

# The SHORT WAVE Magazine

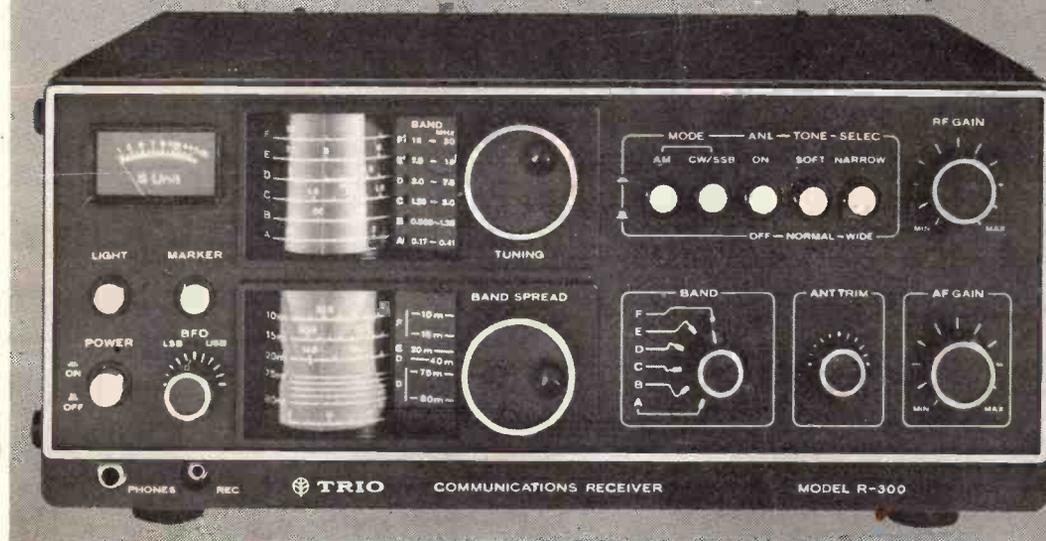
VOL. XXXIV

FEBRUARY, 1977

NUMBER 12

## TRIO R-300

Eavesdrop on the world



### LISTEN TO THE WORLD

Short wave radio is by far the fastest and most convenient type of communications for spreading the news about what is going on in the world. And for this reason TRIO's R300 is the right rig for those who'd like to listen to a live report of the Indianapolis Grand Prix, to Radio Peking or to follow the progress of a Himalayan expedition. The R-300 is the invisible bridge to other countries and continents and the bridge to the home country for many journalists, engineers and technical representatives working abroad. They all want a reliable and sturdy multiband receiver for home use and travel, a receiver working from mains voltage or batteries. And just such a receiver is TRIO's new R-300.

Six Wavebands—LW (170-410 kHz), BC (525-1250 kHz), 4 x SW (160-10m). The four shortwave bands continuously cover the frequency range from 1.25-30 MHz with separate calibration for the commercial (75-11m.) and radio amateur bands (80-10m.) of the large drum-type main tuning and bandsread dials.

**Outstanding Input Sensitivity**—The dual-gate MOSFET front end assures excellent cross-modulation and spurious characteristics, as well as high input sensitivity. Between 18 and 30 MHz the R-300 operates as a double superhet, giving sensitivity of  $1\mu\text{V}$  for AM and  $0.5\mu\text{V}$  for SSB. For full details, contact the sole importers of the exciting TRIO range.

New. CL22 antenna coupler for all shortwave receivers. Perk up your receiver performance the easy way

Sole Importers: LOWE ELECTRONICS  
Cavendish Road, Matlock, Derbyshire  
Tel.: Matlock 2817 or 2430

## 5 Band SSB/CW Transceiver TS520

The Transceiver with everything



### The TS520 System

TRIO have now completed the first stage of the total system concept for amateur radio equipment. With the TS520 and its associated accessories, the amateur radio operator can assemble a station to suit any or all requirements for his hobby enjoyment. All modes and all bands, fixed and mobile/portable are provided by the TS520 system.

### SSB/CW Transceiver TS-520

A real "compact"; powerful, rugged and reliable. It has everything which otherwise is available only as an accessory at extra cost; built-in power supply for fixed-station use, transistorized DC/AC power converter for mobile operation, loudspeaker, fixed-channel provisions, VOX control, etc. All these are the TS-520's special features in short format:

**Versatile Transmit- and Receive Operations**—USB, LSB and CW on all radio amateur bands from 80m. to 10m., and—with the aid of the 2m.-Transverter TV-502—also on the VHF-band from 144 to 146 MHz, as well as fixed frequency operation on four channels. The TS-520 also allows reception of WWV stations on 10 MHz for dial calibration. By adding the External VFO-520 (optional) the TS-520 demonstrates utmost versatility: independent RX- and TX operation with different frequencies transceive operation with slightly variable RX frequency by means of the built-in RT circuit (Receiver Incremental Tuning) plus fixed channel operation totaling nine different combinations.

**Advanced Circuitry**—With the exception of the transmitter driver and final stage which are equipped with blower-cooled vacuum valves of type 12BY7A and 2 x 6X001 the TS-520 is fully transistorized. The semiconductor complement consists of 44 transistors, 18 FETs, 1 IC and 84 diodes. The reliability and stability of this circuit has been substantiated by numerous contests and during rugged mobile operation.

**Outstanding Receive and Transmit Performance**—The transmitter section of the TS-520 features separate driver, plate and final tuning, a 2-stage ALC circuit for local and DX operation, thus assuring undistorted clearly legible TX signals even after hours of continuous operation. Provisions for linear amplifiers, such as ALC input, antenna relay switching output, etc., are available and ready for use. Dual-gate MOSFETs are employed in all critical receiver circuits to improve the input sensitivity, cross-modulation response and spurious rejection. An 8-pole SSB crystal filter in the IF amplifier provides exceptional selectivity and stability. An optional 1500Hz CW filter is available as an accessory and can be installed at any time. The switch-selectable time constant of the AGC assures perfect reception of SSB and CW signals.

**Precision-type VFO**—a feature of all TRIO receivers, transmitters and receivers also contributes to the supreme performance of the TS-520. The VFO is fully encapsulated and is controlled by a meshgear dial drive (reduction ratio 4 : 1). Dial accuracy is better than  $\pm 1$  kHz, frequency drift will not exceed  $\pm 100$ Hz per hour. Dial calibration is accomplished by means of a built-in 25 kHz crystal marker oscillator.

**Built-in Power Supplies**—for fixed station use with 120/240v. AC 50-60Hz line voltage or for mobile operation with 12-13.8v. DC by means of the built-in DC/AC converter.

**Loaded with Extra Features**: threshold-type RF gain control; semi-break-in circuit with sidetone; VOX/PTT/MOX-control; RIT; TUNE switch; LED function indicators for RIT, VFO and FIX channel operation; WWV receive pushbutton; 4-position fixed channel selector switch; built-in 25kHz crystal marker oscillator; two-stage AGC; multi-function meter; terminals for optional accessories such as 2m.-Transverter TV-502, External VFO-520, External Speaker SP-520, linear amplifier, headphone, microphone and key.

### Sole Importers

LOWE ELECTRONICS

119 Cavendish Road

Matlock, Derbyshire

Tel.: Matlock 2817/2430

TS520 £384 VAT Exc.

 **TRIO**

# The 2m First Family

Where quality is a prime requirement

## TR-7200G

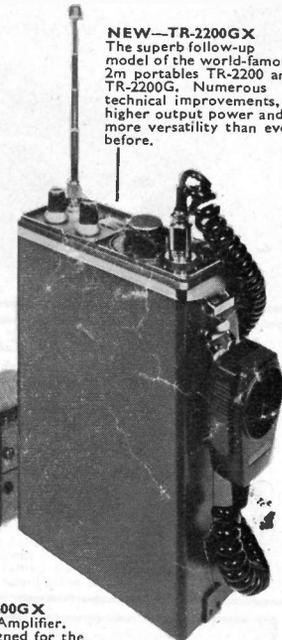
The number one rig when 2m gear is considered. Rugged, reliable, and carrying the unmistakable stamp of TRIO quality. Sensitive receiver, powerful transmitter, 22 channel capability with continuous tuning using the VFO.

## VFO-30G

External VFO, permitting continuous tuning through the entire 2m band from 144 to 146MHz in conjunction with the TR-7200G and TR-2200G transceivers. Precision dial drive and high dial accuracy. Built-in 600kHz frequency shift for repeater operation.

## NEW—TR-2200GX

The superb follow-up model of the world-famous 2m portables TR-2200 and TR-2200G. Numerous technical improvements, higher output power and more versatility than ever before.



5  
Atom-tailored power supply unit for fixed-station use of all 2m. equipment listed above. Supplies filtered and electronically stabilised operating voltage of 13.8v. DC up to 3.2 amps. Built-in electro-mechanical digital clock with 12-hour readout plus programmable 24-hour timer. Line voltage 110-120/220-240v. VAC. 50-60Hz.

**NEW—PB-15** (not shown)  
Battery pack, consisting of two rechargeable NiCad units as efficient and economical power source for the TR-2200GX and the 70cm. UHF Transceiver TR-3200. Battery charger is part of the standard accessories supplied with both models.

**MB-1A** (not shown)  
Special mobile mount for the TR-2200GX, TR-2200G and TR-3200. Can easily be installed under the instrument panel of any car and allows mounting and removal of the transceiver within seconds.

**NEW—VB-2200GX**  
2m FM Power Amplifier, especially designed for the TR-2200GX and its predecessors. Delivers a minimum output power of 10 watts RF with an input signal of 1 or 2 watts. Built-in voltage stabiliser and overload protection.

The through-circuit switch allows routing of the input signal directly to the antenna without amplification.

Regardless of where you are: in your QTH, on the road, on vacation, on a hike: you will always find a QSO on the 2m. band with TRIO VHF equipment. And no matter on which transmit and receive frequencies other 2m. stations are operating, with TRIO equipment you can always join in, because you'll be qrv on all international fixed-frequency channels—either in simplex or via repeaters.

## 2m FM Portable Transceiver TR-2200GX

The TRIO TR2200GX is the latest model in the most successful line of 2 metre FM handy portable equipment ever produced. Logical development, aided by suggestions from happy owners has produced the best 2 metre portable available today.

Look at the features:—over 2W output; receive sensitivity of 0.4 microvolts for 20 dB quieting; IF shape factor of 2:1; exclusive tuning fork controlled 1750 Hz access generator; 12 channel capability with factory fitted crystals for S20, S22 and R7; designed for maximum flexibility of use, on internal batteries or external supply for mobile/fix station operation; built-in telescopic antenna and standard socket for external antenna connection. Built in metering allows checking of signal strength, transmit output and battery voltage. The TR2200GX is housed in a rugged steel case for ultimate protection against accidental damage, with all operating controls placed for maximum operator convenience on the top face of the rig.

The most important asset of course is TRIO quality of design. No other manufacturer can match TRIO's vast experience in producing high quality electronic equipment and as a result, TRIO lead, not only in instruments and Hi-Fi, but also in the amateur field.

Unlike other portable equipment, the TR2200GX is supplied complete with all accessories including a protective carrying case and shoulder strap, external power leads and the all important battery charger for the optional NiCad pack. A set of rechargeable batteries cost £9-72 including VAT. The same option on comparable gear can cost up to £30 so be sure to ask what you get for your money.

## 2m FM Mobile Transceiver TR-7200G

The TR7200G is the best selling 2m. FM mobile transceiver in

Europe. Some of the reasons why this is so may not be obvious from the basic specification. It's not just the high sensitivity (0.3µV 15dB quieting) or the superb finish, it's the full range of accessories and the finest service backup in the country. It's the little details like the LED under the channel number indicator that is RF powered and only lights when you have a receive crystal fitted. The "transmit" lamp gives the same function for the transmit crystals. This means that you no longer have to wonder which channels are operational when you are mobile. Did you know that by removing the rear panel accessory plug you can drop the receiver gain by 10dB to prevent the fellow next to you in the car park at the rally from blowing your head off!

Did you know that the swr protection system is not the "sudden death" variety but gradually reduces the Tx power with increasing SWR so that you are not put completely off the air when your mobile whip antenna gets wet. The same system protects the PA and driver from over voltage damage when the rig is used in a vehicle having a high charge voltage from the alternator. Only Trio equipment has the unique tuning fork controlled repeater access tone generator to ensure access first time, every time.

All these features and more, can only be provided in equipment made to professional standards by a professional company. The Trio Corporation is the largest electronics manufacturer in Japan offering a range of amateur equipment and you, the customer, benefit every time.

The TR7200G comes to you complete with mobile mounting bracket, stand off feet for fixed station use, microphone, microphone bracket, cable manual and fitted S20, 21, 22, R6 and 7. Extra channels for the TR7200G available at £10 inc. VAT for 3 channels, £20 inc. VAT for 6.

Sole Importers  
LOWE ELECTRONICS  
119 Cavendish Road  
Matlock, Derbyshire  
Tel: 0629 2817/2430

 **TRIO**

# LOWE ELECTRONICS



## NR-56 FM RECEIVER

This remarkable little receiver gives the 2m FM listener everything he wants at a very reasonable price. Excellent sensitivity, stability and selectivity coupled with a built-in VFO and very effective squelch make it the ideal receiver for both beginner and keen listener. Although the built-in VFO more than covers the entire 2m. band, crystal control of FM channels offers many advantages (particularly in mobile operation), so crystals, which are ex-stock, may be fitted for the popular repeaters. It requires 12v. DC for operation and is thus an excellent receiver for mounting in the car, boat or caravan as well as for home

- ★ Double filters at 10.7 MHz and 455 kHz.
- ★ Dual conversion 10.7 MHz/455 kHz.
- ★ Narrow filter fitted for European Market.
- ★ VFO RF stage for high sensitivity.
- ★ 12v. operation.
- ★ Built-in loudspeaker.
- ★ Small size 6½" x 6½" x 2"
- ★ Mobile mount and piece supplied.
- ★ Full coverage VFO
- ★ 11 crystal positions (crystals ex-stock).
- ★ 22 transistors 1 into 16 diodes.
- ★ NR-56 £54 inc. VAT. Crystals £2.40 inc.

## RTTY — THE EASY WAY

## TD224

Teleprinter signals are found over the whole radio spectrum. They convey news agency reports usually in English or French, weather information and business messages in plain language or code. RTTY signals are also heard on all the amateur bands including 2 metre signals and may originate from any country in the world.

In the past, the main drawback in decoding these signals has been the necessity to use a mechanical teleprinter. The accompanying noise, and frequent maintenance problems, together with the difficulty in making speed changes to accommodate different standards have tended to put off the dedicated enthusiast.

The advent of solid state devices capable of decoding and displaying the RTTY information in complete silence has opened up a new horizon for the radio amateur and keen SWL. The all new TD 224 video converter accepts RTTY information and processes it to produce a composite video signal which can be displayed on a 625 line monitor, or on a standard TV set using an optional UHF modulator. This now means that you can sit and enjoy decoding RTTY and the SWL can use his general coverage receiver to read news and views from all parts of the world.

The display produced by the TD224 is in the form of seven lines of 32 characters, using large character size for easy reading and trouble free viewing. New information is displayed on the bottom line of the screen and when the line is full, the display steps up one line and continues reading. At the same time, the top line is removed from the display area. Operation of the TD224 is simplicity itself and all you need to copy RTTY signals is a suitable terminal unit (which we can supply), together with either a 625 line monitor or UHF TV set.

Send now for full details and specifications of the new, exciting TD224.  
 Since I am writing this at Christmas—yes, that's how far ahead the adverts have to be prepared; perhaps I can be excused for murdering the well known song: "Jingle bells, jingle bells, jingle all the way."  
 Use the TD224 and find out what they say.



Completely solid state except for the driver and two 6146B fan cooled PA tubes (for that low intermod. signal that means real quality), the T599S has all that you want. All mode operation SSB, CW, AM on all bands from 80m. to 10m. Built in with adjustable delay and anti-vox. Multi position metering for complete operation. Break-in CW with built-in sidetone generator. Dual impedance microphone input system—and of course, TRIO quality of construction with a die cast front panel and rugged casing. Signal quality.

Guaranteed by TRIO's acknowledged leadership in the audio field: by the use of an 8 pole crystal filter; by the use of linear PA tubes and by the use of an amplified ALC system which gives signal punch without sacrificing signal quality.

Measuring only 10½" x 5½" x 12" and weighing only 25 lbs., the T599S is a real mighty mouse. Able to sit on the smallest operating desk, it's a perfect match for the R599S or the earlier JR599 receivers—or any receiver for that matter.

## T599S ON SPECIAL OFFER £255 inc. VAT

## RAK ANTENNAS

The range of RAK antennas (yes, I know it should be "antennae") represents the finest value available today. From the comprehensive range, we offer a selection for the amateur and SWL. All traps are fully encapsulated and splashproof. All hardware is in stainless steel and corrosion proofed alloy. Elements are made from hardened alloy wire (not Listener I) for strength with light weight. For the amateur radio operator who needs the ideal set-up, we would recommend (and we use) the AL48DXN which gives super performance on 80 and 40. Use it in conjunction with either a vertical or beam for 20, 15 and 10. You will get 80 metre performance approaching that of a full size dipole but in an overall length of 28 metres instead of 40!

Model	Coverage	Power Rating	Length	Traps	Price inc. VAT and Postage
Midy V N	80-10m.	1kW P.E.P.	23 metres	6	£41.37
AL48DXN	80-40m.	2kW P.E.P.	28 metres	2	£26.18
ABXL	80m.	4kW P.E.P.	40 metres	0	£12.77
Listener III	3-30 MHz	Receive only	24 metres	0	£26.05
Listener I	3-30 MHz	Receive only	5 metres	1	£10.02

Prices are subject to alteration without notice.

**HEAD OFFICE** 119 Cavendish Road, Matlock, Derbyshire. Tel. 2817 or 2430 9 a.m. to 9 p.m.

**BRANCH OFFICES** Communications House, Wallington Square, Wallington, Surrey. Tel. 01-669 6700  
 Soho House, 362-4 Soho Road, Handsworth, Birmingham. Tel. 021-554 0708  
 27 Cookridge Street, Leeds. Tel. 0532 452657

**AGENTS** Alan GW3YSA, 35 Pen-Y-Waun, Efail-Isaf, Nr. Pontypridd. Tel. Newton Llantwit 3809  
 John G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex. Tel. Ringmer 812071  
 Sim GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. Tel. 041-771 0364

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**2 METRE  
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**Sensational ATLAS-210/215X**

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If you want a general coverage receiver at a modest cost then there's only one answer... The FRG-7. Never mind the fancy specification (and it is very good!), what does it offer that some others don't? Why would I be better off with the FRG-7? The answers are simple!

1. If you want to know what frequency you are on the FRG-7 tells you accurately. (If you buy a receiver with a bandspread and a main tuning dial you only know the frequency accurately if you have the main dial set "Spot on" which is a "chance in a million!")
2. With high sensitivity and a low price what more could you ask!
3. As a bonus it operates on mains, external 12v. D.C. (car, etc.) or its internal batteries (2 x U2 cells extra).

**DON'T DELAY . . . ORDER TO-DAY . . . FROM "WESTERN"**

**FANTASTIC FEBRUARY OFFER!! DON'T MISS IT!**  
**2m. ALL MODE TRANSCEIVERS. Only £299 + VAT**

Save up to £85! All you have to do is WRITE (no phone enquiries or part exchange) WITH CHEQUE (£336.37) stating your requirements and we will either accept your order or return cheque. At worst you lose 5 minutes and a stamp! (but you may save up to £85!) All units carry a full 90 day warranty on parts and labour.

**YOU'LL REGRET NOT SENDING US YOUR ORDER NOW!**



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**SS-727M MONITOR** ... .. £405.00  
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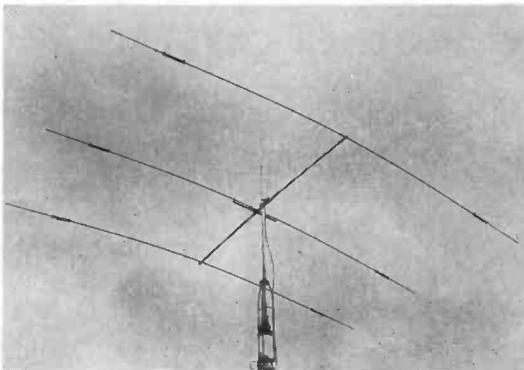
is all you require to send and receive SSTV pictures when connected to your SSB transmitter.

(Prices inc. VAT and Carr.)

# Electronics (UK) Ltd

**Radiate....with the DX-33 "Penetrator" for 10-15-20m.**

THE FIRST OF A NEW PENETRATING RANGE OF ANTENNAS !



HERE'S THE SPECIFICATION . . .

- ★ 3 elements on each band.      ★ Broadband operation.
- ★ Heavy duty 2 kW. rated.      ★ Stainless steel hardware.
- ★ Gain up to 8dB.                ★ SWR less than 1:3 : 1

HERE'S ITS PERFORMANCE . . .

(Report received from a GM3)...."I have erected and tried out the DX 'Penetrator' supplied to me.

"I accepted this antenna because I had very good results from the quad supplied by you and as it was from your design I expected good results from a beam of your design.

"I may state that these expected results have been exceeded. I have had contacts with JA 5 & 9, W7 5 & 8, K9 5 & 9, VE 5 & 9. And this is using a Sommerkamp FT250 running as they say barefoot."

AND NOW LOOK AT THE PRICE !

**ONLY £73.12 (inc. VAT/Carr.)**

(Price correct at time of going to press but will be increased shortly).

**Elevate.... with the Westower.... the stronger one.....**

- ★ STANDARD TYPES, rated at 75 m.p.h. with full head load quoted.
- ★ HEAVY DUTY TYPES, rated at 100 m.p.h. (approximately twice as strong as a standard model (and even our standard model is about 40% stronger than similar types !)
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Standard 58' type 3S/FP, £270 inc. carr./VAT.

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Former customers please note. We regret that we are no longer able to supply replacement sections and conversion-kits for the 60 m.p.h. rated Versatower system.

## HY-GAIN (Prices inc. Carr. and VAT)

BN86 1 : 1 ferrite Balun ...	£13.50	TH2MK3 10-20m. 2 ele. ...	£119.25
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153BA 15m. 3 element ...	£67.50	TH3MK3 10-20m. 3 ele. ...	£163.12
203BA 20m. 3 element ...	£123.75	TH6DX 10-20m. 6 ele. ...	total ...
204BA 20m. 4 element ...	£151.87		£168.75
402BA 40m. 2 element ...	£180.00	DB10-15 10-15m. 3 ele. ...	£118.12
IBV 10-80 Load Vert. ...	£28.12	LC80Q 80m. coil for 18v. ...	£14.62
12AVQ 10-20m. Trap Vert. ...	£40.50	LA1 Lightning arrestor gas ...	£18.90
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18AVT/WB 10-80m. Vert. ...	£82.12		

## JAYBEAM (Prices inc. Carr. and VAT)

DS/2m 5 over 5 slot feed ...	£14.62	PBM14/2m 14 ele. Para ...	£30.60
DB/2m 8 over 8 slot feed ...	£18.84	DB/70 8 over 8 slot feed ...	£16.31
5XY/2m 5 ele. crossed ...	£16.76	PBM18/70 18 ele. Para ...	£19.12
8XY/2m 8 ele. crossed ...	£20.36	MBM48/70 46 ele. Multi ...	£21.94
10XY/2m 10 ele. cross ...	£26.21	MBM88/70 88 ele. Multi ...	£26.32
5Y/2m 5 ele. yagi ...	£9.22	12XY/70 12 ele. crossed ...	£29.25
8Y/2m 8 ele. yagi ...	£11.36	4Y/4M ele. yagi ...	£13.72
10Y/2m 10 ele. long yagi ...	£21.60	PHM2/70 2 way harness ...	£5.91
14Y/2m 14 ele. long yagi ...	p.o.c.	PHM2/4m 2 way harness ...	£9.11
Q4/2m 4 ele. quad ...	£17.10	PHM2/C Circ. phasing ...	£5.17
Q6/2m 6 ele. quad ...	£22.05	PHM2/2m 2 way harness ...	£6.86
PBM10/2m 10 ele. Para ...	£25.31		

## Western Electronics (UK) Ltd

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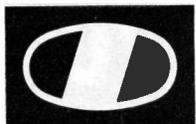
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# ICOM

**INTRODUCE THE LATEST IN FM MOBILES  
10 WATTS 22 CHANNELS (15 ALREADY WIRED)  
AND YOU NEED NEVER BUY ANOTHER CRYSTAL!!**



introductory  
price  
**£198 inc. VAT.**

The IC-240 is the start of a revolution in 2 metre transceivers. It has all the advantages of the highly popular IC-22A, with its easily selected 22 Channel capability, but does it all with a phase locked synthesised system. Hence you can programme it for all 22 channels **WITHOUT HAVING TO BUY ANY CRYSTALS**. Channels are hand wired using diodes according to clearly described instructions. We supply the UK version with 15 channels already wired in, these being 10 simplex and 5 repeater. Thus there are 7 more frequencies for you to programme at your own whim—ideal for RAYNET and local net use. You can programme for any of the 80 channels at 25 kHz spacing between 144 and 146 MHz.

Duplex (for repeater use) operates by shifting the RECEIVE frequency. This means that by switching to SIMPLEX when using repeater channel you will automatically be listening on the INPUT channel of the repeater without having to wire in special "Reverse Repeater" channels.

The main advantage over other more expensive synthesised rigs is that by not having some 400 selectable channels, at 5 kHz spacing (most of which are redundant as they don't fit into the UK 25 kHz channel spacing system), you are relieved of multiple knob twiddling to change from one popular channel to another. 22 channels are ample for UK national simplex, repeater and local net channels and these are selected by one knob which is easier, quicker and safer than "trying to open a combination safe while driving."

As an optional extra, a built-in scanning system will be available which will scan all 22 channels.

The IC-240 has the same excellent FM performance as the well known and highly popular IC-22A. Consider these points which all contribute to providing optimum communication either direct or through the ever-growing number of repeaters in the UK :

- \* Low noise dual-gate mosfet in the front end of the receiver.
- \* 5-section helical filter after the front end to provide high rejection of unwanted out-of-band signals.
- \* Dual conversion with IFs of 10.7 MHz and 455 kHz for excellent image rejection and selectivity, with filters at each IF frequency.
- \* Narrow filter giving high rejection of adjacent channel signals 25 kHz away.
- \* Hard IF limiting using an IC.
- \* A sensitive, temperature compensated, adjustable squelch circuit with front panel indicator to show when the squelch is open should the gain control be turned back to please the XYL.
- \* 1.5 Watts of audio from its built-in speaker giving ample volume for copy on the move.
- \* Line voltages are filtered and regulated for reduction of interference from the dynamo or alternator.
- \* A full 10W output from a sturdy PA transistor.
- \* Built-in 1750Hz tune burst for repeater use.
- \* Automatic PA protection.

The channels already programmed are :

SIMPLEX S0, S16, S17, S18, S19, S20, S21, S22, S23, S24  
REPEATER R3, R4, R5, R6, R7.

Accessories supplied with the rig :

Microphone  
Quick release mobile mounting bracket  
Fixing screws  
Spare Fuse  
DC power cord



## ICOM

**FOR UK ENQUIRIES  
THANET ELECTRONICS  
HERNE BAY**



## IC215 HANDY FM PORTABLE 15 channels 3 watts

ICOM are pleased to introduce their first FM portable and a careful look at the features will soon show how popular it's going to be. You can use it ANYWHERE. Change vehicles, use it in the shack or take it for a walk to the local high spot and you have the high quality FM communication, for which ICOM are so famous, available all the time. The batteries are larger than those of its competitors, thus giving considerably longer life. The 3 watt output and high sensitivity receiver makes it a useful main station set, where it can be operated from an external power supply and a good antenna system. Thus the IC-215 can be a good starting point for the man who has just obtained his licence and wants to get on the air without having to spend too much money.

### LOOK AT THE MAIN FEATURES :

**Aluminium Die-cast Frame** The IC-215 chassis and main frame are integrated into an aluminium die-casting rendering it light but resistant to vibration or shock when carried.

**15 Channels** The unit incorporates 15 channels to select from : 12 by the main channel selector and a further 3 by the function switch. All crystals are plug-in-type HC-25/U and are the same as the crystals used in the popular IC-22A. Being fundamental crystals, they are tunable over a reasonably wide range and a separate trimmer is supplied for each crystal making accurate frequency adjustment possible. This is very important for optimum results with minimum interference.

**Dual Power Mode** The output power can be switched to 3W on HI for long distance work or 0.5W on LOW for short distance contacts or working a nearby repeater. Battery consumption is minimised in the LOW power mode.

**Dial Illumination** The dial can be illuminated to facilitate night operation. This is controlled by a selector switch on the front panel.

**Power Pilot Lamp** If the power voltage falls below the required value a red LED power indicator goes out as an indication that the batteries are almost exhausted or the external power is inadequate.

**External Power and Antenna Sockets** Sockets for external power and antenna are provided on the rear. The antenna socket takes a standard PL259 plug.

**Whip Antenna** A fully collapsible antenna is built into the top of the rig. This can be unscrewed and removed to provide a screw socket for a flexible helical antenna. We have had an Antenna Specialist flexible antenna specially made and tuned to suit the IC-215.

**Meter** The meter indicates receive signal strength during reception and relative output level during transmission.

**Squelch** A sensitive squelch control is fitted rendering the set silent when no signal is being received.

**External Speaker Jack** An external jack is fitted to the front panel for a larger speaker or an earpiece. The internal speaker is muted when this is used.

**Discriminator Meter Jack** By removing a rubber grommet on the side of the transceiver a jack socket is available for connection of a 50 microamp centre-zero meter. This is very useful when tuning extra receive crystals.

**Tone Burst** A 1750Hz tone burst is fitted for opening UK repeaters.

**Shoulder Belt** A shoulder belt is supplied and is fixed to clips on the top of the rig. There is also a microphone hook. The side panels of the set itself are covered in leather simulated vinyl.

**Excellent FM Audio Tailoring and Clipping** This feature, already well known from the excellent quality produced by the IC-22A, ensures clear optimum talk power without over deviation. This makes the IC-215 a far better rig for use with repeaters and gives an optimum range, for the power used, on simplex contacts.

### ACCESSORIES INCLUDED :

Dynamic microphone  
Microphone Case  
Shoulder strap  
Power supply plug  
Comprehensive English handbook

External Speaker plug  
Discriminator socket plug  
Earphone  
9 x Dry cells type C (U11)

### OPTIONAL EXTRAS :

C-3PS Power supply which doubles as a holder for the IC-20L linear and supplies power for both the 215 and the linear.  
IC-20L 10 watt linear amplifier  
IC-SM2 Desk type condenser microphone with built-in amplifier.  
Ni-Cad Batteries.  
Charger for charging the Ni-Cads in situ.  
Helical stub antenna.

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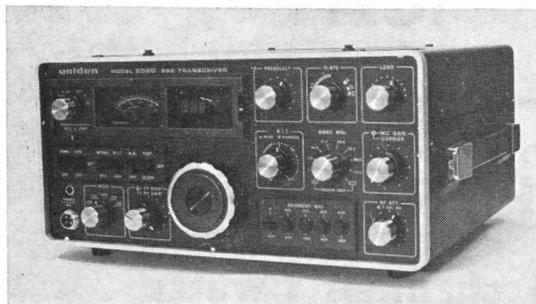
# G3MCN

## STEPHENS-JAMES LTD.

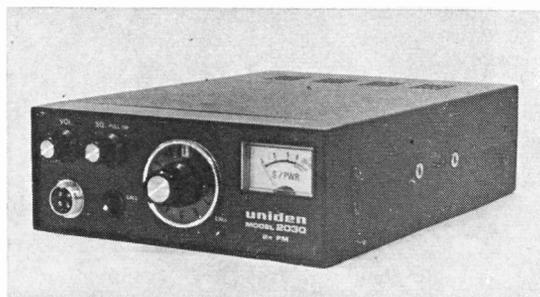
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TEL. 052-35 76790

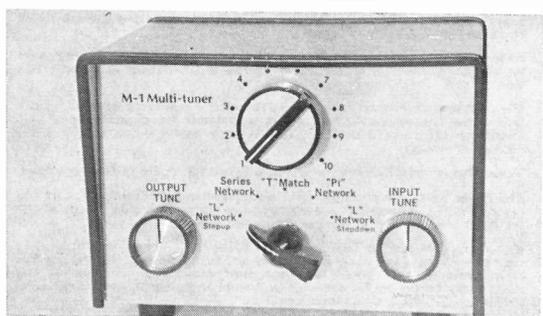
The North West's leading supplier for all your requirements. EASY ACCESS FROM THE M61-62.63—we're 5m. from M6, turn at the Greyhound Motel on the A580 (East Lancs. Road). OPEN 9.30 to 5.30, MONDAY TO SATURDAY.



**UNIDEN 2020.** AC/DC power supplies. CW filter. Noise blander, Blower. Digital and analogue display give direct readout. 2-6146B in PA 80-10 metres. Receiver is pre-mixed single conversion using phase lock loop oscillator circuit. Separate filters for USB/LSB. Price £495-00



**UNIDEN 2030.** 144-146 MHz FM Transceiver. 12 channels. 12v. DC operation. 10 watt or 1 watt output. Antenna impedance 50 ohm. Complete with microphone and mounting bracket. Price £178-74



**Mk. 1 MULTI TUNER.** Designed and manufactured by us. 50 tunable switched positions for antenna lengths over 5 metres in the 2-30 MHz range. Five different circuits to give an excellent match between your receiver and antenna. Now in use in over 35 countries. Price £17.00. MK2 Multi-Tuner covering 550 KHz to 30 MHz. £23.00

#### YAESU

FT101E	Transceiver	...	...	...	...	...	...	...	...	£482-50
FT200	Transceiver	...	...	...	...	...	...	...	...	£326-00
FT401	Transceiver	...	...	...	...	...	...	...	...	£412-00
FR101S	Receiver	...	...	...	...	...	...	...	...	£336-37
FR101D	Receiver	...	...	...	...	...	...	...	...	£438-75
FR101D	Digital Receiver	...	...	...	...	...	...	...	...	£540-00
YC355D	Frequency Counter	...	...	...	...	...	...	...	...	£160-00
FRG7	Receiver	...	...	...	...	...	...	...	...	£167-00
FT221R	VHF Transceiver	...	...	...	...	...	...	...	...	£403-50

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2ML	2m. Linear Amplifier	...	...	...	...	...	...	...	...	£112-50
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PS12	12v. DC 3 amp PSU	...	...	...	...	...	...	...	...	£37-00

#### BARLOW WADLEY

WE ARE PLEASED TO ANNOUNCE WE HAVE BEEN APPOINTED SOLE DISTRIBUTORS FOR THE BARLOW WADLEY RECEIVERS FOR THE MIDLANDS AND NORTH WEST. BADLOW WADLEY XCR-30 EX-STOCK AT £145 INC. VAT.

Complete with FM range ... £170-00

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Whip antenna gutter bracket	...	(post 25p)	...	...	£2-81
UR43 Co-ax 18p metre	...	UR76 45p metre,	...	...	
post 2p metre	...	75 and 300 ohm twin feeder	...	...	
10p metre, post 1p metre	...	Heavy duty 75 ohm twin feeder	...	...	
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Send us a large S.A.E. or 10p in stamps and we will forward you all the latest details and prices. All our prices include VAT at the current rate at the time of going to Press.

S.A.E. with all general enquiries please. H.P. and Credit facilities. Barclaycard and Access facilities. Trade-ins always welcome. We would be pleased to sell your unwanted equipment on a commission basis.

#### SECONDHAND EQUIPMENT

Yaesu FL101 Transmitter	...	...	...	...	£300
KW202 Receiver	...	...	...	...	£185-00
Yaesu FR101D Receiver	...	...	...	...	£350-00
Yaesu FR101D Digital Receiver	...	...	...	...	£450
Heathkit SB610 Monitor	...	...	...	...	£75-00
KW202 Receiver	...	...	...	...	£185-00
Barlow Wadley XCR-30 Receiver	...	...	...	...	£100
FV400S VFO	...	...	...	...	£40-00
Yaesu FT101 MK2 Transceiver	...	...	...	...	£300
Yaesu FR101D Receiver	...	...	...	...	£375-00
Eddystone 840c Receiver	...	...	...	...	£65
Heathkit Mohican Receiver	...	...	...	...	£35
Heathkit SB610 Monitorscope	...	...	...	...	£75
Heathkit RAI Receiver	...	...	...	...	£45

We can supply most items from stock. All equipment is sold from the above premises. We do not supply any agents or agents of agents who work from home in their spare time. All equipment is air tested and carries normal guarantee

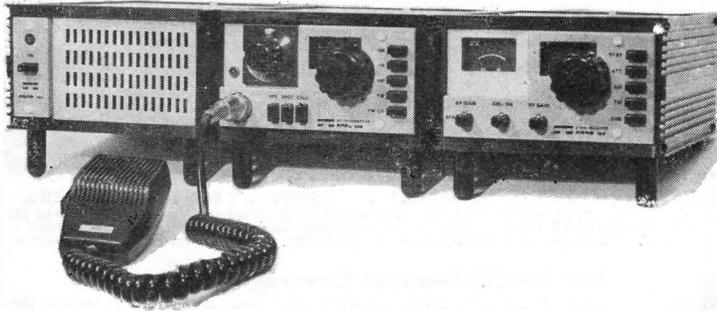
# S.T.E. MILAN VHF EQUIPMENT

We enter our third year as sole distributors for the S.T.E. range in the U.K. The popularity of this equipment is growing all the time. With the kind help of the Directors of S.T.E. we have managed to keep the prices stable for the past three years. This equipment sell for about 20% in some of the ECC countries and to keep cost to the customer down we have not sold to the trade and therefore you get the benefit of lower prices. The quality of these P.C.B.'s are the finest we have ever seen. Following on from the ARAC 102 receiver for 28-30 MHz and 144-146 MHz fully tunable we now have the ARAC 107 28-30 and 430-440 MHz with AM FM and SSB facilities. The base station AK20 transceiver will be soon supplied with mobile mount and also available in kit form. We also look forward to many new models from S.T.E. in the next year.

ASP 154

ATAL 228

ARAC 102



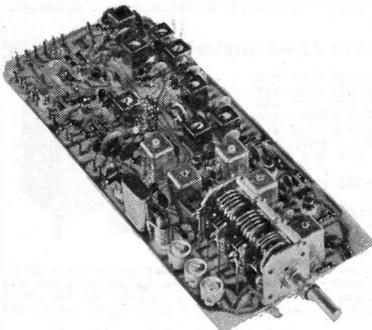
**SPEAKER  
AC POWER SUPPLY UNIT**

**144 - 146 MHz  
AM FM TRANSMITTER  
with Microphone**

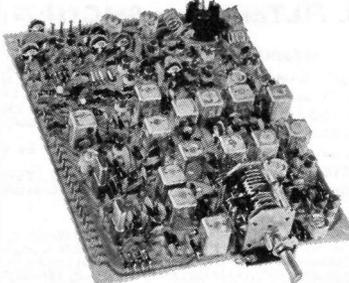
**28-30 MHz 144-146 MHz  
AM-FM-SSB RECEIVER**

**Price List (including postage)**

ARAC 102 Receiver	... ..	£100-00
Atal 228 Transmitter	... ..	£126-00
ASAP 154 AC PSU with speaker	... ..	£35-00
AR10 Receiver Module	... ..	£37-50
AA1 Audio Amplifier	... ..	£4-10
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AL8 Linear Amplifier	... ..	£27-00
AT22 Transmitter	... ..	£50-00
AR20 C.C. Receiver	... ..	£50-00
AT23 C.C. Transmitter	... ..	£36-00
AS 15 Stabilised psu D.C.	... ..	£10-00
AG 10 Tone Generator	... ..	£4-50
AC2A Converter 28-30 MHz	... ..	£20-00
AK20 Transceiver Kit	... ..	£120-00



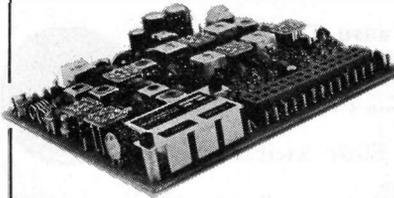
**AR10** Mosfet receiver. 28-30 MHz Double conversion superhet. RF and amplifiers stages are gate protected mosfets for good sensitivity and low intermodulation. Noise limiter and squelch circuit. AM, SSB and CW reception. 12v. DC.



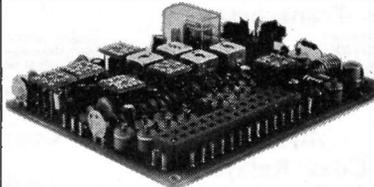
**AT 222.** A complete transmitter exciter unit for 144-146 MHz on AM or FM. VFO controlled or fixed channel operation. Complete with microphone pre-amp., speech processor including active audio filter. 1 watt output. FM. .25 watt AM. Output impedance 50-75 ohm adjustable. Frequency deviation 3-10 kHz adjustable.



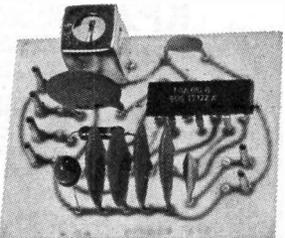
**AK20, STE.** Latest model from the famous STE Milan range of equipment. 12 channel operation in the 144-146 MHz range. 11-15v. DC operation. 3 watt output. Sensitivity 0.2 uv R.I.T. tone burst. Complete with microphone. Price £174.00



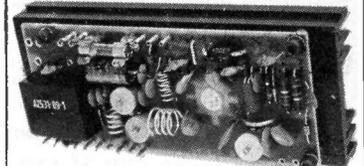
**AR20.** 12 channel FM receiver 144-146 MHz. Input impedance 50-75 ohm. AM-FM modes. Sensitivity 0.2uv AF output 3 watts. 12v. DC operation.



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



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



**Linear Amplifier.** Frequency 144-146 MHz output 10 watts FM, 8 watts PEP SSB, 8 watt AM. Input power 1 watt FM, .25 watt AM-SSB. Input impedance 50 ohm output impedance 50-75 ohm. 12v. DC.

**STEPHENS-JAMES LTD.**  
**47 WARRINGTON ROAD, LEIGH, LANCs. WN7 3EA**  
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## YAESU MUSEN SECURICOR SERVICE 2-YEAR GUARANTEE

WE THINK IT THE BEST NOW IT COSTS LESS !!

### FT221R—£339 (+ VAT)



#### FT221R FEATURES

144-148 MHz INCLUSIVE COVERAGE MULTI-MODE AM-FM-USB-LSB-CW 234V, AC or 12V, DC WORKING 11½" (14" x 5" x 11½" AND 22LBS, DUAL SPEED SMOOTH VFO DRIVE READOUT TO BETTER THAN LKHZ 44 FIX CHANNELS (4 x 11) (2 MHz)

SEMI BREAK-IN WITH SIDETONE UNIQUE AUTOMATIC TONE BURST P.T.T. MICROPHONE SUPPLIED FRONT PANEL ADJUSTABLE VOX FRONT PANEL ADJUSTABLE VOX FRONT PANEL MICROPHONE GAIN ALC EXTERNAL PHONO SOCKET 70W DISSIPATION PA DEVICE

600 kHz AND 1.6 MHz RPT. SHIFTS "S" / CENTRE ZERO/OUTPUT METER CLARIFIER (RT WITH RT + TT) 2.4 kHz SSB 12 kHz FM BANDWIDTH ADJUSTABLE SENSITIVE SQUELCH 100 kHz CRYSTAL CALIBRATOR SWITCHABLE NOISE BLANKER

Thanks to our bulk buying policy, we have beaten inflation and the falling pound saving you £22.50 on LAST YEAR'S price ! As an added bonus all new SMC FT221Rs cover 4 MHz and are equipped with 600 kHz and 1.6 MHz shifts.

Yaesu's state of the art technology brings you a fully modular plug in board construction, multimode, 2m, transceiver that renders over the board "rats nest" wiring obsolete. The 134 MHz phase locked voltage controlled oscillator, combined with automatic varicap tuning of the transmitter and receiver gives you, without resort to preselectors, an exceedingly clean transmit signal, and a sensitive receiver without degradation of strong signal handling capabilities.

#### THE FRG7 GENERAL COVERAGE RECEIVER Ex-Stock

The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drill cancelling loop for continuous, spin-tuned inclusive coverage of 5 to 30 MHz with calibration accuracy better than 5 kHz. Frequency selection is accomplished by setting the RF (pre-selector and range switch), dialling up the required number of megahertz, then tuning the VFO knob as normal.

The receiver is sensitive (0.5µV for 10dB, S + N/N (SSB)) and stable (within 500Hz for any 30 minutes after warm up) with A.M., SSB and CW modes catered for. A 3 position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required, 8 dry cells are automatically switched in.



#### A TRIO OF YAESU WINNERS ALL EX-STOCK IN TOTTON



FT301

Top to ten, solid state, transceiver 4 models to choose from, 10 or 100W output, digital or analogue.



FT223

2m, F.M. 23 channels. 12v. D.C.—10W, output c/w tone burst, mic, mounting bracket, smart sensitive and selective.



FR101

WORLD FAMOUS transceiver, top to ten capability 3 models to choose; 234 and 12v, DC speech processor, etc. Large range of matching accessories available.

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We stock the largest range of masts and antennas in the U.K. from the Versatower (copied but not equalled) to the products of Belgium, England and Australia detailed below.

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**TELESCOPIC LIGHTWEIGHT**  
3, 2 or 1.5m. Quick lock sections.  
Many versions 6 to 21 metres.  
Rigging extra. Carriage £2 VAT 8%  
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Galvanised lattice 10' sections.  
Freestanding with climbing steps.  
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10' steel sections c/w guy rings, etc.  
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**RINGO RANGER ARX** 6dB gain (over 1/4) ultra low angle radiation, excellent 50 ohm match uses 3 x 1/4 in phase and 1/4 stub, 145 MHz version approx. 9' 6" (& 1 1/2 lbs.) 432 MHz approx. 3' 6" (illustrated).  
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### SMC TRAPPED DIPOLES (Post 45p) VAT 12½%

S 500W P.I.P. 14 SWG ... £19-60 P500W P.I.P. Cu/Terylene  
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### MOSLEY TRI-BAND BEAMS (Carriage £2-50) VAT 12½%

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GQ2E 2 element ... £119-00 GQ4E 4 element ... £238-00  
GQ3E 3 element ... £178-00 CKIQ 1 ele. Conv. kit ... £60-00

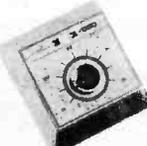
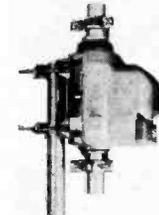
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Ex-Stock in Totton for fast delivery  
VAT-Rotators 12½%. Cable and delv. 8%  
Carriage (BRS or post) FREE. Securicor delivery £1 extra (mainland)  
All rotators supplied complete with appropriate control box and instrs.

AR30 (illus. right near and centre) ... £39-50  
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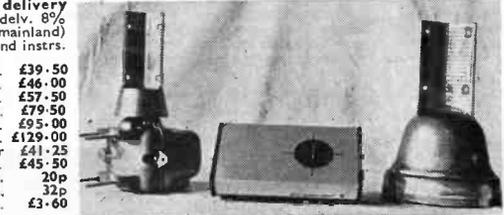
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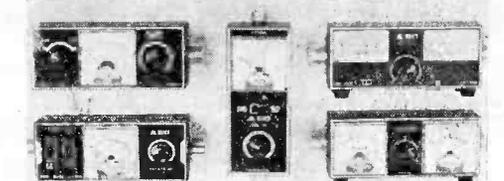
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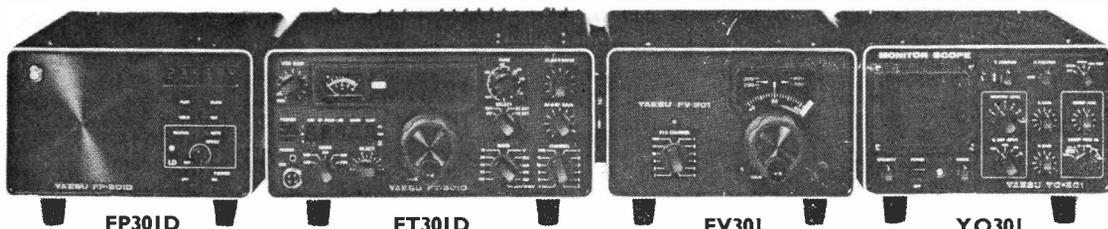
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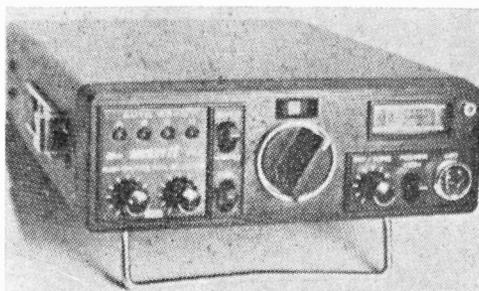
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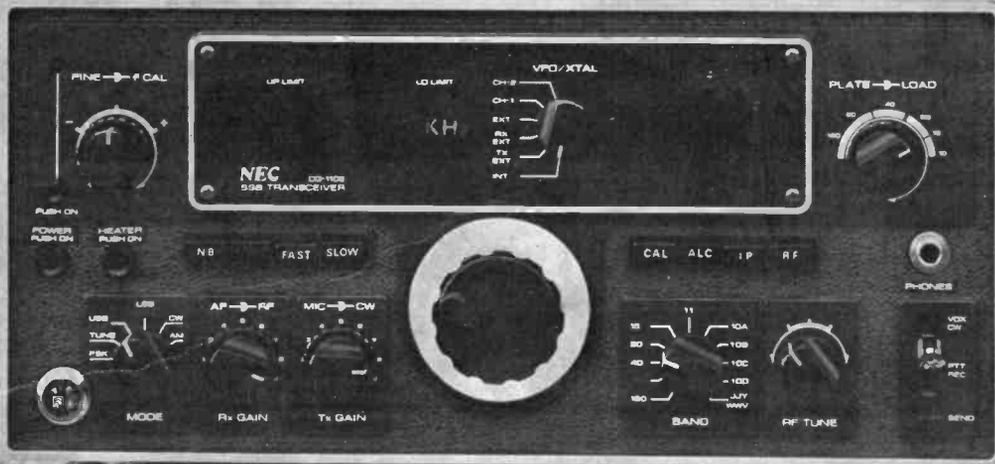
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# SHORT WAVE MAGAZINE

(GB3SWM)

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FEBRUARY 1977

No. 400

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*Advertising: Charles Forsyth*

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*The*  
**SHORT WAVE**  
*Magazine*

***Silent Key***

It is with the deepest sorrow that we have to announce the death, in his 70th year, of Austin Forsyth, O.B.E., G6FO, Editor of "Short Wave Magazine" since 1938.

As his death occurred while this issue was closing for print, a full Obituary will not appear until the March issue.

---

"Short Wave Magazine" will continue under the direction of the Assistant Editor until the new Editor is able to take up his position. In future all correspondence which previously went to Buckingham—particularly material for the feature articles—should be addressed to the Welwyn office.

## COMMUNICATION and DX NEWS

**E. P. Essery, G3KFE**

**L**AST time, we commented on the sudden onset of cold weather and its impact on those poor souls with outside shacks; and as this comes to be written those same chaps will doubtless find a *shovel* an indispensable aid to DX-ing—as the only way of getting a path to the shack and the rig! As for the writer, he has spent most of his valuable DX-ing time just loafing near the sources of warmth and sustenance.

Which is not to say the bands have been useless; far from it, the usual ups and downs have been noted, and each week there seems to have been significant sunspot activity; all in all *not bad for the time of year* is a reasonable comment on the state of the bands.

### Forthcoming

As we have mentioned in previous pieces of late, the true-blue DX-pedition merchants are, it seems in hibernation, but there are rumours around for those with an ear to the ground. For example OH2BH has been looking into the situation regarding Bouvet; the LA-group left on November 22, and were going to operate as 3YØCC from End-Antarctica, heading back at the end of January for home by way of Bouvet and Cape Town; however, the snag is that Bouvet will only be a stop-over if the weather permits, to site a buoy; the absence of a helicopter facility makes the weather position all-important. Listening to LA5DQ keeping skeds with the expedition would be a good thing to do if you really want this one. If it fails, there is an ice-breaker due to be completed in the coming autumn, which will carry a couple of "choppers" and be used primarily to service the bases at Marion, Gough, End-Antarctica, and Bouvet—so patience will in due course reap its deserved award.

It may be recalled that we recorded HZ1AB as being a Silent Key due to a helicopter accident back in the summer; it seems that the call is still being used, the current holder/operators being WB9FUV and WA4FGC; the mailing address is:

HZ1AB, Hqtrs. USMTMSA, Attn: J-6, APO New York 09616. QSL's should contain the SAE in the envelope or self-addressed envelope and IRC's.

If you still haven't worked AJ3AA, it's too late! The station reverted to its normal call at the end of the year, having racked up some 35,306 QSO's; say 3000 a month, or about 100 a day! Now that, *mes amis* is an *active* home station! Another odd little quirk of fate is that W6PT has an SWL card from Geyser Reef—yes, an SWL report!—it seems W6PT was enquiring of G2BY as to whether Bill Rindone was around, the while Bill on Geyser was hearing W6PT but couldn't raise him!

However, having pretty comprehensively demonstrated that the bands are not plastered with island DX-peditioners rushing hither, thither and yon, we might turn to other things; for example, the DXAC turned down the LA1SH/BY QSL's for DXCC purposes, they being of the opinion that the station, was operated maritime mobile though the operator, we understand, insists that the exercise was carried out on dry land. This is hardly a surprise, we have to admit.

### Ten Metres

The general consensus of opinion is that it is a very good band on its day—but there haven't been any days this time round! Thus the comments range from "Gave it a miss" to "heard nothing" and so to the ultimate "Oscar Six heard!" and, while the moment of writing is not necessarily the time when no more news will come in, we feel reasonably confident in closing down the file on this band, at least in DX terms.

### Fifteen

There are many who say this is the best band of all for Dx activity over a period of years; the occasional off moments being offset against the noise and QRM on the lower bands, and your scribe will admit to some sympathy with the idea after a few

trials during holiday or illness periods midweek, rather than judging solely on the heavy occupancy at weekends. One must envy those few who, for one or the other good reason, can keep a rig at the salt-mine, and chase DX while dictating letters or whatever!

All this having been said, along comes G4EAN (Nottingham) who had just one day, with the TH3 cranked up to fifty feet *and* the linear switched in—and he picked a bad 'un!

GM3YOR (Kirkcaldy) made good use of his holiday time, and was to be heard on all the bands at one time or another, always on CW; 21 MHz catches were CO2BB, W2CRG, K4TM, WA4SFN, W8CYA, and WB9RZU; but, says Drew, the list of Gotaways was *much* longer!

G4EDG (Newton Abbot) definitely favours this band, one feels. Be that as it may, it came up with UAØYT in that elusive Zone 23, VP2VDJ, 5Z4NH, VP2ABC, VK8OB, A9XBD, ZS5ZD/3D6, P29JS, WA6EGL/VQ9, ZL4NA, ZL3GQ, A4XVK, CO2BB, VS6AF, ZD8W, K4DBZ/C6A, VP2M, VP2LDT, W6FDG/6Y5, AP2AL, JA1PIG/PZ; but no more JA's. Interestingly enough, Steve comments that much of the DX on this band was worked by throwing out a CQ call on an apparently dead band.

G4DMN (Wirral) stuck to Eighty for most of the time, but he did make pilgrimage to 21 MHz once; his prayer yielded a QSO with PYØZAE on Trindade Is.

### Now Twenty

This, most people would say, is where the action is—when the band is open, which at this time of year means the times when we are at work! But, alas, there is not much we can do to alter the Laws of Nature, however much we would like to. The first thing any regular user of the band would ask, had he been away for a few days would doubtless be "Has that Pestilential Noise-Thing from Poltava gone away yet?"—to which our cautious

reply would have to be that it doesn't seem to be around quite as much as previously (at least, when the writer has been around—he has not had much chance to enquire of other DX-ers if they have met up with it at their preferred operating times). It has also been noted that the strength of the Thing when it is on, with an aerial of reasonable quality but short of the gain of, say, a beam, is such that it is capable of driving the receiver into non-linear operation, which indicates that there could be times when operation is possible through it on parts of the band "least" affected by using attenuation in the receiver front-end.

Our first stop is with G4EVO (Broadstairs) still knocking them off with his five watts and Joystick. This month the pattern seems to have shifted from Eighty largely to Twenty, and the couple of watts of RF output from the machine seem to have connected to most of Europe and out on into Asia; the interesting thing about these real QRP contacts on CW to the writer is to survey the *incoming* reports as compared with, say, a station running 100 watts output; over the few pages of comparison, in both cases the average of R4 or poorer reports received comes out at about one QSO per standard log-book page which is an interesting statistic; it would be rather interesting if someone who operates to the tune of around a log page a week—i.e. both sides of a page in a fortnight—all CW, and someone else who does about the same rate of operating but all SSB were to send us Xerox or similar copies of the log pages for a couple of months, to compare against G4EVO's QRP flex-power and simple receiver of the Argonaut. And of course, one must also accept that G4EVO might be a Senior Citizen, but he has been using Morse for umpteen years before ever he took to our bands, which no doubt explains much of the reason why his incoming report is R4 but he is dishing out R5 to the chap at the other end despite the simple receiver. With the exception of Andorra, and possibly Monaco, one cannot recall any European country with which the little box hasn't completed QSO's.

Twenty is an uphill slog all the way compared with Fifteen, avers

G4EDG, who consequently didn't put in a lot of time on the band; nonetheless, he worked VK4YS, ZL3FM, DJ0UP/VP2D, VP2LDT, W7LCF in Wyoming rounding things off. However, the month was not without its problems, the rig having done its celebrated imitation of Guy Fawkes night, burning out the PA RF Choke, the PA bottles, and most of the shack mains wiring *while he was on receive!*

Twenty for GM3YOR was all CW this time: PY7APS/1, PZ1AP, UW9WL, W1VYE, K2OZ, K2TD, W4QQN, W6WU, W0PA, and VE3DMC not to mention lots of Gotaways.

With cautious optimism, G2HKU (Sheppey) notes that his ZL sked contacts have held up better this winter than last, at least until the time of his letter, but on the other hand static-charged rain has been a bit of a nuisance at times. SSB skeds were kept, as for many years with ZL's, notably ZL1AAE, ZL1VN, ZL1DB, and ZL3SE, while a spot of brasspounding managed to connect to AA7RKJ, PY1RO/0 and PY0FOC, both the latter being on Fernando de Noronha.

G4EAN (Nottingham) seems to have tried 14 MHz during the mornings, mainly to Europeans in SP9AUS, LA8SU, SM0DZL, SM2ELB, SP9KKA, SP9KRT, HA5KHE, OK2KLA, SM2AHP—plus VK4IV and K2JZT to relieve the gloom. On the other hand, all amateur radio is not operating—Ian cleared up his QSL chores right up to date from April 1975!

### Forty

Someone known to the writer once described it as the "Roaring Forties"—a not inept description when you come to think of it, for a band where, at this season and section of the sunspot cycle, one may burrow down through the noise at more or less any time with some hope of finding gold among the dross. One may recall a couple of months ago someone remarking that the use of a Q-Multiplier and audio filter plus a careful tune of the band could dredge up some most remarkable things in the line of DX. Your scribe, as remarked last month, had a dud battery in his MFJ filter, and so had to go out and buy one—

aren't they a price these days!—and having fitted it, tried the filter by plugging into the TS520, which by luck happened to be tuned-up around mid-band on Forty. So, with the '520 on CW, receiving it through the MFJ filter, and with around 20 dB of attenuation in plus the maximum the MFJ could give, we crawled up and down Forty at a snail's pace for thirty minutes. This, around 2100, and when conditions didn't seem all that dandy; EU's of course, but a layer or two down one immediately ran across a brace of VK's, a JA, and several East Coast W's, all good copy, South America, and a questionable African—further investigation of the latter was cut short by a telephone call. At the time, 14 MHz and up were dead. Old hands know this, and, one suspects, keep the good news to themselves!—but the point we were trying to get over is the advantage of throwing everything in the way of selectivity one has got into the system, and then having a slow and thorough winnow through the rest, to those who normally write the band off as not worth bothering with.

However, to return to our mutttons, GM3YOR doesn't seem to have spent a lot of time on the band, but he did stam on it enough to shake out CW exchanges with UA9WBV and ZS5A.

G4EDG met up with the Russian Thing from Poltava on occasion, and was irritated enough to modify his FT 560 by hoicking out the noise limiter, and using the hole so obtained to fit an attenuator; like everyone else who has tried it, Steve found it made an improvement—for example, VP2EEQ, UJ8AQ, UI8AAH, WB00ED, JE3MCC, EA9EO, PY1RO/O and PY0FOC, both on Fernando da Noronha, PY0ZAE still doing business on Trinidad Is., W0HR and ZD8TM in the pre-Christmas era, plus UM8MAO, TF30F, YS1JWD, 9K2EP, VE1ZZ, K4CG, K8IDE, VO1KE, 9Y4A, VP2M, FG0BG, and W7NW for Arizona.

CW on Forty was used, but only once, by G2HKU, when he made contact with UD6DIT.

### Here & There

CQ has produced the results from

the CQ WW WPX Contest earlier in 1976. The U.K. does not have a representative in any of the final "Top Scorers" listings, but quite a few G's, GM's, GW's, GC, were noted as having entered the contest, and some club entries.

Along with the 1976 results, WIWY sends along a note that the same rules apply for the 1977 contest which will be over the weekend March 26-27, 0001z to 2359z. See you there?

A rather clown-like decision by REF changed the rules of the French Contest with no time for the Rules-change to be disseminated through the various DX columns of the world for at least the CW leg, and for most people the Phone one too—so REF have made a rod for their back when it comes to clearing the log scores and placings up.

The ARRL DX Contest is all but on top of us; for Phone the weekends February 5-6 and March 5-6, and for the CW sessions 19-20 February and the same in March. Essentially the Rules are the same as they have been for the past two years, save that single-operator stations will be classified into All-Band, High-Band (14-21-28 MHz), and Low-Band (1.8, 3.5 and 7 MHz). W's exchange RST plus state or province, while DX—in which are included KH6 and KL7—swap RST plus a three-digit number giving power input, which gives cause for much merriment among QRP club members during the CW leg, when they send, say, 002 and the W comes back querying what he *thinks* is a serial-number from someone who doesn't know the rules! The scoring is three points per contact, times a multiplier which is the sum of the number of W states worked, plus VE call areas 1-8, plus VO. Statesiders use a multiplier comprising the number of DXCC countries worked.

Also in March—March 12-13—is the Commonwealth Contest, the modern form of what most old-timers will always describe as BERU; probably one of the oldest if not *the* oldest continuous-running shindig.

Yet a third one is the BARTG Spring one for the RTTY buffs, which, sadly, coincides with the CQ WW WPX contest weekend.

Looking a little further ahead, we have the Swiss Contest H22 dates as 1500z April 23 to 1700z April 24. This one is a CW and a Phone contest all rolled into one, as the only restrictions seems to be to bar cross-mode contacts and cross-banders. Exchange RST plus a serial number starting from 001 (The HB's will also send after the number their two-letter abbreviation for their Canton, which must be noted). Final score is the total QSO points at three points a QSO on each band plus a multiplier of the number of cantons (a maximum of 22) worked on each band. Logs to be postmarked not more than thirty days later than the contest, and addressed to: TM USKA, HB9AHA, im Moos, 5707 Seengen, Switzerland.

On an entirely different tack, we have a letter in from G4CJG, who hopes to be going /MM, aboard the MV Ocean Transport, GHTH, from January to April, using FT101B and an 18AVT/WB, the crystal frequencies being 14104, 14243, 14330, 21104, 21243, and 21330 kHz. Look out for him around 1300z or 1830z.

Earlier on we mentioned the AJ3AA marathon; oddly enough there was a similar domestic effort going on on Top Band, where G8KP up in Wakefield looks to have run up in excess of 3000 contacts in 1976 on Top Band alone! Nick, G2NJ, who passes this information on, has his QSL as the 3000th contact. It all started as a bit of a joke, G8KP having booked in quite good business at the start of the year, and he decided to see whether a reasonable QSO-rate could be maintained through the summer and indeed the year—it so panned out that Bill only missed about four or five days. Just to make it a little harder, G8KP added himself another Rule, which said only one QSO with a station per day.

### Eighty

QRP results are the thing that interests G2NJ—and many others too—on Eighty; Nick managed to work G3XUL who had an input of one half watt, a shining example of what can be done, and that on a very noisy band; then there were G3FMW in Harrogate, G3GET in Sittingbourne, at 2.8 watts, and G3KPT

in Birmingham who has an HW8 and has already in a few weeks racked up an impressive total of countries worked with it.

G3CED (Broadstairs) hasn't managed the time to get on the air this past month, due to pressure of work, but he did find time to send on the G4EVO log, commenting that G4EVO was nurturing a 'flu bug and had joined the QRT brigade temporarily.

Which takes us to G4EVO. Frank, as has already been said, was using Twenty far more than Eighty, but the latter was not completely forgotten. A favourite contact seems to have been with G2CAS in Harrogate, QSO's with John having accounted for half the 3.5 MHz activity; the rest seems to have been up and down the country and nearer Europe, it being understood that G4EVO is a strictly day-bird, his latest QSO on any band being 1600z.

GM3YOR looked in on the band for a moment, and a little "fishing" in the muddy waters with CW eventually netted WIHOC.

G4EDG found it a "decidedly LF sort of month" at his shack, with Eighty opening up at definitely *civilised* hours—not much before 0700, and DX being about at times like 2100; the pickings include KP4BCL, UH8AI, HC2SL, PYØFOC, PYØZAE, UAØAG, UWØAJ, EA9EO, UL7TBM, LU8AHW, ZL3GQ, W6PM, and W1GN (Oregon) on CW, while the SSB hooked up with YV1TO, and CT2BU, the latter, as Steve puts it "all my own work and not on the DX Net!"

G4DMN seems to have concentrated on Eighty, with an 18AVT on the one hand and also an inverted-vee with it's apex at fifty feet available. In December this was the way of things on SSB: EA8's, EA9FE, EA9FL, FGØCRZ/FS7, FGØMM, FP8DX, FP8MM, JA6GDG, JW9FD (Bear Is.), HP1YV, OD5LK, UK9AAN, UL7IBC, VE3, VE2, VP2LDU, VS6DO, all W call areas, XE1FR, XE1LFH, YS1JWE, 6W8A, 6W8FP, 9K2DR, 9L1NP; while the January letter indicated eighty-only as the current play, with CW to UF6OAA, and UH8DU, plus SSB to CN8BF, FG7AO, WA6UAG/

FM0, FM7AQ, HP1YV, HI8RRD, JA1KXY, JW9WT, K6UA, K0RF, KZ5HP, KZ5ED, OY2A, PY5AGK, PJ8UQ, PY5ALD, SV0WZ, TI2BY, UK9AAN, VE1-3, VP2EEQ, VP2VBG, VP2LDU, VE8RR, W1-5, W8-0, XE1FR, XE2AX, XE1KB, YS1AG, ZFI AK, K2IZN/4X, 4X4BT, 4X4AS, 4X4UB, and 7X0BI.

G2BJY (Walsall) continues his Eighty-metre activities, with a spot of receiver home-brewing on the side; so far the beast has been tested and found good on Top Band Eighty and Forty, and so far it has come *entirely out of the junk-box*. We will have to see if we can persuade Geoff to write it up! On a different tack in the correspondence we were discussing the number of ways in which a QSL, complete with SAE or IRC, can be sent and fail to result in a reply without involving the recipient in any blame—and when you add up the number of ways in which this can happen it becomes a marvel that QSL cards ever arrive at all! In fact the correspondence was sparked off by G2BJY being asked for help in getting wanted cards by a DX station; the list was quite long, and contained lots of call-signs—but out of the whole lot only one station could be said to merit the description of being lax in his QSL-ing, the rest being stations who were known either to G2BJY or the writer, or to both of us, as being absolutely meticulous in responding one hundred percent to incoming cards, whether from any Bureau or direct, and with or without SAE/IRC.

### Top Band

We have already mentioned the G8KP Top Band marathon, which was brought to our notice by G2NJ; and the fact that it was G2NJ made one wonder what Nick was up to, he not having been heard on Top Band for many moons. As always, reasons will out, and it seems that Nick has dug out an old war-time transmitter from his "archives" which was modified from crystal-control to VFO without the addition of another valve to an idea by G3EEL, the little rig in the first instance having been bought for a fiver. Rather interesting in a way, in that Nick has clearly forgotten

to whom he gave the fiver a quarter of a century ago in exchange for the little boxes; and when your scribe some few years later acquired another of these same little rigs, he modified his for VFO on Twenty and so had his first taste of TVI—this mod, one seems to recall having been to the address of G3EEM. Anyway, G2NJ has managed some hundred QSO's with it in thirty days, with some slight emphasis on contacts with HB's. On Christmas Eve there was HB9T, who used to be worked twenty years ago when G2NJ had a boat in the county of Huntingdonshire from which to operate; then on January 2 it was HB9CM, who recalled working G2NJ and G6BQ way back in the thirties. On looking up his old logs of the time G2NJ notes that both he and G6BQ used to operate mainly on Forty in those far-off days.

### Vale

It was only by chance that your conductor became aware that G8HX of Mansfield had joined the ranks of the Silent Keys; Frank had been a reader and occasional contributor to this piece since first your scribe took over the writing of CDXN; and for many moons he was the Hon. Sec. of the Mansfield club. He will be missed from the scene of Amateur Radio.

### QSL's

We have already touched on the number of ways in which an out-going QSL can fail to net its due reply even though the intended recipient is known everywhere to QSL 100 per cent to incoming cards; one of the more obvious ways is send the card to the wrong person! Thus, this collection, culled from W1WY and West Coast DX Bulletin might help: 5W1AB, to W4KA, Leo Haijsman, 1044 S.E. 43rd Street, Cape Coral, Fla. 33904, U.S.A.; A4XVK to G4BVH; A6XS to G3SUW; G31JX to DK9FE; C31NA to F2PC; C31KA to c/o Klaus Gerlach Am Muellrain 12, D-644 Bobra, West Germany; OESGML/YK to OE5REB; PJ8CO to K1CO; TA2DX to DJ9ZB; VP2EEQ to Yasmc; FR7BE to B.P. 137, Tampon, Reunion Island; HC5EE to WA8TDY; XT2AG to W1AM; VQ9DF to ON6FN; VQ9HCS to WA1HAA/4; VR3AH

to K2BT; VR3AK to KH6AHZ; VR3AR to WA3GQA; VSSMC to DJ5JA; VS6DO to K4CIA; and FP8DS to K9OTB. And one has to admire the optimism of WCDXB's heading to the list of QSL addresses: "Strike it Rich!"

### Mailing

In an already "difficult" situation because the January issue date fell so near the deadline, it was no great help when a packet contrived to go astray containing some CDXN materials; so will the unfortunates who have missed their mention from this piece accept our apologies—but on the other hand, don't shoot the postman!

Having relieved himself of that broadside, your scribe must now come back to the point of the matter insofar as concerns CDXN. In an experiment to improve our internal communications system, we propose, for the moment, to ask everyone to *send their material to the Welwyn office*, from where the internal sorting will be done; we hope this will help us to get the material to their various users, such as Club Secretary, your conductor, or VHF Bands, or indeed SWL. In due course we may try other changes to the same end, of which we will speak if and when we come to them.

By the time this comes to be read, we should be beginning to see the beginning of the Spring lift in radio conditions and be at the worst point of the winter weather-wise with only improvement to look forward to—and that can't be bad! However, the season brings its risks, so we hope all readers will take care if the winter continues as it seems to have started!

### Finale

Let's hope we shall all be dead on target next time, in which case your contributions should be posted to arrive by first post on February 8, addressed to your scribe, CDXN, SHORT WAVE MAGAZINE, 34 HIGH STREET, WELWYN, HERTS., AL6 9EQ. On the other hand if there are problems, mail can be, *for this month only*, sent direct to your scribe—the address is OK in Call-book—to arrive by first post on 10th.

## THE OTHER MAN'S STATION

THE subject of our picture is G3TKL, owned and operated by W. R. Longmire, Overlea, Stanah Road, Thornton Cleveleys, Blackpool, Lancs., who was first licensed in 1964, after attending R.A.E. classes and brushing up his Maths and Algebra. As he admits having been born in 1895, that meant that he was all but seventy when he started on the trail towards an AT-station licence—which should be a great encouragement to all those more senior SWL's who do not try for their ticket, on the grounds that "learning is too hard at their age!"

His first contact with "Signals" came with his enlistment in New Brunswick in 1914; and in the course of that war he was wounded four times. At the end of the war, G3TKL attended a course in Electrical Engineering at Nova Scotia Technical College and by 1921 was Chief Inspector, Electricity and Gas, Province of New Brunswick. However, the young man has to have his fling, and so in 1926, G3TKL returned to England, when his parents had emigrated twenty-odd years before, and started at Manchester Technical College, taking a

course in Flour, Confectionery and Sugar Confectionery, and the following year he was able to make a start in this line of business. Through Hitler's War G3TKL was in the Observer Corps, but still managed to build up his business until by 1945 he had 63 employees. In that year he retired, and fifteen years later the radio bug bit; after three years of SWL, it was a case of "back to school" on the R.A.E. trail, with G3TKL at the end of it.

Looking at the picture, there is a nice assortment of old and new, commercial and home-brew. Codar, Collins, Drake, and KW are all represented; outside there is a Versatower with a Mustang three-element beam on top; and the G3TKL shortened Top Band vertical which quite a few people use, although G3TKL himself is careful to say that "It can be over-rated" which is less than fair to himself.

Under the digital clock at the centre of the console, the sharp-eyed will have noticed what looks very like the paddle of an el-bug—it is just that, and on the very day he posted the picture to us, his incoming mail contained a R.N.A.R.S. certificate for copying their QRQ runs at 20 w.p.m. G3TKL might be over eighty, but he is a very capable operator; long may he be able to continue his activity on the bands.



*For this month's Reader Small Advertisements, see pp. 762-766*

## R.A.E., Q. &amp; A.

SUBJECT No. 765, MAY 1976 —  
ANSWERING ALL QUESTIONS

THE May 1976 Radio Amateurs Examination results here presented were written out in longhand by the writer, less the Figures, in 2½ hours; of course to produce from this script the copy and figures for publication took considerably longer. Bear in mind that this included the extra questions which a candidate can neglect as he chooses, and that it also included *both* halves of the Question 3. It is thus reasonable to expect that the average candidate should be able to produce answers of this standard in the time allotted if he is well prepared.

From the candidate's point of view, and assuming he is adequately prepared, it is perhaps germane to consider which questions *not* to answer in Part 2, bearing in mind that one is required to answer any six from eight. As each one is to be allocated twenty minutes, so as to get the required number of answers plus time to "dot the i's and cross the t's" (not to mention the *careful* reading of the paper before you pick up your pen), any questions which look as though more than 20 minutes to solve will be needed should be regarded as last-ditch efforts, only to be tackled if one has a mental block on other questions (i.e., one is not fully prepared!). In the May 1976 paper, one feels that Question 3 comes into this sort of category, for the following reasons: 1. You have to produce either an adequate drawing of a diode, or one of a semi-conductor rectifier, followed by an adequate explanation of how the chosen one works; and 2. Having done this, one has to draw the circuit diagram of a PSU, and explain its working principles, which means that one has to talk about a transformer, a bridge rectifier (and, note, what is commonly called a "full-wave" circuit using two diodes only is in fact a bi-phase half-wave with the transformer secondary centre-tap as the "common" of the output, which, strictly, is *not* a full-wave job although the writer would feel a candidate who drew and explained this circuit would "get away with it" on the grounds that it is so commonly called full-wave), show how the output looks at the bridge, and how this becomes smoothed by the capacitor, not to mention describing how the volts travel the way they do through the various diodes of the bridge. All this lot adds up to far more than 20 minutes for a *good* answer. Question 8 also comes near to falling into this category if it is to be dealt with adequately.

Calculators are allowable now, and no doubt there will be people using them; if a "scientific" machine is taken to the Ohms Law problem at Question 5, and the numbers pushed in and inverted using the 1/x key, don't forget that, when you get the startling "2 times 10<sup>-2</sup>" you have to again punch the 1/x key to get out the proper answer which of course is 50 ohms! The reason for this being so confusing is that when the "scientific" machine goes into algebraic notation the "10" in the above statement is *assumed*, which can confuse a user who can read it as 2<sup>-2</sup>—a vastly different number!

One final point; and it is a *very* important one. There are various drawing conventions, which are generally understood, but Fig. 1 is drawn to the British

Standard one used by the printers of the R.A.E. paper, in which the rectangles take the place of the zig-zag line normally used to symbolise a resistor; the rest of the illustrations are drawn to the normal Magazine convention, which will probably be very similar to the convention used by candidates.

## RADIO AMATEURS EXAMINATION, MAY 1976

The examination is divided into two parts; failure in either part will carry with it failure in the examination as a whole.

Each question in Part 1 carries 15 marks; each question in Part II carries 10 marks.

Answer EIGHT of the following ten questions as follows: BOTH questions in Part I, and SIX questions from Part II.

Q.1. (a) List the types of messages and signals which the holder of an Amateur (Sound) Licence is authorised to receive.

(b) What are the requirements on a licensee who receives a message the receipt of which is not authorised by his licence.

(c) On what frequencies, or bands of frequencies, should an Amateur (Sound) station be equipped for reception.

## Answer 1

(a) Messages from other amateur stations which are remarks of a personal nature to the licensee or to the station with whom he is in contact; procedural signals in connection with such messages; messages from other amateur stations in connection with disaster relief operations conducted by the British Red Cross, the St. John Ambulance Brigade, or any police force in the U.K., at the request of these organisations, plus the procedural signals in connection with such messages; and any signals in the Standard Frequency Service.

(b) He must not copy, or allow a copy to be made, of it, or disclose it, its content, or the fact of its existence, except to a duly authorised officer of Her Majesty's Government, a person acting under the authority of the Secretary of State, or a competent legal tribunal.

(c) On all bands and modes of emission for which the station is equipped.

Q.2. See Fig. 1, which is part of the question, and note the drawing convention used.

Fig. 1 shows the circuit of a low power amplifier for a Morse telegraphy transmitter.

(a) State the function of

(i) L1, R1 and C1

(ii) R2 and C2

(b) What are the disadvantages of keying the oscillator stage of a transmitter?

## Answer 2

(a) (i) So modifying the shape of the RF output envelope waveform of keying that the square edges are "rounded off" to a sufficient degree to prevent the transmission occupying an excessive bandwidth due to key click radiation.

(ii) R2 and C2; the presence of R2 is enough to prevent the valve cathode shooting up to HT plus rail voltage when the key is open-circuit and thus saves risk of over-running the heater/cathode voltage rating under keying; C2 is present to decouple the key-leads

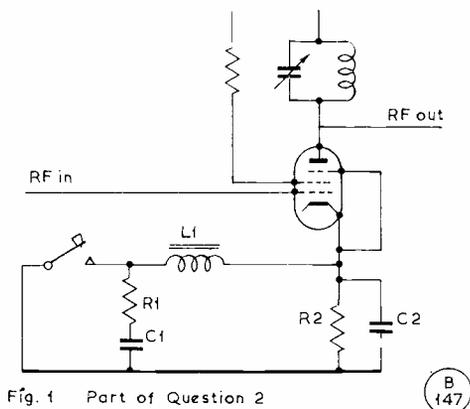


Fig. 1 Part of Question 2

B  
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to RF. (*Editors Note:* Many candidates will no doubt have thought of R2 and C2 as providing protective Class A bias to the valve in the event of a drive failure; but even though no values are given, this answer must be incorrect as in such an event keying would not be arranged as shown in the drawing due to the presence of a "spacer" under key-up conditions.)

In addition to the above points, it should be noted that the presence of R1 and C1 will also tend towards reduction of sparking at the key contacts, thus reducing the "local" clicks due to sparking being radiated by the keying leads external to the transmitters; some compromise between the *main* function as outlined in (i) above, and the spark-reduction function should enable one to radiate a clean RF signal and still hold sparking down to an acceptable level from the TVI/BCI point of view.

(b) As an oscillator stage is keyed, the voltages at the terminals of the active device will of necessity be changed. As these voltages change, so will the oscillator frequency to some extent change. Hence, if the voltage change occurs quickly the outgoing signal will sound clicky, but if an attempt is made to slow them down the result will be a chirp on the outgoing signal. In addition, if there are more than one Class C stage between the oscillator and the aerial, these will in any case square up the signal under keying conditions and so give clicks unless some special method of "differential" time-constant keying of several stages is adopted.

#### Part II—Answer ANY SIX questions from this part.

Q.3. (a) Describe, with the aid of diagrams, the operation of EITHER

(i) a thermionic vacuum diode,

OR

(ii) a semi-conductor rectifier.

(b) (i) Draw the circuit diagram of a full-wave rectifier power unit capable of providing a smoothed output of 25 volts at 2 Amps from a 240 volts 50 Hz a.c. mains supply.

(ii) Describe the full-wave rectification action of the diodes.

#### Answer 3

See Fig. 2 and Fig. 3, covering the valve and semi-conductor diodes respectively, plus Fig. 3c which is the

circuit called for at 3(b)(i).

A thermionic diode consists of a heater/cathode assembly, surrounded by and separated from, an anode, as shown, the whole being placed into a glass envelope which is then given a high degree of vacuum.

The heater is within but insulated from the cathode, and carries sufficient current to raise it to a temperature at which it will heat the cathode to its correct emitting temperature; this heater is the first bit of glow red inside the valve when it is switched on. The cathode may be its own heater (filamentary type) in the higher power ranges, or most likely will be just a cylinder as drawn, surrounding the heater, and coated on its outside surface with suitable oxides to ensure adequate emission of electrons at operating temperature.

In the absence of any voltage on the anode, or any external path from anode-cathode, the electrons which are emitted remain around the cathode, forming the "space charge" around the cathode. When the anode is given a voltage positive with respect to cathode, and a return path to cathode exists outside the valve, then the electrons will be drawn from the space charge towards the anode and current will flow in the external circuit. If the anode does negative with respect to cathode, any electrons will be repelled from the anode and stay in the space charge; thus in this case no anode current flows, and we get the characteristic curve shown at Fig. 2b. The flattening at the upper end of the curve arises when the anode current tries to rise higher than the emissive

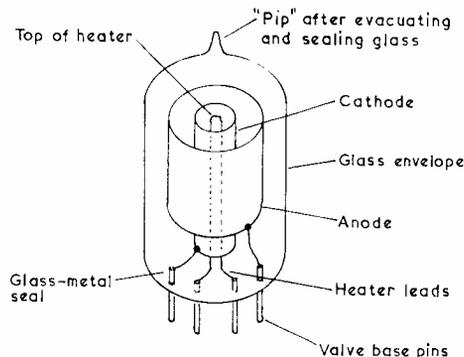


Fig. 2(a) Thermionic diode To go with Qu.3(a)

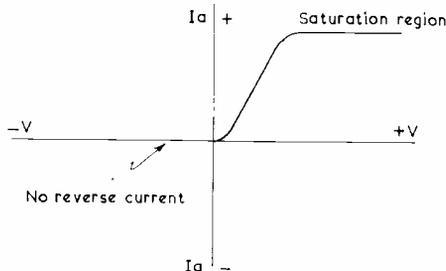


Fig. 2(b) Diode characteristic To go with Qu. 3(a)

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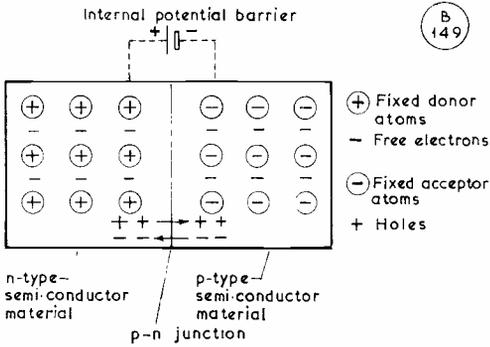
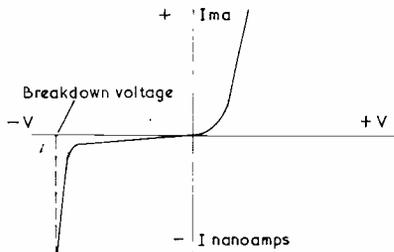


Fig. 3(a) Semiconductor diode. To go with Qu.3(b)



Note - Forward current is in milliamperes and reverse current is in nanoamps.

Fig.3 b Semiconductor diode characteristic. Qu.3(b)

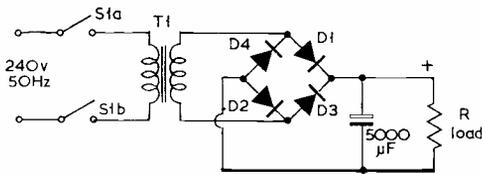


Fig.3(c) 25V 2A Power supply To go with Qu.3(a) or 3(b)

Now reverse the battery connections, and it will be seen that the polarity is such as to cancel the barrier potential and so encourage migration across the junction as shown in the curve of Fig. 3b; the curvature at the bottom end is due to the low external potential not completely overcoming the barrier potential, and current increasing as the external voltage gradually rises and completely cancels the internal potential from when on the curve is fairly linear to the limit of the device. It should be noted that the small reverse current is shown to a different scale, for example nanoamps reverse current and milliamps forward current.

Consider Fig. 3c. A transformer capable of the desired voltage and current is selected, and four diodes capable of carrying considerably more than the mean current of 2A to be taken from the load; they should also have a peak inverse voltage rating of at least 50V to allow for the occasional "spikes" of high voltage coming in on the mains supply. The capacitor may be, say 5000 uF at a working voltage rating of 30 volts, electrolytic. Let the top end of T1 secondary be positive with respect to the bottom; current flows through D1 to the positive terminal of the capacitor, through the load, and back to the bottom of the secondary through D2, the other two diodes being back-biased and so non-conducting. Thus, initially a heavy current flows into the capacitor as well as into the load, so that it is charged to the peak voltage or near it, and when the voltage starts to fall away the capacitor discharges through the load and so keeps the voltage across the load nearly constant. Once the secondary potential has reversed, D3 and D4 can start to conduct and D1, D2 are now back-biased, so again charge flows into the capacitor and into the load in parallel until the voltage is past its peak when again the capacitor discharges into the load to hold the voltage across the load terminals to a reasonably smooth DC voltage depending on the capacity used.

- Q.4. (a) What factors decide
- (i) The ratio of output volts to input voltage in a power transformer
  - (ii) The maximum secondary current that may be permitted to flow?

(b) A power transformer has a primary winding of 1600 turns and a secondary winding of 200 turns. If the primary is connected to a source of a.c. at 240 volts 50 Hz, what voltage will appear across the secondary winding? (Assume losses to be negligible)

(c) Describe a typical low frequency power transformer and state why a laminated soft iron core is used.

Answer 4

(a) (i) The turns ratio.  
 (ii) Neglecting losses and assuming correct design, the primary volt-amps and the secondary volt-amps will be equal until saturation of the iron core occurs resulting in losses given up as heat; on the other hand, if the secondary (or the primary, for that matter) is wound with wire too thin for the required current output, then copper losses will occur due to Ohms Law, and again the transformer will heat up.

(b)  $240 \times 200$   
 $\frac{\quad}{\quad} = 30 \text{ volts RMS.}$

abilities of the cathode will permit and this "saturation" condition is to be avoided if damage to the valve is not to result.

A semiconductor diode rectifier may be based in either silicon or germanium; in either case the material can be "doped" with an impurity of valency 3, leaving a "hole" in the lattice of valency four material, or it can be similarly doped with a valency five material, in which case a surplus electron exists. The former is known as p-type material, the latter n-type. Imagine a piece of semiconductor material as shown in Fig. 3a, one half being doped to be p-type and the other half to be n-type. At the borderline between the two areas we have a "barrier layer" with a voltage gradient across it due to the free electrons and holes trying to migrate across it and so setting up a state of electrical strain. Now apply an external battery, negative terminal to the p-type end, and positive to the n-type end; the effect is to further increase the voltage gradient and make it harder still for migration to occur, so substantially zero current flows (the small reverse current is due to minority carriers and is very temperature conscious).

(c) See Fig. 4. The winding is wound upon a bobbin, primary first, then a Faraday screen, followed by the secondary; each layer of winding is interleaved with paper or tape. The wound former is then fitted with a "stack" of laminations each of which is insulated on one side; each lamination is of E shape, or U's and T's may be employed, to form a closed iron magnetic path around the winding and through the centre of the bobbin, and a clamp or bolts holds all together. It is then tested "in the white" after which any encapsulation, dipping or fitting in an oil-filled can is completed. The laminated iron core is employed to give a high-permeability magnetic path without the eddy current losses which would occur if a soft solid iron core were used, by preventing the core from acting as a short-circuit turn.

Q.5. (a) State the formula for Ohm's Law, and identify the units used.

(b) Three resistors of 100 ohms, 150 ohms, and 300 ohms respectively are connected in parallel. What is the total resistance and what current flows if an EMF of 15 volts is applied to the combination?

Answer 5

(a)  $E/I$  equals  $R$ , where  $E$  is in volts,  $I$  is current in amperes, and  $R$  resistance in ohms.

(b) See Fig. 5. The formula for calculating the total resistance is  $1/R_T$  equals  $1/R_1$  plus  $1/R_2$  plus  $1/R_3$ .

Thus  $1/R_T = \frac{3 + 2 + 1}{300}$ , whence  $R_T = 300/6$  or 50 ohms.

Now, we have an EMF of 15 volts applied to 50 ohms. Transposing the formula, we get  $E/R$  equals  $I$  in amps, or we can multiply by 1000 to bring to milliamps.

So,  $I$  (ma) equals  $15/50 \times 1000$ , which is 300 ma.

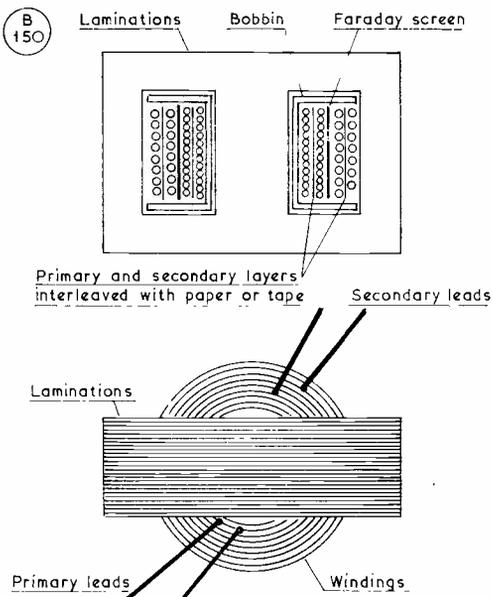


Fig. 4 Simple LF Transformer. To go with Question 4



Fig. 5 To go with Question 5

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(Note: the answer 0.3 Amps is equally correct.)

Q.6. (a) Describe, with the aid of diagrams, the construction of:

- (i) a balanced feeder line
- (ii) an unbalanced feeder line.

(b) What is meant by the characteristic impedance of the line, and what factors determine its value?

Answer 6

(a) See Fig. 6, a and b. The "balanced" line is comprised of two wires suitable spaced by an occasional insulator, as in Fig. 6a; or one may come across a variety of balanced line in which the conductors are surrounded by dielectric which also serves as the spacer between the conductors, this latter type normally being found in 75, 150, or most commonly 300 ohm impedance, and being often known as "twin-lead." The open-wire type diagrammed is usually of higher characteristic impedance, around 600-800 ohms.

The unbalanced type of Fig. 6b is normally known as co-axial cable, and is intended to be used with the outer braid conductor earthed, so that the fields are all inside the feeder, between outer and inner, and pick-up of radiation from outside is prevented. Coaxial cable is normally of 50, 75, or 95 ohm characteristic impedance, for use with the half-wave dipole; however, while it is often connected directly to the dipole, it is correct practice to insert a "balun" (Balance-to-Unbalance) transformer between the aerial and the coaxial feeder.

The characteristic impedance of a feeder line is a constant at all the high frequencies of interest to amateurs, and is a function of conductor diameter, conductor spacing, and the velocity factor of any dielectric between the conductors, times a constant which depends on whether the line is balanced or coaxial; the relationship in each case is shown on Fig. 6 algebraically. It may be defined for all frequencies as that value of resistance which, when connected to the end of a finite length of feeder, between the conductors, will cause the generator to "see" the same conditions as would be present were the line of infinite length.

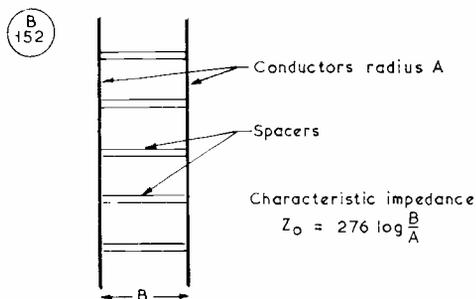
Q.7. (a) What equipment is necessary for accurate (within the terms of the Amateur (Sound) Licence) measurement of the frequency at which a transmitter is operating?

(b) Explain, with the aid of diagrams, the heterodyne method of making frequency measurements.

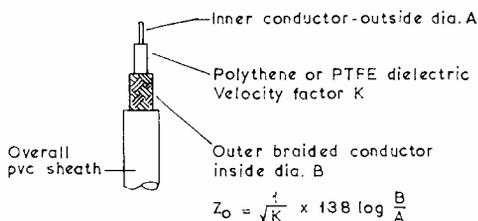
Answer 7

(a) Preferably a suitable calibrated digital Frequency Meter; or, more usually, an absorption wavemeter (which should be available in any case) and a heterodyne wavemeter.

Consider the circuit in Fig. 7; it comprises, in effect, two valves, the triode being used as a crystal oscillator, while the hexode section acts either as an oscillator, or



(a) Balanced feeder - air spaced



(b) Unbalanced feeder

Fig.6 To go with Question 6

both ends of the band are correct as the adjustments may interlock to some degree; this is done by using the headphones, of course. You now have the 100 kHz signal and the VFO signal in the calibrator *mixing* in the hexode section, and so there will be an output every 100 kHz upwards and downwards from whatever frequency the wavemeter VFO happens to be on. Hence, the headphones will now pick-up the mixed result of this and the transmitter output signal, giving a zero-beat in the 'phones when the dial is set to "53" and an audible beat either side of this, provided the right degree of coupling is used. You may now conclude that the transmitter signal is coming out on 14.253 kHz.

Precautions: clearly one *must* define one's position initially as being in the right band, as, for example, a signal on 7053 kHz or 21.153 kHz will also zero at the same point on the wavemeter dial; and one must then define one's position as lying between two 100 kHz harmonics of known frequency before the dial reading can be accepted. In addition, of course, such an instrument requires to be *stable*, a condition best met by running the oscillators permanently, or at least giving a one-hour minimum warm-up period. In addition, X1 and X2 need to be compared at regular intervals against a station in the Standard Frequency Service, as the crystals are subject to aging. This last should be done once in each operating session, at least until the crystals have settled down and aged, after which weekly will probably be sufficient.

as an oscillator-mixer. The triode can be made, by switching S1, to either oscillate on 1 MHz, or 100 kHz. The hexode, when operating as an oscillator only considered, is arranged to oscillate between 3.5 and 3.6 MHz; to this end C1 is pre-set to bring the oscillator nearly correct, C2 then being the "main" tuning, sets the oscillator to 3.5 MHz at maximum capacity by adjustment of the padder C3, called "set zero" because the dial of C2 is adjusted to zero with this. At 3.6 MHz the oscillator is trimmed to 3.6 MHz precisely when C2 is at minimum capacity and its dial reads 100, by adjustment of C4 "set 100." C2 dial is then calibrated every 1 kHz from 3.5 MHz to 3.6 MHz, 0-100 on the dial.

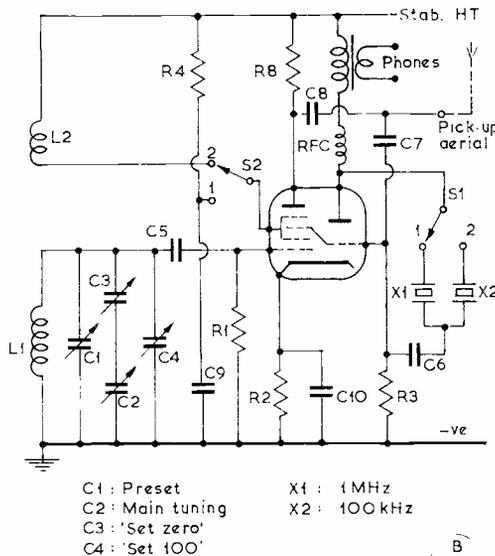
Now, imagine we wish to measure the frequency of our transmitter. If we are in *real* doubt, we would first check with the absorption wavemeter that we are in fact in the area of the desired band, say, 14 MHz, rather than the area of 7 or 21 MHz due to mistuning the transmitter. This being established, we would then listen on receiver, with S1 in position 1, until we had counted the harmonics of the 1 MHz oscillator from 1 MHz upwards and established that we were in fact between 14 and 15 MHz (our transmitter beat lying between the calibrator "pip" at 14 and 15 MHz). Now let us imagine the actual signal to be at, say 14.253 MHz. Switch the S1 to position 2 after returning on the receiver to the 14 MHz position when the "pip" from the 100 kHz crystal should be on the same frequency as was the 1 MHz "pip"—now go carefully upwards in frequency until you hear the next "pip" at 14.1, and then again at 14.2 and 14.3, and note the transmitter signal lies between 14.2 and 14.3 MHz. S2 may also now be switched from position 1 to position 2, and the pip around 0 on the dial zeroed by adjustment of C3, and that on 100 by C4; repeat twice, to be sure

Q.8. (a) With reference to a superheterodyne receiver, what is meant by

- (i) Second-channel or image interference
- (ii) adjacent-channel interference?

(b) Why must these be taken into account when considering choice of intermediate frequency?

(c) How does a double superheterodyne



- C1: Preset
- C2: Main tuning
- C3: 'Set zero'
- C4: 'Set 100'
- X1: 1MHz
- X2: 100kHz

Fig.7 Heterodyne wavemeter. (To go with Q7)

receiver assist in overcoming the types of interference mentioned in part (a) of this question?

*Answer 8*

(a) (i) Consider a receiver having an IF of 500 kHz, tuned to receive a signal at 1.9 MHz; thus the local oscillator will be running at a frequency of 1.9 plus 0.5 equals 2.4 MHz. Now, a signal at 2.4 MHz plus 0.5 MHz, i.e. 2.9 MHz may be strong enough to "ride through" the pre-mixer selectivity, in which case it will also produce an output at 500 kHz, which cannot be separated from the wanted signal by the IF amplifier. 2.9 MHz in our example would be known as the image frequency for this receiver when tuned to 1.9 MHz.

(ii) Imagine a signal at 1.9 MHz again, and another, unwanted one, at 1.9001 kHz; the two signals will both be amplified in the IF amplifier, and an audio beat note produced at the detector. To deal with this problem requires that the IF should have a suitable "nose" bandwidth between the -3dB down points to just accept a signal of the desired type of emission, whether CW, AM or SSB; and that the bandwidth at the -60 dB down points should be as narrow as possible; the ratio between these two is known as the "shape factor" and a good ratio to aim at is better than 2 : 1.

(b) Good adjacent-channel selectivity is most easily obtained with a low IF, while a good second-channel rejection is best obtained with a high IF; thus a balance must be struck between conflicting requirements.

(c) A high first IF as stated above will give a good rejection of images at the higher (14, 21, 28 MHz) bands; if the first IF selectivity is fairly good, this enables one to mix again down to a lower second IF at which it is possible to obtain a suitable bandwidth and shape factor to deal with the adjacent-channel problem. However, the method is complicated by the fact that one now has three oscillators in the receiver, each having harmonics, and therefore any leakage from these will result in tunable beats, called "birdies" at various frequencies depending on the three oscillator frequencies. To avoid this problem, the double superhet is generally, though not always of limited band coverage, for example amateur bands only.

Q.9. (a) Draw the circuit diagram of a variable frequency oscillator suitable for use in an HF transmitter. Explain how oscillations are set up and maintained.

*Answer 9*

In answer to part (a) see Fig. 8. This is a FET

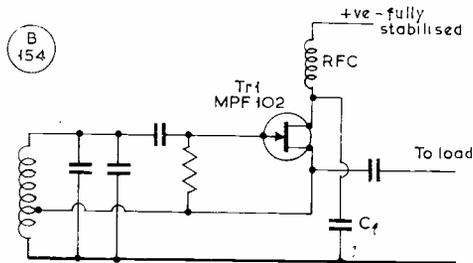


Fig 8. Variable Frequency Osc. To go with Question 9

version of the inverted Hartley oscillator, and would be built at least one band lower than the final output frequency if the normal multiplication method is used rather than feeding into a mixer. Use of an FET is a help in keeping the circulating currents as low as possible and so reducing coil heating from this cause. The drain of the FET is connected to the bottom of the tuning coil, while the source goes to a tap on the coil, so that energy from the drain can be injected back to the gate in such a phase as to cause oscillation by positive feedback; and the positive feedback is kept to a minimum by connecting the source to a tapping point as low down the coil as will sustain reliable oscillation and starting when HT is switched on and off while the load is connected; the latter should be a constant impedance and at least two buffers are recommended before attempting to amplify or multiply frequency. The HT should be fully stable, and of course first-class construction employed.

Q.10. (a) What is meant by the wavelength of an electro-magnetic wave?

(b) How are the wavelength and frequency related to the velocity of a radio wave?

What is the wavelength of electro-magnetic waves in free space at frequencies of

(i) 3510 kHz

(ii) 144.125 MHz?

*Answer 10*

The wave length may be defined as the distance between the same points on two adjacent cycles of the wave. Frequency times wavelength equals the speed of an electro-magnetic wave (or of light) in free space.

Thus  $F \times W$  equal  $3 \times 10^8$  metres per second.

Using this formula, 3510 kHz is a wavelength of 85.47 metres, and 144.125 MHz is a wavelength of 2.08 metres, because wavelength is equal to  $3 \times 10^8$ /frequency. (Note: in the above question, observe how the given figures in the question refer to amateur bands, so if you got an answer nowhere near to Eighty or Two, you would know you had the sum wrong; and conversely if you had it right you should also know immediately.)

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## THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for March issue: February 9)

AT the time of writing this piece (which, it must be admitted, is a while before the deadline) it does look as though the end result will be short of a few clubs, their reports being still in our "pipeline" when this material has to be posted to The Boss for its processing into material for the printer. There are two reasons for this: firstly, we had a hiccup last month, when our publication day was already put back by a week to allow for the Christmas break, which meant that some Club Secretaries would not be able to get off their offerings before the deadline time; and secondly, although when such a situation has arisen for one reason or another in the past, we have always had a situation where someone, such as for instance old A.J. Devon or whoever, has been acting as a sort of long-stop, catching all the ones your scribe could not receive in time, and nipping up to the office and writing them in before the copy is given to the Editor. This time, for various odd reasons, we can't have a long-stop. Thus, a few are going to miss the sight of their offering in print this time—but rest assured that your material will not be wasted, it will be embodied in next month's piece so far as is humanly possible.

Talking of humanly possible, the thought occurs that this is maybe the first opportunity the writer has had to offer his thanks and reciprocal greetings to all those kind souls who added a holiday wish or a card to their letters; for more than one reason they were deeply appreciated this year. Thanks again.

### The Mail

Firstly we have a change of venue to mention, for the **Hinckley** chaps who are moving to the John Cleveland College, Room H86, Butts Lane, Hinckley, for their fortnightly sessions; projecting forwards from the January data we have it as February 2 and 16, albeit we do not have programme details this far ahead. Murphy's Law being what it is, that is the surest way we have of making *quite* sure the desired information is forthcoming in the next incoming packet of post!

If, like the writer, one has seen a particular club newsletter year in and year out, one has a pretty fair idea as to how the group go about things. Take for an example **Cornish**; if one reads their "Link" each month and notes the programmed activity, one realises just how much they can generate their own entertainment each month—it is a rare event for Cornish to listen to a talk from someone not in their own ranks, and they can muster a *normal* turnout which many clubs in metropolitan areas would greatly envy. G3VWK has the chair on February 3, and he will be telling them all about Measuring Instruments. The place to look for is the SWEB Clubroom, Pool, Camborne.

Next we come to the **G-QRP Club**; as its name implies, it caters for the interests of all those who like to operate QRP, on any band. One of the nicer things about this gang is the Newsletter, which makes no attempt at a "super finish" but concentrates entirely on having

lots of meat in the way of articles—the most interesting one this time being the 3.5 MHz band SSB rig, the first SSB rig one has seen written up anywhere for quite a while! And, of course, a useful thing about the QRP Club is that members have lists of back articles from all sorts of publications on matters of interest to the gang; and for an SAE or so, you can obtain reprints of these selected articles.

**Mid Sussex** is another group with a fine newsletter; they concentrate on a good finish to the job, along with reasonable articles; for example, they have a regular contribution from **RO7 Ham** by way of propagation data, and this month they are attempting to make clear the use of the colour code as applied to capacitors of the ceramic variety—someone has spent an awful lot of time digging all that information out, and one can imagine a very large number of professional engineers who would like to get their paws on a copy of that article!

**Midland** find themselves grieving the loss of G5PP, for so long a mainstay in amateur radio activity in the Midlands; our sympathies to his wife in her sad loss. Looking at the meeting situation one is a little confused; there is a meeting at the University of Aston and another at Brasshouse Centre, off Broad Street, but we can't be too sure about the dates by extrapolating them out of the January "gen," because we have a feeling that this was a mite different from the normal run. This, we must refer you to the Hon. Sec. at the address in the Panel.

Not so far away is the **South Birmingham** gang, with their base at Hampstead House, Fairfax Road, West Heath, on the first Wednesday in each month. In addition we see a change of Hon. Sec., which is noted in the panel. As to the subject on February 2, it is Amateur TV, both of the fast-scan and the Slow-Scan varieties.

### New Group

**Dumfries and Galloway** is the name of this new one, and for the moment the venue is Edenbank Hotel, Laurieknowe, Dumfries, on the first and third Mondays of each month. Already there are as many as 34 members, evenly divided between such as amateurs, SWL's, model-control types and the hard-core home-brewer; and while the first meeting each month is a "social" one for a natter, the later meeting in each month is devoted to talks and films, or whatever; the list looks pretty firm for the whole of 1977, which augurs well for success, and we hope they will be able to keep up the momentum.

Now to **Worcester**, who have their room at the Old Pheasant, New Street, Worcester, where they have Monday, February 7, and Saturday, February 19; for the first one the subject is to be Semiconductors, and for the second date the talk will be discussing how RF manages to be propagated around the world.

Back up to GM again, to **Lothians**, at Riddles Court, Lawnmarket, Edinburgh, where the start is at 7.30; and this is where we hit a problem, in that on February 10, GM4FDU will be talking on projects at George Watson's School—does that mean he is talking at Riddles Court about projects taking place at George Watson's School, or does he do his piece at the school and not at club Hq.? You'd better ask the Hon. Sec.—he should know and his address is in the Panel. As for February 24, no doubt about this one being at Riddles Court, and it is by

GM8DOX, giving a show of commercial equipment.

February 10 is the due date for the **Horndean** gang, for a film show on electronic timing with motor cars; looking forward to March 10, G6NZ takes the privilege of an Old-Timer to speak—in reminiscent mood, maybe? Hq. is at Merchistoun Hall, Horndean.

The next sheet is the familiar **Cray Valley** design, but, Murphy being active again, it only carries the January information. However, we can extrapolate this to say the dates are February 3 and 17; the former being usually the "main" meeting, while the latter is an informal natter. The Hq. address is, as ever, 1 Court Road, Eltham, London S.E.9, which is the address of Eltham United Reformed Church Hall.

At **Verulam**, the Market Hall is booked on February 24, for a talk by the Regional Representative plus a talk on the GB3HR repeater by G4DAX. Verulam's informals are at the R.A.F.A. Hq., Victoria Street, St. Albans, on the second Thursday of each month.

More activity seems to be the theme at **Sutton & Cheam**; in addition to the Sutton College of Liberal Arts formals, there are now to be extra sessions at Ray's Social Club, 732 London Road, North Cheam. The latter is the venue on February 9, although the topic is not confirmed yet; on February 17 at Sutton College they have a Constructional Contest plus mini-talks.

The AGM of **Hereford** group is on February 4, and on 18th they have the talk on Pulse Code Modulation

which was originally to have taken place back in December; as usual both these dates are at County Control, Civil Defence Hq., Gaol Street, Hereford.

Neachells Cottage, Danescourt Road, Stockwell End, is home to the **Wolverhampton** chaps. They foregather every Monday evening there, alternating between Natter session and more formal activities, such as film shows or talks.

It seems we got it wrong back in December for the **Crystal Palace** folk, so we must go more warily because February's AGM is on the *fourth* not the third, Saturday in February. It is however still at Emmanuel Church Hall, Barry Road, London S.E.22.

**Stourbridge** believe in hiding their programme details well into the Newsletter, presumably to get everyone to read every bit—and, in fairness, it is worth a read, at that. The informal will be on February 1, and the "big" one on February 21, on which date Colin Burton will talk about Test Equipment. As to the venues, the first date is at the "Shrubbery Cottage" in Heath Lane, Oldswinford, while the main do is at Longlands School, Brook Street, Stourbridge.

### Gripe

Only a minor one, really, but if you change your club's Hon. Sec., please make sure we get the amendment; if not, after a few months someone writes in and asks us "why aren't your records correct?" in a huffy sort of way! The problem is that our crystal ball is of the older,

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NORTHERN HEIGHTS: A. Robinson, G3MDW, Candy Cabin, Ogdan, Halifax (44329).

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

QRP Club: Rev. G. C. Dobbs, G3RJV, 8 Redgates Court, Main Street, Calverton, Notts, NG14 6LR. (Woodborough 3920.)

REIGATE: F. H. Mundy, G3XSZ, 2 Conifer Close, Reigate, (43140), Surrey.

ROYAL NAVY: FCRS M. Matthews, G3JFF, c/o Royal Navy A.R.S., H.M.S. Mercury, Leydene, Hants.

SHEFFIELD: B. Nabb, G4EFZ, 32 Halesmire Road, Sheffield 10 (304939).

SHEFFIELD (Association of Clubs): B. Flounders, 24 Birley Spa Road, Sheffield, S. Yorks.

SOUTH BIRMINGHAM: Mrs. G. Apperley, G8KPA, 35 Denise Drive, Harborne, Birmingham 17.

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

SOUTHGATE: B. Oughton, G4AEZ, 48 Morley Hill, Enfield.

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

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

SUTTON & CHEAM: A. Keech, G4BOX, 26 St. Albans Road, Cheam, Sutton, Surrey. (01-644 4157.)

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

VERULAM: B. H. Pickford, G4DUS, 130 The Drive, Rickmansworth, Herts.

WAKEFIELD: I. R. Forth, G3WWF, 6 Eastfield Deive, Woodlesford, Leeds LS26 8SQ.

WAMRAC: L. Colley, G3AGX, Micasa, 13 Ferry Road, Wawne, Hull, Yorks HU7 5XU.

WHITE ROSE: R. R. Hughes, G4DZI, 3 Primley Park Crescent, Leeds LS17 7HY.

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

WORCESTER: D. Cowden, G4DXE, 20 Constance Road, Worcester.

WORKSOP: D. L. Rush, G4CRE, 87 Rydal Drive, Worksop.

feet-and-inches variety, and it does not respond to any requests in metric dimensions! Seriously, though, **Torbay** have notified us of a change, which will, we hope be correctly reflected in the Panel. As for the Hq., that has not changed, it being still Bath Lane, rear of 94 Belgrave Road, Torquay. February 26 should be an interesting one, when G3UIQ describes how the other half lives, in his talk about a trip to New York.

**Northampton** are a bit out of sync. with us, the scribe having given us the full details for January instead of February; but since he also says it all happens every Thursday evening, we can safely point you to Spencer Dallington Community Centre, Tintern Avenue, off Gladstone Road, Northampton.

An interesting little snippet of news is that the **Reigate** club now hold the call G5LK, once the call of Leslie Knight, who was for long a driving force on club life in that part of the world. The main meeting is held these days in the upstairs meeting room of the Constitutional Centre, Warwick Road, Redhill, the date being February 15, when G3NKS is to give part two of his talk on Aerials and Propagation. Earlier, there is the informal natter session in the Marquis of Granby, Hooley Lane, Redhill on February 1, for which you find the saloon bar and enter about 8 p.m.

Over the water we now go, to **Bangor** in GI-land, where the locals have a booking at the Redcliff Hotel in Bangor on the first Friday each month; we rather gather that February will see G18HUD doing the second part of his two-part session on Colour TV.

That familiar typeface and letter-head tell us that the next one is **Northern Heights**; G3MDW covered the January details, but he will be doubtless only too pleased to hear from anyone who wants the current form. As to the venue, this also has been missed out—most unusual for G3MDW to forget that—but never mind we know they have a booking at the Peat Pitts Inn, Ogden, on alternate Wednesdays.

Another Wednesday-using group is at **White Rose**, who have a place at 83 Town Street, Armley, all to themselves, which has been modified quite extensively to suit a lively club—the only snag being that if the growth rate we hear about goes on, there just won't be enough room for everyone to get in!

A new Hon. Sec. takes over at **Wakefield**, where the big event is on February 2, when everyone is asked to turn up at the Youth Centre, Ings Road, for a general discussion about reorganising things: incidentally, the usual routine is to assemble there on alternate Tuesdays.

A brief note from the **Royal Navy** Hon. Sec. gives details of the 1977 highlights, including an Activity Period by the gang at HMS Belfast in April, two stations active during Navy Days, Portsmouth and Plymouth, the Jamboree-on-the-Air, with which they will combine a radio teach-in at HMS Mercury, and the AGM at HMS Mercury—oh, and we forgot the Mobile Rally, also at Mercury; the Hon. Sec., G3JFF would be pleased to send details if anyone cares to drop him a line.

**Bromsgrove** nearly beat the system by getting their note trapped by a paper-clip in some-one else's report; lucky we spotted it while looking for duplicates! They have a booking at Avoncroft Centre, Bromsgrove, on the second Friday of each month, the start being at 8.0 p.m.

A new country for "Month with the Clubs" comes next, by way of the **Isle of Man**; they have a place at the Highlander Inn, Crosby, on alternate Mondays, says the Hon. Secretary, who also adds that visitors are most welcome and that he will be pleased to give all the details to anyone, either visitor or prospective member.

The normal routine for **Wessex** is for them to get together at the Dolphin Hotel, Holdenhurst Road, Bournemouth, on the first and third Fridays of the month; the first session is the "formal and the later one is set aside for the ragshew session. However, for this month only, we suggest you make certain of the dates, as it is noticed that there is a possibility of a change of date from February 4 and G8BPE's talk on Radio Communications Systems used by Southern Gas Board. For this, contact the Hon. Sec.—see Panel.

Our next stop is **Echelford**, who have the second Monday and the last Thursday booked at St. Martins



The presentation by Dennis Partridge (right) of Redifon Telecommunications, of that Company's gift of a 'Safari' radio-telephone to the East African Flying Doctor Service; the equipment was received by Michael Woods (centre) Director General of the African Medical and Research Foundation (parent body of the Service), and on the left is Mr. A.S. Urquhart of International Aeradio Ltd. The single unit 'Safari' provides speech communications on 1 to 11 channels anywhere in the 2-16 MHz range and operates from a 12v battery.

Court, Kingston Crescent, Ashford, Middx. As to the details, we are a bit out of phase with their Newsletter, and so have to refer you to the Hon. Sec.—see Panel—for the latest details.

**Dartford Heath D/F** seems to have completed some sort of a record; the current issue of their Newsletter announces that two of their YL members have just got their own callsigns, another YL holds the office of Hon. Sec., and yet another YL was a previous Hon. Sec.! Oh, yes, we also note that, at the top of their "league table" of scoring on various D/F hunts, one of the YL's is sitting at the joint first with a couple of the OM's! If you want to know all about this art of direction-finding and hunting for hidden transmitters, the gang have Hq. at the Scout Hut, Broomhill Road, Dartford, Kent; for the rest, either turn up on the second Friday in the month "on spec.," or get in touch with the Hon. Sec.—see Panel.

It's a long time indeed since last we heard of the gang in **Exeter**, where they now foregather at the Community Centre, St. Havid's Hill, Exeter. Reading between the lines a little, we gather that they have some through one of those slacker phases which most clubs tend to get at times, but are now on the rising side of the valley, with a good Hq. and steadily increasing numbers, not to mention a programme that seems to be settled for some six months to come, which is always a good sign. The second Monday it is, and for February the talk appears to be part one of a series on Propagation.

**Southgate** seems to have got themselves a P.R.O., who is a dab hand with a typewriter too; he tells us that they are booked in at the Scout Hut, Wilson Street, Winchmore Hill Green, on the second Thursday in each month; the February topic should be of great interest, it being "Planning Permission"—doubtless with aerials in mind!

We still can't understand why more clubs do not take up the labour-saving scheme for reporting thought up by **Southdown**; they have a pre-printed form on which is the Hq. address, names and addresses of officers, the regular routine of meetings, leaving just a tiny bit to fill in giving details of the current lecture or whatever—the Hon. Secretary can fill the thing up more quickly than he can address the envelope, and for us it is a God-send, saving us all the "Sherlock Holmes" stuff! The lads are to be found at the Victoria Hotel, Latimer Road, on the first Monday of each month, or the second should the first one hit a Bank Holiday; thus, the evening to make for Eastbourne this time is February 7.

Over to **Derby**, who have a newsletter editor actually having to hold material over till next time—he's the envy of just about every other newsletter editors in the country! From the newsletter we gather that the routine is a weekly meeting on Wednesdays; February 2 for a Surplus Sale, February 9 for a talk on Derbyshire Churches with slides (we guess this is one of their regular YL's evenings) and on February 16 there is a film show.

The month rounds off nicely on 23rd, with David West talking about Recording. Oh, and don't forget the AGM, on March 16.

A very brief Newsletter comes in from **Surrey**, and it tells us that their Hq. is T.S. Terra Nova, Croydon; we also glean by a bit of extrapolation that the date is the first Monday in each month, but for the rest we must refer you to the Hon. Sec.—see Panel.

Friday February 18 is the date if you want to look in on the **Peterborough** Radio & Electronics Society at their place in the Scout Hut, Occupation Road; the subject was still to be finalised at the time of their letter.

Brrr! **Milton Keynes** on February 14 will not only have a cold journey to the Hq., but they will also be hearing from G8LFB, and his subject will be "Ben Nevis in Winter." The Hq. address is Lovat Hall, Newport Pagnell; and if you are a stranger to the area, get in touch with the Hon. Sec., and he will send you a map.

The letters **WAMRAC** translate into World Association of Methodist Radio Amateurs and Clubs, which give a pretty fair indication of the aims and objects of the group; they have a worldwide membership, and of recent years it has been open to those of any denomination to become members. All the details can be obtained by dropping a line to the Hon. Sec. at the address in the Panel.

**Acton, Brentford & Chiswick** will be hearing G4FBK giving his Introduction to VHF and UHF on February 15, at the usual venue which is Chiswick Trades and Social Club, 66 High Road, Chiswick, London W.4.

Up in Sheffield the clubs have banded together to form the **Sheffield Association of Clubs**, the idea being in essence that with the members of about five local groups all in one place and at one time, it becomes possible to have some rather special speakers. To run down the various gangs involved, there are the **University** and the **Polytechnic** clubs, who have a get-together of both on Thursdays at the Phoenix club, Charles Street, the **Sheffield** club proper, with Hq. at Sheaf House Hotel, Bramall Lane on the third Monday, and **Worksop**, Thursdays at the Anchor Inn.

On to **Leicester** where the AGM was on January 17; so we can hardly expect much programme data until the committee have had a think about it, so we refer you for all the details to the Hon. Sec. that was (and maybe is!), at the address in the Panel.

#### DEADLINE—and Change of Address

For the moment, it is asked that, instead of the normal arrangements, the Clubs mail should be addressed to: CLUB SECRETARY, SHORT WAVE MAGAZINE, 34 HIGH STREET, WELWYN, HERTS., AL6 9EQ. This will help your Club Secretary no end; and as for the deadline, it will be to arrive, first post on *February 9*, please.

## THIRTY-FIRST ANNUAL MCC

### HAPPENINGS — RESULTS — COMMENTS

**M**CC in December!—never let this happen again, on pain of instant death! Thus, one club summarised its feeling about the “new” date in December, and one gets the general feeling that a reversion to November in future would have general approval.

However, let’s look, not at the future, but at the 1976 contest. There were, of course, several invigilators, and the consensus of their opinion is that there were about fifty stations taking part; the operating was as usual very good overall, but it is noticeable that the speed of sending in MCC is far higher than it is in, say, one of the big world-wide contests, and this occasionally leads to funny log entries when an invigilator compares what he wrote down with what appeared in the logs of the two stations concerned. All fair enough, since MCC is traditionally the place where likely lads are allowed to get experience before they take part in the bigger affairs; and this is the very reason for us not making any firm attempt to specify what abbreviation should be used for any particular county—this way the chap at the receiving end *must* read the stuff and get it down right. It is OK by us if you want to use a “standard” three-letter abbreviation for your county, but equally fair if you could think up another one, especially if it had the additional merit of wit! But, in the end, we must say that a distressingly large number of stations were sending too fast for their own ability to receive.

Signals; in general, they were very good, although quite a few people managed to generate dirty signals from transceivers, and one poor soul lost many contacts because, although he could be heard, his signal was wandering up and down in frequency to the point where it was all but impossible to hold him unless one opened the receiver selectivity wider than wide. One invigilator spent nearly ten minutes following him around, and with audio filter the situation was that one could not expect more than half a letter to be in the pass-band; so everyone this particular chap worked had a struggle. And yet—everyone was giving the guy a T9 report!

Giving a chap T9 in a contest, when he has a dirty signal is considered, at least in some clubs, the “right” thing to do—why, for Pete’s sake? Surely, if the chap is anything of an operator he will realise that he has a problem, and stop to sort it out—with a transceiver the problem may be no more than a rather high drive level setting, and indeed several stations were noted to occasionally produce a rough signal after a retune, but to clear up again almost immediately.

Who was about? Well, on both evenings, there was a CQ VK call being made smack in the middle of the most populous bit of the band; and when your scribe went down for a look at the appropriate frequency, there was a signal replying. On the other hand, while the GM’s were out in force this year, one has to say that there were for some reasons, apparently no club GW activity, nor much GI stuff. However, the Europeans were about, GD, and GC, not forgetting EI where IRTS, despite the date clashing with their Annual Regional Social evening, were out in force—indeed there was a little private battle

going on between EI2BB and EI9ONE, and there were other EI’s noted in the logs. GC was represented in several logs by GC3TMA/P in Alderney, and OH, OK and OL featured in just about all the leading logs. One was a little entertained to notice that the runner-up didn’t even give the third-placer the status of a club in his log—that’s one-upmanship for you!

Of course there were the little crises here and there, of which more will appear in the log extracts; but one of your invigilators was reminded of his duty the day before the contest, and recalled that, although he had gear for the band, he hadn’t used it for upwards of a twelvemonth, the receiver half having been purloined for service as the tunable IF of a two-metre converter. No sweat, thinks he, it’s only a matter of chopping a couple of coax plugs from one place to another and tuning-up the ATU—save that he had forgotten doing an ATU rebuild and that he didn’t know whether it would tune Top Band—it wouldn’t, of course! Luckily, there is one of the Joystick ATU’s in the shack and this dealt with the wire in fine style and saved the day.

Conditions didn’t seem to be too bad on the Saturday, but were a bit down on the Sunday evening, or at least your conductor thought so. However, on both evenings the GM’s were booming through right from the start, with the Glenrothes signal almost as strong as Maidstone which puts it into the receiver-blocking class, at least one invigilator’s station.

### Comments

As usual, a fine selection, from the sour to the plain hilarious. For example: “Nice to see some new fists around, and, also, the old lags!” (IRTS “B”) . . . “December is too late in the year; we would like to see the contest held once more in November” (Dundee) . . . “Surprising how many people didn’t know what county they live in.” (Maidstone Y) . . . “Half-wave dipole over a marsh—it was a sportsfield before the rain started; the whole issue was paddled by G3ORH, G3VTT and G3ZSU, and brass pounded by G3WXM.” (Maidstone Y) . . . “Plagued by timebase interference, which made copy of the weak stations difficult. Could have done with more stations on.” (Surrey) . . . “Our first entry for some years. Enjoyable as always.” (Leicester Polytechnic) . . . “Worked more QSO’s despite losing two hours to the Region One Annual Dinner-Dance—our Social Affairs committee member is on his last chance!” (IRTS “A”) . . . “CUAGN NEXT YEAR” (Greater Peterborough) . . . “Think you require more early publicity for the event.” (White Rose) . . . “One member thought he heard a ZC4 station!” (Worcester) . . . “Very interesting contest; have just learned that my electric toaster radiates on Top Band as well as the FT101. Couldn’t you organise an electric-toaster Top Band contest?” (Verulam) . . . “Large chunks of the band seemed as frozen as the weather.” (Edware) . . . “We did manage to get some of our more reluctant members to have a go on the key.” (Acton, Brentford & Chiswick) . . . “We had trouble with the gear but did not know anything about it until the end of the Saturday evening session.” (Hereford) . . . “I had hoped to use the transmitter in the November 1955 Short Wave Magazine, but have not yet succeeded in neutralising the triode PA. No, I’ve not been trying since 1955!” (Hastings) . . .

"Only a check-log this time; hope it'll be a proper entry next time." G4BUO, Gravesend.

### The Logs

Definitely above average in presentation this year since last your scribe wrote an MCC report several years ago. As to their time of arrival, late or otherwise, a combination of circumstances arose which meant that the logs effectively landed in two lumps on your reporter's doormat, the second lot having perforce taken a rather unusual route and being delayed in delivery by the Christmas postal break. In the latter there was one log which apologised for its lateness; but, since we couldn't say how many of the rest might have been a post late, we felt it unfair to penalise a group who had been honest about their failing.

## RESULTS

### THE 31st ANNUAL MCC

#### Positions and scoring

POS'N	CLUB NAME	CALLSIGN	POINTS
1	Lothians	GM3HAM	19,040
2	Glenrothes & District	GM4AQO/A	16,718
3	IRTS Region 1 "B"	EI2BB	14,528
4	Shirehampton	G4AHG	14,147
5	Dundee Tech. College	GM4AAF	14,136
6	Maidstone YMCA	G3TRF	13,772
7	Sutton & Cheam "A"	G2DMR	13,314
8	Surrey R.C.C.	G3SRC	12,710
9	Leicester Polytechnic	G3SDC/A	12,464
10	Sutton & Cheam "B"	G4CWH	12,160
11	IRTS Region 1 "A"	EI9ONE	11,776
12	Sutton & Cheam "C"	G4ADM	10,982
13	Greater Peterborough	G4BBA	10,880
14	Addiscombe "A"	G4ALE	10,878
15	White Rose	G3XEP	10,872
16	North Staffs.	G4BEM	10,584
17	Shefford & District "A"	G3FJE/A	10,045
18	Derby Topband Group	G4ASB/A	9,828
19	Worcester & District	G3GJL	9,724
20	Verulam "A"	G3VER/A	9,656
21	Edgware & District	G3ASR/A	9,184
22	Leyland Hundred	G3WYV	7,967
23	Acton, Brentford & Chiswick	G3IUU	7,700
24	Bromsgrove & District	G3VGG/A	7,657
25	Hereford	G3YDD/P	7,540
26	Oxford & District	G8IB	7,616
27	Limerick	EI4LRC	7,232
28	Clifton	G3GHN/A	6,210
29	Hastings		6,000
30	Stevenage & District	G3SAD/A	5,643
31	Shefford "B"	G4DRS	2,860
32	R.A. Aux. F., Northwood	G3JNG	2,464
33	Silverthorn	G3SRA	3,801
34	S. T. & C., Paignton	G3WMK	1,738
35	Grimsby	G3CNX/A	1,332

A check log is also acknowledged from G4BUO.

### Equipment

The once-ubiquitous HRO has all but disappeared in favour of transceivers of one sort and another; the advantage of "no netting" probably being the main reason for transceiver operation; and the key-controlled change-over, while in no sense approaching true break-in, did at least allow lots of operators to "kid themselves" and save a few valuable seconds by using the BK signal.

And, one invigilator felt, there were the odd one or two with a full break-in system and definitely listening-through.

### Aerials

Here is where one can see the differences, the more so when one takes a look at the map. Both Lothians and Dundee were using aerials at 140-150 feet high, and all the stations who scored 13000 or better had half-waves, all but one of these being in the dipole configuration, Shirehampton being the exception; they also do not say anything about the height of their aerials. I.R.T.S. "B" and Maidstone YMCA both had their dipoles up at 65/70 feet. On the other hand, the answer was not "all" in the aerials, by a long sight, there being back-markers with good aerials, and people near the top with comparatively indifferent ones.

### The Future

Over the past ten years there has been a steady diminution of the overall level of Top Band activity; the result, one feels, of the growth of the UHF TV service, and the resulting relative freedom to operate at HF after DX, and possibly also the wide-spread availability of VHF equipment, making 144 MHz the common ground between A and B licensees. Be that as it may, the drop in MCC entries over the same period is nothing like as heavy, and that being the case, MCC as an activity is part of the "use or lose" philosophy which we must all stick to until our new allocations are finally settled at the next conference. Thus it follows that there *must* be an MCC in 1977, come what may; and in view of the general preference for a November contest we will here and now say that MCC will be on the weekend of **November 5/6, 1977**.

As to the Rules, we will consider them in the light of all the circumstances, and we will give you any changes of Rules in plenty of time. Meantime, keep up the activity on Top Band!

## THE NEW QTH PAGE

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

# VHF BANDS

NORMAN FITCH, G3FPK

## Awards News

ONLY one VHFCC certificate has been awarded this month, the recipient being Peter Grimshaw, G8KME, for 2m. operation from Yeovil, Somerset. He was first licensed in August, 1975 and started on the band with a *Liner-2* and *halo* aerial, progressing to the present *Trio TS-700*, *Belcom LA-106* amplifier and crossed 10-ele. Yagi array. The certificate number was 274 and Peter says he is studying morse for the Class A licence.

The saga of the Kennemerland Club's award referred to last month has been resolved satisfactorily, the IRC's having been returned. In the covering letter, PAØJY confirmed that the driving force behind the club, PAØZV, has a terminal illness and it would seem that the awards side of the club's activities has been in limbo for the past year because of this. Whilst sympathising with PAØZV and without wishing to appear in any way callous to suffering, this affair does seem to highlight the need for any club to be so organised that it can continue to function when a key member becomes ill or dies.

In complete contrast, full marks to the *Deutscher Amateur-Radio-Club E.V.* for the very prompt processing of your scribe's application for their fine *UKW Europa-Diplom*. The claim and cards were mailed on Dec. 2, the cards being returned before Christmas followed shortly afterwards by first class award No. 24. Details of this award from DK50D, Nordweissenweg 15, D-3204 Nordstemmen, West Germany.

## Beacons

Roger Thorn, G3CHN (Devon) has explained why the Lannion beacon, F3THF, was initially so

loud when it reappeared on its new QRG of 144.905 MHz. It seems that a strong south westerly wind had blown the 9-ele. Yagi off course so that the British stations were getting the best of its 40 watts. The aerial has now been re-orientated to point the desired easterly direction to Paris. At G3FPK, it is now rather weaker than GB3CTC.

Julian Macassey, OZ9IY, writes that a new 23 cm. beacon is now operating from south west Copenhagen with the temporary call, OZ2FO/A. The QRG is 1296.075 MHz, the call being sent continuously on FSK. Operating times are 1700-2300 GMT and Julian promises more details later.

G3JHM (Four Marks, Hants.) told your scribe that he has heard the GB3LBH beacon on 10.1 GHz from the Tatsfield area at 15 dB over noise and from the Chelsfield area in north Kent. Don mentioned that work on the Alderney beacon, GB3ALD on 10.120 GHz is progressing well. It will radiate one watt *e.r.p.* over an aperture of 90° from an 11 dB gain aerial. Siting permission is currently being sought from the IBA. Finally, Don under-

stands that a 10 GHz beacon is being planned for the Lannion site, F3THF, in YL13d.

## Contests

There were only thirty entries for the 70 MHz Fixed contest last Oct. 24. The winner was G3OHH with 389 points from 59 contacts. Runner up was G4ASR who managed 66 QSO's worth 357 points and G3JYP, G3XBY and G3OHC came third, fourth and fifth respectively.

The next major VHF event is the 144 MHz Open contest on March 5/6. Please send your reports on the 70 MHz CW event on Jan. 23 as soon as possible.

## Repeaters

Although licensed since May, 1976, the Central Scotland FM Group's proposed repeater, GB3CS, has still not appeared. According to a very reliable informant, the equipment so far constructed is not of very high standard and will likely have to be re-designed and partially re-built. By the time this appears, a meeting of interested parties should have taken place to

## THREE BAND ANNUAL VHF TABLE

### Final Placings, December 1976

Station	FOUR METRES		TWO METRES		70 CENTIMETRES		TOTAL Points
	Counties	Countries	Counties	Countries	Counties	Countries	
G3BW	62	7	65	14	44	6	198
GD2HDZ	52	6	62	12	50	7	189
G2AXI	50	7	63	16	42	8	186
G3OHC	45	5	63	15	49	9	186
G3FIJ	51	7	60	15	36	10	179
G4BWG	46	6	65	21	25	6	169
G3XCS	43	7	64	18	26	6	164
G5DF	43	5	63	13	30	9	163
G4BYP	41	7	58	9	25	7	147
G8HBQ	—	—	72	13	52	10	147
G3BOC	56	7	66	13	—	—	142
GM4CXP	17	4	71	19	21	9	141
G8GML	—	—	62	14	43	10	129
G4AEZ	32	6	46	12	13	3	112
G4DKX	20	2	46	13	20	8	109
G8GII	—	—	54	16	25	6	101
G3FPK	—	—	77	21	—	—	98
G8BKR	—	—	75	13	6	2	96
G8HHI	—	—	58	14	15	3	90
G3ILO	—	—	61	18	6	2	87
GD3YEO	9	6	54	16	—	—	85
G8EOP	—	—	28	8	35	9	80
G8KLN	—	—	53	16	1	1	71
G3UBX	—	—	—	—	61	10	71
G8KKX	—	—	48	14	—	—	62
G8ITS	—	—	48	13	—	—	61
G8IFT	—	—	33	8	15	4	60
G8KSP	—	—	47	11	—	—	58
G8HAF	—	—	48	10	—	—	58
GJ8AAZ	—	—	26	10	10	5	51
G8JAJ	—	—	31	6	—	—	37
G8GLS	—	—	18	4	—	—	22
G8LGZ	—	—	9	3	2	1	15

formulate a constitution for the group and to get the show on the road again in a properly organised way.

It has always been a condition of all amateur licences that an operator listens on the frequency he proposes to use, before transmitting. Now that the new licences are in force, it is understood that the Post Office engineers concerned with station inspection will expect this practice to be adopted, particularly where repeaters are concerned. This means that one must have facilities for listening on the *input* channel, either within the equipment itself or on a separate receiver. This will be no embarrassment to those with the more comprehensive transceivers, but those using more basic, hand-held sets may not be able to comply with this requirement.

### A New UHF Band?

The United States administration concerned with radio matters has proposed that a new UHF amateur band be established from 902-938 MHz. At this stage, the proposal is merely for discussion as a step to enable the U.S.A. to determine its final approach to frequency allocations at the 1979 WARC in Geneva. This new band would be additional to the present VHF/UHF bands which it suggests be retained as now, on a world wide basis. A less welcome proposal for American amateurs is that part of the 220 MHz band be allocated for Citizens' Band use.

### Satellite News

At a meeting in Guildford on Nov. 20 last, the Committee of the AMSAT-UK group carried out some re-organisation of its functions. G3IOR remains as chairman, the new treasurer/ secretary being James Keeler, G4EZN, to whom inquiries about membership should be addressed. G8KME has been appointed Librarian and G3RWL will handle technical queries. New arrangements are being worked out for the editing, printing and distribution of the publication *Oscar News*. Club secretaries considering lecture programmes might care to note that AMSAT-UK can provide speakers. Inquiries should go to G3COJ.

Following the cancellation of the

last ITOS mission in June, it appears that *Oscar 8* will be launched with LANDSAT C next September. This would put it in an orbit only 800-900 kms. high with a correspondingly reduced communication range of shorter maximum pass. However, the orbit time would be quicker.

The 1977 Orbital Predictions calendar for *Oscar 6* and *Oscar 7* compiled by Skip Reymann, W6PAJ, is now available from G3IOR (*QTHR*) price £1.50 to AMSAT members and £3.00 to non-members; send a minimum size s.a.e. 9in. x 11½in. with 9p stamp. This calendar gives details of every 0-7 and 0-7 orbit for the whole year, plus operating schedules and frequencies.

The first QRP day on 0-6 on Jan. 5 was a non-event as the satellite was switched off by Surrey Telecommand who apparently were not advised of the experiment. The last two QRP Wednesdays are Feb. 2 and 16 when *ten watts e.r.p.* is the maximum power which should be used. To make the point on the days, it is suggested that users state, for example, "this is G4XYZ running 3 watts." Mondays, Feb. 7 and 21 are 10 watts maximum, QRP days for 0-7, mode "B." The next IARU bulletin from HGBME is scheduled for Feb. 23, orbit nos. 19930 and 19937, the latter being in range from 1921-1942 GMT from 0-6 on 29.49 MHz.

One of the *NiCad* cells in the 0-6 battery pack has died. Even so, the signals relayed on 10m. are still very good, even though the passband is noisy at times and switching intermittent. For the time being, the command stations have been told to switch the transponder off when the telemetry reading on the unregulated bus voltage rail—channel 3A—drops below 344, corresponding to 20 volts. There is a dilemma in that if the batteries are being charged and not used, they heat up. Battery temperature is revealed by TLM channel 3D which is the last of the three figure groups beginning with 3. A reading of 331 corresponds to 50°C, the maximum temperature for *NiCads*. A reading *higher* than that is all right. Users can help maintain the life of 0-6 by using the *minimum* possible e.r.p.

0-7 completes an orbit slightly less than three seconds quicker

than 0-6. Consequently, from time to time, the two satellites will cross the equator together. The next coincidence will be on Feb. 11 at 12:06:08, corresponding to orbit nos. 10258 and 19783 respectively, when they will be about 940 kms. apart over Indonesia. As usual, AMSAT has authorised link tests from 0000 GMT on Feb. 9 to 2359 GMT on Feb. 11. From Orbit no. 10227 to 10264, 0-7 will remain in mode "B" so that users may transmit to it on 70 cms. the satellite radiating the 2m. signals to 0-6 which in turn should relay them to ground stations in the 10m. band. It is essential that users of 0-6 and 0-7 do *not* transmit on 2m. any time in these three days, in the uplink band. The next coincidental equatorial crossing will occur on August 16 but it will be remarkable if 0-6 is still functioning then.

The 10m. signals from 0-7 are frequently rather weak. Sometimes the 5D TLM channel reads 556 suggesting that the attenuator pad is switched in. If it reads 552 or less, then it is some 15 dB more sensitive.

It should be obvious that the Amateur Satellite programme is expensive and AMSAT-USA is seeking to raise 10000 dollars towards the cost of future satellites.

FOUR-METRE ANNUAL TABLE

Station	Final Placings at December 31, 1976		
	Counties	Countries	Total
G3BW	62	7	69
G3BOC	56	7	63
G3FIJ	51	7	58
GD2HDZ	52	6	58
G2AXI	50	7	57
G4BWG	46	6	52
G3XCS	43	7	50
G3OHC	45	5	50
G4BYP	41	7	48
G5DF	43	5	48
G4AEZ	32	6	38
G4DKX	20	2	22
GM4CXP	17	4	21
GD3YEO	9	6	15

Accordingly, it is suggesting that members might wish to donate ten dollars to buy a solar cell to be "registered" in their name. Perhaps regular British users would like to donate the equivalent amount to AMSAT-UK via treasurer G4EZN. After all, as with repeaters, those who use the satellites ought to assist with the cost.

### Meteor Scatter

There has been insufficient time for written reports on the activities in the recent *Quadrantids* shower but G3POI (Downe, Kent) told your scribe that he completed an SSB QSO with I1BEP in DE square in 45 minutes. From UK5EDB (QH07e) Clive got just one ping in 35 mins. whilst the sked with UW3YS (RN42c) was QRMed by UR2RX. The long shot, 2880 kms. sked with UW6MA (TH69c) did not come off.

Keith Naylor, G8FUF (Essex) has added nine new squares to his leading 2m. total, all by MS, namely HJ, HX, II, IW, JJ, KI, KN, KZ and NU. Compared with previous years, he found the *Geminids* in December to have been rather poor with only bursts of marginal strength from most stations. At G3FPK, many stations were heard on CW and some on SSB conducting MS skeds in the *Geminids* and *Quadrantids*. Perhaps some of those operators would let us know how they fared? From GB2RS, it was learned that over a 15 hours period on Jan. 3, 25000 pings were recorded from Radio Gdansk in the 4m. band.

### Four Metres

Due to the long Christmas break, postal delays, etc., there are not many reports this time. G3BOC (Shrewsbury) and GM4CXP (Borders) added a few new counties between them but lack of activity plus poor conditions seem to have contributed to the lack of enthusiasm for the band.

### Two Metres

Is it too much to hope that, with the beginning of a new year, more sensible use of the lower end of the 2m. band be made? Firstly, it seems pertinent to mention that 144-20 MHz is the random MS calling frequency so should not be used for QSO's via other modes. Likewise,

### TWO-METRE ANNUAL TABLE

Station	Final Placings		Total
	Counties	Countries	
G3FPK	77	21	98
GM4CXP	71	19	90
G8BKR	75	13	88
G4BWG	65	21	86
G8HBQ	72	13	85
G3XCS	64	18	82
G3ILO	61	18	79
G2AXI	63	16	79
G3BW	65	14	79
G3BOC	66	13	79
G3OHC	63	15	78
G8GML	62	14	76
G5DF	63	13	76
G3FIJ	60	15	75
GD2HDZ	62	12	74
G8HHI	58	14	72
G8GII	54	16	70
GD3YEO	54	16	70
G8KLN	53	16	69
G4BYP	58	9	67
G8KKX	48	14	62
G8ITS	48	13	61
G4DKX	46	13	59
G4AEZ	46	12	58
G8KSP	47	11	58
G8HAF	48	10	58
G8IFT	33	8	41
G8JAJ	31	6	37
GJ8AAZ	26	10	36
G8EOP	28	8	36
G8GLS	18	4	22
G8LGZ	9	3	12

the CW random MS calling frequency is 144-10 MHz. The SSB calling frequency of 144-30 MHz seems to be the tuning up frequency at times with the interminable whistles and gargling noises masking the weaker stations calling "CQ." Perhaps when the next band plan is drawn up, a "garbage frequency" should be designated whereon all would hoot away to their hearts' content!

Secondly, it is difficult to understand why, once contact has been established on 144-30 MHz, stations do not immediately QSY *well away* from it. Many folk merely go "ten up" or "ten down." Why not 120 kHz up or down if your equipment is capable? This ties in with the third point concerning the 144-30-30-144-50 MHz section, which is SSB under the 1975 Warsaw plan. With well over half the band available under the plan for FM mode, there is no longer any excuse for FM stations to occupy this section of the band, nor, for that matter, AM stations. Lastly, how about some more honest reporting? Such as, "You are five-and-nine plus but rather distorted and 40 kHz wide, OM." Recently a few really rotten signals have appeared on the SSB end of 2m. Some are spitchy and very wide although the speech has a real bite to it when tuned in on the nose. Others are so distorted as to be readability four or worse and sound as if the operator has a peg over his nose or is being throttled! Unless one tells these people about their rotten signals, they will likely never know, for this trouble just does not show up on meters. These "throttled" signals are usually as wide as a barn door even when not all that loud. Finally, to illustrate what a properly adjusted, but really strong signal *should* sound like, listen to G8GGK or G8HAL if you receive London stations well. If they seem wide, then you have a lousy receiver!

Not much correspondence is received from SWL's by this column so it was a pleasure to get a letter from Glen Seeneey of Nottingham, a keen 2m. addict aged 14. He lives next door but one to G8HVK and near a good radio shop run by G8CMT. Present RX set-up is an *Eddystone* 840C and *Microwave Modules* converter with an indoor dipole on which Glen has heard FIANH in Normandy recently.

G3BOC (Shrewsbury) informs that his trip to Brora in YS square last October was fruitless and Harry missed the *Aurora* on the 31st. From the London area, conditions have been mediocre for much of the month, most of the longer distance QSO's being subject to very deep QSB. On Dec. 23 there was a lift to the east and people were working

ON's, PA's and DL's. East is the worst direction from G3FPK and only a couple of DL's were worked in DL square, on the key. EI9Q (WM65d) is usually on around 144.2 MHz from 1000 Sunday mornings and was contacted on CW on Jan. 2 for the first EI of 1977. The band was again open to the east on Jan. 4 with more PA, ON and DL stations being worked by the better sited operators. The very high pressure area was in the wrong place for any spectacular lift; the highest reading recorded in London being 1043 mB, corrected to sea level.

G8BKR (Bristol) reckons that 1976 was a good year and John managed to work most of the DX with his *TS-700* apart from some E's *gotaways*.

### Seventy Centimetres

Peter Burden, G3UBX, (Wolverhampton) writes that he has worked 206 different stations in 61 counties and 10 countries on 70 cms. in 1976, almost exclusively on SSB, with a little FM, and CW when necessary. Due to his portable activities, some "easy" counties have been missed. Peter's gear comprises a *Yaesu FTdx560*, a *Datong* processor, *Micro-wave Modules* transverter with BFR90 pre-amp. and a 2C39A amplifier delivering 45 watts p.e.p. The aerial is an 88-ele. *Multi-beam* at 21m. Audio on the RIT *varactor* provides an FM facility on the HF transceiver. For portable and -/A operation, he uses a pair of 18-ele.

all the activity is concentrated around the 432.2 MHz SSB and 433.2 MHz FM calling frequencies, plus the repeaters. He points out what excellent results can be achieved with just 10 watts to an 18-ele.

*Parabeams* or a 46-ele. *Multi-beam* Peter feels it unfortunate that most *Parabeam* at 12m. and hopes that many more amateurs will try the band this year.

Ned Cartwright, G4DKR, (Ipswich) found the *Cumulatives* good fun and was encouraged to hear so many stations on. He heard G3VPK at Chelmsford working DX he couldn't even detect, though.

### 70 CENTIMETRE ANNUAL TABLE

Station	Final Placings		Total
	Counties	Countries	
G3UBX	61	10	71
G8HBQ	52	10	62
G3OHC	49	9	58
GD2HDZ	50	7	57
G8GML	43	10	53
G2AXI	42	8	50
G3BW	44	6	50
G3FUJ	36	10	46
G8EOP	35	9	44
G5DF	30	9	39
G4BYP	25	7	32
G3XCS	26	6	32
G8GII	25	6	31
G4BWG	25	6	31
GM4CXP	21	9	30
G4DKX	20	8	28
G8IFT	15	4	19
G8HHI	15	3	18
G4AEZ	13	3	16
GJ8AAZ	10	5	15
G3ILO	6	2	8
G8BKR	6	2	8
G8LGZ	2	1	3
G8KLN	1	1	2

### Square Hunters' Corner

Via GM8FFX, comes news that DBIXI has permission from Shell Oil to operate from an oil platform in the Brent Field in AT square. The British call is GM5MCJ and the rig a *TS-700* with 100 watts amplifier to a Yagi 200m. a.s.l. on the helicopter platform. Operation should be at two week intervals for a long time as soon as Home Office matters are concluded.

### Deadlines

Some relevant photographs for this feature would be welcomed. Sharp, glossy black-and-white efforts, please, along with your news, views and claims. This time everything to: "VHF Bands," *SHORT WAVE MAGAZINE*, 34 High Street, WELWYN, Herts., AL6 9EQ, by Feb. 4 for the March issue and March 4 for the April edition. *73 de G3FPK*.

## PHOTOGRAPHS ALWAYS WANTED

Readers are reminded that we are always glad to have good photographs of Amateur Radio interest for general illustration in *SHORT WAVE MAGAZINE*. Though colour prints can sometimes be satisfactorily reproduced black-and-white, we much prefer the latter in the original. Except that we cannot conveniently make use of photographs that are either very small or very large, size is not of great importance as this is in any case determined to our requirements in the block-making process. What is

important is that the picture should be clear and sharp with fully descriptive notes—and this description should *not* be written on the back of the print itself, but on a separate piece of paper lightly attached to the photograph. Payment is made for all pictures used, immediately on publication.

Send to: Editorial Dept., *SHORT WAVE MAGAZINE*, 34 High Street, Welwyn, Herts. AL6 9EQ

## COMPONENT SUBSTITUTION

### SOME GENERAL THOUGHTS

IT is a very rare home-brewer of amateur-radio gear who has not faced at some time or another the need for a substitute for a called-for component; either he can't get the prescribed item from new, or, if he is a dyed-in-the-wool amateur, because there just isn't the desired object in the junk-box. The writer has for many years faced almost daily requests to offer substitutes for the specified item, made by buyers, for equipment which will be built on the shop-floor and *must* be O.K. when they arrive in the Test area; and it is axiomatic (from Murphy's Law) that at the time the request is made there is either an equipment available in which to try the substitution but not enough time, or, alternatively that there is enough time to run trials but no equipment to run them on. Thus, he has accumulated—the hard way!—some considerable experience of what is “on” and what is not, which he offers for consideration.

Firstly, then let us look at the sort of substitutions that are often required by amateurs, and where the trick is easy; also the areas where one needs to gang warily.

Mechanical items are largely a matter of common sense; if the article specifies, for instance, an Eddystone drive for a capacitor, and all you have is a Japanese slow-motion dial with numbers round the periphery of the knob, clearly you have to change the mechanical layout, drill the holes as accurately as may be, and, instead of calibrating the dial directly in frequency with a mapping-pen and Indian ink, one must make a calibration graph showing frequency against the numbers on the dial—and the resulting drive, while tolerable will not have that silky feel one associates with the Eddystone device.

If the question is one of electronic components, the situation immediately divides into groups: passive components such as resistors and capacitors, wound components such as coils, chokes, and transformers, and active devices, which in turn break down into valves, transistors, and integrated-circuits.

Taking the first group, the top of the list is resistors. These can be divided into carbon types, metal-oxide, metal film, and wirewound among the fixed resistors, while the “pots” may be carbon-track, wire-wound or cermet, single or multiple turn, and having either a linear, a logarithmic, or a special “law.”

For many years, the carbon resistor had complete domination in the small sizes used in electronic work, usually at twenty per cent tolerance, in either  $\frac{1}{4}$ ,  $\frac{1}{2}$ , 1 or two watt ratings; carbon compo for normal use and “high-stability” for special places. Frankly, these types should be regarded as obsolete, and only used in places where a drift in resistance with time is quite tolerable—certainly never in the front-end of a receiver or converter, where the noise generated by them may prove to be the limiting factor to sensitivity. It should be noted with these types that the values shown on these components is the “selection tolerance” and is *no guarantee* that the component will still be within tolerance by the time you come to use it. In general, carbon types tend to drift higher with life, and to change value after a little use; with temperature rise, the resistance tends to fall, unlike

metallic materials.

In general, these resistors may be replaced by metal-oxide types between 10 ohms and about one megohm, usually to DEF 5115, Style RFG; and here we immediately come up against a marked change in the philosophy—these specifications are “triple-rated.” For example a resistor might be classified as being one watt general purpose, half watt high stability, and quarter-watt semi-precision *at one and the same time*; thus the same component serves three different purposes, to the great relief of the storeman! Additionally, the metal-oxide types are made to five per cent, two per cent, or one per cent tolerance; this by intent not selection, so that the price of each tolerance is the same. The company for which the writer works has standardised on using two per cent types across the board, thus saving the storage space for all the five per cent requirements at a stroke; and “specials” of one per cent are only called for as required. On the other hand, the Navy standardises on one per cent type resistors for all maintenance purposes, regardless of whether the originally fitted component was any higher tolerance. Thus we can explain Rule Number One, which is that a component may always be replaced by one of the same type and closer tolerance of the same nominal value. Thus, in the ship's stores, one type of resistor is now used for replacing maybe twenty different types previously required. The metal-oxide types come from  $\frac{1}{8}$  watt to seven watts dissipation ratings.

Metal film, in fixed resistors, is a term generally taken to refer to a different type to the “thick film” or cermet type of which more anon. In general, the metal film will be an acceptable substitute for metal oxide, and possesses the useful facility of covering a wider range of values, being obtainable from below an ohm to well into the megohm range; however, it is normally only given a single rating. Both metal-film and metal oxide types of resistor are far better as regards stability both with temperature and time, than any of the older carbon types; up to ten times better with temperature, or even better in some cases.

Wirewound fixed resistors should never, ever, be used at RF; they serve only for high-dissipation applications in DC power supplies, such as bleeder resistors. One only exception to this rule is known to the writer; a linear amplifier using four TV sweep-tubes in parallel has been known to use a wire-wound resistor as a sort of lossy RF choke with tolerable results. As to the ratings, it should be noted that wire-wound resistors should be run to dissipate power as near to their rating as may be convenient, because if a wire-wound component carries a very low wattage, the wire will warm up but not heat the former to any extent, so that if there are any air bubbles in the vitreous enamel coating, there may be a place where the wire is not touching either enamel or former, and can therefore get hot and go open-circuit. This would not happen were the resistor dissipating a fair wattage.

### Potentiometers

There are, for practical purposes, three materials, carbon, wire, and cermet. Carbon is the traditional stuff for volume controls and similar applications; it should never be allowed to draw current through the slider, or it will go noisy and/or fail completely at a moments

notice! This material is used with either a "linear taper" or a "log law"—the first one is so made that if you plot degrees rotation against resistance you get a straight line graph on linear graph-paper. Such might be useful for, for example, a voltage-setting pot in a PSU. The log law comes into its own where the application is connected with the faculty of hearing, since hearing is, in terms of loudness, a logarithmic function. Thus a log pot used as a volume control gives a nice even control of the loudness—if one put a linear one in by mistake, the control would be "all at one end."

Wirewound pots are the traditional materials for applications where power is going to be dissipated and current taken off the slider. In the big 'uns it still holds sway, but cermet is a useful—indeed probably a better—alternative. Perhaps the main thing that separates them is the question of "resolution." Clearly, the slider of a wire-wound pot makes its smallest move when it moves from one turn of wire to the next one in either direction; thus, in effect, it moves in small steps. On the other hand the cermet pot has no steps as such, and so we can say it has much better resolution. That alone may be every justification for changing from wirewound to cermet! And, of course, pots aren't always the ones on the front panel, either—the ones on the board may be of any of the three materials mentioned, and may be of one turn or a multiple turn device, often tagged a "trimpot" although that title is a trade name.

### Capacitors

This is where the going gets a bit interesting! Our various capacitors can be of electrolytic, paper, plastic foil, ceramic, and mica as the main variants. Let's look at the electrolytics first. They need to "see" the right polarity—if you want to smell a vile stench try wiring an electrolytic with its negative end to the positive of the supply volts, and its positive to supply negative. Just switch on, and reach for a gas-mask! Enough said about *that*. Of the electrolytics, there are the "ordinary" ones, similar ones but a bit better and glorifying in the appellation "computer-grade," for use on power supplies of one sort and another, low-voltage ones of the "ordinary" breed for decoupling (and coupling, too, in transistor equipment) as well as the "tantalum" ones which have a better life expectation, particularly if the gear is only going to be switched on once in a blue moon. Apart from the tantalum types, all the others should be "formed" again every so often, by putting them, in series with a ten-thousand ohms resistor, across a supply of the right polarity and capable of being taken up to the voltage rating of the capacitor; once there it can be "stewed" for an hour or so until the leakage current is minimal.

If you are going to replace an electrolytic, make sure you put it in the right way round circuit-wise; it is easy enough to do this on power supplies, but if it happens to be a low-voltage one coupling a couple of transistors together in a "clever" bit of circuit, even a professional development engineer would be scratching his head as to which is the right way round. Thus, it is *essential* in such a case to make sure which end of the one you take out is which, and *make a note of it*. If the electrolytic is anywhere in a power supply for a transmitter, put a ten thousand or so pf capacitor across it so as to decouple

the circuit to RF—the electrolytic does not look at all like a capacitor above about a few hundred kilohertz, depending on its value and rating.

Paper capacitors are to be found all over the place in older equipment; and the chances are good that they'll nearly all be a bit leaky, too! Paper ones are not too common in new equipments nowadays, their places having been taken by plastic-foil types of one sort and another. This is O.K. usually because the paper ones were usually decoupling at lowish RF or coupling at audio; and any change will probably be for the better anyway!

Now we come to the truly RF types, namely mica and ceramic. This is where you have got to be CAREFUL. Let's look at the ceramics first. There are two definite types, one for use in non-critical applications such as decoupling, where the object of the exercise has been, essentially, to get as much C into as small a space as possible for a given voltage rating; and t'other is for more "clever" purposes, for which the dielectric will have a specified temperature coefficient, which may be negative with increase of temperature, positive ditto, or as near as dammit zero. However, these are not the only parameters, insofar as size-and-shape vary between manufacturers, and the voltage ratings vary. In addition, one has to decide whether one needs the leads to come out axially or stick out sideways! Thus, by far and away the best thing you can do is to drag out the equipment handbook, find out what the recommended spare is, and buy it from the equipment maker. Obviously, you won't be changing it if it's a good 'un, so you can't run a series of tests to find out what it does with temperature and hence to find out what dielectric is being used. If that can't be done, you may well find that by just fitting whatever is to hand in the line of ceramic capacitors, the gear will work—but whether it will still be capable of working within its specification limits over the whole temperature range for which it is designed is going to be a moot point. However, the amateur in such a situation can console himself with the thought that if it works within his requirements and within his temperature range, that's good enough! If it *isn't* then about all you can do is to make note of which dielectric was in the capacitor you first tried, what the effect of it is, and try and find one of more suitable dielectric material.

If all this sound a bit complicated and unnecessary, the writer suggests you get hold of a 1973 Erie catalogue, (which should be easy because lots of people are tossing them out in favour of the latest, 1976, edition!) or a more recent one, and scan through it carefully, particularly paying attention to the various sets of curves for this and that dielectric material.

Next, mica. Mica is a naturally occurring material, and so its parameters tend to vary a bit; but that is the maker's problem! Basically, the amateur application is essentially summed up as: everywhere the capacitor has to carry currents of sizeable magnitudes. For example, the capacitor joining the end of your pi-tank in the rig to the PA anode; this should always be mica, preferably of the type where the capacitor is encapsulated in epoxy resin rather than in the cheaper "digestive biscuit" coating or plain wax—the digestive biscuit has a tendency to be porous, so if you must use it, examine the capacitor under a glass to see if its coating is not

full of pinholes, while the wax just melts and flows away to the bottom of the cabinet, leaving the capacitor all naked and unadorned. Mica capacitors do not like this and promptly let the damp in from the atmosphere, so the next time you switch the rig on—"Proof!"—and you are QRT again.

One type we have not mentioned specifically is the polystyrene; these come in close tolerances and look (and are) just like the general run of plastic-foil capacitors. However, they have the endearing trait of behaving almost exactly oppositely to the ferrites with temperature; so if you want a tuned circuit using a ferrite pot and a C to "stay put" under all conditions of temperature, then the C will usually be polystyrene, or maybe an equally carefully-selected ceramic. However, beware of polystyrene and plastic capacitors in which you can see the construction—this sort are very useful, but it is awfully easy to pull the leads away from their anchorage, which gives you a disconnected capacitor which looks O.K.

### Inductors

Again there are, basically, three types. First, of course, come the air-wound variety used in receivers, transmitter tanks, and similar purposes. These don't normally "blow up" so much as get sat on when the equipment cover is off! Then we have the ferrite-cored variety, such as, for example the well-known 88mH toroids, and the third general classification is the iron-cored laminated type used at audio and mains frequency.

To deal with the first variety requires a show of ingenuity more than anything. If it is to be fixed-tuned (as, for example, a converter front-end), then get as much information as you can about the problem by carefully looking at the wreckage of the old one and the circuit diagram. For example, let's imagine we have just wrecked the aerial coil of a converter. We can see how far up the wire the input tapping from the aerial lies—if it's  $\frac{1}{2}$  of the way from the earthy end of the coil when straightened out, it's a fair guess that  $\frac{1}{4}$  of the way up from the ground point of the new coil will be about right. There will be a trimmer capacitor shown connected across the coil, or a fixed C and the coil had a slug in it; note the value of a fixed C, and/or remove the trimmer and measure its capacitance at the setting it had before you lifted it out. Now, all you have to do is reach for your trusty GDO, wind a coil and away you go. The coil should resonate with the appropriate value of C connected across it, and with the slug half-way in to the coil turns, to ensure a bit of leeway for adjustment.

Ferrite pot cores and toroids have the characteristic of having virtually no external field, so the use of a GDO is completely out. Also, different ferrites are of use over differing frequency ranges, and the ferrites offered by different makers do not always have the same characteristic. However, your circuit diagram doubtless shows the inductance in the Table of Values, and you—we hope—know roughly the frequency at which the thing is going to be used. From this, you can find as many ferrites as you can in the junk box and select one from these on which to start the new design; or you can get the maker's data sheets and catalogue, and decide on a suitable material and a suitable size, when a little

calculation will show how many turns of what wire gauge (incidentally, "winding wire" as it is called, is almost 100% metric nowadays, so don't waste time doing sums on S.W.G. sizes unless you've actually got some!) should be wound on the former. But, this writer would say, very definitely, don't try it unless you are "in extremis" if only because you *won't* know the Q for which the original was designed; so you will have to aim for the very highest possible Q by choice of wire and ferrite, only to have to lose some of it by damping the beast down to give the correct performance in the circuit.

Finally, in the way of inductors, we come to the laminated iron-core chokes and transformers. Here, the eye is as good a guide as any. If the outputs are the desired values, and the inputs likewise, and the size is the same as the original—particularly as regards the amount of laminated iron present—then it is worth trying at the very least. And it wouldn't be the first time that a mains transformer has been made to do duty as a modulation transformer, at that!

However, while the same arguments can reasonably be applied to smoothing chokes, it must be realised that any attempt to measure the inductance will be misleading in that the value of L falls the moment a direct current is passed through it, be the "iron" just that, laminations, or even ferrites.

### Active Devices

These include valves, semiconductor devices and IC's. In general, a valve of a specified type number can be changed to one of another manufacturer bearing the same type number, or indeed any valve which is quoted in the valve data books as being an equivalent. However, one may find a need for selection of valves from a batch, regardless of maker in some cases. For example, one thinks of the VFO of a certain transceiver—if it goes "drifty" keep on changing VFO valves until you come to the best of the bunch, and use that one. Double triodes used in simple valve-voltmeter circuits often need selection to get a valve which will allow the meter to be zeroed. A good tip with such types as these is to "age" them by running them continuously for a few days and then rechecking that the circuit will still zero properly.

Transistors need watching. Preferably replace with another one of the same type and by the same maker, and, at least with germanium devices, be ready to have to alter the values of resistors to some slight extent due to changes in the technology since the original was made. Turning to silicon transistors, the advent of the planar epitaxial methods resulted in a rapid swing up from low frequencies straight up to UHF and beyond. This is a matter of some importance, as one may find what looks to be a "good" substitute for a dud transistor or one you can't get turns out to be wildly unstable. Usually this is because the original device had a relatively low maximum frequency and the new one shows significant gain right up into the gigahertz region—which can be a darned nuisance if you are trying to make a repair to a Top Band D/F receiver! Even specimens bearing the same type number by different manufacturers may be wildly different. Take the ubiquitous 2N3055 power

transistor; while they all meet the published parameters of a 2N3055, the unpublished parameters vary enormously; and, for example, the low value for FT quoted in the spec. for the 2N3055 may be well beaten by some devices from particular makers, whose output of 2N3055's can happily be used as PA stages on Top Band! In case the significance of this escapes you, recall that electrolytic capacitors don't look like capacitors any more when high frequencies are in question; thus you may find that one of these "Top Band PA" types will go frantic when it is soldered into a previously quite tame power-supply! It is of interest in this connection to notice that often "dud" power transistors, if opened up and examined with a high-power glass, prove to be still workable, the failure being of the lead coming from the chip to the output pin having fused through an overload.

### Warning

It should be noted that some transistor types have Beryllium Oxide in their make-up; if you have one or more such, don't open them up, and don't just ditch 'em into the bin if you "pop" one. If you have any "professional" friends, they may be able to take them, but if not, they may be returned to the makers, clearly labelled for what they are and what is wrong with them. The manufacturers have facilities for dealing with them. Just recall that this stuff is *highly toxic*, so make sure you have the position of any such devices clearly marked on your gear, and know just what to do with them, should they fail.

### Integrated Circuits

As far as TTL is concerned, almost anybody's TTL device will swap with the equivalent from another maker; and RTL and DTL are obsolete anyway. As far as MOS IC's go, the question of whether they will interchange with another maker's device is secondary to the prime one of getting it soldered in without blowing it up (and the same goes for the majority of FETs, too). To use a brass plate on the workbench, to check the bit of the iron is effectively earthed, and the hands too (this latter by being sure the wrists are earth, either on the plate directly or by using "fettors" on the wrists, the chains of which are connected to the brass plate and earth) and to use a conductive material to cover one's seat are just a few of the precautions, not to mention nylon clothing which is *verboten*; all this won't stop you from popping the odd device now and again.

About the only thing to bear in mind with IC's of the logic sort is that, while they are all pretty fast, it seems to be generally the case that new specimens of a given type generally are a bit quicker than older ones.

When one comes to the linear IC's, we have a major collection to play with. Op-amps (operational amplifiers if you are pedantic) are just gain blocks; the special types intended for consumer or communications use are a law unto themselves; and the third category is that of power-supply regulation. This latter is a boon, in that one can provide each of several printed circuits with its own voltage regulator—which of course effectively gets all the surges which inevitably occur with logic which is "clocked" off the main wiring by restricting the surges to the board concerned.

### Conclusions

So, you've got a bit of equipment which has "gone up the spout." You have taken the circuit diagram and traced out and located your fault to a particular item. It is hoped that the foregoing few words will enable you to look into your boxes of bits and to decide if there is anything suitable, or whether you have to go out and buy something! For the budding home-constructor with an article in the Magazine which he wants to build, we hope this will lead him away from the pitfalls of rash substitution—but any home-brew equipment which is a non-goer when first switched on is almost certainly fitted with a wiring error, so check this before you curse the components!

## ANOTHER TIME-OUT INDICATOR SELF-CONTAINED

H. ALLISON, G3XSE

THE proliferation of repeaters, and the consequent short overs, plus the risk and inconvenience in observing the second hand of one's watch while driving, resulted in a unit being designed to give an indication of impending time-out and so preventing the writer "nattering-on" without benefit of a listener.

Many time-out indicators have appeared in the literature, mostly based on the ubiquitous NE555 IC. Though fine for their particular applications, they require modification to existing transceivers, and, by reason of their size are generally of no use with /Portable equipment. The design here presented not only overcomes this, but has the advantage of being transferable from car to car or even (Heaven Forbid!) used in the home station. Another feature of this design is that it is a "hands-off" instrument; in other words no action is required by the operator to use the gadget—it doesn't even sport an on/off switch!

### Circuit Description

Refer to Fig. 1. A 19-inch length of wire acts as a quarter-wave aerial on Two Metres, and a degree of selectivity is also obtained by the tuned circuit L1, C1. CR1 is a germanium diode used to rectify the received carrier signal; the RF is decoupled by C2 and the remaining DC is fed, via a limiting resistor R1 to the base of TR1. This is a high-gain "darlington" transistor and is used to give reasonable sensitivity for portable work—with the normal ten-watt mobile transmitter, almost any npn transistor will serve.

The collector load of TR1 consists of a LED (Light Emitting Diode) and its associated series limiting resistor R2. The DC already mentioned as appearing at the base of TR1 turns it on and so causes the lamp to light when a carrier appears; and TR1 collector is also strapped to ML1A, one gate of a CD4001 used as an inverter. The output of this gate charges C3 via R3 and R4 to give an approximate delay of 55 seconds; CR2 provides a discharge path for C3 through the output end of ML1A.

**Table of Values**

**Circuit of Time-out Indicator**

C1 = 6-25 pF variable	R1 = 10,000 ohm
C2 = 200 pF disc ceramic	R2 = 1,000 ohm
C3 = 68 $\mu$ F electrolytic	R3, R5 = 1 Megohm
C4, C5 = 0.1 $\mu$ F	R4 = 1 Megohm variable
	R6 = 4,700 ohm
	R7 = 47,000 ohm
TR1 = MPSA 14	CR2, CR3 = 1N4148 -
TR2 = BFY 50	ML1 = CD4001
CR1 = OA81	LED = Any suitable LED to choice
L1 = 6 turns, 18 swg, tapped 11, on $\frac{1}{4}$ " dia. former	T1, LS1 = see text 14-pin DIL socket

The output from ML1A and the timing circuit appears at the input to ML1B, which serves both to again invert and, possibly more important still, to "clean-up" the delay output.

ML1C and ML1D are connected as a conventional CMOS oscillator, and are "switched on" by the operation of ML1B just discussed. To work as an oscillator, ML1C and ML1D must be biased in to the linear part of their characteristic; CMOS only draws significant current when it is in this area, and so CR3 is so connected as to bias the oscillator hard into a logic "1" state while the front-end is *not* receiving a carrier. The oscillator output is connected, via a limiting resistor R7 to the base of TR2, which may be any npn transistor man enough to drive T1 and yield a squawk out of the loudspeaker. T1 and LS1 are as easily found by cannibalising a cheap Japanese transistor radio as by any other source.

**Construction**

This has been constructed in umpteen ways, all different; but one precaution to be *insisted* on is to use an IC socket for ML1; remember it is a CMOS device, and put it in place last of all. "Dead-bug" construction techniques can be relied on to produce dead CMOS bugs! The first prototype was built up on a 1½" x 2½" Lectrokit board, and housed in one of the mid-sized

diecast boxed, complete with speaker and PP7 battery. By careful construction and the use of a PP3 battery, the whole issue can be persuaded to go into the small diecast box size.

**Alignment**

Commence by connecting a testmeter such as an AVO Model 8 in series with the battery; it should show less than five microamps. Remove the meter and connect normally, injecting a two-metre signal either by signal generator, GDO or by turning on the station transmitter; the LED should now light, and C1 may now be trimmed for best sensitivity, either by turning the generator down or walking away from the rig as the case may be, all the time tuning C1 for the lamp-on state.

After a period of continuous carrier indicated by the lamp being alight, a tone should be heard emanating from the 'speaker'; the delay between the reception of the carrier and the onset of tone can be set to the desired length by adjustment of R4. It should be noted that the time period depends on the leakage resistance of CR2 and C3 and the input impedance of ML1B; thus if the desired timing cannot be obtained, the time constant may be altered by changing R3 as desired.

**Operation**

Shove it on the back shelf, or the back seat, in the car and just forget about it! The low battery consumption makes an on-off switch quite unnecessary. When the box makes its noise, then it's time to go to receive.

**Variations on the Theme**

Some people will regard the current drawn by the LED as being a bit much; if you are one of these, then dispense with the LED and connect a 470k resistor as the collector load to TR1 to reduce the current during the "count-up" cycle.

An untuned RF Choke will give broadband coverage; or the tuned circuit can be altered to give coverage of 432 MHz. If you use the wide-band variation, be careful about parking too near to cars with commercial gear aboard (public services, for example) lest you be interrupted by a tone which you can't shut off!

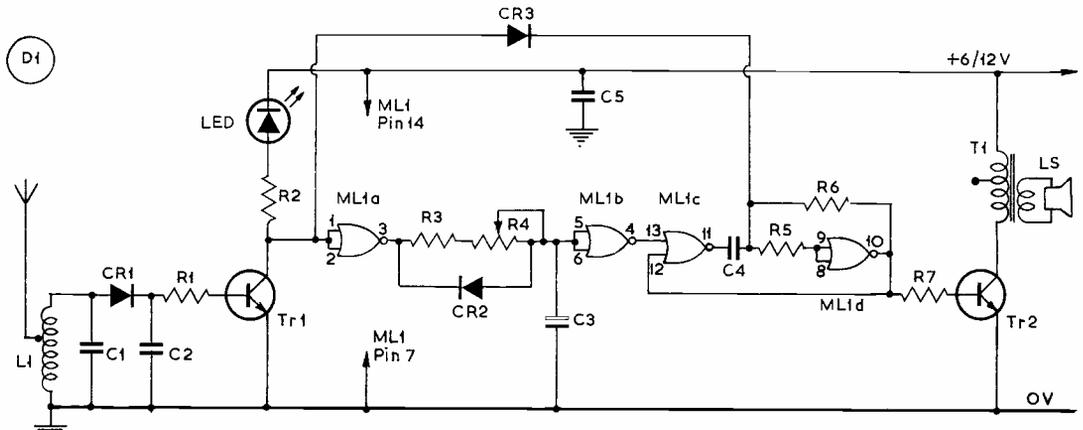


Fig. 1

## SIMPLE BATTERY-CONDITION INDICATOR FOR /M

SIMPLE — RELIABLE AND FAILSAFE

**T**HIS circuit is useful on any car, but all the more so if one is fitted with anything at all QRO in the way of mobile gear. It also, as a matter of interest, shows up the conflict between the "analogue" type of indication, and the modern "digital" approach which is often used purely to be modern and with-it, completely neglecting the strong points of either method.

Basically, one may say that where a user—the pilot of an air-liner, say—requires to monitor umpteen different parameters at a glance, looking for a *change*, then analogue indications such as ordinary panel-meters are the right thing. The pilot knows from experience how each meter-needle *should* lie on its dial, and a change in one out of, say, forty dials is noted at each sweeping glance. Were these forty meters all made digital, then he would have to have a tame meter-reader at work, and even then it is unlikely that he would note a change in one reading. On the other hand, a digital indication is the obvious answer for, say, a calculator (compare it with a slide-rule!), or a depth-sounder aboard a boat, where the object of the exercise is to have a clear statement of a numerical answer up-dated regularly. In such a case, a meter is clearly quite inferior to a digital display.

Our requirement here is for some means of indicating the state of the battery on the car; one which will fail safe—that is, no indication implies the presence of a possible fault, either in the car or of the indicator; it must not distract the driver; and it must supplement any indication already aboard, such as the ignition warning-lamp on the dash, the ammeter, or whatever.

This simple circuit, containing as it does only three components (and one of those doesn't appear on the circuit) meets all these requirements, and in addition, if the work is carried out neatly, will not disfigure the family carriage in the way that, say, an extra bolt-on instrument panel does. Additionally, the cost is minimal—a few coppers almost.

Now, to the mode of operation, and here we have to say, firstly, that the lamp-holder in which the bulb is fitted must have a *green* jewel if the thing is to work properly! In fact this is the third component and a vital part of the system. Consider your car's battery. Normally while running, the battery voltage will sit around 13.5 to 14 volts; above 14.5 says the charging system is going berserk, while a voltage of 13 or under indicates that the dynamo or alternator is not holding the battery voltage up, possibly due to excess load, or a slipping fan-belt of whatever. With these thoughts in mind we may turn to Fig. 1. Some "circuit" you will remark!

Now, the twelve-volt Zener diode voltage is, effectively,

blocking twelve volts off from the lamp, which therefore sees the battery voltage less twelve volts.

Thus, the lamp will approach full brilliance only if the terminal volts rise far higher than they should, saying the battery is being grossly over-charged. If the battery is full, and being charged normally, the lamp will be just aglow; and if the battery volts fall, either due to excess load or lack of charge, the lamp will just go out. In other words, if the bulb fails, you suspect a fault, just the same as if it goes out due to lack of voltage.

Now, this is where we have to consider the question of the green lamp-holder jewel (most likely a plastic "jewel" these days!). Well now, consider what the green jewel does; it stops light of other than "green" wavelength and passes, to a large extent, only light of green. Now, our little lamp will give out mostly red wavelengths when it is only just aglow, and will only emit a sizeable amount of green when the bulb is getting quite bright. Thus, not only have we "suppressed the zero" of our analogue to the tune of twelve volts with the zener, but also we have fitted the bulb into a holder which adds maybe another volt of suppression just by its colour! And, this is just about right; the lamp under normal conditions is not bright enough to disturb by night nor is it quite invisible by day; thus, by day or night your little glim on the dashboard is telling you you can safely carry on mobilising; and if a fault situation develops, it gives you advance warning. For example, if the lamp goes out while you are on full load but comes up again when you go to receive, you know you are "pushing it a bit" and a glance at the ammeter will tell you whether the charge rate has gone up to compensate; if not, but there is at least a mite of, or zero, charge on the ammeter, then QRT and press on—your lamp will give you lots of warning if the battery falls any further. On the other hand, if the lamp comes up abnormally bright while on a run, you can be sure that you are overcharging the battery, and your ammeter will confirm this high charge rate while the lamp is saying the charge rate should have been cut down by the regulator.

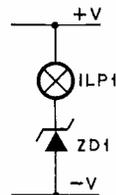


Fig.1 Battery condition indicator

D2

ZD1 is a twelve-volt zener diode, which may conveniently be a BZY 88 or similar type, while ILP1 is a five-volt, forty-millamp lamp bulb, fitted in to a green-glass lamp-holder. It should be noted that one end of the circuit will be at chassis potential; generally the positive with older cars, and the negative end with the more modern types. Thus, in the writer's Rover 100, the positive end is connected to a convenient chassis earth behind the dash, while the negative end is joined to the twelve-volt rail where it leaves the ignition switch so that switching off the ignition disconnects the indicator.



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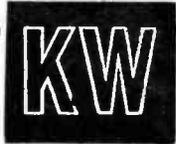


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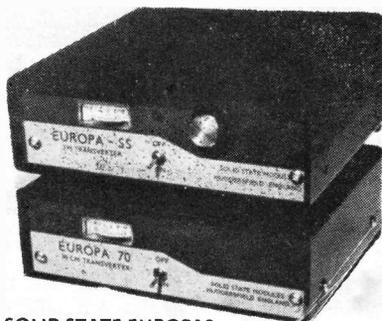
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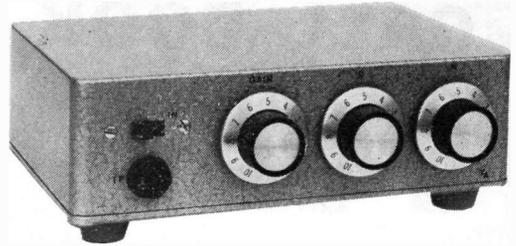


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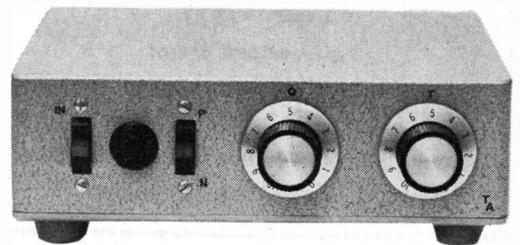
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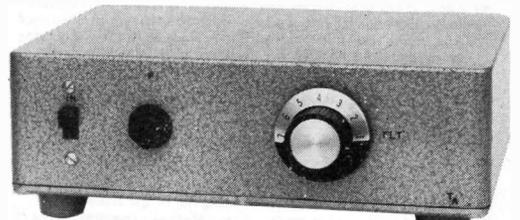
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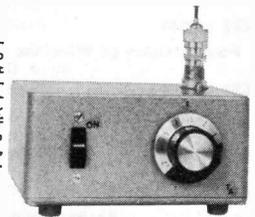
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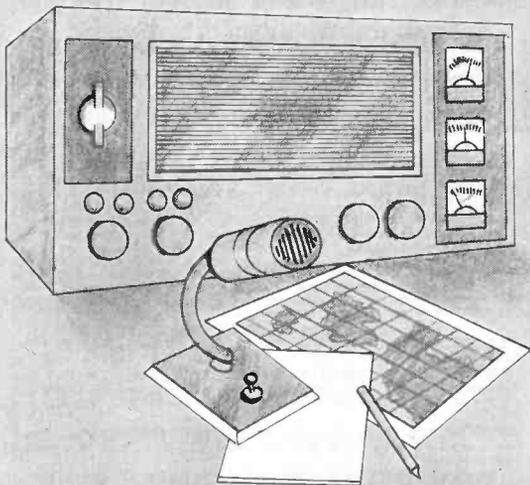


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144-030 ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144-4/433-2 ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
144-480 ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144-600 ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144-700 ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-000/SO ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-050/R2T ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-075/R3T ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-100/R4T ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-125/R5T ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-150/R6T ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-175/R7T ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-200/R8T ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-300/S12 ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-350/S14 ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-400/S16 ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-500/S20 ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-525/S21 ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-550/S22 ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-575/S23 ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-600/S24 ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-650/R2R ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-675/R3R ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-700/R4R ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-725/R5R ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-750/R6R ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-775/R7R ...	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145-800/R8R ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a
145-950/S38 ...	a	a	a	a	a	a	a	a	a	a	a	a	a	a

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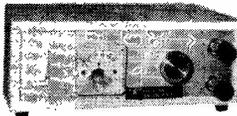
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