£50.60	2.20
14AVQ/WB	Vertical 10-15-20-40M	18.0'H		£64.40	2.20
18VT/WB	Vertical 10-15-20-40-80M	25.0'H		£109.25	2.20
14RMQ	Roof mount kit for above			£36.22	2.20
18V	Vertical 10-15-20-40-80M, tapped	19.0'H		£29.78	2.20
103BA	3 Ele Yagi 10 metres	17.0'LE	8.0'B	£67.85	2.20
105BA	3 Ele Yagi 10 metres	18.5'LE	24.0'B	£143.75	3.95
153BA	3 Ele Yagi 15 metres	23.0'LE	12.0'B	£90.85	2.90
155BA	5 Ele Yagi 15 metres	24.5'LE	26.0'B	£217.35	5.90
203BA	3 Ele Yagi 20 metres	35.0'LE	16.0'B	£166.75	7.30
204BA	4 Ele Yagi 20 metres	36.5'LE	26.0'B	£286.35	7.30
205BA	5 Ele Yagi 20 metres	36.5'LE	34.0'B	£362.25	9.40
402BA	2 Ele Yagi 40 metres	43.0'LE	16.0'B	£247.25	6.50
DB10/15A	3 Ele Yagi 10-15M	23.0'LE	13.0'B	£146.05	4.80
TH3JNR	3 Ele Yagi 10-15-20M	24.2'LE	12.0'B	£194.35	3.10
TH2MK3	2 Ele Yagi 10-15-20M	27.3'LE	6.0'B	£169.05	3.20
TH3MK3	3 Ele Yagi 10-15-20M	27.0'LE	14.0'B	£274.85	5.30
TH5DXX	"Thunderbird" 5 Ele	31.0'LE	18.0'B	£378.35	6.70
TH7DXX	"Thunderbird" 7 Ele	31.0'LE	20'TR	£458.85	8.75
18TD	Dipole Tape 10-80M		132'	£113.85	2.80

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MINI BEAM

MOSLEY Full range. SAE List.

SMC TRAPPED/MANPACK DIPOLES Full range. SAE List.

SMC – HS ANTENNA

SMCHF5V	Vertical 10-15-20-40-80M	15.7'H	£40.25	2.30
SMCHF5R	Radial kit loaded	6.5'-7.3'	£29.90	2.30
SMCHF3VNB	Vertical 10-18-24M 100W pep	16.0'H	£47.90	2.30
SMC3Y1015D203	ele 10 15, Dipole 20M	13.2'B	£134.95	5.00

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ANTENNAS HF MOBILE

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TS530	160-10 metre transceiver	534.00	5.00
VFO 240	External VFO	92.00	5.00
PS30	AC power supply for TS180S	88.50	5.00
TS130S	8 band 200W mobile transceiver	525.00	n.c.
TS130V	8 band 20W mobile transceiver	445.00	n.c.
TL120	200W pep linear	144.00	2.00
MB100	Mobile mount	17.00	1.00
VFO 120	External VFO	85.00	2.00
SP120	External speaker unit	23.00	2.00
AT130	100w antenna tuner	79.12	1.30
MC50	Deluxe desk microphone	25.75	1.50
MC35S	Fist mic. 50K impedance	13.80	0.75
MC30C	Fist mic. 500ohm impedance	13.80	0.75
LF30A	HF low pass filter	17.90	1.00
TS780E	2m/70cm all-mode duobander	748.00	n.c.
TR9000	2m multimode mobile	359.00	n.c.
BO9	Base plinth for TR9000	34.95	2.00
TR7800	2m FM synthesised mobile 25W	284.00	2.00
TR2300	2m FM synthesised portable	166.00	2.75
TR2500	2m FM handheld transceiver	207.00	2.00
R1000	Gen. Cov. Receiver	297.00	n.c.

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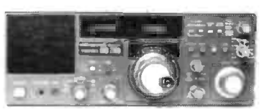

FT102	160–10m 9band trans. FM	725.00	n.c.
FT101ZD	as above with digital FM	645.00	5.00
FT707	80-10m 8 band trans. 10w	549.00	5.00
FP707	230v AC PSU	125.00	5.00
FC707	160-10m atu	85.00	2.00
FV707DM	Digital vfo for FT707	203.00	5.00
MMB2	Mobile mount	16.00	1.00
FL2100Z	160-10m 1200 watt linear	425.00	5.00
FT902DM	160-10m 9 band receiver	885.00	n.c.
FC902	All band ATU	135.00	5.00
FT208	2M FM synthesised handheld	209.00	n.c.
FT708	70cm synthesised transceiver	219.00	n.c.
NC9C	Compack trickle charger	8.00	1.00
FT480R	2m 10w SSB/CW/FM transceiver	365.00	2.00
FT290R	2m portable synthesised multimode	249.00	n.c.
NC11C	240V trickle charger	8.00	0.75
FRG7	General coverage receiver	199.00	n.c.
FRG7700	1981 version of FRG7000	329.00	5.00
FRG7700	Antenna tuning unit	37.85	0.75

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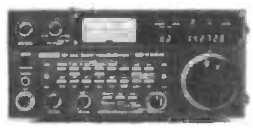

IC740	HF mobile transceiver 8band	699.00	n.c.
IC720A	HF transceiver and gen. cov. receiver	883.00	n.c.
PS15	Power supply for 720A	99.00	3.00
IC251E	2m multimode base station	499.00	n.c.
IC25E	2m synthesised compact 25w mobile	259.00	n.c.
IC290E	2m multimode mobile	366.00	n.c.
IC2E	2m FM synthesised handheld	159.00	n.c.
ICL1/2/3	Soft cases	3.50	0.50
ICHM9	Speaker Microphone	12.00	0.75
ICBC30	230v A.C. Base charger & hod	39.00	1.50
ICBC25	230v A.C. Trickle Charger	4.25	0.75
ICCP1	Car Charging Lead	3.20	0.50
ICBP2	6v. nicad pack for IC2E	22.00	1.00
ICBP3	9v. nicad pack for IC2E	17.70	1.00
ICBP4	Empty case for 6x AA nicads	5.80	0.75
ICBP5	11.5v nicad pack for IC2E	30.50	1.00
ICDC1	12v Adaptor Pack for IC2E	8.40	0.75
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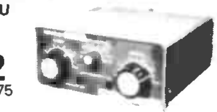

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CONTENTS

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT WAVE Magazine

EDITORIAL

Cover Price

Increases in many of our costs mean that, regretfully, we have to announce that cover price of *Short Wave Magazine* will be 60p with effect from the January, 1983, issue; annual subscription rate will be £9.00 (2nd Class post). Current subscribers will not, of course, pay the new rate until their sub. falls due for renewal. Single copies posted first-class from Welwyn will cost 85p.

Owing to circumstances entirely beyond our control, this issue of *S. W.M.* could be a few days late arriving at your newsagent or through your letter-box, and we apologise for any inconvenience caused by this possible delay.

Christmas

The Festive Season is nearly with us once again (hard to believe!), and so the entire staff of *Short Wave Magazine* would like to take this opportunity to wish all our readers, advertisers and trade friends a very Happy Christmas and a Peaceful and Prosperous New Year.

G3KFE.

VHF BANDS

NORMAN FITCH, G3FPK

APART from a very good tropo. lift at the end of the month, October was a rather average period, with no spectacular *Auroras*. Indeed, these seem to have virtually ceased due to a significant decline in geomagnetic activity. As this is being edited, we seem to be in for an unsettled, depression-type weather period with scant prospect of any immediate good tropospheric openings. Time, then, to dwell a little on the content of this feature.

Only one letter referred to the repeater scene, the writer stating he regarded them, ". . . as non-news, only occasionally useful, generally used by people using poor equipment . . .". A few contributors have indicated similar sentiments over the air, so it would seem that your scribe's conclusion that repeater users' needs are adequately catered for in the various groups' publications is valid.

During a very long telephone conversation, another regular reader made a number of points. One was the suggestion that past events, such as a major *sporadic E* opening, should be studied again in the light of later reports and when space was available. Another topic boiled down the difficult question of what is DX? He pointed out that for an east coast station to work across the North Sea to PA or OZ is no great achievement in reasonable conditions, but for someone in the Midlands or west of England, for example, it represents good DX. However, one has to consider more than the geography. For instance, it is no great achievement for G3FPK to work into Scotland on VHF, but were the station located a few hundred yards away, it would virtually be an impossibility.

Your scribe has always tried to assume the role of reporter, first and foremost. Last month's events left little room for additional comments, for example. Part of the monthly effort is to encourage those new to VHF to improve their station and operating capabilities, mostly by chronicling what others have done. Looking back seven years, it is rewarding to see how well many readers have done, perhaps through the friendly challenges of the annual table and the cumulative squares listings.

It is the aim to try to mention everyone who has taken the trouble to write and, space permitting, list some of what they have worked. Letters range from neatly typed, long and detailed accounts of the month's activity, to hastily scribbled, last-minute notes, but all are read carefully and edited to produce, hopefully, a balanced and interesting feature, bearing in mind coverage of all bands from 50 MHz upwards, and including satellite activities.

It seems it would be welcome if it were made clear which mode, *i.e.* CW or SSB/FM, was used in reported QSOs. In the case of G6 and G8 contributors, this is obvious, but not so with Class A licensees. There have been suggestions that home computer use in amateur radio be covered. While these can be usefully employed in CW work, such as high speed MS schedules, this would seem to be outside the scope of "VHF Bands". However, the Editor would welcome further manuscripts on this aspect of the hobby and one thinks of computer programs for tracking *Phase 3* satellites, including automatic aerial azimuth and elevation control, contest log keeping and scoring, working out distances from QTH locator information, etc. Meantime, if any readers are using home computers in their day-to-day station operation, please mention this.

Award News

This section is non-news this time and it is a rare month when nobody has been elected to the VHF Century Clubs or added to their QTH Squares Century Club tally. An application from an overseas reader for QTHCC membership had to be postponed since some of the QSLs were for portable operation. Our rule sheet does make it clear that all confirmations must relate to QSOs from the same location, normally the home QTH. However, if you have operated long enough from an alternative QTH, like a summer home, or during a stint working overseas, or from the *same* portable site as some contest groups do, then you can submit claims for these places, too. Full details of the rules of the two, basic VHF/UHF awards can be obtained by sending an *s.a.e.* to the Welwyn address.

Beacon Notes

Main news on the home front is the re-appearance of the Cornish beacons, GB3CTC, now putting good signals into the London area from the new site on Hensbarrow Downs, to the north of St. Austell. The locator is XK46d. The 4m. one is on 70.030 MHz with 40w. *e.r.p.* to a 2-ele. *Yagi* at 45° azimuth and F1A keying. The 2m. one is on 144.915 MHz with 40w. *e.r.p.* to a 3-ele. *Yagi* at 45° QTF. The 70cm. one is on 432.970 MHz with 5w. *e.r.p.* to a 4-ele. *Yagi* at 45° QTF, with F1A keying. The 2m. beacon has A1A keying. The aerial height is 320m. *a.s.l.* Thanks to Brian Bower, G3COJ, for the foregoing information.

Satellite News

The latest information concerning the launch of the *Phase 3B* satellite is that it has slipped again, now being between April 17 and 20, 1983. The launch vehicle will be *ARIANE L-06,* not *L-07* as reported previously. As intimated last month, some details are now available of the tested performance of the transponders and beacons of the **Phase 3B** package, and these were passed on to your scribe by G3AAJ on Oct. 17. First, though, the orbit. Because the overall weight of the satellite is lower than expected, it will be able to carry 52 kg. of fuel. This means that the expected *inclination* is 63.4° and the *argument of perigee* 230° to 235°.

Next the various beacons. At 0°C, the frequency of the engineering beacon was 145.9880 MHz, dropping to 145.9870 at 25°C. Its nominal output power was 1.5w. with the transponder on and 3.0w. with it off. The engineering beacon frequency at 0°C was 145.8105 MHz, and at 25°C, 145.8100. The power out was 4.0w. at −20°C, 1.8w. at +25° and 1.0w. at +45°.

The Mode "B" transponder's 435 MHz Rx has a *noise figure* of 3.0 dB at 25°C and the *a.g.c.* threshold is −105dBm (−108 dBm at 0°C). The power output of the 145 MHz Tx is 50w. *p.e.p.* at 25°C dropping to 42w. at 0°C. A 435.100 MHz signal into the Rx translated to 145.903 MHz from the Tx at 25° and to 145.906 MHz at 0°C. The other transponder is to be known as Mode "L", presumably since 1 to 2 GHz was known as "L-Band". (Under the latest designation, this is "D-Band".) The 1,269 MHz Rx has a *n.f.* of 3.0 dB, plus/minus 0.1 dB. and the 436 MHz Tx output of 32w. *p.e.p.* is lower than expected.

Unfortunately, up to the time of editing, no information is available concerning the all-important aerial parameters. A tiny illustration of the satellite seemed to show what looked like a *bicone* for 1,269 MHz so would not be very gainy. With any luck, having recently been advised of the current address of AMSAT's Engineering Director, some first-hand aerial information may be available for the next issue.

According to the *ARRL,* which now manages the *Oscar 8* satellite, the telemetry indicates its battery to be a bit "rubbery", whatever that means. Nevertheless, *O-8* seems to be working all right. *UOSAT,* or *U-O-9,* is now firmly under the control of the command station at the University of Surrey. Telemetry at 45.5 and 300 *Bauds* has been transmitted on 145.825 MHz at weekends. The CCD Camera and Imaging Unit were tested on Oct. 14 by using a picture dump. However, interference from FM stations operating in the satellite sub-band messed things up a bit. Spin-down manoeuvres continue and, in the weekend of Nov. 6/7, G3AAJ advised that the spin rate around the Z-axis was one revolution in 12.93 seconds, and the Z-axis angle to the orbit plane, 90°. In spite of low *e.h.t.*, the radiation counters are still working satisfactorily.

The Russian satellites continue to operate well. Quite a few British stations can be heard regularly through them on the 10m. downlink but very few reports are ever received from users. Since 10m. is frequently open to the U.S.A., there is often QRM from FM operators using the recognised downlink sub-band. For example, at 1520 on Oct. 10, G4KGE was heard at G3FPK working a W station on FM on 29.475 MHz.

It now seems pretty definite that the gibberish signals heard on 29.502 MHz emanate from the otherwise defunct *O-7*. AMSAT sources suggest that the times do coincide with particular orbits. However, it seems that the transponders are dead, so these observations can only be of curiosity value.

Contests

The only event left this year is the 144 MHz Fixed Contest scheduled for Dec. 5, from 0900 to 1700. There are two sections; Single-op. and Multi-op. Radial ring scoring and all permitted modes with entries to G5HD (*QTHR*). It is just possible this issue will reach you before Nov. 28, in which case you may like to participate in the *Verulam ARC's* 2m. contest which is from 0900 to 1300. Report/serial number/county to be exchanged, using the administrative counties and *not* the postal ones. One point *per* contact, but G3VER is worth 10. Final score is no. of QSO points multiplied by total of U.K. counties worked. Countries outside the U.K. count as additional counties. Logs to G3JKS, (*QTHR*) postmarked no later than Dec. 13.

Ted Double, G8CDW, the *BARTG's* Contests and Awards Manager, has sent along the results of the Autumn RTTY Contest. The Single-op. section attracted 23 entries and was won by G3NNG, who made 62 QSOs worth 544 points. Runner up was G4NQC who had one more QSO but whose score was 423 pts. The Multi-op. section saw nine entries and was won by G4IVV/A with 862 pts. from 78 QSOs. G2BRS/P, 555/61, was second. Over 170 stations were active, over 110 from the U.K. A frequent comment on the entries referred to operators using micro systems who fail to appreciate the need to manually send line-feed and carriage-return signals, vital to avoid "corrupt copy" especially when a mechanical device, such as a *Creed 7*, is in use at the receiving end. The *BARTG* Spring VHF/UHF Contest is during the April 9/10 weekend, next spring; more details nearer the date.

ANNUAL VHF/UHF TABLE

January to December 1982

Station	FOUR METRES Counties	FOUR METRES Countries	TWO METRES Counties	TWO METRES Countries	70 CENTIMETRES Counties	70 CENTIMETRES Countries	23 CENTIMETRES Counties	23 CENTIMETRES Countries	TOTAL Points
G2AXI	56	7	73	24	50	19	*12*	*2*	229
G3BW	45	6	74	22	48	10	*5*	*4*	205
GD2HDZ	54	7	68	15	45	11	*3*	*2*	200
G3PBV	35	7	67	23	41	14	*14*	*6*	187
G8TFI	—	—	78	20	62	21	—	—	181
G4JZF	—	—	82	22	58	17	—	—	179
G8RZO	—	—	77	25	45	16	—	—	163
G8RZP	—	—	77	25	45	16	—	—	163
G6ADE	—	—	65	16	53	16	—	—	150
G3FIJ	42	4	54	17	25	3	—	—	145
G6ADC	—	—	67	14	46	14	1	1	143
G4ARI	40	5	72	23	—	—	—	—	140
G4MUT	15	4	52	19	36	12	—	—	138
G8ULU	—	—	61	22	37	16	—	—	136
GW3NYY	—	—	81	27	19	7	—	—	134
G8HHI	—	—	60	19	28	12	10	2	131
G8VRJ	—	—	46	15	33	11	20	5	130
G8VR	24	3	62	35	—	—	—	—	124
G6ADH	—	—	65	21	26	7	—	—	119
G4DEZ	—	—	77	41	—	—	—	—	118
G6DER	—	—	72	16	22	6	—	—	116
G6ECM	—	—	80	25	—	—	—	—	105
G3FPK	—	—	76	25	—	—	—	—	101
G8KAX	—	—	42	12	24	9	10	3	100
GM8OEG	—	—	74	25	—	—	—	—	99
G8LFB	—	—	72	23	—	—	—	—	95
GM4CXP	8	3	51	21	6	3	—	—	92
GW3CBY	12	4	44	15	13	2	*4*	*3*	90
GW3CCF	—	—	42	8	23	4	10	2	89
G6FSH	—	—	71	15	—	—	—	—	86
G4NBS	—	—	25	6	34	5	11	1	82
G8WUU	—	—	41	15	18	6	—	—	80
G8VFV	—	—	60	16	—	—	—	—	76
G4KLX	—	—	53	18	3	1	—	—	75
G4MEJ	—	—	51	23	—	—	—	—	74
G6CGY	—	—	51	14	4	2	—	—	71
G4FKI	21	2	23	10	9	1	—	—	66
G8RWG	—	—	54	12	—	—	—	—	66
G4NRG	—	—	34	14	12	4	—	—	64
G8XTJ	—	—	52	11	—	—	—	—	63
G6AJA	—	—	49	13	—	—	—	—	62
GW4HBK	35	7	14	5	—	—	—	—	61
GM4COK	—	—	28	20	5	6	—	—	59
GW8TVX	—	—	39	11	—	—	6	3	59
G8LXY	—	—	30	7	16	2	—	—	55
G4BVY	9	2	—	—	29	11	—	—	51
G6HDD	—	—	40	7	—	—	—	—	47
G8XHL	—	—	25	8	9	3	—	—	45
G8ZYL	—	—	35	8	—	—	—	—	43

Three bands only count for points. Non-scoring figures in italics.

Sporadic E

H. Irwin, GI8ROJ, (Armagh) reports that he, and GI5MPS, heard I4TDK calling "CQ DX E's" on 144.300 MHz for about a minute at 1145 local time on Oct. 10, at about S4. During a post-mortem afterwards, the two GIs, with their beams pointing south-east and edge-on to each other, received very strong "back scatter-type signals" from each other for a few minutes, which sounded very *Auroral*. Looking back through the solar data for that day, the critical frequency was 12 MHz at the Appleton Laboratory, the solar flux was declining, and the geomagnetic A index was unsettled. It will be most interesting to read of any other reports of possible *E's* propagation that day.

Four Metres

Tim Raven, G4ARI, (Leics.) is the only correspondent this month who mentions 4m. and his report lists five more counties and three countries added back in August and September for the 1982 table. It would make for a more balanced feature if more reports were received on this "Cinderella" band.

Two Metres

The main feature in October was the excellent tropo. lift at the end of the month. Syd Harden, G2AXI, (Hants.) worked two new, 1982 countries on the 30th, OK1KHI/P and Y38ZA. He had not worked much earlier due to revamping the aerial system and only got his act together on the 29th. Bill Hodgson G3BW, (Cumbria) wrote just before the lift to say how difficult it is now to find new squares as most of the wanted ones are around the 2,000 km. range. However, he did complete an MS QSO with OK2KZR (IJ34j) *via* random meteors and is now just two short of his double century.

Clive Penna, G3POI, (Kent) was looking for very long distance QSOs in the

QTH LOCATOR SQUARES TABLE

Station	23cm.	70cm.	2m.	Total
G3VYF	—	117	307	424
GJ4ICD	1	102	223	326
G3JXN	46	91	137	274
G3XDY	30	86	131	247
G3COJ	30	82	150	262
G3PBV	17	81	159	257
G8ATK	15	81	129	225
GJ8KNV	12	76	191	279
G8RZP	—	76	147	223
G8KBQ	4	75	161	240
G8RZO	—	75	148	223
G2AXI	9	72	120	201
G4BVY	9	72	—	81
G8HHI	11	70	132	213
G4JZF	—	68	140	208
G6ADE	—	64	70	134
G8ULU	—	62	91	153
G3NAQ	—	58	128	186
G8PNN	25	57	104	186
G4NBS	13	57	90	160
G4HFO	—	57	92	149
G8FMK	16	57	71	144
G8KAX	14	52	80	146
G4MUT	—	50	69	119
LA8AK	23	49	195	267
G8CXQ	—	47	143	190
G4ERX	6	46	121	173
G4NQX	—	46	111	157
GD2HDZ	13	46	91	150
G4MCU	—	44	158	202
GW3NYY	—	42	169	211
G4GFX	7	40	103	150
G8VRJ	16	38	101	155
G4NFD	—	36	138	174
G3BW	5	35	198	238
G3IMV	—	34	322	356
G6ADC	—	34	58	92
G4HMF	—	32	140	172
EA3LL	—	30	252	282
G6ADH	—	29	124	153
G3FIJ	—	29	90	119
G4PCI	—	28	165	193
G6HKT	—	28	62	90
GM4COK	—	26	194	220
GM4CXP	—	26	159	185
G4OAE	—	26	157	183
GM8BDX	—	24	53	77
G8WUU	—	22	70	92
G4NWT	—	22	55	77
G8SRL	—	21	83	104
G8LXY	—	20	34	54
G4IGO	—	19	245	264
G8WPD	—	19	120	139
G8ZSU	2	18	65	85
G6DER	—	17	67	84
G6HTJ	—	17	66	83
G4ERG	—	16	235	251
GW3CBY	5	16	79	100
G4MJC	—	12	108	120
9H1BT	—	11	210	221
G6DDK	—	11	122	133
G4NRG	—	9	51	60
G4KLX	—	5	74	79
G8XQS	—	4	76	80
G8VR	—	3	216	219
G4LDY	—	4	41	44
G3POI	—	—	379	379
DK3UZ	—	—	304	304
G4IJE	—	—	286	286
SP2DX	—	—	280	280
G4DEZ	—	—	231	231
G3CHN	—	—	224	224
GFPK	—	—	192	192
GW4EAI	—	—	187	187
G3KEQ	—	—	186	186
GJ8SBT	3	—	161	164
G8LFB	—	—	147	147
G6ECM	—	—	138	138
G8TGM	—	—	122	122
G8XIR	—	—	112	112
GM4IPK	—	—	111	111
GM8OEG	—	—	109	109
G4MEJ	—	—	105	105
G4GHA	—	—	104	104
G4MWD	—	—	95	95
G8RWG	—	—	83	83
G8WPL	—	—	79	79
G8VFV	—	—	76	76
G6CNX	—	—	63	63
G8XMP	—	—	62	62
G4PEM	—	—	50	50
G6ABB	—	—	49	49
G8ZYL	—	—	46	46

Starting date January 1, 1975. No satellite or repeater QSOs. "Band of the month", 70cm.

lift and did manage OH5LK in NU37g on the 30th. At 1,960 km., this represents his best ever tropo. DX although he was hoping to break the magic 2,000 km. barrier. He reckons that if some of the bigger OH folk had been on, he could have done it. UQ2GCG (LR) was another rewarding contact. These were CW contacts.

Dave Sellars, G3PBV, (Devon) heard a few ON and D stations in DK square on the evening of the 29th, before going on to 70cm. At 1030 on the 30th he heard OE5XDL (HI) with a terrific pile-up which he could not crack before a necessary shopping trip. Coming back around 1200, he got DF9RJ (GI) and OK1KKH/P (HJ). Later on, DJ8YZ (EN), Y24XN/P (GK) and OK1KRA (HK) were contacted. At 1630, OK2BFH/P (JJ) was called for a long time. He was calling for Gs, but kept going back to PAs! Dave remarks that he is always amazed ". . . at the way the OKs rush up to the mountain tops as soon as the bands start to open up". He reckons they must be well organised.

It is some while since John Quarmby, G3XDY, (Suffolk) has been in contact. He updates his squares totals, increased in ". . . various bursts of activity over the past few months using a variety of mediocre, temporary aerials". Latest DX was on the 30th with OK2BLE/P (JJ33g) on CW. Other loud OKs were worked. Ray Elliott, G4ERX, (Essex) is another reader who had not reported for some time and he also worked OK2BLE/P at 1,296 km. Another one was SM5CBN (HS56c) at 1,198 km.

In up-dating his Annual Table scores, Tim Raven, G4ARI, included S1AD as a new country. This one was commented upon in a previous column and we are not counting it for anything. Adrian Chamberlain, G6ADC, (Coventry) has sent along a copy of a QSL from this station, located on "The Principality of Sealand". John Fitzgerald, G8XTJ, (Bucks.) also refers to S1AD suggesting that, as it is outside U.K. territorial waters, we have no jurisdiction over it. He says they have tried to join the United Nations but, as they have failed, they cannot join the I.T.U. and sign the treaty, therefore licence themselves, in effect. This confusion over territorial waters has your scribe puzzled since, in the current dispute with Denmark over the E.E.C. Fisheries Agreement, the Government, in the guise of Peter Walker, has clearly stated we have 200 miles of territorial waters. If so, then Prince Roy, Princess Joan, and their chums are illegal immigrants and SIAD is a pirate station, surely?

John Cleaton, G4GHA, (Dorset) is a "White Stick operator" and is very pleased to have passed the hundred mark in his squares tally, now at 104. His gear comprises a *Trio* TS-700S and 6-ele. *Quad* at 30ft. New squares on the 30th were DL6NAA (FK), OK1KKH (HJ), DK5GX (DI) and OK1KHI (HK), all worked on SSB.

Ken Osborne, G4IGO, (Avon) can always be relied upon to work some of the better DX. Referring to the Sept. 26 *Ar*, he did not get on till 1610 but then worked HG1YA (IH), Y22LI (FL), HG8CE (KG), YU7AR (KF), FIGAR (ZG), SM7DLZ (IQ) and SM7GEP (HR), all over 1,000 km. This event finished at 2100, with QTFs of 70-75°, but 50° for SM. On Oct. 1 between 1830 and 1850, a couple of GMs were heard, with another session from 2233 to 2311 when SM4GVF (HT) was contacted. GMs in XQ, YQ and YR were heard at 25°.

In the Oct. 30 tropo., G4IGO lists the following worked:— OK1s KHI/P, KSL, ATQ, KRA, MBS and MG, all in HK square; OE5XDL (HI); OK1KKM/P and 'AZ in HJ; Y21VC/P (HN); OK1KPL (GJ); OK1s KPU/P and IBI/P in GK; Y31QM/A (GL); OK2KZR/P (IJ); OK1DJW/P (IK) and OK2SBL and OL7BDQ in JJ. Ken did not identify the modes, but most would seem to be on CW.

Paul Turner, G4IJE, (Essex) continues to make regular MS QSOs and in October, had skeds. with DJ5MS (GI) on the 9th, 12th and 16th. Also on the 9th, LA6QBA (GV) was new, as was SM3JGG (HV) on the 22nd. Other successes were:— 10th, OE3CEW (II); 17th, OK1MAC (HJ); 20th, special event station OK6WW (GK); 23rd and 30th, DL3MBG (GI); 27th, OZ1FDH (GP) all these on CW. On the 29th, YU3ZV (HG) was worked on SSB. He used 100w. and *sixteen* 11-ele. *Yagis*, all home made and being half of an *E-M-E* array!

Jon Stow, G4MCU, (Essex) first noticed the tropo. lift on Oct. 29 when OE2KMM was heard weakly and on 70cm. too. On the 30th, Jon lists:— 0945 OK1KHI/P on SSB; 1018 OK2KZR/P on CW; 1111 OE5XDL on SSB; then at 1253 OK2EH (JJ); 1304 OK1DJW/P; 1447 OK1AWL/P (HJ) and 1512 Y31QM/A, four new ones, all CW. Subsequent QSOs included OK1KSL (HK); OK2BLE/P; Y26LI (FL) on CW and OK1MBS; Y24XN/P; Y25VL/A (GL); DL2AX and DD8NG, both in FK and on SSB.

Tony Collett, G4NBS, (Bucks.) has not written for some time but says he has missed all the good openings. Back on Aug. 16, he worked EA2JG (YC) for a new square, however. For G6ADC, OK1KHI/P was a new square and new 1982 country. Mick Cuckoo, G6ECM, (Kent) got five new squares on Oct. 30, *viz.*— OE5XDL (HI); DL6NAA (FK); OK1KKH/P (HJ); OK1MBS (HK); and OK2BFH/P (JJ). The band was open towards the east and south-east from 0615 till 1900 for him and other nice contacts included HB9AEN/P (DG); Y21VC/P; Y38ZA; OK2VIL/P (JJ); OKs in GK and HK and a number of DLs.

Mike Hearsey, G8ATK, (Surrey) did spend a little time on 2m. on the 30th and lists:— OK1KRA and 'KHI/P; Y24XN/P and OK1KPU in GK; DG7YBN (EM) and Y48VD (GM). Jim Rabbits, G8LFB, (London) worked OE2KMM (GH16c) and DL1MAX (FI24b) on the 29th and the next day notched up another eight squares. His list includes seven OKs: OE5s XDL and 'VHL, the latter in GI58b; and eight Y stations in GK, GL, GM, HM and HN. F6CVN (CI23b) was a new French square to bring Jim's total to 147.

Jackie, G8RZO, and John, G8RZP, Brakespear now have a new aerial tower up at 45ft. with two 9-ele. *Tonna Yagis* on top, after prolonged hassles with planning applications. Their notes cover activities from August through the end of October in which period they both added another 15 squares. The more recent new ones were EI5EG (VM) in the Sept. 26 *Ar*, Y23DI (GL) and OE5XDL on Oct. 30. Pete Godfrey, G6ULU, (Kent) spent most of the time on 70cm. in the end-of-October lift but did come onto 2m. to work OK1KPU/P in GK for a new 1982 country.

Rod Burman, G8ZSU, (Surrey) runs 75w. to an indoor 4-ele. *Yagi* and did quite well in the tropo. lift, adding seven more squares. His QSOs included HB9AEN/P; OK1KHI/P; DL6NAA (FK); OK1KPU/P and stations in CH, CI and CJ, with OZ heard. He is still trying to persuade the wife to agree to the 6-ele. *Swiss-Quad-Yagi* being erected outside. GI8ROJ's letter preceded the tropo. affair but he did well in the Sept. 26 *Ar*, noticed around 1400 GMT. He has a mediocre site, the gear comprising a *Liner-2* with 3SK88 preamp., 50w. amp. and 13-ele. *Tonna* at 45ft. When near neighbour GI8RLE came on neither could work much so they compromised by both operating from the latter's, better QTH. A goodly assortment of D, F, OE and U.K. stations were worked, such as OE2KMM (GH); DF9RJ (GI); OE5OLL (GI) and F6BSJ (CG) being very good *Ar* DX on SSB from Armagh. Both operators are now thinking about "crunch proof" front ends!

Seventy Centimetres

The October-end tropo. gave G2AXI OK1MXS/P and Y22ME on the 30th for two new 1982 countries and Syd devoted most time to 70cm. G3COJ found 70cm. conditions poorer than on 2m. on the 30th, but between 1935 and 2105, Brian worked OK1MXS/P (HK); Y23FG (FM); OK2JI/P (IJ) and Y23JK (FK). G3PBV also worked OK1MXS/P but Dave's best DX was OK2BFH/P (JJ) at 1,572 km. He missed Y22ME but did work his first East Germans, Y23KK/P (FK) and Y24XN/P (GK). DC7QH and DL9UT in GM in Berlin were also contacted. The *Cumulatives* sessions on Oct. 8 and 24 were poor, activity-wise, but the contacts made were over good DX. The best session was Nov. 1 with 12 worked.

Mike Lee, G3VYF, (Essex) added another four squares on the 30th: OK2VPB/P (JJ); Y22ME (HM); SM0FZH (JT) and SM0DJW (IS) to make it 117 on the band. G3XDY heard SM0DJW working down to AG square — 1,700 km! John managed Y24XN/P and OK2JI/P himself on the 30th. G4MCU is QRP on 70cm. with about 2½w. of CW at the bottom of the feeder. Nevertheless, Jon managed Y24XN/P and HB9AMH/P (on SSB). Unfortunately, OK2VIL/P did not copy Jon's call correctly so is listed as a "gotaway". He heard the OK0EA beacon at S7 at 2050 on the 30th on about 432.94 — should be 432.96 — in HK18d. OZ2ALS (EQ79c) beacon on 432.983 MHz was S2 at 2250.

G4NBS was on for the *Cumulatives* on Oct. 8 and 16 and worked 35 and 27 stations, respectively. G6ADC lists ON7OW (CK) and F1EZQ (CH) as new on the 30th. Keith Hewitt, G6DER, (S. Yorks.) did not date his letter which refers to the contest in which he worked some new G counties for the table, the first QSO being F6CTT/P (AJ). G8ATK was on from 1722 to 2128 on the 30th but lists only one OK, OK1MXS/P. Mike worked Y22ME and Y23FG (FM), most of the rest being Ds in the E, F and G squares.

G8RZO/RZP have each added 14 more squares since August, seven in the Oct. 30/31 period for Jackie, and nine for John. The pick of the crop were DJ9HO (FK); OE2CAL (GH); Y23FG; OE3XVA/3 (HH) and OK1MXS/P. It is interesting to note they were still able to work the DX when conditions had folded for those in London and further west.

Chris Easton, G8TFI, (Gloucs.) found conditions "super to the east with some noticeable ducts forming on the 30th". He worked thirty squares and is now up to 94. Five stations in JJ were worked at 1,485 km. along with II, IJ, FJ, HM, etc. Stations to the west of Nympsfield seemed to be doing well, but not those in ZL square and to the east. ON4YZ said he heard an OH on the 30th. Y24XN/P was an outstanding signal throughout with 40w. to a 6-ele. *Yagi* 100m. *a.g.l.* Chris is now using a *muTek* GLNA 432 Gasfet preamp. in a home made waterproof box up the mast and hears 7dB of sun noise. He had 69 QSOs in the Nov. 1 leg of the *Cumulatives*, best DX being EK sq. Operating —/P with G4NXO in AL sq. in the contest, they made 328 QSOs with many Germans in En and Fn worked.

G8ULU worked DC9NH (FJ) and DF6NA (EJ) on the 29th and on the morning of the 30th, OK1MXS/P following a tip-off *via* the telephone from G8RZO. During the evening, Pete got Y24XN/P, Y23FG and SM0DJW which, at 1,250 km., is his best DX. The rare Armagh county is now available with GI8RLE who has 10w. to an 88-ele. *Multibeam.*

Gigahertz Bands

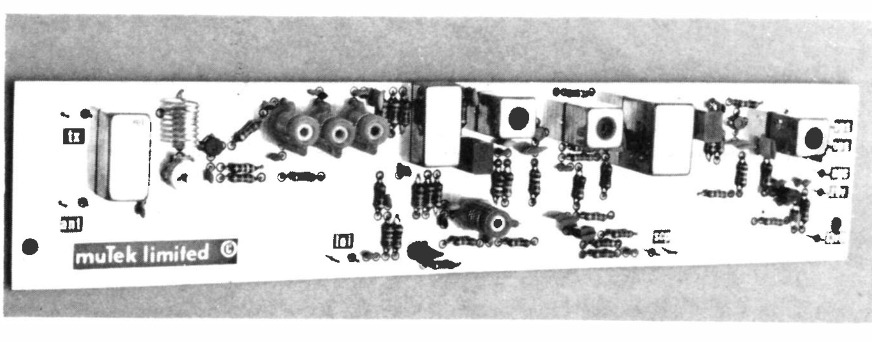
The bad news is the loss of part of the 13cm. band, namely 2.30 to 2.31 GHz, withdrawn on Oct. 1 in the U.K. The beacons can be operated therein till Dec. 31, 1983. G3COJ and G3PBV both report little DX on 23cm. during the Oct. 29/31 period. In the *Cumulatives,* G3PBV has only heard G4HWA/P (Berks.) but who never seemed to beam west! G6ADC is now on 23cm. with an *MM* transverter and *D15* aerial. Adrian is planning a second *D15* at any time. The only station listed worked on the 30th by G8ATK is DJ6GQ (EI13j) at 1812.

Derek Brown, G8ECI, (Lincs.) is now back home and QRV on 23cm. from AN square with one watt and a *Heliax* fed 23-ele. *F9FT* beam.

Deadlines

All your news for the January issue by Dec. 8 please and for the February piece, by Jan. 5. The address is:— "VHF Bands", SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts. AL6 9EQ. *73 es Happy Christmas de G3FPK.*

muTek Ltd. **announce the availability of the RPCB251ub complete front-end replacement board for the Icom IC-251 and IC-211 144 MHz transceivers, which uses advanced circuit design techniques to provide a combination of low noise figure with superior dynamic performance. Full details are obtainable from muTek Ltd., Bradworthy, Holsworthy, Devon EX22 7TU. (0409-24543.)**



PLUG IN YOUR SOLDERING IRON AND BEGIN HERE PART VII

A GUIDE FOR THE INEXPERIENCED IN THE METHODS, TECHNIQUES, PITFALLS AND FOLKLORE OF BUILDING EQUIPMENT, WITH PRACTICAL PROJECTS TO BUILD ALONG THE WAY

REV. G. C. DOBBS, G3RJV

IN the days of my youth when I was busily building up little receivers with valves and plug-in coils we used to think that a 'real constructor' was someone who had built a superhet receiver; most of us were building up regenerative receivers. I guess these days the direct-conversion receiver is usually seen as the simple end of the receiver range. We looked at the building of a simple direct-conversion receiver in *Parts V* and *VI* of this series (*Short Wave Magazine,* Oct. and Nov. 1982) so perhaps it is natural to go on to building a superhet receiver. These articles also discussed the design and making of printed circuit boards and a simple superhet will provide a good testing ground for those techniques.

This series is not written as an introduction to radio theory, there are many books and better authors to be consulted to seek such information, but a block diagram of a superhet receiver, shown in Fig. 1, will illustrate some of the background to the receiver in this article. Incidentally, knowledge of theory, or the lack of it, need not be the barrier that many people think it is for the building of radio equipment. I have never received any formal training in radio theory, my formative years were filled with useful subjects like Greek and Medieval Church History. What radio theory I have comes from reading up what I required to know to do the things I wanted to do, and most of all from building up items of equipment.

The block diagram of Fig. 1 shows an 80 metre amateur band superhet receiver. The signal on the 80 metre band is tuned by input tuned circuits and fed into a mixer. Here it is mixed with a signal generated by a variable frequency oscillator (VFO) which tunes 455 kHz higher than the input frequency from the aerial. The output from the mixer contains the input signal, the VFO signal and two mixed frequencies – the input minus the VFO and the input plus the VFO. The input signal minus the VFO signal will be at 455 kHz over the whole tuning range of the band. This is the intermediate frequency (IF), and this signal is tuned and amplified by an IF amplifier and passed to a second, balanced, mixer. This mixer also receives a signal from another oscillator, the beat frequency oscillator (BFO) which is tuned close to the IF of 455 kHz. We require to extract the audio content of the IF signal and if the BFO is tuned off the IF by the required audio frequency, this will emerge as a beat note. The radio signals are thus detected, this form of detection only being suitable for CW (Morse) or single-sideband (SSB) signals. As these form the bulk of amateur traffic on this band, the method is ideal. The resultant audio signals are then amplified to suitable listening levels.

Obviously such a receiver contains more tuned circuits than our direct conversion receiver and has critical components like the IF filter. Would-be superhet receiver builders may be put off by the expensive items they see in commercial receivers. In the receiver to be described here use has been made of cheaply available components. Although the receiver is a simple one of its type, the prototype handled very well on the 80 metre band and was inexpensive to build. Some time ago I designed a direct conversion receiver for *Short Wave Magazine* called the "Direx", so following that line of naming I have called this little receiver the "Superex". The complete circuit diagram for the receiver is shown in Fig. 2.

The Superex Receiver

The circuit is about the simplest arrangement for an amateur bands superhet. One of the most expensive components in such circuits can be the IF filter: this circuit has made use of a cheap ceramic filter which contains two tuned circuits and a ceramic plate resonator. The VFO is very simple being the same circuit employed for the PCB80 direct conversion receiver featured in *Part V* of this series. It should be possible for anyone who built that receiver to use the same VFO for this circuit by simply altering the setting of the core in the tuning coil. The audio amplifier from the PCB80 could also be used for this receiver, thus saving the building of another circuit board. The two IF transformers used in the prototype were culled from old transistor radios; once again the idea is to get hold of the components as cheaply as possible. The receiver follows the method of construction advised with the PCB80 receiver: it is built in small sections, each on its own printed circuit board capable of being tested in its own right.

Following the usual method of section-by-section construction for a receiver, begin at the output and work to the input; the receiver is described board by board. *Parts V* and *VI* of this series dealt with the making-up of printed circuit boards from a circuit diagram. For this project I have not given any printed circuit board track layouts – did the reader get the message in the previous sections? However to provide a little aid a layout diagram of the top of each board is given. The housing of the receiver is also left to the ingenuity of the reader and could be based upon the advice given for the housing of the PCB80 receiver.

The Audio Board

The layout diagram for the audio board is shown in Fig. 3. This is the obvious starting point for the receiver as the board can be tested as an audio amplifier. The audio board circuit, Fig. 2, shows that a three-transistor audio amplifier is used. Some of the readers of my previous offerings to this magazine will recognise it as the audio board I used for the "Ben" transceiver, a little rig for the 10 MHz band described in *Short Wave Magazine* for January 1982. To the charge of lack of originality I

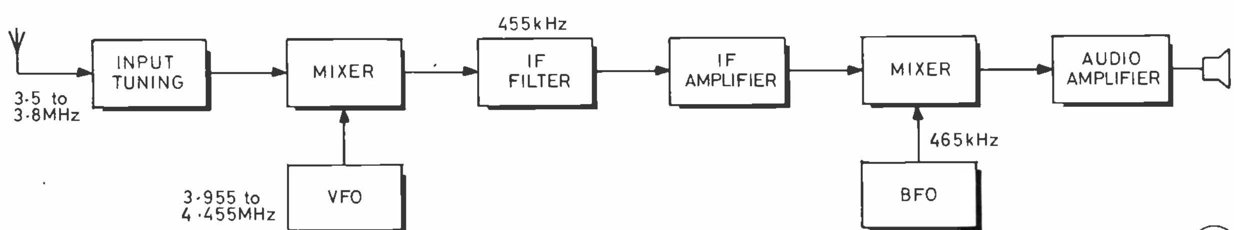


Fig. 1 BASIC 80m SUPERHET

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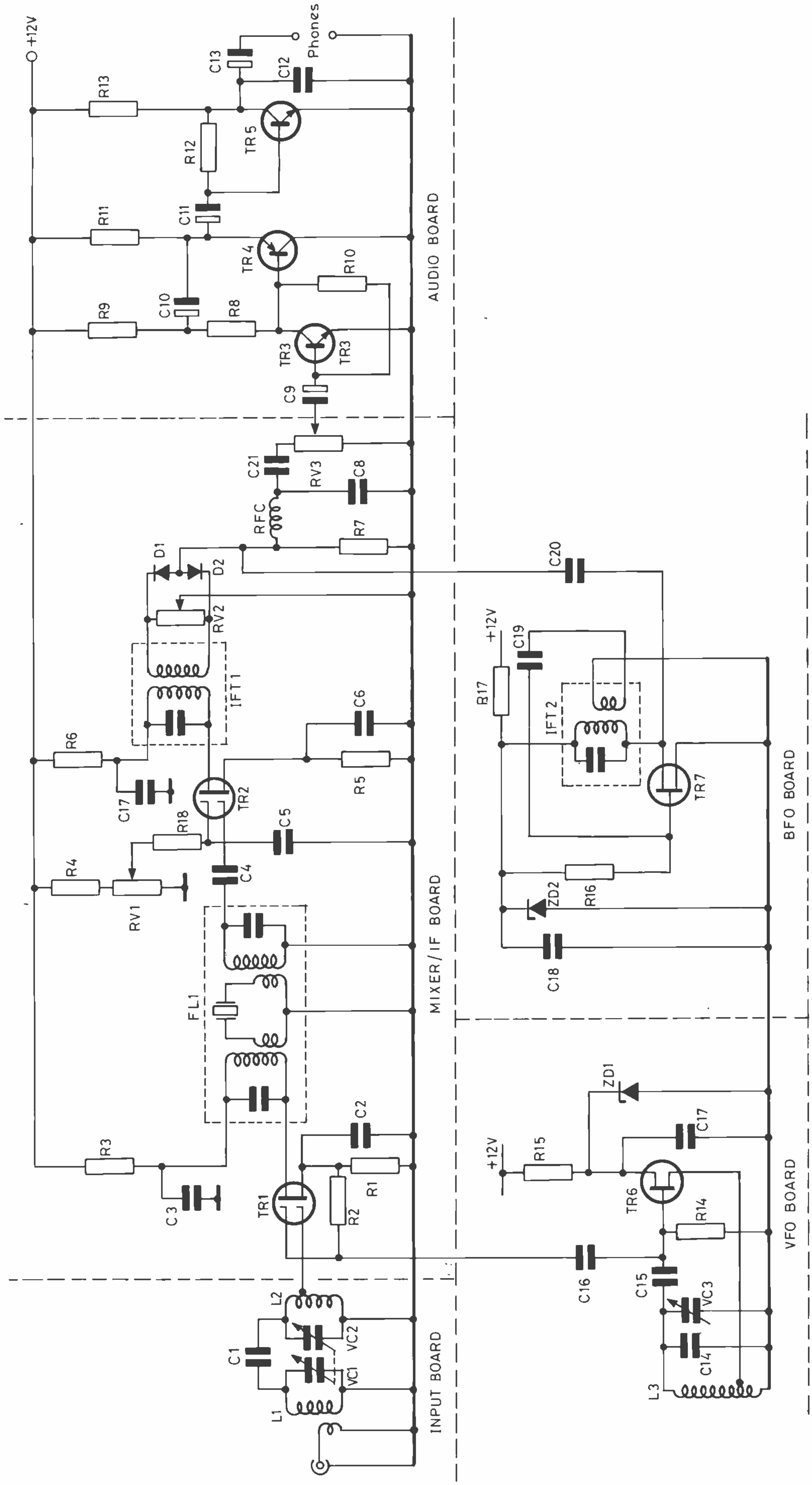

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Fig. 2 SUPEREX RECEIVER COMPLETE CIRCUIT DIAGRAM

Table of Values
Fig. 2

R1 = 820R	C9 = 2μF, tant.
R2, R14 = 100K	C10 = 50 μF, tant.
R3, R5, R6 = 100R	C13 = 2.2 μF, tant.
R4 = 39K	C14 = 220 pF
R7 = 10K	C15, C16, C20 = 100 pF
R8 = 220K	C19 = 0.001 μF
R9 = 2K2	RV1 = 10K lin.
R10 = 1M	RV2 = 1K preset
R11 = 2K7	RV3 = 5K log
R12 = 82K	
R13, R18 = 1K	VC1, VC2 = 2-gang 200 pF, *see* text
R15, R17 = 220R	VC3 = 25 pF variable, air-spaced
R16 = 470R	D1, D2 = 1N914
C1 = 15 pF	ZD1, ZD2 = 6.8V. zener
C2, C5, C8, C12 = 0.01 μF	FL1 = 455 kHz filter, *see* text
C3, C4, C6, C7, C17, C18, C21 = 0.1 μF	IFT1, IFT2, = *see* text

L1 = 40 turns, 36 s.w.g., plus 5 turns on 3/16" dia. former with core. **L2** = 40 turns, 36 s.w.g., tapped at 30 turns, on 3/16" dia. former with core. **L3** = 10 turns plus 35 turns, 36 s.w.g., on 3/16" dia. former with core. **RFC1** = 8 turns, 40 s.w.g. (or similar) on ferrite bead.

can only reply that this circuit has become my standard receiver audio board. It is high gain, low noise and simple to build. It would be possible for the constructor who has built the PCB80 receiver to begin with the audio amplifier used in that circuit for the Superex receiver then perhaps add this circuit later.

The discerning reader will have noticed that TR4 in the audio amplifier is a PNP transistor: in fact, TR3 and TR4 are a complimentary pair of transistors. Several types of transistor will work well in this circuit. Apart from the BC318/BC321 combination given in the table of values, BC171/BC251 and BC414/BC416 have been used with success in the amplifier. The output transistor type is not critical either, in this case the same type as TR3 has been used. The amplifier is designed for medium to high impedance headphones. I have several pairs of phones with an impedance of 200 to 500 ohms all of which do the job well. If only 8-ohm phones are available, try adding a transistor output transformer, taken from a scrap AM transistor radio with transformer output. The electrolytic capacitor C10 was a tantalum bead type, but these are expensive and a normal electrolytic type can be used, with the correct working voltage and correct polarity connections.

The diagram in Fig. 3 should assist in laying out the printed circuit board. Like all layouts it will depend upon the available components and their physical size. This layout is quite compact and several of the resistors are mounted vertically to save space but a larger layout may be easier for a beginner. Remember that TR4 is not only a PNP type but it is also mounted "upside down" with the emitter to the top of the board. When the board is completed, after the usual check over against the circuit diagram, it may be tested as an audio amplifier. Apply power and try the "hummy finger test" – a finger on the input of C9 should produce lots of hum in the phones. The sophisticated can

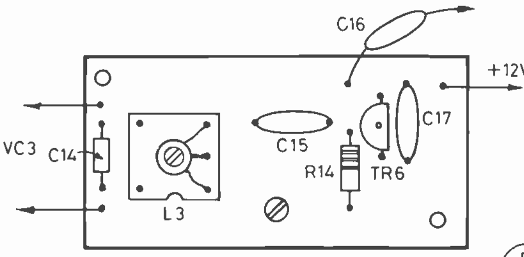

Fig. 4 VFO BOARD (actual size).

D 978

try feeding in an audio signal to test amplification, though the signal should be quite small as this circuit can overload.

The VFO Board

The VFO board may be built next as this can be tested in its own right. The circuit exactly matches that used in the PCB80 receiver. The constructor can use the same VFO if required. The PCB80 VFO will give the required coverage (3.955 to 4.455 MHz) by merely adjusting the core in the coil L3. A full account of building up a VFO was given in *Part V* of this series. The main point is to build it physically strong and rigid – the worst problems with a VFO usually arise from the way it is built rather than any other single factor. (I have a three-year-old son who is a cross between a demolition engineer and a caveman and I imagine putting the VFO into his hands as I build it). The board layout is shown in Fig. 4.

The coil former is a surplus 3/16" diameter former with a slug. The type used has a five pin base and a screening can. Any similar former can be used, and on this circuit board the screening can is not important as the whole VFO board is mounted into a screened box. VC3 is probably the most difficult component to find in the whole receiver. Lovely airspaced low value variable capacitors can be very expensive, *Jackson Bros.* make a fine example, but such components are to be hunted out from cheap sources and hoarded. The combination of C14 and the adjustment available with the core of L3 should give the desired frequency coverage, but if not, the value of C14 can be adjusted. Increasing C14 lowers the frequency and decreasing it raises the frequency. The two capacitors C14 and C15 are in the tuned circuit of the VFO and should be of good quality. The ideal types are either good silver mica or polystyrene capacitors.

The VFO circuit is fitted with voltage stabilisation in the form of a zener diode ZD1. This does help to overcome drift, although in the initial tests of the receiver a 12 volt battery was used without ZD1 present in the circuit and the receiver seemed quite stable enough. The completed board is mounted in a stout box which should also house VC3. The board is firmly fixed inside the box with small screws, 4 or 6 BA, and held above the base of the box with standoffs. Use hefty bits or wire to join VC3 to the board and remember that the connection which goes to the moving plates on VC3 must be the ground connection, an obvious point but not a few have wondered why their VFO would not "O" when all the time the variable capacitor was shorted out.

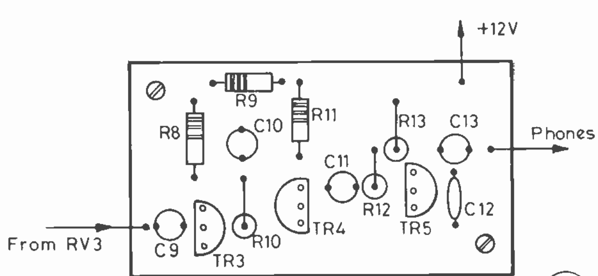

Fig. 3 AUDIO BOARD (actual size)

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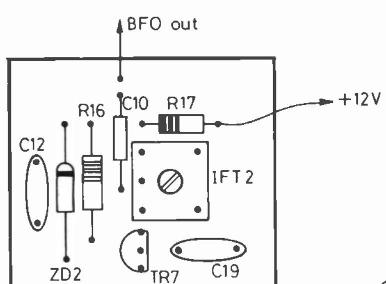

Fig 5 BFO BOARD (actual size)

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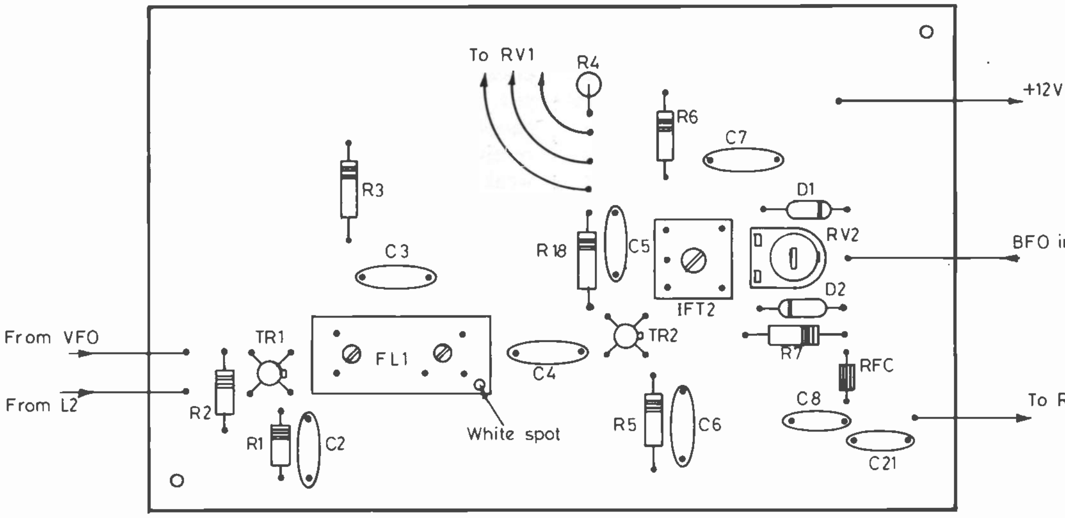

Fig. 6 MIXER / IF BOARD (actual size)

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When finished and in the box, the VFO can be tested. Power should be applied and the output can be checked using a diode RF probe feeding a meter. Using the simple RF probe described in *Part IV* of this series, I measured some 10 volts peak-to-peak of RF output from the VFO before it was connected into the receiver. The frequency can be checked by listening for the signal on a receiver; this will also allow the range of the VFO to be checked. Those with frequency counters, or friends with frequency counters, can check the output directly on the counter readout.

The BFO Board

As oscillator boards can be checked when built, the next board to attempt is the BFO board. The circuit, Fig. 2, is very simple and is based upon a standard 455 kHz IF transformer. The tuned circuit of the IFT is in the drain of the FET transistor, TR7, and the output from the coupling winding is fed back into the base of TR7 *via* a capacitor C19. This provides the feedback path to maintain oscillations. Correct phasing of this feedback path must be used and the capacitor C19 is taken to the end of the coupling winding at the same side of the IFT as the side of the tuned winding that goes to the drain of TR7. This is illustrated in both the circuit and layout diagrams. Any standard 455 kHz IFT will serve for IFT2; I used one taken from an old AM portable radio. The BFO need not be a screened box, but it is important to take the screened can (which should be on the IFT) to ground to prevent stray radiation of the signal.

A suitable layout for a printed circuit board is shown in Fig. 5. Again the layout depends upon available components and the obvious one that might differ is the IFT. When the board is completed it may be tested by looking at the output on a meter *via* the RF probe. The prototype gave some 10 volts of output, peak-to-peak, before it was connected into place in the receiver. Eventually the BFO will be tuned a little off 455 kHz to give the beat note, but for testing leave the core slug as found as this will probably be on 455 kHz. If a receiver is available that will tune 455 kHz, this can be used to listen to the signal from the BFO – and naturally the output could be viewed on a frequency counter.

The Mixer/IF Board

This is the largest board and forms the heart of the receiver. The main component worthy of note is the filter FL1. Following the usual principle of using what is cheaply available, FL1 is a surplus item. It is a ceramic filter sold by *J. Birkett* of Lincoln at 50p (order as "455 kHz Filter" and do not forget to enclose 30p for postage; the address of the stockist appears at the end of this part). The filter is housed in a red plastic case which has a white spot of paint as a locator, the position of which is shown in the layout diagram, Fig. 6. On first inspection and testing the filter proved to have a centre frequency of 452 kHz, so forget all I have said about 455 kHz! In fact this is so close to 455 kHz that I shall continue to use the more usual 455 kHz as the named frequency.

Looking at the circuit within the dotted lines on Fig. 2 marked for the Mixer/IF Board, the volume control ("audio gain" to we informed amateurs!) is not mounted on the board but is a front panel control. The board is best built by starting at the output end, that is C21 backwards. This will enable those constructors with a signal generator or signal on 455 kHz to test as building proceeds (I built as far back as C4 for my first section of this board). The board can be tested by injecting a signal at the IF frequency into C4. The BFO and the audio amplifier should be connected to the Mixer/IF Board for this test. No signal generator? Well, I didn't have one when I built my first superhet. If so, the idea is to press on in faith and set up the whole lot at the end. The ultra cautious might even like to try building up a copy of the BFO to provide a signal source for testing the IF strip.

TR2 is a simple IF amplier using a dual gate MOSFET transistor. The 40673 is named as the type, but I used a cheap equivalent from *J. Birkett,* although I believe his stocks of these are near, or at, an end. The spare gate at the top of the circuit is used as a means of controlling the gain of the stage. In this circuit RV1, a front panel control, becomes the IF Gain control. The ouput from TR2 goes into the tuned winding of IFT1; this is yet another surplus IFT, culled from the ever useful scrap AM radios. The coupling winding feeds a couple of diodes which act as a passive balanced mixer, with RV2, a board mounted preset control, providing a degree of balance adjustment. R7 is the output load and RFC and C8 decouple any RF signal present on the output. All very clever, isn't is? With a signal tuned near 455 kHz feeding into C4 it should be possible to adjust the frequency of the injected signal to mix with the BFO and produce quite a distinct tone in the audio amplifier. The function of RV1 can

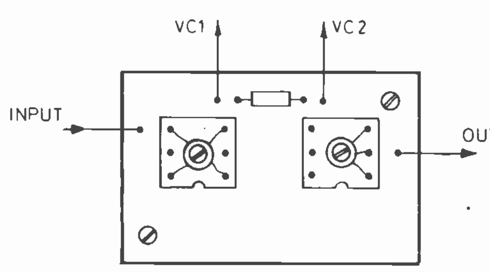


Fig. 7 INPUT BOARD (actual size)

D 981

also be checked – bet you connected it the wrong way round and clockwise decreases the gain!

The filter FL1 can now be added to the circuit; its mounting is shown in Fig. 6. I do not know much about this filter except that it is cheap, has two tuned circuits for input and output and a ceramic plate in the middle. I guess it is very similar to the Toko CFT455C filter and this filter could be used in the circuit; in fact many of the Toko 455 range of filters would probably do the job, but they all cost hard earned money. As for the bandwidth, again I use subjective data, but I reckon it must be at least the 6 kHz of the CFT455C. I base this on its performance in the circuit and a quick look at the response on an oscilloscope. With the filter in place a signal can be injected into the circuit *via* the input of FL1; IFT1 may require a little peaking with the core to obtain the maximum output. Do not be overconcerned about the signal losses in the filter – after all that is what TR2 is all about.

Finally the mixer stage TR1 can be added to the board. Once again the cheaper equivalent to the 40673 was used in the prototype. Signal generator owners or borrowers can now test the board at the signal frequency of the 80-metre band. The VFO must be connected to the mixer and a signal on 80 metres injected into TR1 on the bottom gate in the circuit. Swish about to find the signal with the VFO or if the calibration on your signal generator is as bad as mine, swish the signal generator about to find the frequency of the setting on the VFO. A little readjustment of IFT1 and IFT2 may help here, but leave the final adjustments until the receiver is completed.

The Input Board

Fig. 2 shows the circuit used to tune the input signal to the required frequencies on the 80-metre band. It is a simple two stage bandpass filter made up from two tuned circuits L1/VC1 and L2/VC2, loosely top coupled by a low value capacitor C1. Although only one tuned circuit might have been used for such a simple receiver, the arrangement of Fig. 1 offers a much tighter input circuit for very little extra expense. The two coils are wound on the 3/16" diameter coil formers mentioned above. L2 has a tapping to match into the gate of TR1, and L1 has a small input winding to match the usual low impedance aerial input. VC1 and VC2 are two sections of a ganged polycon variable capacitor of the type used in cheap AM radios, yet again a component to raid from a scrap receiver. The value of the one I used seemed to be about 180 to 200 pF which is usual for such components. The cores in L1 and L2 will provide adjustment to match suitable variable capacitors. I have described the use of such components before in this series and pointed out that the ones to look for are those with longer than usual control shafts. Many such AM radio tuning capacitors have very short shafts and these can present problems when wanting to add a control knob.

The layout of the input board is shown in Fig. 7. What could be simpler? Once again it helps if the formers with the bases and screening cans can be found. When I was raking through my junk to find the IF transformers I came across some old IFTs which were wound on formers which would have been ideal for L1 and L2; 3/16" diameter formers in cans are very common, so look around – I bet you regret throwing out some of those old 1960's transistor radio boards now. If screened formers cannot be found, unscreened ones will do, but some form of screening ought to be mounted between L1 and L2 as they are mounted quite close together and inductive coupling could occur, masking the effect of C1.

Although L1 and L2 will be set up in the final tidying up of the receiver, it is possible to check the frequency coverage and adjust the input board on its own. A signal on 80 metres can be injected into the small winding of L1 and the output measured with the RF probe. Set VC1 and VC2 about two-thirds closed and adjust L1 and L2 for a peak in the output. The prototype setting was done with the variable capacitor about two-thirds meshed, but if the value of the available polycon variable is higher VC1/2 might have to be opened further to set the coils on the band. The important thing is to ensure that the whole of the 80m. band can be tuned by the control. A cruder, but quite effective, way to set up the board without a signal source is to put it onto the front of an existing 80-metre receiver. Try coupling the output of L2 *via* a capacitor, say 100pF, into the receiver and use a small antenna on the input of L1 or tune a weak signal: the cores should make enough difference in signal level to enable them to be peaked by ear.

Setting-up the Receiver

This bit can be fun, or not, depending upon your state of humour. The important point to remember is to make small adjustments at a time and note how far the adjustment has been made, so that the original condition can be restored if required. We are not winding up a clockwork toy, but optimising a piece of technology . . . Begin by injecting a low level signal on the 80-metre band, try the end of the band you favour or just the middle of the band. If no signal source is available, remember the oscillator from the transmitter you built some time ago might be useful as a signal on the band. The work required to be done is to peak up the input coils, peak up IFT1, adjust the BFO beat note and set the mixing level with RV2. Assuming that the input coils are not far off their settings, park RV2 in the middle of its travel and begin with the BFO note.

One of the problems with the BFO is that it only requires to be set very slightly off the filter frequency. Probably some 800 Hz off the frequency to give a good beat when tuning from the high end of the band to the low. This involves very small adjustments of the core in IFT2. It is possible to get harmonic beat notes which may seem correct but produce "birdies" – nice juicy signals permanently parked on useful frequencies on the band. Assume that the IFT is tuned near enough to 455 kHz and try minor movements of the core to get the correct beat note. If a signal on the band is being used, look for an unmodulated carrier or a clear Morse signal to adjust the BFO; tune it in from either side and adjust until the signal can be resolved without problems. The peaking of IFT1 is very simple: adjust a little at a time for maximum signal. The balance control RV2 can be adjusted at this time but I prefer to make the adjustment in use with a weak signal. It takes a lot to beat "adjustments on the hoof".

Sophisticated superhet builders will speak of tracking problems and trimming and padding . . . but let them. This simple receiver has the VFO control VC3 as the main tuning control, and as the frequency is changed the input can be peaked up if required with VC1/2. Hopefully if L1 and L2 are similar coils with the same number of windings, they will tune the same frequency as each other over the whole band. All we are required to do is peak them, either using the centre of the band or a favoured part of the band and trust to luck that they track each other over the whole band . . . they will! All of this may sound complex, but really the receiver is easy to set up, with a little care. The prototype was built in unseemly haste and set up in about 5 minutes without problems.

The completed receiver deserves a case and a slow-motion drive for VC3 with a calibrated scale. It may not beat the latest Far Eastern grey boxed receiver – although it would not be difficult to beat some of the medium priced modern receivers I have heard – but it is "of your own hands". The constructor forgives the little shortcomings of his equipment because he identifies with it; but the shortcomings of a £500 box, and there always are some, just mean frustration and a compulsive desire to throw it across the room. The Superex is certainly a useful little receiver on 80 metres.

to be concluded

Components Source. *J. Birkett,* 13 The Strait, Lincoln. (0522-20767).

GETTING OUT ON 10 MHZ

IT MIGHT BE FAIRLY EASY TO ERECT A SEPARATE ANTENNA FOR THE 10 MHz BAND, BUT IT COULD BE EVEN EASIER TO MAKE USE OF EXISTING ARRANGEMENTS WHERE A VERTICAL IS IN USE TO ELIMINATE THE NEED FOR EXTRA CABLE. IT'S WORTH A TRY, ANYWAY!

STATIONS using 5-band vertical antennas in conjunction with a decent radial system might find results obtained on the newish 10 MHz band are not good due to the mismatch not catered for in a vertical designed primarily for 80, 40, 20, 15 and 10 metres.

Verticals are usually good DX performers when carefully set up and it is not unusual to find the larger 5-band types mounted fairly close to ground, the coaxial cable either lying on the ground or even buried in it on the way to the station.

This was in fact the case at one location examined recently and where the vertical — a Butternut HF5V-III — stood on the lawn some 40ft. from the shack and had been adjusted to provide direct SWR readings of better than 2:1 on each of the five bands in the CW segments so that no ATU was required.

The 10 MHz band was accommodated by running out a sloping wire approximately 72ft. long from the antenna 'hot' connection to a distant support and thence towards ground, inverted 'V' fashion as indicated in Fig. 1, the length being close to 0.75λ at 10 MHz and thus presenting a low impedance to the cable. Theoretically the wire could be any *odd* number of ¼λ-lengths at 10 MHz and in some restricted locations only one — approximately 24ft. — may be possible. The 0.75λ dimension however should confer maximum radiation at points 'A' and 'B'.

Adjustments

In setting up a similar arrangement and in order to avoid use of a tuner or ATU, the station rig would be set up initially for optimum 50-ohm output at, say, 10.12 MHz or thereabouts in the usual way in conjunction with a dummy load. In exchanging the dummy load for the antenna the SWR noted may be unsatisfactory necessitating a slight shortening of the overall length of the added wire. Progressively snipping off a few inches at a time from the far end and re-checking on a 'cut and try' basis should result in a final low SWR indication. It might be thought that the additional wire would adversely affect previous SWR adjustments for the other bands, but this does not appear to be so since the antenna end of the coaxial cable apparently 'sees' an unsuitable impedance presented on bands other than 10 MHz; no switching seems necessary therefore, the wire being left permanently connected.

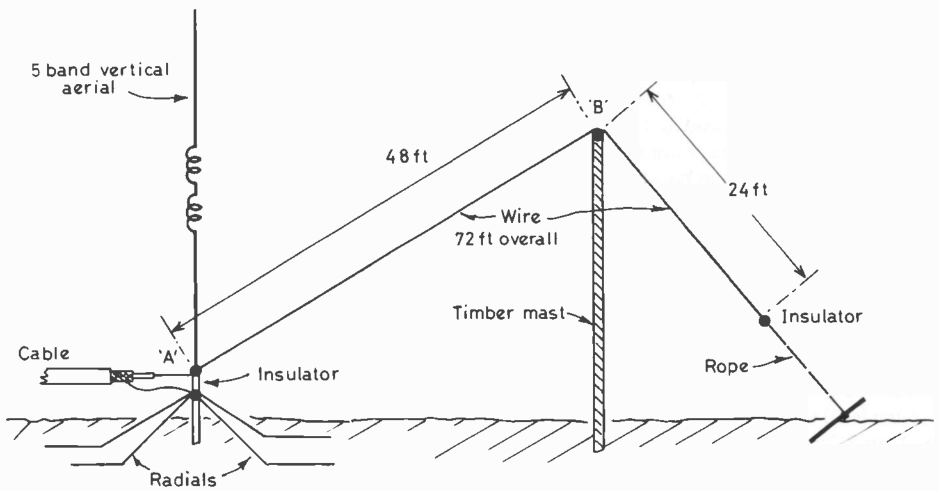


Figure 1 Not to scale

Shown here is one of the latest products of that imaginative and prolific company, *Datong Electronics Ltd.* It is the Model DF, which adds Doppler direction-finding capability to existing VHF/FM communications receivers or transceivers. Applications include tracking mobile transmitters, locating interfering signals, locating transmitters with stuck microphones, search and rescue. Designed as an external accessory, Model DF needs access only to the antenna and external speaker terminals of the receiver; no internal connections or modifications are required. Operating frequency range covers from 20 to 200 MHz, and a typical mobile system involves four magmount quarter-wave whips mounted in a square array on a vehicle roof, and connected to Model DF's magmounted head unit; bearings are continuously displayed on a circular array of 16 LEDs on the control and display unit located close to the receiver, the control/display unit and head unit being connected by a single co-ax cable. For further details contact the designers and builders, Datong Electronics Ltd., Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE.

EQUIPMENT REVIEW

THE DATONG MULTI-MODE FILTER MODEL FL3

THERE are two basic approaches to controlling selectivity in radio receivers, The first method is to provide the desired filtering at radio frequencies in the IF chain, and frequencies from 50 kHz upwards have been used. Modern crystal filters at the popular IFs of 9 and 10.7 MHz can have excellent shape factors when properly terminated, but can be quite expensive, particularly those for narrow, CW bandwidths. The second method is to do the filtering at audio frequencies.

Datong Electronics Limited have been marketing suitable audio filters for some years and introduced their *FL1, Frequency Agile Filter* in the mid-1970s. It was reviewed in the July 1976 issue of the *Magazine*. The *FL2* appeared in 1980 and a report on its use by three operators was published in the October 1980 edition. The innovation of the *FL1* was that it included a circuit that automatically scanned the AF spectrum and locked on to an interfering heterodyne in addition to the normal peaking and notching functions. The later *FL2* did not incorporate this scanning feature but the manufacturer subsequently introduced the *FL2/A Automatic Notch Filter Module*. This can be added to an *FL2* to turn it into an **FL3**, or it can be used by itself with other equipment. The **FL3** reviewed here is the original *FL2* with the *FL2/A* built in.

Description

The **FL3** consists of independent, five-pole elliptical function high-pass and low-pass filters, a two-pole peak or notch filter, a two-pole, constant-Q automatic notch filter and a two watts protected output stage. The HPF amd LPF feature linear voltage tuning from 200 to 3,500 Hz with a minimum stop band rejection of 40dB. In CW mode, the bandwidth of the LPF is halved to 100 to 1,750 Hz. The cut-off rates are 40dB in 500 Hz at 2 kHz and 40dB in 120 Hz at 200 Hz. The peak/notch filter has a constant bandwidth of 200 Hz at the —6dB points and is linearly tunable between 200 and 3,500 Hz. The notch depth is 30dB. The automatic notch filter sweeps the range 200 to 4,000 Hz and locks on to the undesired whistle in less than a second with a 40dB notch. The overall gain of the **FL3** is unity.

The DC supply voltage range is 10 to 15 at 400mA maximum. (*N.B.* In the caption to Fig. 2, an 8-20v. DC supply is mentioned. However, *Messrs. Datong* advise a 15v. maximum since an IC in the *FL2/A* module is only rated to 16v.) The LM380 AF output stage is short circuit proof and delivers two watts into eight ohms with a 15v. supply. A phono socket is provided from which output for a tape recorder can be taken at a source impedance of 680 ohms. No circuit diagrams were provided, so it can only be stated that the **FL3** incorporates 29 ICs, mostly state-variable, multi-operational amplifiers. The input impedance is 5,000 ohms.

Connections

The **FL3** is designed to go between the output stage of the receiver and a loudspeaker or head phones. In practice, this means plugging the unit into the extension loudspeaker or head phone socket on the set and using an extension 'speaker. Alternatively, head phones can be plugged into the socket on the **FL3.** Two, one metre long screened leads with phono plugs on one end, and a 3.5mm jack plug for the power supply are supplied. For this review, a 13.8v. stabilised supply was used taken from the accessory socket of the station transceiver.

Results

Most of the reviewer's HF bands operation is in CW mode, often winkling out weak DX signals and trying to crack DX-pedition pile-ups, so the **FL3** was first tried in this mode. There are two ways to use the **FL3** on CW. First, by pressing the "CW" button, the two-pole filter in peak mode is connected in series with the high-pass and low-pass filters giving an effective twelve poles of filtering with a domed response. The AF note is peaked by the middle knob, the bandwidth being varied from 100 to 1,750 Hz by the right hand knob. The skirt selectivity at the —6dB points for this range is 70 to 700 Hz and at the lowest bandwidths, ringing occurred on the higher speed CW signals — an unavoidable phenomenon to do with the mathematics of the business. Once accurately tuned to a stable signal using the minimum practical bandwidth, copy was excellent with signals standing out remarkably above the noise.

The second CW reception method is CW(2) brought in by simultaneously pushing the "CW" and "SSB" buttons when only the HPF and LPF are in circuit. This combination gives a flat-topped response, as in SSB reception, with the centre frequency and bandwidth controlled as before. This method is useful in net operation when not everyone is on the same frequency. For RTTY reception, the "CW" and "SSB + NOTCH" buttons are pressed. This combination again brings in the two-pole filter as for "CW" but used as a notch filter, enabling unwanted signals in between the "Mark" and "Space" signals of wide deviation RTTY signals to be greatly reduced.

When used in narrow bandwidth of about 500 Hz, i.e. 1 kHz as marked on the dial, a faint whistle of about 1 kHz pitch was noticed. The intensity varied with the setting of the centre and right hand controls and the note was randomly intermittent. This impaired copy of very weak signals since the reviewer's gear is set up for optimum CW performance with an 800 to 1,000 Hz beat note.

For voice reception, there is a variety of options available. With the "SSB" button only pressed, the HPF and LPF are in circuit, their respective cut-off frequencies being controlled by the centre and rights hand knobs. For general use, the LPF was left set to about 2.5 kHz and only reduced when severe interference was encountered. Although nothing can be done to eliminate parts of an unwanted, overlapping signal within the passband, the overall readability of the desired signal was improved by reducing the cut-off frequency of the LPF to attenuate "monkey chatter."

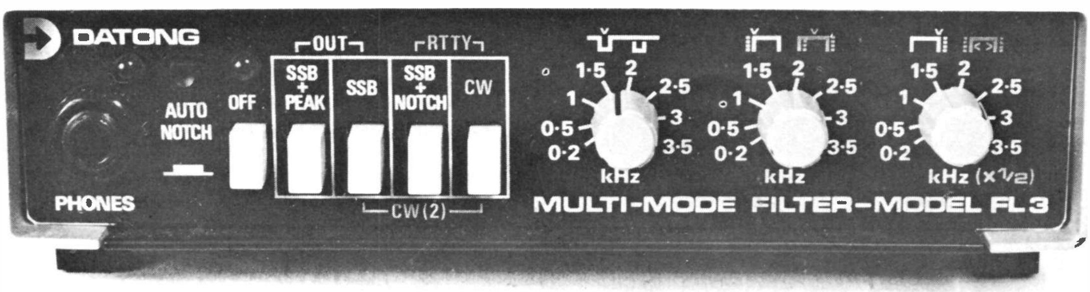


Fig. 1. Front view of the Datong FL3 Multi-mode Audio Filter, showing the neat front panel layout. The overall size is 184mm. wide, 44mm. high and 153mm. deep, the wrap-around case being anodised aluminium. The front panel is matt black with white and yellow legends.

Photo: T. Traill

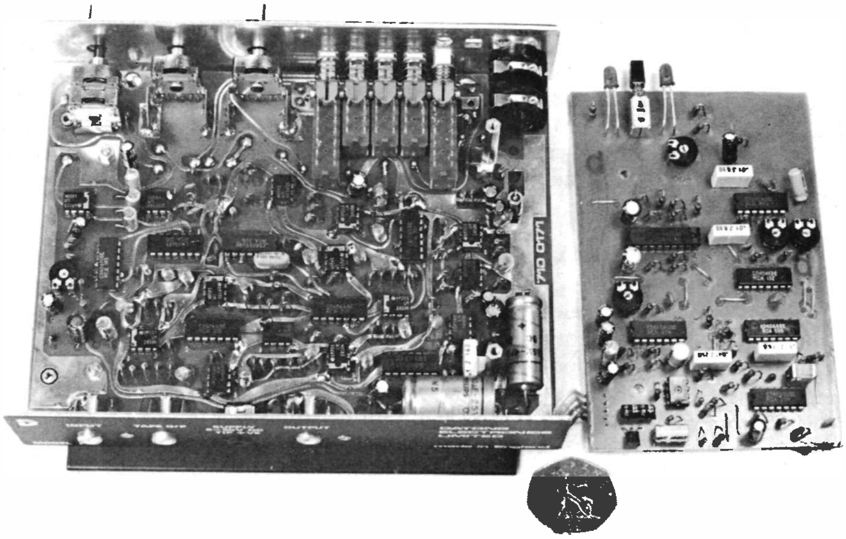


Fig. 2. View of the FL3 from the rear, with the automatic notch filter board detached. The sockets on the rear panel, from left to right are, Input, Tape output, 8-20v. DC supply and Output.
Photo: T. Traill

Occasionally, a heterodyne whistle came in the passband and here the notch filter was extremely effective. This function is brought in by pushing the "SSB + NOTCH" button. Because of the narrow notch width of 200 Hz, accurate tuning was essential so Datong's suggestion of using the "SSB + PEAK" button first to peak the offending signal was adopted. Then, pushing the former button invariably eliminated the heterodyne.

The other way to cope with an unwanted whistle is to use the auto-notch feature which is independent of the manual notch function. Provided the interfering signal exceeded about 20mv. peak-to-peak, this automatic "zapping" of some 40dB was quite dramatic. However, unwanted signals just below this threshold were often louder than the weak signal being copied, so the manual notch filter was a better bet. With no signal for the auto-notch scanner to latch on to, a slight swishing noise was audible as it swept the band. It needed a steady signal to process and would not lock on to a CW signal, even if it was being keyed very fast. Perhaps something akin to slow AGC could be incorporated to overcome this slight drawback.

Other Uses

Being a purely audio processing device, the **FL3** can be used with other audio equipment. For example, if a tape recording is found to contain an unwanted whistle within the 200 to 4,000 Hz scanning range of the auto-notch filter, it can be switched in to "zapp out" the tone. One Continental VHF meteor scatter operator uses an *FL2* when playing back slowed down, high speed CW and reckons he gets a worthwhile improvement in signal-to-noise ratio by using the filter in narrow CW mode.

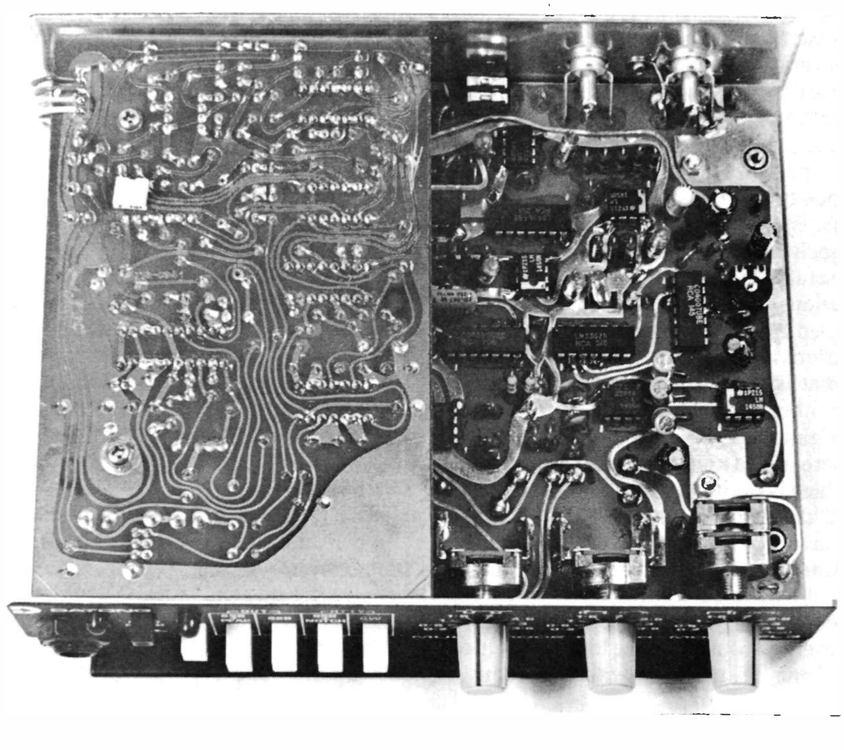
Conclusions

There must be thousands of communications receivers in use which are stable and sensitive enough for today's crowded bands, but which could use better selectivity. Such sets can be "souped up" by installing better crystal filters, and perhaps extra ones for different bandwidths, but this involves some internal surgery and can be a costly exercise. There is no doubt that such receivers would benefit greatly from the quite painless addition of a **Datong FL3 Multi-mode Filter**, which would provide continuously variable bandwidth, passband tuning, peak and notch filtering and an automatic notch filter option. At £112.50, plus VAT, it would be a cost effective acquisition and if the auto-notch facility is not wanted, the *FL2*, at £78, plus VAT, is still available.

The manufacturer of the **FL3** is **Datong Electronics Limited** of Spence Mills, Mill Lane, Bramley, Leeds, LS13 3HE, to whom we are indebted for the loan of this sophisticated filter.

N.A.S.F.

Fig. 3. Top view of the FL3 with case removed. The main, lower printed circuit board contains the original FL2 circuitry and is a double-sided fibreglass board. The FL/2A automatic notch filter module is the "upside-down" board, fitted sandwich fashion and occupying the left half of the unit.
Photo; T. Traill



A MICROPROCESSOR CONTROLLED MORSE DECODER, PART I

Peter Lumb, G3IRM

IN the November 1971 issue of the American magazine *Ham Radio* W7CUU and K7KFA described their automatic radiotelegraph translator and transcriber, alternatively called the 'automatic fist follower'. The article laid down the basic principles needed to read Morse code digitally and print the results on paper tape. Each stage was described in detail and partial circuit diagrams given, but apart from saying that TTL devices were employed no details of the actual types used were given. Suffice it to say that a look at the photographs showed that a large number of them was employed. When the article was written large scale integration devices were few and far between and those that were available were expensive. The writers also admitted that "the ICs used in the AFF were scrounged from cast-off vendor's samples and surplus computer circuit boards". Since reading the article the present writer has experimented with automatic Morse decoding and hereby acknowledges all the assistance obtained from the original article.

The first G3IRM decoder used a circuit put together from the partial diagrams in the *Ham Radio* article but substituted some large scale integration ICs to reduce the total count. The paper tape printer used by W7CUU and K7KFA was expensive so the writer's version used a video monitor as a display. Although the circuit worked well, and still works well, there are one or two problems which can cause confusion so these will be mentioned at the outset. Interference, as in normal reception of Morse code, is the main problem and this is admitted by the original authors. The only way to overcome it is to incorporate adequate filtering in the receiver and any audio filters used. The other form of interference (QRN) is also troublesome as this is treated by the decoder as a series of dots and the display thus shows a series of the letter E, each one produced by a pulse of interference. Again noise filtering in the receiver can help. However, due to the clever things that microprocessors can do, an attempt has been made in this new design to reduce trouble from this source. This will be explained when the programming of the microprocesor is described later in this series of articles.

The other problems encountered are caused by poor Morse code being received and there is a lot of this to be heard on the air. Everyone has heard DROM sent as one word and it is too much to expect that an automatic decoder will know that it is meant to be DR OM (and CQ sent as TR MA). This is not too serious as the meaning can be guessed. What is much worse is when the operator does not leave adequate spaces between letters. Once again the decoder cannot be expected to know what is intended and it has to do the best it can. The highest number of dots and dashes per letter recognised by the writer's original design was six so that if, for example, letters P and L were joined together the decoder would accept this as · — — · · — which is a symbol not recognised in Morse code; the last two dots of the letter L are omitted. The decoder also included a conversion to change the code received into ASCII (the American standard code for information interchange) which could be used by the video display unit. The result of this conversion produced something on the display but it could never, of course, be the letters PL. It could be any letter, figure or one of the many miscellaneous symbols in the ASCII depending on which letters had been joined. The problem has been partially overcome in the new design by training a microprocessor to recognise these strange symbols, reject them, and then print out a dash in the same way as a Morse operator may write a dash for a missing letter. The philosophy is that having nothing is better than having something quite wrong and misleading.

Basic Principles

All Morse code is built up from one unit, namely, the dot and the length of this can vary for various reasons. One of these is a variation in sending speed and hand-sent dots may be of differing length. So the first thing to do is to provide some method of measuring the length of each dot. In digital circuits this is done by the system clock or oscillator being gated by the signal so that each dot (or dash) may let through a number of pulses. The original design used six pulses to the dot and the present one uses ten, though this could be varied; however, ten is a convenient number. From this it can be deduced that thirty pulses represent a perfect dash. Some leeway must be provided as each dot may not be the same length as all others so any number of pulses between five and fifteen is recognised as a dot and any number above fifteen is treated as a dash. In the original design a dot consisted of any number of clock pulses between one and twelve; the reader will thus note that even the shortest of dots allowing only one clock pulse to pass was accepted and this could be caused by an interference pulse resulting in a print out of the letter E. It will also be noted in due course that in the present design a count of less than five clock pulses is not accepted as a valid mark and is rejected by the microprocessor program. One of the beauties of microprocessors is that these numbers can easily be changed by the program without any rewiring. This part of the program provides some immunity from interference though it is by no means perfect. In a similar way clock pulses are counted during spaces to determine space length and this will be further explained when the program is discussed.

A feature of the earlier designs was an automatic system to vary the clock speed with the speed of sending. This was done by a counter and digital-to-analogue converter, so that if a count of less than six (ten in the new design) was obtained when a dot was received the decoder assumed that the speed of sending had increased and automatically increased the frequency of the clock to compensate. A long dot resulted in a lower clock frequency. This most useful feature has been retained in the present design but much more modern devices have been used. Note that only dots affect the automatic speed control.

The Present Design

It will have been gathered from the title of the article and the text so far that this decoder employs a microprocessor, in fact, it uses an 8085A by Intel. But before going further the author must make more acknowledgements for assistance received. In order to develop a program some form of development system must be used. However, once the program has been written, the development system can be disregarded so anyone who may care to duplicate this decoder need have no fears that it will be necessary to buy a microcomputer before the program can be used. A simple programmer will be described later in this article which is all that will be needed to set up the decoder. An excellent book on the 8080A microprocessor (a forerunner of the 8085A) is the *8080A Bugbook* published by Howard W. Sams and Co. Inc. in the United States and written by Rony, Larsen and Titus. The book contains the circuit diagram of the MMD-1 microcomputer designed by the authors together with an enormous amount of information about the 8080A system. The 8085A is an improved 8080A and is somewhat simpler to use. Both devices use the same programming instructions so that any program developed on the MMD-1 can be used in a system using the 8085A with only minor amendments. It can safely be said that without the generous help given the author by Jon Titus

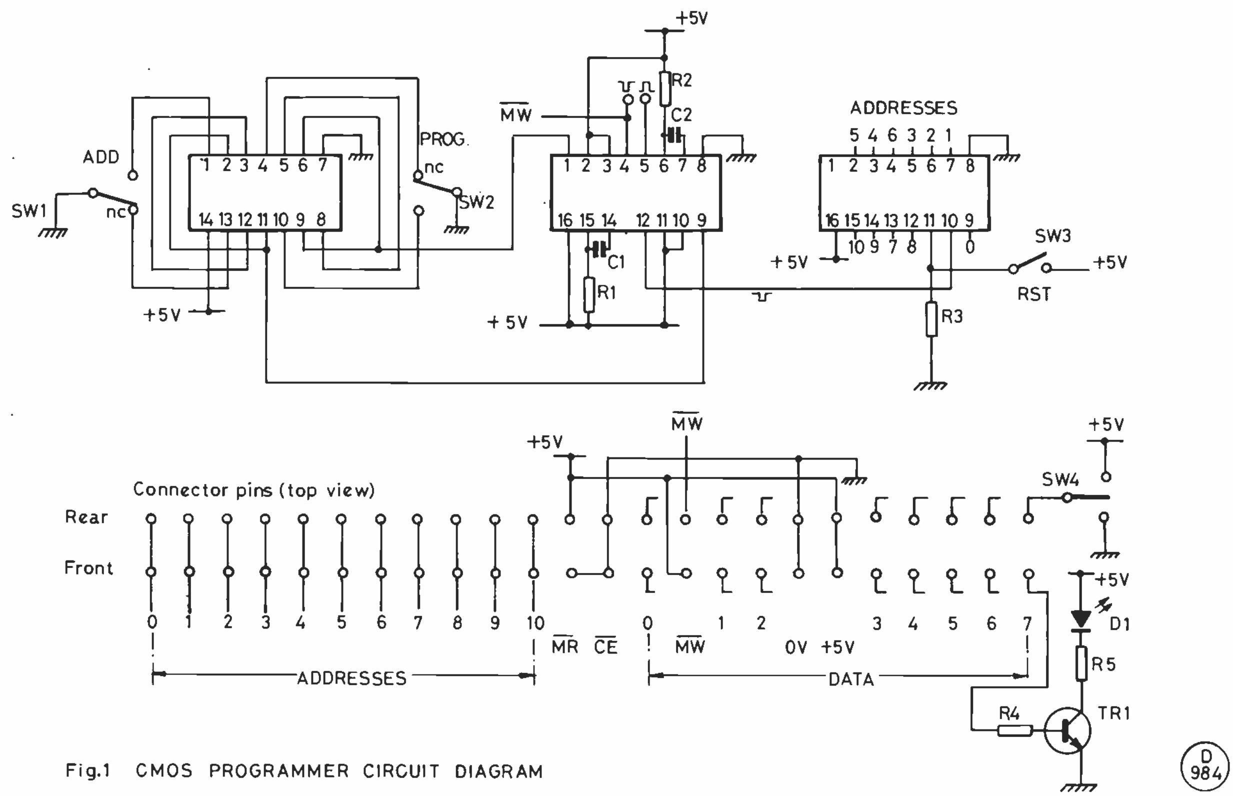


Fig.1 CMOS PROGRAMMER CIRCUIT DIAGRAM

KA4QVK this Morse decoder may never have been built. As a result of reading the *8080A Bugbook* and other books by the same authors the writer has become fascinated by the things that can be done by microprocessors. They *can* be programmed to do things other than play silly games!

Memories

At this point a short discussion on memories used in conjunction with microprocessors may not be out of place. Basically there are two types, the read only memory (ROM) and the read/write memory (R/W). The ROM must be programmed and the program cannot be altered when in use; it is only possible to read information out of it. The program in some types can be erased and new programs written into the device. The R/W memory on the other hand can have information written into it and read from it, and this information can be changed at any time. Unfortunately when the power is switched off all the information in the R/W memory is lost; it is therefore usual in microprocessor systems to provide both types of memory, a ROM to contain the permanent program and a R/W memory to store information temporarily as the program is being run.

The 8085A contains a number of general purpose memories known as registers but these are only capable of holding small amounts of information. In the present design these registers have been used to the full and it would be possible to build the decoder using only a single ROM. This would have to be programmed and the instructions for programming ROMs are usually complicated and would be expensive for the amateur to reproduce just to program the one ROM for this decoder. As mentioned above the ROM cannot be altered in use and this would make it impossible for the microprocessor to make alterations to the program as it goes along. The advantages of being able to do this will become apparent when the program is discussed.

However, all is not lost as there are CMOS R/W memories available which consume very little power in the standby mode and it has been possible to use a single R/W memory to provide all the storage needed by the decoder. Various CMOS R/W memories could be used as the device is mounted on a separate small circuit board which can be plugged into the main board. It must be emphasised, though, that only CMOS R/W memories can be used as a battery back-up system is employed. A small nicad battery is used so that when power is disconnected the battery takes over and maintains information in the memory, the battery being trickle charged when power is available. The current consumed by CMOS memories is so low in the standby mode that the battery will ensure the information can be stored almost indefinitely but can still be altered at any time either by using the programmer to be described next or "on the run" as the decoder is being used. It will also be appreciated that should the battery fail or become disconnected the program will be lost and the memory will have to be reprogrammed using the programmer.

Table of Values
Fig. 1

R1, R2, R3 = 10K	IC2 = 74LS123
R4 = 4K7	IC3 = CD4040
R5 = 470R	D1 = l.e.d.
C1, C2 = 47pF	SW1, SW2 = microswitches
TR1 = BC107 or similar	SW3, SW4 = slide switches
IC1 = 74LSOO	

Note: R4, R5, TR1 and D1 are duplicated on each data line (front row); SW4 is duplicated on each data line (rear row)

The CMOS Programmer

This simple programmer is all that is needed to set up the decoder although other test equipment is an advantage if fault finding is needed. It is assumed that the reader will have at least a multimeter. The circuit diagram is given in Fig. 1 and consists of three integrated circuits, a few transistors, switches, resistors and light emitting diodes. It will be noted that the unit consists of two sections, one of which is used for programming and the other for verifying the program when it has been entered in the memory. The 74LSOO is wired as two separate set/reset flip flops which are used to debounce the two microswitches used to increment the memory address and produce the programming pulses. All switches make and break a few times when they are changed over the two flip flops ensure that only the first make or break is recognised. The second IC is a dual monostable used to produce one negative going pulse at pin 4 whenever the programming switch is pressed, and at the same time a positive going pulse at pin 5. The other half of the IC produces a negative going pulse at pin 12 when the address microswitch is pressed; this pulse is fed to a CMOS binary counter chain in the CD4040 IC. This device consists of twelve flip flops connected in a row, each one of which divides the frequency presented to it by two; the output from each flip flop is available for external use. At the rear of the board are two rows of twenty-four connecting pins (the writer used Minicon connectors as they are small, easy to use and reasonably priced); the matching sockets can be glued to a piece of board and used as edge connectors. There is nothing special about the order in which the pins are used, they just happen to be in the same order as used by the writer in his version of the MMD-1 microcomputer so that memories can be interchanged. All the address pins together with the two power lines and $\overline{CE}$ are common to both sets of connectors. The memory board to be programmed is plugged into the rear row of pins. When the programming has been carried out the board is transferred to the front row of pins for verification. Although the data pins are the same for both rows they are not connected together. The rear (programming) pins are each connected to a changeover switch so that each pin can be connected to either Ov or +5v. The data pins for verifying the program are each connected to a simple light emitting diode display so that the state of each bit of memory can be checked. A reset switch is also provided to set the CD4040 at the first address in the memory before programming or verification can commence.

The programmer has other uses apart from its original purpose. By making up a connector for the data output lines it can be used to monitor the output of digital circuits. The switches are available for use as inputs to integrated circuits. A binary counting sequence is available at the address pins counting from zero to 2048, and if a connection is made to pin 1 of the CD4040 this can be extended to 4096. The outputs from pins 4 and 5 of the 74LS123 are connected to separate sockets on the board and these can be used to provide negative and positive going pulses for clocking counters and similar purposes.

Finally, the following is a list of useful literature which can be consulted in relation to this series of articles.

Magazines articles:

"Automatic Radiotelegraph Translator and Transcriber", by Clarence Gonzales K7CUU and Richard A. Vogler K7KFA, *Ham Radio,* November 1971.

"Iprom", *Elektor,* December 1981.

"Audio Processor for Reception", by Don E. Hildreth W6NRW, *Ham Radio,* January 1980.

"The KC2FR QRM Fighter", *QST,* July 1982.

Books:

"The 8080A Bugbook".

"The 8085A Cookbook".

"Microprocessor Interfacing with the 8255 PPI Chip".

"8080/8085 Software Design" (2 volumes).

The above five books are by various authors of the Blacksburg Group published by Howard W. Sams and Co. Inc.

"8080 Microcomputer Experiments", by Howard Boyet, published by Delithium Press.

"G9BF CALLING"

VERY disappointed with letter from floating critic in November issue. Ticket every bit as authentic as original, paternal G9BF. As for criticism of use of CO in Tx, this shows sad lack of gen on Moonbounce techniques. Narrow bandwith essential in Rx for best S/N ratio, so rock in Tx is a must, even though it does go a bit against the grain! As mentioned in March column, old push-pull 813 Tx going FB and giving this Russian Woodpecker a bit of stick. Thought had been called by it once, but turned out to be 5H5SI, or HS5IH. Not sure as his fist not too good; could have been 5E5HH.

Editor still trying to make out "G9BF Calling" waste of time, but fan mail shows many want to read about *real* AR. Far too much of this black box stuff killing off FB hobby. As example, local lad who works as service bod for a dealer, says some lids can't even replace a dial lamp or fuse, these days, so take rig back to shop! All this fault of R.A.E. now utter farce. Urgent need to introduce practical part in exam, like repairing deliberate fault in a BC-610 Tx or R1155 Rx. Can't learn about AR from books; essential to get cracking with pliers and soldering iron, preferably under guidance of a good Old Timer.

Now for the Big Project. The big tranny acquired for the QRO Tx proved perfect. Admiralty spec. very conservative, with lovely ceramic terminals on the secondary. As about 3 kv. at 3A. needed for 20m. Moonbounce PA, choke imput filter in PSU adopted. Spent one morning humping Dad's old gear around in the garden shed and unearthed super swinging choke. The label said "3/15H. 3A." and couldn't believe my luck. Also found box full of 8 mFd, 600v. oil-filled paper condensers, and a dozen 2k. 100w. vitreous enamelled resistors, ideal for the bleeder chain. Next goodie was a big kilovolt meter the size of a small dinner plate: ex-power station, I reckon.

Final design of PSU uses full wave rectifiers — lots of 800v. 5A. diodes equalising resistors, etc. — the swinging choke and six 8 mFd. smoothing Cs in series. Nailed/screwed all the big stuff onto the L.N.E.R. luggage trolley, soldered up long lines of rectifiers between tranny and choke, supported by milk bottles, mid way. Used eight bleeders in series and wired in dinner plate meter. Quick flash on the calculator showed 40–50A. off the mains at full load, so used old ceramic insulated knife switch in primary of tranny, like they use in power stations.

Moment-of-truth time had arrived. Being more cautious than the OM, bunged 20A Variac in primary side. Took a swig of home brewed beer, then banged over the knife switch. Nothing! For one moment thought that primary on tranny was O/C, but then saw I'd forgot to switch on mains to the Variac. Repeated performance. Success; nothing went bang, no smoke, just nice hum so cranked up Variac to 240v. Hum a bit louder, but nothing to worry about. Also a bit of a pong but only bleeders getting warm. Voltmeter read 3.15 kv. and just the ticket.

G9BF now QRL completing big 3 x PL-172 PA chassis. Found rusty spin drier in shed, but motor in good nick. Unbolted drum and replaced it with fan blades to make super fan to cool the bottles with potent blast of air. Should be finished soon and ready for testing into the end-fed Zepp antenna. Am hoping to persuade troop of local Boy Scouts to help put up rhombic in field for eventual Moonbounce tests.

Back to the workshop. 73 de G9BF.

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

THE word of the month this time must be 'happenings'! First off, then, the Americans have now got 10 MHz; General, Advanced and Extra class licences only, allowed A1A and F1B modes only in the ranges 10.100 to 10.109 MHz and 10.115 to 10.150 MHz; the gap is reserved to government services and barred to US amateurs. Power input maximum 250 watts, starting 1900z on October 28.

On a totally different tack, we have a letter from GM8OLV (Prestwick) who enclosed a page from the magazine *Do It Yourself* for October 1982, in which Peter Blackwell FIAS discusses the changes to town planning laws, and one paragraph contained the sentence "Full exemption is also given to fireproof radio sheds of quite a size and their free-standing tower masts". Now, we hope no-one rushes out on the basis of this remark and builds a new shack and sixty-foot crank-up tilt-over mast with Quad on top before looking at Building Regulations on the one hand and getting professional advice as to what these apparently magic words can be taken to mean *in practice*. The desire to de-regulate is clear, as the Minister has expressed it on umpteen occasions; but there is a strong body of opinion in the 'powers that be' which still wants to regulate *everything*. So – the motto must be 'Gang Warily'.

The Bands

The general consensus seems to be that the conditions through October and early November were considerably improved on the summer; but of course it has to be said that the lowered sunspot number is having a noticeable effect on propagation. Nevertheless, we have reports on all bands which radiate optimism and pleasure at the state of play. So – let's look them over, starting at the higher end.

Ten Metres

Nice to hear again from G2ADZ (Chessington) who laments his lack of time for radio and writing at present. Bill offers a list of Ten-metre beacons or stations with some twenty-odd call-signs and frequencies, which we will list up in detail for next time. On a different tack, G2ADZ mentions the events on Ten around July 14, and refers to the noise build-up as being in smooth gigantic waves. Among the more interesting QSOs of late, Bill offers S1AH, S83AH, 3D6AK, 3B8FG, SV5OX (Rhodes), ZK2VU, 4K1A, J2OZ, KL7EZ *not* in Alaska, and of course shoals of VK, CE, ZS, PY and spasmodic W. Gotaways included FK8CCO, CR9VT, and ZD7BW.

The first letter from G4HZW (Knutsford) just missed for last month so we have two of his to look at. Tony reckons that September was very poor for DX openings, although there was an interesting *Ar* event during the Scandinavian contest; but the highlight of the month was the receipt, through the Bureau, of not one but *two* cards from Mongolia to complete the full set of cards for WAZ on 28 MHz only. Turning to the October report, this month saw some very good days, but more disturbed ones. The band didn't seem too good on the weekend of the CQ WW contest, as the skip was favouring the Europeans and so blotting out DX heard weakly underneath. Nonetheless, the G4HZW haul for the month included 4M3AGT, 4T4O, N1GL/6Y5, 9I1BO, 9N1WW, 9Y4VT, A92C, AH0B (Mariana Is.), CE6EZ, CN8MC, CX4BW, CX8CS, EA7TV, HD8GI (Galapagos), HK5BCZ, HL9AZ, H44PT, HZ1AB, KP4BO, KH2AY, KB7IJ/KH2, KH6IBA twice, JAs, LUs, M1Y, OH0W, P47N, PYs, UA9s, RH8EAK, UK7PAL, UK7NAQ, U9H, UA0s, all W call areas, VP2EC, VP9AD, VQ9PG, VS6IW, VKs, YB0ACL, ZD7BW, ZLs, ZSs, and a brace of ZY calls. Life in the old band yet!

A return to the fold for G4BUE (Upper Beeding) who seems to have got the gardening bug out of his system for the moment, although aerial-farming is also being practised. On Ten, the activity was mainly in the CQ WW contest – yes, G4BUE does own a microphone! – in which Chris reckons conditions were excellent; five watts SSB with the Argonaut brought in VS6, EA9, CN8, YV, LU, 9Y4, VP2E, FM7, CE, HK, UF6, 4Z4, HZ, A4, ZS, EA6, ZD7, Z23, HH, V3 and ZF.

G2BON (Aldridge) runs an IC-701 into a G5RV aerial, and sticks to SSB; this method yielded contacts with ZS1HE/P, UK7PAL, FM0HOR (Martinique), UA0WAM, 9N1MM, CN8MC, NP4A, FM7CD, N1GL/6Y5, VP2EC, C53CG, 5W1DQ, OX3BX, KL7NX, KA5JSA, VK9NS, VK7GE, WA6SOV, VK2QT, VK3ST, YI1BGD, 6W8EX, VK5AWC, VK4AHE, 4U1VIC, VK3DHV, PT7BZ, and ZF2FL on Grand Cayman.

G4MVA (Snainton) has been playing with his Guy Wire Doublet; the 300-ohm ribbon between the aerial and the entry to the house – some 14 feet of it – has had the centre web removed, and is now located by 4-inch spacers every 18 inches. In the loft it continues to the ATU in 300-ohm ribbon. The proof of the pudding is, as always in the eating, and Glyn says that it loads up beautifully at the ATU and gives reports averaging a couple of S-points up on the previous arrangement; the first station heard after the mod was DJ5SI/T5, who was raised on the first call. The ten watts of CW accounted for W5TG, KC5JS (Arkansas), W5GWI, KA3CRC who had two watts, LU9CV, and ZS6BWK; gotaways included PY0SP (St. Paul Rocks), S83H, ZF2BN, HZ1HZ, and VP5WW.

At G2HKU (Sheppey), eight of the nine HF bands were visited, which is quite a pile of activity; naturally it meant not so much on each band, so on 28 MHz Ted was CW only to raise CX8DR and LU7XP.

GI4MXW (Portadown) spent the odd evening hour at the rig, and found conditions during the month generally up, with the best improvement being on Ten. Aurora helped with contacts with GD3GMY and GW3NNF for a couple of new countries, plus more normal propagation to UF6FCZ, LU9CV, A4XJQ, UR2QD, 4N9OLY, EA9JV, UP2DM, OH0W, 4X6DF, VP9AD, CN8MC, 4M3AGT, K6OJ/P/C6A, 9K2BE, J6LOV, VP2EC, 9Y4LL, VD3GCO, VP5B, N1GL/6Y5, FM7CD, VO1CM, and the odd European.

We turn next to G4NKM/A; Steve was on holiday at Great Ellingham, Norfolk, where he had a 150-foot wire and the FT-7. This, with SSB, raised WA5KVO, VE2AJD, UB5VEJ, RH8HCV, UK6LAI, and LZ1BK, while a gotaway was J20DU.

G4LDS (Chelmsford) had his rig away at 'the doctor's' for a while, but it didn't stop him getting into the DX; Chris found himself booking in V3DX, SV0CT, 5N22ATW, TR8JD, CN8MC, ZS6PT, VP5B, 8P6KX, K6OJ/C6A, 9Y4VT, V3TV, VP2EC, 6Y5IC, W3BTX/PJ2, N1GL/6Y5, NP2A, ZF2GI, EA4LH/CE3, YV2AMM, KB7IJ/KH2, JT1BG, SV0AU, HZ1AB, LU4F, VP9IB, WA6ZVO/PJ4, and W8OK/VE2 for Zone 2 at last!

Xtal Ball

A tour of Africa is projected by F6BBJ and F5MF, and at least nine and possible eleven stops are projected; the only snag being that we don't yet have dates and details! They propose to concentrate on the LF bands and CW, although not exclusively.

BY1BC operation by VE7BC seems to have been a bit of a frost; he couldn't operate SSB as they had severe TVI problems, so his contacts – which were not very many – were all on CW. Operation from BY1PK continues, but is a bit erratic as the shack is being rebuilt – and the aerial is not as high as would be desired, being only six feet above a metal roof. However, we have it that part of the rebuild activity may well involve hoisting the aerial up a few feet, which would help the BY signals enormously.

That Heard Is. business; some time ago we remarked that someone should grip the WIA and VK9JS groups and make them combine forces. They haven't and so now we see the strong possibility that either both expeditions will arrive, and then QRM each other seriously, or the funds will not be enough to let either expedition get away (though if concentrated earlier there would have been enough to get at least one group to Heard Island). Our own sympathies lie, if anything, with the Jim Smith group, although *The DX Bulletin* suggests that the support be offered in terms of funds to the WIA party, on the rather tenuous grounds that this group is being supported by a couple of American DX foundations. The whole affair seems quite crazy to this old buffer.

New Bands

Not a lot has been reported, but we will summarise what we have to hand. G3ROO (Dover) has been concentrating on 10 MHz with his version of the Tunbridge transceiver for this band, running five watts of CW. October 17 was the first day of QRP operation and yielded only Europeans, but a second go on October 20 produced QSOs with VE2LI, VK2DU, VK2PA and VE1AST. October 24 found the G3ROO signals getting over to VE6HH, VK3XU, and, best of all FK8EB, who came back to a one-by-one call after lots of Gs had called him without success.

G2HKU offers a QSO with OK1FAE on 10 MHz, and with G3LCK on both 18 and 24 MHz bands, just to see that the rig worked OK.

GI4MXW listened on the new bands, but reckons his timing was wrong and so nothing of interest was raised.

Another one to not mention any contacts specifically was G4NKM, who says that he found 10 MHz not dead but just empty of amateur signals, while on 18 and 24 MHz he found only G contacts.

Reading through *DX News Sheet* for the past few weeks seems to give us a better overall picture of what is to be had on these bands. On 18 MHz, FK8EB, HB0BFN/M, OY7ML, and FC9VN were reported in the issue dated October 19, while 24 MHz seemed to be the province of VP8ANT, HBs, GJ3EML and FC9VN. As early as October 5's issue, VP8ANT was reported as having worked, on 18 MHz, DL, F, G, GI, GM, GW, HB9, HB0, OX and PA, while on 24 MHz he found F, G, GI, GW, GM, HB9, LU and OE, the time slot being around 1700-1800z.

"CDXN" deadlines for the next three months –

January issue — December 2nd
February issue — January 6th
March issue — February 3rd

Please be sure to note these dates.

Top Band

Our first stop must be to mention the CQ WW 160-metre contest; the CW leg is over January 28-30, and the SSB affair is over February 25-27. The rules are revised to take into account the changes in Top Band both in USA and world-wide. Two classes are allowed, single-op and multi-op, the latter with a maximum of five operators. Exchange RS(T) and QTH – State for Ws, Province for VEs, and country for the rest of us. No serial number. Contact with stations in one's own country two points, other countries in the same continent five points, stations in other continents ten points. Multiplier, the sum of U.S. States, VE provinces, and DX countries. Final score, the sum of QSO points times the multiplier, *less* deletion of three contacts for every duplicate, false or unverifiable contact, and a second multiplier for every one lost by the above action. Logs to go forty contacts to the page, and carry time GMT, station worked, exchange each way, and columns for QSO points claimed and multipliers claimed. Mailing deadline is February 28 for CW entries and March 31 for the SSB section, envelope marked on the outside CW or SSB as may be appropriate, addressed to CQ 160 Contest, 76 North Broadway, Hicksville, NY, 11801, U.S.A. As this is a really major change in the rules, perhaps readers will pass on the story to any Top Band friends who they think may enter.

G2HKU operated CW to raise 4U1ITU, OK1KCU, UQ2GCN, UP2BCG, EA8AK, EA9EU, PA0PN, EA1KC, EA6CE, UB5MGT, EA3CCN, OH0W, and YU3EF, while his CW reached out to SM5AHK, PA0PN, RC2ICC, OX5RM, OZ5PA, SM6EHY, OZ1W, GM3HBT, and U2G.

Time was a bit tight for G4AKY (Harlow) at deadline time, so instead of his usual digest he passed on Xerox copies of the relevant log pages. One is immediately struck by the amount of information Dave encodes into his log pages, the reason for this being his serious and continuing interest in propagation on this band. For example, one observes that while in QSO with OL0CKC on September 29, HZ1AB was heard on 1.861 MHz. October saw contacts with: UM8MAZ, 5N8ARY, UA9FKW, VE3JPN, W4AH, U2G (during this last QSO UM8MAZ was heard again), EZ9FAC who was QRP with five watts, G6CJ on his ZL skeds, RA9UAS, WA2SPL, 5N8ARY again, K2GNC, VE1ZZ, VE1YX, WA2SPL again, ZB2EO, I3MAU on SSB, DL0HSC/5B4, UF6FHC, UA9SJL. In amongst this we note that most of the better-known EU calls appear, and the painstaking business of listening out for the ZL skeds; on these lines the time of sunset or sunrise is noted to the nearest minute, and frequencies used for transmit and receive, so that it is possible to deduce that G4AKY was probably heard one morning by ZL1AH. On a different tack, the log also shows that G4AKY has a pirate pinching his call – the pest calls himself Peter and claims to be located in Wellington.

G4OBK (Chorley) replies to our recent appeal for more news on Top Band; Phil runs an FT-101E, a 230-foot end fed for the lower bands, and a G4MH Minibeam for the HF bands. Phil confesses to a liking for CW, and finds that it is getting to be steadily more fun as his receiving abilities improve. Countries worked include such as PA, DL, YU, OZ, OL, HB0 and IO3 for a couple of new countries on the band, EA, OH, F6CTT who was a booming great signal, UK2RDX, OE5HE, HB9CM, EA8, W8LRL for another new one, LX1YZ, 4U1ITU and EA9EU for yet more new ones, YZ1E and UA3PFN; the mode seems to have been split between CW and SSB with, notably, the W8LRL QSO being on sideband. Not many of us come on Top Band to make our first W QSO on Phone!

Another first report comes from GW4OFQ (Llandeilo), who has a G5RV aerial with an FT-101ZD as the prime mover and on Top Band this set-up reached out to UQ2GFU and DF4GA.

Fifteen

Staying with GW4OFQ, Roger was on the band around 0900 to work a string of JAs, VK7KF, VK2PY, 5N9ACO, followed at 1500 by 5Y4ITU and 9K2BE; then at 2100 KP2AD was hooked.

GI4MXW raised some new countries

on this band, and mentions QSOs completed with CT2EF, VE8YH, VE7DGI, VE6OU, IT9GSF, OH0W, UL7BAW, ISOKKX, N1GL/6Y5, 4Z4DX, JY9RC, IO5OYY, 4N5CYZ, VO1QU, and DJ6QT/P/CT3.

It was QRP all the way for G2HKU, who used his four watts of CW to work K8IF, K4AHK, KM9Q, and VE3BNJ.

We come next to a bit of a surprise, finding G2ADZ has been listening on this band; he heard BY1PK calling CQ at the lower frequency, raising a pile-up and then calling CQ a little further up the band to enjoy a QSO in peace! Others noted were several VKs, some with the AX prefix, and YA1CP.

G4BUE next. Chris has been on SSB, with QRP of five watts from the Argonaut; VP2M, 8P6, ZS, VP5, VP2V, VP9, HZ, 4Z4, and ZF all raised in the contest.

G2BON comes in to bat now; Tom used his SSB to get to AX9NYG, VK2XT, DU1CPL, PP2ML, FY7AN, P29CH, VS6KH, TU2LE, VE2FOU, DJ6QT/CT3, VE5GF, N1GL/6Y5, and ZF2FL.

The aerial mods at G4MVA seem to have been doing the trick on 21 MHz, as Glyn mentions his contacts on CW with all W call areas, including WA7CWM (Nevada), K7ZA (Washington), AF7F (Oregon), a string of 'sixes', K5POW (Oklahoma), 5Y4CS which was a 'special' for the ITU conference in Nairobi, 9H1R, SV0BE/9, G3KTJ/VP9, KA4TAU who was running 400 milliwatts and didn't belive Glyn's call (!), JAs, SV5OX, V3CQ, DL0HSC/5B4, FY7CG, and C31XO who came back to a CQ call.

G4LDS mentions his QSOs with EC4AVC, VE1TG, ZS6BRZ, VP5B, ZS5IV, VK4VU, JH6SOR, FM7CD, CN8CX, VO2CW, N1GL/6Y5, VP2EC, and HH2CQ.

Now Twenty

While it carries much of the world's DX traffic, it has to be admitted that the proportion has fallen over the peak sunspot years. However, we still have some reports to mention.

GW4OFQ makes life easier for your scribe by his use of different coloured inks. Roger offers QSOs with FY7BO, ZL3ADA in the morning, and on return from work he worked J28DN, TU2JL, JA6FKY, PY0ZZ, 4K1A, 5Z4RL, 9X5PP, ZD7MG, 8Z1AB, VK6VU, ZD9BV, KC4USV, TG9GI, and YI1BGD.

GI4MXW found conditions on other bands so good that he didn't have much left for Twenty, but he did work N1GL/6Y5, OH0W, IS0XIE, 4X4EC, UG6LQ, N2BZQ/P/X, A4XJO, and UF6FFF.

G2HKU tried SSB for the contacts with ZB2FA/MM, HB9CIX/M, KL7FE, ZL3RS and ZL3FV, but turned to CW for K6DDO, VE3DEP, W5HE, G8NF/W4, VK2CX, UA6AOO, and HB9QO/EA.

We have already mentioned G4BUE's activity on SSB in the contest with the Argonaut on 28 and 21 MHz, but the beast didn't seem to cut the mustard on Twenty with ZC4 and A4 on QRP, and the Big Rig needed to raise J20DU after a long time unsuccessfully trying with low power. This, deduces G4BUE, requires some investigation of the 14 MHz aerial's workings.

G4MVA worked CW and ten watts to EA9KM, TA1ES who was QRP, U2G, DJ6SI/T5, FP8HL, and KP40; the gotaways included 5B4CY (Glyn reckons this one might have been a pirate), 4K1A, HI8BFP, and KL7H.

Eighty & Forty

G4LDS has a random Best Bent Wire up, and on 7 MHz this raised some Europeans, while on 3.5 MHz it sought out UL7LCW in Zone 17, and some more EUs. G4NKM/A, as already noted, was in Norfolk, and his long-wire was put on the air around 0100 on CW on 7 MHz to work 4NOLY and UC2CFZ.

Back in April 1979 we mentioned G2VF (Southampton) using a Joyframe aerial; Bob now writes to say that with it he has made some 1700 QSOs using 30 watts, to collect 65 different awards, all with the Joyframe in the shack.

G2NJ (Peterborough) found himself in improved conditions in the early afternoons when he likes to operate, and as a result he worked some twenty-odd pre-war calls on CW. Among the QRP stations, Nick mentioned G2CNN, G5JP, and G4GCB in Belper who was a handsome 579 on one watt of RF.

We have a long report on the LFs from SWL D. A. Whitaker (Harrogate) which details stations heard on Top Band in the contest; during the contest period he heard 64 countries on 7 MHz, 54 on 3.8 MHz, and forty on Top Band.

Turning to GW40FQ, we have a list on 7 MHz, including YB5BZX, UJ8JCQ, W1-4, and PJ9EE, while on Eighty ZD7BW, PY7WTD, D44BC, YV3BRF, 6Y5HN, VP2EC, 5B4JE, 5N8ARY, ZL4AP and all W call areas were worked.

The fall of the leaves, wryly comments GI4MXW, gets a bit more of his trapped dipole out of the foliage and relatively into the clear. David mentions working LX1AI, OH0W, CT2AK, GD5CQV, LX1BW, and EW6V, while a quick blast in the last half-hour of the contest caused him a pile-up of EUs looking for a GI multiplier. 7 MHz showed with 4N9OLY, HW8WE, HW6EYS, UR2FU, UP2BHC, OH0W again, IO3MAU and M1Y for a new country.

The list from G2HKU covers more territory than any other this time, with only 3.5 MHz missing; on Forty CW raised U2G and W1AXA, while SSB also worked the trick with U2G.

G4BUE has, as already indicated, been aerial-farming; the pole at the top of the tower has been lengthened by some twenty feet, and has the beam at its lower end, the upper part being used to support sloper arrays, as Chris wrote them up in the G-QRP Club magazine some time back. What it boils down to is that the top of the slopers can now be as high as eighty feet. They have not yet been tried at this height, but at 60 feet the results are quite fair, with some JAs worked at 1600z, and UA0YAE in Zone 23 hooked at 1700z, for a useful QSO.

Eighty at G2BON meant SSB contacts with D44BG, EA9GS, K1PT, WB2DHY, KR2N, HH2WW, K1JX, AB1A, W1ZM and W1FC. On Forty the bag included OH0W, 5T5TO, YV5EUX, VK9NS, VE7SZ, KM4K, PT7WA, DJ6QT/CT3, NP4A, N4RJ, K2IGW, KS8S, N2AA, W3LPL, K1CC and N4ZC.

G4MVA doesn't have room for a 3.5 MHz dipole, so he loads up the 7 MHz aerial; this is enough to work all around EU, while on 7 MHz of course it comes into its own: GU3AAM, WA6GKJ/KP4, HW6 (CYV) on SSB, LX1JAQ in J-O-T-A, R4ASK, DL0HSC/5B4, YV4DDT, RK3ABO, VP2VDH, and 4U1ITU. Gotaways included VP5JNX, VU9TTC and ZL1JJ/K, heard at 2343z.

QRP

From G4BUE we have the revised dates for the 1983 QRP club sessions. The Spring QRP Activity Weekend is now down for March 19/20 on CW, while the SSB Late Spring Activity Weekend is down for May 7/8. The late Summer CW QRP Activity Weekend, which is intended to promote intercontinental QRP contact is on 10/11 September 1983. All dates for the diary.

Finale

So – that's is for another month. Dates are in the 'box', and are to arrive, addressed to your scribe, "CDXN", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. 'Bye now.

January issue due to appear on Friday, December 31st

LINE TERMINATION IN AERIAL DESIGN

DISCUSSING THEORY, FACT — AND THE MYTHS

C. C. DRUMELLER (W5JJ)

Editorial note: *this authoritative article was first published in the October, 1975, issue of SHORT WAVE MAGAZINE but is, of course, equally applicable to today's solid-state PA's.*

ALMOST any good text on transmission lines will tell you about the effect of terminations that do *not* match the characteristic impedance of the line. Also almost all will stop when they've told you about the five classic terminations. These are *(a)* An open circuit, *(b)* A short circuit, *(c)* A resistance equal to the line impedance, Z_o, *(d)* A resistance greater than Z_o, and *(e)* a resistance less than Z_o.

Just why they stop there is hard to say, for these five do not define the load seen by a large majority of coaxial transmission lines used by stations in Amateur Radio! What usually *is* "seen" is a complex load, one involving resistance plus either capacitive reactance or inductive reactance.

Let's pause for a moment and consider why the antenna most often forms a complex load. There are, of course, some types of antennas that present little reactance. Usually these are of the travelling-wave types, non-resonant varieties such as the rhombic or the Beverage. Resonant antennas, the garden variety most of us use, such as the half-wave Hertz or the quarter-wave Marconi, display reactance at their feed points when operated at other than their resonant frequencies. Consider, for the moment, a half-wave Hertz antenna cut for 3850 kHz. Have it centre-fed and mounted approximately 0.15 wavelength above an ideal ground. It will then present a load to its feedline of very nearly 52 ohms, and that load will be purely resistive. Such a termination would be ideal for use with the type of cable most often encountered in Amateur Radio.

However, few radio amateurs operate their stations on a single frequency. Most of us roam over a quite wide range of frequencies within a band. Suppose we move the transmitter frequency from 3850 kHz to 3750 kHz. The antenna now is too short to resonate on the operating frequency. Instead of presenting a purely resistive load, it now acts as if the resistance had a value of capacitance in series with it — just how much capacitance, or, better stated, capacitive reactance, depends upon several factors. Perhaps the most significant of these factors is the ratio of length to diameter of the antenna wire (or other conductor). The larger the diameter, the less will be the intrusion of reactance. Of course, when you make that diameter larger you also affect both the feed point resistance (make it lower) and the resonant frequency (also make it lower).

Had you made the move from 3850 kHz to 3950 kHz, you would have caused the feed-point impedance to appear as a resistance in series with an inductive reactance (or inductor).

Feed Point Impedance

So we've seen that as we've departed from the resonant frequency of the Hertz antenna, the feed point impedance changes in nature, from purely resistive to partly-resistive, partly-reactive. Not only the nature of the load changes but also its magnitude.

At 3850 kHz the wavelength is 77.92 metres. A height of 0.15 wavelength would be 11.688 metres or 38 feet and 4.1 inches, a reasonable figure for an antenna owned by an operator who doesn't also own an interest in a structural steel company. Not all antennae offer such an ideal relationship between height and the impedance of their feedlines. Therefore we must be aware of the effect of line terminations.

Perhaps it is best to start with a review of the five classical graphs showing the effect of terminations upon the voltage along a transmission line. Such graphs are usually plotted from data obtained by passing a voltage probe detector along a length of slotted transmission line, often encompassing at least one wavelength. These data normally are plotted right to left, using the load as the right-hand (starting) point. The plot is identified in terms of electrical degrees, with 0° being, of course, the starting point. A point a quarter-wave back from the load, that is, to the left of the load, is marked as 90°, a half-wave back, 180°, a full-wave back, 360°.

Reflected Wave

As all texts tell us, an RF wave originating from the generator (off-scale to the left of the graph) contains voltage and current manifestations. These are in phase coincidence; therefore they represent power. Should this wave continue on down the transmission line, undiminished, for an infinite distance, this relationship would be unchanged. The transmission line, though, has a termination. If this termination is purely resistive, and if that resistance is of a magnitude that precisely equals the characteristic impedance of the line; then all the power contained in the wave (called the incident wave) is dissipated in the load. This doesn't happen often! More often, for one reason or another, part of the power "bounces off" the load (is reflected back). This reflected wave is unlike the incident wave in that it has its voltage and current phasors 180° out of phase. The reflected wave travels back to the generator, where it adds to the incident wave and loses its identity.

The analysis of the interaction between the phasors depicting the incident wave and those for the reflected wave although complex is highly interesting. It's not too rough when the assumption of a lossless line is made; without this, it can be downright hairy! Fortunately, for the amateur HF bands, such an assumption is valid. Keep in mind that the length of transmission

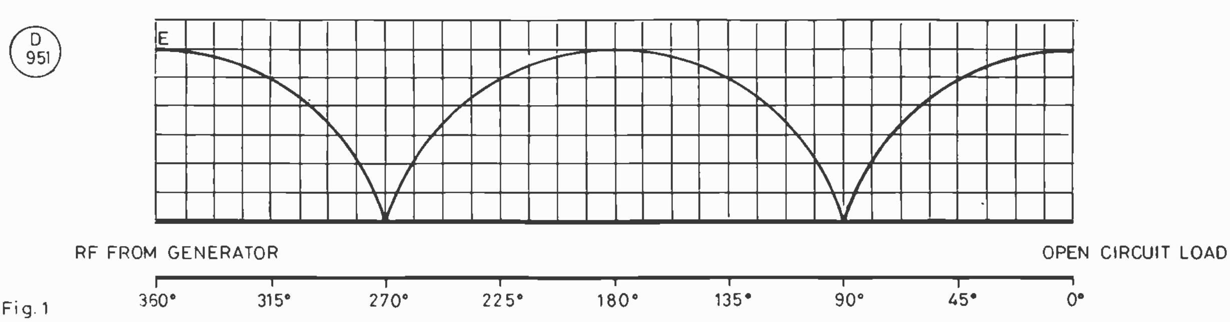


Fig. 1. Voltage standing waves on transmission line terminated in an open circuit, Note that the position of minimum voltage points is more easily established.

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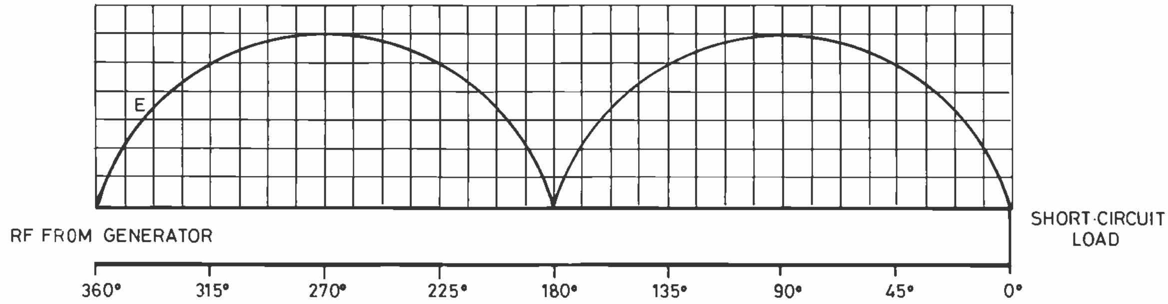

Fig. 2

Fig. 2. Voltage standing waves on transmission line terminated in a short circuit—note that the minimum voltage points are more sharply defined than the maximum points.

line always should be thought of in terms of wavelength (not feet) and that for lines less than several wavelengths, losses are too low to worry about.

You need only to glance at a series of graphs, Figs. 1-5, which depict the results of the interaction between the voltage phasors. These are the five classic graphs, ones that should be as familiar as A B C. Let us now go to another series of graphs shown in Fig. 6. These show the transmission line equivalents of discrete components, such as capacitors and inductors.

how a reactive load affects the Voltage Standing Wave pattern. Several effects are shown. Note that the voltage goes to zero at the minimum spot. This is as though the load were zero or infinity, as depicted in Figs. 1 and 2. Note also that the relative position of the minimum voltage point is shifted laterally, the direction of the shift being determined by the nature of the reactance.

As mentioned earlier, real-life loads most often consist of resistance plus reactance. Be sure to remember that only the resistive component of this impedance can accept power;

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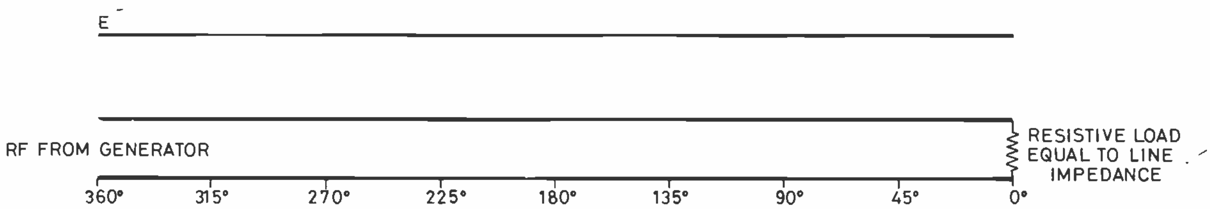

Fig. 3

Fig. 3. Plot of voltage on transmission line terminated in a pure resistance equal to the characteristic impedance of the line—this assumes a "lossless" line, a valid assumption with short lines measured in terms of wavelengths.

Now look at the information we've collected. The antenna, which, at its feed point, can be considered as a resistor ranging from a few ohms to over a hundred ohms; it also may have either a capacitor or an inductor effectively in series with that resistance. Graphs of the voltage along a transmission line, ranging from the extremes (Figs. 1 and 2) to the almost fictitious "matched line"(Fig. 3) to the moderate in-betweens (Figs. 4 and 5). Taking the transmission-line equivalents of capacitors and inductors, let us see what they can tell us about real-life situations involving antennas and feed lines.

The graphs of Fig. 6 show how short sections of transmission lines behave as lumped components, giving the effect of capacitors or inductors. The latter two portions of the series depict the effect of using reactive components as line terminations. These reactive components can be either the real article or short sections of lines. It doesn't matter, because the effect is just the same. The important thing to notice in Fig. 6 is

therefore it is only that component of the antenna load that affects the ratio between E_{min} and E_{max}, which, in turn, determines the Voltage Standing Wave Radio (VSWR).

Line Termination

With these facts in mind, let's talk about the truly important effect of line terminations. It's not the VSWR that might be brought into being, at least, not directly. In the HF spectrum (3 MHz to 30 MHz) the dissipative losses engendered by a reasonable VSWR, say 5 : 1 or less, are too low to give concern unless one is using a feed-line many wavelengths long. The real concern lies with having a load acceptable to one's transmitter.

It is not difficult to design a transmitter that will function properly with a wide range of antenna loads. To build such a transmitter, however, costs a bit more than for one with a quite limited scope. In today's highly competitive market,

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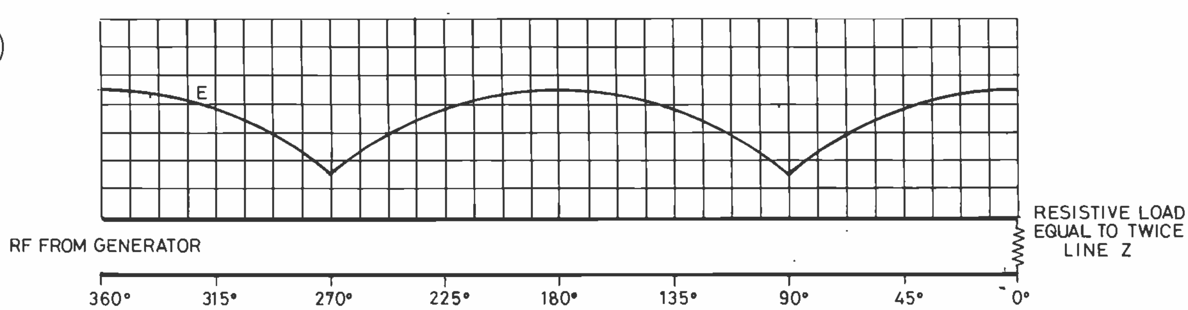


Fig. 4

Fig. 4. Voltage standing waves on a line terminated in a pure resistance of twice the line impedance. Note that the minimum voltage points are at the same position as in Fig. 1, but the magnitude does not go to zero, nor is the maximum voltage as high.

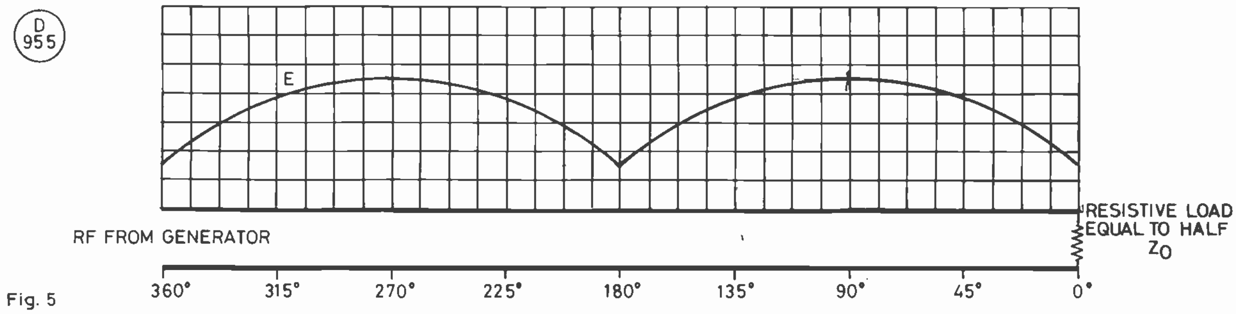


Fig. 5

Fig. 5. Voltage standing wave on a transmission line terminated in a pure resistance of half the impedance of the line. The position of minimum voltage points correspond with those of Fig. 2, differing only in magnitude.

manufacturers cut costs wherever they can . . . and today's buyer has been conditioned to accept as "state of art" transmitters that will load into purely resistive loads of between 25 ohms and 100 ohms (2 : 1 VSWR). Fortunately, most transmitters with tuned outputs will cope well with a greater range of resistances and even with a moderate amount of reactance. This is not true of transmitters having untuned outputs, a breed increasing in numbers and popularity. So with one of these, be prepared to accept certain limitations!

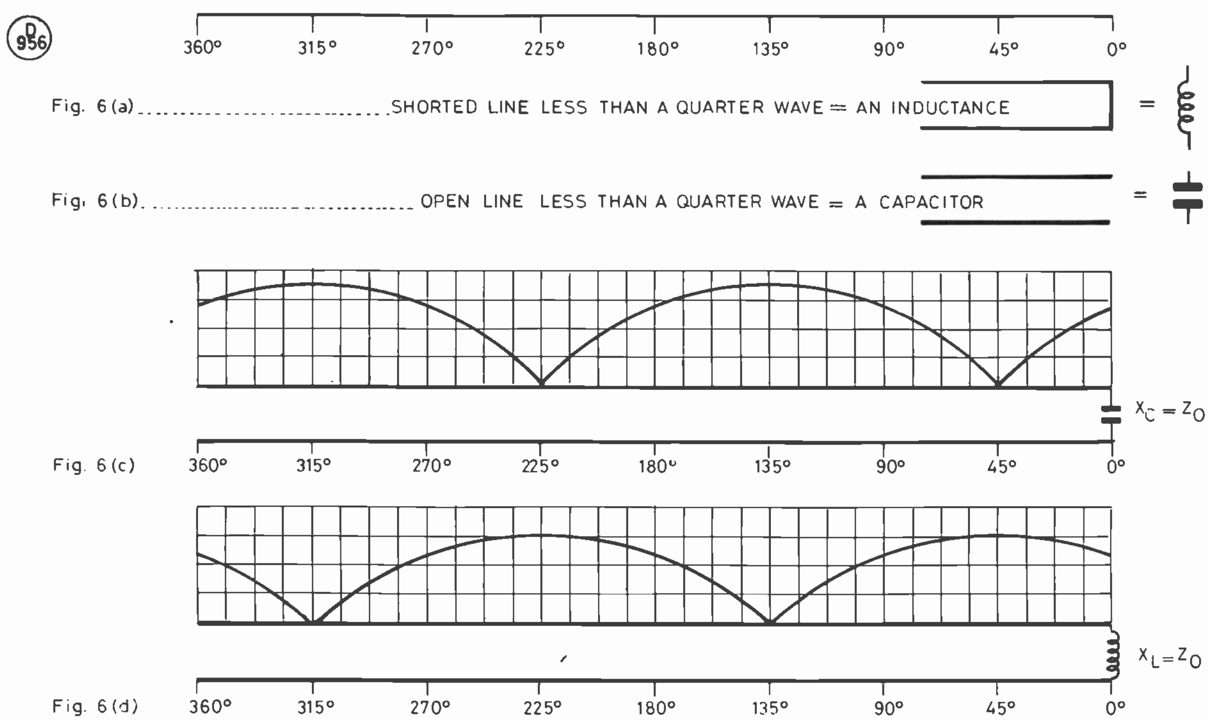
Why is the element of reactance so important? Because very many antenna-feeding combinations result in a load being presented to the transmitter that departs from the ideal of 52-ohms non-reactive.

To see one reason why, look at Fig. 7, which is much like Fig. 1 but with some significant details added. The second portion is like Fig. 4 but with the additional information. Looking at Fig. 7A you'll note three significant items. At 0°, 90°, 180°, 270°, and 360° the line "looks like" a pure resistance to a generator hooked on to any of these five points. Of course, the resistance appears as infinite at 0°,180° and 360°; and as zero at 90° and 270°. But the important thing is that it is non-reactive at these points. Looking further, you'll see that from 0° to 90° it "looks like" a pure capacitive reactance, between 90° and 180° as a pure inductive reactance, and that these conditions are repeated every 180° down the full length of a line.

Of course, we don't make much practical use of open-circuit lines; so let's look at Fig. 7B to see what a transmitter would "see" at the sending end of a typical transmission line. This'll give you a clue as to why some people put such great trust in "magic" lengths of feed lines! With only "eyeball evaluation" you can see that between approximately 60° and 75° the voltage doesn't deviate drastically from that of a matched line, as shown in Fig. 3. The area between approximately 105° and 120° shows the same small voltage variation but with opposite reactive component. And as depicted in Fig. 7C, the impedance along the line varies roughly in the same manner as does the voltage. Now, it should be clear that a line cut to one of these lengths (or at half-wave intervals farther on down the line) has a strong probability of presenting an acceptable load to the average transmitter having a tuned output. This suggests that feedline length may be an important factor in enabling a transmitter to load properly. It is, but only if the line's termination is not matched to the line. With a matched termination, line length is immaterial excepting only for the factor of attenuation. Line attenuation is important in the UHF and VHF bands but can be ignored in the HF and MF ranges unless extraordinarily long runs are made.

Loading

Still another facet of the effect of reactance must be considered. Most transmitters using valves in the final stage and having a tuned output circuit use either a *pi* or *pi*-L net to perform the dual



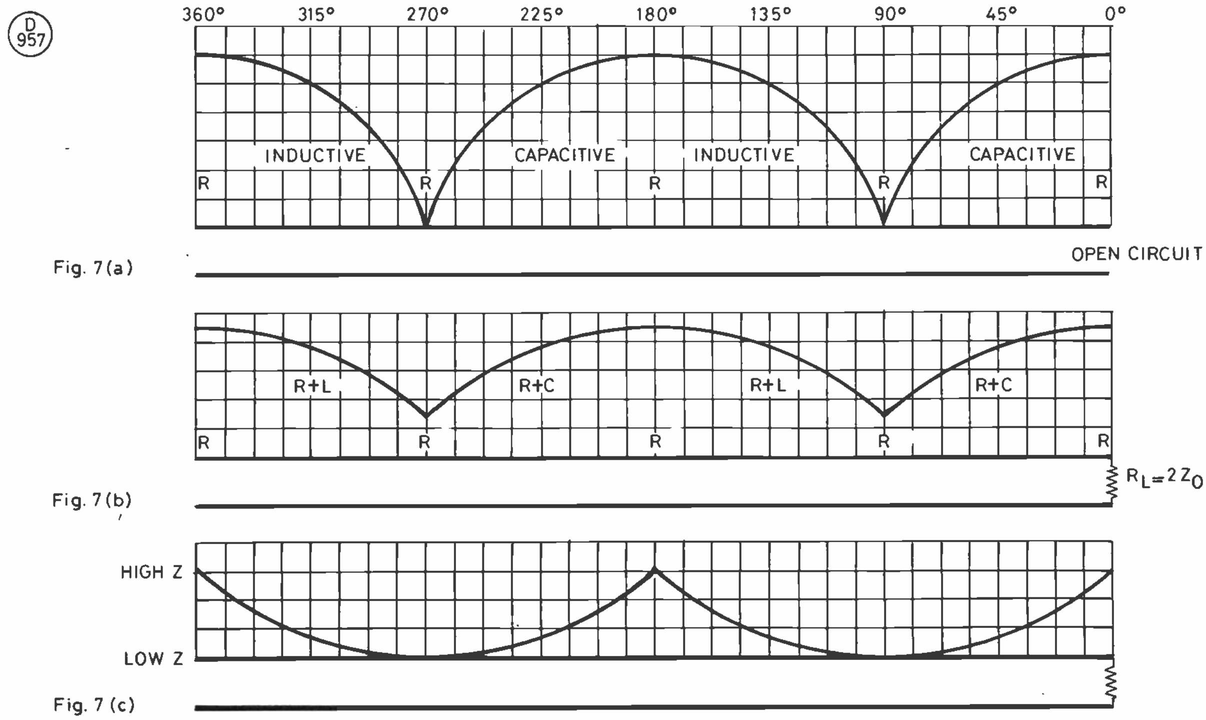


Fig. 7. Plots of reactance, resistance plus reactance and impedance on a line—see text.

function of providing frequency discrimination and effecting an impedance match between the feedline and the load impedance demanded by the PA. The valves want a purely resistive load. When the plate tank circuit is tuned to resonance, all reactance is cancelled. But with a feedline attached, some additional reactance is coupled in. This must be cancelled by an equal and opposite reactance provided by the plate tank circuit. Usually a variable capacitor is the tunable component, and in some instances this capacitor must be varied so much in an attempt to cancel the induced reactance that it cannot bring the plate circuit into resonance. And, as you know, a non-resonant plate tank can cause PA valves to draw excessive (and sometimes fatal) plate current.

This leads into the domain of the facts and myths relating to the effects of line mal-termination and their ancillary VSWR's. The facts are simple: Besides the mal-tuning resulting from the effort to cancel induced reactance, the extremes of C and L used to transform very high or very low values of feedline load impedance to that demanded by the PA may result in excessive circulating current in the tank. This can (and does) cause coils to get so hot as to melt their supporting material and collapse. At the other extreme, the voltage developed across a very small value of output capacitance may be high enough to cause flashing across its plates. These effects, though, are seldom encountered.

Reflected Power

Which brings us next to the myths. The hoary one of reflected power being lost power has been so thoroughly punctured by many writers that we'll skip it as being unworthy of mention! Another one, often heard, tells of blown valves. In well over a half-century of association with amateur and professional radio, this writer has never encountered an authenticated instance. It's easy to see, however, if one were a bit slow in one's reactions, a plate circuit detuned to draw excessive plate current could "cook" a valve quickly!

Still on the subject of myths, there are several relating to measuring VSWR that die slowly. One is that accurate measurements can be made only at the junction of feed-line and antenna. This, like many old wives' tales, has a basis of fact. If a transmission line is long, in terms of wavelengths, line attenuation will mask differences between the voltage of the incident wave and that of the reflected wave, thereby causing the indicated VSWR to be less than it really is. This is a matter of consideration only when line attenuation is high, a factor seldom encountered on the amateur HF bands. The other slow-dying myth holds that valid VSWR measurements can be made only at designated spots along the transmission line, usually stated at quarter-wave or a half-wave, depending upon who's relating the tale. Here, again, there's a slight basis of fact. If you're interested in knowing what is the feed-point impedance of your antenna, and you're exploring this quest with some form of an RF impedance measuring device, such as a Noise-Bridge, an Antennascope, etc., the restriction holds true. That is, the actual feedpoint impedance can be measured only at the feed-point or at half-wave intervals back down the transmission line. There are ways of making correction factors so as to enable measurements to be taken at any point along a line, but these are too complex for casual inquiries.

But don't confuse these feed-point measurements with VSWR appraisements. The magnitude of the VSWR is ascertained by comparative measurements of the incident wave and the reflected wave, sampled by some variety of directional coupler. These waves co-exist at all points along the line; therefore the ratio between the two may be ascertained with equal ease and accuracy at any point along the line.

The effect of transmission line terminations may be summed up in five simple statements. The termination must contain a resistive element in order to accept power. If the magnitude of the resistive component does not equal the characteristic impedance of the line or if the termination contains a reactive element, a portion of the generator's power will be reflected back to the generator, where it is added to the forward power for another assault on the load. The presence of reactive components in the termination will cause the positions of voltage minimum and maximum points to be shifted from their expected locations on a line. Mal-termination causes appreciable power losses in lines that are many wavelengths long, negligible losses in moderate-length lines. The most weighty effect of mal-termination often lies in creating a sending-end impedance that is not compatible with capabilities of the transmitter.

BASICS FOR THE S.W.L. AND R.A.E. CANDIDATE, PART VIII

SUGAR-COATED THEORY

WE must now turn our attention to the FET, or *Field Effect Transistor*. Why anyone wanted it to be called a transistor at all is a mystery, as its physics are very different. The ordinary transistor is *bipolar;* in other words both electrons and holes have equal importance in the workings. Not so in a FET, so we'd better make a clean start.

Starting from a chunk of semi-conductor material, which may be silicon, let us make a 'channel' of *n*-type material, as shown in Fig. 1, and let us give it a 'gate' of *p*-type also as shown in Fig. 1. If we connect a battery with its positive end to the top of the channel and its negative to the bottom, the upper connection is called a drain and the lower one the source. (Sometimes 'emitter' is used as a loose term for the source and 'collector' for the drain.) Now we take another battery and connect it between source and gate such that the gate is negative relative to the source – old-timers will recognise this immediately as the normal way of things with a triode valve. Just as with a valve, zero bias corresponds to high drain current; increase of bias causes a depletion layer to form at the *p-n* junction, and so the current through the channel reduces. We have dreamed up an '*n*-channel depletion-mode junction FET' – or you might see it called a JUGFET. By making the channel of *p*-type material, and the gate of *p*-type, we would have a *p*-channel depletion-mode device, and of course the voltages would have to be reversed all round. Fig. 2 shows symbols for both these types.

So much for junction-gate FETs for the moment. There is another breed of FET, known as an 'insulated-gate FET' or IGFET (or metal-oxide semiconductor FET or MOSFET). Again we have *p*-channel or *n*-channel depletion-mode types, but in addition we can have *p*-channel or *n*-channel 'enhancement-mode' devices, where the increase of bias increases instead of decreasing the channel current. The difference between the junction gate depletion-mode FET and the IGFET is just simply that the gate of the IGFET is insulated from the channel – *see* Fig. 2. Thus the gate resistance is very high – higher than that of a valve indeed, and that makes it very vulnerable to *static* while being handled, although lots of IGFETs do in fact have gate protection diodes to make things a little easier.

Returning to the depletion-mode devices, the characteristics are, in general, very much like those of a valve, and indeed the use of an FET as replacement for the valve is often possible with only very minor changes in circuit, to allow for the different electrode voltages of valve and FET. On the other hand, because the characteristics show more gentle curves than the bipolar transistor, it is not surprising to find, in general, that the drain voltage on a FET is higher than the collector voltage on a bipolar. Looking at the symbols, all of which are shown for the *n*-channel case, observe the difference between the enhancement-mode and the depletion-mode IGFETs; in the former case the heavy line is broken, and the latter continuous. This reflects the difference in the construction, insofar as the enhancement-mode device doesn't have a complete channel, and so the gate must be pushed for several volts towards the drain voltage in order to make the *p*-type material become intrinsic and then to look like *n*-type to complete the 'channel', which will disappear again if bias reduces towards zero.

Complications: some types will have a connection to the substrate, and of course there are the well-known dual-gate IFGETs. Study the drawings and it won't seem too complicated!

Normal FET devices are very definitely low-power animals, but over the past year or so various makers have brought to birth so-called 'Power FETs' all of which are essentially junction-gate devices with structures modified so as to cope with high currents, high voltage, and the dissipation of power; these power devices are much used in switch-mode power supplies, and it does rather seem that this is where we might see the HF PA stages of the future, once we have got over the present wave of "don't-tune-'em-up, just-pray" bipolar designs.

Why bother with the FET when we already have the bipolar transistor? A Good Question! The characteristics of the FET (or the valve for that matter) are way ahead of the conventional transistor when used as a mixer, and the high input impedance also is useful. Perhaps most important, in terms of the professional electronics field, is the use of the Complementary MOS (CMOS) type of construction where *p*-channel and *n*-channel MOS devices are used on the same chip in various useful forms of integrated circuit in which the current drain is at a minimum, except when the devices are switching states; this enables much more computing power to drive off a given power supply as compared with, say, the older TTL logic. However, more of integrated circuits in due course.

Right now, we have to consider the use of any of these devices in a practical circuit, and here we must accept that in general, the circuit comes in two quite separate parts, which must be considered separately. The first exercise is to take our 'active' device, be it valve, FET or transistor, and provide it with the DC voltages at each pin in order to make it capable of the task we mean it to carry out; and the second part of the exercise is to inject and extract the *signals* (whatever they may be) in such a fashion that we don't upset the DC conditions and so stop the thing from 'perking' properly. With valves alone, we often find ourselves in the position where, because all valves require positive HT and zero-to-negative voltage, we have to use such subterfuges as feeding in and/or extracting signals by way of transformers or capacitors. When we come to the transistor and the FET we have somewhat more flexibility, at least in theory, insofar as we can use *p-n-p* and *n-p-n* devices in pairs to ease our problems, and indeed manufacturers produce 'complementary pairs' of transistor types which comprise an *n-p-n* and a *p-n-p* device which have similar characteristics

Integrated Circuits

We will deal fairy briefly with these, at least for the moment, and expand as appropriate in future articles.

Integrated circuits fall, essentially, into distinct types: Linear and Digital. The Linear IC can be regarded as a circuit like an amplifier, which produces at its output a faithful reproduction of what appears at its input (or, at least, it tries to, and succeeds if you give it a sporting chance!) while the Digital IC is only interested in producing an output which is near the HT rail voltage or near the earth rail voltage, and receiving inputs of the same nature. Such ICs are the stuff of the digital computer, and binary arithmetic, and appear in our shacks within such items as frequency counters. Of late there has been a trend to turn analogue ('linear') signals into digital equivalents for processing, but this latter development needn't concern us at the moment.

Turning back to the analogue or linear IC, we find various types: firstly the operational amplifier, or more often 'op-amp' which may be regarded as nothing more than a packet of gain – lots of it, as it comes, and reducible by suitable circuit

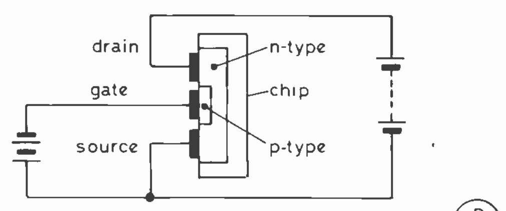
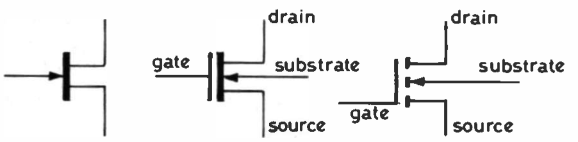


Fig.1 Construction of a FET



(a) J FET (b) Depletion mode IGFET (c) IGFET

Fig. 2 Symbol of JFET and IGFET (n-channel) D 986

design. These appear in, for example, 'active' audio filters, as part of the audio gain in direct-conversion receivers, and such. Things like comparators (which compare to signals) don't much concern us, but 'voltage regulators' most definitely *are* of interest. One takes an ordinary un-regulated DC supply, derived from wobbly and dirty mains, and puts it through a voltage regulator, to find on the output side a stable and clean voltage will 'stay put' as the load current changes. Old-time stabilised PSUs were heavy things in their own chassis, but the modern regulator IC is a thing the size of a transistor – indeed it most commonly comes in a standard transistor type of package; some give out a standard voltage (5 or 12 volts, for example) and some are so arranged that they can be adjusted to suit requirements between wide limits. The more useful ones also usually include a 'fold-back' protection circuit such that if the current drawn rises beyond the limits the IC, as it were, turns off so that no damage occurs to the circuit the IC is powering up – very handy in a bench PSU when you are playing with a new circuit and a transistor in the circuit tries to go into thermal runaway! – or if you drop a screwdriver across the printed-circuit. All you have to do is remove the screwdriver, switch off and then on again, and you are back in business.

to be continued

ASPECTS OF AMATEUR RADIO

A PERSONAL VIEW

LES MAY, G4HHS

SOME time ago a friend gave me a pile of *Short Wave Magazines* dating back to the late 1940's and through to the early seventies. These have given a fascinating glimpse into the development of amateur radio over the past thirty-five years. The now almost universal use of the pi-output, the growth of SSB and the steady decline of AM are all catalogued together with the more recent explosive growth of FM on VHF. As a fairly recently licensed amateur, I sometimes wonder if some of our radio 'pundits' did not have their thinking arrested during the period covered.

The implication seems to be that if newly licensed amateurs were limited to 10 watts of CW for a year or so before being turned loose with QRO and phone then all that ails amateur radio (does it ail?) would be put right. But what is it really like to get a call today? What are the differences?

At first sight it might appear that the introduction of the 'B' licence has had the effect of bringing about the supposed lowering of standards. The dogma goes that a 'B' licence is very much second best and that 2-metre FM-ers are all ill-mannered lads who have turned the band above 145 MHz into a glorified citizens band. But how true is this? Apart from the repeater burpers I have only come across one case of really bad manners, a G3 + 3 who had, it seems, one crystal only and that nearly, but not quite, on the S20 calling channel used in this area. When politely reminded that he was hogging the calling channel he could only mutter darkly about CB-ers and that his licence said nothing about channels anyhow. True, but how about FM at the CW end of the band? What is sauce for the goose . . . For many amateurs the emphasis is on communication and FM works best when it is channellised, so why not adopt the sensible procedure and designate calling and working channels? There seems good sense in using 2-metres and 70cm. FM for local nets and mobile working, by both 'A' and 'B' class licensees. A few watts of RF can give BBC-quality reception with manageable aerials. As for a 'B' licence being second best it certainly is not an open and shut case. The G8 or G6 who casts his eyes on the higher frequency bands meets problems just as difficult to overcome as passing the Morse Test. Many "linears" for VHF and UHF are homebuilt and SWR meters for 70cm. and above are not exactly off-the-shelf items.

Perhaps the change that has affected all of us most profoundly has been the much greater choice of commercially built gear and the money in our pockets to buy it.

Would SSB have swept aside AM so completely if off-the-shelf gear had not been available, or FM become the most common mode for 2m? A glance at *S. W.M.* for the middle 1950's reveals perhaps four or five commercially built receivers and maybe three transmitters regularly advertised. One of the latter, the Panda, being built less than half a mile from where I now sit. Today the story is very different.

The clock cannot be turned back to some valve-filled golden yesterday. Our bands are quite wide enough to accommodate all modes and both classes of licence given reasonable good sense and an absence of bigotry. It may still be quite true that with careful buying one can put together a 25 or 30 watt CW rig for £10-20, but who really tries to *sell* CW as a pleasure in itself? If the new G4 or G6 goes out and buys a glossy new rig he is simply following a trend already well established. Glossy ads. hint at the exotic DX to be worked when a speech processor, linear or beam is added. Is it any wonder we fall for it?

If being super-modern and sophisticated is the criterion then CW hardly looks to be in the running. Its appeal must lie in some other quarter and what better reason than to work all that exotic DX on the HF bands. But if that is the only reason for going to the trouble of learning Morse the key will go straight back in the drawer after the test. Perhaps a better argument for CW is its simple elegance. It is difficult to improve one's technique in shouting down a microphone, but to send and receive good Morse means that technique must continue to develop after the magic 'A' licence drops through the door.

Earlier I mentioned that CW does not *seem* to be in the running as a modern technique. This is far from the case. The recent availability of a wide range of general purpose ICs has lead to the development of an armoury of add-on devices to improve the communication effectiveness of CW. From simple one-stage active filters through devices which produce a stereo CW signal giving a spatial distribution to the various signals in the receiver pass band, to coherent audio filters, and finally to fully coherent CW where in effect the receiver "knows" when a dot, dash or space can be expected to start by careful control of the transmit, receive and timing functions. I have purposely left out the increasing use of computers to send and receive CW because this approach seems to lack the sense of personal involvement which gives a lot of pleasure.

I found learning Morse quite difficult and my QSOs are still sometimes hesitant affairs. The test was one of the more nerve racking experiences of my life and knowing nothing of "activity nights" on two-metres it took me more than eight hours to find my first QSO when my G4 call arrived. Having finally passed the Morse Test it is easy to forget just how difficult it can be for some people.

There are probably as many reasons for becoming an amateur as there are amateurs. Only by co-operation and mutual respect can we make best use of the available frequency space — which is after all a finite resource. That is unless someone has found a way of booking their private channel!

CLUBS ROUNDUP
By "Club Secretary"

A VERY short preamble this time — just enough to remind everyone of the need for regular up-date and, of course, to wish all Clubs, and their Officers and Members, a Very Happy Christmas and Prosperous New Year.

The Clubs

The first one is **Abergavenny**, where the gang are still based on the room above Male Ward 2 in Pen y Fal Hospital every Thursday evening, while Tuesday evenings are for the RAE class which is held at Nevill Hall Hospital, also in Abergavenny; and locals could note that the club is registered as an RAE centre for the examination – the Hon. Sec. (*see* Panel) has all the details you may require.

Now to **Acton Brentford & Chiswick**, on December 21, at Chiswick Town Hall, when the gang will have a demonstration of the Icom IC-720A by G3CCD.

The **Atherstone** group have a talk by Richard Margoschis on December 9, designed to make them get the best out of their tape recorders – the venue, according to our records, being the Tudor Centre, Coleshill Road.

Aylesbury Vale have only the Christmas Dinner on 28th as their December event, unless the Hon. Sec. has anything else up the sleeve, and on January 25 they have an AGM, at Stone Village Hall. For the rest, the Hon. Sec's address and phone number are in the Panel.

If you want to find the **Bedford** club, you start out by looking for a pub called "The Case is Altered" and the club house is within 100 yards of you. More details from the Hon. Sec. at the address in the Panel.

Christmas Dinner is in prospect for **Biggin Hill** club on December 21; for January it is the AGM, at the usual Biggin Hill Memorial Library Hq.

A new Publicity Secretary takes over at **Braintree,** where they seem to have a large supply of YL/XYLs for these tasks! The group are based on the Community Centre, which is next door to the Bus Station in Braintree's Victoria Street, and foregather on the first and third Monday of each month.

B.A.R.T.G. look after the interests of the chaps who have the RTTY facility in their stations, whether by old-fashioned teleprinter or new-fangled electronics; and one has to wonder how a non-member can operate an effective RTTY station! Details from the Hon. Sec. – *see* Panel.

The **Bury** club don't shout much about themselves, but at the last count they had over eighty members current on the books. They have their AGM, at Mosses Youth & Community Centre, Cecil Street, Bury, on December 14, but the same venue will find them every Tuesday evening informally.

Next, **Caradon Hill Repeater Group** have their Christmas get-together on December 9 at the "Arscott Arms", Chapmans Well, which lies about four miles to the north of Launceston, Cornwall, on the Holsworthy Road. Visitors would seem to be welcome – details from the Hon. Sec., *see* Panel.

At **Cheltenham** it all happens at the Old Bakery, Chester Walk, Clarence Street, Cheltenham; and in that we must include the AGM on December 2.

Every Wednesday the Stable Loft of Bury Farm is opened up to admit a group of **Chesham** radio hams. This hide-out is to be found in Pednor Road, Chesham – ring the Hon. Sec. for details.

Cheshunt is much easier to find – the Church Rooms, Church Lane, Wormley, Cheshunt – just be sure the 'Church Lane' you have got is in Wormley! Any Wednesday evening will find them. Thus, December 1 is down for G4MAS to talk about Town & Country Planning, and on 15th they have a video show. December 8 and 22 are both down for a natter and the 29th date is cancelled.

Turning to **Chichester** they seem to have happily settled into their new Hq at Fernleigh Centre. December 7 sees a talk on the GB3PH repeater in the Long Room, and on 16th they have the Annual Christmas Social and the presentation of the Marcuse Trophy, in the Green Room.

The **Clifton** club gather each Friday evening in the New Cross Inn, Clifton Rise, London SE14, where they have an upstairs room.

Colchester have their home in the Staff Common Room, Colchester Institute, Sheepen Road, where they get together on alternate Thursday evenings.

We are in fact overdue for an up-date from **Conwy Valley;** they meet on the second Thursday in each month at Green Lawns Hotel, Bay View Road, Colwyn Bay, if the last data we had is still correct. For details, contact the Hon. Sec. – *see* Panel.

For the **Cornish** gang, December is set apart for the Christmas Party, with films, at the SWEB Clubroom, Pool, Camborne; the date for the festivity being December 2.

We don't have the latest for **Crawley,** as their programme isn't normally announced that far ahead. However, we can say that they alternate between the informals at members' homes, and the 'main' meeting at Trinity Church Hall, Ifield, on the second Wednesday of each month.

The move of Hq by the **Crystal Palace** club has paid off, says the Hon. Sec., with numbers up. December 18 sees the Christmas Party and film show, at All Saints Church Parish Hall, Upper Norwood, which is almost opposite the ITA mast, Beulah Hill/Church Road.

Deadlines for "Clubs" for the next three months –

January issue – November 26th
February issue – December 31st
March issue – January 28th
April issue – February 25th

Please be sure to note these dates!

Our next stop is **Dartford Heath D/F**, where the main reason for the club's existence is D/F hunting, although they do in fact have other activities. There is a monthly meeting at the "Malt Shovel" in Eynsford — they have December 8 for the regular one and another on 22nd is down as an EGM; full details from the Hon. Sec.

We turn now to **Derby,** and here the club are based on the Top Floor of 119 Green Lane, Derby, where they are to be found on Wednesday evenings. Details of the month's programme can be obtained from the Hon. Sec. – *see* Panel.

Every Monday evening sees the members of the **Derwentside** group converging on the club Hq at the R.A.F.A. in Consett, where they have a club station and all the trimmings – not to mention a steadily rising membership.

A new Hon. Sec. – *see* Panel – writes in on behalf of the **Doncaster** club, based on Gertrude Bell Hall, Church Street, Armthorpe, Doncaster, every Monday evening.

Now we head for **Douglas Valley,** and this means Shevington Conservative Club; on December 2 they have another talk by G3KTJ. The club catchment area is basically the Skelmersdale district.

Every second Monday and last Thursday in the month, the **Echelford** lot forgather at The Hall, St. Martins Court, Kingston Crescent, Ashford, Middlesex. December 13 is down for a talk by the RR, G8HMG, and on 30th G4NNS will talk about the role of the microcomputer in amateur radio.

A junk sale is down for December 9 at **Edgware,** followed on

December 13 by a club participation in the Harrow D/F Hunt on Top Band. The club Hq is at 145 Orange Hill Road, Burnt Oak, Edgware.

December for **Farnborough** shows a Chairman's Evening on 8th, and on 22nd a Christmas Social Evening with wives and girlfriends, at the Railway Enthusiasts Club, Access Road, off Hawley Lane, this venue being near to the M3 bridge, Farnborough.

Up to GM now, to **Glenrothes** in the Kingdom of Fife; they are at Provosts Land, Leslie, on Wednesdays.

Some 36 years ago the **Grafton** club was first formed, and hundreds of people have passed the RAE under their classes; nowadays they foregather at the "Five Bells" pub, East End Road, which is about a half-mile east of Manor Cottage on the North Circular Road, on second and fourth Fridays. December 10 is down for the annual Construction Contest.

A much newer group is the one at **Greater Peterborough** where for the latest details we must refer you to the Hon. Sec. – *see* Panel for his details.

The **G-QRP** Club must be one of the strongest in the country, with over 1000 members, united by their interest in QRP working and home-construction. Details of this one from the Hon. Sec. – *see* Panel.

At **Guildford**, G3OLM will be talking and demonstrating his model aerial farm on December 10 – the venue is the Guildford Model Engineers Hq at Stoke Park, and the normal routine is to meet on second and fourth Fridays.

The **Harlow** lads and lasses have their Hq at Mark Hall Barn, First Avenue, Harlow, every Tuesday evening, and they nearly always have something set up for your entertainment; indeed the club is stronger now than for years.

At **Harrow**, December 2 is down for the Christmas Dinner, December 10 for a talk on orienteering, a D/F Hunt with three other clubs on December 12, and on December 17 there is a talk, the subject and speaker yet to be announced. The Hq is at Harrow Arts Centre, High Road, Harrow Weald, and the club have the use of all the facilities there.

The **Hastings** data needs to be looked at with some care; all meetings except the 'main' one are now held at Ashdown Farm Community Centre. This main meeting is on the third Wednesday at West Hill Community Centre, but the club are to found at Ashdown Farm Centre on the other Wednesday, on Tuesdays for an RAE class, and on Friday evenings for a chat night.

Havering have their base at Fairkytes Arts Centre, where on December 1 they have a surplus sale, followed on 8th by an Informal. On December 15 they have a video lecture programme, combining the G6CJ "Aerial Circus" and "The Secret Listeners", which leads to December 22 for a Christmas Party. Sad to say there's nowt on December 29 as the Hq will be closed for the holiday.

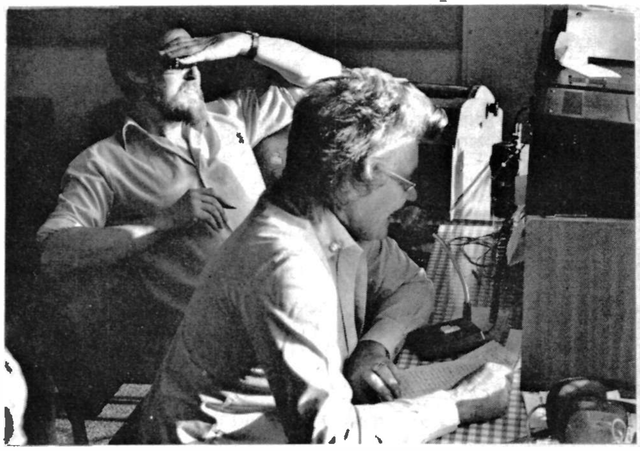
County Control, Civil Defence Hq, Gaol Street, is the ominous-sounding address of the **Hereford** club – but it must be OK as they've been there for years! December 3 is down for a normal meeting and on 17th they have the Christmas Quiz.

Over in EI, the **I.R.T.S.** is the place to address all enquiries about amateur radio in Eire, and in particular about local clubs. The Hon. Sec's address is in the Secretaries Panel.

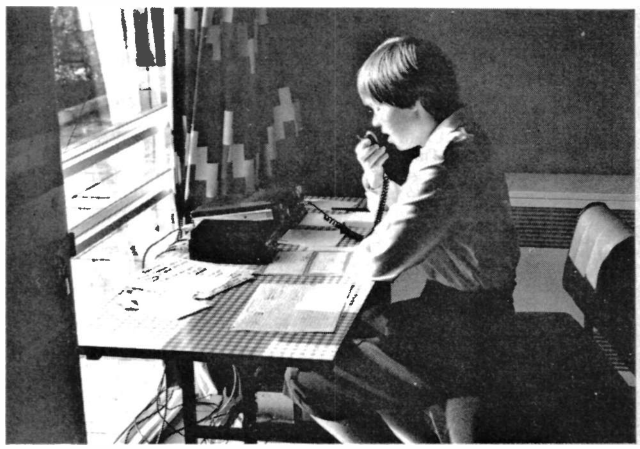
A new one to be announced is called **KSC Amateur Radio Group;** it is open to all Catholic amateurs and is on the lookout for new recruits. Details from the Hon. Sec., G3AKG, at the address in the Panel.

We turn now to one of the clubs in the Leeds district, this one in fact being called **Leeds & District;** it is based on Old Hall Golf Club, Woodhall Lane, Pudsey, where they are to be found on any Monday evening.

Up North again, to **Lothians,** where they now gather at Drummond High School, Edinburgh, on the second and fourth Thursday of each month at 7.30. December 9 is down for a talk, which had not been completely finalised at the time of their letter.



J-O-T-A 1982, October 16th and 17th. Above, David, Jackson G4HYY passes the GB2TOD (Todmorden High School) microphone to Elizabeth Hall, the Yorkshire County Guide Commissioner, who took advantage of the new regulations on greetings messages to talk to GB2CWR near Loch Ness. Below, G4HYY's 15½-year-old daughter Kathryn, G6LHY, seen operating the GB2TOD 144 MHz station. G6LHY is a Brownie Young Leader and hopes to have a G4 call before long. *Photos by G6NIJ*



The **Macclesfield** gang are to be found on the second and fourth Tuesday of each month at St. Andrews Old School Hall, St. Andrews Road, Brough Street West.

Turning to **Maidenhead,** they meet at the Red Cross Hall, The Crescent, Maidenhead. December 2 is the Home Construction Contest, and on 21st they have the Christmas Social.

Another new one for mention now; this one is **Maltby,** where they foregather in the Methodist Church Hall, Blyth Road, Maltby, every Friday evening. More details if required from the Hon. Sec. – *see* Panel for his details.

The **Merion** crowd will be at Nannau Country Club, Llanfachreth, near Dolgellau on December 2 to hear GW6DDF talking about "Dirty Work on an Oil Rig, or Mud Galore" – and on 11th they hope to have regained their appetites enough to cope with the Christmas Dinner at Nannau Hall.

December 17 is the date for the **Melton Mowbray** crowd, at the St. Johns Hq, Asfordby Hill, and the business a bring-and-buy sale, with a raffle for the ladies and the presentation of the G3FDF Trophy.

A new Hon. Sec. takes over at **Mexborough** – *see* Panel – and as we have no other current news of the club we must refer you to her for the latest details of programme and venue.

We turn now to **Midland** where they have their own place at 294A Broad Street, Birmingham; but we have to refer you to the Hon. Sec. for the current details of meetings, save that we know

Names and Addresses of Club Secretaries reporting in this issue:

ABERGAVENNY: D. F. Jones, GW3SSY, 2 Dalwyn Houses, Llanover Road, Blaenavon, Gwent NP4 9HY. *(0495-791617)*
ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, Acton, London W3 8LB. *(01-992 3778)*
ATHERSTONE: T. Court, G4IAG, Wood View, Breach Oak Lane, Corley Ash, Coventry CV7 8AU. *(Fillongley 41814)*
AYLESBURY VALE: M. J. Marsden, G8BQH, Hunters Moon, Buckingham Road, Hardwick, Aylesbury. *(0296-641783)*
BEDFORD: Miss J. Ferguson, G6JJT, 4 Hotch Croft, Cranfield, Beds. *(Bedford 751397)*
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BURY: M. Bainbridge, G4GSY, 7 Rothbury Close, Bury, Lancs. BL8 2TT. *(061-761 5083)*
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CHESHAM: J. Alldridge, 15 Wichcote Gardens, Chesham, Bucks. *(Chesham 786935)*
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CHICHESTER: T. M. Allen, G4ETU, 2 Hillside, West Stoke, Chichester, Sussex PO18 9BL. *(West Ashling 463)*
CLIFTON: R. Hinton, 42 Sutcliffe Road, Welling, Kent.
COLCHESTER: F. R. Howe, G3FIJ, 29 Kingswood Road, Colchester. *(0206-70189)*
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CRYSTAL PALACE: G. M. C. Stone, G3FZL, 11 Liphook Crescent, London SE23 3BN. *(01-699 6940)*
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GUILDFORD: Mrs. H. M. Mullenger, G4OJO, *address wanted. (Aldershot 20384)*
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HARROW: C. D. Friel, G4AUF, 17 Clitheroe Avenue, Harrow, Middlesex HA2 9UU. *(01-868 5002)*
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HAVERING: A. Negus, G8DQJ, 17 Cortenay Gardens, Upminster, Essex RM14 1DH. *(Upminster 24059)*
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K.S.C.: P. J. Fay, G3AKG, 116 Lowfield Road, Caversham, Reading RG4 0PB. *(Reading 476718)*
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R.A.T.E.C.: R. Marsh, G8TYH, 43 Jenny Lane, Woodford, Cheshire SK17 1PE
REIGATE: C. S. Barnes, G8FEE, 25 Hartswood Avenue, Woodhatch, Reigate, Surrey RH2 8ET
ST. HELENS: D. Filer, G4OAM, 9 Heswall Avenue, Clock Face, St. Helens WA9 4DR. *(Marshalls Cross 820471)*
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SOUTHDOWN: J. Pitt, G6BGT, 18 Kingsmere Court, Hurst Lane, Eastbourne. *(Eastbourne 643463)*
SOUTH POWYS: J. Thoms, 41 Uplands, Brecon, Powys LD3 9HT. *(Brecon 3815)*
SPEN VALLEY: I. F. Jones, G4MLW, 54 Milton Road, Liversedge, Heckmondwike, W. Yorks. *(Heckmondwike 409739)*
STEVENAGE: T. Bailey, G6CRF, 187 Archer Road, Stevenage, Herts
STOURBRIDGE: M. Davies, G8JTL, 25 Walker Avenue, Quarry Bank, Brierley Hill. *(Lye 4019)*
STRATFORD-ON-AVON: D. Boocock, G8OVC, 181 Lower Binton, Stratford-upon-Avon, Warks. *(Stratford-on-Avon 750584)*
SUNDERLAND: A. Everard, G8PCD, 19 Roker Park Road, Sunderland, Tyne & Wear
SURREY: R. Howells, G4FFY, 7 Betchworth Close, Sutton, Surrey SM1 4NR. *(01-642 9871)*
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THANET: I. B. Gane, G4NEF, 17 Penshurst Road, Ramsgate, Kent. *(Thanet 54154)*
THORNBURY: A. Jones, G8AZT, 9 Queens Walk, Thornbury, Nr. Bristol
TORBAY: H. Davies, G4DZH, 18 Bowland Close, Paignton, Devon TQ4 7RT. *(Paignton 523063)*
VALE of WHITE HORSE: I. White, G3SEK, 52 Abingdon Road, Drayton, Abingdon, Berks.
VERULAM: A. Gray, G4DJX, 44 Sherwood Avenue, St. Albans. *(St. Albans 54190)*
WACRAL: L. Colley, G3AGX, Micasa, 13 Ferry Road, Wawne, Nr. Hull, HU7 5XU
WEST KENT: P. Reeve, G4GTN, 2 Court Road, Tunbridge Wells, Kent. *(Tunbridge Wells 24689)*
WORCESTER: A. C. Lindsay, G4NRD, 11 Durcott Road, Evesham, Worcs. WR11 6EQ. *(Evesham 41508)*
WIRRAL (WEST KIRBY): N. McLaren, G4OAR, 596 Woodchurch Road, Oxton, Birkenhead. *(051-608 1377)*
YEOVIL: D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil, Somerset.
YORK: K. R. Cass, G3WVO, 4 Heworth Village, York.

they have a Christmas Party on December 7. For the rest, refer to the Hon. Sec. – *see* Panel for his details.

At **Mid-Warwickshire** we have it that their Hq is at 61 Emscote Road, Warwick, on the first and third Tuesday evenings; December 21 is a social evening.

Norfolk come next, and they are at Crome Centre, Telegraph Lane East, weekly. On December 1 they have an RSGB Film, and on 8th there is a short meeting. "Bring the ladies" on December 15, and on 22nd and 29th they again have short meetings.

Turning to **North Wakefield**, they have Thursdays booked in at Carr Gate Working Men's Club; December 2 is informal, and on 9th they have the Christmas Dinner. That leaves December 16, 23, and 30, all of which are down for natter evenings to get the festivities out of the way.

Nice to hear again from **Nottingham**, who used to be so regular with their reports. They still have their home base at Sherwood Community Association, Woodthorpe House, Mansfield Road, Sherwood, Nottingham, and the weekly programme for December looks like: 2nd, a forum; 9th a talk on

VHF Propagation; 16th the Christmas Quiz; and on 23rd and 30th they will have the rig on the air if enough people want a break from the festivities.

Tamar Secondary School, Paradise Road, is home to the **Plymouth** crew. For the dates, we must refer you to the Hon. Sec. – *see* Panel.

There are only three December meetings of the **Pontefract** club; December 2 is an informal, and on 9th they have a cheese and wine party for members and wives. Another informal occurs on December 16, and the meetings on 23rd and 30th are both scrubbed out. The venue is the Carleton Community Centre.

Next, a new club – although frankly we wonder whether this is a club as we define 'em or not! It calls itself the "Radio Amateur Computer Club for Sharp MX-80K Owners", and is aimed at those who own one of these devices, and it is intended to act as a focal point for the interchange of programs, interfaces and indeed everything to do with the specified machine. Details obtainable from G8VHB at the address in the Panel.

Next we come to **R.A.I.B.C.** which caters so well for the blind and disabled adherents to our hobby – not to mention the Supporters and Representatives who also get much fun out of it. Details from the Hon. Sec. – *see* Panel.

R.A.T.E.C. is a club whose full name is Radio Amateurs Technical Engineering Club; they foregather on Monday evenings at the British Legion Club, Moor Lane, Woodford, Cheshire. Associate members are also welcome, and they receive the six editions of the news letter published each year. Details from the Hon. Sec. – *see* Panel.

On to **Reigate** and the Constitutional and Conservative Club, Warwick Road, Redhill. The next date is December 21 when they have "A Constructional Contest with Wine and Cheese" – we wonder what they can make from those?

Every Thursday evening, the **St. Helens** crowd head for the Conservative Rooms, Boundary Road; for the rest of the gen we must refer you to the Hon. Sec. – *see* Panel.

It seems an age since we last heard of **South Dorset** group, but they are still in residence at the Civilian Canteen, Army Bridging Camp, Wyke Regis, Weymouth, where their next get-together will be on December 7, for the Annual Club Quiz.

The **Southdown** Hq is at the Chasley Home for Disabled Ex-Servicemen, Southcliffe, Eastbourne, on the first Monday in the month; we don't know what they have set up for December, so a call to the Hon. Sec. is needed here.

Another new one is called **South Powys**, and this one is based on Concorde House, Brecon, where they have booked the first and third Tuesday of each month, and the committee are now busy organising a programme; they would like to hear from any visitors to the area, and of course potential new members. Details from the Hon. Sec. – *see* Panel.

As he promised in his last letter the Hon. Sec. of **Spen Valley** has sent us a programme of events at Old Bank Working Men's Club, Mirfield, West Yorkshire. December 9 is a committee-and-project night, and on December 23 they have their Christmas Social Evening.

A change of venue for the **Stevenage** club; they have moved, after some twenty-odd years, and now have their Hq at *T.S. Andromeda,* Shephall View, Stevenage; December 7 is the next date given and we understand they have a social evening also planned for this month – details from the Hon. Sec. – *see* Panel.

The **Stourbridge** group now foregather at the Cross Inn, Hagley Road, Oldswinford, on the first and third Monday of each month; December 6 is a natter session and on 20th they have a talk on "Sleighs on 70" which sounds to be a Christmas jollity.

Heading for **Stratford-upon-Avon** we find the locals have their place at the Control Tower, Bearley Radio Station, which lies on the road to Henley-in-Arden. They have a CW evening on December 13 (this is a talk, we gather), and on 27th, the normal meeting is cancelled.

If you are in **Sunderland**, and want to look up the locals, head for the Brewery, Westbourne Road, Sunderland; and for the dates and details we refer you to the Hon. Sec. – *see* Panel for his details.

Surrey have their place at *T.S. Terra Nova,* 34 The Waldrons, South Croydon, on first and third Mondays. December 6 is rumoured to be a "Silly Question Evening" which should be educational, and on 20th they have an informal, which we gather may QSY to some local ale-house. Details from the Hon. Sec. – *see* Panel. Incidentally, G8YLF recently passed his Morse test – at the tender age of seventy-six. Shame on the rest of us! Congratulations, and long may John enjoy his G4 call.

On now to **Thames Valley**; Thames Ditton Library meeting-room is the place, in Watts Road, Giggs Hill; Thames Ditton, on December 1, when they have a junk sale.

At **Thanet** they have bookings on December 3 for a talk on DX operating, and on 17th there is the Christmas Party. The venue is Birchington Village Hall.

Next we have **Thornbury,** where they have the first Wednesday of each month at the "White Horse", Grovesend, Thornbury. For December the talk will be on synthesizer techniques.

December's main meeting at **Torbay** will be the Christmas Party, on the last Saturday of the month; in addition they have informals every Friday evening; all are at the club Hq, Bath Lane, rear of 94 Belgrave Road, Torquay.

Now we head for the **Vale of White Horse** where the first Tuesday of December sees a social evening, while the third Tuesday is informal; the Hq is at the "White Horse" in Harwell Village.

Heading now to **Verulam**, the club have their AGM at the R.A.F.A. Hq in New Kent Road, St. Albans, on December 21.

WACRAL is a group of committed Christian radio amateurs and SWLs of all denominations, held together by nets and a newsletter worldwide. Details from the Hon. Sec. – *see* Panel.

Alternative Fridays at the Adults Education Centre, Monson Road, Tunbridge Wells is the form for **West Kent**; details from the Hon. Sec. – *see* Panel.

Worcester have been getting very good attendances at club meetings of late; find them at the Oddfellows Club, New Street on December 6 for a talk on microwaves, and on December 22 at the "Old Pheasant", New Street, for an informal.

Wirral (West Kirby) is a club based on the Irby Cricket Club Hq, where on December 8 they have a Chairman's Night.

Yeovil seems to have missed us out this month, but we can tell you that they have a place in Building 101, Houndstone Camp Yeovil, where they are to be found every Thursday evening.

Finally, **York**; the venue is the United Services Club, 61 Micklegate, and the gang get together every Friday evening.

Finis

That's the lot again, and it remains only for us to remind the laggards about updates, to tell you the deadline dates are in the 'box' as usual, and that they are dates to *arrive;* and of course, everything should be addressed to "Club Secretary", SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts. AL6 9EQ

Morse Course

Bradford and Ilkley Community College inform us that they are to run a course specifically to prepare students for the Post Office Morse examination. The one-year course starts on 12th January 1983, and classes are on Wednesdays from 7-9 p.m. Prospective students should contact the Course Tutor, P. Nurse, whose address is Bradford and Ilkley Community College, Division of Electrical & Electronic Engineering, Great Horton Road, Bradford, West Yorkshire BD7 1AY.

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QSL cards. Sample pack and price list forwarded on receipt of 22p stamp.—**Derwent Press,** 69 Langstone Drive, Exmouth, Devon EX8 4HZ.

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Amateur Equipment bought and sold, cash waiting. Contact G3RCQ, Hornchurch 55733 evenings.

Aircraft Communications Handbook, (Europe), including UK spot MF, HF, VHF, UHF, frequencies, military and civil airports, air traffic control centres, weather reports, broadcast times, beacons, long range stations, callsigns, maps, etc., 384 pages, £7.50 plus £1 p/p.—**PLH Electronics,** 97 Broadway, Frome, Somerset BA11 3HD.

Personalised QSL's 1000 for £13.75, 5000 for £46.20. **Jumbo logs** available, send s.a.e. for samples.—**Printshop,** 89 Derwent Street, Consett DH8 8LT.

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READERS

Sale: Several new Cathodeon 10 MHz xtal **oven** oscillator units (PCB mounting), £19 each. — Ring Chamberlain, Crawley (0293) 515201.

Wanted: Manual for 1944 R.C.A. AR88D receiver, good condition. — Box No. 5782, Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ.

Selling: Sony ICF-6700L receiver, 11 months Sony guarantee, £125. — Flat 2, 19 Chesham Road, Brighton, Sussex.

Wanted: Two-metre transverter, Europa, Microwave Modules etc. — Acton, 32 Hillcrest Avenue, Winshill, Burton-on-Trent. (Tel: 0283-63767).

For Sale: FT-480R 2-metre multi-mode transceiver, with 40w. linear and AT-145 ATU, all 15 months old, £350. — Ring Terry, G40XD, 0462-35248 after 6 p.m.

Closing Down: Trio 9R-59DS receiver. PSU, 350v. 150mA, 6v. 3A 3 times, 400v. 100mA, 4v. 3A, 12/6v. 7A; PSU, 12v. 3A, two units regulated, two outputs. No. 10 crystal calibrator. 2½-inch oscilloscope. Offers invited. — Rolls, 23 Brandreth Avenue, Dunstable, Beds.

Wanted: General coverage receiver, R-1000, FRG-7700 or similar. — Ring Oxby, Leeds (0532) 675489.

Wanted: S/H Signal R.528 6-channel scanner receiver. — Ring Robins, 01-998 4336 (Ealing).

For Sale: Test equipment, good condition, with some manuals: Taylor Model 62A signal generator, £80. Marconi TF-329G Q-meter, £60. Marconi TF-894A audio tester, £30. Wayne-Kerr B-521 component bridge, £60. Marconi TF-1342 low-capacitance bridge, £30. Heathkit IM-102 digital multimeter, £50. Schlumberger 1250 frequency counter, £20. Will sell the lot for £250. — Ring Zoltowski, Ruislip 75769.

Sale: Yaesu FR-DX400 amateur bands Rx with spare valves, speaker and handbook, £150. SR-9 2m. mobile Rx with mag-mount antenna, £33. G3HSC Morse Tutor, £5. Various *Rad Coms,* text books, valves, components, etc: offers.— Ring Garlick, Pontefract 795821.

Selling: A.E.A. MBA-RO CW/RTTY/ASC11 reader, as new (purchased July), guarantee, £145. — Ring Dubois, 0767-80291 evenings.

Selling receivers: Redifon R-408 marine receiver; Hammarlund, £135. VHF Rx, 70-300 MHz, £85. Marconi universal bridge, £35. Avo multimeter, £25. — Ring Wright, Wigan 55948.

Sale: FT-225RD, fixed channel xtals fitted, muTek front-end, very good condition, £525. — Ring Threapleton, Stamford (0780) 52504.

For Sale: Icom IC-215 2m. FM portable transceiver, 3w., 13 channels fitted, with nicads, charger and helix, £90. — Ring 0702-614122.

Selling: TR-7800 2m. FM transceiver, 25 watts. — Arnfield, G8BHW, QTHR. (Tel. Leighton Buzzard 374928).

Offering: R.C.A. AR88LF communications receiver, 75 kHz to 30.5 MHz, 12-valve, original, unmodified, with speaker and full data. Any reasonable offer acceptable. — Ring Recks, Brighton (0273) 737076.

Wanted: New licensee urgently requires external VFO-30 for Trio TR-7200G. — Ring 021-426 2177.

For Sale: Complete station, all bought new Dec. 1980, hardly used. Drake TR-7 transceiver, PS-7 power supply, SL-1800 and SL-6000 fitted, plus NB-7 and AUX-7, MN-2700 tuner, B-1000 balun and AK-75. HAL DS-3100, ASR and ST-6000. — Ring Walton-on-Thames 55157.

Wanted: Ex-Army R.210 receiver with ATU. — Ring Wigan 38865.

Selling: Entire station comprising: Heathkit SB-100 transceiver, SB-600, SWR bridge, D-104 mic., Diamond 10-80m. trapped vertical, LP filter, £250 or near offer. — Ring Griffin, 0733-203169 evenings.

For Sale: Datong 2m. converter, unboxed, £15. Microwave Modules MM2001 RTTY to TV converter, used once, £130. — Ring Williams, 0376-23604 after 6 p.m.

Wanted: Racal RA-17L receiver in good condition. Details and price please. — Newland, 34 Francis Avenue, Colwyn Bay, Clwyd LL28 4DW.

January issue: due to appear December 31st. Single copies at 85p post paid will be sent by first-class mail for orders received by Wednesday, December 29th, as available. — Circulation Dept., Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ.

Sale: Icom IC-255E 2m. FM transceiver, with regulated DC power supply, very little used, original packing, £150 cash only. — Box No. 5780, Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ. (Or ring Brookside 2894).

Selling: KW-2000B, very good condition, £195. **FRG-7**, excellent condition, £125. **IC-202S**, very good condition, £130. **MK-123** Rx/CW-Tx, 2/20 MHz, PSU, £55. — Alder, G4GMZ, QTHR. (Tel: 02602-2649).

Sale: Yaesu FT-107M with all WARC bands, plus FC-107 ATU and FP-107E PSU, £650 or near offer. Trio TS-780 2m. and 70cm. multimode, with pre-amps. fitted on both bands, £675 or near offer. Pye W.15AM Westminter, low-band 6-channel AM, with all accessories, in mint condition, £80 or near offer. — Ring John, G8KBQ, 0458-33145 after 5 p.m.

For Sale: Trio TR-2300, excellent condition, complete with nicads and accessories, £125. Or any offers? — Ring Jones, Devizes (0380) 3087.

Selling: Owing to unforeseen circumstances, Trio R-1000 with HS-4 headphones and Partridge Joyframe multiband triangle antenna and tuner, as new, £300 cash. Buyer collects, or add £20 for Securicor delivery. — Ring Brighton 727431 any evening.

Wanted: TS-130/TS-520/TS-820 or similar HF transceiver. Also FRG-7700 or similar receiver, and multimode 2m. transceiver. — Ring Godwin, 0246-473086 day, 0773-874768 evenings.

For Sale: HRO Senior, with six bandspread coils, spare valves, service manual, unmarked and unmodified. Offers? — Ring Hurrell, Seaford 891195.

Sale: Yaesu FRG-7700 receiver, mint condition, as new, boxed with handbook, £240. — Ring 01-639 5576.

Wanted: Collins "S Line", including linear, KWM-2, 51J3/4, 51S1, KWS-1. *For Sale:* K.W. Viceroy Tx, 180w. p.e.p., 150w. CW, with original PSU, £55. Marconi Falcon marine SSB Tx, 150w. p.e.p., solid-state, with TT-100 PA and matching Rx, manual, £80. — Clappison, 190 Victoria Avenue, Hull HU5 3DY. (Tel: 0482-43353).

Wanted: Urgently by terminally ill beginner, operating handbook for **Yaesu FRG-7**, good price paid. — Box No. 5781, Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ. (Or ring Romford 40571).

Sale: Vintage communication receiver National HRO, working, good condition. Offers? — Ring Doughty, 01-950 1481 (Watford).

Wanted: Communications receiver in mint condition (VHF/UHF, FM). — Ring Knudsen, Lymington (0590) 76603.

Selling: FT-901 transceiver, with AM and CW filters, £550. YO-901 Monitorscope including Panadaptor, £195. IC-730 with IC-PS20 240v. power supply, £495. All in mint condition and no mods history. — Ring Price, G3KDH, Tring 3505.

For Sale: Bearcat 250F scanning receiver, good condition, £120 or near offer. — Dawes, 3 Chestfield Road, Chestfield, Whitstable, Kent. (Tel: Chestfield 2123).

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