

25p

# The SHORT WAVE Magazine

VOL. XXX

OCTOBER, 1972

NUMBER 8



WORLD WIDE COMMUNICATION

# Installing a Rotator Antenna Tower?

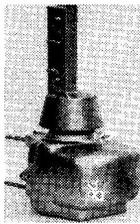
# W.E.

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We have **THE STOCK** . . . for quick delivery  
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**THE EXPERIENCE** . . . to give you the advice you require

There's more to even a simple job like fitting an AR22R than just buying it and attaching a 4-way cable! Naturally, we don't wish to give away all our "trade secrets" by publishing all the pitfalls! We just recommend you to avail yourself of our services! Our aim is to see you with a safe efficient installation.

### ROTATORS CDR and HY-GAIN



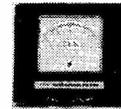
AR20



AR22

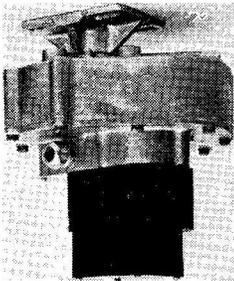


TR44



HAM-M

HY-GAIN 400



### ALL ROTATORS EX-STOCK 24/48 Hour Securicor delivery £1

We stock the best range of rotators, CDE and HY-GAIN and spares. Our stocks are good so you'll get fast delivery plus the after-sales service which counts.

**AR20** This model replaces the old AR10 and is ideal for VHF beams, £20 (40p).

**AR22R** This model will turn HF antennas of TA33 Jnr. size and can be mounted on the top of masts up to 2 1/8" diameter or onto a flat plate. It can carry a dead-weight of 150 lbs. Requires a 4-wire cable, £25 (65p).

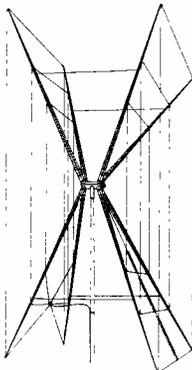
**TR44** This model is also for HF beams as the AR22R but carries a 500 lbs. load and has better braking. The control unit requires a 7-wire cable, £45 (75p).

**HAM-M** The best of the CDE range. Carries 1,000 lbs. deadweight for large HF beams and employs a solenoid operated brake. Requires an 8-way cable, £70 (80p).

**HY-GAIN 400.** It's a brute but takes masts up to 3" dia. and automatically rotates to the desired direction by setting the compass control knob pointer as required. Mounts to standard tower plate on Versatower, £98 (£1).

Note—All above rotators are ex-stock and delivery is normally EX-STOCK. All orders are despatched the same day as received.

**ANTENNAS.** (NOTE—Due to 'the floating £1' and HI-PRICE increases the following prices can be held only whilst current stocks last)



### THE FINEST FROM CANADA

## GEM-QUAD £74.50

for 10, 15 & 20m.

- ★ Weighs only 21 lbs.
- ★ Withstands 100 mph winds.
- ★ Forward gain up to 8 dB.
- ★ Balun included.
- ★ Converts to 3 or 4 element quad.
- ★ Fibreglass tri-dectic spreaders.
- ★ Front/back ratio 25 dB.
- ★ Low angle radiation.

### THE FINEST FROM U.S.A.

## HY-GAIN 18AVT

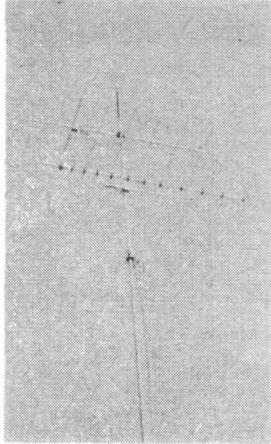
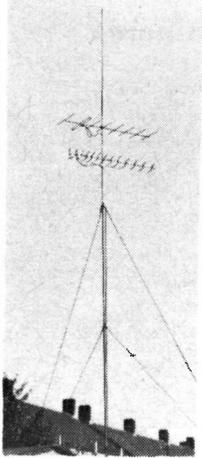
HY-GAIN 18AVT/WB THE GREAT NEW WIDE BAND VERTICAL SELF SUPPORTING FOR, 10-80m. (ex-stock) £33.00. Take the wide band, omnidirectional performance of Hy-Gains famous 14AVQ/WB add 80m. plus extra heavy duty construction and you have the new 18AVT/WB ★ True 1/2-wave resonance on all bands ★ 52 Ω/I/P ★ SWR of 2:1 or less at band edges ★ 1 kW (AM) ★ Radiation pattern has an outstandingly low angle ★ Roof or ground mounting.

Hy-tower, 10-80m. (self-sup.)	£99.50	Hy-Quad, 10-20m. 2 ele. . .	£62.50
18V, 10-80m. vertical	£10.90	DB10-15, 10-15m. 3 ele. . .	£51.00
12AVQ, 10-20m. vert.	£16.50	204BA, 20m. 4 ele. beam . . .	£80.00
14AVQ, 10-40m. vert.	£18.50	203BA, 20m. 3 ele. beam . . .	£67.50
18AVT, 10-80m. vert.	£33.00	153BA, 15m. 3 ele. beam . . .	£33.00
LC80Q, 80m. coil for 14 AVQ	£6.70	103BA, 10m. 3 ele. beam . . .	£26.50
TH6DXX, 10-20m. 6 ele. beam	£88.00	18TD, Reeltape portable dipole	£41.00
TH3MK3, 10-20m. 3 ele. 2 kW	£69.50	LA1 Lightning arrester . . .	£14.50
TH3 Jnr., 10-20m. 3 ele. 600w.	£48.00	LA2 Lightning arrester . . .	£2.50

**W.E.**

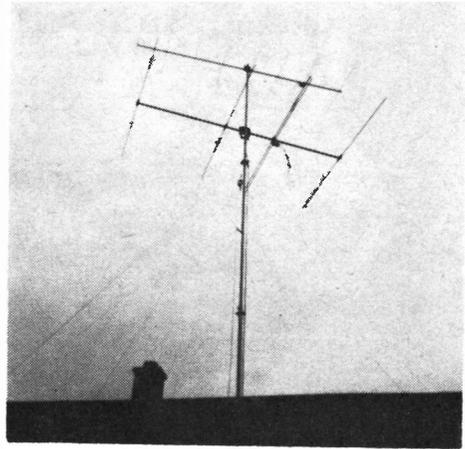
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- ★ Money-saving packaged deals on mast + antenna + rotator.

*That great mast at a little price*  
**The TELOMAST**  
*Look at its uses!*



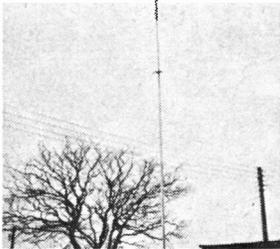
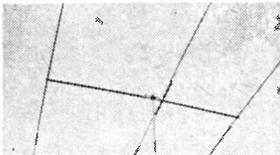
160m.-70cm.

The above two pictures show the installation at G3WYT, Mr. M. EDWARDS, B.Sc. The Telomast acts as a Loaded Vertical on 160m. and rotatable support for 8 ele. 2m. and 46 ele. 70 cms. beams. Customer's comment, "We are very pleased with the mast which has been up about 2 years having survived some fairly strong winds and completely out-clasped our previous array which blew down at least twice, giving us worries every time the wind blew up!"

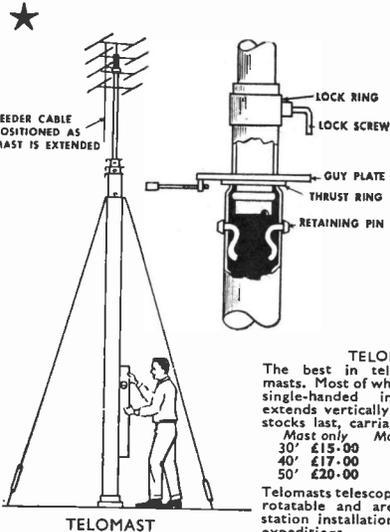
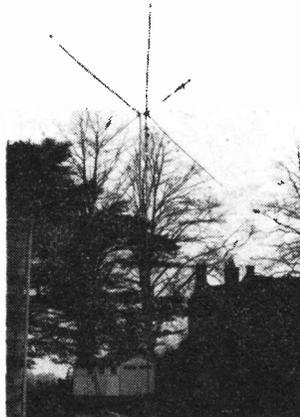


40m., 20m., 15m., 4m. and 2m.

This 5 Band installation at G3TVW is comprised of inverted 'V' dipoles for 40/15m. and 20m. plus 4 ele. 4m. and 8 ele. 2m. beams. G3YMK says of his 50ft. Telomast, "I find the greatest advantage of the Telomast is that antenna can be changed in minutes allowing great scope for experiment. I think the Telomast is just about the best investment I have ever made in Ham Radio; many thanks."



These are 3 ele. H.F. Tri-band beams (TA33 Jr) on Telomasts but, if you have any doubts about the Telomast, spare a thought for the poor Telomast above carrying Western Electronics 10-15-20m. Quad.



**TELOMAST**  
 The best in telescopic rotatable masts. Most of which can be erected single-handed in minutes and extends vertically upwards. While stocks last, carriage paid mainland.  
 Mast only      Mast and Rigging kit  
 30' £15.00      £20.30  
 40' £17.00      £27.00  
 50' £20.00      £33.50

Telomasts telescope down to 10', are rotatable and are ideal for fixed station installations, field days and expeditions.

**TELETOWERS**  
 The finest value in guyed, galvanised steel towers which telescope down to 25'. Price (carriage paid):  
 42' £77.00 57' £107.00 79' £132.00 101' £169.00

**VERSATOWERS**  
 Self-supporting tilt-over towers for 40', 60' and 85'.  
 P40, £121.75, P60', £146.50, T85', £275.00'

**HAMTOWERS**  
 30' self-supporting galvanised steel tower with climbing rungs incorporated. Easily erected single handed. Price: £35.00 carriage paid.

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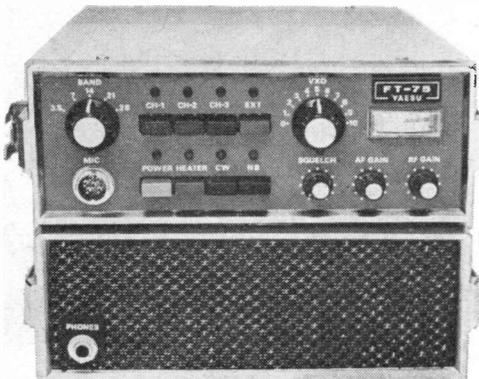
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# WESTERN

### SHE'S A LITTLE BEAUTY! The FT-75 that is! A 10-80m. SSB TRANSCEIVER for ONLY £99 (carriage paid)

FT-75



FP-75

This latest addition to the ever expanding YAESU range is a real winner! Having tested it we can say the receiver side is very good and output power was not less than 15w. R.M.S. on any band. Operation could not be easier! You simply select the band, press the channel button and talk.

#### SPECIFICATION :

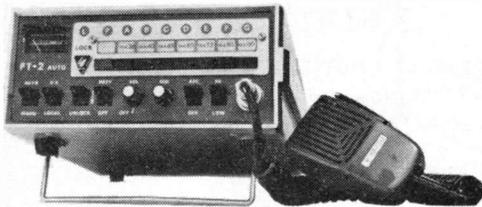
**Receiver :** Sensitivity : 0.5V for 10 $\mu$ B, S/S + N.  
Selectivity : 2.3 kHz (-6 dB), 4.5 kHz (-60 dB).  
Audio o/p 9 1-8w.

**Transmitter :** Modes : SSB or CW. Power : 20w. p.e.p.  
Carrier suppression : better than -40 dB. at 1,000 Hz.  
Unwanted sideband : better than -40 dB.  
Response :  $\pm$  3 dB., 40-2,700 Hz.

**General** VXO swing : 3.5 MHz, 3 kHz ; 7 MHz, 6 kHz ; 14 MHz, 3 kHz ; 21 MHz, 20 kHz ; 28 MHz, 12 kHz.  
Size : 210w. x 80h. x 300d. m.m. Weight : 3.8 kg.  
Current drain : AC DC  
Standby 50w 1.4 amp.  
Heaters on 50w 3.5 amp.  
Transmit 80w 5.5 amp.

Microphone included and 4 crystals (3760, 7060, 21 250 ; 28 550 kHz. Our FT-75's have a crystal on 14200 at £1 extra if required. Other frequencies stocked for our customers are 3737, 3780, 7050, 7000, 14140, 14200, 21240, 21300, 21400, 28490, 28660. Or we will obtain any frequency you wish from Yaesu.

### AND HERE'S THE NEW 2m. FT-2 AUTO SCANNING TRANSCEIVER



#### TUNE 144 to 146 MHz in HALF-A-SECOND !

No laborious "Tuning High to Low" or "Low to High"! This highly advanced and superbly engineered YAESU masterpiece automatically scans eight channels in half a second! It will "lock-on" to any channel where a signal is present or can be set to always "lock-on" to a **PRIORITY CHANNEL** (your favourite frequency) whenever a signal appears.

Controls are : **AUTO-MANUAL** which selects the scanning facility, **DX-LOCAL** for attenuation of strong local signals ; **UNLOCK** which re-starts the scanning sequence ; **PRIORITY** which overrides other channels when on ; **VOLUME, SQUELCH, AFC** and **HI-LOW** power (10w or 1w) output.

Weight : 4.2 kg. Size : 210W. x 25H x 270D (m.m.)

Mode : P3. Power requirements AC, 100, 110, 117, 200, 220.

DC 12V.

COST SAVING EXTRAS INCLUDED

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- BUILT IN SPEAKER.
- COMPLETE WITH MICROPHONE AND 5 CRYSTALS.

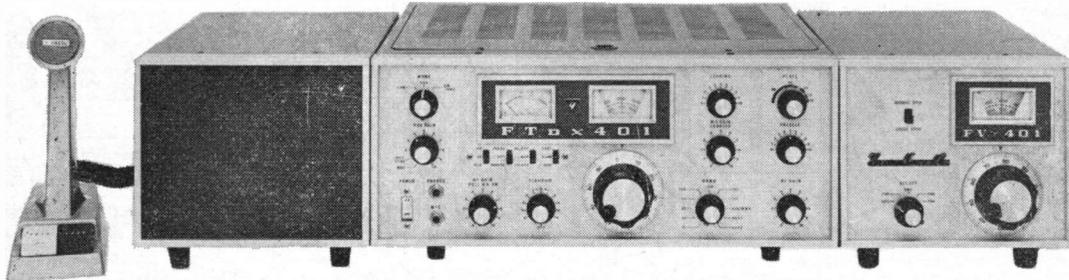
PRICE : £146.00

YD-846

SP400

FT-401

FV-401



THE FT401 offers a high power SSB/CW transceiver with many extra features at a minimum price.

**SPECIFICATION :** Power i/p 560w. p.e.p. Built-in CW filter, noiseblanker and blower cooled pa. Complete coverage 80-10m. Plus WWV (10 MHz) to check the 25/100 kHz calibrator plus 3 spare band positions. VOX is built-in (not an extra). Dial readout to 1 kHz on all bands. Sensitivity 0.5 $\mu$ V for 20dB S/S +N. Selectivity : 2.3 kHz (6dB), 3.7 kHz (80dB), CW filter 600 Hz. Clarifier 5 kHz. Break-in CW with sidetone. Selectable USB/LSB.

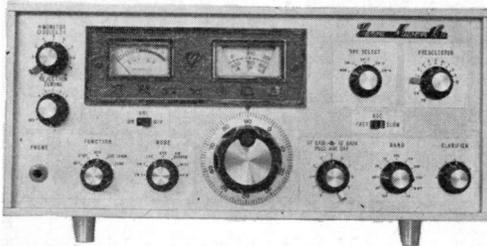
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HOPE WE'LL SEE YOU AT THE LEICESTER EXHIBITION !

**FR 400 SDX**



- 160m. ✓
  - 80-10m. ✓
  - Full coverage of 10m. 28-30 MHz ✓
  - 70-72 MHz (4m.) ✓
  - 144-146 MHz (2m.) ✓
  - REJECTION TUNING ✓
  - AM/CW/SSB/FM Filters ✓
  - FM discriminator ✓
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- = YAESU FROM W.E.

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455 in HC6/U	... £1.75	28-045 in HC25/U	... £1.60
456 in HC6/U	... £1.75	28-500 in HC25/U	... £1.60
500 in HC6/U	... £1.75	30-000 in HC6/U	... £1.60
		32-500 in HC18/U*	... £1.60
		34-000 in HC18/U*	... £1.60
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		35-000 in HC18/U*	... £1.75
		35-500 in HC18/U*	... £1.75
		38-666 in HC18/U*	... £1.35
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		70-000 in HC18/U*	... £2.00
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		72-050 in HC18/U*	... £1.75
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		72-525 in HC18/U*	... £1.75
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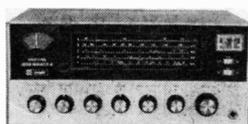
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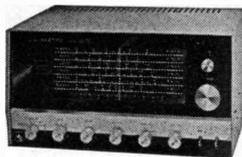
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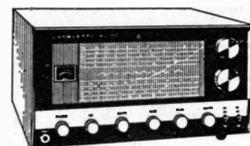
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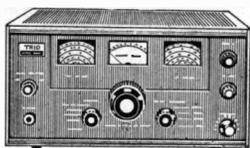
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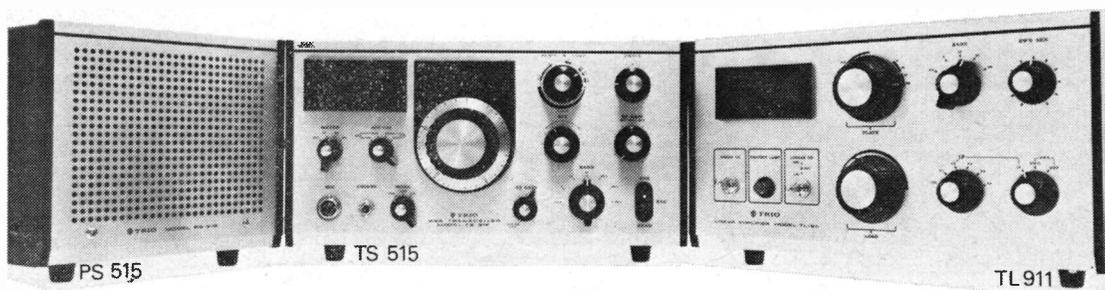
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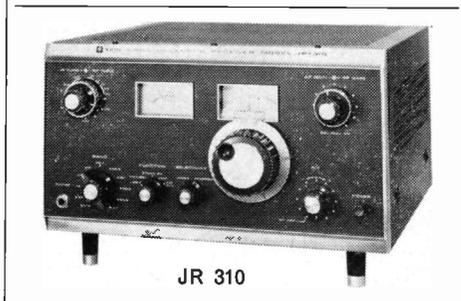
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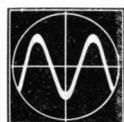
JR 599



9R 59DS



JR 310



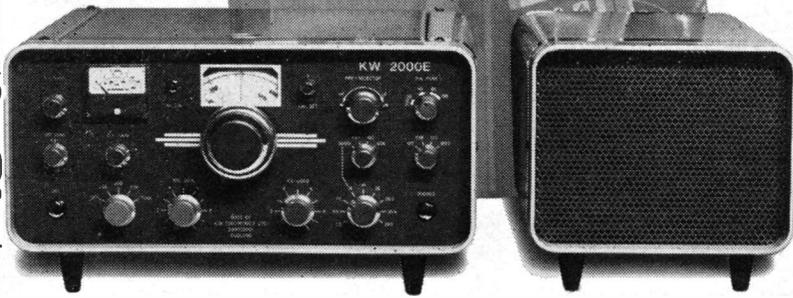
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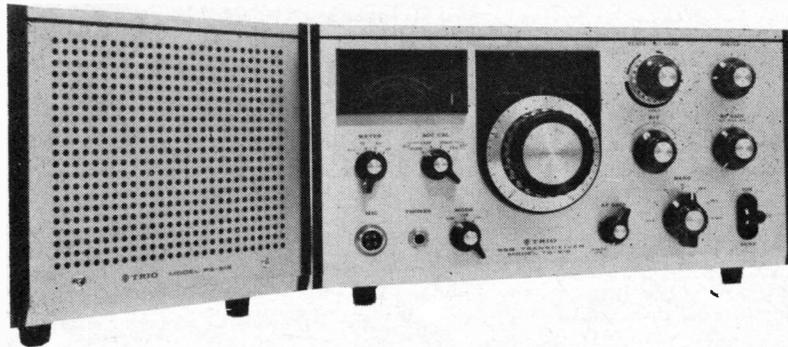
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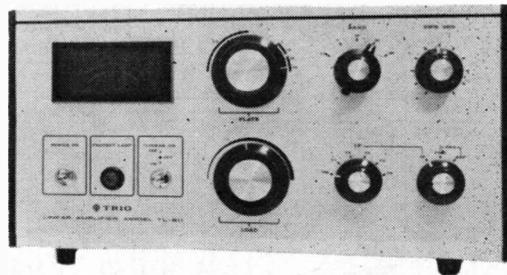
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- ★ Low noise figure 1dB. Transistors selected for low noise figure.
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- ★ 100% modulates our transmitter. Price: £10-00.

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**Frequency Coverage:** 3.5-4.0 MHz, 7.0-7.5 MHz, 14.0-14.5 MHz, 21.0-21.5 MHz and 28.5-2.90 MHz with crystals supplied. Ten accessory crystal sockets are provided for coverage of any 10 additional 500 kHz ranges between 1.5 and 30 MHz with the exception of 5.0-6.0 MHz.

**Selectivity:** Drake tunable passband filter provides: 0.4 kHz at 6 dB down and 2.6 kHz at 60 dB down, 1.2 kHz at 6 dB down and 4.8 kHz at 60 dB down.

2.4 kHz at 6 dB down and 8.2 kHz at 6 dB down, 4.8 kHz at 6 dB down and 25 kHz at 60 dB down.

Selectivity switching is independent of detector and AVC switching.

**I.F. Frequencies:** First I.F., 5645 kHz crystal lattice filter; second I.F., 50 kHz tunable L/C filter.

**Stability:** Less than 100 cycles after warm up. Less than 100 cycles for 10% line voltage change.

**Sensitivity:** Less than 0.25 uv for 10 dB signal plus noise to noise on all amateur bands.

**Modes of Operation:** SSB, CW, AM, RTTY.

**Dial Calibration:** Main dial calibrated 0 to 500 kHz and 500 to 1000 kHz in 25 kHz divisions. Vernier dial calibrated 0 to 25 kHz in 1 kHz divisions. **Calibration Accuracy:** Better than 1 kHz when calibrated at nearest 100 kHz point.

**AVC:** Amplified delayed AVC having slow (.75 sec.) or fast (.025 sec.) discharge; less than 100 microsecond charge. AVC can also be switched off. 3 dB change in AF output with 60 dB change in RF input.

**Audio Output:** 1.5 watts max. and .5 watts at AVC threshold. **Audio Output Impedance:** 4 ohms and hi impedance for anti-vox.

**Antenna Input:** Nominal 52 ohms.

**Spurious Responses:** Image rejection more than 60 dB. I.F. rejection more than 60 dB on ham ranges. Internal spurious responses in ham ranges less than the equivalent 1 uv signal on the antenna.

**Controls and Jacks.**

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The Heathkit SB-303 delivers all the signal seeking capability you could possibly want, plus a complement of performance features most other receivers can only offer as a lengthy (and costly) list of options. The "303" brings you USB, LSB, AM, CW and RTTY, 80-10 metres; 15 MHz WWV reception; solid-state instant warmup, 100 Hz stability in 10 minutes, and superior tracking. The exclusive Heath LMO with 1 kHz dial readout is factory-assembled and aligned for peak performance and incredibly smooth linear tuning. And an RF attenuator lets you adjust sensitivity for optimum signal handling. Other standard features are complete SSB/CW transceive compatibility with the famous Heathkit "400" or "401"; three-position AGC (off, fast, slow); 25 kHz and 100 kHz crystal calibrator for spotting the new sub-bands; antenna and power connections for up to two VHF converters, with front panel switch eliminating need for changing cables—four spare sockets on rear panel for connecting a wide range of Heathkit station accessories. Compare the specs . . . then order your "303" today.

### Kit K/SB-303

**SBA-301-1, optional 3.75 kHz AM crystal filter**  
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Operates USB/LSB & CW, "separate" or "transceive" . . . Covers 80-10 metres; USB, LSB & CW. Single front panel switch selects transceive or independent operation of "401" and 300-series receiver. Usable with any receiver when optional SBA-401-1 crystal group is installed. Built-in 240/120 VAC power supply. Modular sub-pack packaging and assembly procedure add to kit-building ease.

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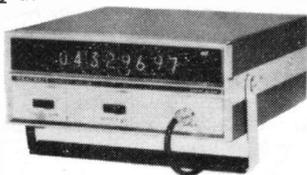
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Measures from 1 Hz to over 120 MHz with 8-digit readout plus overrange, gate and two range indicators. Pre-assembled TCXO time base. 1 megohm FET input. Automatic triggering level. Sensitivity 50 mV or less to 100 MHz, 125 mV to 120 MHz. Uses latest ECL (emitter coupled logic). Assembles in 15 hours. All ICs mounted on plug-in connectors. Plug-in fiber-glass circuit boards. 120/240 VAC.

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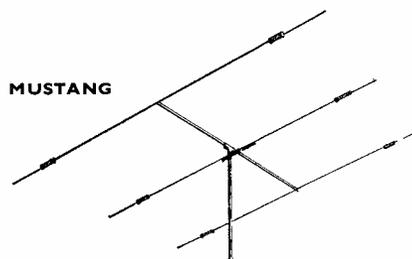
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# SHORT WAVE MAGAZINE

(GB3SWM)

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OCTOBER, 1972

No. 348

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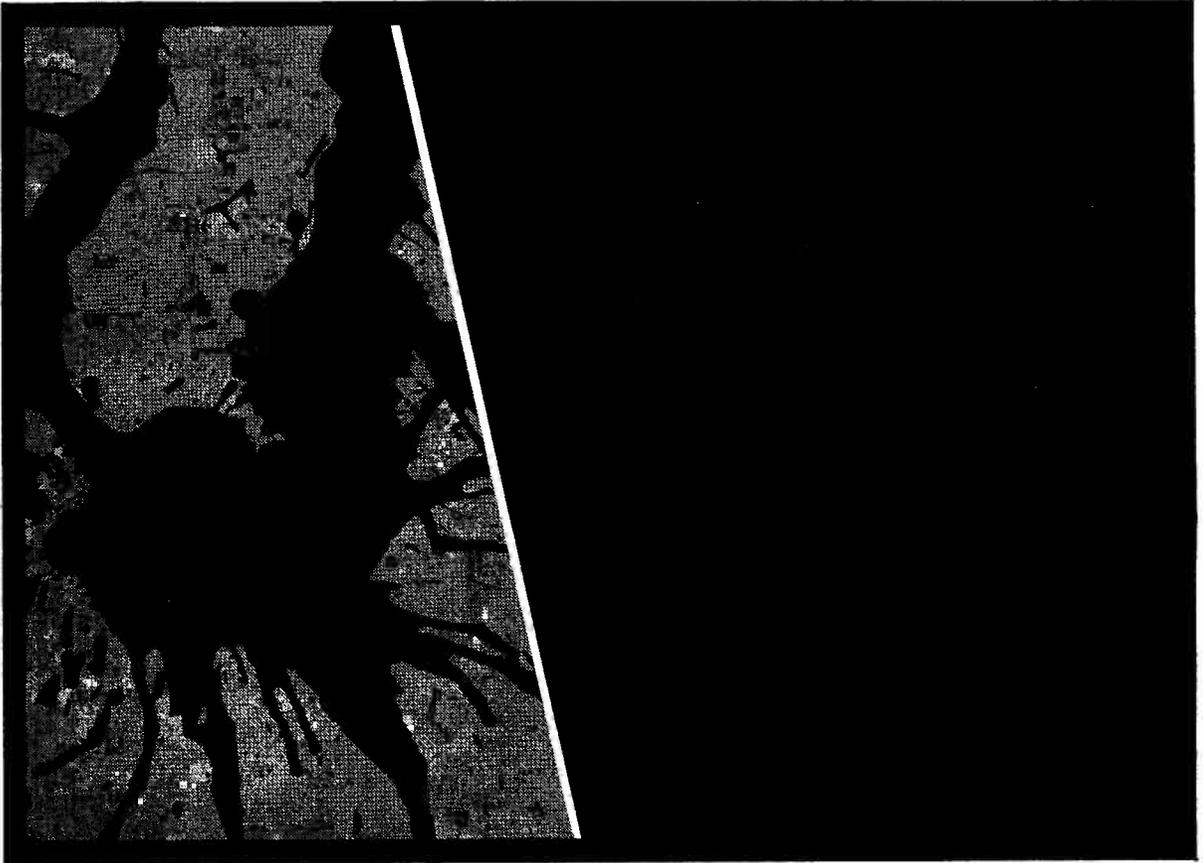
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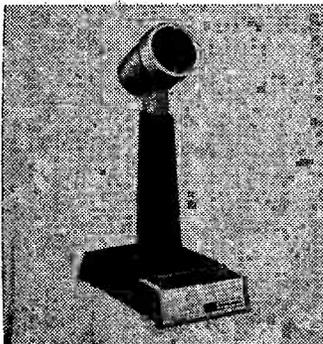
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# The SHORT-WAVE Magazine

## EDITORIAL

### ***Exhibition***

Since the demise of the Amateur Radio Exhibition in London in 1970, there has been no such show since—our own last appearance at one of these events was in 1968, having supported them every year from the outset in 1947, till ours became the only stand-name paying the full rate for space who had been in it from the beginning.

Many well-known names in the context of Amateur Radio came and went but over the latter years only a handful survived. We warned the organisers in 1968 that the Show could go on only if some radical changes were made. This advice, based on more than 20 years' practical experience with a stand at the exhibition, was ignored—so, sure enough, the London Amateur Radio Exhibition died in 1970, in an atmosphere of gloom and frustration.

\* \* \* \*

That is now history and, in the present context, old hat—because during the coming month there is to be a new approach to staging an Amateur Radio Exhibition. It is to be held at an important provincial centre (Leicester), under an entirely new promotion (Amateur Radio Retailers' Association) and with quite a different concept of how such a show should be put on in the Amateur Radio interest.

Of course, at this stage we cannot say what the outcome is likely to be—it could be either a dismal failure or a thumping success.

But what we do say is that the efforts of those undertaking the responsibility of organising a National Amateur Radio Exhibition deserve both the highest commendation and the utmost support.

It will cost you 20p to get into the Granby Halls, Leicester, any day Thursday 26th to Saturday 28th October. With easy access from all over the U.K. by road, rail or air, ample car parking and all the amenities to be expected at an established exhibition centre, it will be well worth a visit to see what goes on within the turnstiles.

*Aus Tin G66FO,*  
G66FO.

# COMMUNICATION and DX NEWS

*E. P. Essery, G3KFE*

PERHAPS the most interesting facet of the DX panorama this time has been the great amount of activity reported on Ten, which, even for those of us who have to earn a crust, has had openings almost daily. Its other delightful characteristic, that of getting a DX reply to a CQ call put out on a "dead" band, has also been the experience of most of the faithful.

Naturally, if Ten is open to DX, it follows that the other bands have also had their share of traffic, although on Twenty there have been times when the European QRM has just smothered the DX.

So, let us commence our look with a few notes on Ten.

G3KMO (Ash Green) runs about 98% of his contacts on CW, with a home-built receiver and linear using a brace of 811A's and a Vespa to drive it, plus a nice aerial farm—consisting of a tilt-over tower, on which there is a four-band Quad, with two elements on Forty, four each on Twenty, Fifteen and Ten, plus a 65-foot vertical with twenty radials for Eighty. The latter can also be run as a vertical on Top Band by switching in a loading coil. And that's about all! (*Phew!*) After a layoff from serious DX'ing for some years, 1970 onwards has seen a resurgence of interest, with 5BDXCC the aim—over the hundred on 7-28 MHz and not far to go on Eighty, is the present state. As for this month on Ten, Mike had CW contacts with VU2AAA, 4X4VE, VK6SA, UA9DC, ZS5KI, CT1VX, 9J2XZ, DJ7ST/OHØ, ZS5BS and P12VD; the SSB contacts were with 7Q7RF and 9Q5RH.

In the view of G2DC (Ringwood), things have opened up with a bang on Ten, although often hampered by a lack of activity; certainly, there was not a lot of response from the G's, little QRM from EU's and DX not getting the nibbles it deserved, let alone a decent bite. Jack celebrated getting his "screws" well under control by hitting it out on the key with CR6AL, CR7IZ, HS1AHM,

SU1MI (daughter of SUIIM), UH8AE, UL7IAP, UL7LBE, UA9MEW, UV9PS, VU2AAA, VK6SA, VK6SM, XE1IJ, ZE1BL, ZE3JO, 3D6AX, 4X4FU, 5Z4JE, 9G1HE and 9L1JT.

G3USF (University of Keele) has a long and interesting letter which could well do to be quoted in full. Martin mentions, first, that the beacons are good indicators, like 3B8MS on 28.2 MHz before settling on to 28.190. Then there is, for the DX readers, GB3SX on 28.185 MHz, and DLØIGI which normally appears on 28.195 but on occasion lurches off to end up on 28.2 MHz, to confuse everyone. G3USF also thinks many people look on Top Band as "tough DX-ing" and Ten as "easy pickings at sunspot peaks"—when a little of the Top Band DX'er's application applied to Ten at its minimum would show results to startle us all. Proving his point, he says "Let's not think about 4X, UA9, 9J2, 5Z4, CR6, CR7, ZS, PY, LU and suchlike—how about 9M2DQ, usually on at 0900-1000 but often working G's as late as 1600; then VQ9MC at 1800z; 3D6AX, 1515; EP2TC, 1115; VK's, 0850-0950; 3X1P (Republic of Guinea), 1132; 9G1HE, 1610 SSB, or 1053 CW; VU's, 0924, 1020, 1040, or 1415z to choice; DU1FH, 1025 or 1130; KG6JBO 1012; VK9RY (Papua), 1020; JY9GR, 1045; ET3JH, 1043; UKØAAB, 0900; UG6GAF, 1102; UD6BR, 1032; XE1IJ, 1923; TU2BO, 1025 or 1715; EL2CB, 1350; KZ5AA, 2000; CE3PY, 1925; VO1JN, 1935; KP4DHC, 1929; ZD8RR, 1400; and CX1BBR at 1405—but he's made his point! It was all on ten metres during the last few weeks.

The absence of late of G3NOF (Yeovil) from our columns is all explained now. Don has had a run of rig trouble, not all at once, but in accordance with Murphy's Law, serially. He is now back on the bands, with a Drake R-4B receiver, KW-204 transmitter, and a Mosley Mustang at 43 feet, and

rarin' to go. His 10-metre pickings since he returned seriously to the fray take in the hours 0800-2100z, by way of 9M2DQ (almost daily), C31FQ, CR5SP, CR6IY, CR6MK, CR7AC, CR7IZ, JY9VR, K4BLL/4, K4YYL (both around 1840z), PY's, VK6KW, VQ9MC, W4GJO (at 2044), W4JCI, W4UF, YB3AA, ZD8RR, ZD8RW, ZD8TM, ZC4EJ, ZS1W, ZS1WX, ZS2AG, 9G1HE, 9G1YA, 9J2AY and 9M2DQ aforementioned who was worked most days around 1515z. And JR6, JA, TU2DO, and 9V1RE were all heard.

Next a batch of CW QSO's on 10 metres, these being to the credit of G3RFG (Henlow) who offers by far his longest list yet on Ten: CT1VX, CX4CO, DK6NC, DL7EH, FØAHY/FC, HA, HB9, I, OK, LU8BAO, LZ, DJ7ST/OHØ, UA9FBM, 5X5NK, 9H1CH, many other Europeans and the beacon stations.

The letter from G3LZQ/ZS6ZE (Pretoria) has so many points one hardly knows which ones to pick out. John has been occupying most of his spare time since his last letter on the task of pruning and tuning-up his aerials for the LF Bands, a job which is nearly completed. He has a Hi-Tower, set atop an 80ft. building, the roof of which is now festooned with sixteen radials of over a hundred feet, each to trap the unwary.

Now to G3DCS (Ipswich) who only found OE5SML and F3MF/M during his limited weekend operating hours; Enver raises an interesting point, which may well be most important on Ten, when he asks if anyone has tried tilting their beams—he reckons that to concentrate on pure azimuth characteristics could be wrong, with modern talk of chordal-hop propagation in mind.

Our final offering on the subject of 28 MHz this month comes from G3LEQ (Knutsford), who rapidly changed his intention to migrate to Forty when he realised that Ten was peaking up so well. The

local net was all called by ZD8TS one night at 2245z when the band seemed quite dead for DX. Bank Holiday Monday was good for single-hop contacts into Europe, and a few days later the Mauritius beacon 3B8MS was audible strongly and QSO's on SSB were made with CR6TP, CN8CG, PW2WH, ZS6OF, plus ZC4BI on CW. Heard were HK3TMI and ET3DS.

#### Fifteen

G3LEQ says his lot may not be interesting to the Quad merchants, but he is quite happy with his 18AVT/WB, sitting among the dustbins; it stumped up with EP2TC, JA9ANK and G5BAI/AM on Holiday Monday, as well as JA9EQN, XE1IJ and UK3AAO, with VU2AAA as heard.

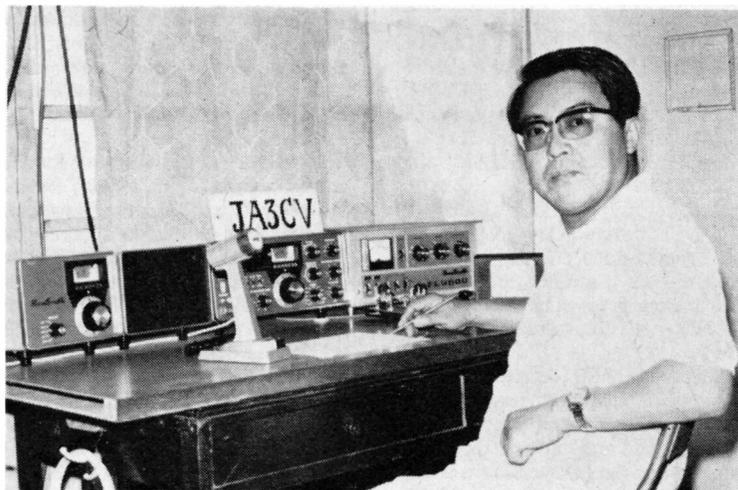
G3DCS stuck to his key on Fifteen, and made his contacts with CE3ED, CX1JM, PY6AIQ, LU2EN, PY4UZ, PY1DUB, W's, 9V1QK, UM8BB, LU5BB, UJ8AB, UA9's, VP9AF and ELØP/MM.

From his hideaway in ZS, ZS6ZE /G3LZQ worked on CW most of the common (to us over here) countries in Europe, plus UA9, UAØ, UH8, UL7, UG6, VS6EN, KX6JS and hordes of JA's; and his phone accounted for 9M8WUW, FHØDL, VK's and some KH6's.

Strictly CW for G3RFG, and less activity than on Ten about sums it up, with JA1CIO, JA2XYO, JA8LWA, JH1BLX, JH1GTQ, JH3JWH, K4CQ, LU2EN, W2HKO and WN8IJA.

What about Fifteen from G3NOF? Don found the mornings productive, particularly for short-path JA's around 1100, and W's after about 1130, Far Easterners in the afternoons, and so on, by way of QSO's with EA8GZ, IH9JI (Pantellaria), JA1JRL, JA4RCY, JA8JGQ, JA8IXM, SV1FT (Crete), VQ9NEW, VS6EN, XW8EO, ZC4DS, 5B4AD and 9HICV.

A notable reduction in the commercial QRM, particularly with the beam turned eastwards, was noted by G2DC; Jack worked his CW out to CR7IZ, CX1JM, CX8BBM, EP2CC, FØANY/FC, HC1CS, HS4AGN, KA6EE, JA1-9, PYØDVG, VQ9R, TU2DD, UL7LAW, UG6GAF, UK7EAA, UJ8AB, UK8AH, UM8DZ, UM8BB, UAØCAB, VU2AAA, W1-Ø, XW8EV, ZD9BM, ZE1BL,



Station of JA3CV, Tadao Sasaoka, of Osaka, Japan, who is one of his country's keenest DX operators. The gear on the bench will probably be familiar to some readers!

ZS1RM, ZS5KI and 9V1QK.

Now G3KMO, who again is a CW-man—he worked FØAHY/FC, KA6AY, UK8HAA, UA9WO, UI8AM, JH1ORA, TU2DD, UM8BB, 9G1HE, 9M6AW, PJ2VD, FL8AG, IS1AEW, VU25JW (a special to celebrate 25 years independence), CX1JM, CX8BBH, ZS5BS, KL7MF, C31FQ, ZM3IS, W6IUV/HK4, all on the key, and a lone VP2SAM/MM on SSB.

Mixed modes is the motto for G3ZPF (Dudley); he ran CW with UP, HA, VRA and I1, in between SSB contacts with EL8G, EL5C, VS9MB, OA4OS, 8R1J, C31EG, FL8HM, K5LWL/YV6, VQ9MI, OD5FH, VQ9DC, MP4MBB, ZC4DS and CR6HX.

G4ALG (Reading) is experimenting with the popular "dipoles in parallel across a single feeder", sans balun or ATU, and finds he has TVI from his Vespa despite the low-pass filter. If Stephen is in a Ch. I area, this LPF needs to be sharpened up a bit with a quarter-wave stub tuned to lie between the TV sound and vision channels; an ATU purely as a TVI measure will probably add a further few decibels harmonic suppression. Then it comes down to tackling the offending TV sets.

Our old friend GM3JDR (Wick) has come back to the fold. Don tackled Fifteen from both ends, and his CW tally notes TY1ABE, UAØFAM, UAØVG, UV9CO,

XV5AC, KG4ER, CX1RY, ZS6OS, ET3GK, FPØZZ, CR5AJ, FL8AG, EL9A, 5X5NK, also all W and JA call areas. As for the Sideband, he tackled FL8MM, FM7WW, VQ9R, 5H1LV and the usual run of W, JA and such.

G3ZAY (Orpington) comes in now, declaring he is convinced summer is the best time for DX, and that of late there has been almost too much DX about. Fifteen, for instance, showed PYØDVG, SVØWU (Rhodes), SV1FT (Crete), 5VZJS, 5T5DY, 6W8AL, TR8VE, FHØDL, A2CJP, 4S7AB, VU25BX, VU25DK, ZD7BB, HS4AGN, XV5AC, HM1EJ, HM1AQ, HL9VJ, VR4EE, DU1GJM, KX6BU, KG6JBO, YJ8BL, VK9ZB (Willis Is.), A35LT (Tonga), VS6AC, VS6AD, ZD3D, 3X1PC, KC4UST and VP8ME as all worked.

G4AMT (Penzance) finds Fifteen by far his best band as far as propagation to westward is concerned; hence his SSB worked out to 5Z4MO, 5Z4ERR, 5Z4IX, OD5BA, ZE7JR, OY5NS, JR1NAV, JR1FVI, JA2SWQ, JH1TQ, W7's and KTØNEB (at the Nebraska State Fair), while CW did the trick with W6MSM, K6QPH, W6PO, W7RM, W7CNL and W7UT.

#### Twenty

It isn't fair, says G3ZAY—every time he wants to go QRT for breakfast, new DX appears to keep him starving! Some of the said DX

appeared under the call signs of KL7AIZ, KL7GOY, KL7MF, KH6GQM, KH6OT, W3UMZ/KS6, PYØDVG, 9V1QW, C21TL, A35FX, F08BY, and VK's and ZL's innumerable. Heard were 3D2AN, KB6CU, WA4DLK/KB6, and ZK1CD.

Sad to say, G2HKU (Sheppey) has been horizontally polarised by the orders of the doctor, so activity on the air has not been high; Ted managed to work UN1CC and VE5ES on SSB, plus W6IVT on CW.

On to G3ZLP (Bristol) who is taking his chance to have a gripe about the splurgy things which wander up and down the 20m. band; when the DX you are working is about RST 439 anyway and their advent turns it into 239—us all, too! Nevertheless, John managed his HW-100 and ground-plane to good effect, accounting for W1-9, VE1-4, VK7CH, FG7XC, TA2EA, PY's, LU9FAN, JA3MXR, JA2ZBI, JA8AA, ZS1OG, ZS6KT, UA9's, UA0's, UM8FM, UH8AE, UF6FAO, UO50AX, VU2AAA, 4X4VL, FPØUX, 9G1HE, CN8CG, KL7GDO and 9H1BZ on the key, whilst a turn or so on Phone dredged up 5Z4KL, VE6WL, YN1CC, YB3AAY, 6W8AL, CR6TP, 7X7Y, JH9JT, W's and, his prize of the month, C29ED.

G3GUV has a piratical "other half" who signs himself "Tim"—all DX'ers please note, the real one is Tom. G3GUV has a very difficult QTH, radio-wise, with overhead power lines and telephone wires forming a very efficient RF blanket right over the shack, but he persists with his 35 watts and dipole, and in the last month tickled with new countries in the form of CT2BO, 5T5AG, and ZP5RD, plus lots of W's and KV4AA—the latter asked for a QSL and sent an IRC for one direct! Tom has his rig set up in Darlington.

G3ZPF (Dudley) has hard things to say about the people who moan about others using excess power—as he points out, with an FT-DX560 on CW, he could extract around 200 RF watts out while the chap with 150 watts of Class-C can get 100 watts RF out or more, to make the disparity only about one S-point. Anyway, the moaners have got that back instantly as compared with

G3ZPF, who has only a dipole at 15ft. on which to work his DX. Perhaps G3ZPF could have added—but he didn't!—that he probably knew more about DX listening and operating *before* he got his ticket than most, as he was for long a correspondent to our "SWL" feature David's CW netted all the Europeans—one way to practise reading awful signals!—while the SSB, to work the five 9Y4's required for an award, took one hour flat to hook 9Y4LP, 9Y4MH, 9Y4RB 9Y4PH and 9Y4LH, clinching the bit of parchment. Others worked included TL8SW, 5Z4MO, 7X7K, LG5LG, PZ1AP, CR6OY, 9M2CP, C31PD, 9J2DT, 5R8CS, FØVM/FC, MP4TDM, HC1PW, VU25MX, VK4VON/MM and EIØZ(!).

W6AM (Long Beach) offers, as his contribution for 20m., CW contacts with DU6RH, JT1KAA, A35FX, F08CR, and SSB with VS6DO, HS4ACN, XV5AC, VR4BS, ZM4MZ, VU25KV, YV5BPG and VK2ADE.

For G3LEQ, most of the DX mentioned was on other bands, but his vertical was going great guns on Twenty on the Bank Holiday Monday, particularly in the way of VK's and ZL's.

It was mainly CW for G3DCS—he worked SSB to DJ1IJ/M and C31FD, but keyed with lots of UA9's, IP1VTI, VE3DMC, 4X4VL, EA9EO, ZS6ARS, UH8BO, CT2BO and the U.S. Similarly with ZS6ZE, who worked his SSB with VU25CT and W's, but raised JTØFAF, UI8, UJ8, UM8 on CW.

Gotaway from the clutches of G3RFG was HS4AGN, but Stan made up for it by working FY7AI, JA6CNL, KØMOL, K2JUL, VK2MT, VK3MR, VP7BL, WB4WHQ, YV1AD and ZL1AH.

As so often, the month past has been best between 0700 and 1000 zulu, considering quality of DX against the QRM level, says G2DC, whose log shows A35FX, CX1JM, CX1AA, HMØB, KL7GPS, KH6HGP, KH6RS, OA4AHO, UA1GZ/M (in Antarctica!), UG6GAG, UF6QAC, UD6BW, UM8DZ, UM8FM, UM8MAK, UK8IA, UI8LL, UH8DK, VP9AF, VK2-8, VU2AAA, VU2GWL, VS6AO, YA1OS, YV71M, ZL1-5, all W call areas and 9V10K.

We come again to G3KMO, the

CW man, who found time to enter QSO's with the following: ZM1BLR, KH6DQ, VP7BL, UM8MAK, UH8BO, TU2DD, UG6GAF, 4S7AB, 9K2BQ, CR7IZ, EL9A, EA9EO, JA3BG, FPØVX, UO5AB, JA6PA, FP8DG, 3AØEJ, KH1QQ, HR1AT and M11.

The acquisition of a Drake 2B receiver has made a world of difference to G4AMT, who reckons Twenty is about impossible without it—Terry has been, since getting it, experimenting with aerials for the band, in the process working on CW CN2NR, ZM4NH, and SSB with VE3MB, VE8ML, 5Z4GK, CR6IY, ZA1B (probably as piratical as most of the other ZA signals!), also ZS5EL, W6NOS, W6PWR, WB6KUC and K6UYC/6.

#### Points from the Post

G3ZAY would be missing some of the DX currently due to hit the bands, such as CE6CA/CEØ, Easter Is. and VK2BQQ/LH on Lord Howe Is., but it just couldn't be helped, as Martin went off to Geneva with G3YMH and G8ASI, for a spell of operating from 4UIITU on the HF bands and One-Sixty, too, between September 5-15.

To his Maritime interest, G2NJ has now added QRP. Since we mentioned G2BUL's QSO last time out, the latter has worked 14 countries on the tiddler rig, the latest being EI9CC with 0.8 watt. Another QRP man is G3DOP, who called G2NJ on September 4 at 1515z for a FB CW contact, running 2 watts only. Notice, this sort of thing being done on Forty, notoriously a difficult band from the QRM angle—it proves we could all get along quite happily on a 20-watt limitation worldwide, probably with much less QRM trouble. Another one who likes to play QRP is G13MIF, Belfast, who uses just the one watt on 40 metres.

Results of the 1971 VK/ZL Contest; there were 42 European entries giving DL8NU top spot with 10660 point on the Phone leg. The U.K. entries were, G3SSO, G8WS, G2DC and G6XL, in that order of placing. Orr CW, DL8NU again scooped the pool, the only G's this time being G2DC and G5RP—which seems to make DL8NU an outstanding signal in either mode.

Quite a programme of awards are



**F. Harrison, G3SFL, of 52 Woodlands Road, Cleadon, Sunderland, Co. Durham, SR6 7UD, who for these days is perhaps in the unique category—all his equipment is home-built, including the Rx, which is a double-conversion all-band job with two-metre converter. On the Tx side he has a four-band CW/SSB rig and a transistorised Tx/Rx for Top Band. Not only is the test gear also home-constructed but also the 8ft. x 5ft. shack itself, built as a lean-to and fully weather proofed. G3SFL is a chartered mechanical engineer and mentions that perhaps this is why he has found radio constructional work not too difficult. Anyway, it shows what can be done.**

available from the Lowestoft Club, details by way of G3XSK—*QTHR*. There is the Norfolk Broads award, the Norfolk and Suffolk award and the British Fishing Ports certificate which is an interesting exercise outside the purely Amateur Radio field, as it involves knowing the registration letters of the ports—133 in all are on the list, which contains fishing ports one never thinks of in this context, and omits some that one would think are fishing ports of consequence in their own right. All these awards are quite tough. G3XSK will send you the details.

G3NOF reminds us that 5B4 calls have once again started being issued, although at the time of his letter only five were allocated. Incidentally, after his lay-off, G3NOF came back on only to find he had now got a new bout of TVI, this time with a single-standard 625-line set—no let-up on TVI, is there?

Last time out, we touched on the work W6AM put in, to make

sure of his VK9JW contacts; we could have added that Don organised propagation predictions to be airmailed out to the gang, to show them a contact or two on Ten was possible and persuade them to do something about it, rather than sticking to the 14/21 MHz beat. As Don remarks, there might—just might—be a few hundred tiny little details like this which make the difference between him holding on to his place on top of the heap and some other station displacing him—or, indeed not being able to make the contacts at all, as the Liddery daily heard on the bands eloquently displays.

If you hear G3KMO on the CW end of Twenty during October 15 and 20, or for that matter on any other band, listen again more carefully, because, all being well, Mike will be signing G3KMO/VP9 from Bermuda between those dates—lucky chap!

That audio notch filter at G3DCS contains a noise-limiter in the form of a brace of back-to-back

diodes, and it is mighty useful once you have the hang of getting it going the right way; but development is ever easier than pure research, which is probably why the G3DCS brain is ticking gently along the lines of a change to the pluggery and a few minor modifications to turn the unit to service as a speech compressor on “transmit” while maintaining the existing facilities on “receive.” Sounds an interesting idea.

#### Forty

Much-maligned, but still carries a remarkable amount of DX, both CW and SSB, for the operator prepared to get the best performance from his receiver.

G3ZAY decided to have one session on Forty to see what it could do—his comment on it was one word—“impressive!” However, we don’t quite know whether he meant the QRM of the DX, which last comprised a couple of South Americans in the shape of PY7BRQ and YV4AGP.

Although his activity has been

very limited G2HKU dabbled with Forty, his SSB going out successfully to EA8HJ, EP2WB, PW7BIH, UK9ABA, UK9CAE and UW9WR, with CW to PY7AJB and UL7BAC.

ZS6ZE found Europe somewhat pre-occupied with itself, and so he settled in and worked VK2, VK3, VK4, VK6, VU and dozens of JA's.

G3RFG picked his way delicately through the QRM to find and latch on to W6IUV/HK4, KP4DHD, PY1EAT, PY2CJW, VE3XK, VK2EO, WA2URS, W9CM and W9RWC.

Conditions seemed to be improving, in the view of G2DC, with more general DX coming in, particularly in the 0600-0700z period. Jack worked PY2CJW, PY5OF, LU3AU, UA9ACN, UA9TS, UK9MDA, UW9WL, UK8NNN, UL7JE, VK2EO, VK3MR, VK3XB and all W call areas.

All CW on Forty from GM3JDR, who mentions UL7MC, 7X7H, VK3MR, TF3AW, TF2IRA, UK7EAB, HK1QQ, VP7CQ, 4M5A, 5X5NK, ZS6ARS, 4X4VE, VU2DX, UF6CAB, CM2CL, UA9MAX, FB8XX, F0AHY/FC, SV1CH and all W call areas.

Nice to hear again from G8HX (Mansfield) who is still exclusively on Forty, with 2½ years passed since his last Phone contact. As he works longish hours, Frank has been adopting a system of grabbing up to three hours sleep before midnight, then a snack and a couple or so hours on the band. The results look quite good: FP0BG, VU2IN, UH8DK, UA9CCK, UA1KAE/1 (Antarctica), UA9MAX, UA9MAY, CN8P, ZP3A and the usual run of W, VE, PY stuff (which is nice on 40m., in any language). On a different tack, Frank bought a Heath SB-301, and finds it the answer to a key-basher's prayer in terms of its selectivity—and he found it by reading the Small Advs. in SHORT WAVE MAGAZINE.

Between 0400 and 0800 is when most folk are asleep or pre-occupied with the idea of getting off to work—not so G4AMT, who used the period to tackle Forty seriously; his CW made its way to all W call areas and C31FG, while the SSB got over the water to OA4OS, VK3ZL, VK5PB, and VK7GK.

A contact with SL6DC/MM on the key is G2NJ's offering in the way

of Maritime Mobiles to add to his remarkable collection—the ship was in Egersund, Norway, and will in due course go back to Sweden, although there is in the meantime a chance she will be on the air in the Lerwick, Shetland, area.

G3KMO's list is all CW, with C31FQ, HP1AC, FP0BG, VU2AAA, KP4DJI, ZM1AYG, ZS6ARS, 5X5NK, VK2, VK3, 4X4VE, 7X7H, JA0BCO, TN8AG, 8P6BU, 9V1MS, CX1RY, ZC4BI, ZC4KJ, CR7IZ, OX3ZO, WA9OTH/TF, UM8MAG, 3A0EJ and UA1KAE/1 in Antarctica.

The LF-band activity at G3DCS seems to have been at a rather low ebb, compared with that on HF—nevertheless, Enver did sample Forty, his CW working out to OK2BMF, UA9JH, UA9ACN and UW9WL.

#### QSL Addressing

G3NOF has his usual contribution to this corner, with: *JY9VO*, to Box 5289, Amman; *ZD8RW*, to G8BXU; *VQ9MC* to Box 193, Mahé; *HS4AGN*, to W5LUJ; *C31FQ*, to DJ5PN; *TU2DO* to WA2DHF, 6 Camp Road, Massapequa, N.Y., 11758; *ZC4EJ*, to G3ZGG; *JY9VR* to DK4PP; *9VIRE* to P.O. Box 3012, Singapore; *SVIFT* to Box 15, Crete; *IH9JT* to IT9JT; *YB3AAY*, to W3BRB; *HS4AGZ*, P.O. Box 125, APO, San Francisco 96386; *ZD8TS* to G3WDV; *9GIHE* to VE3FCL; *VS6AD* to Box 541, Hong Kong; *CR5SP* to Box 97, Sao Tomé; *ZC4DS* to G3LQP; and *XW8EO* to U.S. Embassy, APO, San Francisco 96352.

#### Top Band

Neither Eighty nor Top Band seem to have made much impression on people of late. GM3YOR (Kirkcaldy) reports his progress again; Drew added some more counties to his score for the table, thanks to GM4ABQ/P in Argyll and Sutherland; GM3XOQ/A in Aberdeen; GW4AKA/A in Cardigan; G13SGR/A in Co. Down; G13GDR in Fermanagh and all SSB. Also CW to GM3PJS/M in Pebbles and Perth. A comment is on the lack of CW activity on Top Band by this year's expeditions—it seems to have been very much a SSB exercise.

GW3WSU (Barry) repudiates the suggestion of taciturnity made last month, with a long screed to prove

it—he had a pleasurable time recently when he acted as host to G3WRV, G3ZEM, G3YUV and G3ZXD for a good old natter. Colin adds his new score for the Tables, all raised with a KW-2000B plus 380 feet of wire, sloping from 110ft. down to 20ft., although there is a Vanguard for local AM phone natters.

Summer static has knocked G4ALG (Reading) for six, as far as Top Band goes, but he is standing poised to plant 500 feet of aluminium wire “when the ground gets a bit more supple!” In that case, he should be well away by the time of writing—the G3KFE shack looks out on to mud-bath generated by the rain of the last couple of days (while writing this).

Have you ever wondered who has actually obtained a WAC on Top Band—W4WFL/1 (ARRL) had to find out recently to answer a query, and he gives it as follows—G3OQT, W2KQT, W2IU, K6DZC, DL9KRA, G16TK, W0NWX, W9PNE, W1HGT, OK2PDN, GM3YCB, HB9NL, OK1ATP, HB9CM and W6RW, in that order. Of course, there may be others who have worked them all but never applied for the WAC certificate to prove they have all continents in on Top Band. A mighty exploit, by any reckoning in our DX context.

ZS6KE is still looking for a suitable channel on Top Band—he has 1930-1970 kHz in which he can transceive or work split, or he can listen at the low end of the band between 1800-1850 kHz. If you want to try a ZS Top Band contact, drop John a line at Box 27085, Sunnyside, Pretoria, to let him know your usual active times. John will then try and establish if a path opens to ZS; he is game to be on in the evenings up till 2000z, and 0200 on Saturday nights only.

#### Sign-Off

That, masters, is that for this month; deadline for next time will be **October 9**, addressed as always to CDXN, SHORT WAVE MAGAZINE, BUCKINGHAM. And our thanks to all correspondents—past, present and future—whose offerings go to make up the picture your conductor sees and writes about each month. 73 till we meet again. Closing date for the issue after next will be **November 6**—so make a note in the log.

## LOOKING AT THE YAESU MUSEN FT-DX401 AND FT-DX560 TRANSCEIVERS

NOTES ON PERFORMANCE AND  
OPERATION ON THE AMATEUR  
BANDS

### MAGAZINE TEST REPORT

THIS review covers two pieces of equipment, the Yaesu FT-DX401 and the FT-DX560, both in themselves and in connection with the modification available to give Top Band coverage at a proper power level, which is offered to their customers by Holdings of Blackburn. The '560 in fact came from Holdings, and the FT-DX401, unmodified, from Western Electronics.

The two transceivers are very similar, and it may therefore be understood by the reader that, unless otherwise indicated, the comments apply equally to both transceivers. The FT-DX401 is the same as the FT-DX560, but has a noise blanker to replace the "traditional" noise-limiter of the '560; it also contains a CW filter as standard, and a blower cools the PA compartment. Both equipments have a nominal capability of 560 watts p.e.p. on SSB, and 500 watts of CW; there are taps on the mains transformer which enable the owner to adjust down to either 380 or 160 watts input. Transceivers as supplied by Holdings are normally set by them at the 380-watt level.

Now, to look at them with the eye of a critical reviewer. On the score of appearance, they look quite nice; comparison against the writer's own U.K. commercial rig by four knowledgeable visitors produced about an even split between the two as far as preference for the appearance went; a YL went on to say that she would not object to it in the living-room if it were fitted with a civilised speaker enclosure. This leads to consideration of the looks in more detail. Unlike most rigs, the PSU is built in, which leaves only the speaker to be accommodated in an external housing. The transceiver "body" is mid-grey, the panel being anodised matt silver-colour with areas of smooth anodising surrounding the knobs, to permit the screen-printing of designations in black or red. Two rectangular openings in the bezel allow one to see the multi-purpose meter, or the "coarse" scale of the VFO, the "fine" scale calibrated to one kHz being the surround of the main tuning control.

The controls are nicely grouped and fall to hand comfortably, with one notable exception, which is that for the send-receive switch and Vox gain-setting functions. Compared with, say, a BC set volume control, the latter's off-position flips the rig to "send," while "receive" is the condition with the equivalent BC set control at "on but volume turned right down." Turning up the volume will, in the end, result in the rig involuntarily Vox'ing to the "transmit" state. The sequence of events is very clearly aimed at the operators—probably a majority—who prefer to use Vox or the control on the microphone, as the case may be. However, it must in

fairness be said that Messrs. Holdings mention this problem in their own instructions, and as a result, at no time did your reviewer misoperate the transmitter as a result of this odd quirk of the designer.

### Frequency Range

Coverage is complete, if Holdings' Top Band is included, from Top Band to Ten—otherwise, the standard is full coverage from Ten to Eighty, in five hundred kHz segments. The black scale of 0-500 is used normally but for the 3.5, 28.5, 29.5 segments, the red scale, 500-1000, applies. The Top Band mod., which is connected to the Aux. 1 position, also uses the red scale, from 800 to 1000. This produces coverage of all the bands, leaving us with Aux. 2 facility unequipped (Aux. 1 is taken for the Top Band mod. when fitted, but otherwise is also unequipped). Then, as a final segment, there is a WWV position, which tunes 10-10.5 MHz, *receive* only.

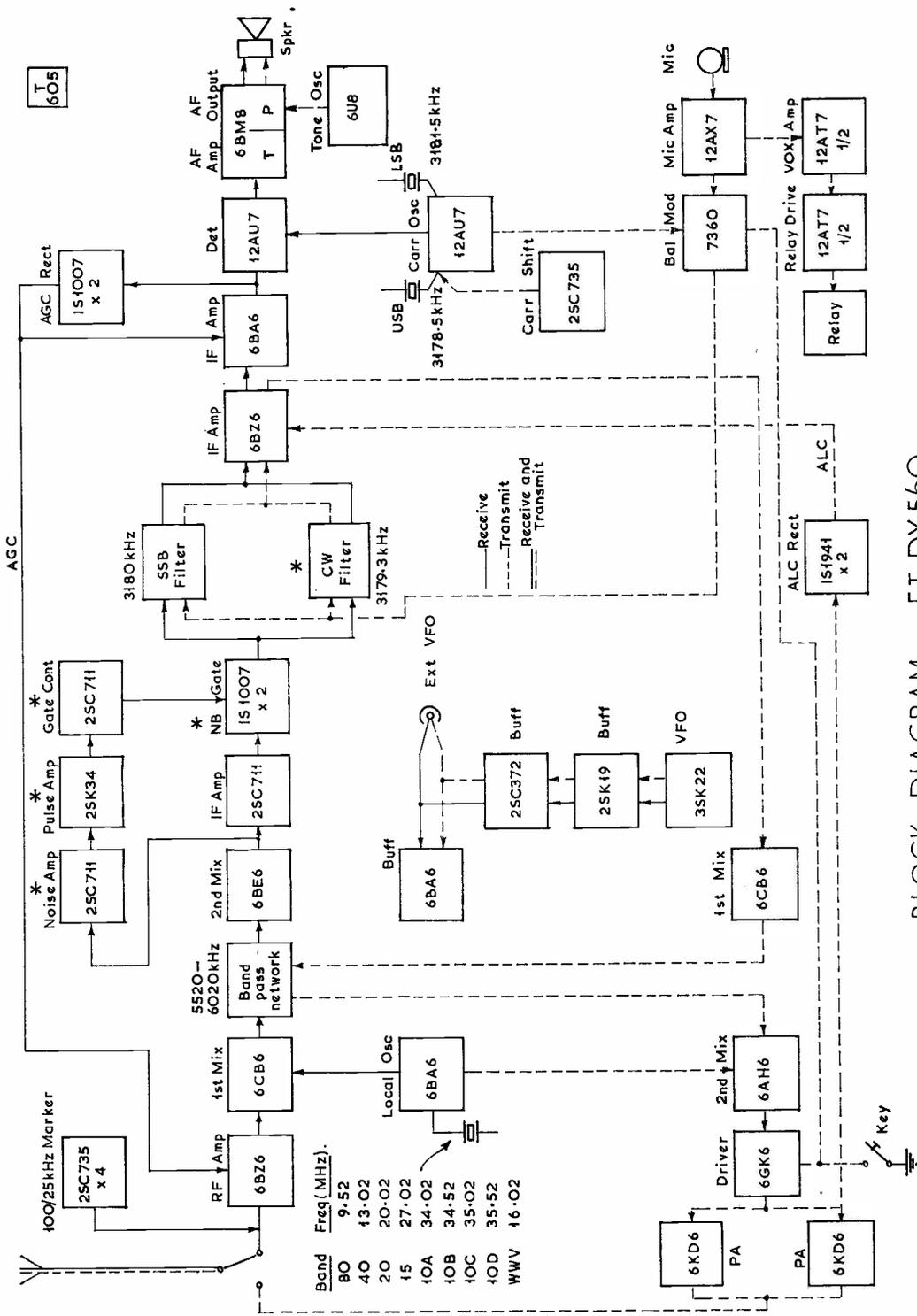
Calibration is therefore pretty comprehensive, as the inbuilt calibrator gives 100 kHz and 25 kHz steps, and, obviously, can itself be calibrated against the WWV signal. To set the transceiver, the rig is tuned zero-beat to a calibrator "pip" and the skirt of the dial is then rotated to its zero or 25 kHz point, as appropriate. Once this was done, the FT-DX560 was uncannily accurate and linear in the VFO department, albeit the 401 was not quite so good. Both were as good as, or better, than one has any need to expect, with a maximum error of well under a kilohertz, and negligible backlash.

SSB signal quality on the air was more than adequate both as far as the transmitted and the received signals went, and indeed the reports praised the outgoing signals for good-quality audio, even though attempts were made to induce distortion by overdriving the audio—as one may well do in the excitement of the chase when good DX is about.

The noise limiter on the FT-DX560 was tried on Loran—this reviewer's standard test—and worked as well as could reasonably be expected, bearing in mind that it was being used with a SSB IF strip and the narrow bandwidth was reducing its ability to cut spikes (a normal situation). However, it did its job as well as could be reasonably expected and better than many limiters. On the FT-DX401 there is a noise blanker in place of the limiter, which could not be put to a similar test owing to the '401 not giving coverage of Top Band. However, a test was improvised and showed the blanker to be quite effective on signals received by the aerial—after all, one should stop RF getting into the mains leads at source, something we could not do within the confines of our simple test, so this last comment is *not* a damnation by faint praise.

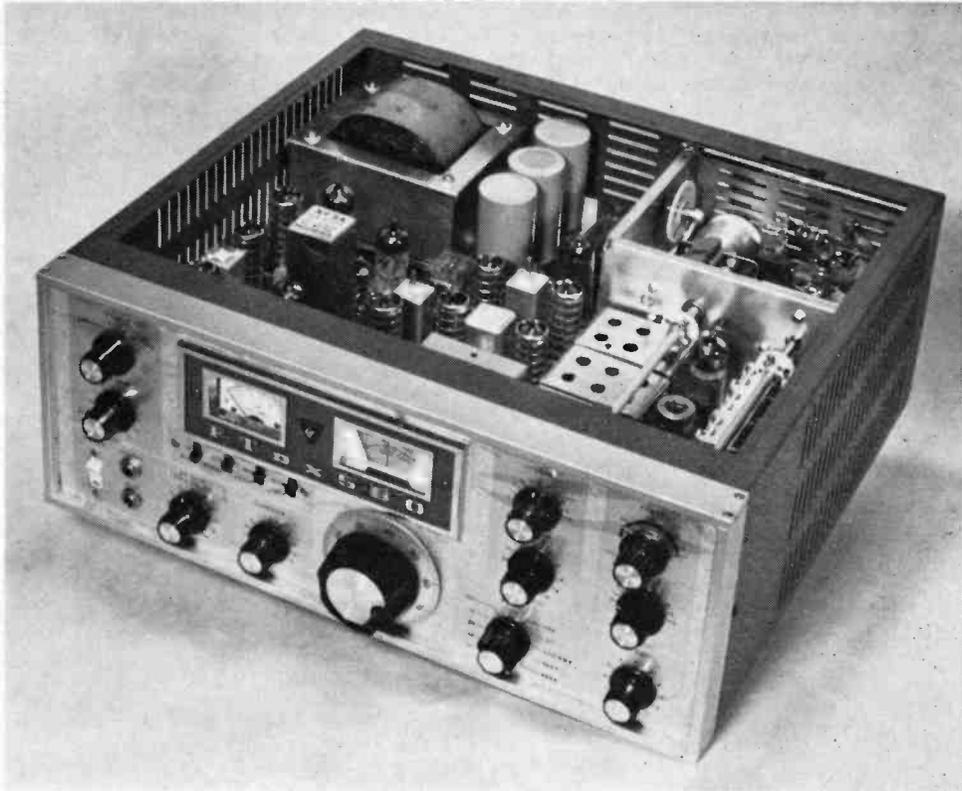
### Output Waveform

The next test was to look at the output waveforms under two-tone test conditions, as seen on a Telequipment oscilloscope, and also as seen by the latest 7000-series Tektronix spectrum analyser, when the transceiver was driven into a suitable non-reactive dummy load and a little RF taken off to the test-gear. This test was carried out on the FT-DX401, if only because the presence of the blower made it more likely we would be able to get some Polaroid pictures before the PA bottles blew up! In the event, it was found that more than about ten



BLOCK DIAGRAM - FT-DX560

Asterisked items fitted FT-DX401 only, which is otherwise identical.



*Yaesu Musen FT-DX560 — front view, cover removed.*

seconds of operation at sustained two-tone or sustained CW key-down conditions would blow the mains fuse, a fact which was surprising and yet confirmed by a few moments with the slide-rule; one must give top marks for such delicate selection of the fuse. Although no photographs were taken, it was confirmed that gross overdrive at the mike input (either by two-tone test signal or speech) would not result in excessive splatter outside the channel in use, or indeed in distortion of the audio to an unreasonable extent. What a pity that the equipment from Tektronix could not have been retained for long enough to enable us to get some more fuses, and to set up completely for the pictures—but after all, the Tektronix spectrum analyser plug-in alone, let alone the scope mainframe, would cost the price of a new Jaguar XJ6!

Temperature was the next question to be dealt with. Here, comparison is fair between the FT-DX560 running at 380 watts input and the FT-DX401 under otherwise identical conditions but running at 560 watts input with PA blown. The test condition was to read a specified passage for a period of ten seconds, the transmitter in each case being run into the dummy load and set for correct ALC operation. The '560 at 380 watts was hot throughout, and *very* hot over the PA compart-

ment, indicating that convection cooling was doing its best, but nevertheless the PA (envelope temperature of the valves) was so hot that one would have expected the life to be temperature-limited at 560 watts. On the '401, the PA is cooled by the "blower" sucking air out of the PA compartment through a TVI-protected hole, air being drawn in through vents at sides and underneath, the top cover of the PA compartment being changed from expanded metal, as on the '560, to a solid sheet.

The result is quite surprising. The air coming out at the rear resembles the output of a domestic fan heater, and the transmitter, with the exception of a small area almost diagonally opposite the blower, *goes cold to the touch!* Even if we assume the temperature gradient between valve envelope and air does not change, this is saying in effect that the envelope temperature of the PA valves is falling by 40°C.—in actual fact the fall is much more than this, if the temperature-sensitive paints used to give a guide are to be trusted; and a test-piece of aluminium suitably heated showed the paint to be at least generally in agreement with the thermometer.

The importance of this blowing cannot be over-rated. It is fair to say that valve life in a PA stage is almost directly related to the envelope temperature, provided there is no disastrous mis-operation. Thus,

the blower fitted on the '401 is possibly the best safeguard for a PA there can be if it is desired to run a brace of line-output TV colour valves at 200 watts or more apiece p.e.p. input—or even, dare it be said, for 807's!

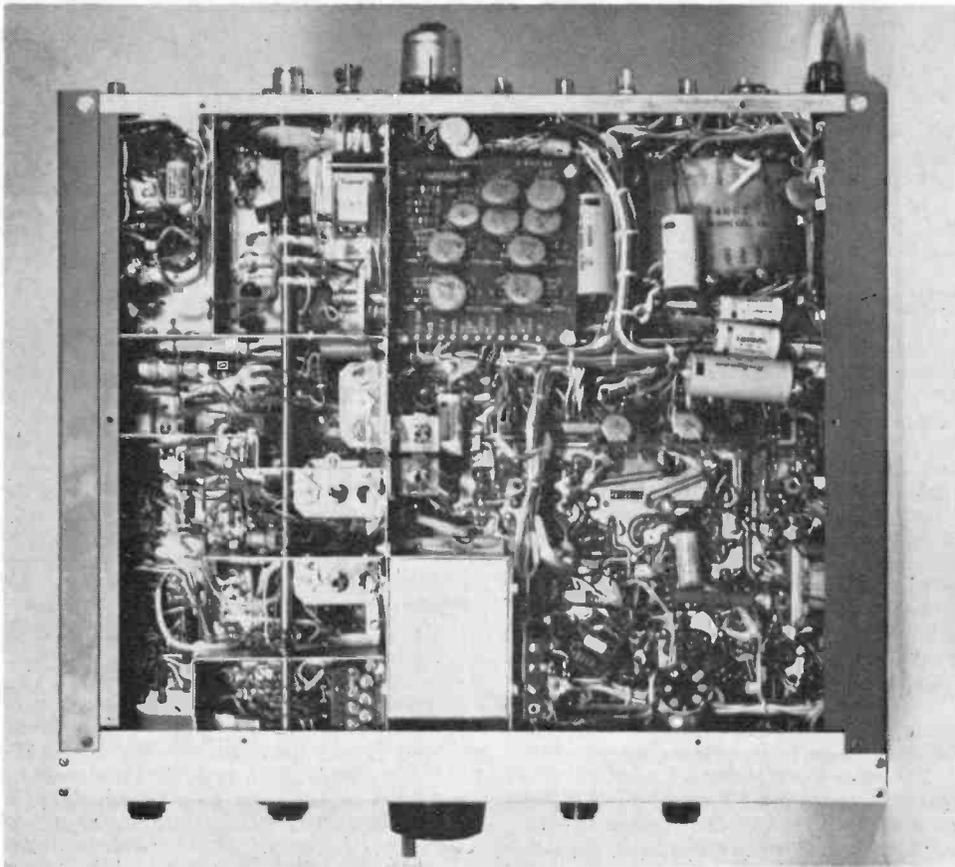
#### The CW Side

Now, CW operation. The big gripe among CW users of the modern SSB transceivers is either a “bloopy” T9 note or the lack of adequate selectivity for CW. The first failing stems from the use of IVS ratings for the PSU components and iron-core hardware, to give a great reduction in PSU weight while producing good SSB signals out at the specified peak powers. The second is simply a function of the “nose” bandwidth of the SSB filter. To take this first, the additional filter, which is switched in for CW, is 600 cycles wide at the nose and only 1.2 kHz wide at -60 dB. One could have thought 600 Hz rather too wide for a good CW filter, as compared with the 100 Hz or less of, say, an HRO filter at its sharpest. In practice, this does not seem to be so—the receiver, when properly tuned, can sort them out with the best on Forty when that band is doing its frightful worst. The reason for the wide-nose bandwidth is probably to

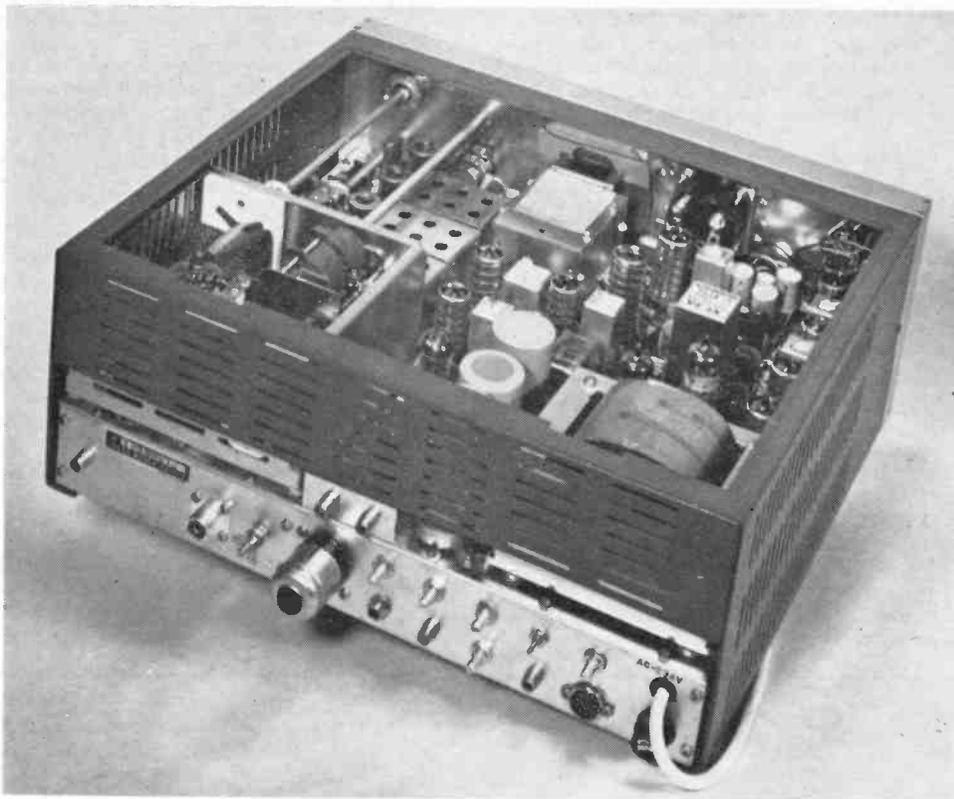
cope with the chirpy signals which become unreadable in narrow passbands such as that of the HRO, the while giving a very narrow skirt bandwidth to avoid adjacent-channel QRM—but whatever the reason may be, the result is very fine indeed for a practical CW operator not possessed of “crystal filter ears” and superb receiving technique. For this cloth-eared old reviewer the Yaesu FT-DX401 CW filter was one of the best aids to CW working he has yet experienced.

#### Signal Outgoing

Now to the consideration of the outgoing signal. It was monitored on an Eddystone 888 receiver, the Tx RF into the dummy load being watched on the oscilloscope, precautions being in each case taken to avoid any form of overload which could give “funny” results. The oscilloscope showed a certain amount of droop, as was to be expected, but the Eddystone receiver made T9 noises in the output, once the signal was taken down to a sufficiently low level—the keying was hard, but not unduly so. Summing up—no complaints from a CW user, especially a 150-watt one!



*Under-chassis view FT-DX560, showing general layout and wiring.*



*Half-rear view of the FT-DX560, showing rear chassis-drop connecting points.*

#### Printed Matter

The *handbook* next. The figures at the start of this piece are taken from the advertisements and the FT-DX560 manual. The FT-DX401 was a rather later specimen, and its handbook showed the CW input maximum had been dropped to 430 watts. There have been rumblings in the past that the JA manufacturers' products and handbooks are very rarely in step or even near it. Having had to do with changes to equipment and to handbooks, your reviewer's sympathies are with the manufacturers. Be that as it may, the FT-DX401 handbook contains a fat wodge of amendments, covering circuit, block diagram, noise blanker circuit, four paragraphs, and a deletion of several lines of material, which the user is asked to embody into his manual. If this is done, there is little to complain about, either factually or in the way of "Japanese English". This book is a model of its kind.

In addition to the book, the paperwork you receive with a transceiver includes a DXCC countries list, a check list for All-JA, All JA districts, WAS, and WAC awards, and the warranty card to be returned to the factory in Japan. They certainly intend their product to be used on the air!

To summarise; the writer, from a practical operating point of view, recommends either the FT-DX560 or FT-DX401 for use in the shack. However, the '401 is to be preferred, because of its blower cooling, and to a lesser degree for the CW filter, depending on the extent to which the owner is addicted to that mode, and the noise blanker.

#### Top Band Considerations

Now, to deal in more detail with the Top Band modification offered by Holdings, *to equipments bought from them only*. Used in accordance with the instruction sheet supplied by Holdings, the output is about twenty watts p.e.p., giving a reasonable margin of error before one goes out of limit. As to the performance, it seems to be able to hear anything audible on the station KW-2000B, and to raise anything workable on the K.W. rig, with somewhat similar reports. Stations worked invariably commented on the pleasant quality of the modulation—again, overdriving the audio did not result in noticeable splatter. Physically, the extra components are so embodied that they can be taken out completely, and the transceiver restored to "works" condition at will, should the owner so desire. This aim is met to some slight extent, at the expense of the PA loading panel markings,

*e.g.*, Twenty tunes somewhat differently from normal, although the method of tuning given in the handbook makes the PA scale markings all but redundant anyway; the reason for this is simply to enable the Top Band mod. to use the existing switch and components on the loading side.

The FT-DX560, or FT-DX401 supplied with the extra Top Band modification, is a very worthwhile addition to the range of SSB transceivers in this country. It enables one to run within limit on Top Band, and yet approach the legal maximum on the other bands, while giving full coverage of all the bands Top to Ten.

#### Ancillaries

The transceivers can be used with an outboard VFO if so desired, under the control of a slide switch on the the 401/560 front panel. The metering gives S-meter indications on "receive," reading backwards (meter sits on FSD at zero signal, current falling with increase of incoming signal strength). On "transmit," the meter can give either PA cathode current, ALC indications (meter to stay within the green area), or power output at the point of departure of RF from the Tx.

For those who may have ideas about a transverter for VHF, a spare socket on the back-drop of the chassis is taken straight off the PA grid, which enables one to pick up enough drive for a transverter.

A favourite gripe of new transceiver-owners is that no-one told them what sort and how many plugs and sockets they would need to get the rig on the air, Murphy's Law stating clearly you would *not* have the right ones. No snag here with the Yaesu equipments—a little box contains two resistors for hi-fi headphones, a trimming tool, a UHF connector, five phono plugs, two two-way tip plugs, and one three-way.

#### Wiring

Mostly on a printed board; and all the joints have been inspected and a dab of coloured paint put on as proof. A dab of paint also locks all pre-set potentiometers, save RV203, the "sigtone adjust" on the printed board which is distinctively marked from all the others. Everything was clean and tidy, with the exception of one of the electrolytics in the PSU, which deserved to be better clamped than by just hanging on its own wires.

A couple of points should be stressed. The modification for Top Band is not "works approved" by Yaesu, although the IF and xtal frequencies are the same as the FT-DX101 for which the modification *is* approved. However, Messrs. Holdings will give the full Yaesu warranty terms themselves; but they cannot undertake to service or modify equipments bought from other suppliers.

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### ON LEARNING MORSE

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**W**HETHER we like it or not, a pre-requisite for obtaining a full U.K. amateur transmitting licence is the ability to "send and receive plain-language text at a speed of not less than 12 words per minute." Thus, one of the first problems facing most beginners is "How can I learn Morse, quickly and easily?"

First of all, there are the excellent courses designed for learning at home and enabling a high standard of proficiency to be reached, *e.g.* The "G3HSC Rhythm Method" on LP records, which we have been advertising for years, and by which many 100's of amateur operators have qualified.

There is also the possibility of local tuition, either at a radio club or by some kind friend who is already a competent operator. If no club exists locally and no personal contact can be made with a qualified operator, a box number advertisement in the local paper will almost certainly bring a reply from somebody who knows the Code well enough to get a beginner started.

#### Self Tuition

But if our beginner is still without his helping hand, he can—strange as it may seem—learn Morse perfectly well all by himself! The first thing to do is to memorise the Code, in terms of dots and dashes buzzed vocally, simply remembering that the length of a dash, *dah*, is equal in time value to three dots, *dit-dit-dit*.

This should be practised until any letter of the

alphabet can be buzzed instantly, on sight, without having to sort it out in terms of *dits* and *dahs*. For example, the letter "Q" should sound like *dah-dah-dit-dah*, in the same way that it looks like "Q" as printed here, without having consciously to analyse its shape.

Having got thus far, and the alphabet memorised with confidence, tune round on the short wave bands—in the BC and amateur frequency areas—till you hear some powerful station sending repetition signals in Morse—there are many of them, fast and slow, and between the sending of actual traffic, they hold the channel open by idling on the callsigns. These are the repetition signals, and what is being sent may be something like "VVV de WSC," or "ABC de OHX." For some little time, you may not be able to make much of this, especially if the repetition suddenly breaks into high-speed sending; then, you leave him, and tune on to some other station transmitting repetition signals. At first, when listening to these signals, all you will grasp is that *is* repetition, because your ear will pick up the *rhythm*. After careful listening, you will start getting a letter here and there, till finally you have the whole sequence complete—VVV de WSC.

This will be your first big thrill—you have picked up something in Morse, entirely by your own efforts. It is an experience you will never forget.

Now the factor of *rhythm* will assume its true importance, for if you have been lucky enough to pick

out a steady, well-keyed repetition signal you will automatically begin to get your time values right. Your "VVV de WSC" begins to sort itself out neatly, because there is a definite timing between the letters of each group and between the groups themselves.

### Practice

Having learnt the Code by its sound values, and appreciated the importance of rhythm—which really means spacing, exactly as print is spaced in this sentence you are reading—the next thing is *practice*, and yet more practice.

Apart from the help your receiver will afford you in finding stations to which to listen, you can also practice continuously, almost anywhere and at any time, without even a receiver! How is this possible? It is by buzzing over to yourself in Morse such phrases as newspaper headings, advertisement posters, car numbers—in fact, any piece of print that happens to catch your eye. By this process you get the *sound* value of each letter and figure impressed on your brain.

Remember, it is by *sound* that you read Morse, not by analysing each group of dots and dashes into their letter-meanings. The importance of this cannot be overstressed, for if you can acquire it, you cut out the one mental process which is every beginner's difficulty in acquiring speed and accurate reading. "Q" must mean (buzz it) *dah-dah-dit-dah* to you, and nothing else. The aim must be to get the sound of each character impressed on your brain, so that you read by ear in the same way as your eye reads print, without having to analyse the shape of each letter, or even the letters of a word.

### General Guidance

There are no snags whatever in this process—except perhaps that your family and friends may begin to look at you a bit oddly when they hear the buzzing noises!

Do not be discouraged by what may seem slow progress—in the preliminary stage, some people can learn the Code, letter by letter, very quickly. Others take much longer, especially if, as they should, the Code is learnt not in alphabetical order (which involves another mental process) but by putting letters and numbers down at random. Avoid anything in the nature of the so-called "memory aids"—that "A" is opposite to "N," or that "U" is "D" the other way round, or that "6" has one more dot than "B." These are not aids at all; they slow you up by giving your brain something else to remember and work out!

The time factor in learning is only important insofar as you should not overdo it and tire your brain, particularly in the ordinary way of work or business you have an exacting job. One hour's practice a day is usually quite enough, unless you feel you really want to give more. A good check on your own progress by this standard is that you may find yourself able to read call signs and previously-unheard repetition signals in about three weeks. The rest comes with continued practice, and you will probably be reading pretty confidently on the amateur bands in about two months. If you can do better than this, you are doing well. Remember, you are learning for the fun of it, so don't wear yourself out, or allow yourself to be influenced or



discouraged by those who tell you either that it took *them* three weeks, or three years, or that they never could get on with Morse at all.

All sorts of nonsense is talked about learning Morse, and the fact is that each case is individual.

### No Key or Buzzer!

Having decided to learn on your own by the method described here—which is, of course, only recommended where there is no expert tuition available—the one thing to avoid is practice with a friend who is at the same stage as you are! The worst and most difficult way in which to learn Morse is to sit down, buzzer and key in hand, with somebody who also has no idea, and then proceed to make unintelligible noises at one another. Unless one partner is an operator with a good knowledge of how properly-sent Morse should sound, the whole business will take very much longer and will almost certainly mean that much will have to be *unlearnt*.

In the early stages, the CW station that you find on your receiver, sending repetition signals, is your partner, sending to you all the time perfect Morse over which you can spend as long as you like in the copying, and from which you will learn rhythm.

It is true to say that most of the Morse you can hear on the amateur bands is pretty poor and does not begin to approach the standard at which the perfectionists aim. The perfectionists stand out because their transmissions are the easiest to copy, irrespective almost of sending speed and receiving conditions.

### AMENDMENTS AND CORRECTIONS

On pp.414-415 of our September issue, there were references to a resistor R9, 47K,  $\frac{1}{4}$ -w. This should have been shown connected in parallel with C2 in the circuit on p.415.

In the article p.416 on the 70 Cm. RF amplifier, it is suggested that the screen resistor R7 in Fig. 1 be shorted out when the PA has been finally set up, to ensure full modulating capability.

The caption under the picture on p.337, August, is not correct. We were given totally misleading information by the Club concerned. The lady does not hold a call sign and it was Mike Yates, G3UIQ, beside the microphone.

# VXO FOR TWO METRES

## PRACTICAL AND EFFICIENT DESIGN

G. P. ADAMS (G8FVN)

THE purpose of the VXO described in this article is to suggest a practical and inexpensive means of varying one's frequency over a wide range of the two-metre band, so that only one crystal is needed. Such a circuit obviously needs to have good stability.

The oscillator itself was built in a small diecast aluminium box, with C1 and C2 bolted to the lid. It was constructed on a small printed circuit board bolted next to C1 and C2 and connected to them *via* two short lengths of 16g. tinned copper wire. This gives a very rigid construction, which is of course essential for good stability. Before mounting both capacitors were thoroughly cleaned with carbon tetrachloride. (Care must be exercised here as the vapour from carbon tetrachloride is poisonous). A screened lead carried the output to the buffer, built in an aluminium chassis with a screw-on base inside which the diecast box was securely fixed.

This arrangement provides excellent screening between VXO and buffer, preventing any interaction.

The capacitors connected to two slow-motion drives mounted on the front of the chassis by flexible couplings and two lengths of insulated rod. Power supplies to both oscillator and buffer were well decoupled and fed via screened leads.

### Circuit Description

The crystal used is an 8 MHz HC-6U type. Frequency variation is achieved by L1 and C1, C2. With C1 at minimum the crystal realises only the small series capacitance.

As C1 is increased towards maximum, the coil is effectively brought into series with the xtal while at the same time the crystal parallel capacitance (*via* C4) is increased, causing the crystal to be pulled on to a lower frequency. The degree of "pull" can be adjusted by adjusting the value of L1.

In the prototype, L1 was 40 turns of 32g. enamelled wire wound on a 3/8in. slug-tuned former securely mounted in the diecast box. A slug with a low coefficient of expansion should be used, for best temperature stability. To ensure a high impedance to the oscillator, and thus minimise loading, an FET is used in the buffer.

Output is fed *via* C10, C11 and S1 to the coax output socket. S1 enables the output of the VXO to be removed when netting or when on receive, as harmonic radiation could be too great if it were left connected to the rest of the transmitter. This enables the VXO to be left on continuously during operating sessions, eliminating problems due to switch-on drift.

The oscillator supply voltage is stabilised at 6.1 volts by a Zener diode. This low voltage was chosen to improve thermal stability. Similarly, the buffer HT is stabilised at 9 volts by series regulator Tr3 and D2.

### Table of Values

Fig. 1. Circuit of the VXO

C1 = 25 $\mu\text{F}$ , var.	R6 = 2,200 ohms
C2 = 365 $\mu\text{F}$ , var.	R7 = 4,700 ohms
C3, C4 = 200 $\mu\text{F}$ , s/m	RFC1 = 2.5 mH RF choke
C5, C6, C9, C13, C14, C15 = 0.1 $\mu\text{F}$	Xtal = 8 MHz, HC-6U
C7, C12 = 10 $\mu\text{F}$ , 12v. elect.	L1 = <i>see text</i>
C8 = 50 $\mu\text{F}$ , s/m	D1 = 6.1v. zener, OAZ203 or similar
C10, C11 = 100 $\mu\text{F}$ , s/m	D2 = 9.1v. zener, OAZ227 or similar
R1 = 1,000 ohms, 1w., w/wound	Tr1 = 2N706
R2, R4 = 100,000 ohms	Tr2 = 2N3819
R3 = 220 ohms	Tr3 = BC108
R5 = 680 ohms	

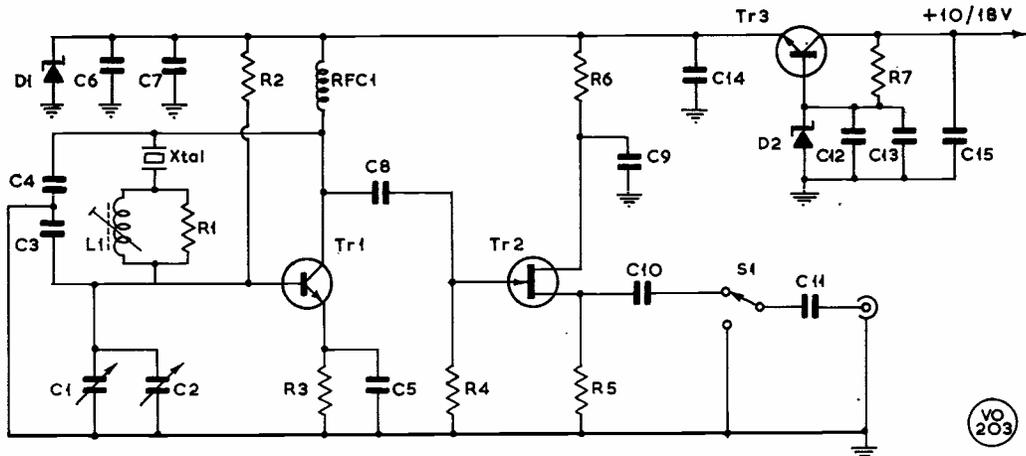


Fig. 1

Fig. 1. Circuit of the VXO by G8FVN — see text.

VO 203

Fig. 2. Class-A buffer amplifier suitable to follow the VXO circuit of Fig. 1, to drive a valve transmitter. Values can be: C1, 100 pF; C2, C3, C4, .01 mF; C6, 47 pF; R1, 100K; R2, 15K; R3, 220 ohms; R4, 1K, 1-watt; L and C chosen to resonate at 8 MHz. Valve may be EF91 or 6AM6.

The unit can be run from a supply between 10 and 18 volts.

**Results**

The results obtained from this circuit were very pleasing. A stable swing of 40 kHz to the LF side at the xtal fundamental frequency was obtained with values for C3 and C4 of 200 μμF each. Silver mica capacitors must be used for C3 and C4. Small adjustment of their value may prove necessary for optimum performance.

Taking a swing in excess of 44 kHz drift increases sharply, but a swing of 40 kHz represents 720 kHz after multiplication to two metres, and this should cover all the frequencies needed by most operators!

The prototype gave a swing from 144.6-145.32 MHz, which proved very satisfactory.

Initial drift after switching on with a 75% maximum pull was about 4.5 kHz in the first ten minutes, after which the VXO settled down and a further drift of only 2.5 kHz occurred during the next eight hours. (These

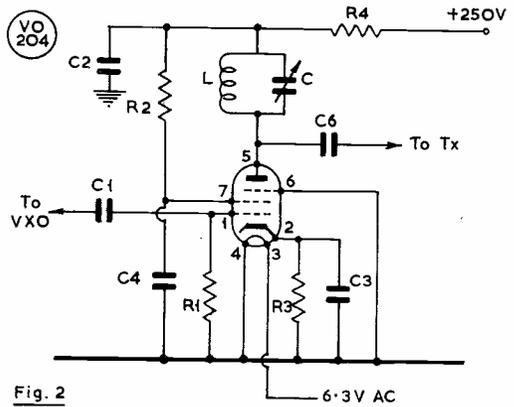


Fig. 2

drifts are at the final two-metre frequency).

Extra amplification will be needed to drive a valved transmitter and a suitable circuit for this is shown in Fig. 2.

**MAGAZINE CLUB CONTEST**

This well-known annual event, the 27th in the series, no less, takes place over the week-end November 4-5, early evenings, on Top Band. The rules and conditions appear in the "Clubs" space in this issue. It is a fast-moving CW-only contest, by which Clubs are competing with others in their own Zone. However, individually-operated stations, not connected with any Club but merely on the air for the fun of it, can give the Clubs they work a scoring point. If you are interested in hot CW operating, come on and see what you can do. We will be very glad to have logs (which will be used for check purposes only) from any Top Band operator who cares to take part. All such logs will be credited and taken into the MCC Report to appear in the January issue of SHORT WAVE MAGAZINE. This is *not* a pot-hunting contest—it is for those interested in slick and efficient CW operating on Top Band.

Pond Road, Islington, London, N.1. Apply to him there if you are interested in joining. This makes the tenth R.A.E. course available in the London area alone—see SHORT WAVE MAGAZINE p.364 August and p.407 September for previous listings.

**EDDYSTONE SERIES 1000 RECEIVERS**

This new range of quality receivers for specialised requirements—the 1000 for HF/MF, the 1001 for spot-frequency working, the 1002 with a wide frequency coverage, and the 1004 for marine reception—can be seen at the Eddystone Showroom, Imhofs Ltd., 112-116 New Oxford Street, London, W.C.1 (Tel. 01-636 7878), where all details can be obtained. Ask for Mr. Roche.

**COURSES IN ELECTRONICS**

Some very interesting Courses for those aspiring to further study and advancement in the field of micro-electronics are being offered by the Enfield College of Technology during the Autumn session now commencing. These will be of particular importance to those concerned with the design and production of new equipment for consumer, professional or military applications. For details, send to The Director, Micro-Electronics Centre, Enfield College of Technology, Queensway, Enfield, Middlesex. (The "Herr Direktor" himself used to be well known to us as G3LAS, very active on the VHF bands.)

We are also advised that, as in previous years, Fred Barnes, G3AGP, is running an R.A.E. course at the de Beauvoir Evening Institute, Tottenham Road, off Balls



"... always keep to the one tap here, OM ..."

## FREQUENCY MODULATION

### RECEIVING FM—BANDWIDTH CONSIDERATIONS— DISCRIMINATORS FOR FM RESOLUTION—THE ADVANTAGES OF FM ON VHF

#### Part III

#### A. J. HENK (G8DIK)

*This is the continuation of articles appearing in our July-August issues. On the question of a permissible, or desirable, deviation it should be noted that it has been internationally agreed that the standard in the amateur context be 3 kHz. Stations exceeding this are likely to be unpopular locally, because of sideband splash—besides which is the fact that the wider the deviation, the more difficult it is, within certain limits, to resolve a good signal on AM receivers having narrow-band IF filters. Because so many amateurs have Rx equipment without FM discrimination, the final result—in the communication sense—is likely to be better if the deviation is restricted.—*

Editor.

ON the particular subject of receiving FM transmissions, the problem of bandwidth again arises, in its practical aspects.

We have seen how an FM signal can occupy significantly less bandwidth than an AM xmission carrying the same modulation.

Whereas the calculation we did in this case was perfectly legitimate as far as the spectrum occupancy was concerned, *i.e.*, how much of the band is used up, it does not apply to the receiver bandwidth. Lest the author be accused of cheating, let us now make the important distinction between bandwidth occupied and bandwidth required.

We saw how an AM transmission of a 3 kHz tone can use 30 kHz of band space with even reasonable amounts of harmonic distortion present. However, this transmission can be received perfectly satisfactorily by a receiver with a bandwidth of only 6 kHz (and the distortion introduced by the transmitter would actually be removed—but don't press this point too far). So although the bandwidth occupied is 30 kHz, that actually required is only one fifth of this. Because of the low distortion performance possible with FM, even without the feedback of the frequency locked loop already described, the bandwidth occupied is very nearly the same as the bandwidth required.

Another point we must bear in mind when designing receivers is that too narrow a bandwidth affects FM quite differently from the way it affects the corresponding AM. In the latter case, a reduction of bandwidth results in the progressive loss of higher modulating frequencies, the reproduction becomes "woolly" and indistinct. If

FM is passed through a narrow-band receiver, the signal will swing completely out of the passband on modulation peaks as the frequency moves away from its steady value and is lost. This obviously gives rise to severe distortion and bursts of noise at—or rather instead of—modulation peaks. The audible effect of this is similar to that of an over-modulated AM signal when the bandwidth is only slightly restricted, and is completely garbled when very restricted. It is important, therefore, to ensure that the receiver passband is adequate to accept all significant sidebands (down to -30 dB is quite satisfactory).

The RF and mixer stages of an FM receiver (see Fig. 12) are similar to those found in AM practice. In Amateur Radio service, the IF bandwidth needs to be wider than is the case for AM, as we have just seen. The actual value of the permitted bandwidth varies with the band in use (details given later). As the bandwidth widens, a higher intermediate frequency can be used for a given amount of complexity in IF filtering, and this feature, if wisely applied, can lead to improved second channel rejection in a single superhet. Another difference between AM and FM IF amplifiers is that enough gain must be provided in the FM case to operate the limiter on noise in the absence of a signal. If this is not done, maximum signal-to-noise ratio and AM rejection will suffer on weak signals.

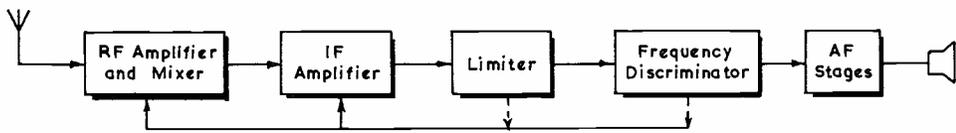
As we progress through the receiver the differences become greater. The next stage, the limiter, has no counterpart in an AM receiver, but its presence is *essential* for satisfactory FM performance. It is not always present as a discrete "block" as is shown in the diagram, sometimes being combined with the frequency discriminator (as in the ratio detector). A self-limiting discriminator does not give the same performance as a separate limiting stage and a high performance receiver, while it may use a ratio detector, will always have such a stage or stages. The principle of the limiter and its purpose were described earlier. Suffice it to add that it must have sufficient sensitivity to operate on the noise present at the output of the IF amplifier and deliver enough output to ensure satisfactory operation of the frequency discriminator.

One complication of the use of a limiter is that the AGC control voltage cannot be derived after it; the signal at this point is completely independent of the amplitude, *i.e.*, strength, of that at the aerial. The AGC must come from the input to the limiter, either *via* a diode detector as in AM or, in the case of some types of limiter, from a DC voltage which is generated by the limiter itself. In the case of a receiver in which the only limiting used is that due to a ratio detector, a voltage is generated within the discriminator which can be used for AGC.

We now come to what is probably the biggest difference between the two systems of communication, that circuit which actually recovers the modulation from the signal—the frequency discriminator. Several types are in common use, but only two will be discussed here, working in quite different ways.

#### Foster-Seeley Discriminator

This is the classical type of discriminator, very popular in high performance receivers and is sometimes



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Fig. 12 FM Receiver Block Diagram

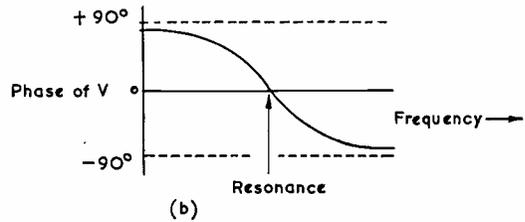
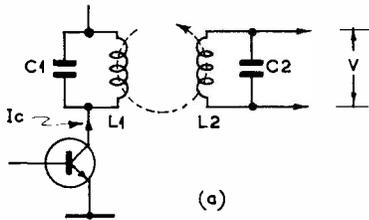
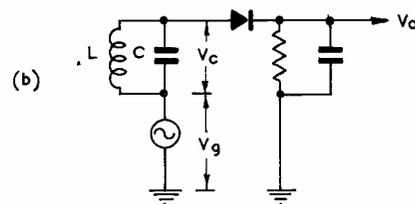
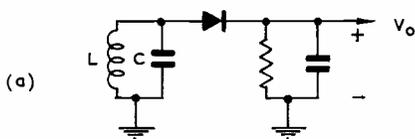
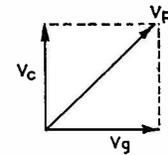


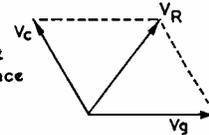
Fig. 13. Phase change across a Tuned Circuit with varying frequency



(b) i On Resonance



(b) ii Frequency input below Resonance VR reduces



(b) iii Frequency input above Resonance VR increases

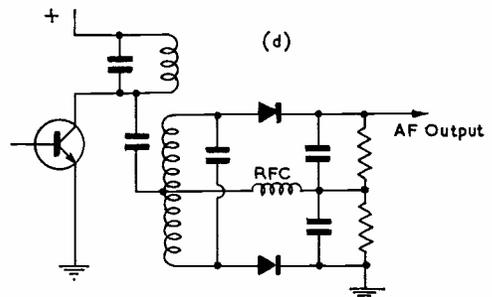
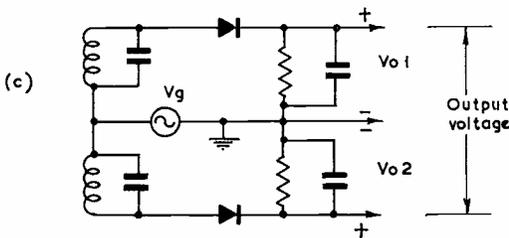
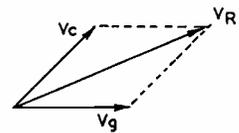


Fig. 14 Derivation of the Foster-Seeley Discriminator

called a phase-detector because of the way in which it works. It relies on the phase change which occurs across a tuned circuit as the input frequency changes, taking the circuit through resonance. Such a circuit is shown in Fig. 13, in which L2, C2 is the tuned circuit we are examining and therefore L1, C1 is assumed to be low-Q so that it does not affect the phase change associated with L2, C2—that is to say, L1, C1 is assumed to be resistive throughout. The coupling (magnetic) between the circuits is assumed to be loose.

As the frequency is swept from below resonance to above, the phase of V, the output of L2, C2 changes from nearly  $+90^\circ$  to nearly  $-90^\circ$  relative to some arbitrary phase; in this case the phase at resonance is chosen. For a single tuned circuit, the phase only actually reaches  $\pm 90^\circ$  at DC and infinite frequency. The phase is changing most rapidly and most linearly at resonance, and the higher the Q the more rapid this change at resonance becomes.

It is now necessary to introduce some vector diagrams, as it is extremely difficult to explain the phase detector without some assistance of this sort. At the same time, we shall start by examining a simple tuned AM type of detector circuit and, step by step, derive from this the full Foster-Seeley circuit. These steps are all illustrated in Fig. 14. The first step is Fig. 14a which shows a simple diode detector fed from a tuned circuit such as may be used for AM detection. The output voltage  $V_o$  is equal to the peak value (approximately) of the RF or IF voltage fed to the diode irrespective of phase. Suppose we now add a second source,  $V_g$ , in series with the tuned circuit, with the same frequency as the signal across LC. Let us further suppose that the phase of  $V_g$  is at  $90^\circ$  to the phase of the tuned circuit voltage  $V_c$ , and does *not* change with frequency. Now, in order to find  $V_o$  we must

add these two voltages—but because of the phase difference the addition needs to be vectorial. The vector diagram in Fig. 14b(i) shows this situation, the resultant  $V_r$  being the voltage which is rectified to produce  $V_o$ . This is now somewhat greater than in the first case. If the frequency now changes, the phase of  $V_c$  changes in accordance with Fig. 13b. This causes a change in  $V_r$  and hence  $V_o$ . The situation below resonance is shown in Fig. 14b(ii), and without the need to put in any numbers, it is clear that  $V_r$  has decreased. Conversely, Fig. 14b(iii) shows that  $V_r$  increases when the input signal is above the resonant frequency of LC as  $V_c$  swings its phase in the other direction.

So here we have the beginnings of our discriminator—a steady output voltage  $V_o$ , value of which changes with frequency. There is, however, a relatively large voltage present whatever the frequency, with the signal superimposed on it; furthermore, this standard voltage will change with incoming signal strength even when LC is at resonance. If, however, we connect two such circuits back to back as in Fig. 14c, we have a total output of zero when  $V_{o1} = V_{o2}$  (that is, at resonance) and we have cancelled the standing voltage. An AM signal on resonance will therefore produce no output even without a limiter. (This does *not* mean that this is a self-limiting detector, as the AM will be read when slightly off tune). Because the two diodes are fed with DC voltages in anti-phase, the vector diagram for the lower diode will have the opposite sense to that for the upper. As the frequency falls and  $V_{o1}$  decreases,  $V_{o2}$  increases and the output becomes positive at the lower terminal and negative on the upper. As the frequency rises through and above resonance, the total output falls to zero and then reverses.

(To be concluded)

## ITEMS OF INTEREST

**USSR:** It seems that the Soviet authorities do not much care to have their AT-stations pictured or described in Amateur Radio magazines outside the USSR. In a recent instance, a Russian amateur was closed down for six months "as a disciplinary measure" because a photograph of his station, with the usual details, appeared in one of our American contemporaries—of course, entirely in good faith on the part of all concerned. It explains why we are never offered pictures from Russia, though we have a large "bogus circulation" in that country generated by their pernicious library-photostat system, by which the *Magazine* (like many other such periodicals) is reproduced for sale, by the library, to local readers. This does not earn us a rouble!

\* \* \*

**Vale:** It was a great grief to hear of the death, down in Pembrokeshire, of George Courtenay-Price, GW2OP, at the age of 80, formerly of Cheltenham, where he was first licensed as 2OP in the early 20's. A keen radio amateur of the old school who always maintained a high level of activity, he was on the air within a few days of his death. He will be remembered as one of the contemporaries of the giants of Amateur Radio of the

era 1920-1930, when so much progress was made in the development of HF communication, mainly by amateurs.

\* \* \*

**RSGB:** In the September issue in this space, it was forecast (on the basis of their own previous statements, incidentally) that the RSGB was likely to show another loss on its operations for the current year. We now learn that, far from there being a loss, there should be a healthy surplus—good for them, and unhesitatingly we withdraw what might have been interpreted as a churlish comment.

\* \* \*

**Illegal:** On p.435 of our September issue, in the New QTH listing, appeared the call "GW5RMA". Though this was queried at the time with the individual concerned he assured us that it was not a mistake and that all was in order. Within a day or two of the appearance of the September issue, we heard from the Ministry that the call sign was illegal and that a prosecution was pending against Milroy, the case having been set down for hearing on September 4. In all our years of publishing

new licence issues and changes of callsign/address, this is the first time such a thing has happened.

\* \* \*

**RTTY:** According to the latest issue of the *BARTG Newsletter*, there were 87 entrants for the RTTY contest sponsored by the Italian journal *CQ Elettronica* in February last. Lead station was VK2FZ with 138,054 points; he had a multiplier of 42. British Isles stations listed are G3OZF, multiplier 24 for 15,600 pts., placed 36th and followed by G3RQY, G3LDI, G3IGG, EI5BH and G6JF. Coverage by the more successful stations was pretty well world-wide. This same issue of their *Newsletter* presents also the BARTG statement of accounts for the year, showing a balance to carry forward of £300.

\* \* \*

**Mullard:** In connection with the BBC-50 celebrations, there is to be a two-month exhibition at Mullard House, Torrington Place, London, running from November 3 till December 31. There will be 33 talks, on a wide variety of radio/TV/Hi-Fi subjects, technical and general, which will have 63 presentations, also a number of film shows with titles like Colour Television, Electrons in Harness, the Post Office Tower, and such, in collaboration with the BBC and the Post Office. A detailed programme covering it all will be available after October 23, from which tickets for particular days can be applied for—all such requests to Mrs. Doreen Smith, Mullard Ltd.,

Mullard House, Torrington Place, London, WC1E 7HD. We can say that Mullard's do this sort of thing very well, so those interested would be well advised to take advantage of the opportunity.

\* \* \*

**Jamboree:** Reminder that the 15th Jamboree-on-The-Air, the big international Scout QSO Party, takes place over the week-end Saturday 21st—Sunday 22nd October, midnight to midnight *local* time, to give 48-hour world-coverage, as last year. This is an all-band non-contest type of event, with Scout stations—or those put on in the Scout interest—on the air all over the world. The "CQ Jamboree" calling frequencies are, for **Phone:** 3740, 7090, 14290, 21360, 28990 kHz (U.S.A. only also 3940, 7290 kHz); and for **CW:** 3590, 7030, 14070, 21140, 28190 kHz. These are *calling* frequencies, when looking for QSO's—on contact being effected stations should move over to leave the channel(s) clear. As in previous years, it is hoped that there will be plenty of support from U.K. AT-station operators offering hospitality to local Scout groups unable to run a station of their own. If you would like to help, get in touch with your neighbourhood Scout Leader or District Commissioner. We shall be glad to have reports, with photographs where possible, by *November 3 latest*, for a write-up to appear in the December issue. To make a success of the event involves quite a lot of forward planning. The U.K. organiser (who also, in fact, gave birth to the whole idea) is Leslie Mitchell, G3BHK, 28 Darwall Drive, Ascot, Berks.

## SPECIALLY ON THE AIR

A few more yet to be activated—and refer to the note on p.408, September, on the always-urgent matter of QSL's.

**GB3SAF, October 7:** Put on as a demonstration station for the 62nd Leicester Scouts annual Autumn Fair. It is hoped that operation will be on 160-80-20-2m. simultaneously, with SSB. Special QSL cards are being produced.—D. Pick, G3YXM, 9A Long Lane, Billesdon, Leicester.

**GB3SF, till October 8:** Operated by the Saltash & District Radio Club for the local Saltash Festival, working all bands Top to two metres. Every contact will be confirmed by a special QSL card.—C. Squires, G3XCS, 5 Frith Road, Saltash (2082), Cornwall.

**GB3SA, October 21-22:** Operated for the Leyland Scout & Guide Group in support of the 15th J-O-T-A, at their Hq., running AM/CW/SSB on all bands as equipment and operators allow, with three bands going at any one time.—R. Banister, G4BEE, 215 Chorley Old Road, Whittle-le-Woods, Chorley, Lancs., PR6 7NP.

**GB3TEL, Nov. 3-4:** At the Sheffield Telecommunications Exhibition, Yewlands School, Creswick Lane, Grenoside, working all bands, with a special QSL card offered for contacts.—P. Avill, G3TPX, 7 Moorland Crescent, Mapplewell, Barnsley, S75 6NS, Yorkshire.

## INTERNATIONAL AERADIO AT FARNBOROUGH

International Aeradio Ltd.—the British firm which provides equipment for air traffic control services, aeronautical telecommunications and navigational aids on a world wide scale—were showing at the SBAC exhibition at Farnborough several new products, including two kinds of VHF receiver. The receivers, which are manufactured by IAL Group member Park Air Electronics Ltd., are the 16W/SS "Channel Scan" monitor and the 1000R ground station Rx.

"Channel Scan" continuously monitors up to eight VHF channel frequencies, scanning stopping automatically on the receipt of a traffic call and then resuming after the reply. The 1000R receiver is designed to handle the extremely crowded signal conditions encountered at large international airports, and for this reason has particularly good inter- and cross-modulation characteristics whilst retaining the sensitivity required for long range communication.

## MARCONI TV TRANSMITTERS IN ITALY

Radiotelevisione Italiana has ordered ten of the latest modular VHF/TV transmitters from Marconi Communications Systems, Ltd., to extend and improve its service. They will be installed at sites throughout Italy and will cover the power ranges from 1 kW to 10 kW in both Band I and Band III.

# MEASURING EARTH RESISTANCE

## PRACTICAL METHOD OF CALCULATION

IT is sometimes necessary, and is of some interest, to know the resistance of the station earthing system. If the resistance of the earth point rises, loss of radiated power can result. The earth is usually taken for granted, and until one measures its resistance it is often assumed to be a much lower value than it is in practice.

If a low-reading ohmmeter or a bridge megger is available a simple test can be made to find the resistance of an earthing system to a fair degree of accuracy. A bridge megger is to be preferred since it is possible to measure down to 0.01 ohm with it. Values of this order can be read off a meter arranged for shunt-type resistance measurements, provided that a sensitive instrument is used with a low-value shunt and a relatively high voltage. In such circumstances, however, some difficulty may be encountered in obtaining a steady reading. The same condition can arise with a bridge megger if the handle is turned quickly, so it is best to keep the generator turning slowly, that is, well below the clutch slip-speed.

Referring to Fig. 1,  $R_a$  is the resistance of the earthing system E it is desired to measure. Two other earth resistances  $R_b$  and  $R_c$  are necessary for the test, and are provided temporarily by suitable earth spikes driven in the ground. If three measurements are made between pairs of resistances, the three relationships below can be written down:—

$$R_1 = R_a + R_b \dots \dots \dots (1)$$

$$R_2 = R_a + R_c \dots \dots \dots (2)$$

$$R_3 = R_b + R_c \dots \dots \dots (3)$$

Adding (1) and (2),

$$R_1 + R_2 = 2R_a + R_b + R_c \dots \dots (4)$$

Subtracting (3) from (4),

$$R_1 + R_2 - R_3 = 2R_a$$

$$\text{therefore, } R_a = \frac{R_1 + R_2 - R_3}{2} \dots (5)$$

However, this formula does not take into account the resistance of the leads used to connect the measuring instrument to the earth points. An inaccurate result will be obtained if the resistance of the leads is not *very small* compared with the lowest earth resistance in the triangle. So, if the test leads have an appreciable value of resistance, which can be denoted by  $R_t$ , this value will be added to those measured for  $R_1$ ,  $R_2$  and  $R_3$ . To obtain a more accurate idea of the resistance of the earth system E, the resistance of the test leads  $R_t$  should be measured before taking any other measurements. The value for  $R_t$  can then be included in the relationships, as below:—

$$R_1 = R_a + R_b + R_t \dots \dots \dots (6)$$

$$R_2 = R_a + R_c + R_t \dots \dots \dots (7)$$

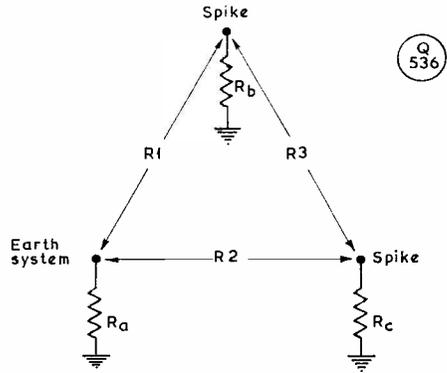
$$R_3 = R_b + R_c + R_t \dots \dots \dots (8)$$

Adding (6) and (7),

$$R_1 + R_2 = 2R_a + R_b + R_c + 2R_t \dots (9)$$

Subtracting (8) from (9),

$$R_1 + R_2 - R_3 = 2R_a + R_t$$



Method of measuring the resistance of an earth system E, using temporary earth spikes set out in a triangle. The resistances  $R_1$ ,  $R_2$  and  $R_3$  between pairs of points are measured; the resistance of E can then be calculated as described in the text. Other uses of the tests and the simple formulae derived are also explained.

$$\text{therefore, } R_a = \frac{R_1 + R_2 - R_3 - R_t}{2} \quad (10)$$

Some examples will show the effect of the lead resistance  $R_t$ .

**Example 1.** Resistances  $R_1$ ,  $R_2$  and  $R_3$  measure 8, 7 and 11 ohms respectively. The resistance of the test leads is very small, and is ignored. Formula (5) can be safely used, so,

$$R_a = \frac{R_1 + R_2 - R_3}{2} = \frac{8 + 7 - 11}{2} = 2 \text{ ohms}$$

**Example 2.** The same earth system is measured with test leads having a resistance of 2 ohms, thus giving readings for  $R_1$ ,  $R_2$  and  $R_3$  or 10, 9 and 13 ohms respectively. Formula (5) is applied, with the following result:—

$$R_a = \frac{10 + 9 - 13}{2} = 3 \text{ ohms, which is wrong.}$$

**Example 3.** The same readings are obtained as in Example 2, but this time the correct formula (10) is used:—

$$R_a = \frac{10 + 9 - 13 - 2}{2} = 2 \text{ ohms}$$

When it is required to make a measurement of earth resistance by the method described here, the temporary earth spikes should be so sited that a large triangle is formed, and if possible with sides of roughly equal length. The three earth points should be widely spaced out to reduce the effect of overlapping resistance areas

around them.

It is possible to find the resistance of the other earth points by re-arranging the formulae to solve for either Rb or Rc. Thus, re-arranging formula (10),

$$R_b = \frac{R_1 + R_3 - R_2 - R_t}{2} \text{ ohms}$$

$$\text{or } R_c = \frac{R_2 + R_3 - R_1 - R_t}{2} \text{ ohms}$$

If these formulae are now considered in conjunction with Fig. 1, a simple rule for solving any one of the three

earth resistances becomes apparent. It is, to find the resistance of one electrode, *add the resistances of the two sides enclosing the angle at that point, subtract the resistance of the side opposite the angle, and divide the result by 2.*

This also suggests a possible means of finding the point of lowest resistance in an area, thus locating the best place to sink a good earth system. Exploratory measurements with three spikes should result in an optimum point being found, and may well be worth the time spent in making them. And when a good low-resistance earth has been made, use a really heavy conductor to connect to it!

## ABOUT DIODE PRODUCT DETECTORS

### NOTES AND CIRCUITS

R. A. PENFOLD

WHILE a diode detector is often used for the demodulation of AM signals, diode *product* detectors are a comparative rarity. A product detector is a mixing device, rather similar in operation to the mixer in a superhet receiver. Fig. 1 shows a block diagram illustrating the method by which a product detector produces an audio output when used as a CW detector. The audio signal is produced by heterodyning the 455 kHz IF signal to an audio frequency, which in this case is one kHz. The other frequencies at the output of the product detector are at RF and are easily removed by a suitable filter.

For the reception of SSB the CIO is tuned to the frequency of the suppressed carrier wave, the sidebands then being heterodyned to produce the required audio signal.

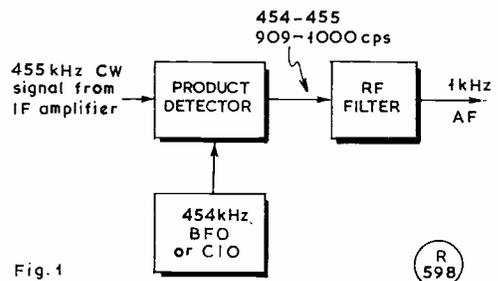


Fig. 1

R 598

Fig. 1. Block diagram to show how an audio signal is derived from a product detector.

### Typical P.D. Circuits

A good product detector will have a high AM signal rejection capability—that is to say, if the CIO is disconnected from the product detector, and an AM signal is fed to the IF input of the p.d., there should be no audio output, or it should be insignificantly low.

If a mixer of the sort normally found in the converter of a receiver were to be used, this would not be achieved. Instead circuits of the type shown in Fig. 2A (tran-

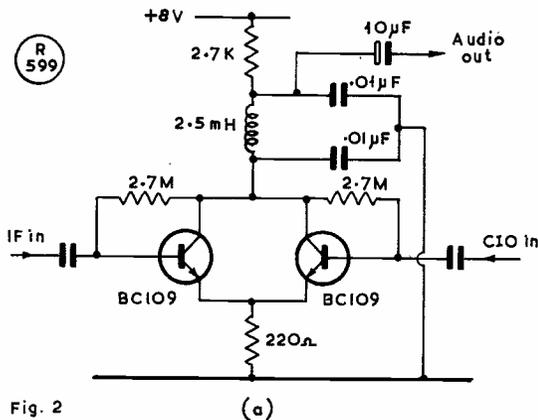
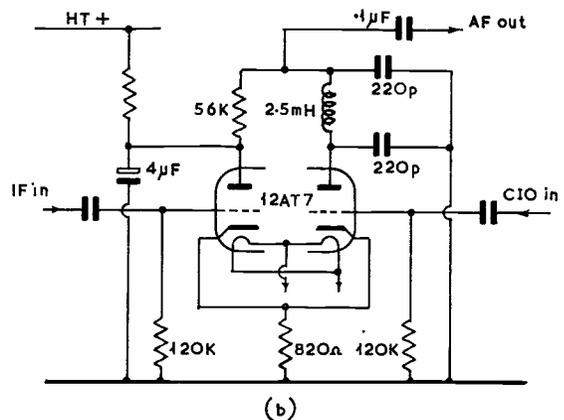


Fig. 2

(a)



(b)

Fig. 2. At (A) the circuit of a typical transistor product detector and (B) a similar valved detector.

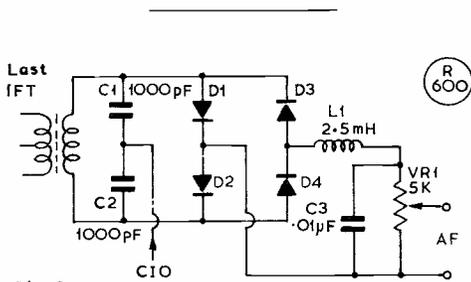


Fig. 3a

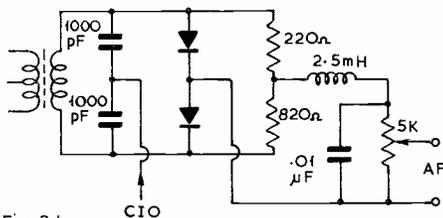


Fig. 3b

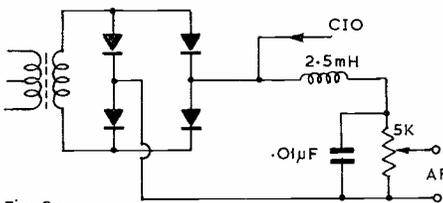


Fig. 3c

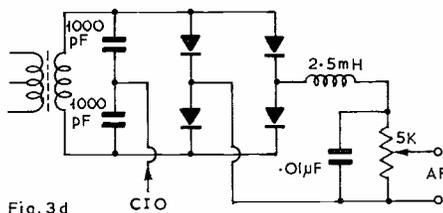


Fig. 3d

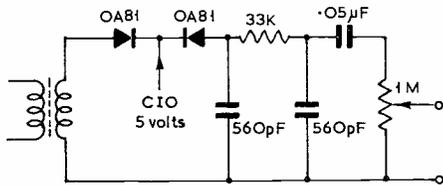


Fig. 3e

Fig. 3. At (A), (B), (C) and (D) are various simple product detectors using diodes, for operation in low-impedance transistor circuits. Fig. 3 (E) is of a product detector for use in a high-impedance valve circuit.

sistorised) and Fig. 2B (valved) are used. The way in which these circuits function is essentially the same.

Consider the operation of the transistorised version: The two transistors have common emitter and collector resistors, and they are biased by the two 2.7 megohm resistors. The RFC and the two .01 μF capacitors, form an RF filter, decoupling any RF signals. CIO injection is applied at one base, and the IF signal at the other base.

With an IF signal applied and no CIO injection, Tr1 will operate as a common-emitter amplifier and Tr2 as a common-base amplifier. Taking its input from the low-impedance signal developed across the emitter resistor. Tr1 will invert the input signal, but the signal will appear in phase at its emitter, and there will be no phase change through Tr2 either. Thus, as the impedance of Tr1 increases, the impedance of Tr2 will decrease, their combined impedance remaining virtually unaltered. There will therefore be virtually no output at the collectors, as the circuit is balanced.

If the CIO signal is now introduced, this will unbalance the circuit and input, sum, and difference frequencies will be produced, and all but the required difference signal will be filtered out.

Diode Detectors

Diodes can be used in simple but effective product detectors, which work equally well to the circuits of Fig. 2, although while these two circuits have a significant gain, a diode product detector will not have this. This is not really important, as it is not the purpose of the p.d. to add gain to the receiver.

Circuits of several diode product detectors are shown in Fig. 3. The first four are intended for use in low-impedance transistor circuits, while the fifth is really only suitable for the high impedances found in valved circuits. It requires a CIO injection of several volts. These circuits are in many ways similar to the balanced modulators found occasionally in SSB transmitters.

All the circuits work in basically the same way. We will take for example the circuit of Fig. 3A. The four diodes form a bridge circuit. Since D1 and D2 are connected with the same polarity, half the IF input voltage will appear at the junction of the two. The same follows for D3-D4. The bridge is therefore balanced, and there will be no output from it.

C1-C2 in effect form a centre tap on the IFT secondary, into which the CIO signal is injected. An

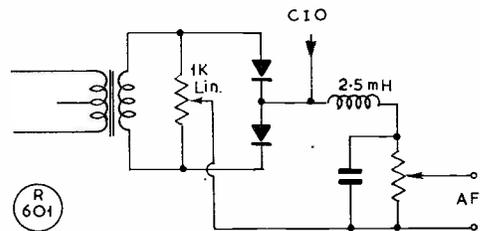


Fig. 4. Circuit diagram of a balanced product detector for optimum AM rejection—see text.

alternative to the two capacitors is to use a couple of low value resistors (about 560 ohms). Detailed operation of the circuit is very complex, but basically what will happen is that the CIO injection will bias the diodes, unbalancing the bridge in doing so. The extent to which the bridge is unbalanced will be proportional to the CIO voltage, and thus the output voltage will be proportional to both the CIO and IF voltages. A mixing action is therefore present, and the input, sum, and difference signals will appear at the junction of D3-D4. L1, C3 filter the unwanted frequencies, leaving the required audio output.

Any small G.P. silicon or germanium diodes will function correctly in these circuits.

#### Balanced Product Detector

To obtain optimum AM signal rejection from a product detector it is necessary to use a circuit with a manual balance control. A circuit diagram of such a detector is shown in Fig. 4. This is very similar to the previous five, and only differs from them in that one side of the bridge is adjustable, in order to attain exact balancing.

While the balance control is being adjusted, the CIO should be disconnected. A modulated RF signal may then be applied to the IF amplifier, and the balance control adjusted for minimum audio output. Alternatively an unmodulated signal can be fed to the IF amplifier, and a VVM with RF probe, or an oscilloscope, used to adjust the balance control for minimum output.

With this circuit a high degree of AM signal rejection should be achieved.

released as much energy in one hour as the whole of the United States would need to continue at its present rate for the next  $10^8$  years!

A second unusual event occurred over the weekend of September 2/3 (and this was not VHF/NFD!). A weak radio star in the constellation Cygnus, known to radio astronomers as *CYG X-3*, suddenly increased its radiation (on a wavelength of 2.8 cm) from 0.5 Flux Units to 22 Flux Units. (A Flux Unit gives a numerical indication of the radiation in the radio spectrum from such a star and is defined as equal to  $10^{-26}$  watts per square metre per Hertz.) This event is unprecedented in radio astronomy, and is giving rise to speculation whether the phenomenon is due to the source, which is possibly a binary system, going nova, or even supernova. *CYG X-3* has been known as a weak X-ray source for about a year, but some two months ago Brae and Miley in Holland and Hjelm and Wade in West Virginia, detected weak, variable, radio transmissions which measurements from the ground, supplemented by *UHURU* rocket observations, indicated could be linked with the X-ray star.

It must be confessed that it is extremely unlikely that this latter event will in any way affect Amateur Radio transmission, or that the transition of the source to the nova or super-nova state will be visible to the naked eye on Earth, although such phenomena have been observed previously, notably the super-novae of the early 13th and 15th centuries, recorded by the Chinese astronomers of those times.

A.H.D.

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#### HEAVENS ABOVE !

The huge solar storm, which occurred at the end of July and beginning of August last, has been described as the most intense for years. The cause was a 100,000 mile diameter group of spots on the surface of the Sun. The first hint of the impending storm, with the consequent disruption of the world's communication systems, came from *Orbiting Solar Observatory No. 7* on July 28, two days before it became visible from Earth, and no fewer than ten spacecraft, of one type or another, measured this unusual activity. Warnings of interference to radio circuits were issued through the established agencies, and broadcasting authorities throughout the world advised listeners to short-wave transmissions that such services were likely to be interrupted. The 28 MHz, 21 MHz and 14 MHz amateur bands were quickly affected and were subject to almost complete blackout, except for very short skip contacts, by August 3-4. An aurora, most unusually visible in the South of England, coincided with the appearance of a radio *Ar* effects in the late evening of August 4, with both the 4m. and 2m. bands exhibiting "Tone A" conditions until 0400 on the morning of the 5th, a second phase occurring during the early afternoon. ESRO scientists describe the event as having established a record for the highest energy solar radiation ever recorded, and research teams at the University of New Hampshire calculate that, on August 7, the storm

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#### "AMATEUR RADIO TECHNIQUES"

The new (fourth) edition of G3VA's *Amateur Radio Techniques* is an invaluable volume on the shack bookshelf; ever since the first edition came out, years ago, Pat Hawker has been doing a unique service to Amateur Radio with what is, in effect, an abstract of all the best of the bright ideas which have appeared in the radio amateur magazines—and some of the professional ones, where the matter of the piece is relevant to our theme. Thus, you can glean the basic idea from this book, and take off from there on your own voyage of research and development; or you can note the reference from which the abstract was gleaned, and go to a suitable library for a copy of the original.

This is a book of *ideas*; the book to turn to when the pet project of the moment is stuck for want of an idea—how to put an aerial into a given space, how to tame a transistor oscillator, how to make a more stable VFO, a simpler keyer, how to etch your own printed circuit, or whatever—here you will find the inspiration you have been seeking. A book for any amateur who has a soldering iron in the shack toolkit, or an enquiring mind. As for "value for money" it is, relative to its present coverage, cheaper than the original edition, being three times the size, and many times as useful.

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E.P.E.

# VHF BANDS

A. H. DORMER, G3DAH

THE general impression of VHF /NFD this year (Sept. 2-3) seems to be that conditions were not as good as last year and that activity on all bands was lower than usual, with 70 cm. particularly poor in most locations. There was DX about at 400/500 miles on two metres, but most signals were subject to very deep and rapid QSB. Four metres was showing fair results, but there seemed to be much less CW in the South than is customary, although rather more was reported from the Midlands. Wx was mainly dull and chilly, and the pressure 1030 mB and steady.

Operating was generally good with no really awful signals logged at G3DAH, but there was quite an amount of persistent out-of-Zone operation by portables at the low end of the phone band on two metres—an unnecessary transgression in these days when most NFD stations are equipped with more than one receiver and habitually tune both ends from the band in, or from the middle out. There was also the appearance of AM and, even worse, FM stations on the 2m. SSB calling channel. Two operators in particular were logged calling EU/DX which it was obvious they were not copying, since the Continentals were working other G stations at the time! If one can't work the DX with FM, the answer is to go SSB and not to chew up the band for those who are properly using the frequency. There is still a need to

define the limits of the SSB spread, and this is gone into in greater detail elsewhere in this piece.

A personal observation on propagation is that it was reasonable on all bands on the Saturday evening, was good on two metres and four metres early on Sunday morning, but a little below average on 70 cm., tailing off, on 4m. in particular, after lunch on Sunday, and then picked up again—with the Continentals coming through from F, ON, PA and DL—just before the end of the contest.

Thanks to all those readers who sent in reports of their activity. To give a general picture of events, extracts from some of them are given below.

G8FIH, operating with the G5BK/P team, noted that GDX were static at slightly above normal. They worked from Cheltenham GM8AGU/P (Ayr), GM8BCP/P (Wigtown), GM8DVD/P (Dumfries), GM3ZSX/P (Moffat), GD8DMA/P (Douglas), GI8AYZ/P (Co. Antrim, who was an excellent signal throughout the contest), EI9ONE/P (Dublin) and a handful of F and ON. G3ONP/P on 4m., G8BHH/P on 2m. and G3UBX/P on 70 cm. were working as a group from Herefordshire and found conditions average and activity none too high. Best DX on 70 cm. was G3XPT/P at 302 km., out of a total of 78 stations worked on that band. They noted that there was a considerable reduction in fixed-stations operating during the contest, and comment also on that G4---/P about 50 miles away who was radiating a very strong signal on 144 MHz when operating on 432 MHz, and that this seemed to confuse quite a few contest operators! The East Kent Radio Society, from near Folkestone on all four VHF bands, found conditions good on 2m. with best DX as GM8FX/P. Twenty-three centimetres produced a good contact with G2RD/P at 93 km. G3OHH (Mow Cop), who was having a go at the IARU contest on 2m. only, found conditions good and the log included GM8CMH/P, GM8AGU/P, GM8BCL/P and GW3BA/P.

## Casual Comment

G3MED was heard on SSB on 2m. after a long time away from the band. G3HBW, now living in South

Africa, was home for NFD and was operating G3EFX/P, his old club call. He says that 2m. activity is poor in South Africa but good in Rhodesia. When he and G2JF get together out there, we may see some improvement! Palm for the best operated CW station goes to G6UQ/P, who was heard consistently throughout the contest, and left nothing to be desired from the point of view of either style or procedure. Interesting to hear many OT calls on CW, not all of whom are regular users of the band. Among those logged were G2UJ, G5VU, G6XX, G5DS, G5SK, G5OB, G6PG and, last but by no means least, Dud Charman, G6CJ, operating from Dorset where he has now made his home, and where, doubtless, he continues to gild the lily by polishing up his antenna lecture and adding modern refinements to what must be one of the most popular presentations on the Club circuit. He must have made about 50 CW contacts on this occasion.

The Reading Club were using the call G3ULT/P on 2m. which gave them 202 contacts, G8DOR/P on 70 cm. with 50 contacts, and G3LFM/P on 4m. which yielded 100 contacts. They found two metres to be by far the best band, and worked all the British prefixes, including four GM, as well as EI and F. They remark on the lack of Continental activity, but this was by no means a general experience.

Although contact numbers without the ranges and multipliers may not mean much, a few noted were:—G6UQ/P with 235 at 1525z; G3UES/P on 173 at 1210z; G3UHF/P with 153 at 1655z; G4ARN/P giving 161 at 1656z; G3SHK/P with 118 at 1755z; G3OHH, 142 at 1650z and, near the end of the contest, G3TNO/P with 163, G3PMH/P with 200 and GW3BA/P with over 250. The Continentals seem to have had better luck, since DC6XL/P, for example, passed 364 at 1740z and PAØJOU/P had 296 a few minutes later.

Another enjoyable Field Day.

## Contest Reports

Conditions during the four-metre affair on August 13 were reported as variable from many areas, with best DX coming on the Sunday morning. Both GM3WOJ/P and GI3TLT/P

were worked/logged in the South before midday. Activity tailed off considerably in the afternoon not, it is suggested, entirely due to the deterioration in propagation—the TVI menace must have played some part. Notable scores were:—G3OHH -055, G3RLE -053, G3JYP/P -075, G3TDH/P -070 and G3XUS/P -066. As should be expected on this band, operating standards were high and there was some notably good CW activity. No really poor signal was heard by, or reported to, your scribe.

The 2m. SSB event on August 20 was not just good fun as a contest, but also indicated the rise in the number of stations using this mode compared with similar occasions last year. There must be over 400 operators on SSB now—regrettably not all of it very good! The early morning start was characterised, as the pundits will have anticipated, by good propagation conditions. The GW portables, notably GW3BA in Welshpool and GW3FEC on Snowdon, were particularly strong in the South East. The two I.O.M. stations, GD2HDZ, a regular, and GD8FFX/P (from GM) were also good signals for most of the day. To the East, DL, PA and ON were all workable without much difficulty. The timing of this event seems to have been popular and, apart from the nonsense of having to pass QTH and QTH Locator, was generally a success. One qualification must be made, however, and this concerns the use of the calling channel of 145-41 MHz. In the early days, when activity was low, there was some advantage in being able to go to a fixed frequency and put out a call with a fair chance of getting a reply. Now, with some 20-30 stations active around that channel every night, and many more during a contest, it is obvious that there must be some frequency spread. The question is—how much? With 1-8 MHz of the two metres available, it might be thought that  $\pm 50$  kHz was not too much—or is it too little? Whatever the answer to that question, it is certain that something more than a single frequency is required, and equally certain that the limits of the band sub-section should be defined, if only to ease the bloodpressure of those unfortunate whose QSO's are ruined nightly by

the intrusion of AM, and particularly FM (not always NBFM), within a few kHz of the International calling channel.

**Results**

Congratulations go to G3OHH who won the fixed station section of the June 70 MHz contest with a score of 401 points, and to GW4ABR/P winner, with 495 points, of the portable section. The microwave contest of June 24/25 brought success to the mid-Essex Group, operating under callsign G3LTF/A, who led by a comfortable margin over G3RPE/P.

The results of the Ainsdale Radio Club contest in June last are now to hand, and the winner, for the third time running, is GD2HDZ, who was also top scorer in the 2m. section. Reporting the results, G2CUZ notes a gratifying increase in 70 cm. operation, but deplures the low entry on 4m. which he suggests may be due to TVI problems.

**Coming Shortly**

The Dunstable Downs Radio Club are running a 2m. contest on the lines of the Cumulatives, involving operation for one hour on each of seven days during October and November. This is open to non-members, and details may be obtained from the Hon. Sec., G8BPK, QTHR.

Other events in prospect are the IARU/RSGB UHF/SHF contest (432 MHz and above) running from 1800z on October 7 to 1800z on October 8; The Colchester A.R.C. VHF/UHF contest over October 14/15 (see p.428 last month for details) and the 144/432 MHz CW event between 2000z November 4, and 0800z November 5. The 70 MHz Cumulatives run from 1000 to 1200 clock on October 15 and 29th, November 12 and 26th, December 10 and January (1973) 14 to 28th.

**The Scottish Scene**

Two newcomers to the Edinburgh 2m. air are GM3DIE, who lays down a hefty signal using similar gear to that of GM3BQA, and GM8FM, who has returned to the band after a long interval; with a callsign like that, need one say that he is *not* using AM! GM4BHA, erstwhile GM8CGS, is waiting eagerly for his first aurora, but meanwhile is

THREE BAND ANNUAL VHF TABLE  
January to December 1972

TWO METRES			
Station	Counties	Countries	Total
G3BW	75	11	86
GD2HDZ	70	13	83
G3NHE	65	14	79
G8CIW	66	12	78
GW8FKB	59	13	72
G8CUT	60	10	70
G8FUI	60	8	68
G5DF	58	9	67
G3DAH	54	13	67
G3YRH	41	22	63
G3OHH	54	6	60
G8BXX	52	7	59
G8ERM	53	5	58
G4AVX	48	8	56
G8DWT	48	5	53
G3RAF	46	6	52
G8BKR	45	6	51
G3POF	42	9	51
G3DAO	39	12	51
G2AXI	42	8	50
G8FIH	43	7	50
G4AJE	39	11	50
G8FKL	46	4	50
G8EMS	42	4	46
G8AGL	40	5	45
G8FAG	41	4	45
G3FIJ	38	6	44
G8CBU	35	6	41
G4ALN	35	5	40
GM8BDX	34	6	40
G8DYK	30	7	37
G8COG	32	4	36
GM3ZVL	23	6	29
G8GJV	25	3	28
GW3CBY	22	5	27
G8BMD	23	4	27
GM3ZVB	23	4	27
F6BQH	20	6	26
G8FNH	20	2	22
G3EKP	16	5	21
G8GBH	19	2	21
GM3IBU	19	2	21
G3MEW	14	4	18
GW3FTQ	13	2	15
G4AZK	12	2	14
G8FVI	11	1	12
G8FSO	6	3	9
G8DBX	6	2	8
GW8CGH	5	2	7

**FOUR METRES**

Station	Counties	Countries	Total
G3OHH	50	6	56
G5DF	50	5	55
G3DAH	33	2	35
GD2HDZ	27	4	31
G2AXI	28	2	30
G3EKP	23	6	29
G3FIJ	10	2	12
G3POF	5	1	6
GW3CBY	3	1	4
G3YRH	2	1	3

**SEVENTY CENTIMETRES**

Station	Counties	Countries	Total
G8CUT	33	3	36
G5DF	31	2	33
G3DAH	28	4	32
G8BXX	28	2	30
G3NHE	25	2	27
GD2HDZ	20	5	25
G3YRH	19	6	25
G4ALN	18	3	21
G8BKR	18	2	20
G3OHH	15	2	17
G8FUI	15	2	17
G2AXI	12	1	13
G3FIJ	9	3	12
G8CIW	10	2	12
GM8BDX	4	4	8
GW3CBY	6	1	7
G8DWT	4	1	5
G3EKP	2	2	4
G8EMS	2	1	3

getting out well to the South and West from up on Corstorphine Hill. Contacts between stations in GM and the North of England were made fairly easily during the recent spell of above-average conditions, with G2AOB, G3ZXX, G3ZTZ, G3UPB, G3XRK and, inevitably, G3BW, he being among the strongest signals heard regularly. GM3VKL/P on the summit of Ben Nevis was peeling off the G stations at the rate of knots during VHF/NFD. There cannot have been many, if any, operators with an antenna as high as his! GM3OXX has been missing from the bands recently due to an injury to his hand received while indulging in that brutal game of cricket, but hopes to be back in circulation again soon.

Tuesday night remain 70 cm. activity nights in the Edinburgh area, with the example of GM3FYB (Dunfermline) to act as a spur. GM8BJF and GM3BCD are to be heard regularly and have established skeeds with GM8BKE in Bearsden (Glasgow). They hope to have SSB on the band shortly. GM8BJF was operating from Lowther Hill during VHF/NFD and made some pretty nice contacts with GW. He reports that he was hearing the Sutton Coldfield beacon at good strength throughout the period. GM6XI, now equipped for SSB with a G3BA-type transverter and a Microwave Modules converter on 2m., expects to be up on 70 cm. shortly. A suitable location for the 46-ele. beam is the immediate problem.

Students at the Kirkaldy Technical College are fortunate in having GM8FVT, GM8FXZ and GM3NMN on the staff and, with the excellent test gear at their disposal, have been completing modifications to Pye Rangers and base stations. They are now engaged in a study of aerial radiation patterns and some interesting experiments are afoot.

Finally, there seems to have been no 27-day repeat of the August 5 aurora in Scotland, much to the disappointment of many, both in the South and North of the U.K.

### DX-Peditions

First, some notes about those expeditions already reported earlier as about to take place. GD8FFX and GD3ZBE (both GM's) had a

successful visit to the Isle of Man, thanks in great measure to the excellent site found for them by GD3MBC. They had over 400 contacts on 2m. with the best DX as HB9XMP/P, who must have been as happy as they were, and on 70 cm. they made it with F9FT. This looks like a couple of "Firsts". They were able to contact GM3EOJ in their home town of Aberdeen every night they were on the Island. During the trip, they also operated from Stirlingshire and Kincardineshire, and some 30 SSB operators on two metres made it with them at all three locations.

GM3ZVB had an entertaining time in the Shetlands recently. He took his 1-watt NBFM Tx with him and, borrowing a beam from a local, he was able to work into Yorkshire at 5 & 9. GB3DM was at about the same signal strength at the time. Not bad at a range of 500 miles or so! From the Lerwick Radio Club premises he had further contacts with the South and, in co-operation with GM4BBL (*ex-G8CUW*) was working northern stations at better strength than they were frequently in '4BBL's home town of Bradford. A noticeable feature of this particular opening, which only lasted for one evening, was the inordinately heavy dew, which confirms the hypothesis that the dew point is an important factor in the conditions necessary for extended propagation on the VHF bands.

For those still looking for Austria on 2m., there is a chance to work that country during October 1-21, when OE3WBA/3 will be operating at 1770 metres a.s.l. in QTH Locator HH25a with 300 watts output from a 4X150A and a ten-element Yagi. He has SSB, CW and AM available, VFO controlled. OEHWJ/3 has the same power with a two by 10-element Yagi and will operate from a mountain at Locator HH11f. He has no AM but is also VFO controlled. They will both tune 145.35-145.45 MHz for SSB contacts and the CW segment for telegraphy.

Did anyone work the Mont Blanc expedition on 2m. during VHF/NFD? No reports have come in as yet.

G3FDW seems to have had a fairly successful 4m. jaunt in northern G and GM at the beginning of August. His best DX was from

Roxburgh whence he contacted G3OUF (Bucks.) and G5DF (Berks.) for a couple of good, long-haul ones. He was operating portable with G3JYP from Co. Durham for the 4m. contest and then moved on to Kirkcudbright, a site which yielded, *inter alia*, G5DF again and G3TLL.

### VHFCC Awards

First Award this month goes to G8EQQ, Steve Emlyn-Jones, Tunbridge Wells, who becomes the 160th member of the VHF Century Club. He first ventured on 2m. in March, 1971, with quite modest equipment, but has now upped the power to 90 watts input to a QV06-40A with plate and screen modulation by a pair of KT88's. The microphone pre-amplifier includes a speech clipper. A dual-gate Mosfet converter feeds an HRO tuning 28-30 MHz, and the beam at the 375ft. a.s.l. site is a 10-ele. long Yagi at 45ft. QSL return rate is the usual 30% or so. Steve hopes to take the Morse test shortly but will not be deserting the VHF bands.

Certificate No. 161 goes to David Smith, G8ERM, Nuneaton, again for two metres. He uses a QV03-10 in the final with 10 watts output to an 8-ele. Yagi at 30ft. on the 276ft. a.s.l. QTH. He would be interested to discuss Quad antennae for VHF with other amateurs who may have tried them. A Mosfet converter feeds an AR88 at 28-30 MHz for reception. QSL return rate is about 55%, a bit up on the norm! A VFO-controlled rig is in course of construction.

Steve Ireland, G3ZZD of Southborough, Kent, gains Award No. 162, again for 2m. operation. He opened up in July, 1971, with a Tx borrowed from G3ZYP. This ran 18 watts input to a halo which also fed the valve converter. Eventually, he had to return the borrowed gear but was able to acquire a second Tx., this time from G8BYC—he says that he doesn't have much luck with those he builds himself—and with this set-up he got in enough cards for VHFCC membership. An interesting point about the claim is that nearly all the QSO's were made using the halo antenna and comparatively low power. At no time did the input to the PA exceed 35 watts, and most of the contacts were made using only half that power.

Shades of G3QG, who does so well from Luton Hoo with a turnstile!

Finally, Richard Russell, G4BAU (ex-G8ELI), of Gravesend, Kent, qualifies for Award No. 163. His 2m. station consists of a Pye Cambridge strip with a Sinclair Z30 amplifier as the modulator. The drive comes from a phase-locked-loop VFO operating at 24 MHz. The dual-gate Mosfet converter feeds a 4-valve, general coverage receiver and the antenna is a 10-ele. Skybeam.

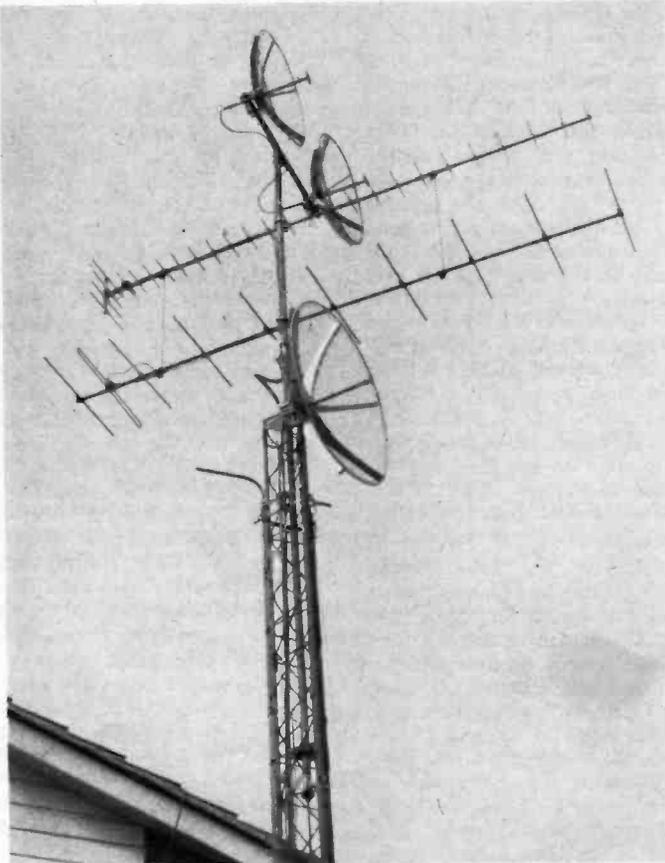
A point which would-be members may wish to note is that there is no objection to a claim which involves two callsigns (as above), but *all* contacts must have been made from the *one* QTH.

### Three-Band Annual Tables

With the end of the year a little over three months away and the competition getting fierce, we show again this month the breakdown of the results by bands. Both G5DF and G3OHH have got their half-centuries on 4m. with significant increases in the number of stations worked this month—obviously the 4m. contest helped here. Mediocre conditions have not helped the 70 cm. scores along very much, but the SSB contest on 2m. has had a significant effect—G3BW in particular having hoisted his score from 68 to 86—although one notices a large jump in the G3OHH total also (no SSB) from 29 to 60. Good to see that GM3ZVL of Edinburgh has joined his colleague, GM3ZVB, in the Tables. He runs a 2-watt solid state AM Tx or a 40-watt job with AM and CW and a QQV03-20A in the final. The G3HBW converter feeds 6-8 MHz into a CR-100. The beam is a slot-fed 8/8 at 40ft. He is well placed for contacts to the South, and would welcome CW skeds with operators in Lincs., Lancs., the Midlands and Wales at around 2000 BST most evenings. *QTHR*. These two were both members of the recent George Watson's College expedition. G8GJV has wasted no time in getting his claim in. His total of 28 points came from his first *week* of operation.

### Beacons and Repeaters

GB3CTC is off the air for an indefinite period but GB3GW, which shut down on August 19 after a catastrophic PSU failure which cost them a couple of IC's and several



This impressive UHF/VHF beam-aerial system is that of G. Coleman, G3ZEZ, 16 Kestrel Way, Clacton-on-Sea, Essex. It covers all bands two metres, 70 centimetres, 23 centimetres and includes a 4ft. dish for 13 cms. A four-metre beam (not shown here) fits on the arm protruding from the side of the tower. The point of particular interest about this array is that it is entirely home-constructed, including the tower, which puts the top dishes up to a maximum height of 52ft. with an electric winch, rotation of the main mast being by a cowl-gill motor. This is one of the finest amateur UHF/VHF aerial installations yet published in these pages—and remember, it is an entirely home-built job.

transistors, is once more serviceable. GB3DM is keying normally again, and GB3ANG is in full operation although the keying is very slow. GB3GEC, which appears to be low in frequency, has a slight ripple and keying abnormality on the figure "3", while GB3SC continues to radiate perfectly. GB3SU has seemed a bit down in signal strength recently, and GB3SX has been difficult copy for some time. HB9HB on 2m. has been off the air due a lightning strike but is back on again though here, also, the keying is difficult copy. The 70 cm. Dutch beacon, PA0VD, is reported up again on 431.025 MHz, but this has not been verified from personal

observation. Should it be 432.025 MHz?

G3VCV, recently returned from holiday in Switzerland, reports that HB9AGG now has a repeater operating up at 5,000ft. in the hills above Geneva. This is a wide-band job accepting all modes on 144.1 MHz  $\pm$  25 kHz and re-radiating on 145.975 MHz  $\pm$  25 kHz. This should be on for those who can copy the HB9 beacon. Incidentally, this beacon has been coming through at 5 & 9 with G8BCL (Halifax) and to prove it, he has a very convincing recording.

### News Items

*Overseas:* There has been some very

nice 2m. DX about for our Continental friends. ON5FF has worked OH0AA in the Aaland Islands (JU70d); F9FT raised HB0XMO, Liechtenstein, and PA0JMV worked GD2HDZ and UR2BU in Tartu, Estonia via the August aurora. There have been several good openings for the DL boys, the night of September 4 being particularly good for contacts into Wales. GW3ZTH worked 30 DL and 28 PA0 over September 4/5, and GW3MFY, GW3TMM and GW3FSP were also enjoying the EU/DX. HB9MCN/P in DG56j worked GD8FFX/P on August 25 on 2m. but a try on 70 cm. didn't come off. HB9XLY/P, HB9XOY/P and HB9XMG/P were also received in the U.K. on the morning of August 26. LA was heard in the Midlands, and G3BA was copying an HB9 on August 27.

**Four Metres:** On four metres, G3EKP (Blackburn, Lancs.) reports reception of the ZB3VHF beacon at 1130 BST on August 26. In their acknowledgement of the reception report, the lads out there say that they are running 5 watts at the present time, but hope to increase this to 50 watts by the end of August. They are still having keying trouble with the Tx on 70-26 MHz. G3PQF (Farnborough, Hants.) is now QRV on 4m. having been spurred on by the advent of VHF/NFD. G5DF has been knocking off some nice DX on the band with GI3HCG worked during the August 4 aurora and GM3FDW/P obliging with contacts from Berwick, Dumfries, Roxburgh, Kirkcudbright and Northumberland. G3OHH (Mow Cop), now heading the 4m. section of the Annual VHF Tables, also made it by aurora with the GI. To G5DF's achievement add a string of GW/P worked during NFD and you can see why John heads the VHF Tables. He also raised GW3LTF/P in Brecon on 70 cm., which is more than G3BYV did since, although he could hear Peter on 23 cm., he couldn't raise him on 70 cm. to set up the contact.

**Two Metres:** G3NHE, Sheffield, found the 2m. band in good shape on September 4 when he was in SSB contact with DM2BZD near Berlin. He noted the slow progression of the opening from due East to E.N.E. After working a French station in QTH Locator BK, he had successive contacts in squares BL, DL, CM,

EM, FM, GM, EN, FN and EO.

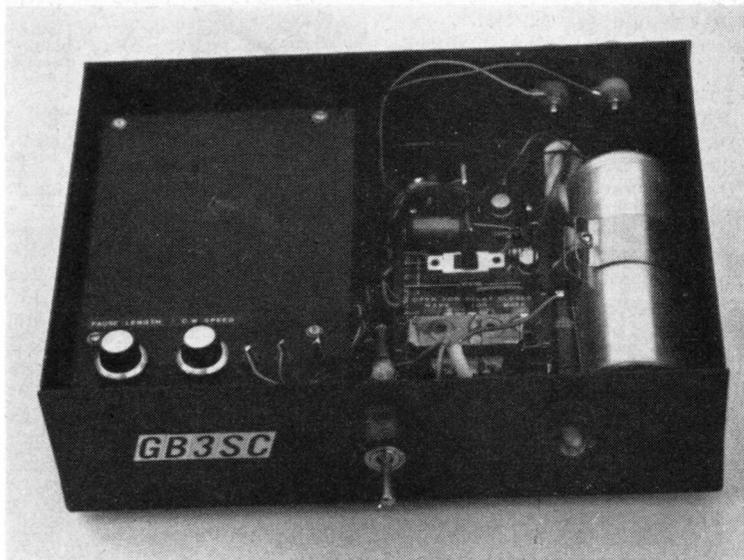
G8BKR in Bristol had a good DX QSO with GM8DMZ/P on Lowther Hill on August 26, and another with GM3ZSX/P on NFD. He was copying GWACG/P, GW8AHI/P and GW8EQH/P on 70 cm. at the time, but could only raise 'ACG. He is looking for 2m. skeds with Northumberland, Durham, Hunts. and Rutland. QTHR. G3DAO laments the dearth of CW on 2m. (See Editorial in the August issue). Although a dedicated CW man, he has worked no GI, no GD and only one GM using this mode, and wonders where they all get to. He has had some FB contacts recently (on the key, of course), with GC, GM, EI, HB9/LX, HB9 and EA, so the gear and the QTH, and the operator must be OK. There is surely a lesson to be learned here. G8CLC in Norfolk has a 5 & 6 contact with LA6OI/Z during the July lift, and this with 40 watts of AM to a halo!

GW8FKB (Anglesey) got in on the August aurora on 2m., having contacts with G8DJM (Staffs.), G8CXI (Kent), G8BNR (St. Albans), GW3XYW (Glam.) and G3ZYC (Derbyshire). He also got busy during the lift on August 25/26 with six PA0, one F, one ON5 and

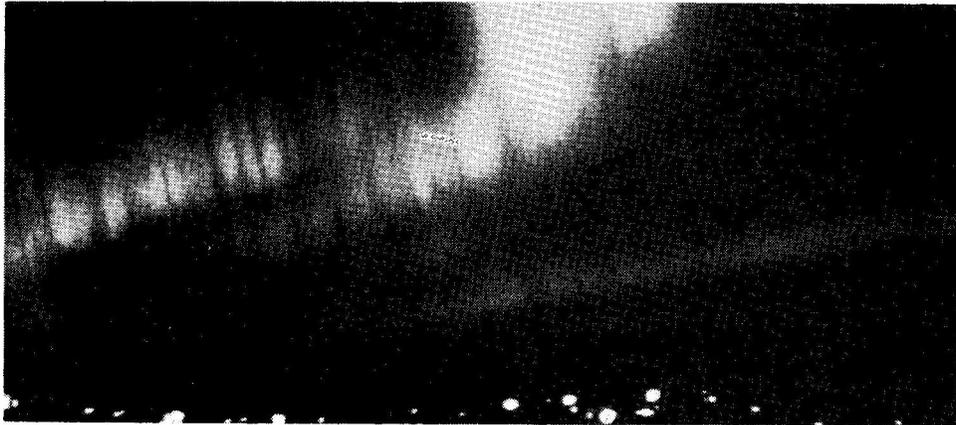
HB9AOF/P to give him four new countries in two days. He followed this by working 12 German and three Dutch stations over September 4/5, best DX being with DM2BZD near Berlin. Although he has worked 204 stations for his VHFCC Award, he has only 30 cards in reply to the 150 or so he has sent out *direct*!

G3BW had the satisfaction of working DL and DK during the evening of September 4, which means that he can now claim to have worked all his Continental DX on tropo. without assistance from an aurora, and can also claim to have a lead in the 2m. Tables over his friendly rival GD2HDZ. G2AXI (Basingstoke, Hants) used *Ar* propagation to work GW3NNF in Anglesey on 2m., and although he was copying GW2HIY at the time, he couldn't raise him. He confirms that the aurora petered out at about 0345z on August 5.

**70 Centimetres:** G4BBB in Malvern has taken over the 70 cm. sked with G8CKX in Ambergate, Derby from G3NEO, Sheffield, and they have now had more than 70 consecutive QSO's without a miss. G3NHE hopes to be back on 70 cm. soon—as soon, that is, as he solves the mystery of why the front end AF239 in the trough-line pre-amp blows



The new GB3SC keyer unit for the Sutton Coldfield 70-centimetre beacon. It was designed and constructed by Brian Coleman, G8AZU, as a free donation. Intended for continuous operation, it is all-solid-state using IC's and the quality of the keying has been commented upon most favourably.



What the Auroral Curtain can look like when viewed in northern parts. This picture, sent in by GM3ZVB, was taken off Scalloway, not far from Lerwick, Shetland Is. (the white blobs in the foreground are the town lights). The phenomenon of the Aurora Borealis, one of the most remarkable of natural manifestations, can have a profound effect on VHF propagation while the display, sometimes known as the Northern Lights, lasts.

up every time he switches the Tx on, even though the antenna is disconnected from it and the supply volts are off! G8EMS is now QRV from Leeds on this band with 12 watts to a QQV03-20A PA, Microwave Modules converter and a 46-ele. beam at 45ft. He is on most weekends. G3SMU (Manchester) is also on 70 cm. running 30 watts to a Multibeam. He copies GB3GEC at any time in spite of the intervening terrain, and the fact that he is less than 100ft. a.s.l.

\* \* \*

G2DQ is having a bit of trouble with breakthrough on the electronic organ in the local Chapel. CQ and Hymns A. & M. don't mix too well! G3WMR had to leave his car behind in the Channel Islands, after his DX-pedition there, as it could not be transported during the recent dock strike. Understand he has it back now. G4ABR apologises to all

those who called him in vain on August 13. His Rx was on the blink!

G8AGL would like to hear from any amateur holding a current pilot's licence who would be interested in attending an aeronautical rally. Write to him at The Hull Aero Club, Paull, East Yorkshire.

GW3ZTH draws attention to the fact that we should pass through the tail of the *Giacobinids* meteor shower during October 8/9. This shower has a 13-year period, but was deflected and missed the earth in 1959. The 1946 pass gave superlative DX conditions with a count rate of 400/Min., which is really stupendous, and the forecast for this one is that it might be just as good. If you do miss it, then the *Leonids* between November 14-18 and the *Geminids* over December 10-14 are likely to yield good results.

### Deadline

Deadline for the next issue is **October 6**. The address for news, views, claims and comments remains "VHF Bands", SHORT WAVE MAGAZINE, BUCKINGHAM. Cheers for now and 73 de G3DAH.

**Stop Press:** Balloon *Sonde N5* went up from Nancy at 1437z on Sunday, Sept. 17. The translator failed at 1514z, at a height of 5000 metres. The only known contacts were by F9FT (Reims) with some DL's; the operating procedure was "in-signal" on 70 cm., "out" on two metres, as explained in this space p.360, August and p.427, Sept.. No U.K. contacts have been reported and, so far as is known, none were made. Geography and wind direction suggest that QSO's from the U.K. would not have been very likely, anyway, unless the balloon had got much higher.

A.H.D.

### COMPLETION OF GOONHILLY III

Marconi Communication Systems, Ltd. have just handed over to the GPO the third earth station at the massive satellite communication complex at Goonhilly Downs, Cornwall.

Working with an *Intelstat IV* satellite, the station has a total capacity of 1800 telephone channels and a colour TV channel. Features of the design of Goonhilly III include the use of microstrip receivers, four

wideband transmitters each with a peak output power of 10 kW in the 6000 MHz frequency band, and a 97ft. dia. aerial. Automatic tracking of the satellite is attained by an auxiliary mode feed system; this provides error signals at the satellite beacon frequency enabling a servo control system to drive the aerial in both elevation and azimuth until the error signals are reduced to zero, when the aerial is aligned with the satellite.

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Concourse in part of the car park for the Derby Mobile Rally on August 13—it was one of the hottest days of the year so far and more than 1,000 cars were in the park.

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\* \* \* **THE MOBILE SCENE** \* \* \*

**MORE RALLY REPORTS AND PICTURES**  
—LAST OF THE SEASON

The Rally Season is just about winding up, with only two more events to go—at Peterborough on October 1 and Sheffield on November 4. The latter, only just notified, is to be a two-day affair (Fri.-Sat.) and will combine with a Telecommunications Exhibition. As well as the usual Rally attractions there will be displays and demonstrations by the Royal Navy, the Army and the Royal Air Force—with their equipment—the West Yorkshire Police, the A.A. and "Radio Sheffield" (BBC). The University is also involved on the electronics side. This is an unusually enterprising, not to say ambitious, effort and though so late in the season and not on a Sunday, should be well supported.

\* \* \*

Once again, the annual Derby Mobile Rally on August 13 was a great success, the total attendance being estimated at 5,000, with about twelve hundred cars in the parks. The 20 or so trade stands were accommodated in nine separate rooms, good support being given by a number of our regular advertisers, including Strumech of Walsall, necessarily outside with one of their towers. As always, a good programme had been arranged, the draw for the raffle probably being the main attraction. Two effective talk-in stations—G3ERD/A on 160m. and G2DJ/A on two metres—were kept busy with such a large /M attendance. Once again, the organising committee under the chairmanship of Tom Darn, G3FGY, put on a very good show for their 15th occasion. And, into the bargain, it was a beautiful day!

\* \* \*

Also on August 13, the Torbay Amateur Radio

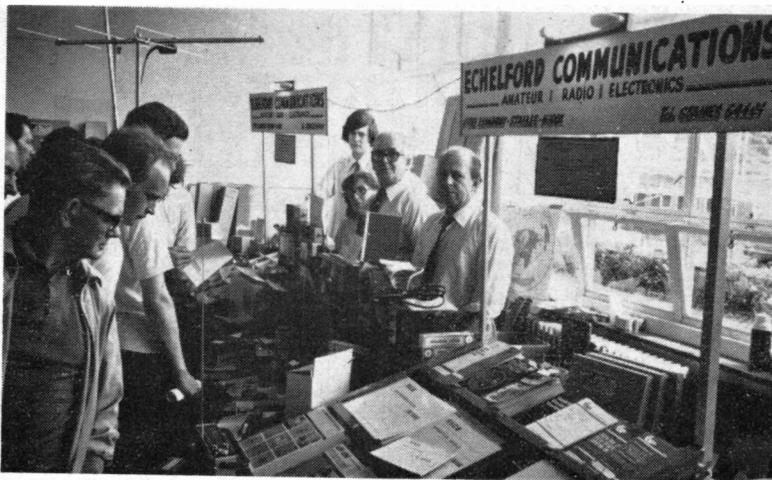



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Always one of the big attractions at the annual Derby Mobile Rally is the grand draw. Here is the crowd poised in expectancy for the good things to be pulled out of the hat.

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For the Derby occasion in August, one of the 20 or so trade stands was that of Echelford Communications, of 11 The Broadway, Kingston Road, Staines, Middlesex.



Society held their Rally, again at the Newton Abbot Rugby Football Club ground. They had an attendance of about 400 in 125 cars, some 25 of which were fitted mobile; at least 100 holders of callsigns were present. One of their attractions was the successful (because of the Wx) demonstration of radio-controlled model aircraft flying by the Plymouth club. Talk-in was given on Top Band and two metres. The organisers feel that they scored a modest success, in that their visitors

appeared to enjoy it all.

\* \* \*

The East Kent Radio Society held their first-ever Rally in Canterbury on Sunday, August 20. Although only a small Club, the organisation indicated that a lot of work had been put into the venture, which included a limited number of trade stands and a raffle. Talk-in stations operated on 160m. and 2m., the latter having been particularly well thought out, with a general-coverage vertical antenna and a 45° Yagi beamed up the M2 Motorway to cope with either halo's or whips on the mobiles; both AM and NBFM facilities were available on the mobile calling channel. The attendance, while not numerically great, was enthusiastic.

\* \* \*

The Thanet Radio Society Rally at King George Park, Ramsgate, on Sunday, September 10 was not as well attended as in previous years, probably due to the poor weather the day before which did not augur well for the morrow. As usual, talk-in was given on Top Band and two metres and it is estimated that some 25 or so mobiles turned up, together with a sprinkling of local visitors.

#### FINAL RALLY CALENDAR

**October 1:** Peterborough Radio and Electronic Society Rally, to be held at Walton School, Mountsteven Avenue, Peterborough, 11.0 a.m. till 5.0 p.m., with talk-in by G3QS on 1980 kHz and G8FFC on 145-00 MHz. Entrance fee of 10p will also cover price of raffle ticket.—A. H. Jackson, 57 Peterborough Road, Castor (353), Peterborough.

**November 3-4:** Friday-Saturday Rally at Yewlands School, Creswick Lane, Grenoside, Sheffield, S30 3NN, in connection with the local Telecommunications Exhibition, open daily 9.0 a.m. to 9.0 p.m., with talk-in on 160 metres and two metres, signing GB3TEL and G3YLS. All the usual attractions, plus many others. Details and further information from P. Avill, G3TPX, 7 Moorland Crescent, Mapplewell, Barnsley, S75 6NS, Yorkshire.



“ . . . anyhow, whose idea was it to go mobile in a hot-air balloon . . . ”

# THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for November issue: October 6)

(Please address all reports for this feature to "Club Secretary", SHORT WAVE MAGAZINE, Buckingham.)

ONCE again we come round to the writing up of "Clubs"—this time, our preamble concerns the question of a name for the club. While most clubs do adopt a name which gives a clear indication of their "service area" there are some which do not give any clear indication of their whereabouts. One wonders whether such names are a good thing in the publicity context, if they result in a potential member not realising that X-club is near enough for him to attend. After all, every month there are several groups which for one reason or another do not give a venue, and in many cases the secretary lives miles from the club Hq.

\* \* \*

Now to the matter of MCC. On pp. 503, 507 appear the rules in full for MCC, taking place over the weekend November 4-5, also the Club Identification List. Please check them carefully—particularly as to the preparation of log sheets and the rule about possible disqualification—and note also that your identification code may *not* be the same as it was last year.

Clubs wishing for additional ident. codes, for "B" and/or "C" stations, should write in straight away (with an s.a.e.) so that codes issued can be included in the Supplementary List to appear in the November issue, due out on October 27. This also applies, of course, to Clubs which may not be included in the present List.

## South-East England

Our first port of call is at Maidstone YMCA, who must be one of the best-equipped, in terms of premises, Clubs in the country. October 13 sees a Junk Sale, and on October 20 it is a Beginners' Theory and Morse Night. October 27 is set aside for Bob Marshall, who has titled his talk "Meet the Transistor." The meetings are every Friday, 2000 for 2030 so as to give time for a natter, at the Y Sportcentre, Maidstone.

Chiltern are lucky enough to have Hq. at the Ernest Turner works canteen, Totteridge Road, High Wycombe, where they get together twice monthly. On October 10, at the informal, G3CAR will be on the air, and on the 29th someone will be giving a talk on Television.

Weekly meetings of the Shefford crowd take place at the Church Hall in Ampthill Road. On October 5, the subject is Astronomy, and on the 12th G2DGF talks about the Technology of Valves. October 19 is set aside for last-minute details for the annual dinner on the 21st to be cleared up, and on October 26 they have

Dr. D. Tyte to discuss Lasers.

How nice to hear from a Club devoted to radio where the interest is really high—Bicester are very pleased with themselves because four of their members, including the hon. secretary, all went up to London to take and pass the Morse Test. What's more, they say, one of the four was "a G8 who persevered!" You can find them any Friday evening—details from the Secretary at the address in the Panel, p.504.

At Edgware the gang seem quite happy in their new place, at Watling Community Centre, 145 Orange Hill Road, where they will go on October 12 for the lecture meeting and on the 26th for an Informal.

G8ENX for Burnham Beeches sent her letter in early this time, as she doubted whether it would be possible to get a letter off in the aftermath of VHF/NFD—one hopes it was not a catastrophe! Seriously, they meet at Hedgerley Scout Hut on October 5 for the Construction Contest, and October 19 for a Film Show.

## Fiftieth Year

Not only is the Medway Club fifty years old, it is happy to be able to have one of the founder members, G6NU. Bill Nutton, as their president in this fiftieth year. It is interesting to notice that a formal meeting as early as 1925 could attract as many as *sixty* people! To celebrate, there is a dinner and dance to look forward to, some time in November. Meanwhile, the group foregathers every Friday evening at the Aurora Club in Gillingham, 7.30 p.m. onwards.

Not so far away, in Tunbridge Wells, is the Arts Centre, in Monson Road; this is the Hq. of the West Kent group, where they meet on alternate Fridays. October 6 is down for consideration of Audio, by G3TXZ and G3ZYP. As for October 20, they are having an Open Evening, to which the public are invited, at which they will have some short talks and demonstrations of what it is all about. A Good Idea, this one.

Over to Dunstable Downs, who have a place at Chews House, 77 High Street South, Dunstable every Friday evening. October 6 is called an "Idiot's Construction Contest" and on the 20th they have a visit from G3GGK. The 13th and 27th are known as "between weeks," when, presumably, the natter reigns supreme and the Tx is on the air.

Verulam have a change of venue to announce for the October date on Wednesday 18th. They will be entertaining Heathkit staff who are to talk and demonstrate

some of the kits, at the Civil Defence Hall, in the Chequer Street car-park, at 7.30 for 8.0 p.m.

"IARU and Region I" is the matter about which G2BVN is booked to speak to Cray Valley on October 5—IARU of course being the international organisation of Amateur Radio. This one is at the Congregational Church Hall, Court Road, Eltham, as is also the Natter on October 19.

On th Echelford where the lads get together on the second Monday and last Thursday of each month, at St. Martins Court, Kingston Crescent, Ashford, Middlesex. However, as we seem to be a bit out of phase with their publicity material we cannot tell you for certain what will happen in October, even though from past experience of writing this piece we can say *something* will be fixed up.

Acton, Brentford and Chiswick next, where the form is a once-monthly session at Chiswick Trades and Social Club, 88 High Road, Chiswick, the October one being on the 17th, when there will be a film show—a mixed selection to which all are invited.

Now that the autumn session has started the Brighton Technical College group will also be in full swing—all the details were to be settled between the writing of their letter and the appearance of the piece complete, so interested people should write to G2CMH at the address



The Silverthorn Radio Club held its own annual field weekend over August 27, at Lambourne End, Essex, where they had a very nice tented set-up, working all bands. It happened that G3DAH/M was in the neighbourhood so he was talked-in for a visit. In this picture G3DAH (foreground, light jacket), talking to G2HR, who for many years has been working in the interests of this Club.

## MCC—TWENTY-SEVENTH ANNUAL TOP BAND CLUB TRANSMITTING CONTEST RULES

- Duration:** Saturday, November 4, and Sunday, November 5; on both days between the hours of 1700 and 2100 GMT (eight operating hours in all).
- Frequency and Power:** All contacts to be made in the 1800-2000 kHz band, using CW, with a power input not exceeding ten watts to the final stage.
- Call-Signs:** Where a Club has its own call-sign, that is to be used; if no club call-sign is held, the call of a nominated member may be used.
- Scoring:** Other Club stations may be worked once in each session, the contacts counting three points each time. Non-club stations may be worked once in each session, to count for one point each time.
- Contest Exchanges:** Inter-Club contacts will take the form of an exchange of RST *plus* the allocated Club Ident. Code. (See p.506.) Non-club contacts to be an exchange of RST and QTH.
- Logs:** The contest logs are to be legibly set out as follows: One side only of quarto or foolscap sheets should be ruled into nine columns, with the Club name and call-sign on *every sheet*. Col. 1, Date and Time; Col. 2, Call of station worked; Col. 3, Outgoing exchange; Col. 4, Incoming exchange; Col. 5, Outgoing RST (non-club); Col. 6, Incoming RST (non-club). Col. 7, QTH of non-club station. Col. 8, QSO Points. Col. 9, points claimed after multiplier applied.
- Final Tabulation:** To each Club contact, apply the correct Zone multiplier. To each non-club contact, regardless of distance, apply a multiplier of ten. Total the points claimed after multiplying to obtain final score. This, together with a declaration that the station was operated within the rules and spirit of the Contest, and comments on the Rules, equipment used, experiences, and so on, should be on the front sheet of the entry (Multiplier table on p.507).
- Disqualification:** This is at the discretion of the invigilators, and reasons will be given. Typically, disqualification could result from a consistently rough signal, deliberate interference with other stations, over-driving of a transceiver producing strong key-clicks or a spread of spuri, unnecessarily long CQ calls or abbreviated call signs.
- Contest Call:** Call "CQ MCC" only. Shortened c/s must not be used.
- Entries:** Logs, addressed to "Club Secretary", SHORT WAVE MAGAZINE, BUCKINGHAM, must be posted to arrive not later than **Friday, November 17**. Results will appear in the January 1973 issue of SHORT WAVE MAGAZINE, due out on December 29. The Editor's decision is final on all matters affecting the Contest.

in our Panel, below.

The secretary for **Thames Valley** writes to say that they have the first Wednesday in each month at the Three Pigeons, Portsmouth Road, Long Ditton, the October session being for G3BPM, who will be talking about Test Gear—not the super-duper sort but the stuff we have in our shacks to do our tasks with.

### Westerlies

Places, not gales. **Torbay** have discontinued their Friday sessions for the winter season; in addition there are alterations going on at Hq. so that the R.A.E. class can sit in the erstwhile shack and get some peace and quiet for their studies. The venue is Bath Lane, rear of 94 Belgrave Road, Torquay, and the October speaker G3ABU. Further details from the hon. secretary—see Panel.

A quiet Summer Season is reported by the secretary of the **North Devon** gang, but attendances will, as ever, perk up once holidays and lawnmowers are out of the way. October 11 is for a Tape Lecture on VHF, and a

ragchew is planned for October 25, both at Crinnis, High Wall, Sticklepath, Barnstaple.

The **Plymouth** group seem to be livelier than for some time past, and of late have been up to all sorts of activities of a "summery" nature. The Club meets on the first and third Tuesday in the month, at Virginia House, Bretonside.

For anyone visiting **Cornish** this month, we have to refer you to hon. secretary—see Panel—as there is to be a change of meeting-place for *this month only*. The usual form is to go to the SWEB Clubroom, Pool, Camborne, on the due date, but on October 5, they will be somewhere else.

Thursdays at the Youth Centre, 31 The Park Yeovil is the place and time for meeting the locals. On October 26 there will be a tape lecture as an extra attraction.

### GI, GM and The North

October 6 is the date for the next meeting of the **Bangor, Co. Down, Club**, when G13YMY and G13WUO

### Names and Addresses of Club Secretaries reporting in this issue :

ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, London, W3-8LB.  
 BANGOR: E. R. Sandys, G12FHN, 25 Moira Park, Bangor, Co. Down.  
 BASINGSTOKE: P. Sterry, G3CBU, Ashley, Orchard Road, Salisbury Gardens, Basingstoke, Hants.  
 BEDFORD: J. Bennett, G3FWA, 47 Ibbett Close, Kempston (2427), Beds.  
 BICESTER: D. E. Williams, 2 Poundon, Bicester, Oxon. (Stratton Audley 475).  
 BRACKNELL: S. Jewell, G8EMY, 3 Tenth Avenue, Garstons Park, City Road, Tilehurst, Reading.  
 BRIGHTON (Tech. Coll.): R. J. Henley, G2CMH, 35 Wilmington Way, Brighton, BN1-8JH.  
 BRITISH RAILWAYS: L. C. Carter, G3ILC, 35 Barnfield Gardens, Kingston-upon-Thames, KT2-5RH, Surrey.  
 BURNHAM BEECHES: Miss N. Appleby, G8ENX, 42 Sutton Avenue, Slough, Bucks., SL3-4AW.  
 BURY & ROSSENDALE: F. S. Burnett, G3RSM, 13 Rhiwlas Drive, Bury, BL9-9DD. (061-764 7554).  
 CHILTERNs: M. I. Connell, 38 White Close, High Wycombe (31314), Bucks.  
 CORNISH: P. King, G3WKP, Nirvana, Comprigney Hill, Truro (4788), Cornwall.  
 CRAY VALLEY: P. F. Vella, G3WVP, 78 Hurst Road, Sidcup, Kent.  
 CRYSTAL PALACE: G. M. C. Stone, G3FZL, 11 Liphook Crescent, London, SE23-3BN. (01-699 6940).  
 DARTFORD HEATH D/F: Mrs. M. Worbe, G3XVC, 13 Havelock Road, Dartford, Kent.  
 DUNSTABLE DOWNS: C. G. Powell, G8BPK, 1 Wenwell Close, Buckland Wharf, Aston Clinton (600), Aylesbury.  
 ECHELFORD: V. Higgs, G3VWJ, 205 Commercial Road, Staines (57021), Middx.  
 EDGWARE: A. J. Masson, G3PSP, 62 Coldharbour Lane, Bushey, Herts., WD2-3NY. (01-950 6827).  
 GLENROTHES: A. Givens, GM3YOR, 41 Veronica Crescent, Kirkcaldy, Fife, KY1 2LH.  
 HARTLEPOOLs: I. R. Whitworth, 83 Southbrooke Avenue, Hartlepool, Co. Durham, TS25-5JB.  
 HORSHAM: R. J. Polley, G3PYC, 81 Beech Road, Horsham, Sussex.  
 HULL: Mrs. M. Longson, 4 Chester Road, Wold Road, Hull.  
 LEICESTER: J. McAllister, 13 St. James' Close, Oadby, Leics.  
 MAIDSTONE YMCA: P. Pickering, G3ORP, 101 Chatham Road, Maidstone.  
 MEDWAY: H. E. Wills, 111 Laburnum Road, Strood, Kent.  
 MELTON MOWBRAY: R. Winters, G3NVK, 32 Redwood Avenue, Melton Mowbray (3369), LE13-1TZ, Leics.  
 MIDLAND: N. Gutteridge, G8BHE, 68 Max Road, Quinton, Birmingham, 32. (021-422 787.)

NORTH DEVON: H. G. Hughes, G4CG, Crinnis, High Wall Sticklepath, Barnstaple, Devon.  
 NORTHERN HEIGHTS: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax. (44329).  
 NOTTINGHAM: S. F. Claringburn, 49 Fernleigh Avenue, Westdale Lane, Nottingham, NG3-6FN.  
 PLYMOUTH: A. G. B. Helms, G4BCX, 94 Cotehele Avenue, Keyham, Plymouth.  
 R.A.I.B.C.: Mrs. F. Woolley, G3LWY, Woodclose, Penselwood, Wincanton, Somerset.  
 READING: D. King, 34 Crawshaw Drive, Emmer Green, Reading, RG4-8SY.  
 ROYAL NAVY: CRS A. G. Walker, Hon. Sec., RNARS, HMS *Mercury*, Leydene, Hants.  
 SHEFFORD: A. Sullivan, G2DGF, 12 Glebe Road, Letchworth.  
 SLADE: J. E. Drakeley, 186 Conway Road, Chelmsley Wood, Birmingham, 17.  
 SOLIHULL: A. W. Bagley, G3XPY, 266 Warwick Road, Olton, Solihull, Warks. (021-706 3688).  
 SOLWAY: J. J. Hardingham, Woodbine Cottage, Dearham, Maryport, Cumb.  
 SOUTH MANCHESTER: D. Holland, G3WFT, 7 Alcester Road, Sale, Cheshire.  
 SURREY: S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon, CR2-8PB. (01-657 3258).  
 SUTTON COLDFIELD: A. W. Ferneyhough, G8AVU, 114 Endhill Road, Kingstanding, B44-9RP, Warks.  
 THAMES VALLEY: C. B. Seaman, G3ATF, 40 Park Road, Ashford, Middx.  
 THORNTON CLEVELEYS: V. T. Budas, G3ZYE, 4 The Cop, Rossall School, Fleetwood, Lancs. (Cleveleys 6826).  
 TORBAY: Mrs. G. Western, G3NQD, 10 Truro Avenue, Hele, Torquay.  
 TYNESIDE: G. Lowdon, 21 Winifred Gardens, Wallsend (627878), NE28-6EF.  
 VERULAM: H. Young, G3YHY, 93 Leaford Crescent, Watford, WD2-5JQ, Herts.  
 WARRINGTON: D. F. Catherwood, G3ZRN, 9 Summerville Gardens, Grappenhall, Warrington, Lancs.  
 WEST KENT: H. Richards, 17 Reynolds Lane, Tunbridge Wells, Kent.  
 WEST OF SCOTLAND: V. T. Budas, GM3VTB, 28 Kelvininside Gardens, Glasgow, G20-6BB.  
 WIRRAL: A. Fisher, G3WSD, 34 Glenmore Road, Oxton, Birkenhead, Cheshire.  
 WOLVERHAMPTON: J. P. H. Burden, 28 Coalway Road, Wolverhampton, WV3-7LX.  
 WORCESTER: B. A. Jones, G8ASO, 12 Woodside Road, Larkhill, Worcester (29208), WR5-2EG.  
 YEOVIL: D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil, Somerset.  
 YORK: J. A. Rainbow, G8BOK, 14 Temple Road, Bishopthorpe, York, YO2-1QN.

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A group of Chester & District Amateur Radio Society members, very active in the North-West, on a recent field-day occasion, when they were signing G3GIZ (their own call) with the support of some 20 of their membership. Working all bands with a KW-2000 into an inverted-Vee, 251 contacts were made.

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will be showing how easy it is to make a printed circuit board—and, what is more, they have hopes that by the end of the talk the board will look right for an AF oscillator for the Morse classes! The main meeting is on the first Friday in each month, but they are also open for a natter every Wednesday, both types of activity being at the Borough Gymnasium, Hamilton Road.

Warrington's Hq. is at Alford Hall, Manchester Road, and they are there on October 3 for G4AUX to discuss the PSU for the Club station, and October 17 for a talk on Printed-Circuit making.

A most important meeting appears in the October schedule at Thornton Cleveleys, by way of the AGM on the 18th; before that, the October 4 session is down for a playing of the W1BB tape lecture. Venue is the St. John Ambulance Brigade Hq., off Fleetwood Road North, behind the Police Station.

The Annual General Meeting is also on the books at Wirral on October 18, at the Sports Centre—ex-Drill Hall, Grange Road West, Birkenhead; October 4 is presumably their Natter session.

Sad to say, the West of Scotland letter got hung up in the mails and so missed us last time out; but we note they have something going on every Friday evening, quite apart from their efforts in the way of the Scottish VHF Convention on October 1 at Shawlands Hotel, Glasgow.

Weekly meetings are also the thing at Hartlepool, theirs being on Mondays. October 2 is down for G8DKU and Mr. Whitworth to talk about Digital Frequency Measurement. This is followed on the 9th by a Bring-and-Buy Sale, and on the 16th the Club call, G3IDV, goes on Two. A talk, of some sort to be decided, comes up on October 23, and the month is rounded off by a discussion of the future club involvement in HF and VHF contests. With such a programme ahead then they should prosper, after a rather lean period over the past couple of years.

For October in Bury and Rossendale we look to the *Newsletter*, which tells us that there is a talk about the Oddities of TVI and BCI, to be given by G2BTO, on October 9 at the George Hotel, Market Street, Bury.

An interesting variation in the usual theme pops up in the Hull letter this month. They have October 6, for

Microwaves, by G8EAH, then on the 13th, G3SSA has the rostrum for his bit on Semiconductors; October 20 is an Open Night, and on the 27th there is the Photographic Club, and guest speaker Mr. Green. Since so many radio types take up photography as a second activity this is may be far from being as odd as it might seem.

The Thursday-evening get-togethers of the amateurs in and around Maryport continue as ever, under and Club name of Solway. The venue for these is the Educational Settlement, Castle Hill, Maryport.

Glenrothes assure us they are still going, and meeting on the 1st Sunday each month at the Old Nursery School Buildings, Douglas Road, Leslie. Their new hon. secretary is Andrew Givens, GM3YOR—of whom we seem to have heard in another connection!

### The Midlands

Leicester make participation in exhibitions a big thing, and also do quite a bit in the way of portable and contest activity. They are lucky to have their own place, where they can meet on Sunday mornings or Monday evenings each week, at Gilroes Estate Farm Cottage, Groby Road, Leicester. At the time of writing the programme for the coming months was not finalised so for that we must refer you to their secretary, address as in Panel, opposite.

An informal in the Malt Shovel, High Street on October 3, is followed on October 17 by the all-important AGM, at 1930 sharp, to make up the month's activities at Solihull.

Worcester have just gone through their AGM, so it is hardly likely they will be able to give us any detail on the doings at the session they have at the Crown Hotel on October 2.

We really are in a confusion over the date for the Midland October meeting, as two *different* dates are noted in the copy of the *Newsletter* which we have at hand! Perhaps the best thing under the circumstances is for a prospective member or visitor to contact G8BHE—see Panel. However, we can say with certainty that they get together, as they have done for so many years now, at the Birmingham and Midland Institute, in Margaret Street.

No mistaking it from the Slade letter, though;

## IDENTIFICATION CODES FOR CLUBS IN "MCC"

<b>Zone A—Scotland</b>		Sheffield	B64	Stafford		Chichester	F46
Aberdeen	A2	Sheffield (University)	B65	(Coll. of Tech.)	C65	Chiltern	F47
Ardeer	A3	Southport	B66	Stockport	C66	Chippenham	F48
Border	A4	S. Shields	B67	Stoke-on-Trent	C67	Clacton	F49
Dundee (Tech. Coll.)	A5	Spn Valley	B68	Stourbridge	C68	Clifton	F52
Falkirk Group	A6	Star, Leeds	B69	Stratford-on-Avon	C69	Colchester	F53
Glasgow University	A7	Sunderland	B72	Sutton Coldfield	C72	Crawley	F54
Glenrothes	A8	Thornton Cleveleys,		Wirral	C73	Cray Valley	F55
Greenock	A9	Lancs.	B73	Wolverhampton	C74	Crystal Palace	F56
Heriot-Watt Univ.	A22	Tyneside	B74	Worcester	C75	Culham, Berks.	F57
Inverness	A23	Wakefield	B75			Dartford Heath	F58
Lothians	A24	Westmorland	B76			Dorking	F59
Mid-Lanarkshire		West Riding Contest	B77			Dunstable Downs	F62
Group	A25	White Rose, Leeds	B78	<b>Zone D—Eastern</b>		Dursley	F63
Moray Firth	A26	York	B79	Bury St. Edmunds	D2	Ealing	F64
Pentlands	A27	Durham Contest	B82	Cambridge	D3	East Barnet	F65
Radio Club of		Northumbria Contest	B83	Cambridge University	D4	East Kent	F66
Scotland	A28	Catterick	B84	Digby R.A.F.	D5	Echelford, Middlesex	F67
Spey Valley	A29	East Riding Group	B85	Grimsby	D6	Edgware	F68
West of Scotland	A32	Manchester Contest	B86	Grimsby (Wheatsheaf)	D7	Fareham, Hants.	F69
				Haverhill	D8	Fareham Group	F72
				Ipswich	D9	Fawley, Hants.	F73
<b>Zone B—Northern England</b>		<b>Zone C—Midlands</b>		Lincoln	D22	Finchley	F74
Ainsdale	B2	Ashton-u-Lyme	C2	Lowestoft	D23	Gosport	F76
Billingham	B3	Bromsgrove	C3	Norfolk	D24	Govt. Comms.,	
Bishops Rawthorne	B4	Burslem	C4	Pye, Cambridge	D25	Cheltenham	F77
Blackpool and Fylde	B5	Cannock Chase	C5	Scunthorpe	D26	Grafton	F78
Bolton	B6	Chapel Green, Warks.	C6	Skegness	D27	Greenford	F79
Bradford	B7	Chester	C7	Spalding	D28	Guildford	F82
Bury and Rossendale	B8	Chesterfield	C8	Stowmarket	D29	Harlow	F83
Carlisle	B9	Covenry	C9	Wattisham R.A.F.	D32	Harrow	F84
Chorley	B22	Derby	C22	Wymondham	D33	Havering	F85
Cleveland	B23	Derby (Nunsfield)	C23			Hemel Hempstead	F86
Culcheth, Lancs.	B24	Dudley	C24	<b>Zone F(L)—Southern</b>		Henley G.S.	F87
Cumberland	B25	Henley-in-Arden	C26	Acton, Brentford and		High Wycombe	F88
Dial House, Salford	B26	Hereford	C27	Chiswick	F2	Hillingdon	F89
East Lancs.	B27	Keele (University)	C28	Addiscombe	F3	Horsham	F92
Eccles	B28	Kings Norton Contest	C29	AERE Harwell	F4	Isle of Wight	F93
Fulford	B29	Leicester	C32	Ampfield, Hants.	F5	Kingston	F94
Fylingdales	B32	Lichfield	C33	Ariel (BBC)	F6	Leyton and	
Halifax	B33	Macclesfield	C34	Axe Vale	F7	Walthamstow	F95
Hallamshire	B34	Magnus, Newark	C35	Baden-Powell House,		Loughton	F96
Hartlepoons	B35	Mansfield	C36	London	F8	Luton	F97
Hull	B36	Melton Mowbray	C37	Barking	F9	Maidenhead	F98
Leeds	B37	Mid-Cheshire	C38	Basildon	F22	Maidstone YMCA	F99
Leyland Hundred	B38	Midland	C39	Basingstoke	F23	Marconi Apprentices,	
Lindholme R.A.F.	B39	Mid-Warwicks	C42	Bedford	F24	Chelmsford	L2
Liverpool	B42	Newark	C43	Bicester	F25	Medway	L3
Liverpool (University)	B43	Northampton	C44	Bishops Stortford	F26	Mid-Herts.	L4
Manchester Group	B44	North Notts.	C45	Bracknell	F27	Mid-Sussex	L5
Manchester		North Staffs.	C46	Brighton	F28	Minehead	L6
(University)	B45	North Staffs.		Brighton		Nailsworth, Glos.	L7
Manchester		(Polytechnic)	C47	(Coll. of Tech.)	F29	Newbury	L8
(I.S. & T.)	B46	Nottingham	C48	Bristol	F32	Newham, London	L9
Mexborough	B47	Nottingham		Bristol		North Bucks.	L22
Morpeth	B48	(University)	C49	(Shirehampton)	F33	Northern Poly.,	
Newcastle-on-Tyne		Nuneaton	C52	Bristol (University)	F34	London	L23
(University)	B49	Painton		Brunel University,		North Kent	L24
Northern Heights	B52	(Northampton)	C53	London	F35	Oxford	L25
North Liverpool	B53	Peterborough	C54	Burnham Beeches,		Paddington	L26
Northumbria	B54	Redditch	C55	Bucks.	F36	Purley	L27
N.W. Durham	B55	Rugby	C56	Burnham-on-Sea	F37	Racal, Berks.	L28
Ovingham	B56	Salop	C57	Chelmsford	F38	Reading	L29
Otley	B57	Sealand R.A.F.	C58	Cheltenham G.S.	F39	Redbridge, London	L32
Preston	B58	Slade	C59	Cheltenham	F42	Reigate	L33
Rotherham	B59	Solithull	C62	Cheltenham Group	F43	R.M., Portsmouth	L35
St. Helens	B62	South Birmingham	C63	Chesham	F44	R.N., Petersfield	L36
Scarborough	B63	South Manchester	C64	Cheshunt	F45	Royal Signals	L37

R.A.F. Locking	L38	Cornish	G3
Salisbury	L39	Exeter	G4
Sheffield	L42	North Devon	G5
Silverthorn,		Plymouth	G6
E. London	L43	Saltash	G7
Silver Wing (BEA)	L44	Torbay	G8
Southampton	L46		
Southampton		<b>Zone H—All GW Counties</b>	
(University)	L47	Bangor	H2
South Bucks. Contest	L48	Bangor (Univ. Coll.)	H3
Southdown, Sussex	L49	Barry College	H4
Southend-on-Sea	L52	Blackwood, Mon.	H5
Southgate	L53	Cardiff	H6
Speedbird (BOAC)	L54	Chepstow	H7
STC Harlow	L55	Conway Valley	H8
Stevenage	L56	Flint	H9
Stroud, Glos.	L57	Haverfordwest	H22
Surrey	L58	Llanelli G.S.	H23
Sussex University	L59	Maesteg, Glam.	H24
Sutton and Cheam	L62	Pembroke	H25
Swindon	L63	Port Talbot, Glam.	H26
Taunton	L64	Rhyl	H27
Thanet, N. Kent	L65	Rhondda	H28
Thames Valley	L66	Sully, Glam.	H29
Thornbury, Glos.	L67	Swansea Telephone	H32
University of Essex	L68	Univ. Coll., Cardiff	H33
Vange, Essex	L69	Univ. Coll., Swansea	H34
Verulam, St. Albans	L72		
Wanstead and		<b>Zone J—</b>	
Woodford	L74	<b>Ireland and Isle of Man</b>	
Wessex	L75	Ballymena	J2
West Kent	L76	Bangor	J3
Wimbledon	L77	City of Belfast	J4
Winchester	L78	IRTS Region 1	J5
Worthing	L79	Isle of Man	J6
Yeovil	L82	Limerick	J7
Adur, Sussex	L83	South-East EI	J8
Isle of Purbeck,			
Dorset	L84		
		<b>Zone K—Channel Islands</b>	
<b>Zone G—South-Western</b>		Guernsey	K2
St. Lawrence's,		Jersey	K3
Bodmin	G2		

**THE MCC ZONES**

The Zone in which a Club is located is indicated by the initial letter of the Ident. Code. The multiplier for a contact with another Club is defined by the Zone letter sent and received, and will be the same for both stations (see Scoring Table). The Zones are as follows:

- Zone A:** All Scottish counties.
- Zone B:** Northern England—Northumberland, Durham, Cumberland, Westmorland, Lancashire and Yorkshire.
- Zone C:** The Midlands—Cheshire, Derby, Shropshire, Stafford, Hereford, Worcester, Warwick, Nottingham, Leicester, Rutland, Northampton, and Huntingdon.
- Zone D:** Eastern—Cambridge, Norfolk, Suffolk and Lincolnshire.
- Zone F (or L):** The South—Somerset, Dorset, Gloucester, Wilts, Berks, Hants, Oxford, Bucks, Herts, Middlesex, Surrey, Sussex, Kent, Essex, London and Bedford.
- Zone G:** South-Western—Devon and Cornwall.
- Zone H:** Wales—All GW counties.
- Zone J:** All EI/GI/GD.
- Zone K:** Channel Isles.

**Scoring Table**

*Multipliers to be applied to Club Contacts.*

Contact with own Zone, multiplier 10

<b>Contact between</b>				<b>Contact between</b>			
<b>Zones</b>	<b>A</b>	<b>and B(V)</b>	<b>11</b>	<b>Zones</b>	<b>C(X) and H</b>		<b>11</b>
	A	C(X)	13		C(X)	J	13
	A	D	14		C(X)	K	15
	A	F(L)	15		D	F(L)	11
	A	G	17		D	G	15
	A	H	13		D	H	12
	A	J	15		D	J	15
	A	K	20		D	K	15
	B(V)	C(X)	11		F(L)	G	11
	B(V)	D	13		F(L)	H	11
	B(V)	F(L)	13		F(L)	J	15
	B(V)	G	15		F(L)	K	15
	B(V)	H	13		G	H	11
	B(V)	J	13		G	J	15
	B(V)	K	20		G	K	12
	C(X)	D	11		H	J	11
	C(X)	F(L)	11		H	K	12
	C(X)	G	12		J	K	12

*Contact with non-Club station, regardless of location, attracts multiplier of 10.*

*N.B. Letters (L), (V) and (X) to accommodate possible late-entry stations in B, C and F Zones, and Clubs wishing to run two or more stations. (Code to be applied for before October 10.)*

**EXAMPLES FOR OPERATING**

Coventry works Derby and sends 579C9, receives 579C22; Aberdeen works Jersey and sends 559A2, receiving 549K3.

**EXAMPLES FOR SCORING**

Coventry works Derby. Each claims three points *times* multiplier of ten, equals thirty points.  
Aberdeen works Jersey. Each station claims three points *times* multiplier of twenty, equals sixty points.

*cont'd from p.505*

October 6 for a display of members own equipment, and the 20th for a "Knight of the Round Table" evening, to which you are invited to bring your question, ideas and whatever.

It must be quite a time since last we heard from **Sutton Coldfield**, where on October 9 they have a talk on VHF Operating Techniques—and who can do such a talk better than G3BA? However, to get the details on the Hq. address, we have to refer you to G8AVU, as in Secretaries Panel.

Friday night is club-night at **Coventry** where the October 6 date is down for their AGM. Then comes a Night-on-the-Air on the 13th, followed by Beginners' Night on the 20th, the night being nicely finished off by a trip to the Enterprise Bakeries.

It is also a Fridays pattern at **South Manchester**, where October 6 sees G4AOK talking about the uses of an Oscilloscope, and October 13th the showing of three films. October 20 is for G3SMT to talk about and demonstrate the building and use of a Grid Dip Oscillator, and October 27 is still at the time of writing not finalised. Then, for the keen types, there is the VHF group, who

## SHORT CLUB NOTICES

CLUB NAME	HEADQUARTERS LOCATION	MEETING DAY MONTHLY
Basingstoke	Chineham House, Popley	October 7, 21
Bedford	The Dolphin, Broadway, Bedford	Thursdays
Bracknell	Coopers Hill Centre	October 2, 16, 30
Crystal Palace	Emmanuel Church Hall, Barry Road, S.E.23	October 21
Dartford Heath D/F	Broomhill Road, Dartford	October 20
Horsham	Guide Hall, Denne Road	October 3
Northern Heights	Peat Pitts Inn, Ogden, Halifax	Wednesdays
Nottingham	Sherwood Community Centre, Mansfield Road	Thursdays
Reading	White Horse, Kidmore End Road, Emmer Green	October 10, 24
Surrey	Swan and Sugarloaf, Croydon	October 17
Tyneside	Community Centre, Vine Street, Wallsend	Mondays
York	British Legion, 61 Micklegate, York	Thursdays

N.B.—In each case the Secretary's name and address appears in the Panel on p.504.

get together separately on Monday evenings. The Friday dates, incidentally are taken at Sale Moor Community Centre, Norris Road, Sale.

About once a year we hear from **Melton Mowbray**, with a notice for the AGM—but this year they sent it in too late for inclusion. However, enough is still valid for us to say they are still getting together at the St. John Ambulance Hall, Asfordby Hill. For further details we refer you to G3NVK, who will no doubt be pleased to give you the details.

### Another 50th Anniversary

**Wolverhampton** have been very active and are now celebrating their 50th year of continuous existence, in connection with which a booklet *Wireless in Wolverhampton, 1922-1972* has been published. With their exhibition at the local Art Gallery & Museum and a station at the GKN Sankey Sports Ground at Telford, they have been brought in contact with "Radio Birmingham" of the BBC, which has brought them good over-the-air publicity. Their AGM is on Monday, October 2.

### The Nationals

First in this pile are the **Royal Navy** whose *Newsletter* is always, for this writer anyway, worth a read and a chuckle, and sometimes has something quite serious to say. Anyone who has a connection with the Royal Navy will find it well worth joining—for details, find the secretary's name and address in the Panel.

**R.A.I.B.C.** and its newsletter, *Radial*, is as it has always been—a boon and a blessing to the handicapped

members of the Amateur Radio fraternity, whether SWL or licensed, sighted or blind. However, such unfortunates usually need to be put in touch with the Club. And, of course, to achieve its "helping hand" the Club needs lots and lots of supporters who are game to help in whatever small way they can. Details, from the Hon. Sec. at the address in the Panel.

Then we have **British Rail**, and for this reader at least, their Newsletter is made memorable by the letters which come in from WA5VFW, concerning railway activity and history in the States; details of the club can be obtained from the Hon. Sec. at the address in the Panel.

### In Conclusion

That's it for this time—except to remind you about **MCC** and also that the closing date for next "Month with The Clubs" is **October 6**, latest, reports to be addressed: "Club Secretary," **SHORT WAVE MAGAZINE**, **BUCKINGHAM**. Keep the fire in till we meet again.

### "CARE AND FEEDING OF POWER GRID TUBES"

#### A Review

First published in 1967 this Manual has had neither the publicity nor the distribution it deserves. Compiled as it is by the Eimac Division of Varian much of the data, and many of the worked examples of typical designs, relate to the 4CX series of Eimac valves, but as these are readily available in this country, usually under the same type numbers the information it contains will be of value to constructors in the U.K. who have high power linear amplifiers in prospect.

Opening with a description of the valves externally, succeeding chapters cover electrical design considerations in great detail, including practical worked examples of use in Class-C as well as linear modes. Special attention is paid to keying, AM modulation methods, power supply considerations and stabilisation. Included with the manual is a performance computer, with the aid of which optimum designs for all operating modes can be worked out very easily.

A complete chapter is devoted to the use of these valves in SSB service, and further sections deal with neutralising problems, excitation and loading, harmonic suppression, two-tone testing, drive power requirements and the special precautions to be observed in VHF/UHF applications.

*The Care and Feeding of Power Grid Tubes*, available from **SHORT WAVE MAGAZINE** at £1.60 post free. The valves themselves, 4CX250, 4X150, etc., are to be found on the surplus market in large quantities, but the bases are more difficult to come by, and are expensive. If you want new equipment, then **EMI-Varian Ltd.**, Russell House, Molesey Road, Walton-on-Thames, Surrey are the people to contact.

This comprehensive manual is thoroughly to be recommended for novice and expert alike.

A.H.D.

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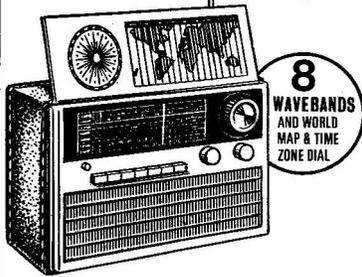


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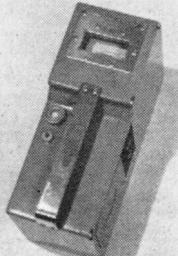
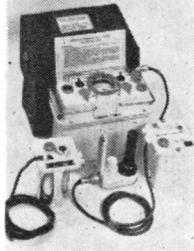
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**SELLING:** Swan 500CX with special separate CW filter unit, five hours' use only, £325 (cost £425). Also tunable 2m. IF, new, £30. Several other oddments available cheap.—Ring Goodbody, G3YQE, 01-592 7800 daytime, Romford 61191 evenings.

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**WANTED:** Adcock-type HF D/F radiogoniometer, as used in R.A.F. D/F stations, ex-Hitler's War and since. Good price paid for a complete instrument with coax outlet connectors. State details and price expected. Appropriate operating manual also required.—Box No. 4932, Short Wave Magazine, Ltd., 55 Victoria Street, London, SW1H-0HF.

**FOR SALE:** Creed Type 54N Teleprinter, £40. Terminal Unit 5R6, working but not finished, £10. TDMS 5AB A.T.M., £20. GPO Type 66B PSU, 80-0-80v., 160v., £10—or £70 for The Lot. Also a Murphy Radio A.P.100335, coverage 60 kHz to 30 MHz, £20; and a TCS-12 Rx, tuning 1.0 to 12 MHz, £8. Buyers to collect.—Lines, 3 Galmpton Court, Galmpton, Nr. Brixham, South Devon. (Tel: Churston 3879).

**SELLING:** Codar A.T.5 Tx. Mk.II, with PSU, £20. An HRO Rx, in clean working order, no PSU, £8.—Stampton, 125 Gravesham Court, Gravesend (63284), Kent (Ring evenings).

**SALE:** Heathkit HW-17A two-metre Transceiver, with halo Ae. and DC/PSU, in mint condition, £55.—Heeley, G3PFT, 39 Somerset Avenue, Rugeley (2930), Staffs.

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**WANTED:** Manual and any other data for R.C.A. AR88D receiver. — Kirkham, 32 Lynton Gardens, Arnold, Notts. (Tel. 0602-268794).

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**FOR SALE:** RSGB "Bulletin" Vols. 41-43, and "Short Wave Magazine" Vols. 20-26; all bound and in excellent condition, £1 each. — Levitt, Copse Lodge, Brighton Road, Burgh Heath, (55973), Surrey.

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**WANTED:** S-meter and manual for R.C.A. AR88D receiver; also valves type HL2/K or information on conversion of W.1191 wavemeter to modern valves. **SELLING:** Lucas 11AC alternator, 12v. neg., unused, ideal mobiles, £16. — Poynton, 51 Manor Square, Dagenham, Essex RM8 3RU.

**WANTED:** An Amateur Radio receiver for a beginner. Some details of coverage and capability. — Calder, 36 Gartshore Crescent, Twechar, Kilsyth, Glasgow, G65 9SX.

**WANTED:** SARAH search-and-rescue equipment. Also R.1155 receiver and 400 kHz inverter. Details please. — Bell, 82 St. Catherines Avenue, Luton, Beds.

**WANTED:** Electroniques HSO-85 unit for valve circuits.—Nash, 3 Shawley Crescent, Epsom Downs, Surrey. (Tel: Burgh Heath 57847).

**FOR SALE:** R.C.A. AR88LF receiver, with manual and speaker, £28. Stepdown transformer, 115v. to 230v., 10-amp, £8. Type 88 Set, needs attention, with PSU, £8. Buyer collects. **WANTED:** Amateur band receiver. — Earnshaw, 12 Clarke Brown, Middleton, Manchester.

**WANTED:** To purchase, manual or circuit diagrams of Airmec Radivet 211. — Ring Butler, Leatherhead 73906.

**WANTED:** Manual for Redifon R.50M general coverage receiver, purchase or loan. — Bell, 24 Park Lane, Guiseley (6444), Leeds, Yorkshire.

**WANTED:** Manual for Heathkit DX-40U transmitter, purchase or loan. — Palk, 14 Hillview Road, Minehead, Somerset.

**WANTED:** Manual for National HRO, loan or purchase. Assistance please. — Gale, 6 Wayland Road, Grove, Wantage (4943), Berks.

**EXCHANGE:** Wanted Drake 2B, KW-77/201, EA-12 or SB-301 FOR Tequipment Lab 'scope Type D.43, dual trace, 15 MHz, in good condition. — Hanson, 29 Scotland Wood Road, Leeds 17, Yorks.

**WANTED:** Earlier and larger type all-valve American SSB Tx, with original manual. — Herbert, G6RF, QTHR. (Tel: Perranporth 2047).

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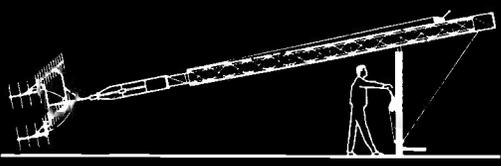
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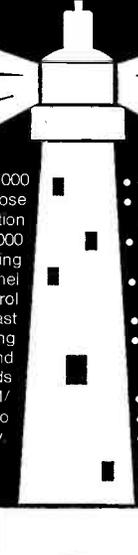
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