

The SHORT WAVE Magazine

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TRIO TS700S

NEW TS700S. 2 metre all mode transceiver

The TS700S is intended to be top of the line in 2 metre multi mode stations. Building on the solid foundation of the TS700S with its outstanding signal quality and unbeatable receiver dynamic range, TRIO have now incorporated all the facilities which customers have expressed a wish to see in the 700 series. Main new features are:

Digital readout

Built into the rig and using the same easy on the eye blue/green readout tube as the TS820. The counter is a complete frequency measuring system and incorporates the VFO and carrier oscillator frequencies to measure the CW transmit/receive shift as well as USB/LSB shift. The display reads to 100 Hz on SSB and CW but is automatically rounded off to the nearest 1 kHz on FM—However—if you insist on reading to 100Hz, the touch of a switch restores this facility on FM also.

Smooth accurate tuning

Using the new dual ratio gearbox with flywheel action for fast band scanning. It is true to say that nothing compares with a real VFO backed up by first class mechanical engineering, when it comes to pin point accurate tuning of SSB and CW.

Receiver pre amplifier

The TS700S is fitted with a low noise receiver pre amplifier with carefully calculated gain figures to give that extra performance when digging into the noise for real DX. When signal levels are high, simply remove the pre amplifier at the touch of a front panel switch.

Vox operation

And break in CW using the built in VOX system. Front panel gain and delay controls allow instant adjustment to suit every situation.

High/low power

A front panel button allows instant selection of high power or a nominal 1 watt low power transmitter output.

Split frequency working

Using the new external VFO unit VFO/700S. The frequency of the external VFO is checked by the digital readout on the TS700S. A press switch on the VFO allows instant frequency checking at any time and any frequency split or full transceiver operation can be carried out using the external VFO. A unique accessory for the VHF operator.

New standards of performance

On the samples which we have checked, the 10dB S/N ratio sensitivity is around 0.15 μ V on SSB and the 20dB quieting level is less than 0.2 μ V on FM. This gives the TS700S a real lead over any other rig around.

Plus of course all the features which make the 700 series so outstanding. Remember the signal quality resulting from the use of a high supply voltage on the PA and driver giving unbeaten linearity (TRIO patent). Remember the rugged, go anywhere construction which makes the 700 series so popular on expeditions and field days. Remember the all mode (AM, FM, USB, LSB, CW) operation—not all rigs have them. Remember the Simplex/Repeater/Reverse repeater operation available at the turn of a switch.

Finally, remember the combined reputations of TRIO and Lowe Electronics and you will agree with us that for the ultimate 2 metre all mode station it has to be the TS700S.

TS700S £542 inc. VAT.

VFO70S £83 inc. VAT

LOWE ELECTRONICS

TR-7500

Why settle for anything less ?



The TR7500 is the very latest 2 metre FM mobile to be introduced by TRIO and will delight the owner with its combination of performance, reliability and unique design. It represents another step forward in the TRIO product line and is designed to give you the very best FM transceiver available in its class.

Whatever you now own, or may have been thinking of buying, it would be foolish to settle for anything less than the TR7500.

PLL Synthesiser, no crystals to buy, ever, with the TR7500 since the operating frequencies are generated by a TRIO designed LSI phase locked synthesiser. This provides 80 FM channels at 25 kHz spacing from 144-146 MHz, all 10 repeater and reverse repeater channels. The channels are selected by a single knob and no programming is required from the user—just unpack the rig, connect 12 volt dc and you are on the air.

Unique display

TRIO attention to detail at its very best is shown in the method used to display the channel number. TRIO believe that ease of use is the priority consideration, and have arranged the large LED display to show the correct channel number at all times. If you want to operate on S24, turn the channel knob until the display shows 24—simple isn't it? Need R7? Turn the knob until the display shows 7. There's no need to wonder "did I programme S24 into channel 15 or channel 9?"

Repeater operation

Available at the touch of a front panel switch. Turn this to "N" (normal) and you operate normal repeater with 600 kHz receiver up-shift. If you wish to listen on the input, turn the switch to "S" (Simplex), and you are there—and can operate simplex on the input frequency. Need reverse repeater? Turn the switch to "R" (reverse) and you operate with transmitter up-shift of 600 kHz. This facility is most useful when you hear several stations calling into a repeater with only one (of course) appearing at the output. Using reverse repeater operation, you can call into the pack to invite anyone to a simplex channel for direct QSO.

Automatic tone burst is provided, with a front panel LED to remind you that you have the tone burst on. Needless to say, the 1750Hz is generated by TRIO's unique tuning fork oscillator which guarantees spot on frequency at all times and in all temperatures.

Performance plus

A combination of multi section helical filtering at signal frequency, monolithic crystal filters at 10.7 MHz, and sharp multi pole filters at

455 kHz allows the TR7500 to keep on working under strong adjacent signal conditions when other rigs give up.

The receiver performance for sensitivity is excellent. On the samples checked so far, we obtain 12dB SINAD for a startling 0.18 microvolts and under mobile conditions, we copy repeaters in terrain which previously presented real signal problems.

The transmitter generates a true FM signal at 10.7 MHz which is translated directly to two metres in a fully balanced mixer system. This guarantees a superbly clean signal with no unwanted multiplier products, and an all new PA system with specially developed transistors, gives rugged reliable power in excess of 10 watts.

As a final test for freedom from unwanted in band signals, we ran the TR7500 at full output with a TS700G coupled to it on the bench. Tuning from 144-146 MHz on the TS700G, we found just one signal—the wanted one. It was impossible to find a single unwanted signal coming out of the TR7500 under these extremely severe conditions. Wideband checks using the analyser revealed no spurious outputs detectable above noise level. At this point we retired happy!

Attention to detail

As is well known, TRIO introduced the since copied variable power SWR protection system, and it is of course fitted to the TR7500 with an improved high gain dc amplifier for tighter and faster control.

High/low band change is by push button, with S-meter illumination colour change to remind you of the band in use.

Another simple but typically TRIO thoughtful provision is the special channel knob with a deep moulded indent at S0. You can set this vertical by touch alone and can then count up the channels without even seeing the channel display. Great when mobile and you need your eyes on the road.

Finally the TR7500 with all its potent performance is packaged in a case not much bigger than a TR2200GX!

Accessories

The TR7500 is supplied complete and ready to use with the TRIO, quick release mobile, microphone, power leads, comprehensive manual etc., etc. Nothing more to buy to own the best mobile/fixed station FM rig on the market.

DON'T SETTLE FOR ANYTHING LESS

THAN THE TR7500

£225 inc. VAT



TRIO

LOWE ELECTRONICS

The new TS520S

The TS520S is the logical development of the TS520, the rig which has earned high praise from amateurs the world over. The TS520S keeps the main design features which made the TS520 a success but has an updated specification which includes full 160 metre coverage, 15 MHz WWV and an auxiliary uncommitted band for possible future amateur frequency changes.

Outstanding receiver performance

Due to the use of a 35K35 dual gate MOSFET RF amplifier which gives excellent cross modulation performance. The 35K35 has a low noise figure (typically 3.5 dB) and high gain (typically 18dB). The result is that the TS520S has a receiver sensitivity better than 0.2 μ V for 10 dB S+N/N ratio on all bands.

New speech processor

The TS520S incorporates a new audio compression system for extra punch in the pile ups and when the path is fading—and it does it without the distortion of clipping.

Vernier PA tuning

Slow motion tuning drive to the PA anode tuning control guarantees easy, accurate tuning at all times.

Effective noise blanker

The TS520S is fitted with an advanced noise blanker system for elimination of impulse and ignition interference. Just one of the de luxe features fitted as a standard item to the TS520S. The transceiver is also fitted with a 20dB attenuator selected by a convenient front panel push button.

AC power supply

The TS520S is completely self contained with a built in top quality AC power supply 100-240v. ac. The addition of the optional DS1a DC-DC converter allows mobile operation from any 12v. dc supply.

One thing has not changed

Trio's excellent speech quality due to the use of a pair of rugged 6146B PA tubes. When we asked the Trio designers if they were considering a solid state HF transceiver, their reply was "when anyone can produce a solid state PA which can match the low intermod performance of proper transmitting tubes, we

shall then produce a solid state rig. Until then, we prefer to keep our signals clean." They are only stating the facts that existing Trio owners know—that Trio signals sound outstandingly good on the air.

All the other features which made the TS520 so popular are retained—RIT control, 8 pole 55B filter, 25 kHz calibrator, separate carrier and mic gain controls, semi break in CW with keyed sidetone, VOX/PTT/MOX operation, low power tune up for long PA life, built in speaker, built in low noise cooling fan, fixed channel operation, etc., etc.

A new digital readout unit, the DG-5 is

available as an option, and in the TRIO tradition of doing the job correctly, the DG-5 mixes the carrier oscillator, VFO, and heterodyne oscillator frequencies so as to display the true operating frequency at all times.

The DG-5 sits on top of your rig and shows the frequency in six large easy to read digits.

A unique feature is that the DG-5 can be used as a normal frequency counter from 100 Hz to 40 MHz at the touch of a switch.

TS520S owners

The DG-5 will also work with your rig using the DK 520 adaptor kit.

TS520S £489 inc. VAT. DG-5 £132 inc. VAT

TS520S



TS820

The ultimate transceiver... TRIO's TS-820. No matter what you own now, a move to the TS-820 is your best move. It offers a degree of quality and dependability second to none, and as the owner of this superb unit, you will have at your fingertips the combination of controls and features that, even under the toughest operating conditions, make the TS-820 the leader that it is.

Unprecedented demand plus the painstaking care TRIO lavishes on each TS820 created an initial backlog of orders but happily we can now supply the TS820 from stock. Once you have operated the TS820, you will not be satisfied with anything else.

Features

SPEECH PROCESSOR ● An HF circuit provides quick time constant compression using a true RF compressor as opposed to an IF clipper. Amount of compression is adjustable to the desired level by a convenient front panel control IF SHIFT ● The IF SHIFT control varies the IF passband without changing the receive frequency. Enables the operator to eliminate unwanted signals by moving them out of the passband of the receiver. This feature alone makes the TS-820 the pacesetter that it is.

PLL ● The TS-820 employs the latest phase lock loop circuitry. The single conversion receiver section performance offers superb protection against unwanted cross-modulation. And now, PLL allows the frequency to remain the same when switching sidebands (USB, LSB, CW) and eliminates having to recalibrate each time.

Specifications
FREQUENCY RANGE: 1.8-30 MHz (160-10 metres)

MODES: USB, LSB, CW, FSK
INPUT POWER: 200W PEP on SSB
160W DC on CW
100W DC on FSK

ANTENNA IMPEDANCE: 50-75 ohms, unbalanced.
CARRIER SUPPRESSION: Better than 40dB.

SIDEBAND SUPPRESSION: Better than 50dB.
SPURIOUS RADIATION: Greater than -60dB (Harmonics more than -40dB)
RECEIVER SENSITIVITY: Better than 0.2 μ V.
RECEIVER SELECTIVITY:
SSB 2.4 kHz (-6dB)
4.4 kHz (-60dB)
CW 0.5 kHz (-6dB)
1.8 kHz (-60dB)

*With optional CW filter installed.
IMAGE RATIO:
160-15 metres: Better than 60dB.

10 metres: Better than 50dB.
IF REJECTION: Better than 80dB.
POWER REQUIREMENTS: 120/240v. AC 50/60Hz. 13.8v. DC (with optional DS-1A DC-DC converter).
POWER CONSUMPTION:
Transmit: 280W.
Receive: 26W. (heaters off).
DIMENSIONS: 13 $\frac{1}{2}$ "w. x 6" h. x 13 $\frac{1}{2}$ " d.
WEIGHT: 35.2lb. (16kg.)
DG-1, digital readout optional.
TS820 £645 inc. VAT DG-1 £127 inc. VAT



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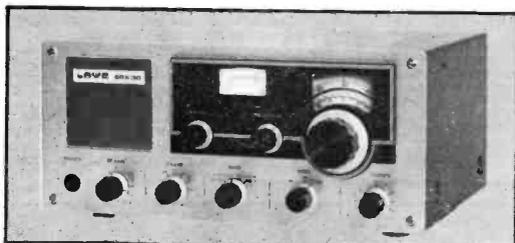
Disconnected ramblings

Every month I have the impossible task of trying to reconcile two opposing requirements, one the need to give adequate and correct details of particular equipment, the other to provide the reader with some idea of the wide range of amateur and professional equipment which we and our agents carry in stock. On this page, therefore, I shall simply ramble on about some of the wider range in an attempt to cover the second requirement.

NEW THINGS

We have in stock the new TD960 video display unit. Replacing and updating the well known TD224 system, the TD960 is much more than an RTTY video display. It can receive RTTY at 45, 50, 75 and 100 baud but in addition, operates in ASCII code at 110 and 300 bauds for data transmission, VDU use or as a terminal for micro-processor data. It will accept inputs, from current loops, TTL or different voltage levels and anything it can receive, it can also send. The AFSK RTTY generator is built in as is the UHF modulator system for the TV display.

The on screen display is as recommended by the BBC for domestic TV viewing i.e. ORACLE or CEEFAX and consists of 24 lines of 40 characters per line. It's really superb in use—it's all British made, and requires more space than this to describe—just ask us for details.



SRX-30 receiver

For the keen short wave listener and the radio amateur who needs to tune around frequencies other than the amateur bands, the new SRX-30 is the one. This all new receiver covers the entire range of 500 kHz or 30 MHz in 30 bands and caters for AM, USB, LSB and CW reception. Using advanced drift cancelling techniques, the SRX-30 is the receiver for stable, trouble free listening. Housed in a rugged case measuring only 12½" x 5½" x 9" deep, the SRX-30 operates from 12v. dc or 100-240v. ac and with its built-in speaker, gives high performance, go-anywhere capability.

The SRX-30 brings a new high standard to low cost listening—at £152 including VAT, it has to be seen and used to be appreciated—ask for full details now.

VHF/UHF operators

After you have erected your shining new beam and connected the shining new coax, have you wondered where your signal is being lost? That's right—in the feeder. Current thinking suggests using

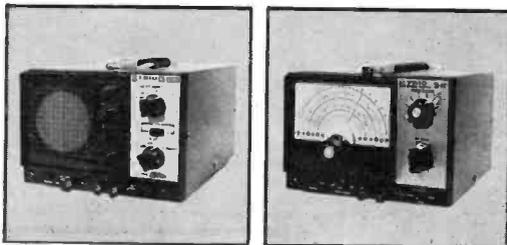
mast-head preamplifiers to boost the signal at the aerial feed point before pushing it down the coax but of course you need some smart switching arrangements to ensure that when you stick RF back up the feeder from the TX, you bypass the preamp otherwise that puff of white smoke from the mast-head may tell you either (a) the new Pope has been elected or (b) you've just done in your preamp!

From Daiwa, who are well known for top quality RF products, we are now stocking their range of mast-head preamps for 2 metres and 70 cm. Models are available which include mast-head selection of two aerials and a top of the range model which gives gain in both receive and transmit directions with a built in linear.

If you want to be ahead with your DX chasing, mount a head amplifier by DAIWA on your mast. Send for full details NOW.

For the lower frequency bands, many operators have problems involving long aerials and short gardens. We can help out by offering the range of RAK trap dipoles. These top quality aerials cater for all sorts of requirements and include the AL48DXN giving 2kW, rated 80/40m, operation in only 23 metres overall length for around £25, the MIDY VN which gives 80-10m. coverage at around £40, the superb LISTENER 3 which is designed for the advanced SWL and is complete with feeder, support ropes etc. at around £25 and other models down to about £10.

Why bother struggling to find wire and insulators when you can find RAK quality at these prices?



TEST EQUIPMENT

We've been creating quite a stir in the oscilloscope field recently with the professional series of dual trace models from Trio. Three scopes having bandwidths of 10 MHz, 15 MHz and 30 MHz complete with two matching full bandwidth X10 probes at prices starting from £250 constitute the best sellers at the moment. For the radio amateur, there is a single beam 5 MHz bandwidth workshop oscilloscope at £108 inc. VAT and the same instrument with RF pickup and two tone oscillator for station monitor use at £129 inc. VAT. Also for the amateur, the DM300 dip meter has sold like mad—in fact the first shipment vanished in a week. Far more than a normal GDO, the DM800 can be used as a signal generator, xtal activity checker and is a first class instrument for many, many purposes.

We should by now have the AG202 and SG402 matching AF and RF signal generators for general purpose shack use. Very neat and compact in matching cases to the 5 MHz scope, these two units complete the well equipped workshop or shack—ask us for details. We also stock every possible accessory from plugs and sockets upwards but it's impossible to list them all. If you send 55p in stamps to Matlock and request our short form catalogue and price lists, you will receive an invaluable reference book of our products—do it NOW! 55p only.

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Telephone: 01-669 6700—closed Mondays and Saturday afternoons.

27 Cookridge Street, Leeds, Yorkshire, LE2 3AG

Telephone: 0532 452657—closed Mondays.

Soho House, 362-364 Soho Road, Handsworth, Birmingham B21 9QL.

Telephone: 021-554 0708—closed Mondays.

AGENTS : John—G3JYG, 16 Harward Road, Ringmer, Lewes, Sussex.

Telephone: Ringmer 812071 (evenings and weekends).

Sim—GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow.

Telephone: 041 771 0364 (evenings and weekends).

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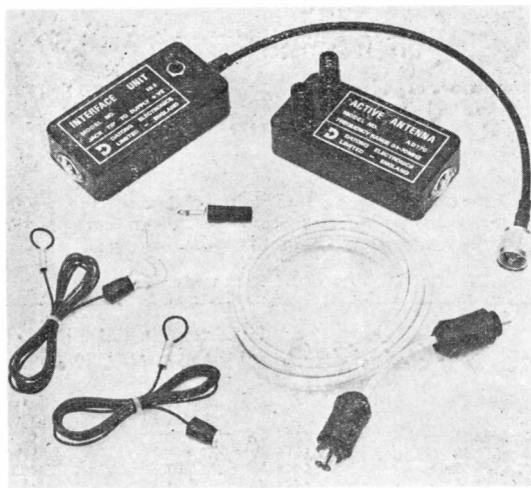
NEW : ACTIVE RECEIVING ANTENNA

A COMPACT INDOOR ACTIVE DIPOLE FOR 60 kHz to 70 MHz

MODEL AD170 Continuing our policy of constructive innovation we are proud to introduce what we think is the first broadband active dipole antenna at a price which puts it within easy reach of the Radio Amateur or short wave listener.

The Datong Active Antenna is designed for indoor mounting only but in all electrical respects it is in the same league as the active antennas the professionals use, and for which they pay prices comparable to a complete amateur bands transceiver.

The same performance advantages which make active antennas attractive to professionals make Model AD170 especially attractive to the amateur. They include :

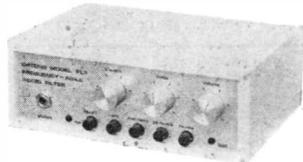


- ★ Ultra broadband coverage from 60 kHz to 70 MHz.
- ★ Ideal for remote mounting (e.g. loft or attic) since no tuning adjustments are required.
- ★ Only 3 metres long yet signal-to-noise ratios in the LF and HF ranges are comparable to those from much larger conventional antennas.
- ★ Uniform sensitivity over the full frequency range minimises receiver intermodulation effects.
- ★ Balanced dipole configuration gives choice of polarisation plus useful directivity and eliminates dependence on ground plane or earth connection.
- ★ No need for expensive accessories such as antenna tuner units or matching units.

Although active antennas give lower signal strengths than conventional antennas, received noise levels are also lower and therefore signal-to-noise ratios are comparable when used with modern sensitive receivers.

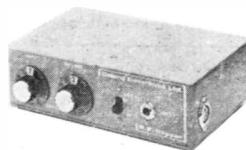
Model AD170 is supplied fitted with PL259 coaxial output plug and complete with the accessories shown in the illustration, i.e. interface unit, head unit, 4 metre coaxial connecting cable (extendable if necessary), two 1.5 metre dipole elements, spare jack plug. A separate DC power supply is required (12v. at 80 mA) and this plugs into the interface box and feeds the antenna via the coaxial cable. A suitable mains power unit is our new Model MPU (see special package price below).

FREQUENCY-AGILE AUDIO FILTER MODEL FLI



A versatile bandpass or band-reject filter with fully variable bandwidth and centre frequency plus unique search/lock/track capability for automatic removal of heterodyne whistles. Improves reception of CW, RTTY, and SSB. Connects between receiver and loudspeaker.

R.F. SPEECH CLIPPER MODEL RFC



Processes speech as a SSB signal at 80 kHz to increase its ratio of average to peak levels without adding harmonic distortion. Improves talk power of SSB, FM, and AM transmitters without increasing the peak transmitted power. Connects between microphone and transmitter. (See articles by Dr. D. A. Tong, Wireless World Feb. 1975, 79-82 and Oct. 1976, 77-81).

UP-CONVERTER MODEL UC/1



Adds full receiving coverage from 90 kHz to 30 MHz to existing receivers or transceivers tuning 28-29 MHz or 144-145 MHz. The full range is covered in thirty 1 MHz wide synthesiser controlled segments. Also works as a two-metre converter. Connects between receiver and antenna.

MAINS POWER UNITS MODELS MPU & MPU/1

Good quality mains adaptors designed and made in the U.K. specifically for use with our products. The unbalanced output is suitable for Models FLI, AD170, and UC/1 when using 240v. AC mains, and for FLI and AD170 when using 220v. AC mains. MPU has a built-in 13 amp fused mains plug while MPU/1 has an 18 inch long mains lead. When ordering please specify whether output plug is required to suit FLI, AD170, or UC/1.

PRICES : (NOT INCLUDING VAT) : AD170 £29.50, MPU and MPU/1 £5.50, AD170 + MPU or MPU/1 special package price £33.00, FLI £53.00, UC/1 £105.00, RFC £40.00, RFC/M £21.50 (PCB version of RFC).

All prices are subject to VAT at 12½%. Prices include delivery within U.K. More data on any product plus complete price list showing accessory leads, etc., available on request.



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SP101B £15.00	FP301 £89.00	FL101 £395.00	*YC500S £209.00
SP101PB £38.00	FV301 £73.00	FL101RF £429.00	*YC500J £149.00
*YO100 £149.00	SPI20 £15.00	FT227R £189.00	*YPI50 £45.00
FT200 £299.00	FL110 £119.00	FT221R £399.00	YC601 £115.00
FP200 £65.00	*YO301 £152.00	FT223 £149.00	YC221 £73.00
FV200 £73.00	LL301 £28.00	FTV250 £165.00	QTR24 £14.00
FT7 £299.00	301 Relay box £9.00		YD844 £17.00
	FC301 £95.00		YD846 £7.00
			YH55 £8.00

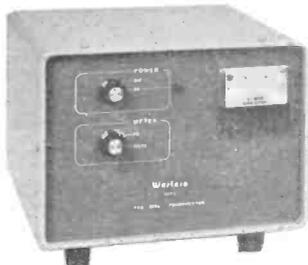
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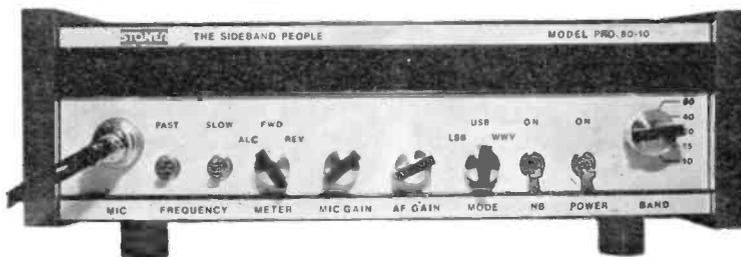
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GREAT PERFORMANCE!**

FDK QUARTZ-16

NOW £149.75 inc. VAT !

THE FASTEST SELLING 2 METRE VHF FM MOBILE CAR TRANSCEIVER

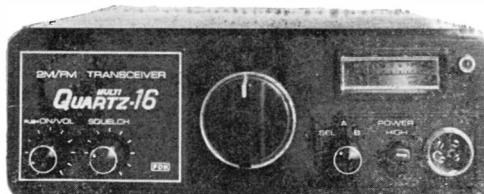
**EASY PAYMENT PLAN
DEPOSIT: £30.75**

Balance:

12 monthly payments of £11.31

18 monthly payments of £8.02

24 monthly payments of £6.33



Here it is, the no-nonsense car mobile transceiver that enables you to keep in touch with all your friends whilst driving around town or across country. The Quartz-16 is a compact single packaged transmitter-receiver that only requires 12v. DC from your car battery plus a suitable aerial (priced from £2.95) for you to enjoy the true thrills of VHF FM mobile operation.

The front illuminated panel control selects the channel required. For example, "S20" is the main calling and monitoring channel. "S22" is the mobile calling frequency. Once you have established contact you simply change frequency to one of the other channels that are not in use for continuation of your private contact.

With the Quartz 16 you will also be able to work through any of the dozen or so repeater stations dotted around the major cities in the U.K. Included in the Quartz 16 is a special in-built tone that automatically switches on your local repeater station thus enabling you to make contact with other fixed or mobile stations up to 100 miles away or more. Yes, whichever way you look at it, the Quartz-16 is a powerful package at a price that makes sense. If you simply want to communicate why pay more—we can quote for a complete packaged mobile station including transceiver, aerial cable, etc. at a price lower than any other model! and that includes a 12 month guarantee with off-the-shelf spare parts—we import direct from our factory in Japan—you save! It's as simple as that.

For the technically minded, here's a few additional pieces of information. The transmitter is 12 watts output switchable to 1 watt for local or private contacts. A squelch control enables you to set the receiver so that any station operating on the channel you are tuned to automatically switches your receiver on. If there are no signals then there is no noise! A large slide-rule meter indicates the strength of the received station and the power output of your transmitter. The transceiver is capable of operating on up to 25 different channels selected by the front panel switch including 2 priority channels that over-ride the main dial setting. The transceiver comes supplied with simplex channels S0, S22 and repeaters R3, R4, R5, R6 and R7. The price includes microphone, connecting cables, quick release mobile brackets and all hardware.

Additional accessories: 3 extra channels S21/22/23—£7.50

Standard aerial £2.55

High gain aerial £7.95

Aerial (no-hole boot mount) £3.50

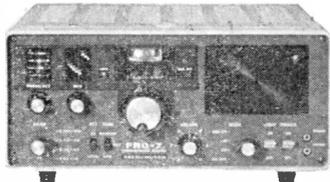
MOTORWAY OR COUNTRY LANE — YOU'RE NEVER ALONE WITH THE Q-16!

LISTEN IN ON THE ACTION! — THE FUN & THRILLS

SIGNALS FROM DARKEST AFRICA TO THE NORTH POLE

OR KEEP IN TOUCH ON THE ROAD OR AT YOUR FIRESIDE WITH YOUR LOCAL AMATEURS
WE'VE GOT THE ANSWER BELOW:

**YAESU FRG7
SHORT WAVE RECEIVER**



**GREAT VALUE — GREAT PERFORMANCE
STILL £162 inc. VAT delivered UK**

Whether your interest is in amateur band listening or short wave broadcast monitoring, this receiver must be your first choice. Rarely does one find a low cost receiver that embodies the advantages of general coverage whilst retaining first class band-spread—but the FRG7 is the exception. None of the weaknesses manifest in similar models such as drift, cross modulation, image problems or poor calibration are evident in the FRG7. We have sold many of these receivers to customers throughout the U.K.—and all agree the FRG7 is a winner.

If you're thinking of buying one, why not give us a visit, telephone call or drop us a line. We'll be glad to give you any additional information you may require. And remember, we have our own fully trained service personnel to give you the back-up service that has made us one of the U.K.'s leading communications retail outlets.

**TM56B AMATEUR VHF
MONITOR RECEIVER**

230 volts AC 12v. DC 10 Channels fitted

12 CHANNELS
+
4 AUTOSCAN



IN STOCK NOW

Tune into the exciting World of Amateur Radio with this advanced monitor receiver. Listen to your local amateur radio stations both fixed and mobile, direct or through your local repeaters. From the comfort of your fireside chair using the built-in 230 volt AC power supply, this receiver will open up the whole new World of VHF Amateur Radio for you... Alternatively the necessary hardware supplied enables you to power the TM56B from your car radio battery for true mobile operation.
GREAT VALUE

Little wonder that the first shipments of these beautifully engineered receivers were sold out within weeks of the advertisements appearing. We're really amazed at their superb performance at such a low price.

SOUND DESIGN

The design is well and truly tried and tested, and the circuitry is almost identical to the receiver section of the FDK mobile transceivers. Both sensitivity and selectivity leave nothing to be desired and the auto-scan enables the popular calling channels to be continually monitored for activity.

NO HIDDEN EXTRAS

The receiver is supplied complete with all leads, circuit diagram crystals for channels S0, 20, 21, 22, 23, R3, 4, 5, 6, and 7 plus space for a further 6 channels making 16 in all. An additional matching desk top aerial is also available at £2.50 extra.

£85 including delivery and VAT.

ELECTRONICS

TELEX 897406

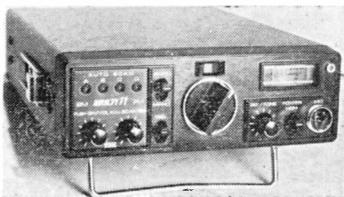
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MAIL ORDER
SERVICE
& EXPORT**

FEBRUARY BARGAINS!



MULTI-11 2M FM

- ★ Deluxe tcvr.
 - ★ Auto Scan
 - ★ 28 channels
 - ★ 10 fitted
 - ★ Auto-tone burst
 - ★ Pre-amp
- £199-68



SAE for Brochure

NAIGAI 2200 LINEAR



ORDER NOW
FOR
DELIVERY
FEB/MARCH

230v. AC—500W. PEP input
(400W. FM)
TUBE—4CX-350 (Fan cooled)
RECEIVER PRE-AMP—10dB
12v. DC OUTPUT—3 amps

DRIVE REQUIRED—
10-13 Watts
FREQUENCY—144-146 MHz
SWR METER—Built-in.

STOCKTAKING SPECIALS!

Qty.	Description	List	Special
2	Yaesu FT221R	£382	£335 (cost)
2	FDK Multi-11 (10 ch.)	£199	£179 (cost)
1	Declan programmable keyer... ..	£54	£45 (n/c)
1	QM70 Cobra 70cm. transverter	£86	£75 (n/c)
1	Quartz-16 (5 ch. only fitted)	£149	£95 (n/c)
1	QM70 4m. conv. 28/30	£19	£16 (n/c)
1	QM70 70 cm. conv. 28/30	£27	£22 (n/c)
1	QM70 23 cm. conv. 28/30	£27	£22 (n/c)
2	Comni VHF 1120 ch. air band receivers	£295	£245 (cost)
12	MONTHS GUARANTEE	S.A.E. or phone for details	

FEBRUARY DISCOUNTS

	List	Discount	(Carriage)
ANTENNA SPECIALISTS			
ASP 201 1/2 wave	£3-03	£2-55	(£0-50)
ASP 2009 3/4 wave	£7-95	£7-10	(£1-00)
ASP 677 de luxe 3/4 wave	£15-75	£14-20	(£1-00)
ASP No hole boot mount	£3-50	£2-60	(£0-50)
K220 Magnetic mount	£9-50	£6-50	(£0-75)
SHURE MICROPHONES			
201 hand type 50k	£14-18	£11-25	(£0-50)
444 desk type 50k	£31-72	£25-50	(£0-75)
526 Desk type 600/50k ohm	£38-47	£31-00	(£0-75)

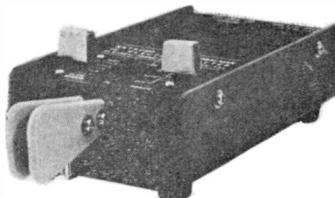
TESTED TRADE-INS

Drake SPR4 Rx 160-10m. + 10 BC bands	£350
ICOM IC201 2m. all-mode	£295
ICOM IC22A fitted 10 ch. as new	£149
ICOM IC215 fitted 12ch. plus ni-cads and AC charger (as new)	£159
ICOM IC 225 (as new) 80 ch's.	£165
Yaesu FR101 Rx 160-10m. + BC	£349
Liner-2 2m. ssb tcvr. + AC PSU	£149
Heath GR 78 Rx.	£89

JAYBEAM VHF/UHF ANTENNAS

4Y/4M 4 el. yagi	£12-65	(£2-00)
PMH2/4M 2 way harness	£8-35	(£0-75)
C5/2M 5dB colinear	£30-95	(£2-00)
5Y/2M 5 el. yagi	£7-70	(£1-00)
8Y/2M 8 el. yagi	£10-50	(£1-00)
10Y/2M 10 el. yagi	£21-32	(£1-50)
PBM10/2M parabeam	£25-37	(£1-50)
PBM14/2M parabeam	£31-16	(£2-00)
5XY/2M 5 el. x'd yagi	£15-97	(£1-50)
8XY/2M 8 el. x'd yagi	£19-91	(£2-00)
10XY/2M 8 el. x'd yagi	£26-33	(£2-00)
PMH/2C Circular harness	£5-00	(£0-50)
Q4/2M 4 el. quad	£16-31	(£1-50)
Q6/2M 6 el. quad	£21-71	(£2-00)
D5/2M el slot	£13-61	(£1-50)
D6/2M el slot	£18-22	(£1-50)
SVMK/2M vertical slot kit	£3-83	(£1-00)
UGP/2M ground plane	£7-03	(£1-00)
HO/2M halo head	£3-26	(£0-75)
HM/2M halo + mast	£3-88	(£0-75)
PMH2/2M 2-way harness	£6-80	(£0-75)
PHH4/2M 4-way harness	£16-34	(£1-00)
D6/70cm. 8 el slot	£15-47	(£1-50)
PBM 18/70cm. Parabeam	£18-56	(£1-50)
MBM48/70cm. Multibeam	£21-65	(£2-00)
MBM88/70cm. Multibeam	£28-97	(£2-00)
12XY/70cm. 12 el. x/d yagi	£29-70	(£2-00)
PMH2/70cm. harness	£5-90	(£0-50)
PMH4/70cm. harness	£12-26	(£1-00)
C8/70cm. 8dB colinear	£39-37	(£2-00)
D15/1296 Yagi	£23-06	(£1-00)

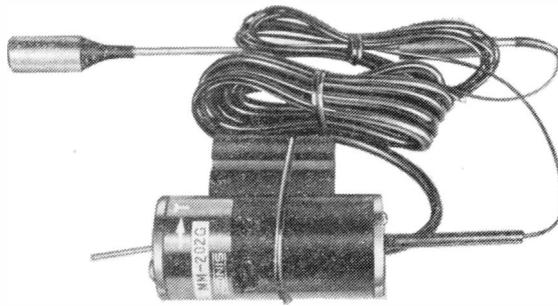
EK-121 DELUXE ECONOMIC ELECTRONIC KEYS



ONLY
£29-95
inc. VAT
(50p)

MOBILE SAFETY MICROPHONE

Clips on lapel, sun vizor, safety belt, etc. Weighs 5 grams and complete with gear lever Tx/Rx control box—keep both hands on the wheel in future! Suits most transceivers except IC240.



ONLY £19-95 inc. VAT (50p)

MAIL ORDER & HEAD OFFICE: Hockley Audio, 31 Spa Road, Hockley, Essex. Tel.: 03-784 6835 (2 lines)
ALL PRICES INCLUDE VAT CARRIAGE IN BRACKETS



AGENTS: G3TX J.R. Electronics, 198 Collier Row Lane, Romford, Essex.
Tel.: Romford (0708) 68956
GM3GRX Eric Simpson, 6 Drossie Road, Falkirk, Stirlingshire. Tel.: 0324 24428
Monday to Saturday 9 a.m.-5.30 p.m. E 1y closing Wednesday



AMATEUR ELECTRONICS UK

YOUR KEENEST BUY FOR YAESU MUSEN SWAN AND ATLAS!



**AS DIRECT
IMPORTERS
WE OFFER
YOU . . .**

**THIS IS THE FABULOUS FT-227R
WHY PAY MORE FOR LESS ?**

A GREAT DEAL IN AMATEUR RADIO !

KEEN PRICES ALONE ARE
SIMPLY NOT ENOUGH —
IT'S ATTENTION TO
DETAIL AND AFTER-SALES
SERVICE WHICH REALLY
MATTER IN THE LONG

RUN—AT AMATEUR ELECTRONICS UK YOU GET THE BEST OF BOTH WORLDS TOGETHER
WITH AN EX-STOCK CHOICE OF EQUIPMENT BY THE WORLD'S TOP MANUFACTURERS—
WHY NOT CALL IN AND SEE FOR YOURSELF—REMEMBER WE ARE IN THE CENTRE OF THE
COUNTRY BUT NOT IN THE CENTRE OF THE CITY (AND CERTAINLY NOT IN THE MIDDLE
OF NOWHERE !) IF YOU CAN'T GET TO SEE US THEN WHY NOT TAKE ADVANTAGE OF OUR
UNIQUE CREDIT VOUCHER OFFER AND GET THE VERY LATEST MANUFACTURERS
LITERATURE.



£2.50 FOR 25 PENCE !! 25 pence brings the latest Yaesu catalogue
with our Credit Voucher for £2.50. A couple of stamps obtains the
FT-227R, SWAN, or ATLAS leaflets, used equipment list, or Digitex
DI10 Broadsheet.

HOW TO REACH US (EASY PRIVATE PARKING ON OUR 70ft. FORECOURT)

FROM SOUTH AND EAST. We are located approximately two miles from Junction 5 of the M6 from which follow signposts to Birmingham. Within ½ mile turn right at Clock Garage and proceed towards city. After one mile look for traffic lights at Fox & Goose and immediately over the lights take minor left fork into Alum Rock Road. We are located one mile from this point.

FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway complex. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100 yds. veer again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.

FROM THE WEST AND SOUTH/WEST. Follow M5 then M6 to Spaghetti Junction (see above). Alternatively, leave M5 at Junction 4 or 3 and proceed to inner ring road. Turn South on ring road and leave on A47 (East). We are located three miles from this point.

Hours : 9.30-5.30 Continuous including Saturdays—Early closing Wednesday, 1 p.m.

**BRANCH: AMATEUR ELECTRONICS, UK—COASTAL, CLIFTONVILLE,
KENT. KEN McINNES, G3FTE, THANET (0843) 291297. 9 a.m. - 10.30 p.m.**

**BRANCH: AMATEUR ELECTRONICS UK—SCOTLAND 287 MAIN STREET,
WISHAW, LANARKSHIRE. GORDON McCALLUM, GM3UCI.
TELEPHONE WISHAW 71382. (EVENINGS CARLUKE 70914.)**

**AGENT : WALES & WEST—ROSS CLARE, GW3NWS, CAERLEON, NEWPORT
(CAERLEON 422232)—Only 20 minutes over the Severn Bridge.**

**508-514 ALUM ROCK ROAD 021-327 1497
BIRMINGHAM 8 Telex 337045 6313**





YAESU proudly announces a new Synthesized 2 metre FM transceiver FT-227R



The world famous Yaesu state of the arts technique has brought computer theory into VHF communications.

What are the frequency splits for repeaters? Don't worry! Yaesu has computerised it. In addition to a conventional ± 600 kHz split, any transmitter offset frequency is memorised with a touch of a push-button.

What was my last frequency channel? Don't check! A touch of a push-button will bring you back to the memorised channel instantly.

Why one knob to select a channel out of 800 channels? Yaesu utilises an "OPTICAL COUPLING" system to select each channel in 10 kHz steps and the channel will be offset

5 kHz higher with a touch of a push-button. Thus 800 fully synthesised channels are provided with one-knob and no rotary switches to get oxidised and noisy.

When will the FT-227R be available? October, 1977.

Many, many other features such as automatic encoder-decoder for tone guarded squelch (TGS) (optional). Tone burst accessed repeater operation, automatic final protection, busy channel indicator, high-low output selection, diecast front panel, and famous Yaesu quality throughout!

See your dealer today for an informative catalogue, at a most attractive price.

Amateur Electronics,
508-514 Alum Rock Road,
Alum Rock,
Birmingham B8 3HX

South Midlands Communications Ltd.,
S.M. House, Osborne Road,
Totton, near Southampton,
Hampshire SO4 4DN

Western Electronics (UK) Ltd.,
Fairfield Estate,
Louth,
Lincolnshire LN11 0JH



JUST A PILE OF WINNERS

WAITING TO BE BOUGHT



THE ICOM RANGE OF 2 METRE GEAR IS SOME OF THE BEST YOU CAN BUY — FOR QUALITY, RELIABILITY AND EXCELLENCE OF PERFORMANCE !

ADD TO THIS THE OFF' PRAISED SERVICE OF THANET WITH OUR WELL QUALIFIED TECHNICAL STAFF AND RANGE OF TEST EQUIPMENT AND YOU NEED HAVE NO WORRIES IN BUYING



FOR MOBILES :

IC-240 The well tried and high popular FM synthesised rig. If you know a friend with one you will know we have every right to boast about the excellent quality of the signal it puts out. (Perhaps that is why we have sold so many !) Now available with Super-Scan as an extra. By the way this is the same size as the SSB unit on the IC-245E.

IC-245E The leader in multi-mode mobiles. Fully synthesised to give full band coverage in 100Hz or 5 kHz steps. LED readout of frequency to the nearest kHz. FM, USB, CW, Normal or Reverse Repeat or split frequency working with any spacing, automatic tone burst etc. An excellent bit of engineering which can also serve as a base station.

FOR PORTABLES with a decent power output and large battery capacity :

IC-202 The 3W SSB portable which is tunable over all the sideband patch and can be used, when fitted with extra crystals, to cover 144-145 and 145.8 to 146 MHz. Used by many as a prime mover for something bigger because of its excellent clean signal. By far the most popular VHF SSB only set on the market. There are a lot about !

IC-215E The big boy in FM portables, with Rx sensitivity and transmission quality every bit as good as a base station (and better than many !). A healthy 3W of FM and sensible batteries with four times the capacity of those used in most other portables—so that they don't run flat on you in the middle of a QSO quite as often. Despite this and its rugged construction it is still easy to carry around. Lots of these about also !

*We have a limited number of IC-215s fitted with 8 Channels at the special price of £149 inc. VAT.

FOR BASE STATIONS :

IC-211E The leader of them all. Fully synthesised VFO with 7 digit LED readout to the nearest 100 Hz. FM, CW, LSB, USB. There's nothing quite like it. Most would make this their choice if it wasn't for the problem that you have to pay more for the best ! (With these days of inflation it isn't silly to think about HP.) See October's add for more details.

ALL PRICES INCLUDE VAT, AND DELIVERY IS FREE ON MAIL ORDERS FOR TRANSCEIVERS WHY NOT POP A NOTE ON THE ANSAFONE FOR A PRETTY COLOURED BROCHURE AND DETAILS ?

THANET ELECTRONICS
HERNE BAY, KENT
02273 - 63859

SHOPS

THANET NORTHERN
WOMBWELL, S. YORKSHIRE
0226 - 756229

OTHER AGENTS

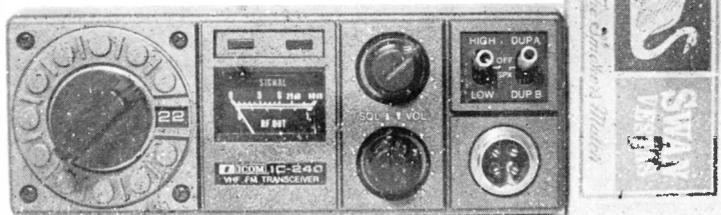
(PHONE FIRST—All evenings only except Norfolk and Burnley)
LONDON—Terry G8BAM (01-556 9366) NORFOLK—Ted G3FEW (05088 632) MIDLANDS—Tony G8AVH (021-329 2305)
SCOTLAND—Ian GMBDOX (07868 3223) WALES—Tony GW3FKO (0222 702982) NORTH WEST—Gordon G3LEQ (Knutsford (0565) 4040)
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FROM

THANET ELECTRONICS
HERNE BAY
(02273 63859)



IC-240

Still your best choice in mobiles

Are you going around in circles trying to choose which synthesised mobile to buy?

About twelve months ago there was no problem in choosing as there was only the 240 and one other which was much more expensive and difficult to tune when driving. Now it's a bit different, with two others on the market—and all claiming to be the best. Before you choose just sit down and think about what you really want from a mobile. For instance, do you really want 400 channels and do you understand the complex mathematics which enables you to fit these into two megahertz of bandwidth when each channel requires some 16 kHz? How many channels do you actually need to have available? Well, there could well be up to ten repeater channels in time in the UK and in a really busy area such as London you could well need 8 simplex. Another requirement is that you want to be able to listen on the input frequency of the repeaters to check whether a simplex QSO is possible. You want to be able to do this instantly at the flick of a switch and don't want to have to do a bit of computer programming in order to tell your rig which channel the input is on. Most important though is that you want an ABSOLUTE MINIMUM of knob twiddling and button pressing when driving and your tone burst should work automatically as and when required. Just think how complicated it will be when the rig offering some 800 channels is required to operate on the frequency Joe has suggested:—"QSY to 23" he says to you on R4 "QSY" you reply—and then your problems start when you have to do the following (perhaps while also driving at 70 m.p.h. on a busy motorway):—

1. What frequency is S23 — 145.575 MHz.
 2. Can I manage to QSY without looking at the dial for more than about $\frac{1}{2}$ sec.—NO, unless you work out in your head how many 10 kHz steps you need to click the switch round, i.e. $145.575 - 145.100 = 575 \text{ kHz} = 57\frac{1}{2}$ steps. (You need to memorise the repeater input frequencies of course).
 3. Do I have to press the 5 kHz button? Well, as S23 is odd and R4 is even the answer is YES.
 4. OH! QRX for a moment... Sorry officer I didn't see him as I was tuning my radio.
- ... so that really leaves you with a choice of excellent rigs to choose from which both have 25 kHz tuning steps and are easy to operate, providing easy channel selection and reverse repeat at the flick of a switch. No doubt the respective importers will both try to tell you their's is best—so let us list the advantages of the IC-240:—
1. Its solidly built and the several hundred already sold have shown an excellent reliability rate.
 2. You can reduce switching down to an absolute minimum as you can arrange the channels exactly where you want them. 22 is plenty when mobile and it's easy to arrange, up to 80 if you wish, for home use (you can also get up to 148 MHz if you are going to the USA!) Also you can have a scanner if you wish.
 3. It has that superb, clear and crisp modulation which is so very characteristic of ICOM.
 4. The receivers are very sensitive—we measured 0.1 uV pd for 10dB SINAD (which for comparison is better than 0.14uV for 12 dB SINAD!)
 5. Its cheaper in price but not in quality.

YOU CAN'T GO WRONG WITH AN IC-240!



IC-701

IC-701 The HF rig to beat them all which will be available in the spring to those who have their names on the list. *All solid state including the finals *100W RF output, Continuous Duty on All Bands, All Modes. *All bands 1.8–30 MHz. *USB, LSB, CW, CW (narrow), RTTY. *Double balanced Schottky Diode mixer used in both Tx and Rx. *Fully synthesised with Digital readout to 100 Hz and two stores to enable split frequency operation. *ICOM's unique band-pass tune. *VOX, Semi-break-in CW, RTT, AGC, Noise Blanker. *Built-in RF speech processor. *Extremely compact. *All filters built in. *12v. or mains operation. *Electret desk mic.

After having used this rig for several weeks on the air we think that it is definitely the nicest HF rig we have ever used.

During the evenings and at weekends (when calls are cheap) why not use our Ansafone to record your request for data, etc. (02273 63850)

STEPHENS-JAMES LTD.

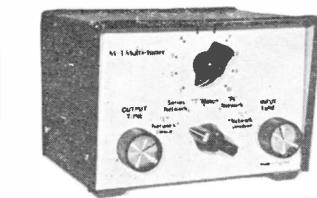
47 WARRINGTON ROAD, TELEPHONE
LEIGH, LANCs WN7 3EA (0942) 676790

G3MCN



Midland and North West distributors for the XCR30 unique crystal controlled receiver. This receiver is designed to provide precision frequency tuning over the full short wave spectrum up to 30 MHz with exceptional frequency stability for both AM and SSB. Separate tuned whip antenna.

XCR-30 FM Receiver with FM band 87-5 to 101 MHz. £150-00 inc. VAT
£170-00 inc. VAT



Mk. 1 MULTITUNER. Designed and manufactured by us. 50 tunable switched positions for antenna lengths over 5 metres in the 2-30 MHz range. Five different circuits to give an excellent match between your receiver and antenna. Now in use in over 35 countries.
Price £17-50 including VAT and Postage

Mk. 2 VERSION, £23-00. Covering 550 kHz to 30 MHz. Send S.A.E. for full information and Test Report.



YAESU FRG-7 RECEIVER. Mains and battery operated receiver 0.5 to 30 MHz. Solid state. Advance circuitry offers excellent performance for the DX listener at a moderate price.
Price £162-00

TRIO	
T5820 Transceiver	£645-00
VFO820 External VFO	£112-00
DG1 Digital Readout	£127-00
DS1A 12v. DC Inverter	£40-00
YG88C 8 pole CW Filter	£36-00
5P820 Speaker	£19-00
T5520 Transceiver	£432-00
T5520S Transceiver	£489-00
VFO520 External VFO	£72-00
DG5 Digital Display	£132-00
ES59D Receiver	£403-00
T5700G VHF Transceiver	£426-00
T5700S VHF Transceiver	£542-00
SP70 Speaker	£18-00
TR7010 VHF SSB Transceiver	£189-00
P55 Power Unit Clock	£58-00
TR7200G VHF Transceiver	£189-00
TR7500 VHF Transceiver	£225-00
TR2200GX portable 3 channels	£139-00
TR200GX portable 12 channels	£169-00
MB1A Mobile mount	£9-70
VB2200 GX 10 watt mobile PA	£45-00
TR8300 UHF Transceiver	£227-00
R3000 General Coverage Receiver	£184-50
MC50 Desk Microphone	£25-00
Crystals and accessories.	

YAESU	
FRG7 Solid State Receiver	£162-00
FR101D Receiver	£439-00
FR1200B Linear Amplifier	£289-00
YG-100 Monitor Scope	£129-00
YD844 Desk Microphone	£22-00
YD846 Hand Microphone	£8-95
FC301 Antenna Tuner	£89-00
24 Hour World Clock	£15-00

DRAKE	
RAC Receiver	£495-00
T4XC Transmitter	£495-00
TR4CW Transceiver	£562-00
AC-4 AC psu	£108-00
SSR-1 Receiver	£150-00
M54 Speaker	£24-75
Filters, crystals, etc.	

HY-GAIN	
12AVC Vertical 10-15-20m	£39-93
14AVT/WB Vertical 10-15-20-40m	£56-19
18AVT/WB Vertical 10-15-20-40-80m	£81-45
TH2MK2 2 element Tribander	£117-56
TH3MK3 3 element Tribander	£167-72

DIGITEX	
D110 Visual Display Unit	£347-34

MICROWAVE MODULES	
MMC70 4m. Converter	£20-25
MMC144/28 LO 2m. Converter	£22-50
MMC144/28 LO 2m. Converter	£27-00
MMC1296/28 23cm. Converter	£31-50
MMC1296/144 23cm. Converter	£31-50
MMV1296 23cm. Tripler	£33-75
MMD050 50 MHz Counter	£66-96
MMD500P Prescaler	£27-00
MMD500P 500 MHz Counter	£85-32
MMT432/28 70cm. Transverter	£133-88
MMT432/144 70cm. Transverter	£169-88
MMT144/28 2m. Transverter	£88-87

G-WHIP	
Tribander Helical 10-15-20m.	£19-68
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Multimobile 78, 10-15-20m.	£21-08
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TE-702 Antenna noise bridge to 300 MHz	£29-70
ROTATORS	
AR30	£46-13
AR40	£51-75
CD44	£106-87
AR22	£48-38
KR400	£96-00

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D8/2m. 8 over 8 slot fed yagi	£18-22
UGP/2m. ground plane	£7-03
MBM48/70cms. Multibeam	£21-65
MBM168/70cms. Multibeam	£28-96
TAS 3 1/2 2m. Whip mobile	£13-05
CS/m. Colinear	£30-93
CB/70cm. Colinear	£39-37
D15/1296 23cm. Antenna	£23-06

ATLAS	
210X Transceiver	£445-00
215X Transceiver	£445-00
220-CS Console and AC Power Supply	£118-12

BARLOW WADLEY	
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XCR30FM Solid State Receiver	£170-00

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RX Band Pass Filter	£27-56
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BANTEX	
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Standard base mount	£2-70

COMTEK	
144 MHz Linear Amplifier	£141-50

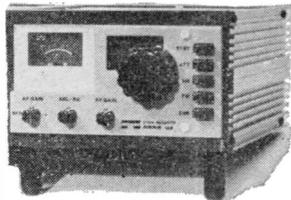
MARC	
NR56 2m. FM Receiver	£54-00

ACCESSORIES	
Single Meter SWR wall mounting	£9-50
Single Meter SWR desk type	£9-50
Twin Meter SWR desk type	£10-50
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PL259	51p
PL289	75p
Cable reducers 15m	

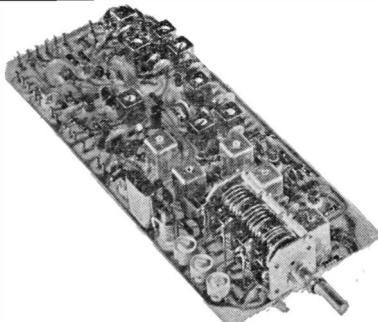
SECONDHAND EQUIPMENT	
(in stock going to press)	
Atlas 180 Transceiver	£285-00
Belcom Liner 2 Transceiver	£120-00
Collins F45 FA-05 CW Filter	£65-00
Collins F455 FA.15 RTTY Filter	£45-00
Comtek 2m. Linear Amplifier	£100-00
Drake R4C + 7 broadcast crystals	£400-00
Drake M54 Speaker	£16-00
Drake T4XC Transmitter + AC Psu	£425-00
Drake FL250 Filter	£115-00
Barlow Wadley XCR30 Receiver	£30-00
Eddystone 730/4 Receiver	£128-00
E. Developments 2m. Transverter	£85-00
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Trio 7200G Transceiver	£130-00
Technical Associates Audio Comp.	£20-00
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Yaesu FR50B Receiver	£85-00
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S.T.E. MILAN VHF EQUIPMENT



ARAC 102 receiver, 28-30 MHz, 144-146 MHz. AM-SSB-FM-CW Price £100.00

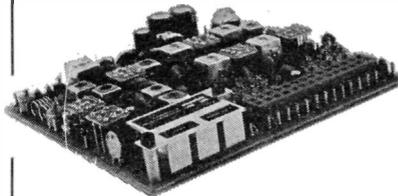


AR10 Mosfet receiver, 28-30 MHz Double conversion superhet. RF and amplifiers stages are gate protected mosfets for good sensitivity and low intermodulation. Noise limiter and squelch circuit. AM, SSB and CW reception. 12v. DC.

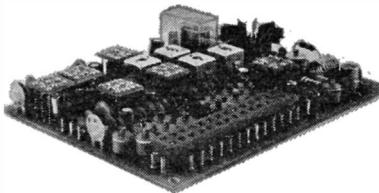
As sole distributors for the STE range of equipment for four years despite rising prices, we have maintained prices stable for over two years. Surely the finest value for money on the market. With the opening of the 28 MHz band the AR10 Receiver module is now one of our fastest selling lines. Demand for these is growing every month.

PRICE LIST including VAT and postage

AK20 FM Transceiver	£165.00
AK20 FM Transceiver Kit	£105.00
ARAC 102 Receiver	£100.00
ARAC170 Receiver	£127.50
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ASAP 154 AC PSU	£37.50
AR10 Receiver Module	£37.50
AA1 Audio Amplifier	£4.10
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AT22 Transmitter	£50.00
AG10 Tone Generator	£4.50
AR20 C.C. Receiver	£45.00
AT23 C.C. Transmitter	£50.00
AS15 Stabilised DC PSU board	£10.00
AL8 Linear Amplifier	£27.00
AB40 Mobile 40 Watt FM Amplifier	£55.00



AR20, 12 channel FM receiver 144-146 MHz. Input impedance 50-75 ohm, AM-FM modes. Sensitivity 0.2uV AF output 3 watts. 12v. DC operation.



AT23, 12 Channel PM Transmitter, 3 watts, 144-146 MHz. Frequency deviation 3-10 kHz adjustable. 12v. DC operated AF input sensitivity 2mV adjustable to 50 mV.



AK20, STE. Latest model from the famous STE Milan range of equipment. 12 channel operation in the 144-146 MHz range, 11-15v. DC operation. 3 watts output. Sensitivity 0.2 uv R.L.T. tone burst. Complete with microphone, and mobile bracket.

We are also acting now as distributors for another Milan manufacturer—Novel. This company is now producing one of the finest range of SWR power meters we have seen. All built to professional specifications but sold at an Amateur price. All units are built in solid diecast boxes and the finish is in a "Commando Green."

SWR200B. Switched 50 and 75 ohm. 3 to 200 MHz. 2000 watts at HF. 2-200 watts at VHF. £36.25

SWR 400B. Impedance 50 ohm. 144 and 432 MHz. 20 and 200 watt range. Insertion loss 0.2dB. £55.90

PW120B. Dummy Load Wattmeter. Impedance 50 ohm. 5-20-120 watt. Frequency 3-500 MHz. £38.25

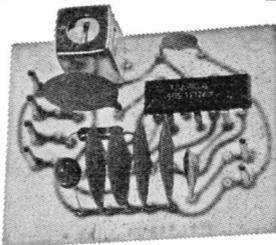
DL120. 50 ohm Dummy Load. 50 ohm to 500 MHz £20.48

CRS 110-B. 4-way Co-axial switch £37.91



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3/8" Gutter Mount 2m. Whip	£12.00
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Ground Plane, 4 Radials, 2m.	£13.89



455 kHz FM Discriminator Amplifier. Limiting threshold 100uV. Amplitude modulation rejection 40dB. Audio output voltage at 1 kHz 200-300mV frequency deviation +/- or - 3 kHz.



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FT901DM



THE FT77 MOBILE OR QRP BASE TRANSCIEVER

This is a 10-80m. transceiver, VFO controlled (to 1 kHz accuracy) plus crystal control facility. Selectable sidebands, CW, crystal calibrator, clarifier and an advanced noise blanker are some of the features packed into a cabinet only a few inches high, but through careful design the front panel remains remarkably uncluttered. Designed for a linear 100V. output consuming only a few Amps it eliminates: 30A cables from the passenger compartment and the cooling problems of a massive heat sink. Need more power? Flick in a FL110 (at 200W. PIP linear) installed in any suitable place in your car.

THE FT101E COMPLETE HF STATION—Ex stock

The FT-101E a complete mains or 12v. DC station contained in a compact 30 lb. package, 260W. P.I.P. of SSB (with in-built R.F. speech processor) 180W., CW and 80W. of AM 10 to 150m. (incl) 10 MHz RX). The sensitive and selective (permeability tuned RF stages and 8 pole crystal filter, receiver offers: threshold adjustable noise blanker, switchable 25 and 100 kHz calibrator, \pm 5k clarifier (with separate on/off switch), etc., etc.

The VFO is stable and linear (readout to 1 kHz) external VFO or crystal control can be selected with LED indicators illuminated accordingly. Carrier level is adjustable for: tune up, AM and for CW operation, whose performance with the semi break in keying, with side tone, and the optional filter installed in a high order. Linear and transverter provisions are made with sockets for: relay contacts, ALC output, all internal HT supplies, low level RF heater links and switches, etc., etc.

Service Manual for FT101 Series £12.00 (No VAT P/P Free)



FT101E

THE FRG7. DIGITAL OR ANALOGUE

The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drift cancelling loop for continuous, spin-tuned inclusive coverage of 0.5 to 30 MHz.

The receiver is sensitive (0.5 μ V for 10dB, S + N/N(SSB) and stable with AM, SSB and CW modes catered for. A 3 position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required, 8 dry cells are automatically switched in.

FRG-7 Analogue Readout £145 + VAT COUNTER £50 + VAT

FRG-7 Digital Readout £199 + VAT YH55 Headphones £8 + VAT



The SMC, full specification, internally mounted counter (easily installed in existing receivers) provides: a 100Hz readout (100 fold improvement), flashing 8 digit (to indicate VFO over-range) and adjustable gate time.

THE FT301 RANGE EX-STOCK IN TOTTON

The new FT301 transceiver range (with options installed) offers: Full solid-state 12v. DC working, external matching mains power supplies with speaker, and an external VFO are available. Plug in boards, 160-10m. in 500 kHz segments, MSF and CB receive, RF speech processor, noise blanker, front panel controlled VOX (with MOX) and P.P.T., semi break-in keying with side tone, clarifier with separate switch, 11" x 5" x 13", 25 kHz crystal calibrator, internal VFO or 11 crystal per band (on external VFO with same facility) 3W audio to internal or external speaker.

FT301 100W. Analogue

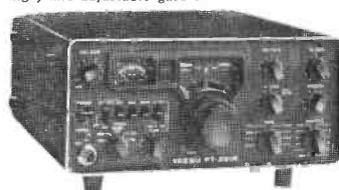
FT301S 10W. Analogue

FP301 AC PSU 12v.

FT301D 100W. Digital

FT301SD 10W. Digital

FP301D PSU & Clock, etc.



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METER**



**FL110
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AMP.**



**YO301
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TX & RX
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10-160m. Switched, 50/75 input, 500W. PEP max. handling. Power meter with 25, 250 & 500W FSD ranges, MSF and CB receive, RF speech processor, noise blanker, 11" x 5" x 13", 1 wire and 3 50239 sockets.

10-160m. Switched L.P.F. 15W \rightarrow 200W. PIP A1/A3j, 4W \rightarrow 75W. Fl. Negative feedback with ALC to exciter. RF sensing (Adjustable hang time) with override.

1.8-54 MHz Tx monitor 10-500W. Envelope, Trap and Cross. Vert. 2Hz-4 MHz (\pm 9 and 10-7 provision). Horz. 10Hz-250 kHz, sweep 10Hz-10 kHz. 2 tone generator.

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FT227R

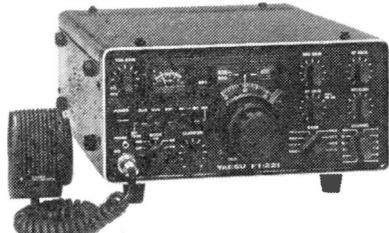
THE FT221, COMPLETE 2M. STATION Ex stock

The FT221. The multimode USB, LSB, AM, FM, CW (with semi-break in and side tone), 2m, transceiver offering the choice of phase locked VFO or 44 crystal channels, simplex or repeater (600Hz up and down shifts), with unique "double push" auto tone burst, mains or 12V, (3A) operation, excellent selectivity SSB 2.4 kHz (1.7 : S.F.) or FM (12 kHz). Front panel adjustable VOX and mic gain, a calibrator (1 MHz \div 10), 1 kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes F.S.K. easy), switchable "S" and centre zero tuning meter, noise blanker, serviceable plug in boards all contained in 11 $\frac{1}{2}$ " (14 $\frac{1}{2}$ " x 5" x 11 $\frac{1}{2}$ ", 22 lb. rigid package.

600 kHz and 1.6 MHz shifts over 4 MHz.

YC221 digital readout unit—Ex stock £72.50 (+8% VAT)

New service manual for the '221 series £9.00 (VAT free, p & p free)



FT221R

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D5/2m, 5 over 5 slot feed ...	£12.10	PBM10/2m 10 ele. Para ...	£22.55
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5XY/2m 5 ele. crossed ...	£14.20	D8/70 8 over 8 slot feed	£13.45
5XY/2m 8 element crossed	£17.70	PBM18/70 18 ele. Para ...	£16.50
10XY/2m 10 ele. crossed	£23.40	MBM48/70 46 ele. Multi	£19.25
5Y/2m 5 ele. yagi ...	£6.85	MBM88/70 88 ele. Multi	£25.75
8Y/2m, 8 ele. yagi ...	£8.80	12XY/70 12 ele. crossed	£26.40
10Y/2m 10 ele. long yagi	£18.95	4Y/4m element yagi ...	£11.25
14Y/2m 14 ele. long yagi	£24.25	PMH/70 7 way harness ...	£5.25
Q4/2m 4 ele. yagi ...	£14.50	PMHC Circ. phasing ...	£4.50
Q6/2m 6 ele. quad ...	£19.30	PMH2/2m 2 way harness	£6.05

BANTEX VHF WHIPS		(Carriage 90p) VAT 12 $\frac{1}{2}$ %	
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COAX PLUGS		(Post and Packing extra) VAT 8%	
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UG176 Reducer UR70 ...	£0.12	Back to back male ...	£1.20
PL259R Fix reducer plug	£0.56	"T" Adapt (2F1M) ...	£1.20
PL259S "Soldierless" UR76	£0.51	"T" Adapt (3F) ...	£1.48
PL259S "Solderless" UR67	£0.51	Angle 90° (1M + 1F) ...	£0.90

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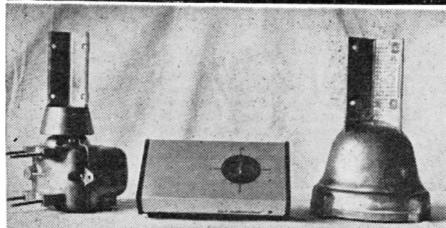


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Carriage (BRS or post) FREE. Securicor delivery £1.50 extra (mainland). Rotators supplied complete with appropriate control box and instructions.

ROTORS

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AR22 VHF Light HF	... £43.00
AR40 VHF Light HF	... £47.50
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CD44 Medium duty	... £95.00
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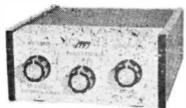
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(GB3SWM)

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The
SHORT-WAVE
Magazine

EDITORIAL

Busted Flush

The meteoric rise of CB over the past year or so in the U.S.A. is over. Competition is now so hot, and prices so low, that even the Japanese are pulling out of the market, leaving the remains to Korea and Taiwan. The very latest forty-channel boxes and SSB have not altered the trend: indeed some traders are trying to unload these for the equivalent of £20 in an attempt to at least cut their losses and overstocking. What, we wonder, will be the next craze?

But in this country, the debate continues. It is really rather pathetic, though, to argue in amateur radio circles the pros and cons of CB in the U.K.—instead we should be well aware that within five years Amateur Radio *itself* may be a thing of the past (to say nothing of CB) and concentrating all our efforts on staving off that disaster, rather than fretting over something for which there is little demand and no spectrum-space.

[Handwritten signature]
[Handwritten signature]
G3KFE.

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

Forty Metres

What an odd place to start our monthly exploration of the bands—but why not? G6TC (Wednesfield) stuck with his KW-2000A and half-wave inverted-vee; Ted worked W1AB, W1KM, W3AE, W3TV, N4AR, K5MA, K5JA, K5UA, W6PVB, W7KW, K7NA, W8IHO, W8JO, K9BG, HC2AO, YV1AD, KV4CI, JA1CWZ, JA1DRW, JA1KSO, JA3BZC, JA1QVR, JA1RLV, VK3VJ, VK2BPN and VK2BQQ. Commenting on his results, G6TC notes how few VK's have been about this month, as compared with others—but the loss has been made up by other DX to compensate.

G4GIE (Gt. Moulton) is happy with his HW-8 and Joystick but is clearly in difficulties on Forty, in that QRP just does not often net a come-back to a call; however the odd EU, such as DJ8RK, DL1GA, PA0AEE, YO5KLL, SP1HXC, F6EYP, E19BT and DL9TD demonstrated that the set-up was radiating—which is the first question one tends to ask oneself when the run of non-repliers gets a bit long.

G4EDG (Newton Abbot) seems to have been rather cross with his aerial mast—he sawed it up and made a 28 MHz ground-plane aerial out of it! This being done, a 7 MHz dipole was slung between a couple of trees at about 40 feet and proved to be a cracker—up a couple of S-points on the old G/P in the favoured direction, E-W, and at least equal North/South. Thus the G4EDG signal has beaten down the opposition and collected DX in the form of KL7XX, KH6AKX, N5VV (New Mexico), W6, W7, JA's, VK7GK, OA9TH/SU, EP2SV, EP2IA, PY1WO, CT2BU, TA2CN, OY2MA, 7X4AN, FM7AZ, FM7AV, PY4BYI, UA0KAW (Cape Schmidt), XE2ABW, P29MO, YV4AZ, K7CS, WV4VU, K0RF (Colorado), UM8AP, UA0BBN, K6NA, ZL1AMO, VK3XBO, WD6DPR, ZF2AY, KP4EAJ, HH2DX, VP2M, 9Y4VT, VU2GU, VP2VJ using 5 watts, 3A0GY,

W5PK (New Mexico), K7NN (Arizona) HI3PC, JA8GU, W6NA, CM2HB, KV4CI, TI2PZ and W6NER, which turns the year over with 135 countries worked on the band in 1977.

G3ILO (Dursley) last reported back in 1975 when he was G4BKY; he now has the call of his late father who became a Silent Key in 1972. Since it was received, G3ILO has made a change of QTH from up on the side of a hill to down in the valley surrounded by hills but having a larger lump of garden. An initial survey, using an FT-101E and 160 feet of wire at 25 feet has demonstrated that the spot has possibilities, at least on the LF bands, although the only 7 MHz operation has been in the CQ WW Test when UA6LO and UP2ND were booked in.

Eighty

CW and a wire aerial is the recipe at G2BJY (Walsall) who is a 100% home-brewer, both alcoholic and station-equipment; and we could remark that, allowing for the Midlands taste for mild as against the Southron's preference for bitter, Geoff brews a very pretty pint. However to business: G2BJY now reckons he had been a bit premature in slinging everything at Ten metres which has let him down quite badly, so he dug out and dusted-down the old eighty-metre CW rig, at about 66 watts. One of the things Geoff likes about 80 is the variety: he instances QSO's with a DM using 25 watts, followed by a DK using full-house Drake-Line, followed by an SP with 15 watts and an O-V-2 receiver!

G2NJ comes next, and Nick has been most fascinated to hear OH, LA and OZ stations working JA's around 1445-1500 at the low end of the CW section, the effect being noted on December 22, 28, 31, January 1, 2—and possibly since. It does seem that no G's got in on the act, although G2NJ did hear a JA9 suddenly pop up out of the noise calling CQ. As for the QRP stations, G2NJ worked G2CP,

GW5TW who was using two watts and said he was building the "one-lung four-bander" featured in our November 1976 issue, G8IB, G3TXQ, G4CQK, G3KSU and GM4CXP.

"CDXN" deadlines for the next three months—

March issue—February 2nd

April issue—March 2nd

May issue—April 6th

Please be sure to note these dates!

Despite all the family festivities, G4DMN (Wirral) seems to have continued to rise early in order to ensure that DX is aware of his continued interest. Some days it would appear that DX was to be taken for as many as twenty hours of the twenty-four—for instance, SSB to CN8HC/M, D4CBC, EA6CP, EA6EE, EP2TY, HK3LT, HK0LE (San Andres Is.), IS0FMN, JA6BSM, JA6WEE, JX9WT, K5NU, K5UR, K7ITW, K7NN, K7RI, K0RF, K0KX, K0SF, K0ZZ, KG400, KP4EJE, LU4EGE, N6KP, N7RK, N0BG, NORF, PY's, TF30F, UF6VAA, UI8IAR, UL7NW, SV1TO, VE4ACY, VE4KE, VE4KR, VE4SL, VE4ZS, VE5UA, VE8MA, VP2LJ, VP2LDB, VP2VJ, VP9IR, W5MQ, WA6OGW, other assorted Westside W's including G30PJ/W0, OE6DK/YK, ZL, ZF2AD, ZL3NR/C, 3A3GX, 4Z4RB, 9L1SL/A and 9Y4NP.

An interesting letter reached us from SWL Whitaker, brother of G3IGW and organiser of the Ten metre activity periods; but David's expertise at the receiver extends to other bands too, like for example MIC, EP2TY, 3A0GX, 5H3KG, HB0LL, U18's and UK0, all heard between midnight and around 0100; mornings seems to have cleaned up on VP2VJ, ZL3NR/C, D4CBS, TF30F, TF2ST, VE8MA, HKOLE, 9Y4NP, WO's, FG7AN, VP2LJ, VE4's from 0700, followed by VP2LDJ, TF30F, KP4ETE, JX9WT various W9/W0's W6's and W7's.

VE7WJ to 0800, then 8R1G and W's to 0900. No more entries until 1500 at which time ZL1AGO and ZL3NR/C were noted, not to mention JA6BSM, with a gap again until 1700 when ZL's were about, plus JX9WT and OH0NA; 1800 for OX3CO and JX9WT again, W's, JA, 9K2DR around 2000, W's again plus WB5LBJ/DU6 at 2100, a swing which was quite noticeable an hour later. However by 2300 the band was displaying its normal self to the world.

Back to QRP now, and to G2HKU (Sheppy) who managed to find DL1JF, GM4FXF, ON7EJ, DM5PUL, YU1ONX, OK1DCW, OK1AYE, DJ1PK, 13BLF, DK41Z, UB5MIE, YU4ALM and OZ1W.

Although some 60 stations were worked in the TOPS CW contest there wasn't any real DX, and Europeans only on the key for the rest of the month for G3ILO: however SSB did make one DX contact, with K2YJ.

Yet another one to comment on the way the band has livened up over the past few days is G6TC, who keyed to WI1BU, K1IK, K1PR, K1PL, W2AA, W2BA, N2DU, K2HYM, WA3NAN, W3PC, K3UA, N4AR, W4ELM, K5UR, K8NO, N8II, K9AA, WA9ITD, K9JF, K9KA, W9RN, W9TG, W0NO, W0SF, VE2EAQ, VE2EHH, VE3ATF, VE3BCH, VE3DW, VE3GCS, VE3FZW, KV4CI and KP4EMS.

G4GIE mentions an interesting contact he had with the HW-8, working PA0AAE; Jack who is a retired missionary of 79, who spent 26 years in China before being expelled by the Communists, after which he spent his time in Central America until his recent retirement. Otherwise it was DL7ZC, SM6GQS, F6DJK, GM3COB, DF1OK, ON6XB, DL6BB, DK3NP, G3AIO and DJ8IQ, all being CW from the HW-8 machine at two or three watts to a Joystick 13 feet in the air.

G4EDG tied the feeders of his 40-metre dipole together and resonated them as a marconi against a pretty extensive ground arrangement of short and long radials; this proved quite satisfactory with a variable C as the resonating element to give a 1.5 VSWR right across the

band; and it found JA4KGR, JA8UI/PZ, 3V8NB, VP2MRJ, CN8CC, UL7, UA9, and UA0.

Oddments

One or two people mention the TV programme "Pebble Mill" in which G2BAR of Bristol was shown, and also G3WW, in a demonstration of SS/TV. However, we notice from G3WW's notes in the "Cambridgeshire Times" that G2BAR had an accident on his way home: we hope it was nothing serious.

On the contest front, February is a busy month, with the ARRL Phone and CW first legs on the first and third week-ends—rules all-same last three years—and the YL-OM contest clashing with the CW leg at that. The second week-end sees some stateside QSO parties and the last week-end of the month is the French Phone contest.

Anyone for Raynet? We are advised that a group has been formed on the Isle of Wight, with G3IOW elected as Controller. If you want some more details, ring him on Ventnor 852392.

Looking a little ahead now, R.N.A.R.S. will have their Activity Period between March 24 (0800z) and April 2 at 1800z, the location being aboard HMS *Belfast* in the Pool of London. The ship is open to the public from 1100 every day until 1600 in winter and 1800 in summertime.

On the question of QRP, the GM stations seem to be making the running at the moment, with GM3OXX up to 90 countries worked on 2 watts of CW, while GM3RFR has 86 countries worked at five watts of SSB. So—these chaps have a bit more room for aerial-farming, but several of the back-yard aerial brigade are right being them, G3KPT G3DNF and G8PG being all well over the fifty mark.

Ten Metres

Really beginning to show its value now—quite a few people known to the writer have worked over 100 countries on the band in 1977. SWL Whitaker of Harrogate collated all the ten-metre data from the Activity Days last year, and concludes that some 175 countries were worked from U.K. during the year. That's not bad, when one

considers that at the beginning of 1977 the smoothed sunspot number was still in single figures.

G2ADZ (Chessington) reckons Ten has fallen off a bit of late but that it is far and away better than it was a year ago, as during the month under review the bands have been open to some sort of DX on every day. CW, of course, accounted for XE1FR, J3AAG (Grenada), YV10B, several QSO's with VK6HQ, FR7BE, VK8HA, ZE2JV, ZS6DL, ZS2AG, ZS2CB, ZS0RK (QSL via DL7FT), W6PV, 4Z4ZY, PJ2VD and on New Years Day, ZL3GQ. Gotaways included a CW VK in the Phone Section, 5T5ZR who appears to CQ but not to QSO, TU2GA, and a W1AW news bulletin.

We have already mentioned G2BJY's view of the band, and G3PKS (Wells) is of the same opinion—dead as the proverbial dodo.

G3NOF (Yeovil) sits somewhere in between; Don found nothing beyond Russians and ZS until January 2 when the band opened up for a couple of hours to the States, and SSB QSO's resulted with K9EGA/2, KP4EDM, N4WX, N4YM, W4CZU, W4JMU and WB8ALP.

G14FUM writes in to say he has now moved to Lisburn, from where he wrote on Christmas Eve. He says he has only gone as low in frequency as 14 MHz a couple of times, simply because 21/28 MHz have been so good. On Ten, Dave offers a selection of EU's, plus CN8CC, EL2AH, HB9AAA, IT9CMU, KP4DSD, KV4CI, OA7BI, PY1DAR, VE3KZ, K1XX, K2GBC, K9EGA/2, K2ARD, N4PP, WA4AKS, WA4ZJZ, K8MJZ, WA9FZQ, W7KXB/MM2 off KP4-land, and the comment that a VK6 was heard one morning but the G14FUM signals were obviously disappearing under a load of DK's that weren't audible in G1.

G4BHE (Basingstoke) notes that he ended with 107 countries and 31 states during the year, running a "barefoot" transmitter but aided by a four-element beam, and 80% of all operation being 28 MHz stuff; December brought CE5CN, CT2AO, CT3BM, FM7AV, KP4FGH, LU1HE, OA4BP;

PJ2FR, UJ8JCQ, VE3KZ, VK6EB, VP2AZB, along with all states in *W1*, *W2*, *W3*, *W4*, *W8* and *W9* (less Delaware), plus Iowa, Missouri and Minnesota.

An interesting note from the Greater Peterborough Radio Club mentions their net, Tuesdays at 2000z on 28-700 MHz. They would welcome anyone who cares to break in on them; and any good SWL reports will be greatly appreciated and a QSL sent; reports should be sent to V. Cunningham, G4FDF, 8 Viney Close, Peterborough PE1 5LS.

G3ILO managed 4X4VE and 4LM plus Russians in the CQ WW Test, plus FR7BE, G2WS and G3HXQ.

G4EDG reckons the band was in fair shape on the Saturday of the CQ Test, his score of States for the band going from 1 to 23 in just ninety minutes, all call areas except 7, and ZL3GQ, KP4RF, 9Y4VT, VK3MJ, VE4RF, UL7, PY7APS/IYV10B, LU8DQ, EA8BK and J28AY.

Top Band

Not a great deal to report this time. G2HKU starts the ball rolling with his SSB to GD4BEG and PAØPN, plus CW to GM4AWF, 4U1ITU, GM4CHX, OL8CGB, GM3PFQ, GM4ALK and GM3OXC.

Next we have G4FJU (Bloxwich) who wonders why he's not tripped over G2BJY on the bands—probably different hours of operation. Ben is pleased to note that the factory which generates his local high noise level seems to be off-duty at week-ends of late, which is a relief—but of course there is always the nagging thought that the blighters might start overtime again!

Looking at his operating, G4FJU mentions CW QSO's with GU4DAA, DK0BN, DL0WU, OH2BO, OH2BC, GU4EON/A, GU3HFN, YU2HDE, OK1ATP, and others of that ilk—rather odd that, as having never heard GU, Ben should then collect three in an evening.

We have already mentioned the G4EDG aerial, and how he got it from Forty to Eighty: getting on to Top Band wasn't quite so simple. First attempts with a loading coil only succeeded in wrecking a pair

of PA valves while using them as a signal generator. Eventually the trick was done by shunt feeding the loading coil by tapping up it, and now it resonates at 1825 kHz, albeit with a rather narrow bandwidth, around ± 10 kHz. However, as to whether or not it works, a first try raised some Europeans at fair strength, followed by W4DHZ and W3HXK; and, to his amazement, a call of CQ DX at around VK sunrise time resulted in a QSO with VK6HD—just time for completion of the QSO before the VK sank under the noises-off from the commercial station on 1799 kHz. As for the Gotaways—heard at times when the aerial wasn't available for use, they included JA3ONB, JA3BPB, JA3AHQ and ZC4IO.

Twenty & Fifteen

As will have already been gathered, most of the "excitement" has been elsewhere; but there can be no doubt at all that these two bands are a whole world better than at this time last year. Nonetheless, they need to be taken in context—what we are in effect saying is that "normal" today is better than "above normal" in the forecast of a year ago. Then, if the solar flux got up to the mid-eighties we cheered, whereas now if it goes down to the lower nineties . . .

However, the "conditions" aren't the whole tale by a long scratch—we think of the upper-bracket DX-er over in W6 who tried a day when the forecast said "low normal" and none of his locals were to be heard—and landed three nice new countries in a row!

It was all run-of-the-mill for G3PKS, save for one QSO, with UL7PQ, between 1003 and 1019z, 21-06 MHz, on December 19; the UL7PQ signals had a "crystal ring" on it. Jack realised he was getting an echo, and by concentrating on the ends of words, he was able very clearly to hear a *double echo*—the original signal at S7, the first echo at good readable strength, and the further repeat clearly audible due to quiet band conditions. Although G3PKS sent the report "57 Echo 9" several times, UL7PQ made no comment. Interesting, in that the double echo seemed to be taking a significant part of a second, making the reading of the overs

difficult.

Now to G3NOF (Yeovil) who reports that 21 MHz opened up around 0830 for long-path to VK and JA, with the short path coming in around 0930 till 1300; *W*'s from 1130 to 1900, Africans noted between 1100 to 1600. SSB QSO's were made with AA6AA, C5AAD, CN8CX, CT2BD, EP2LI, FM7WY, JA6AA, JA6GBB, JH6ADQ, JH6LNO, JH6RFK, JR1FCT, JR6RKL (Okinawa), JX9WT, an assortment of *W*/*K* stations, and *VK*'s, STØRK, TU2GK—a regular "CDXN" reader, we are told—ZS's, ZE's, ZL's, 3C1X, 3D6BP and 9K2FO. Turning to Twenty, the morning opening to *VK-ZL-DU-P29-KG6-KR6* is all long-path and continues from about 0830 to 1100, with *W*'s from noon to around 1900, the latter part of the period being useful for the West Coast chaps; the Africans sticking around till a little later. On this band the SSB contacts were with C31NE, EP2DT, FP8DX, H5FXT, HI8WR, JA3YKC, K7DK, VE5DX, VE6AGV, VE7CQX/SU, VE7YF, VE7AUZ, VK2AHK, WA7UHE, WB5ZCS, W5XZ/7, ZL2PV, ZL2AFH, ZL3HN, ZS3KC/M, ZS4MX, ZS6APO and 9K2FO. On a different tack, we seem to have made a bit of a pigs' ear out of the G3NOF report last time—we left that last, important bit out of his 28 MHz report, and on the following page we forgot to give G3NOF's call to his list. Sorry, everyone!

On to G14FUM, who seems to have done a rapid QSY from his old site to a new one at Lisburn—doubtless in the hope that it'll be a better one, radio-wise. So far the most notable thing is the refusal of the TS-520 to load properly on Eighty; but on 21 MHz the 12AVQ was coupled up to TK7GAS (normally FG7AS), TL2OS, 7P8BE, ZE1AN and on Twenty there was 3AØGY.

Now to G3ILO; 14 MHz yielded, during the CQ WW Test, all the *W* call areas save *W5* and *W6*, *VE2*, *VE3*, *VE6*, KP4EAJ and KL7RA, plus a lunch-hour session which turned up VE6CJO, VP9IN, W7NW, W7KD, WA7UUF, WA7RKJ, all on CW. Turning to the 21 MHz front, there were lots of *W*'s in the CW leg of the contest, plus PJ2VD, and the odd *W* type other-

TOP BAND/TEN METRES COUNTY/COUNTRY LADDER

November 1, 1976 to October 31, 1977 (Final Listing)

Call	TOP BAND				TEN METRES			
	AM	CW	SSB	Countries Total	AM	CW	SSB	Countries Total
G3FJU	39	80	80	17 216	—	—	—	—
GM3YOR	—	160	—	14 174	—	2	—	20 22
G4AEJ	50	30	12	6 98	—	—	—	—

Scoring is on the following basis: one point per county worked on SSB, two per county on CW, three per county worked on AM: two points for county AM/SSB QSO's, each end to score two points in the appropriate column for the mode used. No other cross-mode working permissible. Countries score one point each regardless of mode.

wise.

G8PG has a question: he notes the stations that send letters "C" and "D" just below our 21 MHz band and observes that when "C" is loud, conditions are usually good to Asia and Europe, while "D" peaks with a transatlantic opening. Now, the interesting bit is that when he was in Canada last year, he came across these two again—but this time near 10 MHz. What, he demands, are they? A good question—but very likely on the air for the very purpose for which G8PG finds them useful!

Now to a strictly twenty-metre fan. G3RCA (Wigan) has quite a crop now he has sorted out the beam and rotator problems. 7Z2AP, VE3HRS/TZ6, KG6RT, KC6MM, P29CC, YB0ACT, TR8's, RG, RS, BR and WR, 3C1X, FB8XR, FB8WE, FB8ZL, FO8AQ, 8Q7AD, SU1CR, H5FXT, VR4DN, KC4AAC, 9AXCD, FY7YE, OE6DK/YK, FM7WY, J28BD and C5AL. Tom also passes on the news that he was told by ZD8EW that ZD8RR had become a Silent Key. On an entirely different theme, some indication of the patience of the good DX-er is indicated by the fact that G3RCA has just received his VR4DX QSL, some thirteen months after the QSO, and direct airmail both ways!

During a visit to our Office, G4EAN (Nottingham) got a peek at the file copy of the very first issue of SHORT WAVE MAGAZINE, which fascinated him to the extent that he would like to see us do some extracts! G4EAN is still not liking Eighty, so he has decided on a dipole; the only snag, of course is that it needs to have the ends paid out or taken in as the tower is winched up and down—and has anyone got long enough arms? Meantime, back at the range, G4EAN worked four stations over the holiday, all Euro-

peans, on Twenty.

Great QRO now at G2DHV—power up from sixty to eighty watts of CW—this helped to raise UT5VZ, VK3PG, VK5RD, ZE1FL/N (aboard a ship), P29AB, 9J2BO, ZS5A, ZS6DL and ZS6BQT. The band, as usual, 21 MHz.

It was a mixture of QRO and QRP for G2HKU. SSB at high (for him!) power made it to UF6VAG, ZL1VN, ZL3RS and ZL3SE; CW dealt with VP9HZ/MM who at home is, we gather, G8AXB from Liverpool way. Turning to the HW-8, CW with that was enough to reach EA7ALG and EA7TL.

On to G4GIE and his HW-8; this low-power and a Joystick was quite adequate for W QSO's on both 14 and 21 MHz, 9H1 on 21 MHz, and a goodly assortment of Europeans.

Crystal Ball

First some new prefix allocations, namely P3, P4 and P5-P9; the first equates to 5B, the second to P1, and the last group have been allocated to the People's Republic of Korea.

If you are looking for South Shetlands, you should note that a Polish scientific expedition will be there until March; the operator is SP2BHZ, and he has been given a special call HF0POL, which he will drive with some 750 watts of CW and SSB, from King George I Island. QSL via SP2BBD, N. Dolny, ul Grzmaly Siedleckiego 9/30, 85-140 Bydgoszcz.

We hear through the grapevine that the MIC on Forty is not of the true-blue blood; but on the other hand we have it that 9N1NFO is OK, and is a Bell Telephone employee. Back to phoneys, and we have deep suspicion ourselves about the SY1MA on offer at the low end of Eighty.

If you want to make it difficult, try beating Diana, G4EZI, who is now up to some 122 countries worked with YL-YL QSO's and still steaming ahead at a great rate!

F6BBJ seems to be on the war-path: arrival in Mauritius over Christmas, with plans maturing for Rodrigues, Comoro, Mayotte, Glorioso and Geyser Reef.

We hear that during the February-March period, there will be some activity from the Saudi/Iraq Neutral Zone, with four JY's, 9K3DJ, HZ1TA and DJ9ZB, which last is the QSL route. The call is believed to be going to be 8Z4X.

Still looking for Clipperton? That must apply to most of us, but there seems to be a whisper about that a group may be trying for a licence for late March or early April, tying this up with some work on the scientific side.

By now the interested ones will have started looking out the counties on Top Band for CCA, and should be well on the way; but your old conductor who had rather yearned after getting the first one himself, is in some difficulty over aerials and getting strings over high tree-branches: fishing-rods, bows-and-arrows, weights on strings, the lot. The current trend of thought on the matter rather indicates a radio-controlled model helicopter to carry the first thin string over, ready for human intervention with a thicker string. Only snag, we have to build and learn to fly the blasted thing first!

Finale

That's the lot for another month. The deadlines are as usual in a "box" in the body of the piece, and the address as always CDXN, SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

AN INEXPENSIVE SWR BRIDGE

PETER BURNETT, G4BLL

THE object of this exercise was to produce a practical, everyday, piece of measuring equipment by the most inexpensive means possible; this approach dictated the use of components already to hand and which should be available in most radio junk boxes. It was desired that the instrument should be useful over the full 160m.-10m. amateur spectrum. Unfortunately in the end the 160m. band had to be traded off, but it was found that the instrument also worked on the 2m. band as a consolation bonus.

The circuit diagram for the design is shown in Fig. 1 and is based on the well tried principle of coupled transmission lines. The version described here was

fabricated from printed-circuit board off-cuts, a $\frac{1}{4}$ -inch diameter brass (or copper) bar as the main coaxial conductor and two secondary lines of 14 s.w.g. tinned copper wire. The dimensions for the individual parts are given in Fig. 2, and Fig. 3 shows how they go together—the sequence of assembly is as follows:

- (1) Slide the two polystyrene or fibreglass spacers on to the main conductor.
- (2) Attach the two end pieces to the main conductor using four B.A. screws, ensuring that they are square to each other.
- (3) Place the two 6-inch p.c. board screens, with copper side facing and parallel with the main conductor; the spacing should be $\frac{5}{8}$ -inch. Solder the end pieces at the points shown.
- (4) Push the secondary lines into the slots and parallel with the main conductor.

An inexpensive 1 mA meter was used as the indicator and in the original version did not incorporate the meter

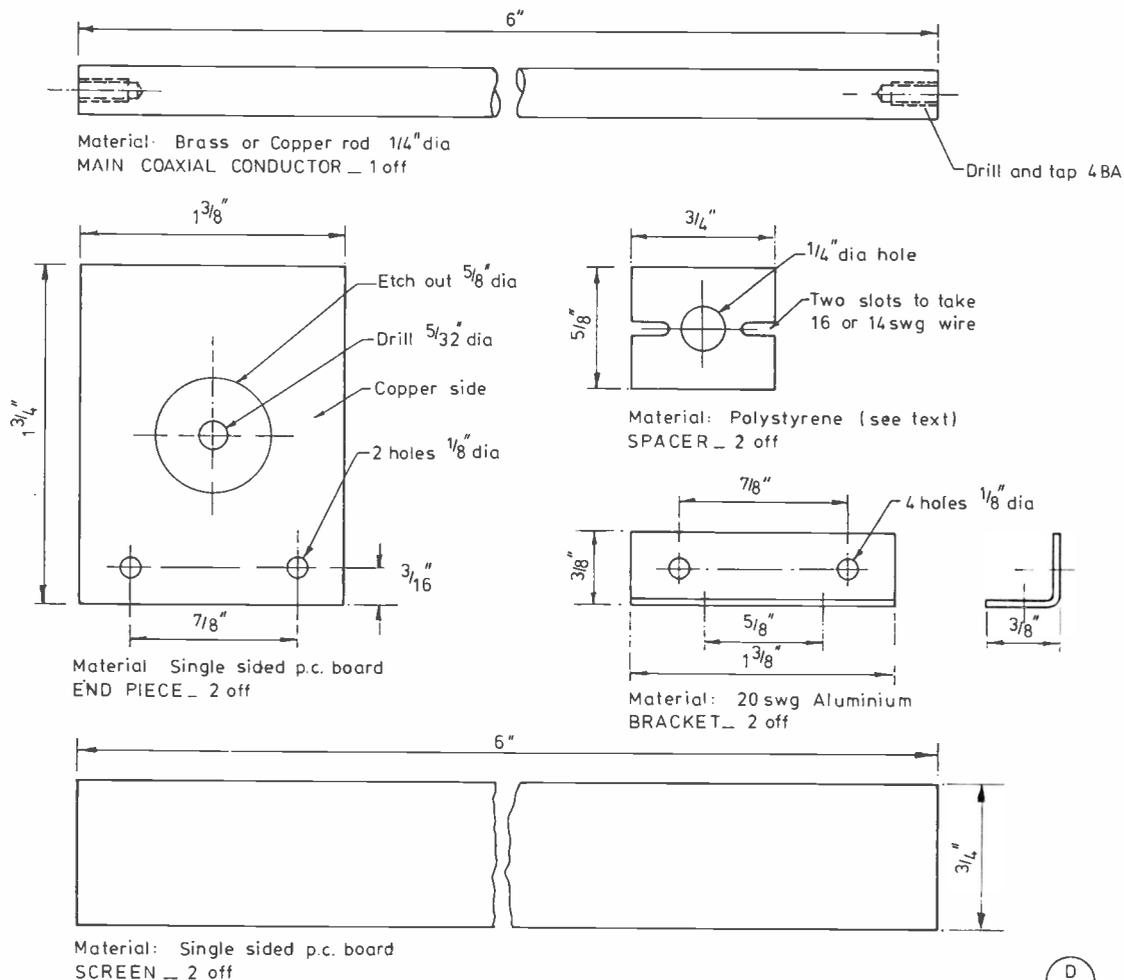


Fig. 2 COMPONENT PARTS

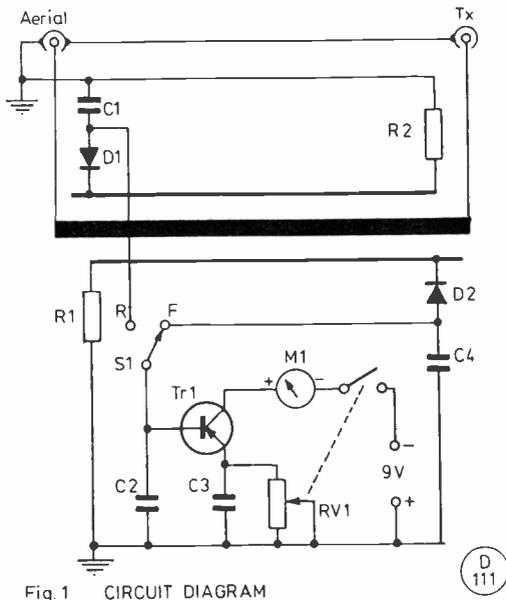


Fig. 1 CIRCUIT DIAGRAM

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amplifier, but this was found to be too insensitive on the 80m. and 40m. bands and even at full power would not give full scale read out. The transistor used for the amplifier is not critical and an unmarked *npn* was used as this was the first to come out of the box; if an *npn* is used reverse the battery, meter and diode polarities. Similarly the diode type is not critical, try any germanium ones you have available. The diodes are soldered approximately a half-inch from the end of the coupling

lines to give a small amount of end capacitance.

Setting up the instrument is quite easy. Terminate the aerial socket with a 50-ohm (or 70-ohm) pure resistance dummy load; switch the Tx to the highest frequency band it is desired to use and the SWR bridge to "reverse" with the sensitivity control set for a near

Table of Values

Fig. 1

C1, C2,	D1, D2 = IN34, GEX66,
C3, C4 = 0.001 μ F, disc	OA71 etc.
	(see text)
R1, R2 = 150 ohms (for	Tr1 = see text
50 ohms	S1 = Single pole 2-way
impedance)	M1 = 0.1 mA meter
= 100 ohms (for	
70 ohms	
impedance)	Also required:
RV1 = 10K linear	Suitable case; PP3 9v.
(with s/pole	battery; two control knobs;
on/off switch)	two co-ax sockets

maximum indication on the meter, with the Tx tuned for maximum output. Adjust the position of the "backward" coupling line relative to the main line for minimum indication on the meter—do not switch to forward at this point. Change over the Tx and load connections and repeat the above procedure with the instrument *now* switched to "forward" by adjusting the position of the "forward" coupling line (now operating in reverse mode) for minimum indication on the meter. It should not be necessary to adjust the setting of the sensitivity control when making these adjustments.

The instrument is now set up and ready for use. It may be calibrated directly if desired and a number of articles have appeared in *Short Wave Magazine* over the

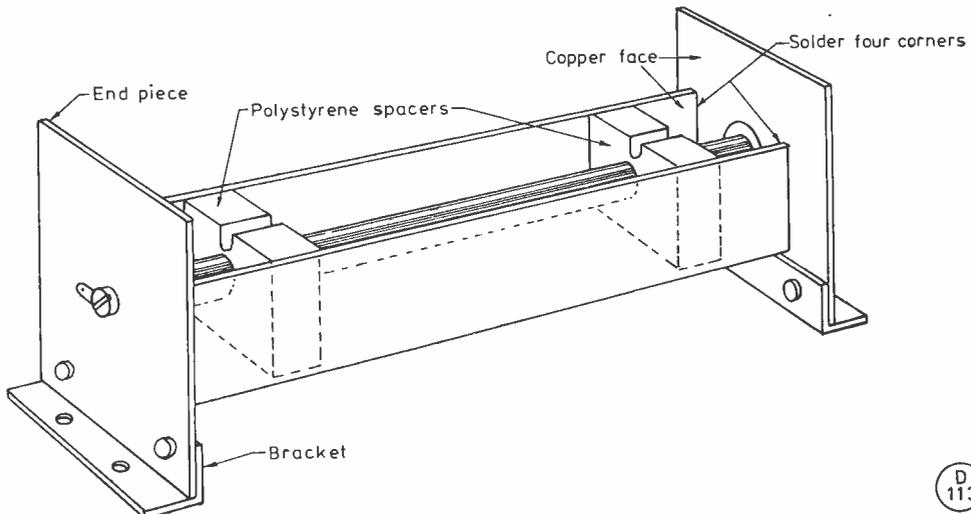
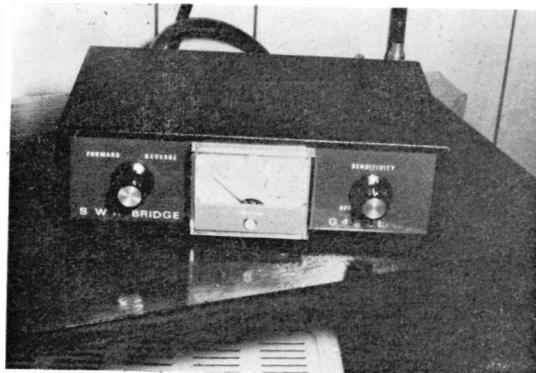


Fig. 3 COAXIAL LINE ASSEMBLY

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past few years explaining how this may be carried out.

The writer has now had the SWR bridge in use for some months without any signs of the battery requiring replacement and it should last for a considerable time. Replacement will be required when one is unable to obtain full scale indication on 80m. with the sensitivity control at maximum. An on/off switch was incorporated on the rear of the sensitivity control, or a separate toggle-switch could be used. The battery is retained within the instrument simply by the use of double-sided adhesive tape; a small metal bracket could be made if desired, but it has been found that the PP3 battery can vary in size depending upon manufacturer. The photograph shows the writer's version built in a commercial box, size 9 inches by 5 inches by 2½ inches, which happened to be available; however, size is immaterial and any size of metal enclosure may be used, minimum dimensions being dictated by the size of the lines and the meter used.



General external appearance of the SWR Bridge discussed by G4BLL.

AMATEUR RADIO — COMMUNICATION OR TECHNOLOGY, OR BOTH ?

PART 1

N. H. SEDGWICK, G8WV

THE motivations for indulgence in the hobby of Amateur Radio, the philosophies and methods of such participation, and the psychology of the satisfaction derived from it have changed greatly over the years. Pondering the reasons behind such changes the conclusion was arrived at that the greatest single contribution was the transmitter—its availability and the operational modes offered. Amateur HF radio is now firmly determined by commercial interests, principally foreign, and the complex operational modes offered by the commercial equipments impose disciplines of procedures which certainly do not appear in the licence regulations. For example, at one time no British amateur would think of calling an American telephony station on his frequency in the US 'phone band on twenty metres, but now it is accepted practice always to call on the same frequency when answering a CQ call, and the widespread use of transceivers probably contributed to this.

It is quite normal for the newly-licensed amateur to spend several hundreds of pounds just to get on the air in the first instance. Forty years ago (rated in purchasing power) the outlay was a mere fraction of this; we were limited to ten watts input, certainly had to build our own two-valve transmitter (probably on plywood) and might just have ventured £15 on one of the new-fangled communications receivers like the Tobe Deutschmann if we were well-to-do—but more probably built ourselves a TRF or fitted a BFO to an "all-wave" broadcast receiver. In fact our licences were to enable

us to carry out experimental work, and did not recognise us as communicators. We had to make a case outlining what we intended to investigate technically when applying, and could be turned down on the ground that too many people were working on the same thing!

Having laboriously learned Morse code we used it, and not entirely because we could not afford the high level modulator for the Class-C amplifier. In the last couple of years before the war there was a lone voice from Havering-atte-Bower in Essex which called "Hello test SSB from G3CQ"; he got some mention in the *RSGB Bulletin* but there was little enthusiasm amongst the rest of us. The Post Office had used SSB for multi-channel line communication for years, but their carrier frequencies were so low that there was no problem in filtering out the unwanted sideband. At HF the problem was enormous, but the writing was on the wall and we unconsciously awaited the advent of the 9 MHz crystal filter!

Thirty years ago the world was a gigantic scrapyard of military electronics, and what a time we had! Enterprising amateurs, discharged from communications sections of the forces, jumped into the surplus market and became millionaires overnight, and the periodicals of the amateur fraternity bulged with articles on how to modify this or that military set (British, American, or very curiously, German) to meet the amateur requirement. Our power limitation was lifted to 150 watts input and the surplus market enabled us to reach it, and our licences were now for amateur communication and not for experimental work. At last we could call "CQ" and not "Test." It was a good time: value for money was enormous, and we hit a sun spot cycle peak which made DX working real joy. Amateurs were all over the world organising peace in war-ravaged areas; and they had been taught to use Morse code in the forces. With such opportunity available, "home-brew" dried up and the fraternity went flat out on communication—operating as distinct from technology.

Fifteen years ago the supply of military surplus had assumed peace-time proportions and SSB was beginning

to be felt. Two results are now apparent:—

(a) SSB had made home-brew complex, requiring a lot of time and some complicated and accurate test equipment. Commercial interests saw the opportunity and produced the transceiver custom-built to meet amateur needs. There was no resurgence of home-brew!

(b) Morse code CW telegraphy had always been able to beat A3 AM telephony, partly because all the RF power developed in the PA was used to convey the message intelligence in Morse, as against the much lower efficiency of the telephony in A4 mode; and partly because much greater receiver selectivity could be used to receive slow Morse code, whilst A3 reception required a bandwidth capable of receiving both sidebands arising from the audio modulation. Suppressed carrier SSB allowed all the RF power developed in the PA to be used for intelligence, although the necessity for a linear amplifier reduced efficiency somewhat; suppression of the unwanted sideband allowed the receiver bandwidth to be half that used for A3. The SSB thus went some fair way towards Morse code CW in communication efficiency, allowing communicators to forget the use of Morse code and giving full reign to their conversational talents when they could not be interrupted. There was no resurgence of Morse code working!

Thus we have a situation where the present occupancy of the HF amateur bands is very largely devoted to SSB telephony, made possible almost entirely by the availability of commercially produced equipment for amateur use, and in particular the transmitting part of such equipment, since any modern receiver equipped with a BFO can be used to receive SSB telephony.

For two years in succession the standard of living in this country has deteriorated and the purchasing power of our currency abroad falls almost continuously. When the West German currency was introduced after the war it was set at 40 marks to the pound: now it is 4! In this trend it is quite possible to visualise a situation where amateurs simply cannot afford to buy complete commercial rigs of foreign origin. In judging his priorities a family man may well consider acquisition of an amateur rig to be personal to himself and thus selfish, since it allocates a large sum of the family's capital or income to something that provides no service or pleasure to the other members of his family. Such a situation must change the practice of the hobby by re-introducing "homebrew" activity, in which case the modulation technique adopted by any amateur will depend on his technical knowledge, practical ability, workshop facilities, and availability of components. Setting up and equipping a workshop is an expensive business, but electronic components are cheap enough; many amateurs can make use of workshop facilities at their place of work, and community workshops provided by education authorities have possibilities, but for the great majority of amateurs the accent will be on simplicity, and we see a return to Morse code working in some degree.

Turning again to the satisfaction or fulfilment aspect of the hobby, it does seem that most prospective amateurs have no intention at all of ever using Morse code although licensing rules require that they should be proficient up to 12 w.p.m. in the art if they wish to work the HF bands. Discussion reveals that they give

no thought at all to the possibility that operating Morse code can be enjoyable and rewarding; they simply do not want to know, and clearly found the experience of learning Morse so tedious that they cannot understand that practice when proficient may be much pleasanter than learning when not proficient. There is no doubt that operating Morse code CW offers the best opportunities for using one's skill and technical knowledge in the setting of the receiver options to turn what appears to be a hopelessly jammed signal into a fully readable and clear signal. The ultimate can be reached by the use of a sharply peaked audio filter, giving selectivity of say, plus or minus 3 Hz to the half power points. An SSB signal will require a receiver bandwidth of at least 2500 Hz, and thus cannot compete with Morse signals in the presence of QRM.

Contemptuous distaste for using Morse code is generally a reaction of no self-confidence in one's ability in the art; when learning Morse one tends to follow individual dots and dashes to identify characters up to about 10 w.p.m. Beyond that speed it becomes too fast to do this and one's reading technique has to change to recognition of characters as a whole: it is analogous to learning to read a script. One meets the situation of getting up to 10 w.p.m. fairly quickly and then suddenly finding a hang-up in progress. Once one does start progressing again and gets up to 12 w.p.m. it normally means the breakthrough has occurred and all it needs is practice to get right up to 20 w.p.m. or so. Unfortunately learners do not realise they have passed the worst bit, take the exam, and forget it as soon as they can! There is much to be said for the American rule that novices are restricted to Morse code working, since it ensures all amateurs have a period of familiarisation with the art and enables them to gain confidence.

However, we must admit to two types of Morse operators in the HF bands who deter even the most dedicated amateur CW operator from replying to their calls. The first is the commercial or military operator who is also amateur, but who *must* demonstrate his proficiency in the art of Morse code by immediately going up to 25 w.p.m. as soon as he has contact established. The simple result is that the other chap cannot read him but is too shy to say so. This does not worry the high-speed types, who rate QSO satisfaction as maximum number worked in minimum possible time, and come out in contest periods like suburban motorists on bank holidays.

The other type is the real 'amateur' who has never appreciated the point that "spaces" are just as important as "marks" to the intelligibility of his code sending, and runs his characters into each other with unrhymic jerkiness which knocks two points off readability 5. These operators are very much the self-taught men who had nobody to criticise their sending practice and nip the bad habits in the bud before they became ingrained. To them we say: "Use that cassette recorder you surely own and record your own Morse code, and then play it back and see what it sounds like. Does it flow rhythmically and yet have each character distinct and unambiguous, or is it jerky and disjointed with your 'AI' indistinguishable from 'L'?"

Since our licence requirement is for a speed of 12

w.p.m. and there are bound to be amateurs on the band whose proficiency is limited to that order, why go faster? What is the necessity for the mad rush in the indulgence of a leisure-time hobby? In view of the usual band conditions, QRM and noise, 12 w.p.m. is probably not far from a generalised optimum speed for QSO satisfaction, bearing in mind that reduction in speed increases intelligibility (which cannot be said of any form of telephony!) There is a breed of American Very Old Timers who come up on CW for the occasional rag-chew. These chaps have long since worked all the DX, plastered the walls of their shacks with certificates, alienated their XYL's by sitting up half the night, and proved that they can send Morse code faster than anybody else can read it. Now all they want to do is to communicate (which is a two-way affair!), and their Morse is a joy to read, for they never send too fast for prevailing conditions, and they know that the cleaner and more precise their keying, the easier it is for the intelligence to penetrate the opposition, including the ears and brain of the chap they are working. They even tell of their grandchildren on the key, and will listen with apparent enthusiasm to reciprocal information, which makes a pleasant alternative from the exchange of Japanese equipment type numbers. They are, in fact, great guys and we love them for the QSO satisfaction they provide.

Then there is the technological wrongdoer who likes a ping on his note so that it transmits from mark to space with a pronounced ring as if coming at one through a mile of drain pipe, which ring added to a mite of round-the-world echo makes it impossible even to be sure of his call-sign. Key filtering needs only to be adequate to stop key clicks spreading across the band, and anything more just detracts from readability of the Morse when sent over an HF path, or rather, a number of HF paths since multipath is sure to be present on any DX contact.

All of which adds up to the fact that if one wishes to work CW with success one needs to know what one is doing, because there is a great deal of craftsmanship involved.

Having set the scene we may sum up before proceeding to actual home-brew matters.

- (a) A1 Morse code CW is by far the most efficient way of communicating in current amateur practice.
- (b) At hand speed A1 Morse code requires about one seventh of the bandwidth required for F1 RTTY telegraphy and about one two hundred and fiftieth of the bandwidth required for A3J SSB telephony. Communications receivers can easily give this order of selectivity by using highly selective audio filters after the detector.
- (c) A3J SSB is the most efficient modulation system for telephony in current amateur practice.
- (d) In the early days of SSB it was necessary for the amateur to make his own side band filter, generally from military surplus crystals: this required a lot of skill and time, and often proved disappointing. The advent of the complete SSB transceiver on the market for amateurs saved all this and popularised the use of SSB. Nevertheless, the only really difficult bit about home-brewing SSB gear is the side band filter, and these can now be bought at very reasonable price as individual items.

When considering home construction of amateur

equipment one is immediately faced with the decision whether to use valves or transistors. People tend to associate transistors with printed circuit boards and special assembly techniques, but this is quite unnecessary in the amateur radio world: transistor circuits can be assembled and wired on simple tag strips without disadvantage. Miniaturisation is neither necessary nor desirable in an amateur rig, for there is no merit in making things difficult to get at when repairs are required. The limitation of transistor circuitry is the low power handling capacity at RF for transmitting amplifiers. Solid-state transmitters up to 1 kW rating are now produced commercially, but the power is developed by using many RF service power transistors effectively in parallel; these transistors are expensive and liable to "run-away" faults which can ruin a whole group in parallel. Amateurs are more or less restricted by price and loss risk to medium power types such as the BFY51 and 2N2102, but these have the disadvantage that the metal shell is connected to collector which prejudices use of a sufficiently large heat sink when used in common emitter mode, and means that what heat sink there is at RF "hot" potential. Bigger and better, but at ten times the cost in the stockists' advertisements, is the BLY84, rated as a "high power transistor," which has no internal connection to its mounting screw and 12 watts dissipation at 90°C. and will give an output of 13 watts; unfortunately it needs a lot of drive.

For the shack the choice for the PA still lies with valves, and the decision whether to use valves or transistors for the exciter and driver stages almost depends on one's age, for the older man will want to use the valves he understands and loves, and the younger man will feel the same about semi-conductors.

Transistor circuits permit wide-band couplings at RF because the low impedances to be coupled do not necessitate tuning out of reactances by use of tuned circuits, as in the case of valves with their high circuit impedances. However, this can be an empty advantage, for the tuned circuits also serve to exclude unwanted frequency products from the couplings and are often necessary for that purpose alone. A further and less readily appreciated risk which attends wide-band transmitting amplifiers is the fact that wide-band noise arising in mixer and other circuits right through the exciter and amplifier will be amplified and radiated as well as the proper signal power. The user therefore pollutes the spectrum with noise over the bandwidth that his aerial will radiate. The noise may well be 60 dB below signal: but if the signal is putting down S9 +30 dB at a particular receiving site, the wide-band noise there will be S9-30 dB, and at 6 dB to an S-point this represents a man-made noise level across the band of S4, which is distinctly anti-social! Thus, although it may be convenient to use wide-band couplings in a transistor transmitting amplifier, inevitably a tuned circuit needs to be inserted before the aerial connection to restrict noise to the bandwidth of the main signal. Transistor amplifiers are also terribly rich in harmonics.

On the whole, valve circuits are easier to set up and adjust by reason of the circuit isolation between input and output of the valves, and they are certainly easier to change when fault finding.

to be continued

THE STEPHENS-JAMES LTD. MULTI-TUNERS, Mk. 1 AND Mk.2

A TEST REPORT

WE are dealing with the Mark 1 and the Mark 2 in one review, for the reason that the latter is, as it were, an extension of the former to give coverage of lower frequencies. The two are shown in the photographs and the smaller is the Mark 1 in both cases.

It doesn't take a lot of study to see from the two shots that this is just what it is claimed to be, namely an aerial tuner for any sort of length of wire which the SWL may sling up and wish to resonate; the Mark 2 version permits the medium-wave DX-chaser to cover the whole gamut from there to around 30 MHz with the one tuner, while the simpler Mark 1 can be regarded as giving cover from 1.8 MHz through to 30 MHz.

When they arrived by post at the reviewer's home and were unpacked, it was discovered that both units were wet inside and outside.

We rang the makers who were highly alarmed at the news and immediately set into motion an enquiry as to "how has this happened, and whose head is to come off?" But as the writer knows only too well, this sort of mishap can arise in even the very best regulated concerns. Our station ATU with the big after-burner we thought would probably scare the pants off an ATU that was designed for listening-only (and in a reasonably dry state at that!), so if these survived being

used with the station they could be recommended without fear.

So—we gave the gear 48 hours in the shack with the covers off to dry, and then coupled them into the existing station in which the ATU has two outputs directly, plus one through the ATU-proper, and another switch position in which a dummy load is connected. Thus with each Multi-Tuner we could feed into the coaxial to the station-proper and switch from a wire fed through the Multi-Tuner and through the normal station ATU set-up instantly, and compare the results on receive in terms of S-meter reading of a given signal; this was done initially using the receive side of the TS-520, repeated with the station KW-77 and an Eddystone 888 for good measure. Once we had some sort of feel for the tuning routine under SWL conditions, we then cheated a bit and tuned it up on the transmitter against an SWR bridge and field-strength meter reading and compared the performance against that of the home-brew multi-purpose ATU. If it would stand up to this sort of maltreatment we reckoned it would stand up to any reasonable sort of shack conditions which an SWL would tolerate for the sake of his hobby, and if the results were comparable with that of the home-brew box we felt that the range of adjustments provided would cope with most things in the aerial line which an experimentally-minded SWL might dream up.

In view of the rough handling we would not have been all that disturbed if we had found things a bit out of kilter, but in fact over the amateur bands there was nothing in it between either Multi-Tuner and the home-

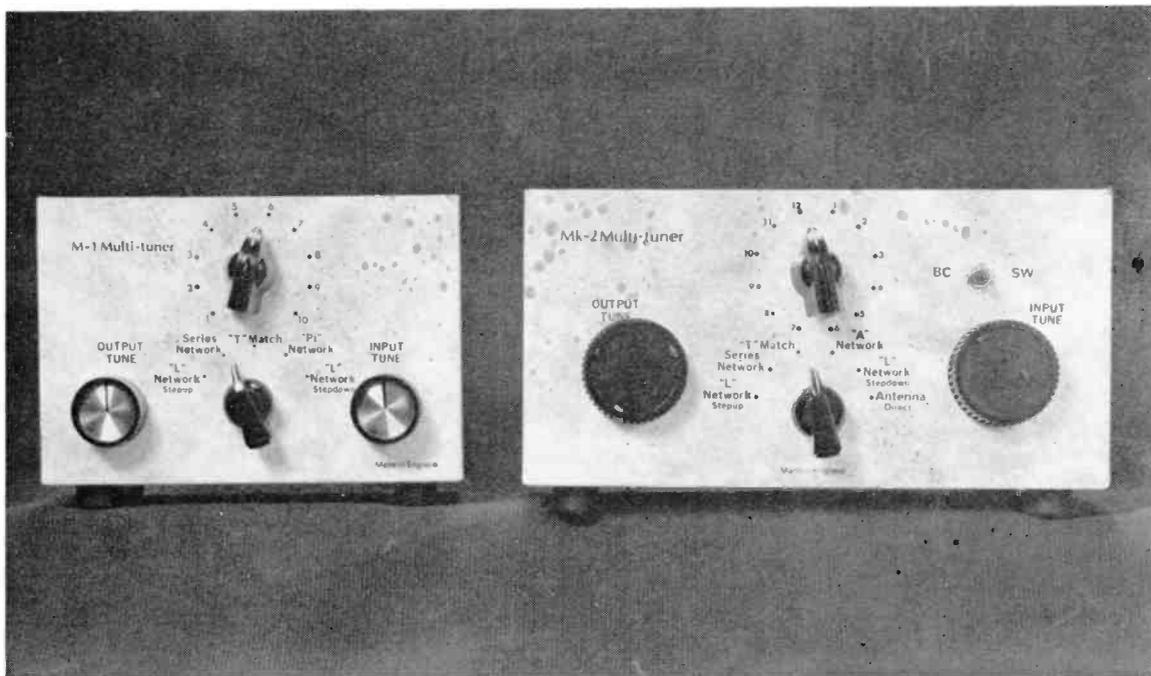


Fig. 1. The Stephens-James Ltd. Multi-Tuners, Mark 1 (left) and Mark 2.

brewed ATU on receive or for that matter when taking the output of the two 6146s either in CW or SSB modes of operation (save that on Top Band the Tuner was tried on receive only thanks to the present lack of RF for that band in the station). When we think of the hours we have spent in attempting to obtain the maximum RF out of the home-brew ATU on each band, then we have to give the Multi-Tuners full marks on that score. However, we will come to our reservations next.

Perhaps a quarter-of-a-century of tuning up transmitters has biased us somewhat, but for purely SWL work the old-fashioned parallel or series tuned ATU—set up carefully in the first instance—has the advantage that there is a quite definite peak with the signal falling off on either side, so that tuning the ATU in normal listening is possibly more easy. On the other hand, such an ATU needs to be set up with care to cope with the aerial in use; and a change of aerial means, generally, getting out the soldering iron. Against that we have the fact that the wide-band ATU based on either the pi-, the T-, or the L-networks is going to be, dependent on the network selected, either high-pass or low-pass in essence. Thus, for the purely SWL, to peak a signal with the Multi-Tuner requires either a receiver with an S-meter or a keen pair of ears and a means of disabling the AGC so as to give the ears a chance.

The writer, for more years than he cares to think, has always tuned his aerial up so that the transmitter "sees" a unity SWR, and switched the coax from the ATU to the receiver so that he can peak the receiver on a known correctly-tuned ATU/aerial combination. This has always been of the "tuned-circuit" as against the pi-, the T-, or the L-network (until recently) which method is acceptable in that one tunes-up on the dummy load, cuts carrier, switches the ATU to the desired band and aerial, and tunes up the ATU on the other side of the room after putting in a whiff of RF, for unity SWR; this without looking at the receiver S-meter which in fact is invisible to all but a contortionist while tuning-up. When one goes back to the operating position, one knows the transmitter is "on the nose" as is also the transceiver, so that one merely peaks up the separate receiver preselector control and accepts it that everything is then right. In an SWL station using the Multi-Tuner, one would want to have the box on the table alongside the receiver, so that one can see on the S-meter precisely what is going on. All this being said, there is no doubt that the Multi-Tuner of either mark is going to be capable of coping with just about anything you can offer it in the way of an aerial, and lots of SWL's who have never known different systems find the use of one or other of the networks "a piece of cake."

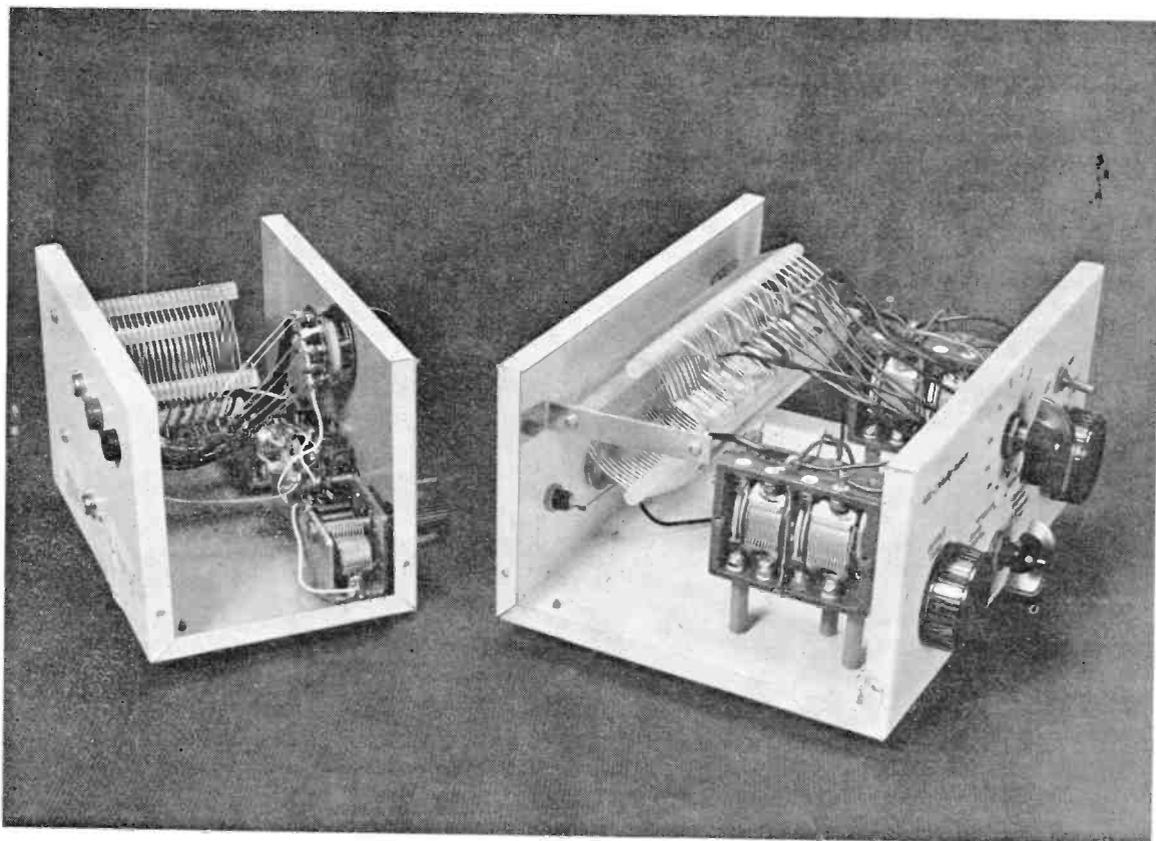


Fig. 2. Internal details of the Multi-Tuners.

Other criticisms are few. We didn't like the use of the "phono" type of connector for the coaxial feed to the receiver, and would have preferred something like the Belling-Lee coaxial socket as used for TV sets as being both electrically and mechanically sounder when used with a transmitter; but since it is described as an SWL ATU and all the instructions are couched in terms of reception the gripe is only just valid, even though as we have shown the unit would be an asset to most amateur transmitting stations who use something of the order of one or two 6146's in the PA stage, and particularly for /P forays or Field Days. We would like to see the aerial side changed over to a "switched" arrangement so that one could put both a coaxial-fed aerial and an end-fed on to the relevant terminals and switch the ATU from one to the other, as we foresee this versatile unit being used by lots of people who like "playing with aerials" as a major part of their hobby activity.

It will be noted that we have not made any attempt to review the Mark 2 Tuner at the lower frequencies: for one thing this is outside our sphere of interest, and for another we just don't seem to have a general-coverage receiver around the place with which we could give a fair report on the Tuner at medium-wave. However, there is a lot more coil available, the capacitors are of large capacity swing, there is a switch labelled BC/SW which can be used, and on the function switch of this Mark there is a "direct" position for comparison purposes. It will also be noted by the sharp-eyed that the "pi" which was intended was turned by the panel printer into an "A"—but so many people are after these units that Stephens-James have released this one batch rather than disappoint them.

Summing-up, here is a pair of handsome-looking British made aerial-tuners intended basically for the SWL, and capable of dealing with about anything he is likely to want to tune up; and we wouldn't see much problem in using one with one of the 180-watt class of transmitters, such as the KW-2000 series, FT-101 series, or the TS-520 and similar powered rigs, although it is a reasonable guess that it wouldn't want to be used with a linear or with a voltage-fed aerial such as an end-fed half-wave. The criticisms are minor on the technical side and the wet condition in which they arrived was probably nothing whatever to do with the makers.

YOU'VE MET 'EM

*When first I got my licence through
I thought the best thing I could do
Was listen to our Top Band net
for information there to get
on how to hold a QSO
from those whom you would think should know.*

*Now when you hear someone you seek
there are some rules before you speak
the first being plain for all to see
Don't call him on his frequency
And when in nets where there's a lot
each one should use a different spot.*

*Why this should be I do not know
But listen round—it sure is so
And when a net goes on a while
they drift apart by half a mile
so those who use selective gear
must retune to each one they hear*

*Make copious notes—with ears agog
list' to each lengthy monologue
so when your turn comes to transmit
then you won't have to sit and sit
and wonder what on earth to say
you simply add the words "O.K."*

*'Tis easier you will find by far
to say "O.K. about blah blah"
repeating comments, points and jokes
already said by previous blokes
just reading from your notes as shown
and adding nothing of your own.*

*Some phrases and some words as well
are used whose meaning's hard to tell.
Much used is "going QRT"
or "I'm now running QRP"
or QRX or QRZ
Is this "plain language"?—'nuf said.*

*The word used most must surely be
the small word "there" for you'll soon see
it's tucked in everywhere—it's clear
it may mean "there" or may mean "here"
Though used a lot by nearly all
it may mean no darned thing at all.*

*A phrase that many like to send
is "That's the story from this end"
so stories you must learn to tell
give lectures, and tell jokes as well
so if your turn's not been forgotten
remember conversation's not on.*

*The moral that comes clear across
is say as many words as poss.
It matters not what 'ere your choice
so long as you can hear your voice
It seems that what it's all about
is talk at length and still say nowt.*

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SOME BITS AND PIECES

OPERATING AIDS FOR THE HEATH HW-8 QRP TRANSCEIVER, WHICH SHOULD ALSO BE USEFUL FOR OTHER APPLICATIONS

THE HW-8 equipment is a solid-state CW-only transmitter/receiver and on 'transmit' it will deliver some 3 watts of clean RF on the '80,' '40,' '20' and '15' metre amateur bands. Obviously various external operating aids are found useful with the HW-8 and of these the following will be briefly dealt with, each having been air tested over a lengthy period; they are:—

- (1) A Top-Band transverter
- (2) A simple audio amplifier
- (3) A mains-driven power supply
- (4) A 4-band RF amplifier

The Transverter

Although a reliable transistorised affair would be pleasing for rapid, sure-fire results, the valved circuitry

shown in Fig. 1 does perform well; no alterations or modifications of any kind need be made to the HW-8 unit and if the home-made coils are pre-resonated with the aid of a dip-oscillator the unit should function from switch-on.

To achieve Top Band coverage the HW-8 is best operated at 14 MHz for both 'receive' and 'transmit,' mixing to and from 1.8 MHz being done in the transverter where a crystal-controlled oscillator V1a runs during both functions at 12.2 MHz.

On 'receive' Top Band signals are routed via S1c to V3 grid circuit together with the oscillator output. The resultant 14 MHz signals pass to the HW-8 aerial socket via T2 and S1a and 'forward tuning' on the scale results, 1.8 MHz corresponding to '0' and 2 MHz to '200.' During receive the screen supplies to V1b and V2 are removed. A 12.3 MHz crystal could also be used but 1.8 MHz would then correspond to '100' on the HW-8 scale; in either case frequency read-out is made easy. The trap coil L3 and its associated components is not needed unless break-through is experienced from a broadcast station; some 60 turns of 30 s.w.g. enamelled copper wire close wound in two layers is about right to cope with Radio Bristol for example when TCI is

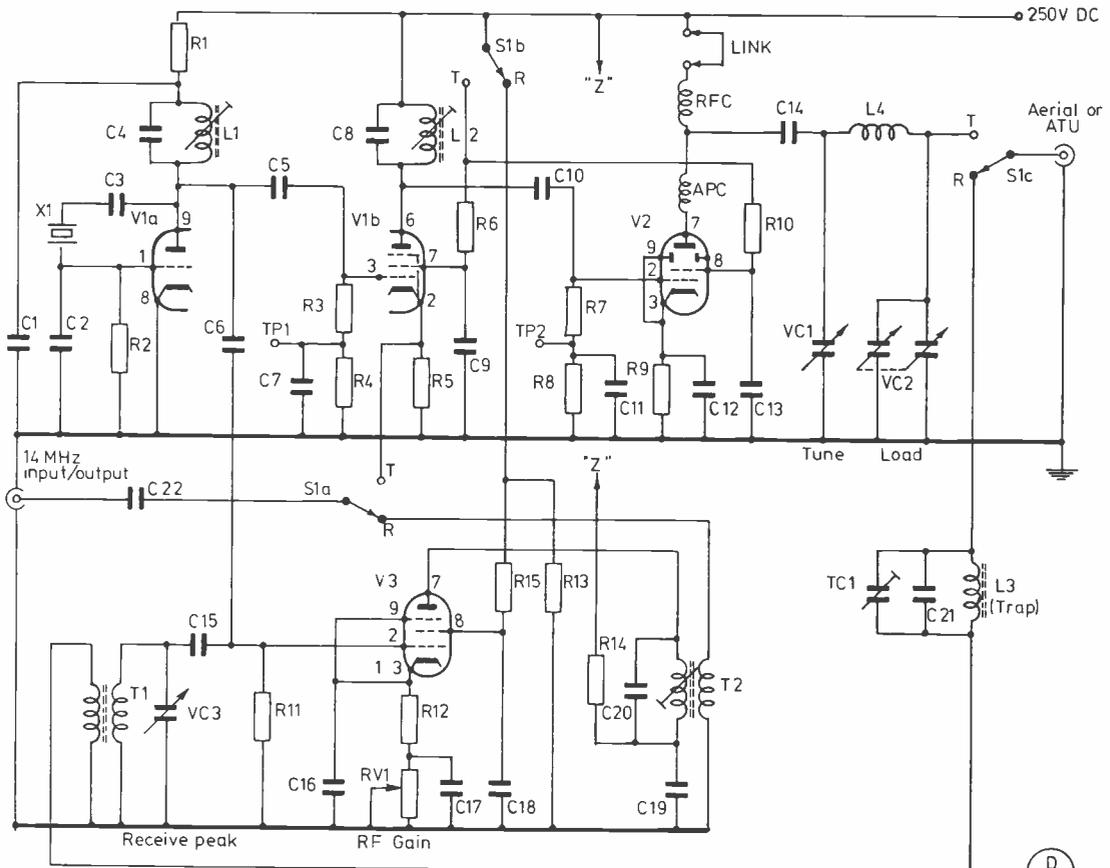


Fig 1 '160 TRANSVERTER' CIRCUIT DIAGRAM

Table of Values

The Transverter—Fig. 1

R1 = 1800 ohms	C8 = 47 $\mu\mu\text{F}$
R2 = 100,000 ohms	C9 = 0.01 μF
R3 = 100,000 ohms	C10 = 1000 $\mu\mu\text{F}$
R4 = 1000 ohms	C11 = 1000 $\mu\mu\text{F}$
R5 = 470 ohms	C12 = 1000 $\mu\mu\text{F}$
R6 = 10,000 ohms	C13 = 1000 $\mu\mu\text{F}$
R7 = 22,000 ohms	C14 = 5000 $\mu\mu\text{F}$
R8 = 1000 ohms	C15 = 100 $\mu\mu\text{F}$
R9 = 220 ohms	C16 = 0.01 μF
R10 = 1000 ohms	C17 = 0.01 μF
R11 = 2.2 megohms	C18 = 0.01 μF
R12 = 190 ohms	C19 = 0.01 μF
R13 = 18,000 ohms, 3w.	C20 = 47 $\mu\mu\text{F}$
R14 = 1000 ohms	C21 = 100 $\mu\mu\text{F}$
R15 = 10,000 ohms	C22 = 1000 $\mu\mu\text{F}$
RV1 = 5000 ohms pot.	TC1 = 50 $\mu\mu\text{F}$ trimmer
C1 = 0.01 μF	VC1 = 200 $\mu\mu\text{F}$ variable
C2 = 15 $\mu\mu\text{F}$	VC2 = 2 x 400 $\mu\mu\text{F}$
C3 = 1000 $\mu\mu\text{F}$	VC3 = 200 $\mu\mu\text{F}$ variable
C4 = 200 $\mu\mu\text{F}$	variable
C5 = 1000 $\mu\mu\text{F}$	X1 = See text
C6 = 47 $\mu\mu\text{F}$	V1 = ECL82
C7 = 1000 $\mu\mu\text{F}$	V2 = 6BW6
	V3 = EF183

Notes: VC3 can be a sub-miniature solid-type as found in pocket radios and for S1 a 3-pole, 2-way rotary switch can be used. The three valve heaters should be parallel wired for 6.3v. AC supplies.

Coil Data

- L1 = 11 turns 30 s.w.g. enamelled copper wire on 0.3in. dia. dust-cored former.
- L2 = 85 turns 36 s.w.g. enamelled copper wire, pile-wound on 0.3in. dust-cored former.
- L3 = See text.
- L4 = 60 turns 30 s.w.g. enamelled copper wire on 1½in. air-cored former.
- T1 = Tuned winding—55 turns 36 s.w.g. enamelled copper wire on 1in. length of ¾in. dia. ferrite rod. Coupling winding—10 turns p.v.c. wire over earthy end of main winding.
- T2 = 12 turns 30 s.w.g. enamelled copper wire on 0.3in. dust-cored former.

adjusted correctly. The former is conveniently a 1in. length of ¾in. diameter ferrite rod.

Placing S1 at 'transmit' brings transmitter-mixer V1b and the PA V2 to life by applying screen potentials; this places the transverter at readiness. On keying the HW-8, 14 MHz signals are applied to V1b cathode and with 12.2 MHz input from the crystal oscillator on its grid, output in Top Band results to drive the PA. During this function V3 is killed by removal of its screen potential.

All coils are easily hand wound and the former for T1 should be a short length of ¾in. diameter ferrite rod plugged into a grommet fixed to the chassis. No permanent meter is needed but at the setting-up stage the station *Avo* can be connected at points 'X' in place of the link to ensure initial satisfactory functioning; thereafter tuning up may be done by means of an SWR or RF indicator cross-checked with a wavemeter. Resistor R13 is necessary to bleed some current during 'receive' thus preventing the HT rail going over-high. External power requirements for the transverter are from AC mains input, 250v. DC at up to 100mA, and 6.3v. AC at 2A. Suitable chassis and panel layouts are shown in Figs. 2 and 3.

Adjustments

Initially the 'receive' function is attended to, and with the link at 'X' removed supplies are connected and the crystal oscillator energised by adjusting the core of L1. Either by monitoring the current drawn by V1a or

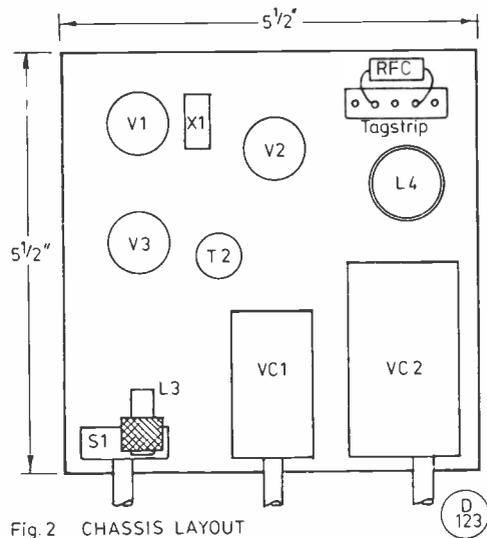


Fig. 2 CHASSIS LAYOUT

by utilising TP1, proof of oscillation can be checked by momentarily disturbing the grid circuit when a rapid upsurge of current should be observed if all is well. The final setting of L1 core should tune the coil very slightly on the low side of optimum to ensure rapid firing at subsequent switch-ons.

If a 12.2 MHz crystal is in use, the HW-8 tuning scale is then set to '100' or thereabouts and with the unit connected and switched to the 14 MHz band the core of T2 is adjusted for maximum received noise. Thereafter, as VC3 and RV1 are manipulated, signals in Top Band should come through when the aerial is connected.

With a meter set to 0-100mA connected to points 'X' on rotating S1 to 'transmit', receiver noise should cease; with a dummy load applied to the aerial socket the 'transmit' side is attended to in the usual way—L2 being peaked to afford maximum output around the section of the band to be used. The HW-8 loading control also affects output considerably and since the cathode of V1b is unlikely to be overdriven at any setting, adjust-

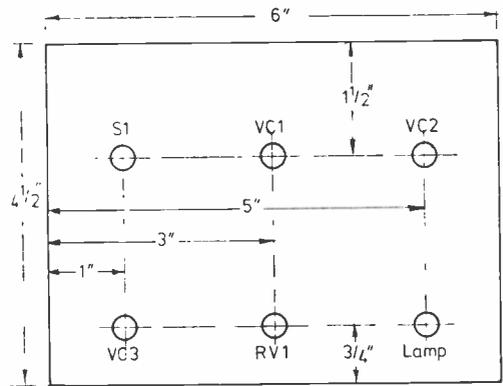


Fig. 3. FRONT PANEL

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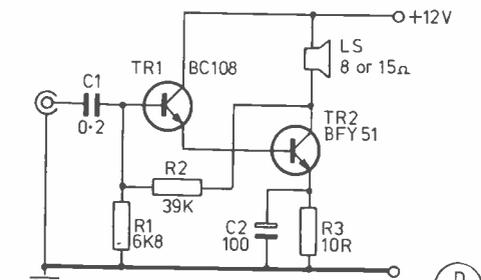


Fig. 4 AF AMPLIFIER

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Table of Values

Audio Amplifier—Fig. 4

R1 = 6800 ohms	C2 = 100 μF, 6v.
R2 = 39,000 ohms	Tr1 = BC108
R3 = 10 ohms—see text	Tr2 = BFY51
C1 = 0.2 μF	LS = 8-15 ohms speech coil impedance

ments can be made to afford the maximum possible output. As mentioned earlier the transverter is best finally tuned for output into the aerial *via* a suitable SWR indicator, points 'X' being linked.

A Simple Audio Amplifier

The HW-8 as supplied gives headphone output, but if this proves tiresome a simple Class-A audio amplifier using but a handful of components can be added to drive a loudspeaker. The amplifier (Fig. 4) is easily constructed on a 2in. square oddment of etched copper-plated board and can be fixed to the rear casing on the inside. Resistor R3 is experimentally selected to obtain a current drain of 50-60mA and no output transformer is needed provided the speaker speech coil impedance is 8 ohms or more. The positive DC potential can be

picked up at the HW-8 On/Off switch with audio input taken from the existing phone socket tag; the BFY51 needs to be fitted with a heat sink and runs fairly warm. A Class-B integrated-circuit amplifier could be used alternatively but additional components would be required.

A Mains-powered PSU

Although dry batteries or a spare car battery can be used as a power source, it is usually more convenient to utilise the station mains supply. A matching mains-powered PSU for the HW-8 can be obtained from Heath if desired, and some 430mA from 14v. DC is required when on 'transmit.'

A suitable home-brew PSU circuit is shown in Fig. 5, and up to one amp regulated and switched DC outputs (always slightly less than the control Zener voltage) are available as selected by S1. The unit can thus be used with other transistorised apparatus from time to time. Short-circuit protection is not provided for these outputs. The additional fixed 5v. DC regulated supply is short-circuit protected however and up to 1A can be taken; this can be a useful source of power for an electronic keyer, particularly so if it utilises integrated circuits. All outputs are positive with respect to chassis. In use,

Table of Values

Power Supply Unit—Fig. 5

R1 = 1000 ohms	C4 = 500 μF, 50v.
R2 = 680 ohms, 1w.	C5 = 100 μF, 50v.
R3 = 680 ohms, 1w.	C6 = 250 μF, 25v.
C1 = 0.01 μF, 1000v.	C7 = 100 μF, 10v.
DC	Tr1 = AD161—see text
C2 = 1000 μF	T1 = Sec. 15-0-15v. AC at 1.5A
C3 = 2000 μF, 50v.	

Notes: For the 5v. regulator a MC7805C (positive output) is correct with Zeners Z1 and Z2, 13 and 6v. respectively, 1w. S1 is a 3-position slide-switch and the bridge rectifier may be a plastic type, 1A.

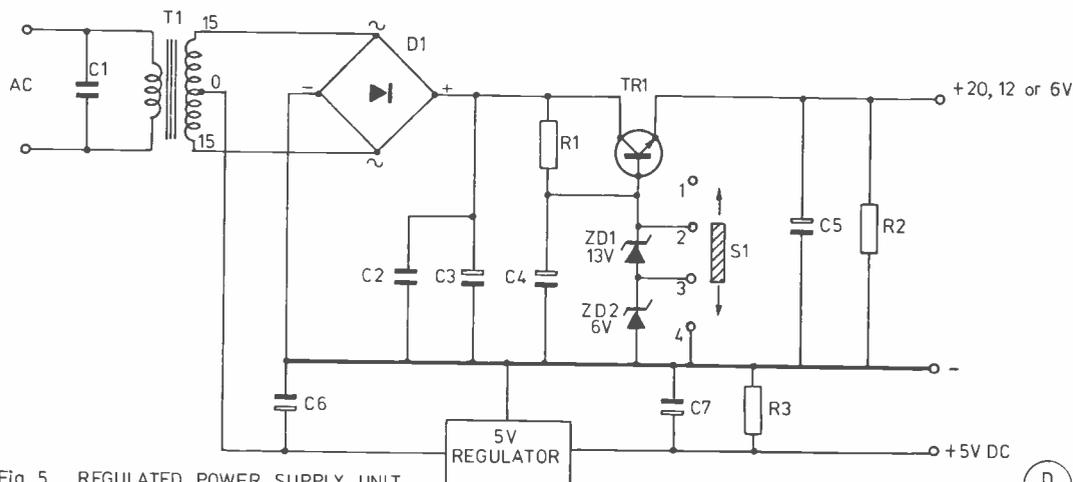


Fig. 5 REGULATED POWER SUPPLY UNIT

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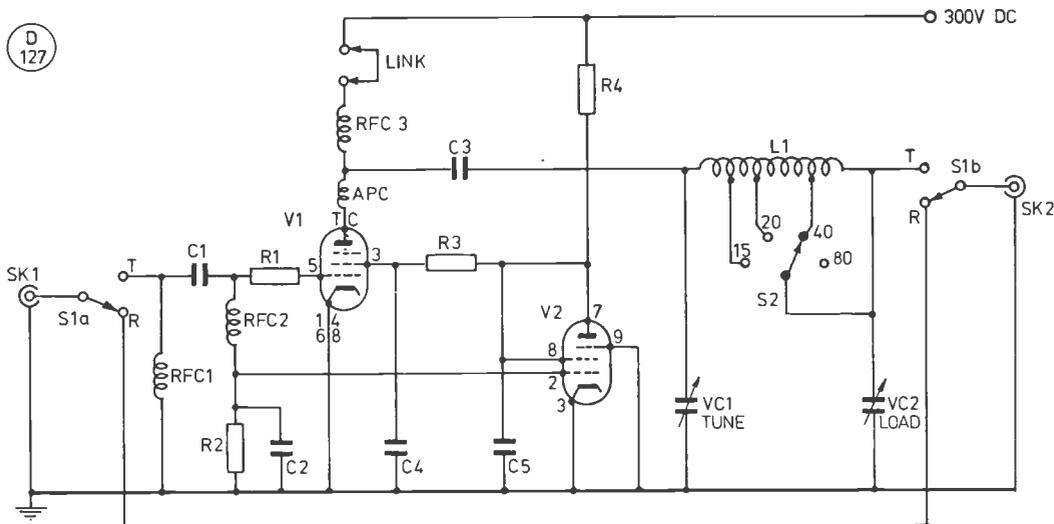


Fig. 6

Table of Values

RF Amplifier—Fig. 6

R1 = 100 ohms	C4 = 1000 $\mu\mu\text{F}$
R2 = 27,000 ohms	C5 = 1000 $\mu\mu\text{F}$
R3 = 10,000 ohms	VC1 = 350 $\mu\mu\text{F}$ variable
R4 = 6800 ohms, 3w.—	VC2 = 2 x 450 $\mu\mu\text{F}$
<i>see text</i>	variable
C1 = 1000 $\mu\mu\text{F}$	RFC1-3 = 2.5mH
C2 = 1000 $\mu\mu\text{F}$	APC = 4 turns p.v.c. wire
C3 = 1000 $\mu\mu\text{F}$	1/4 in. dia.

L1 = 33 turns 20 s.w.g. slightly spaced on 1 1/4 in. former tapped at 20, 9 and 4 turns from cold end.

Notes: S1 can be a 2-pole, 2-way (DPDT) slide switch and a section of a 4-way rotary switch is suitable for S2. V1 = 6146, and V2 = 6BW6.

Tr1 will run fairly warm and a good heat sink is thus necessary. The type 7805 5v. regulator is best bolted to the chassis using the insulated washer provided.

A 4-Band Amplifier

Adding a small RF amplifier to the HW-8 clearly improves overall performance to give extended range and the simple valved arrangement shown in Fig. 6 is easily built; outputs in the '80,' '40,' '20' and '15' metre bands result, corresponding to those afforded by the HW-8 now used as an exciter. The circuitry shown allows the amplifier to be by-passed for comparison purposes—for if S1 is left at its 'receive' position the HW-8 output passes direct to the output socket; amplified output results on moving the switch to 'transmit' provided the amplifier is appropriately tuned up.

The RF amplifier-proper is V1 with V2 as clamper. Socket SK1 accepts RF from the HW-8 when it is keyed,

and when S1 is set to "transmit" the amplified signals appear at SK2 to be fed subsequently *via* an SWR indicator and matching unit to the aerial. Again as with the transverter (except for initial setting-up) a permanent meter need not be fixed in the PA anode circuit but the station *Avo* can be used for checking purposes by removing the link and inserting it there.

In the absence of RF input and during "receive," V2 is not biased and the voltage drop across R4 reduced the applied screen potential to V1 thus limiting anode current. During "transmit," V2 is virtually cut off by the RF input and the PA screen voltage rises to permit maximum output to the tank circuit. The value assigned to R4 may need adjustment depending on circuit constants and applied HT potential; without stopper resistor R1 instability can result but choke RFC1 is not essential and could be omitted. The external power supply source can be as used for the transverter, and suitable chassis and panel dimensions can be as for the transverter.

Operation

It is of course important initially to check valve cathode currents and to select a value for R4 to avoid V2 being over-run, but otherwise few snags should be found. With S1 at "receive" the associated HW-8 can be tuned-up for maximum output on the band required; the amplifier with its bandswitch appropriately set is then switched to "transmit" and the normal loading and tuning adjustments made whilst keying the HW-8. Subsequently, if at any time during a QSO, one forgets to place S1 at "transmit" signals will still be emitted when the HW-8 is keyed but at QRP level, and as was mentioned earlier this does permit comparisons to be made.

THE MONTH WITH THE CLUBS

By "Club Secretary"

WHAT makes the difference between the successful and the dying (or dead) club? Despite what we read from Newsletters and hear from Hon. Secs. at expansive moments we have no magic formula. However, we can observe with no difficulty at all that every successful group has the sort of Hon. Sec. who would be quite sure *his* arrangements never go wrong, and *never* relies on anyone else doing anything correctly or on time! We could go a bit further and add that such a paragon is not to be obtained by any variety of arm-twisting, simply because this sort of person will either volunteer at once, or refuse altogether. Equally, before you make your nomination, look at how many other interests your man has; there are some people about who just cannot say "No" to anyone, and are therefore so up to their ears in umpteen areas that they are no damn good in any—which is not the spec. for a good Club Secretary!

The Reports

Our first ones are from Scotland and the North. **Mid-Lanark** are one of an increasing number of groups who are going over to more elegant methods of newsletter production—would that all clubs had such a realistic approach to the inside pages as this one! The outside front cover is a picture of Wrangholm Hall, Jerviston Street, New Stevenston, Motherwell, where the Hq. is located; and the back cover carries a map to aid finding the place. Inside there is a list of the officers, a preliminary warning—a year ahead!—of the Construction Contest, and details of those evenings when there is something special going on. They are to be found at the Hq. each Friday from 7.30 onwards, and it looks from here that in February the "specials" are the 3rd, when Mr. D. Crone of IBA will be coming along to talk about Couplers—to connect transmitters to aerials; next is the 17th when GM8DOX will, it seems, be taking some FM, turning it into SSB, and then back to FM again. Electronic wizardry no less!

Turning to **Northern Heights**, the writer has often felt that too much of their newsletter is filled with jokes, but this time it has come up with a gem of a suggestion for Christmas—a "Do-it-Yourself Witch (or Warlock) kit with which you learn the easy, fun, way about curses, familiars and night flying. All needed raw materials such as eye of newt, tooth of wolf plus, for 1978, an accurate pentagram floor chart and a high-impact ABS broomstick." Sounds ideal for club secretaries looking for speakers! Look for the lads at the Peat Pitts Inn, Ogden, Halifax, on any Wednesday.

Midlands & East

Odd it is that though we know of several clubs in the East Anglia area, very few of them ever bother to make a report. This time we have one, from **Norfolk**, who tell us that on February 1 they will have G3RQY

to give a demonstration of either RTTY or SS/TV, while 8th is down to G3PTB who's theme is home-brew test-gear; 15th is down to a ragchew and CW session, while on February 22 the month is rounded out by a discussion on the events of last year's HF NFD, with a view to ironing-out some of the snags and doing better next time.

Wolverhampton have their place at Neachells Cottage, Danescourt Road, Stockwell End, where they foregather on Monday evenings. February 6 is down to a Film Show, with a Natter session on 13th; February 20 will be a discussion on "vehicle ignition interference suppression," based on information available from *Joseph Lucas Ltd.* The last meeting of the month, as always, is down to the committee.

There are three dates for **Stourbridge** this time, on February 1, 7th and 21st. The first is an informal, the second one a constructional evening, and the third is a big one, when G3ZUL will appear live on TV—no doubt using his ATV equipment. Hq. is at an unspecified spot!

Wirral come next in the pile, and there is no mistake here: first and third Wednesdays at the Sports Centre, Grange Road West, Birkenhead. However, we don't have any details on the activities, simply because we are too far ahead of their newsletter this time—doubtless the Hon. Sec. will be only too pleased to give you the details—see Panel for his name and address.

At **Cheltenham** the amalgamation of the club and the RSGB group into the Association has resulted in some 60 members on the roll, with the chance therefore to really "sock it to 'em," which should result in an ever-rising membership. For the date (to be finalised) for February, we must await the outcome of the first AGM—this will in fact have happened by the time you get this. However, the venue will be the Old Bakery, Chester Walk, which is at the rear of the Public Library in Clarence Street; G3KII at the address in the Panel will no doubt be more than happy to pass on the date.

The usual very brief and very professional note comes in from **Peterborough**; it says they get together on February 17, at the Scout Hut, Occupation Road, the topic not finalised at the time of writing.

Its Fridays and Mondays at **South Manchester**: Fridays for the main meetings at Sale Moor Community Centre, Norris Road, Sale, and Mondays at the club shack, "Greeba," Shady Lane, Baguley, for informals. Reverting to the main sessions, we see February 3 is down to G3FNM, his theme being the Assembling of a Station; G3SMT takes over on 10th, to talk about Test Equipment, which seems an ideal prelude to the talk on February 17, which will be by G3WFT on fault-finding. February 24 is given over to "a transverter for 70 MHz," the speaker on this occasion being G2SMM.

Now to **Coventry** where the group foregather on Fridays; February 3 and 17 are both "Nights on the

Deadlines for "Clubs" for the next three months—

(For March issue—January 27th)

For April issue—February 24th

For May issue—March 31st

For June issue—April 28th

Please be sure to note these dates!

Air," 10th is the RSGB tape-and-slide talk on Aerials, and the month ends on 24th with an evening of mini-lectures by members. However, we still have to refer you to the Hon. Sec.—see Panel—to get the club address.

The Committee Room, Youth Centre, Bromsgrove Road, Kidderminster is "home" to the **Kidderminster** chaps on February 1—a Film show—and 15th for an Activity Night. The nature of the latter doesn't need much explaining when we tell you they have a trap dipole up for LF and a multiband beam for HF, not to mention VHF and UHF aerials!

Special Interests

Our first in this category are **R.A.I.B.C.** The Radio Amateur Invalid and Bedfast Club, to give it its full name for the benefit of newer readers, exists to cater for the interests of the blind and invalid, SWL or licensed. The initial objective for a new full member is to get him fixed up with a receiver and aerial; then there is the matter of R.A.E. and Morse if required, followed by help in getting on the air, such as aerial-erection parties and so on. From all this it must be pretty clear that, in addition to the members as defined above, there has to be another active element in the membership: these are "supporters"—just that!—and "representatives" who keep an eye on all that goes on in their own areas, to anticipate needs, and generally to point people in the right direction. Details from the Hon. Sec.—see Panel for his address.

Next we have **B.A.R.T.G.**, the teleprinter types; the December newsletter we have at hand is indeed a fine bit of work; we would say anyone who operates RTTY, whether VDU or mechanical, would find it well worth while being a member. For details, the Hon. Sec.—see Panel.

Now to the **Royal Signals**, catering for members past and present of that Corps, and we believe also of other signals orientated types from other Corps; all the details from the Hon. Sec.—see Panel.

Last in this group, but by no means the least is the **G-QRP Club**—that is QRP by European standards which implies around five watts, whereas the equivalent USA club talks of 100 watts as "QRP"! The index to the December issue shows enough articles for us to wonder where the editor got his shot-gun from! Seriously, this is a very good group, covering an interest that encourages such things as CW operation, home-brew equipment, simple gadgets to ease operating and tuning, and so forth—one could wish, though, for someone to reduce the dearth of QRP (or QRO for that matter!) home-brew transmitters or receivers. This is a club which is well worth the subscription, as a membership of some 350 would indicate!

West Countries

No, that "r" in the middle wasn't an error—we have news from GW and EI, not to mention Cornwall which has always regarded itself as a separate country! Taking the latter first, **Cornish** who have the first Thursday in the month booked at the **SWEB** Clubroom, Pool, Camborne. To find it when heading West along the A30 keep a weather-eye open for the **SWEB** site on the right-hand side of the road; turn right and immediately right again into the entrance. It its your first visit, we would suggest

a "dummy-run" in daylight first!

Hereford have their place at the Civil Defence Hq., Gaol Street, Hereford, where they are to be found on the first and third Friday in each month. For February the first meeting will be on 3rd, featuring G3NPA on Repeaters, but at the time of writing they had not finalised the topic or speaker for 17th.

Over-the-water now, to **Region One of I.R.T.S.**, and to note that their "A" station in MCC, EI9ONE, sent in a log which for some reason was delayed in arriving until after the results had gone off for printing. Hard luck, and we'll see you in MCC 1978! If there is anything you want to know about amateur radio in EI-land, this is the place to find out about it—see Panel for the Hon. Sec. address.

Bristol City RSGB are one of the "with it" groups, the programme for 1978 being complete at the time of their letter. February 27 will see them absorbed in the "dynamic blackboard" of G3JMY, on which giant-sized components are placed and carry out the same actions as the "real" components. The place is Queens Building, University Walk, Clifton, Bristol, starting at 7 p.m. sharp.

Our next one is **Poole**, who are booked in at the local Technical College on the last Friday of each month, the start being set for 7.30. For the latest details, refer to Hon. Sec. at the address in the Panel.

University College, Swansea pass on advance notice of their Rally on April 2 on the campus; this is about 1½ miles out of Swansea centre on the Mumbles Road.

Still with the GW's we come to **Blackwood** who are to be found at Oakwood Community Centre on February 10 and 24; the former will be for GW8LJJ to talk about Constructional Techniques, while the latter will feature the G3IOR tape-slide presentation on *Oscar 7*, which last will be given in two parts, the second half being on March 3. All this indicates that the booking in fact is for every Friday evening.

The subject of the lecture at **Torbay** on February 25 will be "Rocks and Stones"—one wonders if quartz crystals come into that category? The Hq. address is at Bath Lane (rear of 94 Belgrave Road, Torquay).

Southerly

Our opener here is from **Silverthorn**; the editor of their Newsletter says he "didn't get anything in the way of contributions, so he didn't think it worth producing an edition." We must admit, it's the best way we've ever heard of not only getting out of the editor's chair but killing the Newsletter at the same time! To come back to the matter in hand, they are to be found on any Friday evening, appropriately enough at Friday Hill House, Simmons Lane, Chingford E4 6JH.

On to **Sutton & Cheam**, where the Hon. Sec., G2DMR, and Chairman G3DCZ were featured in the local paper, the Sutton & Cheam Herald, with a nice shack photo and a reasonable minimum of newspaper twaddle about our hobby. Turning to the club, they will be at Sutton College of Liberal Arts on February 16 for a Constructional Contest, followed by some mini-talks if time permits. The informal at Ray's Social Club on 22nd will be built around a Junk Sale.

Not too far away our next stop, **Surrey**, where the group have Hq. at TS *Terra Nova*, 34 The Waldrons,

South Croydon, booked on the first and third Wednesdays of the month. However, as their Newsletter was printed before the December party, we don't at the time of writing have any idea as to what has been fixed up. That being the case, either go along "on spec" or get in touch with the Hon. Sec.—see Panel.

Now to **Maidenhead**, where the group are based on the Red Cross Hall, The Crescent, Maidenhead. On February 2, G3LVW will be making an introduction to the *Wireless World* frequency synthesizer, and on 21st G3OTN will be talking about TV games.

"Third Method SSB Generation" will be the subject at **Southgate** in February; this is a combination of both filtering and phasing and has the advantage that if it is overdriven the splatter so generated tends to stay within the transmitted spectrum—rough justice on the user but good for everyone else! This club always have the second Thursday of each month, at the Scout Hut, Wilson Street, Winchmore Hill.

Now we press on to **Barking** where the routine is to open for Construction on Mondays, Morse lessons on Tuesdays, CC/TV on Wednesdays, and a matter session on Thursdays, all at Westbury Recreation Centre, Westbury School, Ripple Road, Barking.

The Dolphin Hotel, Holdenhurst Road, Bournemouth, on February 2 and 17th is the arrangement for **Wessex**, who cover the Bournemouth area. The former date is given to G3VPC, who will be talking about RTTY—what you need to get started and how to go about it; and it should be an interesting beginning to be followed up in April by G3PLX who will be talking about video-display RTTY. On February 17 there will be a talk and

display of early crystal sets and W.W.I. signals equipment from his collection by Mr. H. M. Journeaux.

Incidentally, at this point it would be a good thing to notice that the nearby *Poole* club has been put in the Western section, the line having been drawn between Hants. and Dorset.

Back to the London area again, this time to **Verulam**, where on February 23 they will have a talk on Vintage Wireless by Mr. A. R. Constable, who is chairman of the British Vintage Wireless Society. This one will be in the Market Hall at St. Albans, as usual, and the informal on the second Thursday of the month will, again as usual, be at the R.A.F. Association Hq., Victoria Street, St. Albans.

Last time we heard from **Addiscombe** was umpteen years ago, and in the meantime they have gradually changed from being "just another club" to being an out-and-out contest group, and at that they would like to recruit some more likely lads—meet 'em on any Tuesday evening at the Spreadeagle, Portland Road, South Norwood, 9.15 onwards.

Crawley are set up for meetings on February 8 and 22, at the United Reformed Church Hall, Ifield on the latter date, while the informal on 8th will be at the home of one of the members—for details, check with the Hon. Sec. at the address in the Panel.

Pressing on with the rounds, our next stop is at **Echelford**; their booking is for the second Monday and last Thursday of every month at The Hall, St. Martins Court, Kingston Crescent, Ashford, Middlesex. Looking on to the "coming events" part of the Newsletter we see February 13 as being down to Mr. Pedder of the Kingston

Names and Addresses of Club Secretaries reporting in this issue:

ADDISCOMBE: P. J. Hart, G3SJK, 42 Gravel Hill, Croydon, Surrey CR0 5BD. (01-656 9054.)

BARKING: N. Dowsett, 44 St. Annes, Barking, Essex. (01-594 6584.)

B.A.R.T.G.: J. P. G. Jones, GW3IGG, Heywood, 40 Lower Quay Road, Hook, Haverfordwest, Dyfed SA62 4LR.

BLACKWOOD: S. R. Cole, GW4BLE, 10 Llanthewy Road, Newport, Gwent.

BRISTOL (City RSGB): B. L. Goddard, G4FRG, 2 Greenfield Park, Portishead, BS20 8NQ. (Bristol 848140.)

CHELTENHAM: G. D. Lively, G3KII, 26 Priors Road, Cheltenham (34785), Glos.

CHILTERN: N. C. Ambridge, G4FRL, 53 The Avenue, Chinnor, Oxon OX8 4PE.

CORNISH: H. F. Adcock, 1 Bowlags Close, Castle Road, Ludgvan, Penzance TR20 8HD. (Corkwells 562.)

COVENTRY: D. Parker, 41 Brookdale Road, Nuneaton, Warwickshire CV10 0BL.

CRAWLEY: G. C. Reid, G3OUX, 11 Coombe Close, Langley Green, Crawley RH11 7TP.

CRAY VALLEY: P. J. Clark, G4FUG (address wanted).

CRYSTAL PALACE: G. M. C. Stone, G3FZL, 11 Liphook Crescent, London SE23 3BN.

ECHELDFORD: R. S. Hewes, G3TDR, 24 Brightside Avenue, Laleham, Staines, Middx.

G-QRP: Rev. G. C. Dobbs, G3RJV, 131A Mansfield Road, Nottingham (411546).

HEREFORD: S. Jesson, G4CNY, 181 Kings Acre Road, Hereford (3237).

I.R.T.S. Region 1: J. Ryan, 23 Dollymount Avenue, Clontarf, Dublin 3.

KIDDERMINSTER: B. Hitchins, G4CTU, 12 Parkland Avenue, Kidderminster, Worcs. DY11 6BX.

MAIDENHEAD: M. Adams, G3ZLQ, 76 Blind Lane, Bourne End, SL8 5LA.

MID-LANARK: J. Gallacher, GM8FHK, 135 Scotia Street, Motherwell, MLI 3LR.

NORFOLK: P. W. Forster, G3VWQ, 12 Thor Road, Thorpe-St-Andrew, Norwich NR7 0JS.

NORTHERN HEIGHTS: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax (244329) HX2 8XG.

PETERBOROUGH: L. Critchley, G3EEL, 36 Waterloo Road, Peterborough, Cambs.

POOLE: J. Worth, G3ZKA, 8 Hodges Close, Canford Heath, Poole (0213-79582), Dorset.

R.A.I.B.C.: H. Boutle, G2CLP, 14 Queens Drive, Bedford MK41 9BQ.

REIGATE: F. H. Mundy, G3XSZ, 2 Conifer Close, Reigate (43130), Surrey.

ROYAL SIGNALS: Lt.-Col. (Retd.) Sir E. Y. Nepean, Bt., Goldens, Telford (275), Salisbury, Wilts.

SILVERTHORN: C. J. Hoare, G4AJA 41 Lynton Road, South Chingford, London E4 9EA. (01-529 2282.)

SOUTHDOWN: B. Chuter, G8CVV, 15 Coopers Hill, Willingdon, Eastbourne, East Sussex BN20 9JG.

SOUTHGATE: J. Fitch, G8EWG, 16 Kent Drive, Cockfosters EN4 0AP. (01-440 7353.)

SOUTH MANCHESTER: W. L. Seddon, G3VIW, 12 Barwell Road, Sale, Cheshire M33 5FF. (061-973 3355.)

STOURBRIDGE: A. Dewbury, G4CLX, 10 Rectory Road, Oldswinford, Stourbridge (3530), West Midlands.

SURREY: S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon CR2 8PB. (01-657 3258.)

SUTTON & CHEAM: J. Korndorffer, G2DMR, 19 Park Road, Banstead, Surrey.

TORBAY: M. Yates, G3UIQ, Top Flat, 23 Waverley Road, Newton Abbot (3025), Devon.

U.K. FM GROUP (London): R. G. Street, G3TJA, 3 White Ledges, St. Stephens Road, London W13.

UNIVERSITY COLLEGE OF WALES (SWANSEA): J. Morris, G4BXS, 1 Hadland Terrace, West Cross, Swansea SA3 5TT.

VERULAM: B. Pickford, G4DUS, "Netherwood," 130 The Drive, Rickmansworth (77616), Herts.

WESSEX (Bournemouth): G. D. Cole, G4EMN, 6 St. Anthony's Road, Bournemouth (0202 2027) BH2 6PD.

WEST KENT: B. P. Castle, G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent. (0732 36708.)

WIRRAL: H. I. Crofts, G3DLF, 3 Barmouth Road, Wallasey. (051-638 2515.)

WOLVERHAMPTON: J. Cook, G8EDG, 75 Windmill Lane, Castlecroft, Wolverhampton WV3 8HN.

club up the road, giving a talk which is entitled "Alice in Logic Land." As for the February 23 date it was, at the time of writing, shown as "not confirmed" so for that a call to the Hon. Sec. is advised—see Panel.

A change of Hon. Sec. and of Hq. address are both notified by Cray Valley; the new Hon. Sec. is P. J. Clark, G4FUG although at the time of writing we do not have his address. As for the Hq., it is Christchurch Centre, High Street, Eltham, London S.E.9. To find it, the top of the hill in High Street, almost opposite Footscray Road, will put you in the right spot; however there are local car-parking restrictions so if you decide to visit them, make sure you don't break the rules.

The AGM of Chiltern included a proposition to change the meeting date each month, so until we know how that went we are unable to give you any firm information. This being the case we have to refer you to the Hon. Sec.—see Panel. However, we understand that their meeting for February, regardless of date, will be a Junk Sale.

The front page of the Reigate Newsletter has it all; February 14 for a talk on the design and construction of solid-state transceivers by G3TDR, the venue being the Constitutional Centre, Warwick Road, Redhill; there is no mention of a "natter night" for February, although it would normally appear on the first Tuesday at the Marquis of Granby in Redhill.

We have two sheets from Southdown, in both of which the club PRO notes that the details for February 6 are not as yet finalised, so please to contact the Hon. Sec.—see Panel. However we have the date, given above, and we know the venue to be the Chaseley Home, South Cliff, Eastbourne.

Rather a nice thought in the Crystal Palace Newsletter: G3FZL lists the current situation with regard to several members who haven't been seen lately at club meetings! The gang get together at Emmanuel Church Hall, Barry Road, East Dulwich, on the third Saturday in each month from 8 p.m.

Now to UK FM Group (London) and their excellent Newsletter; reading it, it is clear that the members are more concerned than most at ensuring their signals are of good quality, and that they do not lack a sense of humour. However, we don't have any details on their next meeting, for which we have to refer you to the Hon. Sec. at the address in the Panel.

Changes in the advertised programme have occurred for West Kent with, for this month, G3POI talking about Meteor Scatter on February 3, while on 17th G2BT will recall the Early Days of Radio. Looking just a wee bit further, March 3 is down for G6TQ to talk about RAIBC.

Finale

Which is where we turn over the last letter for another month, and give you the "gen" for next time. The deadline date is in the bold-bordered "box" in the body of the piece, as usual; and letters should give the name and address of the Hon. Sec., the date, the topic if one has been fixed up (plus the call or name of the speaker), the Hq. address, and any other items you may feel to be relevant. Address it to CLUB SECRETARY, SHORT WAVE MAGAZINE, 34 HIGH STREET, WELWYN, HERTS. AL6 9EQ.

Do You Know That —

—It is possible to use your 25 watt mains soldering iron from a car battery? That is if you have a mobile power supply which gives 250 volts at 100 mA.

—A Belling coax' plus can be turned into a dummy load bulb holder for low power transmitters? Throw away the "spider," solder a piece of solid wire into the spigot in the normal way, twist and bend the wire over inside the insulator to form a contact. Now, taking the screw cap, push a suitable torch bulb into the hole where the coax' usually comes out, pack a few turns of solid wire around the bulb shell inside the plug cap, screw the cap and bulb onto the body of the plug and tighten up. The bulb will be held firmly and may be plugged straight into the socket in the transmitter.

—The varnish used on fishing rods, obtainable at anglers' suppliers, is useful for fixing the turns on home brew coils?

—You can "kill" the static build-up on the plastic "glass" of some test meters by using Fairy liquid? Just wipe a thin film of the liquid onto the surface, allow to dry, then gently wipe the mistyness away.

—These are contributions by readers. If you have any good ideas based on practical experience, send them to "DYKT," Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ.

R.A.E. Q. & A.

The answer given to Question 4(b) on p.670 of the January issue was incorrect and should have been as follows:

$$X_L = 2\pi fL \text{ and } X_C = \frac{1}{2\pi fC} \dots (1)$$

where f=Hertz, C=Farads, L=Henrys
At resonance $X_L = X_C$

Transposing Equation 1 at resonance we get

$$\frac{1}{C} = 4\pi^2 f^2 L \text{ farads}$$

Inserting figures:

$$\frac{1}{C} = 4 \times 9.86 \times (1 \times 10^6)^2 \times (100 \times 10^{-6}).$$

Converting to picofarads and microhenrys, and inverting, we get:

$$C = \frac{10^4}{4 \times 9.86} = 253 \text{ pF}$$

VHF BANDS

NORMAN FITCH, G3FPK

VHF Convention

SATURDAY, February 25 is the date for all VHF/UHF and microwave enthusiasts to underline being the occasion of the RSGB's National VHF Convention to be based on the Winning Post Hotel, Whitton, Twickenham. As before, the trade show will be held in the hotel with the important proviso that only components and accessories will be on sale; no complete, ready-to-operate, black, brown-grey or blue boxes. Thus the emphasis will be on the needs of the home constructor instead of the button-pushing appliance operator.

The nearby Whitton School will be used for the afternoon lecture sessions which commence at 1400 with a keynote address by Dr. Dain Evans, G3RPE. The three streams have been broadly titled—techniques, operations and microwaves. The first includes UHF high power, solid state amplifiers by G8AGU; advanced repeaters by G3VEH and G3JVL on loop quad yagi aeriels. The second stream will cover basic meteor scatter and advanced procedures by G3SEK and G3POI and will give an opportunity to discuss the proposed new band planning and procedures, followed by an open forum by the VHF Contests Committee. The Microwave stream will include G8DEK on oscillator locking techniques and G3WDG on 2.3 GHz equipment followed by a general discussion on these topics. There will be gaps between the talks to allow listeners to change streams.

The lecture sessions are to end formally at 1730 and the school will close at 1800. The social evening will commence at 1930 with dancing to a four-piece band a "disco" back at the Hotel. There will not be a

formal sitdown dinner with speeches but a buffet supper. We are promised periods of relative "hush" to allow conversation, and the affair will end at midnight. Additional features include a bring-and-buy sale and a raffle, plus a constructors competition and exhibition. Certain VHF/UHF trophies and awards will be presented during the evening.

Tickets are available from G3DAH, Mike Dormer, "Summerleigh," Bettinge Road, Herne Bay, Kent CT6 6HA. For the Convention only, the fee is £1.00 (under 18, 50p) and for the evening only, £3.00. Tickets for the complete proceedings are £3.50. Please send an *s.a.e.* for your tickets.

The Winning Post Hotel is on the northern side of the A316 road, called Chertsey Road. The new flyover at the western end of the A316 has been completed since the 1975 affair. Those travelling *via* the M4 should leave at Junction 3 taking the A312 southwards for 5 miles till they reach the aforementioned flyover and roundabout. The A316 is the first exist. The opening time is 1100 for the public.

There are Southern Region trains from Waterloo to Whitton station which is 5 minutes walk from the hotel. Our thanks to Geoff Stone, G3FZL, the "C-in-C" of the event, for the foregoing information.

G to W6 on Two Metres

In previous months mention has been made of the A.E.R.E. Harwell A.R.C.'s *moonbounce* experiments using a large fixed *rhombic* aerial. Success came on November 25, 1977 between 0610 and 0624 when a CW QSO with Bob Sutherland, W6PO, was concluded. On Nov. 30 K1WHS in Maine was worked. A month later, during the next "window" W7FN in the state of Washington was worked on Dec. 27 between 0804 and 0814. It is a very great pleasure to be able to record these very important "firsts," especially since G3PIA, a British station, is involved.

This success was only possible due to the dedicated efforts of at least twenty club members. The equipment used was that of Ian White, G3SEK. A lot has been written and said about the latest very low noise figure RF transistors so it is interesting to learn that the first RF stage was

FOUR-METRE ANNUAL TABLE
Final Placings
at December 31, 1977

Station	Counties	Countries	Total
G3OHC	51	7	58
G2AXI	48	7	55
G3XCS	44	6	50
G4ECQ	44	4	48
GD2HDZ	41	5	46
G3FIJ	37	5	42
G4AEZ	32	6	38
G4FCD	36	2	38
G4BYP	25	5	30
G4DWZ	26	3	29
GM4CXP	18	2	20
G4DKX	7	1	8
G4ERX	3	1	4

a 3N204. Furthermore the receiver bandwidth was 2.5 kHz rather than the much narrower filter bandwidths usually employed. Chris Bartram, G4DGU, thinks that the fixed, wire *rhombic* must have had a gain of about 25 dB and would like to record his club's appreciation of the aerial information supplied on tape by Dick Hart, KØMQS.

One of the biggest problems was *Faraday rotation* which is the rotation of the polarisation of the received signal. While some *E-M-E* operators have fully steerable and selectably polarised aerial arrays, the G3PIA *rhombic* was purely a horizontally polarised affair. Doug Parker, G4DZU, (W. Yorks.) listened in on the G3PIA QSL's and copied their echoes *via* his 56-ele. array. Subsequent comparisons proved identical "Faraday fading" at both sites.

And now for the sad news. The *rhombic* aerial has been dismantled as the farmer wanted his field back for his pigs! Consequently, the planned schedule with an Hawaiian station has been abandoned.

High Power Licences

Following the remarks in last month's feature on high power licence matters, Roy Stevens, G2BVN, points out that there are

cases on record where initial Home Office refusal has been taken up by the RSGB on behalf of the applicant. The Society has been able to persuade the Home Office to issue a special licence by verifying that there was a sound reason for needing to run higher power. Such reasons would include *E-M-E* experiments and very long distance meteor scatter tests by experienced and properly equipped stations. It is comforting to learn that the H.O. has not necessarily shut the door on these applications.

VHFCC Award

Peter Lennard, G3VPS, from Hailsham, E. Sussex, has been awarded VHFCC certificate No. 292 for 2m. operation. He started on the band in October 1971 with a valve converter feeding a *CR-100* and a home-built 15 watts AM/FM/CW Tx. A *Belcom* Liner-2 transceiver was acquired in May 1973 and is used on CW as well as SSB. The aerial is an 8-ele. *Yagi* at 32ft. the QTH being 50ft. *a.s.l.*

Contests

Results:—From GB2RS, the results of the Oct. 1/2 Open UHF Contest. On 432 MHz, winner of the fixed section was G3NNG with G3VPK second. The portable section was won by G4BPO, the Martlesham RS, with GW3UCX, the Wulfrun Contest Group, runners up. On 1296 MHz, G4BEL was first in the fixed part with G3VPK second while the portable section winners were again the Martlesham folk, G3XDY, with the Bracknell ARC second with G4BRK. On 2304 MHz, G4BEL was first.

Forthcoming events:—March 4/5 is listed as "144/432 MHz and SWL" but whether it is open or fixed or portable is anyone's guess; nor can the times be revealed. Once again, the information was not available from the London headquarters of our national society. Likewise, all that can be mentioned about March 19 is that it is listed as, "70 MHz Open."

Beacons

Howard Bottomley, G8BCL, recorded that GB3MLE (ZN32b) was commissioned on December 17 on

THREE BAND ANNUAL VHF TABLE

Final Placings, December 1977

Station	FOUR METRES		TWO METRES		70 CENTIMETRES		TOTAL Points
	Counties	Countries	Counties	Countries	Counties	Countries	
G2AXI	48	7	56	21	43	8	183
G3OHC	51	7	61	15	32	9	175
GD2HDZ	41	5	59	14	42	10	171
G8HBQ	—	—	72	15	54	11	152
G8GML	—	—	68	14	55	12	149
G4BYP	25	5	57	12	31	9	139
G3XCS	44	6	53	19	10	4	136
G3FIJ	37	5	52	11	24	6	135
G4FCD	36	2	69	20	3	1	131
G8LEF	—	—	66	21	36	12	130
G4ECQ	44	4	65	15	—	—	128
G4GEE	—	—	59	15	41	10	125
G8HHI	—	—	58	16	40	11	125
G8BKR	—	—	70	16	29	7	122
GM4CXP	18	2	55	21	14	8	118
G3BW	—	—	54	13	41	8	116
G4AEZ	32	6	42	12	20	4	116
G4DWZ	26	3	52	13	17	4	115
G8HJQ	—	—	58	17	28	10	113
G8IFT	—	—	61	13	33	6	113
G4CMV	—	—	74	21	7	2	104
G4ERX	3	1	50	13	29	7	103
G3FPK	—	—	77	23	—	—	100
G4DEZ	—	—	71	21	—	—	92
G8ITS	—	—	50	10	23	4	87
G4FOR	—	—	62	16	7	2	87
G4FBK	—	—	58	14	12	1	85
G8LHT	—	—	66	16	2	1	85
G4DKX	7	1	37	11	19	6	81
G8JHX	—	—	61	18	—	—	79
G8KSS	—	—	57	18	—	—	75
G8JJR	—	—	58	15	—	—	73
G8GII	—	—	31	5	28	6	70
G8MKW	—	—	51	12	—	—	63
G8JGK	—	—	47	12	—	—	59
G4GCQ	—	—	45	9	—	—	54
G4GET	—	—	40	7	—	—	47
G8IZY	—	—	38	7	—	—	45
G4FKI	—	—	27	7	5	1	40

1296.93 MHz with 50 watts *e.r.p.* It has been widely received by listeners in the London area, south Devon, etc. Reports to G8BCL,

please.

In Cyprus, 5B4CY (QU14g) on 50.070 MHz has been re-commissioned and is currently beaming

towards South Africa. Reception reports to Roland Whiting, 5B4WR. The Lannion beacon FX3THF (YI13d) on 144.905 MHz is still QRT. The keepers are still waiting for the R.E.F. in Paris to send a new PA valve. G3CHN (Devon) misses this beacon so much that he almost feels inclined to donate them one! On 4m. GB3SX (AL71d) on 70.685 MHz now sends its call, QTH locator, latitude and longitude in RTTY.

Repeaters

GB3MH is now on R3 instead of R7. The Aberdeen repeater, GB3GN, is now operational on R7. On 70 cm., GB3MR was due to be taken out of service on Jan. 4 and should be back by now on its new frequency RB14 beaming WSW. GB3CH (XK27c) on RB2 and GB3AW (ZL53c) on RB10 have been on since mid-December.

Satellite News

For its small membership, the U.K. branch of AMSAT seems to have an unnecessarily large number of officers. As an ordinary member, your scribe is usually unable to decide to whom a particular inquiry should go. Even so, only rarely do we get any communications from AMSAT-UK. On the VHF net on 144.28 MHz at 7.30 p.m. on Jan. 8, Ron Broadbent, G3AAJ, said he had been appointed "secretary" although he was first to admit he did not know exactly what was entailed at that time. One point Ron made was that he is receiving requests for the 1978 *Oscar 7* Calendar without stamped and addressed envelopes. One fellow had not signed his cheque, another did not give his address!

So, if you are a member of AMSAT and want a calendar giving all the 0-7 orbits for 1978 plus other data, send a cheque for £1.40 made out to AMSAT-UK; state your membership number and enclose a self-addressed and stamped (9½ stamp) size 12½ by 9 inches to:—R. J. Broadbent, G3AAJ, 94 Herongate Road, London E12 5EQ. Non-members should send £2.80 plus the *s.a.e.*

A-O-D, still due for launch on March 5, will spend the first two days on Mode "J" until the orbit

stabilises and the 10m. aerial is deployed. Mode "J" is 145.90-146.00 MHz uplink and 435.1-435.2 MHz downlink while Mode "A" is the same as for 0-7. More details next month.

The new operating schedule and band plan for 0-7 started on Jan. 1 with the first two days Mode "B" and the third Mode "A" and so on. The second of the "B" days is a QRP one as the satellite's Tx output power is reduced to one quarter. As before *every Monday* is a user QRP day whatever Mode, and the satellite should not be used on *any Wednesday*.

Concerning the Russian OSKARS there is no news at all about any launch date.

70-CENTIMETRE ANNUAL TABLE
Final Placings
at December 31, 1977

Station	Counties	Countries	Total
G8GML	55	12	67
G8HBQ	54	11	65
GD2HDZ	42	10	52
G8HHI	40	11	51
G4GEE	41	10	51
G2AXI	43	8	51
G3BW	41	8	49
G8LEF	36	12	48
G3OHC	32	9	41
G4BYP	31	9	40
G8IFT	33	6	39
G8HQJ	28	10	38
G4ERX	29	7	36
G8BKR	29	7	36
G8GII	28	6	34
G3FIJ	24	6	30
G8ITS	23	4	27
G4DKX	19	6	25
G4AEZ	20	4	24
GM4CXP	14	8	22
G4DWZ	17	4	21
G3XCS	10	4	14
G4FBK	12	1	13
G4CMV	7	2	9
G4FOR	7	2	9
G4FKI	5	1	6
G4FCD	3	1	4
G8LHT	2	1	3

Meteor Scatter

During a visit to South Wales some weeks ago, G3SEK, G4DEZ and G4DGU called in on Dave Price, GW4CQT (YL25d) and had an opportunity to hear the tapes of the MS QSO with UW6MA (TH69c) from last August 11. They are quite satisfied that all the required information for a complete QSO was received by Dave so we can now claim this 3090 km contact as a new European MS, indeed any mode, record on 2m. Congratulations Dave and Vlad. GW4CQT now has 33 countries confirmed on 2m. with UP2 outstanding.

During the *Taurids* on Nov. 8, Derrick Dance, GM4CXP, just managed a complete MS QSO with SP2DX in JO square. In the December *Geminids*, G4DZU worked OK1KRA and SM3BYA (IV) but heard nil during a sked with CT1WW. However, Clive Morton, G4CMV, (Leeds) did conclude a QSO with CT1WW (WB64b) on the 12th. The next day he worked I4AE (FE28g) who came through with 20 second bursts three times peaking S9-plus-10 dB. On the 14th, he managed F1JG (CD24g) on random SSB and Jacques also peaked S9-plus-10 dB during long bursts. Shortly afterwards, Clive worked SM3BYA (IV06j) and I1KTC (EF44g) was another success that morning.

Probably the first G/ISØ MS contact was made between G4CLK (Essex) and ISØPUD (EZ) in the *Geminids*, all the more interesting since the Sardinian was only running 20 watts of SSB to a 5-ele. beam.

Clive Penna, G3POI, now has 40 countries confirmed on 2m. many of them *via* MS contacts. In the *Geminids*, his successes included EA3AIR (AB48d), HG4KXG (JG05j), I4GOC (GE), SM3AVQ (IU27a) and YU1NPW (KE13j). G4DZU was disgusted to find some G3's on SSB on 144-100 MHz, right on the MS random CW spot. Seems it was a 23 cm. "talk-back" and they grudgingly moved up 5 kHz but later came back to "100" again. We offer these clots the December "Lids of the Month" award!

Fausto Minardi, I4EAT (FE60) got four new countries in the *Geminids*, GD, GJ, GU and ZB2,

to bring his grand total to 44 in 196 squares. On Dec. 13, he worked G4DEZ on random SSB but was not certain of Bryn's call, which he thought might have been G4DZ. Fausto suggests calls are given in phonetics occasionally on random QRG's. On the 12th, he worked SM3FGL (IV) on random CW, while the following day yielded GD3YEO and DM2BHA (GO) in skeds, plus PA0XMA (DM) and DM3BQG (FM) on random SSB. The evening of the 13th saw a successful CW sked with Jim Bruzon, ZB2BL (XW64g). On the night of the 14th, Fausto had success with GJ8EZA on a sked, with random SSB bringing G3WSN, G4BWG, G4DZU, GW4CQT and OZ6OL.

MS activity was hectic during the *Quadrantids* at the beginning of January. G4CMV's aerials were buffeted by storm force winds which prevented his completing a dawn QSO with UK5EDB in QH07e after a promising start. Skeds with I6ZAU and LZ2KSQ only produced a few pings but an SSB sked with OE5JFL came off. Occasional monitoring of the 144-200 MHz SSB random QRG revealed some folk with clocks up to 20 seconds out!

Twenty-three Centimetres

Chris Bartram, G4DGU (Oxon.) is looking for skeds over 150 km. He now has 40 watts of CW and SSB generated from 144 MHz via up-converter ending up with two 2C39's in cascade. The receive side, using an NEC 57835 device, has yielded a noise temperature of 250°K including a relay and a piece of UR67 cable. The aerial array comprises two G3JVL loop yagis. Chris is *QTHR*.

John Fielding, G8FPH (Merseyside) has 100 watts of SSB available and is looking for contacts. George Zitterstein, G8ITS (City of London) aims to be QRV for the April 1 contest using a home built Tx and a loop yagi further festooning the balcony. The converter is a *Micro-wave Modules* one.

Seventy Centimetres

John Woodham, G8BKR (Bristol), caught the good tropo. conditions of Dec. 20 and his best DX was

DB5JJ (DL13h) at S7. However, G8BDM in Bath seemed to be hearing and working much more suggesting selective ducting. John

TWO-METRE ANNUAL TABLE

Final Placings
at December 31, 1977

Station	Counties	Countries	Total
G3FPK	77	23	100
G4CMV	74	21	95
G4DEZ	71	21	92
G4FCD	69	20	89
G8LEF	66	21	87
G8HBQ	72	15	87
G8BKR	70	16	86
G8LHT	66	16	82
G8GML	68	14	82
G4ECQ	65	15	80
G8JHX	61	18	79
G4FOR	62	16	78
G2AXI	56	21	77
GM4CXP	55	21	76
G3OHC	61	15	76
G8KSS	57	18	75
G8HQJ	58	17	75
G8HHI	58	16	74
G4GEE	59	15	74
G8IFT	61	13	74
G8JJR	58	15	73
GD2HDZ	59	14	73
G3XCS	53	19	72
G4FBK	58	14	72
G4BYP	57	12	69
G3BW	54	13	67
G4DWZ	52	13	65
G4ERX	50	13	63
G8MKW	51	12	63
G3FIJ	52	11	63
G8ITS	50	10	60
G8JGK	47	12	59
G4AEZ	42	12	54
G4GCQ	45	9	54
G4DKX	37	11	48
G4GET	40	7	47
G8IZY	38	7	45
G8GII	31	5	36
G4FKI	27	7	34

Pilags, G8HHI (Hants.) also worked a number of Dutch and German stations in DM and BL, CL, DL and EL squares but nothing further east than EL heard. John's 70 cm. station uses the 28 MHz output from a *Liner 2* to a *Modular Electronics* transverter with an 18-ele. *Parabeam* at 46 ft.

Two Metres

Syd Harden, G2AXI (Hants.) caught the Dec. 2 *aurora*. Most QTF's were at about 010° true with no signals more than S6. GM3JFG (XR) gave him the last county for 1977 and 183 points for the annual table making Syd the 1977 winner. A very major solar storm on Jan. 3 caused an extensive *aurora* the following day, from about 1215-2140 in the north but from about 1345-1945 in the south. G3CHN (Devon) reports that the QTF's shifted around a lot. Roger's best DX was SM4COK in HT. In the same event, G4CMV worked GM3UU, GM3UKG and LA6HL (040-050°) and PE1AFU at 080° and heard several more LA's, SM4, 5, 6 and Ø and was later told by G5YV that an OH2 had called him! On Jan. 6 in a good tropo. opening, Clive worked HB9MTY (DG16d) and a number of DL's in DK, DL, EH and EI squares. Prior to that, on Dec. 16 he contacted EI9D (Wicklow) plus DM2DTN (GK07c) and DL's in EL, EM and FO squares.

Bob Nash, G4GEE (Coventry), managed his first auroral QSO's on Dec. 2 with GM3JFG and GM3UKG on CW. At the time, there was a bright visual display in Fort Augustus.

Julian Moss, G8ILO (Essex) cannot understand why Class "B" licensees are not allowed to use CW since it would be so useful in getting one's QTH locator across, for example. He now runs an *Icom* IC-201 with a 50 watts linear and managed to get in on most of the tropo. lifts. On Jan. 1, DB5UK/P (FK76j) was worked for a new square. C. J. Reed, G8MFP (Warks.) caught the Dec. 2 *aurora* and worked G8JHL in Manchester, who was auroral, whereas G8MFP's signal was not. Strongest signal heard was from GM8LHE (YR24j).

GM4CXP (Borders) worked 20 stations in LA, PA, G, DL, SM

and GM in the Dec. 2 *aurora* all at QTF's between 030 and 050° except for the last 20 minutes when GM, DL, PA and SM6 came in at 310-340°. A minor event on the 4th produced one QSO only with SM5FND at QTF 000° and another one on the 11th in the early afternoon permitted QSO's with LA2PT (FT13b) and G3CHN, G3POI and G3WSN at QTF's 045-060°. Alistair Simpson, GM8NCM (Fife), found the Dec. 2 *aurora* very good and logged 3 G's, including G3AWZ in Somerset, plus G18EWM (XO2lj), GW4CQT (YL25d) and 6 GM's between 1741 and 1906. He remarks that some signals on SSB were much easier to read than others, and wonders why. Is it the *aurora* or perhaps a poor quality signal? Your scribe's view is that any distortion on speech by overdriving, speech processing, etc., will render an auroral signal less readable.

At G3FPK, most of the reported openings were taken advantage of except for the one on Jan. 6. On Jan. 7, F1CYB was heard operating portable from BC square on the

F/EA border. Unfortunately, he was so close to the calling frequency that a QSO was impossible. G3KEQ (Sanderstead) did work Edouard and tried, unsuccessfully to persuade him to shift.

Irish Affairs

Back in September, a few lucky folk picked up some rare Irish squares thanks to a brief journey by Paul O'Brien, K1CM, who uses the call, EI4CM. He has written from Quincy, Mass., to say that from VO6lg, the only U.K. station worked was G3CHN. From UO70c he worked G2XK/M, G3BA, G3CHN, G4CBW, G4CZP, G8JHL and GW8EQH, while from UN50d, only GW8CFQ and GW8IVJ were worked over here. Paul used an IC-202, a 70 watts amplifier and 7-ele. beam and hopes to return this year in April or May—perhaps September too—for 2m. and 70 cm. operation and will try to give us more warning.

Summer DX-Pedition

GM8NCM informs that he is joining the GM30LK/GM3YOR trip

to Iceland and the Faroes Is. where 70 cm. and 2m. operation is envisaged, mainly through satellites but with some MS. Due to travel arrangements, only three days operation from OY is possible. No final dates yet but possibly around either *Aquarids* time in July or the *Perseids* time in August.

The Scillies

David Butler, G4ASR, has now moved to Hereford but will be going to Cornwall in March for more operation from XJ square, on 23 and 70 cm. and on 2m. and 4m. A weekend in the Scillies (WJ) is planned.

Sign Off

No "Squares" table this month due to the band-by-band breakdown of the 1977 Three Band Annual affair. All your letters for the March piece by February 2 and for the April issue by March 9 to: "VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts. AL6 9EQ. 73 de G3FPK.

NEW QTH's

This space is for the publication of the addresses of holders of new call signs, or changes of address, in EI, G, GC, GD, GI, GM and GW of stations not already listed. All addresses published here will appear in the U.K. section of the American "CALL BOOK" in preparation. Please write clearly and address on a separate slip to QTH Section. Be sure to give correct County designation and post-code. In the case of direct subscribers needing Change of Address, please state for card index adjustment. Address items for this space to: "New QTH Page," SHORT WAVE MAGAZINE, 34 HIGH STREET, WELWYN, HERTS., AL6 9EQ.

G2FQC, W. Wright (ex-G8KIU), 38 Argyle Street, Glasgote, Tamworth, Staffs. B77 3EG (re-issue).
 G3NKC, D. L. Sharred, 30 Upton Road, South Yardley, Birmingham, West Midlands B33 8SY (re-issue).
 G4FTN, J. Grainger (ex-G8ATN), "Everglades," 50 John Street, Brierley Hill, West Midlands DY5 1HE.
 G4FWM, C. A. Webb, 5 Leyburn Avenue, Fleetwood, Lancs. FY7 8HG. (Tel. Fleetwood 5404.)
 GD4FDWQ, C. Matthewman (ex-GD8LFA), 20 Terence Avenue, Douglas. (Tel. Douglas 22295.)
 G4FZG, B. Sirignano, 38 Newnham Street, Bedford MK40 3JR. (Tel. Bedford 56144.)
 GI4GDV, R. Montgomery (ex-GI8NEA), 11 Limehurst Way, Low Road, Lisburn, Co. Antrim BT27 4YF.
 G4GEP, V. R. T. Peake (ex-G8MDQ), 25 Neales Close, Harbury, Leamington, Warks. CV33 9JQ. (Tel. Harbury 613237.)
 GI4GIC, D. Mathers (ex-GI8LDL), 55 Fulmar Avenue, Lisburn, Co. Antrim.

G4GIE, J. A. Spinks, 13 Heather Way Great Moulton, Norwich, Norfolk NR15 2HP.
 GM4GIF, B. Lyons, 2 Lorne Street, Helensburgh, Dunbartonshire G84 8TT.
 GW4GJD, C. Mason, Pen-y-Wen Cottage, Stackpole, Pembroke, Dyfed SA71 5DH. (Tel. Castlemartin 378.)
 G4GKY, C. S. Williams, "Trevelyan," 36 Dracaena Crescent, Hayle, Cornwall TR27 4EN. (Tel. 0736-753667.)
 G4GLM, G. L. Manning (ex-G8JBH), 63 The Drive, Edgware, Middlesex HA8 8PS. (Tel. 01-958 5113.)
 G5CCI, A. Voss (DF2XV), "Westwold," Burrows Lane, Prescot, Merseyside L34 6JW.
 G8CN, E. R. Ward (pre-war G8CI), Flat 40-A Oole Road, Cleethorpes, Lincs. DN35 8LR.
 GD8LFA, Mrs. Anthea Matthewman, 20 Terence Avenue, Douglas.
 GI8NAH, Londonderry College of Technology Radio and Electronics Dept., Strand Road, Londonderry BT48 7BY.

GW8NBK, J. D. Eastment, 211 Pantbach Road, Rhiwbina, Cardiff, South Glamorgan CF4 6AE. (Tel. 0222-60694.)
 G8NPC, K. J. Homewood, 73 Hughenden Road, Hastings, East Sussex TN34 3TF.
 G8NQQ, A. T. Sturman, 50 Miller's Park, Wellingborough, Northants NN8 2HR. (Tel. Wellingborough 225655.)
 G8NQL, L. W. Bailey, 47 Millers Park, Wellingborough, Northants.
 G8NRJ, A. Stone, 122 Stradbroke Road, Pakefield, Lowestoft, Suffolk NR33 7HX. (Tel. 0502-4122.)
 G8NTW, W. H. Maddison, 49 Mannheim Road, Heaton, Bradford. West Yorkshire BD9 5DX.
 G8NXH, M. Booth, 167 East Bawtry Road, Rotherham, South Yorkshire S60 4LH. (Tel. Rotherham 65827.)
 G8NXS, D. Stevenson, 16 Brushrise, Watford, Herts. WD2 5SZ. (Tel. Watford 36134.)
 G8NYK, M. N. Nicholson, 12 Whiteacres, Morpeth, Northumberland NE61 2UT. (Tel. 0670-3840.)
 GW8NZN, D. F. Roberts, 54 South Drive, Rhyll, Clwyd LL18 4ST.
 G8OAJ, A. Keir, Barnard Castle School, Barnard Castle, Co. Durham DL12 8UN.
 GM8OAJ, A. Kier, 27 Blacket Place, Edinburgh EH9 1RJ.
 G8OAZ, L. C. Bennett, 7 Maple Avenue, Fishponds, Bristol, Avon BS16 4HJ. (Tel. 0272-651841.)
 G8OCM, E. A. Dubbins, 2 Elizabeth Avenue, Rose Green, Bognor Regis, West Sussex PO21 3EL.
 G8OCN, B. T. Dubbins, 2 Elizabeth Avenue, Rose Green, Bognor Regis, West Sussex PO21 3EL.



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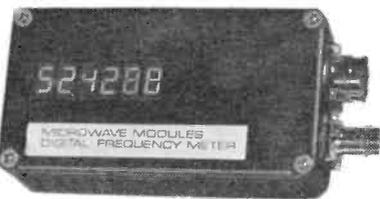
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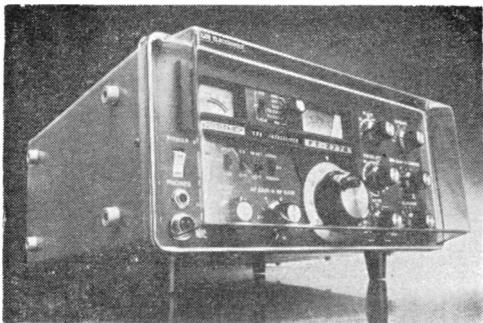
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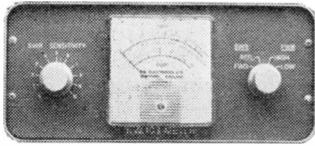
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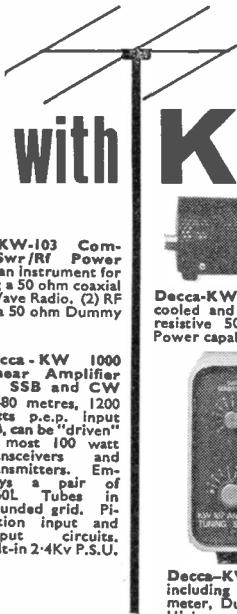
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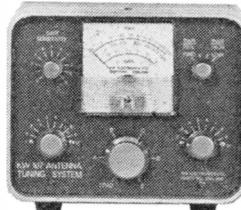
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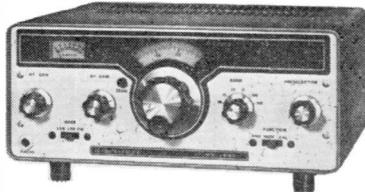
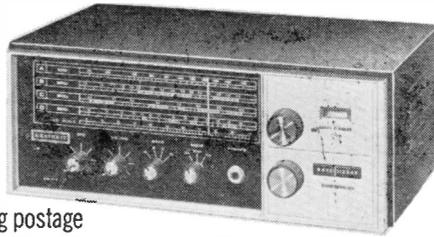
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144-030 ...	a	b	b	b	b	b	b	b	b	b	b	b
144-4/433.2 ...	a	b	b	b	b	b	b	b	b	b	b	b
144-480 ...	a	b	b	b	b	b	b	b	b	b	b	b
144-800 ...	a	b	b	b	b	b	b	b	b	b	b	b
144-850 ...	a	b	b	b	b	b	b	b	b	b	b	b
145-000/SO ...	a	b	b	b	b	b	b	b	b	b	b	b
145-050/R2T ...	a	b	b	b	b	b	b	b	b	b	b	b
145-075/R3T ...	a	b	b	b	b	b	b	b	b	b	b	b
145-100/R4T ...	a	b	b	b	b	b	b	b	b	b	b	b
145-125/R5T ...	a	b	b	b	b	b	b	b	b	b	b	b
145-150/R6T ...	a	b	b	b	b	b	b	b	b	b	b	b
145-175/R7T ...	a	b	b	b	b	b	b	b	b	b	b	b
145-200/R8T ...	a	b	b	b	b	b	b	b	b	b	b	b
145-300/S12 ...	a	b	b	b	b	b	b	b	b	b	b	b
145-350/S14 ...	a	b	b	b	b	b	b	b	b	b	b	b
145-400/S16 ...	a	b	b	b	b	b	b	b	b	b	b	b
145-500/S20 ...	a	b	b	b	b	b	b	b	b	b	b	b
145-525/S21 ...	a	b	b	b	b	b	b	b	b	b	b	b
145-550/S22 ...	a	b	b	b	b	b	b	b	b	b	b	b
145-575/S23 ...	a	b	b	b	b	b	b	b	b	b	b	b
145-600/S24 ...	a	b	b	b	b	b	b	b	b	b	b	b
145-650/R2R ...	a	b	b	b	b	b	b	b	b	b	b	b
145-675/R3R ...	a	b	b	b	b	b	b	b	b	b	b	b
145-700/R4R ...	a	b	b	b	b	b	b	b	b	b	b	b
145-725/R5R ...	a	b	b	b	b	b	b	b	b	b	b	b
145-750/R6R ...	a	b	b	b	b	b	b	b	b	b	b	b
145-775/R7R ...	a	b	b	b	b	b	b	b	b	b	b	b
145-800/R8R ...	a	b	b	b	b	b	b	b	b	b	b	b
145-950/S38 ...	a	b	b	b	b	b	b	b	b	b	b	b

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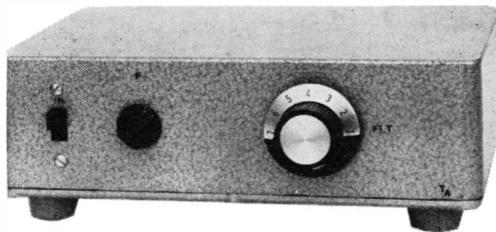
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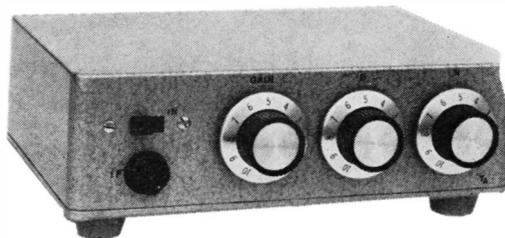
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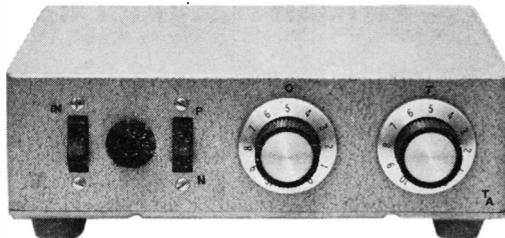
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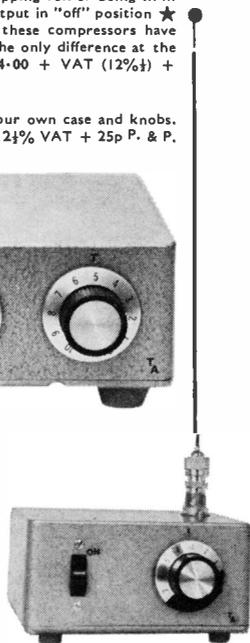


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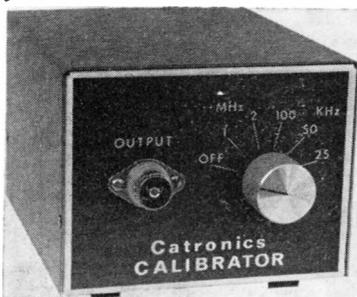
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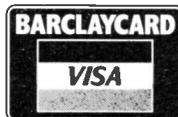
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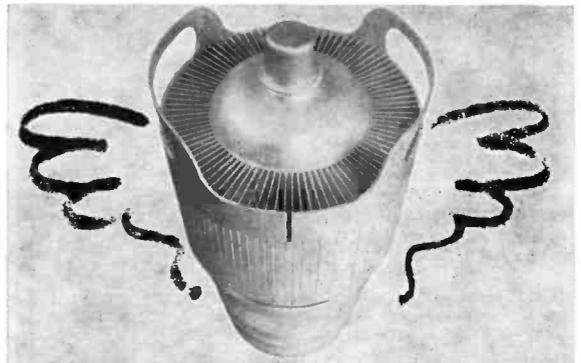
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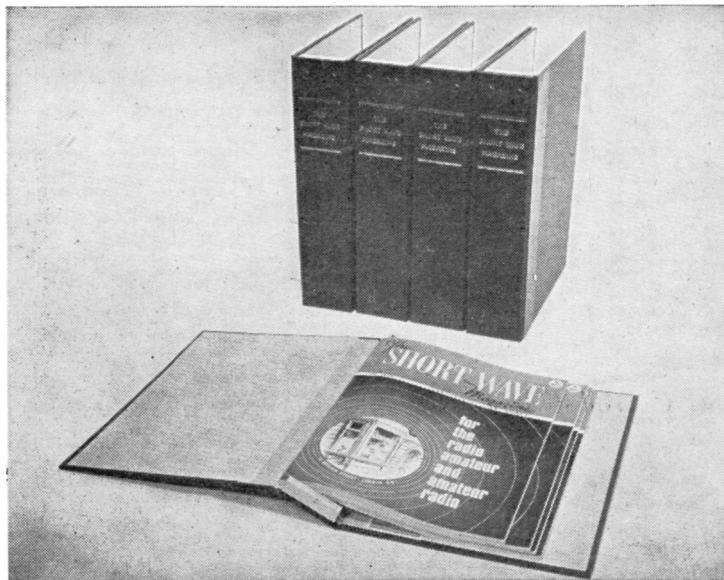
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